Draft Initial Study/ Proposed Mitigated Negative Declaration

University of California Santa Cruz

Merrill Residence Halls Capital Renewal

(Tiered from 2005 LRDP EIR)

Prepared By:

Office of Physical Planning & Construction
University of California Santa Cruz
1156 High Street, Barn G
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June 2012

Contact: Alisa Klaus, Senior Environmental Planner
(831) 459-3732

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UNIVERSITY OF CALIFORNIA **June 2012**
Santa Cruz Campus

1 PROJECT INFORMATION

Project title:

Merrill Residence Halls Capital Renewal

Project location:

Merrill College, University of California, Santa Cruz main campus, Santa Cruz, CA

Lead agency's name and address:

The Regents of the University of California
1111 Franklin Street
Oakland, CA 94607

Contact person:

Alisa Klaus, Senior Environmental Planner (831) 459-3732

Project sponsor's name and address:

Office of Physical Planning & Construction
University of California Santa Cruz
1156 High Street, Barn G
Santa Cruz, CA 95064

Location of administrative record:

See Project sponsor, above.

Identification of previous documents relied upon for tiering purposes:

UCSC 2005 Long Range Development Plan Environmental Impact Report. Available on line at:
http://lrdp.ucsc.edu/final-eir.shtml

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.

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. As shown in the Determination form in Section 5 of this document and based on the analysis contained in this Initial Study, which is tiered from the UCSC 2005 Long Range Development Plan Environmental Impact Report, it has been determined that the proposed project would not result in any potentially significant impacts that either were not previously identified and analyzed in the 2005 LRDP EIR, or that cannot be mitigated to less-than-significant levels through mitigation included in the project.

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 less-than-significant impact with the implementation of mitigation measures. Therefore, preparation of a Mitigated Negative Declaration is appropriate. The proposed Mitigated Negative Declaration is presented in Appendix A.

2.2 PUBLIC AND AGENCY REVIEW

This Draft Initial Study will be circulated for public and agency review from June 8, 2012 to July 9, 2012. Copies of this document are available for review at the following locations:

UCSC Physical Planning and Construction, Barn G, UC Santa Cruz

McHenry Library and the Science and Engineering Library on the UC Santa Cruz campus

Central Branch of the Santa Cruz Public Library in downtown Santa Cruz

The UC Santa Cruz web site, at http://ppc.ucsc.edu

Comments on this Draft Initial Study must be received by 8:00 AM on Monday, July 9, 2012, and should be sent to:

Office of Physical Planning & Construction
University of California Santa Cruz
1156 High Street
Santa Cruz, CA 95064
Attn: Alisa Klaus, Senior Environmental Planner

Comments also may be submitted by email, by 8:00 AM on Monday, July 9, 2012, to: EIRcomment@ucsc.edu. Please include "Merrill Capital Renewal" in the email subject line.

2.3 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 UC decision-maker will consider design approval of the proposed project in September 2012. Removal of trees for construction of the site improvements would require a timberland conversion permit from the California Department of Forestry and Fire Protection (CalFIRE) and preparation of a timber harvest plan.

2.4 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 are 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, the standards of significance, and an explanation of all checklist answers.

Section 7 - Fish and Game Determination: indicates whether the project has a potential to impact wildlife or habitat and therefore will require payment of a Fish and Game filing fee.

Section 8 – References

Section 9 - Agencies and Persons Consulted

Section 10 - Report Preparers

Appendix A – Proposed Mitigated Negative Declaration

Appendix B – 2005 LRDP Mitigation Measures Incorporated in the Project

Appendix C – Proposed Mitigation Monitoring and Reporting Program

Appendix D – Construction Health Risk Assessment and Noise Technical Analysis

Appendix E – Greenhouse Gas Emissions Calculations

3 PROJECT DESCRIPTION

3.1 PROJECT LOCATION

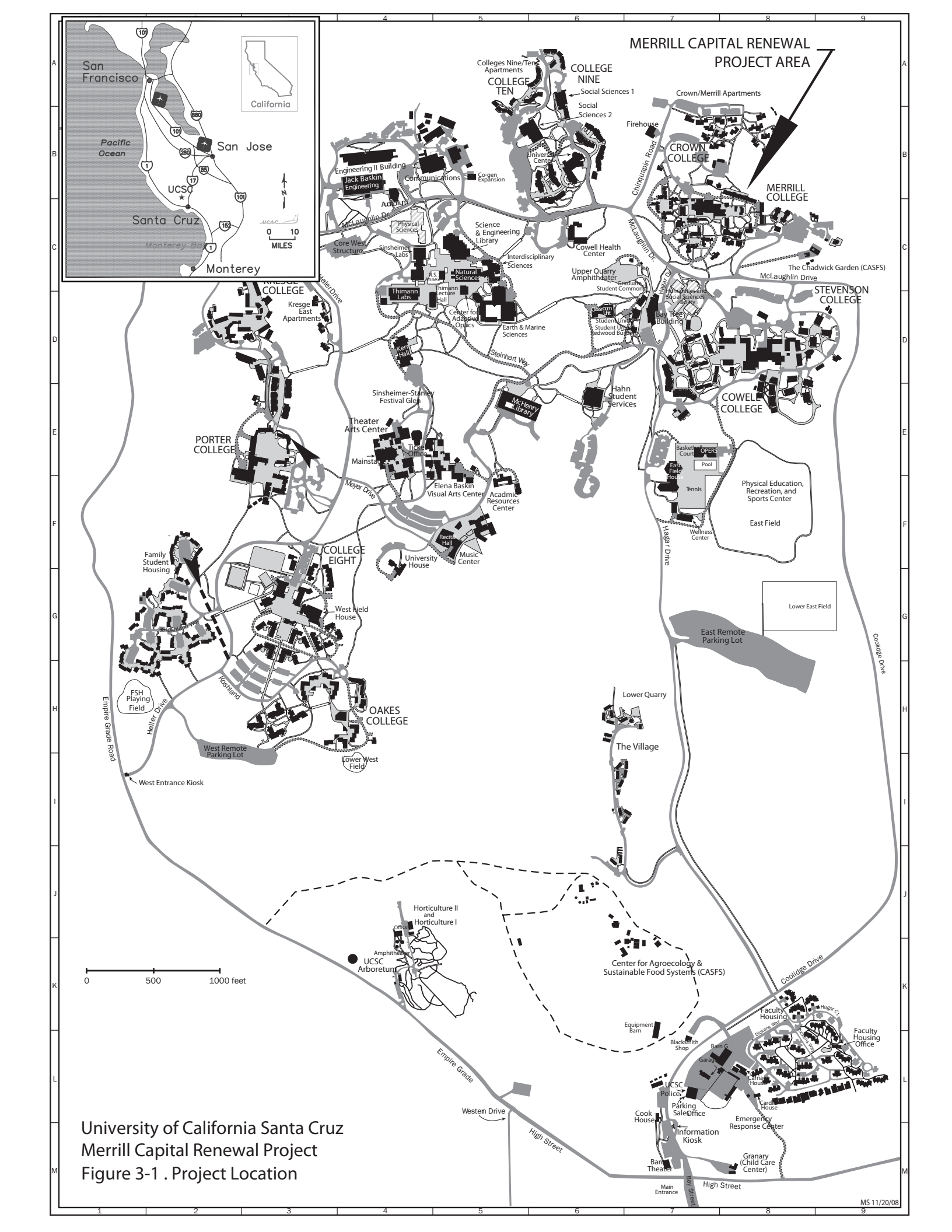
The University of California Santa Cruz (UC Santa Cruz) is located on the coast of Monterey Bay in Santa Cruz County, approximately 70 miles south of San Francisco, 30 miles southeast of San Jose and 30 miles north of Monterey (Figure 3-1). The approximately 2,020-acre main campus is roughly rectangular in shape, with its narrow side toward the coast. Approximately 53 percent of the main campus, including most of the area that is currently developed, is located within the city limits of Santa Cruz; the remainder is in unincorporated Santa Cruz County. Approximately 250 acres of undeveloped campus land on the western side of the Empire Grade are within the Coastal Zone.

Public open space borders the campus on two sides: Pogonip City Park and Henry Cowell Redwoods State Park on the east and Wilder Ranch State Park on the west. On the south, the campus borders the City's upper west side residential neighborhoods. The rural residential Cave Gulch neighborhood is located adjacent to a portion of the campus's northwestern boundary. To the north, the campus is bounded by private land and small-scale rural development. High Street, Bay Street, Western Drive, and Empire Grade Road are the primary access routes to the main campus.

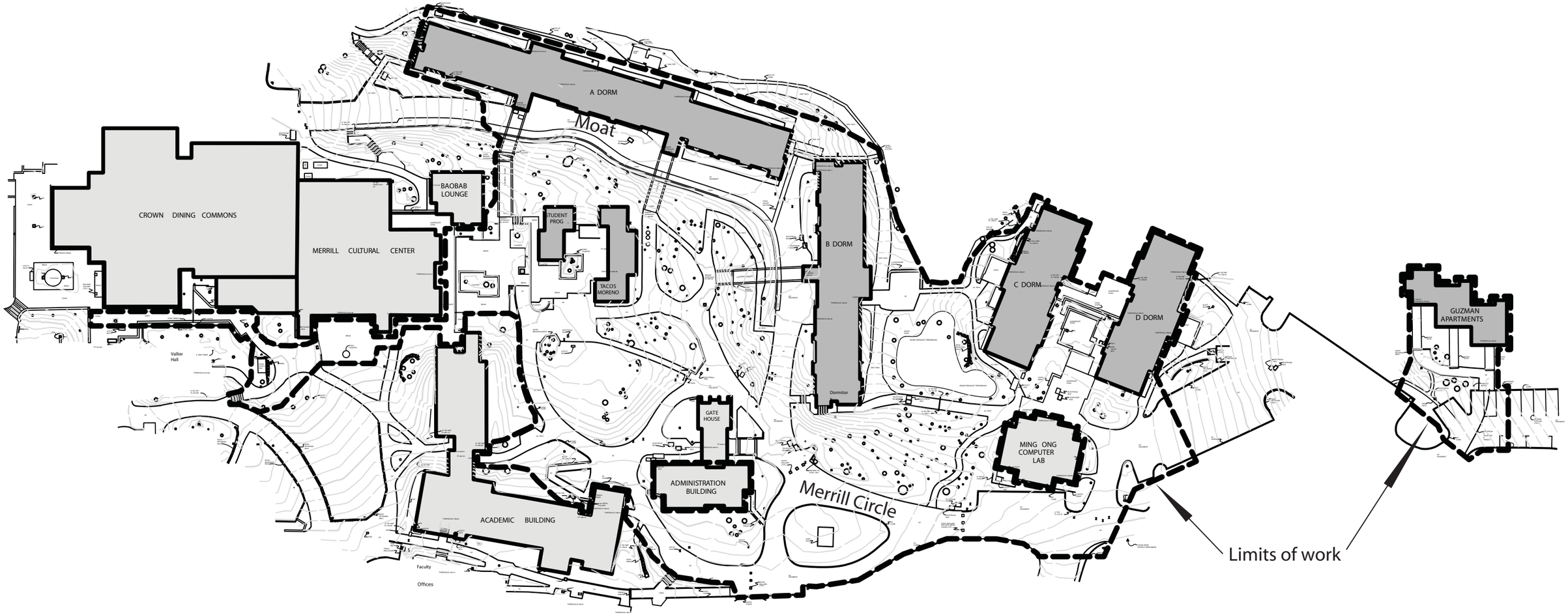
The project site is Merrill College, which is located near the northeast corner of the central campus, and is developed with college academic and residential facilities (Figure 3-2). Constructed in 1969, Merrill Residence Halls A and B are five-story reinforced concrete shell buildings (approximately 44,441 sf and 26,957 sf, respectively), and C and D residential halls are wood frame stucco shell buildings (8,179 sf and 7,322 sf, respectively). The Guzman Apartments is a wood-frame and stucco building that houses three apartment units (3,242 sf). Merrill Taqueria and the adjacent Student Activities office are small, wood-frame and stucco buildings (1,200 sf and 715 sf, respectively). The taqueria houses a cafe that serves breakfast and lunch. Altogether, the existing capacity of the residential buildings is 468 bed spaces. The Merrill Residence Halls provide housing for lower division undergraduates.

Merrill College and the adjacent Crown College are situated on an east-west-trending ridge. The taqueria and the adjoining patio lie at the center of Merrill College and just north of the crest of the ridge. The Taqueria sits at the elevation of the third floors of Residence Halls A and B. A wooded open area lies to the south of the taqueria; the Merrill Academic Building forms the southern boundary of the college center. The Merrill Cultural Center and the path to the Crown Dining Commons are to the west and several feet higher than the taqueria. Residence Halls C and D are downhill and to the east of the college center, beyond a dense redwood grove. Guzman Apartments lies further to the east.

The primary vehicle access to Merrill College is at the Merrill Circle, southeast of the quadrangle, where there is one accessible parking space. A service road descends from the Merrill Circle and provides access to the first floor of the Merrill Academic building. Service vehicle access to the taqueria and the Merrill Cultural Center is provided by a road that loops around the south side of the college center and connects with a wide path on the north side. Service access to Residence Halls A and B is provided by a service road the descends from the Merrill Circle into a depression known as "the moat" and connects to the Crown College Circle to the west. The moat is flanked by the residence halls on one side and a retaining wall on the other. The service road in the moat provides pedestrian entry to the first floor of residence halls A and B. Pedestrian bridges provide access from the taqueria and other buildings at the college center to stairway landings between the 3rd and 4th floors of residence halls A and B. Two bridges serve Residence Hall A, and one bridge serves Residence hall B. Vehicle access to Residence Halls C and D and Guzman Apartments are available from parking lots northeast of the Merrill Circle. There is also a pedestrian path that connects the south end of Residence Hall B to Residence Halls C and D.



University of California Santa Cruz
Merrill Capital Renewal Project
Figure 3-1 . Project Location



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Scale

N

University of California Santa Cruz
Merrill Capital Renewal Project
Figure 3-2 . Existing Site Plan

3.2 PROJECT OVERVIEW

The Merrill Residence Halls Capital Renewal Project (Project) consists of two major components. The first component is major maintenance and renovation of Residence Halls A, B, C and D; and Guzman Suites apartments, and improvements to interior building accessibility. The second component consists of improvements to the pedestrian circulation system and outdoor gathering spaces within Merrill College to meet accessibility requirements of the Americans with Disabilities Act (ADA) and to enhance the outdoor spaces within the college center. These improvements would provide accessible routes throughout the Merrill College center and between the buildings in the college center to the Crown College Dining Commons; improved community spaces; and enhanced visual and physical connectivity within the college. In order to achieve the gradients required for ADA-compliant paths of travel, the taqueria and Student Activities building would be demolished and replaced with a single building (the Plaza Building) in a slightly different location. The proposed site improvements are shown in Figure 3-3.

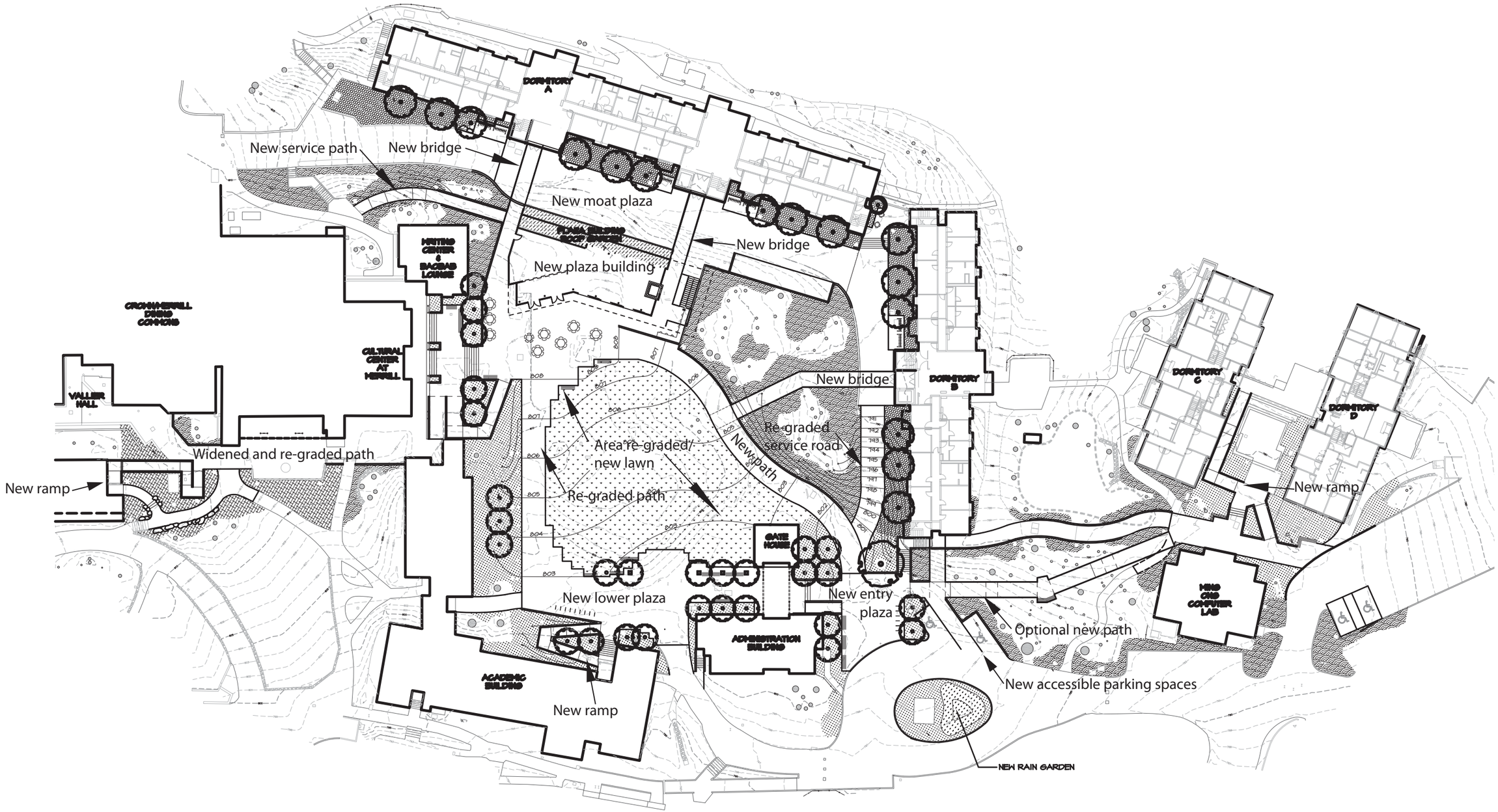
3.3 PROJECT BACKGROUND, NEED AND OBJECTIVES

The proposed project is part of a program of major maintenance of the campus' ten residential colleges. The goal of the program is to complete a cycle of major maintenance and repair for each of the campus' ten colleges every ten years, to address life safety issues, energy efficiency, changing codes and ADA compliance. The proposed energy retrofits, infrastructure repairs, and renovations to the residence halls are part of this program. In addition, the retrofit of toilets in the residence hall dormitories would partially implement an LRDP EIR mitigation measure that requires the replacement of all toilets in student housing on Campus with low-flow fixtures. The internal renovations trigger code requirements for ADA-mandated upgrades to the college. In addition, improvements to college gathering spaces are desired to enhance the community experience for students at Merrill College.

Implementation of the 2005 Long Range Development Plan as provided for in the Comprehensive Settlement Agreement between the University, the City and County of Santa Cruz and local community groups and members resulted in campus commitments to make housing available for 67 percent of all new students above an enrollment base of 15,000. Interior renovations may include reconfiguration to provide up to 61 additional bed spaces, in support the University's on-campus housing commitment.

The objectives of the Project are:

- Address mechanical, electrical, plumbing, and security maintenance issues in existing buildings
- Provide fit and finish upgrades on all the residential buildings
- Add up to 61 additional student bedspaces with minimal capital costs
- Increase occupant retention by improving the aesthetic appeal and functionality of the residential buildings
- Increase natural light inside the buildings, especially at common areas
- Provide additional sunny exterior spaces for social interaction
- Provide additional interior social interaction spaces
- Relocate Residential Life offices from residence hall to new Plaza Building
- Improve building and site accessibility
- Improve water and energy efficiency
- Improve way-finding within the college and within buildings
- Replace the existing taqueria building with a new building at the heart of the college for a small restaurant and residential life offices



University of California Santa Cruz
Merrill Capital Renewal Project
Figure 3-3 . Proposed Site Plan

3.4 PROJECT DISCRETIONARY APPROVALS

Following the close of the public and agency comment period on this draft Initial Study on July 9, 2012, the University will prepare responses to all written comments that raise CEQA-related environmental issues regarding the project. The responses will be published in the Final Initial Study/Mitigated Negative Declaration (IS/MND). The Final IS/MND and approval of design of the Merrill Residence Halls Capital Renewal Project will be considered by The Regents of the University of California through approval delegated by The Regents and adopted if it is determined to be in compliance with CEQA. Upon adoption of the IS/MND, The Regents will consider approval of design for the Merrill Residence Halls Renewal Project. The Campus anticipates that the project will be considered for approval in September 2012. As the wooded areas of the site are considered "timberland" under the California Forest Practice Rules, the Campus would be required to obtain a timberland conversion permit (TCP) from the California Department of Forestry and Fire Protection and to prepare a timber harvest plan (THP) before removing trees from the site. Prior to the beginning of construction, the Campus would submit a Notice of Intent to the Central Coast Storm Water Regional Control Board (SWRCB) and obtain coverage under the General Permit for Discharge of Storm Water Associated with Construction Activity.

3.5 CONSISTENCY WITH THE 2005 LRDP

The proposed project is consistent with the scope of development projected in UCSC's 2005-2020 LRDP (UCSC 2006a) and analyzed in the 2005 LRDP EIR (UCSC 2006b). The Project would not change alter the existing uses of the site. The 2005 LRDP building program includes 1,196,000 gross square feet (gsf) of student and employee housing and 151,000 gsf of Student Services space. The Project would replace the existing taqueria and Student Activities office building (a total of 2,250 gross square feet [gsf] of building space), with a new, approximately 7,200-sf building that would house a café and residential life offices. This would result in a net increase in Student Services building space of approximately 4,950 gsf. Previous projects constructed under the 2005 LRDP added 49,215 gsf of student residential building space at Porter Residence Halls A and B in 2008 and 2009. The proposed Project would bring the total new gsf of student housing space constructed under the 2005 LRDP to 54,165 gsf. Therefore, the new building area added by the proposed Project would be consistent with the 2005 LRDP building program.

The project would not result in campus population growth, but would provide housing for up to an additional 61 enrolled students. As discussed in relevant sections below, the project would not contribute to off-campus housing demand and would make a negligible contribution to off-campus traffic. The Project would increase energy efficiency and reduce water use in existing buildings, and would accommodate student housing demand on campus. Therefore, the project is consistent with the policy objectives of the LRDP with respect to compact, sustainable development that is sensitive to the environment. Sustainable design elements included in the project are detailed in Section 3.7, below.

3.6 DETAILED PROJECT DESCRIPTION

3.6.1 Building Renovation and Capital Renewal

Work on the existing residential buildings would include structural additions and/or repairs to residence halls A, B, C and D and Guzman Apartments; reconfiguration and remodeling of existing spaces to create new accessible restrooms and convert apartments to student rooms; replacement or upgrade of selected elements of the building mechanical, plumbing, electrical, and IT systems; replacement of roofs and single-paned windows; interior and exterior painting; carpet replacement; and miscellaneous other interior repairs and improvements.

Structural Additions/Repairs. New elevator structures would be constructed at residence halls A, B and D. The three pedestrian bridges to residence halls A and B would be demolished and replaced with new steel bridges a half-story above the existing bridges. At Residence Hall A, a new storage room would be created in an area of the basement that is currently underlain by unexcavated fill. Existing roof decks and stairwells at residence halls A and B would be enclosed to create lounges, and small portions of concrete walls removed to straighten hallways.

Building Envelopes. The roofs of all five residential buildings would be replaced, and single-paned windows in all of the buildings would be replaced with new dual-pane, low-E glass windows. At Residence Halls A and B, guard rails would be added at the roof perimeters. Other work on the building envelopes would include painting of exterior doors and walls and replacement of window coverings. The new elevators and stair and lobby towers would be enclosed with glass.

Building Systems. Selected elements of the building mechanical and plumbing systems would be replaced, including ductwork, piping, and air handling units on the roofs of Residence Halls A and B. Improvements to the electrical and IT systems would all be within the buildings' interiors. These improvements would include replacement of all lighting and some electrical outlets, and conversion of trash chutes in residence halls A and B to IT closets.

Bathrooms. New accessible bathrooms would be created in residence halls A and B. In existing restrooms, toilets would be replaced with high-efficiency fixtures; shower fixtures would be replaced; and other repairs would be made as needed.

Other. Other interior repairs and renovation would include replacement of carpets and window covers, replacement of door hardware, painting, drywall work and reframing at dry rot locations, and the addition of guard rails and handrails in stairwells.

3.6.2 Site Work

Circulation and Accessibility. Much of the area within the Merrill College center would be re-graded to allow for construction of ADA-compliant paths. The service road in the moat would be re-graded to reduce the gradient. The lower portion of the moat service road would also be widened and repaved to create a plaza with an entrance to the new plaza building (described below). The service road and path that provide service access to the taqueria and the Cultural Center would be widened from 8 feet to 12 feet and re-graded, and a new plaza created at its southern end, north of the Academic and Administration buildings. New service vehicle parking would be provided at the edge of this plaza. The three bridges that cross the moat to provide access to residence halls A and B and currently enter the buildings between two floors, would be replaced with new steel bridges. The new bridge to Residence Hall A would be a half story below the existing bridge; the new bridge to Residence Hall B would be a half story above the existing bridge. The path from the college center to the Crown College Dining Commons, along the southern edge of the Cultural Center, would be widened and re-graded for ADA compliance. Access to the Guzman Apartments would be provided by a new ADA-compliant parking space and a raised ADA-

compliant path to the building entrance. The Merrill Circle would be widened to provide a loading/drop-off zone and a passing lane. Two new accessible parking spaces would be added at the north side of the Merrill Circle. If funding permits, a new floating walkway would be constructed from the Merrill Circle south of Residence Hall B to residence halls C and D.

Other Site Work. Grading for the accessibility improvements would require removal of most of the trees in the wooded area south of the taqueria. That area would be graded to conform to the adjacent path and service road, and to create a flat, sunny gathering space. The existing taqueria patio would be demolished and the area incorporated into a new terraced patio that would extend to the eastern facade of the Cultural Center. The dense trees on the slope above the moat would be thinned. Exterior building lighting and site lighting would be replaced. Portions of the existing irrigation piping and sewer piping would be replaced, and utilities extended to the new Plaza Building.

Site work for the Project would require removal of a total of approximately 120 trees, mostly redwoods. Approximately 45 new coast live oak, ginko biloba, and scarlet oak trees would be planted in the site as part of the new landscaping.

Pervious or semi-pervious pavement materials such as concrete pavers, pervious concrete, or stabilized decomposed granite would be used for new paths. Asphalt would be used to surface Merrill Circle and the adjacent parking spaces, the upper portion of the moat service road, and a service path above the western end of the moat. Concrete would be used for the widening of the existing path from the Cultural Center to the Dining Commons. A rain garden would be added in the center of the Merrill Circle to collect and filter runoff from the new parking spaces.

3.6.3 New Plaza Building

The taqueria and Student Activities buildingf would be demolished and replaced with a new building of about 7,200 gsf, to the north of the existing building (the Plaza Building). The new, three-story building would house a small restaurant and offices, and would be accessed from both the central plaza and the moat. Utilities would be extended to the new building from within the project site. Residential Life offices currently located inside the residence halls would be moved to the new building.

3.7 SUSTAINABLE DESIGN ELEMENTS

Sustainability refers to principles of physical development, institutional operation, and organizational efficiency that meet the needs of present users without compromising the ability of future users to meet their needs—particularly with regard to the use of natural resources. Accordingly, the University of California has adopted the UC Policy on Sustainable Practices (formerly the Policy on Green Building, Clean Energy, and Sustainable Transportation).

The Sustainable Practices Policy (updated August 2011) recommends that university operations incorporate the principles of energy efficiency and sustainability in capital projects; minimize the use of non-renewable energy; incorporate alternative means of transportation to and from and within the campus; and continue to provide affordable on-campus housing to reduce commute volumes. To comply with the Sustainable Practices Policy, the Project must achieve a US Green Building Council LEED-NC certification of at least "Silver," and register with PG&E's Savings by Design program[1]. By improving

[1]LEED-NC applies to new building and major renovations of existing buildings. PG&E's Savings By Design program offers cash incentives and technical assistance to help maximize energy performance in commercial new construction projects.

the energy efficiency of existing buildings, the Project would contribute to the Sustainable Practices Policy goal of reducing system-wide growth-adjusted energy consumption by ten percent or more by 2014 from the Year 2000 base consumption level.

The proposed Project includes the following sustainable design elements.

- Improves energy efficiency through replacement of all interior and exterior lighting with new energy-efficient lighting equipped with occupant sensors and timers; replacement of all single-glazed with double-glazed windows; and new "cool" roofs on residence halls A and B;

- Reduces water demand through replacement of bathroom fixtures with high efficiency fixtures;

- Minimizes storm water runoff through use of permeable pavement for paths and a rain garden at the Merrill Circle;

- Uses lumber from trees removed from site for benches, decking, mulch, and other site features;

- Increases the number of student beds within existing building footprint, and in a location that is served by public transportation and existing utilities.

The project would strive for further sustainable solutions wherever possible; specifically in building materials, paint, carpet, lighting, equipment, and furniture purchases.

3.8 POPULATION

The proposed Project would not cause or stimulate an increase in enrollment. Merrill College residence halls A, B, C and D, and the Guzman Apartments, currently have approximately 468 bed spaces. The project would provide up to 61 additional student bed spaces, which would help to meet the demand for on-campus housing. New staff would not be required to maintain or service the new housing.

3.9 CONSTRUCTION SCHEDULE AND STAGING

Trees would be removed as early as December 2012. Building construction would be carried out in two phases, in the summers of 2013 and 2014. Site work would be completed during the summer to the extent possible but may extend into the 2013-14 academic year.

If staging for project construction cannot be accommodated within the project site, a portion of the existing construction staging area near the East Remote parking lot may be used.

During the summer construction periods, the offices in the academic and administration buildings adjacent to the site would be occupied, but the residence halls would be vacant. However, all buildings in the project area would be fully occupied during the 2013-14 academic year.

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.

❑ Aesthetics	❑ Agricultural Resources	❑ Air Quality
❑ Biological Resources	❑ Cultural Resources	❑ Geology, Soils & Seismicity
❑ Hazards & Hazardous Materials	❑ Hydrology & Water Quality	❑ Land Use & Planning
❑ Mineral Resources	❑ Noise	❑ Population & Housing
❑ Public Services	❑ Recreation	❑ Transportation, Circulation & Parking
❑ Utilities/Service Systems	❑ Mandatory Findings of Significance	

Based on the analysis presented in this Initial Study, it has been determined that for all resource areas, the proposed project would not result in any significant impacts that cannot be mitigated to a less-than-significant level. Please see the analyses below and refer to the Mitigated Negative Declaration (Appendix A to the Initial Study).

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, the project impacts were adequately addressed in an earlier document or there will not be a significant effect in this case because revisions in the project have been made that will avoid or reduce any potential significant effects to a less than significant level. A MITIGATED NEGATIVE DECLARATION will be prepared.
☐	I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

John Barnes (for CLV) June 6, 2012

Christina Valentino
Vice Chancellor - Business and Administrative Services

Date

6 EVALUATION OF ENVIRONMENTAL IMPACTS

Introduction

The following Environmental Checklist form is based on Appendix G of the CEQA Guidelines. The Environmental Checklist identifies potential project effects as corresponding to the following categories of impacts:

Potentially Significant Impact: There is substantial evidence that the effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

Project Impact Adequately Addressed in LRDP EIR: The potential impacts of the proposed project were adequately addressed in the LRDP EIR and mitigation measures identified in the LRDP EIR will mitigate any impacts of the proposed project to the extent feasible. All applicable LRDP EIR mitigation measures are incorporated into the project as proposed. The impact analysis in this document summarizes and cross references the relevant analysis in the LRDP EIR.

Less than Significant with Project-Level Mitigation Incorporated: The incorporation of project-specific mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." All project-level mitigation measures must be described, including a brief explanation of how the measures reduce the effect to a less than significant level.

Less-than-Significant Impact: An effect for which no significant impacts, only less than significant impacts, would result. The effects may or may not have been discussed in the LRDP Program EIR. The project impact is less than significant without the incorporation of LRDP or Project-level mitigation.

No Impact: The project would not create an impact in the category or the category does not apply. "No Impact" answers need to be adequately supported by the information sources cited, which show that the impact does not apply to projects like the one involved (*e.g.*, the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (*e.g.*, the project will not expose sensitive receptors to pollutants, based on a project specific screening analysis).

6.1 AESTHETICS

AESTHETICS Would the project…	Potentially Significant Impact	Project Impact Adequately Addressed in LRDP EIR	Less than Significant with Project Level Mitigation Incorporated	Less than Significant Impact	No Impact
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?	☐	☐	☐	☑	☐

Aesthetics issues and programmatic mitigation measures applicable to LRDP development are described in Volume I, Section 4.1, of the 2005 LRDP EIR (UCSC 2006). The following, previously adopted LRDP EIR mitigations for potential aesthetic impacts are applicable to and included in the project (the full text of the mitigation measures is included in Appendix C):

LRDP EIR Mitigation AES-5A (Design Advisory Board review of project design for consistency with the valued elements of the visual landscape identified in the 2005 LRDP EIR)

LRDP EIR Mitigation AES-5C (minimize removal of health and mature trees around new projects)

LRDP EIR Mitigation AES-5F (evaluation for their aesthetic value, of trees identified for removal, and replacement of large unique trees)

LRDP EIR Mitigation AES-6B (use of directional, shielded lighting to minimize light spillage an atmospheric light pollution)

LRDP EIR Mitigation AES-6C (Design Advisory Board review of project-related light and glare)

LRDP EIR Mitigation AES-6E (Design Advisory Board review of outdoor lighting fixtures to ensure the minimum amount of lighting is used)

a) Important vantage points from the lower campus looking across open space areas towards the central campus include points along Empire Grade Road, Glenn Coolidge Drive, and Hagar Drive. The campus is regarded by local residents as an important visual resource for the city because it provides an open backdrop for developed areas of western Santa Cruz. The lower campus grasslands and forest canopy of the upper campus are visible from various points throughout the city of Santa Cruz, including the wharf, the Boardwalk and Highway 1. Because it is screened by trees and topography, none of the buildings at Merrill College are visible from these on- or off-campus vantage points. For the same reason, the project site does not provide long-distance views. No impact would occur.

b) The project site is not visible from any scenic highways. The project site is not located near or within view of the historic buildings on the lower campus or other historic features. No special landmarks or

landforms, including rock outcrops, are present on the site. The proposed project would not affect any of the other scenic resources identified in the 2005 LRDP. No impact would occur.

c) Consistent with LRDP Mitigation AES-5A, which is included in this project, the project design was reviewed by the UCSC Design Advisory Board for consistency with the valued elements of the visual landscape identified in the 2005 LRDP. Consistent with LRDP Mitigation AES-5F, the trees that would be removed to accommodate the new paths, bridges, and building, were evaluated for their aesthetic value and aesthetically valuable trees retained to the extent feasible. The college is built on a steeply sloping site in the northeastern corner of campus and was built around mature redwood trees that contribute to the college's unique character. The visual character of the project site is shaped by the dense redwood trees that cover most of the open spaces between buildings. The trees screen the buildings from one another and reduce the visual scale of the large residential buildings. However, the density of the trees also prevent views around the site and from the college gateway at the Merrill Circle to destinations within the college. In addition, unlike the Campus' other residential colleges, Merrill College lacks a sunny central gathering space that contrasts with the shaded forest.

The proposed project would remove approximate 120 trees, mostly redwoods. Most of the tree removal is necessitated by the grading required to achieve ADA-compliant paths of travel throughout the central area and to maintain the service road widths adequate for emergency access. Trees would also be removed from the area north of the existing taqueria and Student Activities buildings, for construction of the new plaza building. In addition, some of the less healthy trees would be removed from the remaining wooded areas.

The Campus considers the increased sunlight and visual access to the site to be a secondary benefit of removing trees to meet the accessibility requirements. The tree removal and grading would permit the creation of a social and physical center for the college that would be bounded by Residence Halls A and B, the Academic Building, and the Cultural Center. The design retains groups of redwood trees at each corner of the site, including a large group of trees above the moat west of Residence Hall B, several trees north and west of the Baobab Lounge, three large trees at the southwest corner of the site, and a small grove group of redwoods south of the Administration Building. These remaining trees would continue to visually reduce the mass of the larger buildings, and maintain the forest character of the area.

Although the Project would remove a large number of trees within Merrill College and substantially alter the visual character of the interior of the college, these changes would not be apparent from outside the Project site. The Project retains aesthetically valuable trees to the extent feasible while still accomplishing the goal of providing accessibility throughout the site and open space to accommodate recreational opportunities for Merrill residents. The Project also would be consistent with the Campus' goal of providing public exterior spaces that support and encourage gathering, and of creating welcoming sunny outdoor spaces that contrast with the shaded forest. Therefore, the Project would not degrade the visual character or quality of the area and the aesthetic impact would be less than significant and additional mitigation is not required.

d) The project would replace all exterior lighting on the project site. Consistent with LRDP Mitigation AES-6B and -6E and Campus Standards the project lighting has been designed to be directional and shielded and the project includes only the minimal amount of new exterior lighting needed for safety. Potential for glare. With the inclusion of the design features described above, the project would not result in significant new light or glare.

Summary

2005 LRDP EIR mitigations AES-5A, AES-5F, AES-6B, AES-6C and AES-6E are applicable to and incorporated into the project design. The project would not result in any significant aesthetic impacts. No project-level mitigation is required.

6.2 AGRICULTURAL RESOURCES

AGRICULTURAL RESOURCES **Would the project…**	Potentially Significant Impact	Project Impact Adequately Addressed in LRDP EIR	Less Than Significant with Project-Level Mitigation Incorporated	Less Than Significant Impact	No Impact
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) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g), timberland (as defined in Public Resources Code 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	❑	❑	❑	❑	☑
d) Result in the loss of forest land or conversion of forest land to non-forest use?	❑	❑	❑	☑	❑
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?	❑	❑	❑	❑	☑

Agricultural Resources materials background relevant to LRDP development is presented in Volume I, Section 4.2, of the 2005 LRDP EIR (UCSC 2006).

a) As State lands, campus lands are not eligible for Williamson Act agreements, nor are they subject to local zoning controls. Therefore, projects on campus lands have no potential conflict with existing zoning for agricultural use or a Williamson Act contract. Based on the Important Farmland map produced by the California Department of Conservation, Division of Land Resource Protection under the FMMP, the proposed project site is not designated as Prime Farmland, Unique Farmland or Farmland of Statewide Importance. Furthermore, the project would not alter the land use of the site. Therefore, the project would not convert farmland to a nonagricultural use.

b) There are no lands within 1-mile radius of the campus that are designated Important Farmland; most of the land adjoining the campus is within state or city parks and unlikely to be developed for other uses, and there are no ongoing agricultural operations on any of the lands that adjoin the campus. The project would not result in an increase in population that could contribute to the demand for housing and associated development in the region. Therefore, the project would not result in the conversion of farmland to non-agricultural uses.

c,d) The project site is not forest land as defined in Public Resources Code Section 12220(g), and it is not zoned Timberland Production. A portion of the site (approximately 0.7 acre) is considered timberland as defined in Public Resources Code 4526. The project would remove a total of approximately 120 trees. The trees provide an aesthetic benefit as landscaping features that are consistent with the Campus' guidelines for development in forested areas. However, the trees are within close proximity to existing

structures within a developed area that is not used for timber production. Furthermore, timber production would not be compatible with the existing uses of the surrounding land. Therefore, the project would not result in a significant impact to timber resources. As analyzed in Section 6.1, *Aesthetics*, above, the tree removal would not result in a significant aesthetic impact. As analyzed in Section 6.3, *Biological Resources*, the potential biological resources impacts of the tree removal would be less than significant with mitigation. As analyzed in Section 6.7, *Greenhouse Gases*, the project construction and operation, which includes removal of trees to accommodate the proposed site improvements, would not result in a net increase in the emission of greenhouse gases. This impact would be less than significant.

e) There are no lands within 1-mile radius of the campus that are designated Important Farmland; most of the land adjoining the campus is within state or city parks and unlikely to be developed for other uses, and there are no ongoing agricultural or timber operations on any of the lands that adjoin the campus. As discussed in Section 6.13, *Population and Housing*, the project would not result in an increase in population that could contribute to the demand for housing and associated development in the region. Therefore, the project would not result in the conversion of farmland to non-agricultural uses or conversion of forest land to non-forest use.

Summary

The project would not result in any impacts on agricultural resources. The impacts of converting approximately 0.7 acres of land defined as timberland under Public Resources Code 4526 to non-timberland uses would not result in a significant agricultural impact related to forest conversion.

6.3 AIR QUALITY

AIR QUALITY Would the project…	Potentially Significant Impact	Project Impact Adequately Addressed in the LRDP EIR	Less than Significant with Project-Level Mitigation Incorporated	Less than Significant Impact	No Impact
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?	❑	❑	❑	❑	☑

Air quality issues and programmatic mitigation measures applicable to LRDP development are described in Volume I, Section 4.3, of the 2005 LRDP EIR (UCSC 2006). The following, previously adopted LRDP EIR mitigations for potential air quality impacts are applicable to and included in the project (the full text of the mitigation measures is included in Appendix C):

LRDP EIR Mitigation AIR-1 (construction dust control measures)

LRDP EIR Mitigation AIR-2A (incorporation into new projects of measures to conserve natural gas and/or minimize air pollutant emissions from space and water heating)

LRDP EIR Mitigation AIR-6 (measures to minimize construction emissions of toxic air contaminants)

a-d) **Air Quality Management Plan Consistency**

According to the Monterey Bay Unified Air Pollution Control District (MBUAPCD) CEQA Air Quality Guidelines (MBUAPCD 2008), a project that is consistent with the Air Quality Management Plan (AQMP) is considered to be accommodated in the AQMP and therefore would not have a significant impact on regional air quality. The AQMP for the MPUAPCD (the air district in which UCSC is located) is based on population and housing forecasts prepared by the Association of Monterey Bay Area Governments (AMBAG). Therefore, for a proposed residential project, consistency is determined by comparing the number of housing units at the year of project completion with the number of housing units forecast for the appropriate five-year increment for the jurisdiction in which the project is to be located. A proposed residential project is considered to be consistent with the AQMP if the housing increase resulting from the project would not cause the estimated cumulative number of housing units (i.e., existing housing from locally approved and unconstructed projects plus the proposed project) to exceed housing forecasts for the appropriate five-year increment. However, AMBAG subtracts the projected population living in group housing such as the Merrill College residence halls from the total projected

population before developing the housing forecasts. Therefore, the standard consistency determination procedure for residential projects is not applicable to the proposed Project. After consulting with MBUAPCD, the University has determined that the proposed Project is consistent with the AQMP because, as described below under "Operational Emissions," project operations would not result in an increase in criteria air pollutant emissions.[2] No impact would occur.

Construction Emissions

Criteria Pollutants

Construction of the proposed project would involve use of equipment and materials that would temporarily generate dust (including PM_{10}) and emit ozone precursor emissions (i.e., ROG and NO_X). The proposed project would include approximately 2 acres of ground disturbance for construction of new pedestrian paths, parking spaces, bridge, and elevator. Dust associated with the proposed project could cumulate with fugitive dust from the other projects during the periods of concurrent construction. The proposed project also would generate other criteria pollutants from the operation of heavy equipment construction machinery (primarily diesel-fueled) and construction worker automobile trips (primarily gasoline-fueled). Construction-related dust emissions would vary from day to day and would depend on the level and type of activity, silt content of the soil, and the weather. Construction activities could result in temporary local increases in dust and PM_{10} concentrations, and as a result local visibility could be adversely affected on a temporary basis during the construction period. In addition, larger dust particles could settle out of the atmosphere close to the construction site resulting in a potential soiling nuisance for adjacent uses.

The MBUAPCD does not require specific consideration and estimation of emissions from construction activities using typical construction equipment, except for PM_{10}. Construction related VOC and NOx emissions are accommodated in the emissions inventories of State- and federally-required air quality plans and therefore are not considered significant. The MBUAPCD's CEQA Guidelines establish a threshold of significance for PM_{10} related construction emissions of 82 pounds per day, and provide the following screening level thresholds: projects with less than 2.2 acres per day of major earth moving such as grading or excavation, or 8.1 acres per day with minimal earth moving are assumed to be below the significance threshold of 82 pounds per day (MBUAPCD 2008). Assuming that 25 percent of the 2-acre site, or 0.5 acre, may be subject to grading in a day, Project construction would not result in emissions of PM_{10} that would exceed the significance threshold. One other project planned for construction during the summer of 2013, the Infrastructure Improvements Project Phase 2 (IIP 2), may involve grading concurrent with grading for the proposed Merrill Residence Halls Capital Renewal Project. The IIP 2 Project would entail grading of up to a total of 1.8 acre per day distributed among multiple small sites at various locations on the campus, primarily in the Jordan Gulch and Moore Creek drainages. More than half of the IIP 2 area would entail only minimal grading or just brush clearing; therefore, the IIP 2 Project could involve up to 0.9 acre of major earthmoving and 0.9 acre of minor grading in a single day.[3] Cumulatively, the Merrill Project and the IIP 2 Project could involve up to 1.4 acre of major earthmoving and 0.9 acre of minor grading in a single day, result in PM_{10} emissions of 61.1 lbs/day, which would not exceed the significance threshold. Furthermore, LRDP Mitigation AIR-1, which requires specific contract requirements designed to minimize construction fugitive dust, is applicable to and included in both projects. These require that the contractor implement dust control measures recommended by the

[2] Amy Clymo, MBUAPCD, personal communication with Alisa Klaus, UCSC PP&C, April 19, 2012.

[3] University of California, Santa Cruz. 2008. Infrastructure Improvements, Phase 2, Final Initial Study and Mitigated Negative Declaration, SCH # 2008052110.

MBUAPCD to reduce PM_{10} generated by utility trenching or by demolition. Implementation of this previously adopted LRDP mitigations would further reduce the less than significant impact of the project with respect to construction emissions of PM_{10}. Demolition of the existing buildings is also subject to MBUAPCD Rule 439, which limits particulate emissions from the removal of buildings through the application of measures specified in the rule.

Toxic Air Contaminants

Construction of the proposed project would generate emissions toxic air contaminants in the form of diesel particulate matter (DPM), which could result in health impacts to sensitive receptors, including residents of Merrill, students in nearby classrooms, and staff and faculty working in offices in the vicinity. For the 2005 LRDP EIR, the MBUAPCD asked that UC Santa Cruz conduct a HRA to identify potential health risks associated with emissions of TACs from potential construction projects in the future. For the LRDP EIR analysis, UC Santa Cruz developed estimates of potential human health effects from future construction activities on the campus, assuming three hypothetical construction projects covering a total area of 6.75 acres of land, and a total building area of about 270,000 square feet (URS 2005). The results of the analysis predicted that the total estimated cancer risk and the chronic non-cancer risk from projected construction projects at UC Santa Cruz over the 15-year LRDP period would be below the relevant significance thresholds both on- and off-campus. The modeled acute non-cancer index would exceed the significance threshold value (a hazard index of 1.0 or greater) at both on- and off-campus locations. However, the 2005 LRDP EIR (Vol. 1, pp. 4.3-37 to -38) determined that no conclusion as to the significance of the impact could be reached because of uncertainties in the analysis.[4] The Campus nonetheless implements LRDP Mitigation AIR-6 in conjunction with construction projects on the campus to minimize emissions of TAC, including acrolein, to the maximum extent feasible.

Because of the proximity of residential buildings to the project site, a project-specific health risk assessment (HRA) screening analysis was conducted to evaluate the health impacts from DPM emissions (Appendix D). The methodology used in the HRA is based on the 2008 MBUAPCD CEQA Guidelines and the CalEEMod air quality emissions model.[5] The DPM emissions were estimated based on estimated construction phasing and equipment activity levels and specifications provided by CalEEMod. Dispersion modeling[6] was used to determine the concentration of DPM at maximum exposed individual (MEI) and guidance from the Office of Environmental Health Hazard Assessment (OEHHA) was used to determine the associated carcinogenic risk and chronic, non-carcinogenic hazard index at the MEI. The acute health impacts were not estimated because of the uncertainty in the analysis of acrolein impacts described above, and because OEHHA has not determined an exposure threshold to be used to estimate acute DPM health impacts.

The significance thresholds for health risks associated with emissions of toxic air contaminants are based on the MBUAPCD CEQA Guidelines. Equipment or processes that emit non-carcinogenic TACs could result in significant impacts if emissions would exceed a Hazard Index of 1.0 for non-cancer impacts. Emissions of carcinogenic TACs that could result in a lifetime cancer incidence of one per 100,000

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[4] Acrolein, a by-product of fossil fuel combustion, made a major contribution to the calculated risk. The MBUAPCD suspended application of the reference exposure level ([REL], i.e., threshold) for acute impacts of acrolein in June 2007 and the MBUAPCD's 2008 CEQA Guidelines state that the MBUAPCD's comment letters on projects subject to CEQA will not address the short-term impacts of acrolein from diesel equipment.

[5] Available from the following website: http://www.caleemod.com.

[6] Dispersion modeling is the mathematical simulation of how air pollutants disperse in the atmosphere and can be used to predict pollutant concentrations downwind of a source.

population or 10 in one million would also be considered significant. While these thresholds are usually applied to impacts of operation of a facility that emits TACs, they are used here to assess the potential significant of the Project's construction-related health impacts.

The dispersion model was used to predict the cancer health risk for the maximally exposed individual (MEI), using different exposure assumptions for college residents and those working in the college buildings. As shown in Table 6.3-1, the cancer risks, as a result of construction of the proposed project, would be less than 10 in one million for both residential and workplace receptors. This is considered a less than significant impact.

Table 6.3-1
Summary of Construction Cancer Risks

Receptor	Modeled DPM Concentration (micrograms/cubic meter)	Cancer Risk (in 1 million)	Significance Threshold	Exceeds Threshold?
University Residents	6.32E-01	2.88	10 in 1 million	NO
Workplace	8.19E-01	1.17	10 in 1 million	NO

Source: Impact Sciences, Inc.

Chronic Hazard Index

In addition to the potential cancer risk, DPM has chronic (i.e., long term) non-cancer health impacts. The chronic non-cancer Hazard Indices for the proposed project were calculated by dividing the maximum modeled annual average concentrations of DPM by the Reference Exposure Level (REL)[7]. OEHHA has recommended an ambient concentration of 5 micrograms per cubic meter ($\mu g/m^3$) as the chronic inhalation REL for DPM exhaust.

The maximum chronic hazard indices at the MEIs are shown in Table 6.3-2. The results are based on the highest concentrations at any receptor point. Therefore, the results are considered to be conservative. As shown, the chronic Hazard Indices at the MEIs are less than the significance threshold of 1 for non-cancer health impacts. This is considered a less than significant impact.

Table 4
Summary of Construction Non-Cancer Chronic Health Impacts

Receptor	Modeled DPM Concentration (micrograms/cubic meter)	Maximum Chronic Hazard Index	Significance Threshold	Exceeds Threshold?
University Residents	6.32E-01	0.126	1	NO
Workplace	8.19E-01	0.164	1	NO

Source: Impact Sciences, Inc.

[7] The REL is the concentration at or below which no adverse health effects are anticipated.

Operational Emissions

The proposed project would not result in an increase in stationary source emissions of criteria air pollutant. The increase in natural gas consumption for space heating in the new Plaza Building would be offset by an estimated 10- to 15-percent reduction in natural gas for space heating in the existing buildings by installing "cool" roofs on residence halls A and B, and replacing single-glazed windows with doubled-glazed windows. Although the Project would add up to 61 new bed spaces in residence halls A and B, the residents of those buildings will be lower-division students who are not permitted to have cars on the campus. Therefore, the Project would not result in an increase vehicle traffic and would not have the potential to result in significant operational emissions of either criteria pollutants of toxic air contaminants (TACs).

e) The project would not generate any objectionable odors and no impact would occur.

Summary

The proposed project would not result in any significant or potentially significant air quality impacts. The project includes 2005 LRDP EIR Mitigations LRDP AIR-1 and AIR-6, which further reduce the less-than-significant construction air quality impacts of the project and minimize the emissions of toxic air contaminants during construction. No additional project-specific mitigation is required.

6.4 BIOLOGICAL RESOURCES

BIOLOGICAL RESOURCES Would the project…	Potentially Significant Impact	Project Impact Adequately Addressed in the LRDP EIR	Less than Significant with Project-Level Mitigation Incorporated	Less than Significant Impact	No Impact
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 US 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?	☐	☐	☐	☐	☑

Biological resources issues and programmatic mitigation measures applicable to LRDP development are described in Volume I, Section 4.4, of the 2005 LRDP EIR (UCSC 2006). The following, previously adopted LRDP EIR mitigations for potential impacts to biological resources are applicable to and included in the project (the full text of the mitigation measures is included in Appendix C):

LRDP EIR Mitigation BIO-6 (measures to avoid or minimize the potential to introduce or spread noxious weeds or plant diseases)

LRDP EIR Mitigation BIO-11 (preconstruction monitoring for and avoidance of nesting special-status birds)

LRDP EIR Mitigations BIO-13A and BIO-13B (pre-construction monitoring for and avoidance of special-status bats)

a) A biotic assessment of the project site was conducted in fall 2011 to map habitats and evaluate them for the potential presence of special-status plant and wildlife species and sensitive habitats (Biosearch Associates, 2011). The biotic assessment report concluded that special-status plants are unlikely to occur on the project site because the site: 1) lacks suitable habitat components for most special status-plants known in from the region; 2) it heavily disturbed by development and human use, including extensive pedestrian traffic in the redwood understory; 3) is not contiguous with suitable habitat found elsewhere on the UCSC campus; and 4) no special-status plants have been observed on or adjacent to the study area during previous studies, and none were observed during the current study. Therefore, it is highly unlikely that special-status plants are present, no adverse impacts to special-status plants are anticipated from the proposed project, and no mitigation measures are recommended for special-status plants.

The biotic assessment found that the project site generally lacks suitable habitat for most special-status wildlife species known from the UC Santa Cruz campus and surrounding region. However, three special-status bat species may occur on the site and could be adversely affected by the proposed project: pallid bat (*Antrozous pallidus*); fringed myotis (*Myotis thysanodes*); and long-legged myotis (*Myotis volans*). All three species are Western Bat Working Group High Priority species, and pallid bat is also a state Species of Special Concern. Daytime roosting habitat for all three species may be present in the redwood trees on the project site; maternity roosting habitat for long-legged myotis may also be present in trees in the project area. Potential impacts to non-maternity roosts are considered to be less than significant. However, impacts to maternity roosts is a potentially significant impact. This impact would be reduced to a less-than-significant level with implementation of LRDP EIR Mitigations 13A and 13B, which require field surveys for active roosts of special-status bats if tree removal or grading activity commences on a project site during the breeding season of native bat species (April 1 through August 31), and avoidance measures if roosting bats are found. No additional mitigation is required.

Suitable nesting habitat for non-listed bird species that are protected under the Migratory Bird Treaty Act and the state Fish and Game Code is present in trees and shrubs in the study area and on nearby buildings, although the likelihood of nesting is reduced by existing human activity. Construction activities and vegetation removal during the nesting season could potentially result in the destruction, abandonment, or failure of nests. The project may also adversely affect native nesting birds which are protected by state and federal laws during the breeding season. This is considered a potentially significant impact. With implementation of previously adopted LRDP EIR Mitigation BIO-11, which requires pre-construction surveys for nesting birds and avoidance measures if active nests are found, the impact would be less than significant. No additional mitigation is required.

b,c) The biotic assessment for the proposed project (Biosearch Associates, 2011) concluded that there are no natural drainage channels or riparian, wetland, or other sensitive plant communities, on the project site. There is a small (about 2 feet wide by 20 feet long) man-made, ephemeral drainage channel in the landscaped area in the southern portion of the site. The channel lacks an ordinary high water mark and wetland/riparian vegetation, does not support aquatic life, has a bed consisting primarily of decorative rock. This channel receives runoff from a culvert that drains from the study area, and discharges to a storm drain. The channel does not capture or replace any natural surface flow. No impact to riparian or wetland habitat or other sensitive plant communities would occur.

d) The project site is a developed area surrounded by dense development, is subject to ongoing human disturbance, and lacks significant areas of refuge or cover from most wildlife. Common species such as striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), and mule deer (*Odocoileus hemionus*) are expected to continue to use the project site after construction is complete. Due to the low habitat value of the project area for wildlife and the fact that the proposed Project would primarily consist of changes to existing developed land, the project would not have a significant impact on wildlife movement.

e) The proposed project is consistent with the policies of the 2005 LRDP with respect to biological resources. No other biological resources policies or ordinances are applicable. No impact would occur.

f) The proposed project site is not within an area covered by any adopted Habitat Conservation Plan or other approved habitat conservation plan. No impact would occur.

Summary

The project could result in potentially significant impacts nesting raptors or other migratory birds and special status bats. Consistent with LRDP Mitigations BIO-6, which is included in all campus construction contracts that involve ground disturbance, the project would implement measures during construction to avoid the spread of noxious weeds. Accordingly, because the project incorporates LRDP Mitigations BIO-11 (to identify and avoid nesting birds) and BIO-13A and -13B (to identify and avoid bat maternity roosts), all biological impacts of the project would be reduced to a less-than-significant level.

6.5 CULTURAL RESOURCES

CULTURAL RESOURCES Would the project…	Potentially Significant Impact	Project Impact Adequately Addressed in LRDP EIR	Less than Significant with Project-Level Mitigation Incorporated	Less than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	☐	☐	☐	☐	☑
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 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?	☐	☐	☐	☑	☐

Cultural resources issues and programmatic mitigation measures applicable to LRDP development are described in Volume I, Section 4.5, of the 2005 LRDP EIR (UCSC 2006). The following, previously adopted LRDP EIR mitigations for potential impacts to biological resources are applicable to and included in the project (the full text of the mitigation measures is included in Appendix C):

LRDP EIR Mitigation CULT-1A (archaeological records review of project site)

LRDP EIR Mitigation CULT-1B (training for construction crews on how to recognize archaeological sites and artifacts)

LRDP EIR Mitigation CULT-1C (archaeological survey during project planning and design)

LRDP EIR Mitigation CULT-1G (measures to be taken if an archaeological resource is discovered during construction)

LRDP EIR Mitigation CULT-2B (requirement to determine the potential for a project to result in impacts to historical resources)

LRDP EIR Mitigation CULT-4C (measures to be taken in the event of a discover on campus of human bone, suspected human bone, or a burial)

LRDP EIR Mitigation CULT-5A (evaluation of whether a project site is underlain by a formation that is known to be sensitive for paleontological resources)

LRDP EIR Mitigation CULT-5C (measures to be taken in the event of a discovery of a paleontological resource on campus)

LRDP EIR Mitigation CULT-5D (measures to be taken in the event that a proposed project would result in impacts to a unique paleontological resource)

a,b,d) Consistent with LRDP mitigation CULT-1A and -2B, areas of potential effects (APE) for archaeological resources and for historic buildings and structures were defined for the project. For

archaeological resources, the APE was defined to include all areas where native soils potentially could be disturbed (see Figure 3-2 for the limits of the Project). For historical built environment resources, the APE includes all buildings and structures that would be directly affected by development and from which the project site is visible.

Cultural resources literature review indicated that there are no previously recorded archaeological or historical resources within the areas that would be subject to ground disturbance for the project. Archaeological survey of the project's area of potential effects revealed no archaeological materials, deposits or features, nor were any such materials uncovered during the extensive prior development of the site. Since the presence on the project site of undiscovered archaeological features or deposits, or of human remains, is considered unlikely, the project is not expected to result in any impacts to archaeological resources or human remains (Staub Forestry and Environmental Consulting, 2012)

Nonetheless, there is a slight chance that undiscovered subsurface archaeological resources or human remains could be present on the site. Consistent with LRDP Mitigation CULT-1B, contractors involved in the project will be required to attend an informal training session prior to the start of earth moving regarding how to recognize archaeological sites and artifacts that might be turned up in excavations. Further, consistent with LRDP Mitigation CULT-1G, the construction contract will include the specification that if an archaeological resource is discovered during construction, all soil disturbing work within 100 feet of the find shall cease and the campus will provide for a qualified archaeologist to plan and carry out appropriate investigations to assess the significance of the resource, provide avoidance measures, and/or implement data recovery to mitigate any significant impacts. Consistent with LRDP Mitigation CULT-4C, construction contract documents also would include provisions for work stoppage in the event of discovery of human remains, and subsequent protection and treatment that is compliance with the state Public Resources Code. Because the Project includes previously adopted LRDP mitigation measures, the potential for impacts to undiscovered archaeological materials and human remains is less than significant.

There are no buildings or structures more than 45 years old within or immediately adjacent to the project site. Thus, the project would not result in any impacts to significant historic structures or buildings.

c) Consistent with LRDP Mitigation CULT-5A, the campus consulted the most recent campus soils and geology map and determined that the project is sited on schist, which has low paleontological sensitivity. There are no known unique paleontological resources or geologic features on the project site. Consistent with LRDP Mitigation CULT-5C, construction contract specifications will include the requirement that in the event of a discovery of a paleontological resource on the project site, work within 50 feet of the find shall halt until a qualified paleontologist has examined and assessed the find and, if the resource is determined to be a unique paleontological resource, the resource is recovered. LRDP Mitigation CULT-5D is a component of the Project requiring that the Campus adequately document, analyze, and curate any finds at at an appropriate institution. The project therefore would not result in a significant impact to paleontological resources.

Summary

The project incorporates previously adopted 2005 LRDP EIR Mitigations CULT-1A, -1B, -1C, -1G; -2B, -4C, -5A, -5, and -5D and therefore will result in less-than-significant cultural resources impacts.

6.6 GEOLOGY, SOILS, & SEISMICITY

GEOLOGY, SOILS, & SEISMICITY Would the project…	Potentially Significant Impact	Project Impact Adequately Addressed in LRDP EIR	Less than Significant with Project-Level Mitigation Incorporated	Less than Significant Impact	No Impact
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?	☐	☐	☐	☐	☑

Geology, soils and seismicity background and issues, and programmatic mitigation measures applicable to LRDP development, are described in Volume I, Section 4.6, of the 2005 LRDP EIR (UCSC 2006). The following, previously adopted LRDP EIR mitigations for potential impacts to biological resources are applicable to and included in the project (the full text of the mitigation measures is included in Appendix C):

LRDP EIR Mitigation GEO-1 (preparation of geotechnical investigations for new development)

a,i) The UC Santa Cruz campus and the surrounding area are not located within an Alquist-Priolo Earthquake Fault Zone and no active faults are mapped on the campus (Nolan Zinn 2005). No impact would occur.

a,ii-v) The proposed project site, like much of California, could experience significant seismic shaking. Consistent with LRDP Mitigation GEO-1, a geotechnical study has been prepared for the Project (Pacific Crest Engineering 2012). The structural additions to the existing buildings would be designed and constructed in conformance with the California Building Code (CBC). Consistent with the University of California Seismic Safety Policy, nonstructural building elements such as furnishings, fixtures, material storage facilities, and utilities that could create a hazard if dislodged during an earthquake would be anchored for seismic resistance.

The geotechnical study for the new bridge and storage room concluded that the liquefaction potential at the site is low, based on the type of soil encountered, the estimated ground acceleration, and the fact that ground water was not encountered in the geotechnical borings (Pacific Crest Engineering 2012). Potential hazards from landslides on campus are limited to areas where steep slopes are overlain by substantial thicknesses of colluvium and soil, generally only along the larger stream drainages and in the old marble quarries (Nolan Zinn 2005). The proposed project does not involve construction on steep slopes. The project would not result in significant impacts related to seismic shaking or landslides.

b) The potential for erosion related to construction activities and to new impervious surface is addressed in Section 6.9, below.

c) Liquefaction, lateral spreading and landslides are discussed under item (a,ii-iv) above. Previous geotechnical studies of the site and the geotechnical study performed for the new pedestrian bridge and storage room indicate that it is underlain by schist, which have a low potential for hazards associated with construction on karst (Nolan, Zinn & Associates 2005; Pacific Crest Engineering 2012).

d) The geotechnical study for the new bridge and storage room found moderately to highly expansive soils at the Project site (Pacific Crest Engineering 2012). Expansive soils shrink and swell as a result of moisture changes. This can cause heaving and cracking of concrete slabs, pavements, and structures founded on shallow foundations if they are inadequately designed for these conditions. Potential risk to life and property can result if buildings were constructed on expansive soils without appropriate design. These risks can be avoided through the use of engineering solutions such as replacement of expansive soils with fill, lime treatment of soils, or deepening of foundations.

The 2005 LRDP EIR (Vol. 1, p. 4.6-16) concluded that, with implementation of 2005 LRDP Mitigation GEO-1, in conjunction with Campus Standards Handbook and compliance with the CBC, construction of campus facilities on expansive soils under the 2005 LRDP would be a less-than-significant impact.

Consistent with 2005 LRDP Mitigation GEO-1, a geotechnical investigation has been conducted for the proposed Project and its recommendations will be incorporated into project design and construction. These requirements will ensure that the project incorporates appropriate soil treatment and/or foundation design. Therefore, the impact would be less than significant and additional mitigation is not required.

e) Merrill College buildings are connected to the sanitary sewer and would not use septic tanks or alternative wastewater disposal systems. No impact would occur.

Summary

The Project incorporates previously adopted LRDP Mitigation GEO-1, and thus all impacts of the proposed project related to geology and soils would be less than significant. No additional mitigation is required.

6.7 GREENHOUSE GAS EMISSIONS

GREENHOUSE GAS EMISSIONS Would the project…	Potentially Significant Impact	Project Impact Adequately Addressed in LRDP EIR	Less Than Significant with Project-level Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	❑	❑	❑	☑	❑
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	❑	❑	❑	☑	❑

The 2005 LRDP EIR was certified before the passage of Assembly Bill 32 (Global Warming Solutions Act of 2006) and therefore did not analyze greenhouse gas emissions or climate change. There are no previously adopted mitigation measures for climate change impacts that are applicable to the proposed project.

6.7.1 Standards of Significance

The proposed project is located in the Monterey Bay Unified Air Pollution Control District (MBUAPCD). The MBUAPCD has not adopted thresholds for assessing climate change impacts. In a white paper published in January 2008, examining approaches that local governments might take to assess GHG emissions under CEQA, the California Air Pollution Control Officers Association (CAPCOA) examined a non-zero threshold of 900 MT CO_2e per year, which would capture approximately 90 percent of residential projects in the state (CAPCOA 2008). Several air quality management and air pollution control districts, including the Sacramento Metropolitan Air Quality Management District (SMAQMD), the San Joaquin Valley Air Pollution Control District, and the Bay Area Air Quality Management District (BAAQMD), [8] have adopted guidance documents for evaluating the significance of GHG emissions under CEQA. Other districts have published draft guidance documents that have not yet been formally adopted, or have adopted thresholds for stationary source emission but not for residential and commercial projects. For residential projects, the BAAQMD adopted a threshold for total emissions of 1,100 MTCO2e per year and a efficiency-based threshold of 4.6 MTCO2e per service population (employees plus residents) per year (BAAQMD 2010). These thresholds are based on projected increases in GHG emissions using growth data related to residential and commercial development specific to the Bay Area. The South Coast Air Quality Management District (SCAQMD) has evaluated, but not adopted, a screening threshold of 3,000 MT CO2e per year, which would capture 90 percent of GHG emissions from

[8] The significance thresholds contained in the BAAQMD's 2010 CEQA Guidelines were challenged by the CA Building Industry Association. On March 5, 2012, the Alameda County Superior Court issued a judgment finding that the Air District had failed to comply with CEQA when it adopted the thresholds contained in the District's 2010 CEQA Guidelines. The court found that the adoption of the thresholds was a project under CEQA. The court issued a writ of mandate ordering the District to set aside the thresholds and cease dissemination of them until the District had complied with CEQA. The BAAQMD accordingly is not recommending the use of the 2010 significance thresholds to determine the significance of air quality impacts. Instead, the BAAQMD recommends that the lead agency should "determine appropriate air quality thresholds of significance based on substantial evidence in the record." The Court did not rule on or question the adequacy of the evidentiary basis supporting the significance thresholds that are contained in the 2010 CEQA Guidelines and the BAAQMD-recommended impact assessment methodologies. Therefore, a lead agency has the discretion to use the significance thresholds and methodology for analyzing air quality impacts under CEQA based on the evidence and technical studies supporting the Guidelines or other evidence.

development projects in that region. The San Joaquin Valley Air Pollution Control District (SJVAPCD) adopted performance-based standards to assess the significance of project specific greenhouse gas emissions on global climate. Projects implementing the District's "best performance standards" would be determined to have a less than cumulatively significant impact. Otherwise, the SJVAPCD standards require that a project demonstrate a 29 percent reduction in GHG emissions from business-as-usual to determine that a project would have not have a cumulatively significant impact. The SMAQMD guidance does not provide a quantitative threshold, but recommends that the project be analyzed with respect to AB 32 goals, specifically a reduction in GHG emissions to 1990 levels by 2020, or approximately a 30 percent reduction from business as usual.

In developing the thresholds described above, the CAPCOA and the air districts did not take into account the contribution of GHG emissions from release of sequestered carbon as a result of development. The approaches to GHG emissions from construction equipment and construction-related vehicle trips also vary; although lead agencies are directed to estimate construction GHG emissions, these emissions may or may not be taken into account in the assessment of the significance of a project's impact. Since, as documented below, operation of the proposed Project would not result in a net increase in GHG impacts, the Project's potential contribution to climate change derives only from its construction-related emissions and from the release of sequestered carbon. Therefore, none of the adopted quantitative thresholds may be directly applied to the Project, although they do provide a sense of the scale of the Project's impact in comparison with the range of other residential and commercial projects in California. This analysis uses CAPCOA's threshold of 900 MT CO_2e per year for to determine whether the Project would make a cumulatively considerable contribution to global climate change. CAPCOA estimated that this threshold would capture 90 percent of commercial and residential projects, and is the most stringent of the non-zero thresholds that have been proposed for these types of projects.

The second Appendix G criterion, requiring a determination of whether the project will conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases, may be evaluated by demonstrating compliance with plans, policies, or regulations adopted by local governments to curb GHG emissions. According to the Natural Resources Agency: Provided that such plans contain specific requirements with respect to resources that are within the agency's jurisdiction to avoid or substantially lessen the agency's contributions to GHG emissions, both from its own projects and from private projects it has approved or will approve, such plans may be appropriately relied on in a cumulative impacts analysis (California Natural Resources Agency 2009). The University of California has set the following emissions reduction goals: 1) Reduce GHG emissions to 2000 level by the year 2014; by 2020, reduce GHG emissions to 1990 levels; by 2050, reduce to 80 percent below 1990 levels. UC Santa Cruz has developed a Climate Action Plan (CAP) that quantifies the Campus' emissions sources and the reduction in emissions that will be needed for the Campus to meet the University's targets, and identifies a range of potential emission reduction projects (UC Santa Cruz 2011). However, the Campus' CAP does not include a comprehensive strategy by which the Campus will meet the University identified reduction goals and therefore does not provide the basis for a cumulative impacts analysis. Furthermore, the Campus' GHG inventory, which is the metric for evaluating progress toward those goals, does not include either construction-related emissions or the release of sequestered carbon.

The only applicable plan that addresses sequestered carbon is California's AB 32 proposed 2020 Scoping Plan (California Air Resources Board, 2008). AB 32, the California Global Warming Solutions Act of 2006, which Governor Schwarzenegger signed on September 27, 2006, was the first enforceable statewide program to limit GHG emissions from all major industries with penalties for noncompliance. The Scoping Plan contains an outline of the proposed State strategies to achieve the 2020 GHG limits required by AB 32. Statewide GHG emissions resulting from the loss of sequestered carbon are addressed in the forestry sector elements of the Scoping Plan.

According to the Scoping Plan, California's forests are a carbon sink, currently absorbing approximately 5 MMT CO2E per year. The Scoping Plan sets forth a target for California's forest sector to maintain that level of sequestration through sustainable management practices, including reducing the risk of catastrophic wildfire, and the avoidance or mitigation of land-use changes that reduce carbon storage. Under the Scoping Plan's Sustainable Forest Target (Scoping Plan Measure F-1), the Board of Forestry and Fire Protection is to use its existing authority over sustainable forestry, post-harvest restocking, fire hazard reduction and fire safety, timberland conversion, and existing forest improvement assistance programs to ensure sustainable management practices and, at a minimum, to maintain current carbon sequestration levels. The Scoping Plan identifies CEQA as a mechanism that for assessment and mitigation of greenhouse gas emissions resulting from timberland conversion, through the timberland conversion permits, which are subject to CEQA, as well as through land use decisions by local governments. The Scoping Plan anticipates that regulatory changes for the timberland conversion process could help direct conversion away from forest lands that provide net GHG benefits and identify potential mitigations. CalFIRE has not yet adopted thresholds for determining the significance of GHG emissions or a requirement for mitigation to offset the climate change effects of timberland conversion.
The significance of the loss of sequestered carbon associated with the Project, relative to the global cumulative impact is evaluated in this EIR by determining whether it would conflict with AB 32 Scoping Plan Measure F-1.

6.7.2 Project Greenhouse Gas Emissions

Operational GHG Emissions

Operation of the Campus results in both "direct" and "indirect" GHG emissions. The Campus' direct emissions are those emissions from sources that are owned or controlled by the University. At UC Santa Cruz, these include the emissions from stationary sources such as the cogeneration plant, boilers, and generators, and from vehicles owned and operated by the Campus. Indirect emissions are those that occur because of the Campus' actions but that are produced by sources owned or controlled by another entity. These include emissions from the production and distribution by PG&E of electricity purchased and consumed by the Campus, the production and distribution of water to the Campus by the Santa Cruz Water District, the treatment of wastewater from the Campus by the City of Santa Cruz, and decomposition of waste materials from the Campus that are disposed of at the City landfill.

The Project would improve the energy efficiency of the existing buildings by 10 to 15 percent, by installing "cool" roofs at residence halls A and B, replacing single-glazed windows with dual-glazed windows, low water-use plumbing fixtures, and replacing all light fixtures with more efficient lighting. The proposed Project would increase the building area that requires heating and lighting, by enclosing roof decks to create lounges. The new elevators at three of the residence halls would also create new electricity demand. The replacement of the existing café and Student Activities buildings (a total of 2,250 sf) with the new Plaza building (7,200 sf), would add 4,950 sf of new building space. However, the increase in energy use resulting from the new residential building space, the new elevators, and the Plaza building would be offset by the reduction in energy use in the existing residence buildings. Overall, the natural gas and electricity demand at Merrill College is expected to be approximately the same as under existing conditions. As explained in Section 6.16, below, the Project would result in a net reduction in water consumption and in the amount of wastewater discharged to the City's wastewater treatment plan. As discussed in Section 6.15, below, although the Project would add up to 61 new student bed spaces, the students living in the residence halls are lower-division students who are not allowed to bring cars onto the campus. The Project would not increase the number of staff working at the site. Therefore, the Project would not add a measurable number of new vehicle trips to and from the site. Overall, the Project is not anticipated to result in an increase in the direct or indirect operational GHG emissions of the Campus.

Construction GHG Emissions

The URBEMIS2007 program was used to calculate construction emissions of carbon dioxide CO_2 from site grading, construction of buildings, roads and parking lots, including importation of soil to the site by truck. The analysis used URBEMIS2007 default estimates of equipment usage and construction-related vehicle trips were used. Construction of emissions of two other greenhouse gases, methane and nitrous oxide, were estimated separately based on the URBEMIS2007 estimates of CO_2 from diesel construction vehicles and equipment. Because these gases are more powerful global warming gases than CO_2, the estimated emissions of methane and nitrous oxide were multiplied by correction factors to estimate "carbon dioxide equivalents." Methane was assumed to have a global warming potential of 21 times that of CO_2, while nitrous oxide was assumed to have a global warming potential of 310 times that of CO2 (BAAQMD 2006). The URBEMIS2007 results and the conversion calculations are included in Appendix E of this Initial Study.

The manufacture of construction materials used by the projects would indirectly contribute to climate change (upstream emission source). Upstream emissions are emissions that are generated during the manufacture of products used for construction (e.g., cement, steel, and transport of materials to the region). The upstream GHG emissions for these projects, which may also include perfluorocarbons and sulfur hexafluoride, are not estimated in this impact analysis because they are not within the control of the University and a lack of data precludes their quantification without speculation.

Construction GHG emissions are one-time emissions that would occur only during construction activities. It is common practice to amortize construction-related GHG emissions over the project's lifetime (generally 25 to 40 years) in order to include these emissions as part of a project's total emissions so that GHG reduction measures will address construction GHG emissions as part of the operational GHG reduction strategies. Although Campus buildings typically have a lifetime of over 50 years, the construction GHG emissions were conservatively amortized over a period of 30 years. The total Project emissions of GHGs from construction activities are estimated at 115.00 MT CO_2e, or 3.83 MT CO_2e per year for 30 years.

GHG Emissions from Release of Sequestered Carbon

Carbon sequestration is the retention, capture or placement of CO_2 into a repository, such that it is removed from the atmosphere. Plants and microorganisms in the soil sequester carbon by removing CO_2 from the atmosphere as they grow. Removal of trees at the project site and replacement with developed urban surfaces would result in a loss of the CO_2 sequestration on the site that is afforded by the existing trees. The new trees planted as part of project landscaping would sequester CO_2 as they grow, which would partly offset the loss.

The biomass of the existing on-site trees that would be removed as part of the project was estimated using carbon stock rates and other factors from the California Climate Action Reserve Forest Project Protocol, Version 3.2 (California Climate Action Reserve 2010). The carbon sequestration calculations for the project are included in Appendix E of this EIR. The carbon stock equations calculate the biomass of the bole, or tree stem, the bark, and the crown from individual tree diameter and height measurements. These are then added together to yield the total above-ground biomass. The above-ground biomass is then used to estimate below-ground biomass. A carbon fraction factor of 0.5 is then applied to the total biomass in order to convert the amount of biomass matter to carbon.

In the case of the trees at the Project site, a portion of the carbon stock would remain as carbon in the form of furniture and other wood products. Some of the biomass would decay gradually in a landfill or composting facility or as wood chips in landscaping. The conversion from stored carbon to CO_2 would

take place over time as the wood products and waste slowly decay. Because the amount of wood that would be used for furniture or other wood products is unknown, and for consistency with the analysis of construction emissions, which are also one-time emissions, the GHG emissions resulting from the release of sequestered carbon were amortized over a period of 30 years.

The analysis also took into account the loss of future sequestration by the trees on the project site. At full maturity, trees reach an equilibrium point whereby carbon loss through decay and oxidation is equal to the carbon gain through photosynthesis. The age at which trees reach this equilibrium point varies by species; redwoods, which make up most of the trees on the project site, continue to increase their carbon sequestration for a longer time period than most other species. For this analysis, the future sequestration was estimated using standard redwood yield tables, adjusted for regional conditions by using inventory and growth data from comparable stands in the Santa Cruz Mountains. A growth rate of 2 percent per year was applied to the entire biomass of the existing trees. Table 6.7-1 presents the estimated GHG emissions resulting from removal of trees as part of the proposed project.

Table 6.7-1
GHG Emissions from Release of Sequestered Carbon

Existing Biomass	
Total above-ground biomass (kg)	*149,239.51*
Total above-ground biomass (MT)	*149.24*
Above-groundbiomass (MT/hectare)[9]	*1,920.59*
Below-ground biomass (MT)	*30.28*
Total existing biomass	**179.52**
Future increase in biomass over 30 years (MT)	***145.65***
Total existing and future biomass (MT)	**325.17**
Carbon biomass (MT)	***162.58***
Total one-time emissions of CO2e (MT)	**596.14**
Total emissions amortized over 30 years (MT/year)	**19.87**
Significance threshold	**900**

Note: All equations and calculations are presented in Appendix E.

The proposed planting plan for the Project includes a total of 44 new trees, including ginko biloba, scarlet oak, and coast live oak. These trees would sequester carbon as they grow, which would partly offset the GHG emissions associated with removal of existing trees. The emission reduction associated with these new trees was calculated using the methodology specified by the CAPCOA in its 2010 report, *Quantifying Greenhouse Gas Mitigation Measures*. This methodology assigns a default annual CO_2 accumulation per tree to broad species classes. Sequestration is assumed to occur for a period of only 20 years, which is the active growing period of most trees. After that, the amount of increase in biomass slows and will be completely offset by losses from clipping, pruning, and death.[10] Using an annual CO2

[9] To determine the amount of biomass per hectare, only the area immediately surrounding the trees that would be removed was included. This is smaller than the proposed area that would be covered by the timberland conversion permit, since not all of the trees within the conversion area would be removed.

[10] CAPCOA 2010. Note that this does not apply to the redwood trees that would be removed from the site, since redwood trees can continue to add biomass for more than 100 years.

accumulation rate of 0.0354 MT CO_2e per tree per year, the new trees would provide a total GHG emission reduction of 31.15 MT CO_2e. Amortized over the same 30-year period as construction emissions, this would equate to 1.04 MT CO_2e per year.

6.7.3 Impact Significance

a,b. Table 6.7-2 summarizes the net Project GHG emissions from all sources.

Table 6.7-2
Summary of Project GHG Emissions

Source	Total GHG Emissions ($MTCO_2e$)	Annual GHG Emissions(MT CO2e/year)
Operations	0	0
Construction	115.00	3.83
Tree removal	596.14	19.87
Carbon sequestration by new trees	-31.15	-1.04
Total	**679.99**	**23.84**

The proposed Project would not result in an increase in GHG emissions associated with Campus operations. Improvements in energy efficiency in the existing residence halls would off-set the GHG emissions associated with energy use in the new building space. Additional reductions in indirect GHG emissions would result from the plumbing fixture retrofits included in the Project, which would reduce Campus water use and the volume of wastewater discharged to the City wastewater treatment plant. The Project is not anticipated to result in a measurable increase in vehicle trips to and from the site. Residents of Merrill would continue to benefit from the existing public and Campus transit service to the site. In addition, consistent with the UC Policy on Sustainable Practices, the Project would be designed to achieve, at a minimum, LEED certification of "Silver," and to exceed Title 24 energy efficiency requirements by at least 20 percent. As part of the detailed design process, the building's energy use will be modeled to ensure that this energy efficiency standard is met. Parking for 100 bicycles would be added to the site. New solid waste stations in the moat are being designed in consultation with UC Santa Cruz Grounds Services and the Campus Sustainability Office to ensure that they support the Campus' goal of diverting all solid waste away from landfills by 2020.

As discussed in Section 6.7.2, above, GHG emissions from Project construction activities are estimated at 115.00 MT CO_2e, or 3.83 MT CO_2e per year if amortized over a period of 30 years. GHG emissions resulting from the removal of trees as part of the Project are estimated at 596.14 MT CO2e, or 19.87 MT CO_2e per year if amortized over a period of 30 years. When the carbon sequestration of the new trees in landscaping at the site are taken into account, the net annual GHG emissions of the Project would be 23.84 MT CO_2e per year. This level of emissions would be well below the significance threshold of 900 MT CO_2e per year and the impact would be less than significant. Nonetheless, the Campus has committed to offset the GHG emissions associated with the release of carbon sequestered in the trees that would be removed from the Project site (18.83 MT CO_2e per year), through one of the actions listed below, or a combination of actions that would result in a net offset of 18.83 MT CO_2e per year[11]:

- Planting additional trees on the project site or elsewhere on the campus;

[11] This amount may be reduced if the results of building energy efficiency modeling indicate that the Project would result in a net reduction in direct and indirect Campus operational emissions of GHGs.

- Incorporating additional energy efficiency elements into the Project such that Project operations would result in a net reduction in GHG emissions of 18.83 MT CO_2e per year;
- Funding bi-level lighting or other lighting improvements in other existing buildings on the campus.

This analysis also evaluates the potential for the Project to conflict with AB 32 Scoping Plan Measure F-1, under which the Board of Forestry and Fire Protection is to use its existing authority over sustainable forestry, post-harvest restocking, fire hazard reduction and fire safety, timberland conversion, and existing forest improvement assistance programs to ensure sustainable management practices and, at a minimum, to maintain current carbon sequestration levels.

As summarized in the AB 32 Scoping Plan (CARB 2008), CalFire's Fire and Resources Assessment Program (FRAP) projects conversion of 312,000 acres of forestland and 258,000 acres of woodlands between 2000 to 2020.As discussed in Section 6.7.1, above, the AB 32 Scoping Plan estimates that the forestry sector, statewide, is a net carbon sink, that sequesters 4.7 million metric tons (MMT) of CO_2e annually. The timberland conversion area for the Project would be approximately 0.7 acre, although not all of the trees in the conversion area would be removed. This 0.7-acre area would constitute less than 0.000003 percent of the total projected forestland conversion for California. The net annual GHG emissions from release of the carbon sequestered in the trees that would be removed from the Project (18.83 MT CO_2e[12]), would reduce this sink by about 0.000004 percent. The Project would have a negligible effect on the ability of the State to maintain the current rate of sequestration, and therefore the impact would be less than significant.

Summary

GHG emissions associated with the proposed project would not make a cumulatively considerable contribution to climate change. The Campus will offset the GHG emissions associated with the release of sequestered carbon as a result of removal of trees at the project site. Mitigation is not required.

[12] This takes into account the carbon sequestration by trees planted as part of Project landscaping.

6.8 HAZARDS AND HAZARDOUS MATERIALS

HAZARDS & HAZARDOUS MATERIALS Would the project…	Potentially Significant Impact	Project Impact Adequately Addressed in LRDP EIR	Less than Significant with Project-Level Mitigation Incorporated	Less than Significant Impact	No Impact
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☑	☐
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 a 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 wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☐	☑

Hazards and hazardous materials issues and programmatic mitigation measures applicable to LRDP development are described in Volume I, Section 4.7, of the 2005 LRDP EIR (UCSC 2006). The following, previously adopted LRDP EIR mitigations for potential impacts related to hazards and hazardous materials are applicable to and included in the project (the full text of the mitigation measures is included in Appendix C):

LRDP EIR Mitigation HAZ-7 (survey for and remediation of potential contamination before any demolition or renovation work is performed)

LRDP EIR Mitigation HAZ-9A (construction traffic control and roadway closure notification requirements for contractors)

a) Like any other construction activities, construction of the proposed project could involve use of hazardous chemicals, such as petroleum products and solvents associated with the use of heavy construction equipment. Any such materials would be handled and disposed of in compliance with state and federal laws regulating hazardous waste. Campus Standards provide specific requirements for hazardous materials spill prevention, reporting and response. These requirements would minimize the potential for hazards to the public or to the environment as a result of a release of hazardous materials.

Consistent with Campus procedures and LRDP Mitigation HAZ-7, the buildings have been surveyed for the presence of potential hazardous materials as part of project design. The survey identified lead-based paint, building materials that contain asbestos, light ballasts that contain PCBs, and lamps containing mercury at various location in the buildings. The Campus has developed procedures and workplans for abatement of these materials during construction, that will be incorporated into the contract documents. These documents include qualification requirements for contractors, workers, and hazardous materials haulers; identify relevant regulatory requirements; specific procedures for removal of each type of material, for waste disposal and manifesting procedures, and for final clean-up and criteria for clearing the buildings for re-occupancy. Inclusion of these requirements in the construction contract documents would ensure that hazardous materials encountered during construction are managed in compliance with federal and state regulations, campus policies, and current procedures of UC Santa Cruz Environmental Health and Safety. This would minimize the potential for exposure of workers to contaminated building materials or other contamination inside structures. Therefore, the project's potential to expose people or the environment to hazardous materials would be less than significant.

b,c) With the exception of household hazardous materials used in cleaning and maintenance, hazardous materials are not used in any of the buildings at Merrill. No impact would occur.

d) There are no sites on campus that are listed as hazardous-materials sites pursuant to Government Code Section 65962.5. Past uses of the campus, including the proposed project site, are well known, and are not likely to have resulted in soil or groundwater contamination. Therefore, no impact would occur.

e,f) There are no public airports or private airstrips in the vicinity of the UC Santa Cruz campus. No impact would occur with respect to air traffic hazards.

g) Construction of the proposed project could necessitate temporary lane closures on the Merrill College access road and service roads within the college. Consistent with LRDP Mitigation HAZ-9A, the proposed project would therefore be required to comply with standard Campus contract provisions that include: (1) Construction must be conducted in a manner that minimizes the obstruction to traffic; (2) Contractors are required to provide advance notification of proposed road closures to the campus community and to emergency services providers; (3) Alternate access routes must be clearly designated; (4) Adequate access to fire hydrants and for the passage of emergency vehicles must be maintained, and campus police and fire departments and dispatchers must be notified of proposed road closures and alternative travel routes for emergency vehicles; (5) Handicapped-accessible and emergency exit routes from occupied buildings must be maintained at all times. The proposed project will comply with these and all other relevant Campus Standards. The project's potential to interfere with to Emergency Operations therefore would be less than significant.

h) Although there is some risk of wildfire in undeveloped areas within the central campus, including within Merrill College, Campus fire management procedures have been successful in preventing and controlling fires on campus in the past decade. The proposed project would not increase development

footprint at Merrill College, nor would it interfere with Campus fire management or otherwise exacerbate the existing hazard in any way. Furthermore, as required by LRDP Mitigation HAZ-10A, UC Santa Cruz Fire Department conducts annual inspections of all residential buildings, including those at Merrill College. Therefore, the project's potential to result in increased risk of wildfire would be less than significant.

Summary

LRDP EIR mitigation HAZ-7 was implemented during project design and LRDP Mitigation HAZ-9A would be implemented during construction and occupation of the project, respectively. Accordingly, the project will have no impact or a less than significant impact related to hazards and hazardous materials.

6.9 HYDROLOGY & WATER QUALITY

HYDROLOGY & WATER QUALITY Would the project…	Potentially Significant Impact	Project Impact Adequately Addressed in LRDP EIR	Less than Significant with Project-Level Mitigation Incorporated	Less than Significant Impact	No Impact
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?	☐	☐	☐	☑	☐
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?	☐	☐	☐	☐	☑

Hydrology and water quality background for the campus, and issues and programmatic mitigation measures applicable to LRDP development, are described in Volume II, Section 4.8, of the 2005 LRDP EIR (UCSC 2006). The following, previously adopted LRDP EIR mitigations for potential impacts to

hydrologic resources and water quality are applicable to and included in the project (the full text of the mitigation measures is included in Appendix C):

LRDP EIR Mitigation HYD-2B (erosion and sediment control measures for hillside grading)

LRDP EIR Mitigation HYD-3C (storm water runoff flow rate requirements for projects that create new impervious surface)

LRDP EIR Mitigation HYD-3D (storm water runoff volume control requirements for new capital projects)

a-f)The Merrill Project would result in a small increase the area of hardscape (paths, patios, etc.) at the site. The project site is in the San Lorenzo –Pogonip watershed. The San Lorenzo – Pogonip watershed has a combined total on-campus drainage area of about 510 acres. In general, the San Lorenzo – Pogonip watershed drains most parts of the campus that lie to the east of Hagar Drive and portions of Merrill College and the Crown-Merrill Apartments. The watershed is divided into eight sub-watersheds associated with eight gullies (known as Gullies A through H) that drain to the east. Several sinkholes are located on campus property within this watershed. Apart from runoff lost to the subsurface through sinkholes, runoff also percolates through permeable hillslope soils. The percolated runoff as well as runoff that drains to the subsurface via sinkholes contributes to several springs located about ½ mile east of the campus's eastern boundary in the Pogonip City Park and in Harvey West Park. The springs feed creeks in the Pogonip that drain to the San Lorenzo River. Runoff from the northern portion of the Merrill Project site discharges to Gully H; runoff from the southern portion of the site discharges to Gully G.

The San Lorenzo River is included on the Clean Water Act section 303(d) list of impaired water bodies for both fecal indicator bacteria and sediment. The UC Santa Cruz Storm Water Management Program (SWMP) contains restrictions that are intended to improve water quality in the San Lorenzo River by limiting sediment from construction activities. The restrictions apply to projects throughout the campus, not just to areas within the San Lorenzo –Pogonip watershed.

There are existing erosion conditions in both Gully G and Gully H. The Campus is planning to install a system of underground detention vaults beneath a parking lot south of the project site, to detain runoff from existing impervious surfaces within the Gully G, to prevent future exacerbation of the erosion in that drainage. The detention system is included in the approved Campus' Infrastructure Improvements Project Phase 2.

Short-Term Construction Water Quality

Ground disturbance and grading has the potential to result in water quality impacts during construction. The proposed project would entail grading for the new pathways, bridges, and outdoor common areas, and excavation for foundations for the new bridge and elevator. Overall, the project could result in approximately 2 acres of ground disturbance. As required for all construction contracts that would disturb more than 1 acre of soil, project construction contract documents would require the project contractor to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) to comply with the State Water Resources Control Board general permit for construction activities. The SWPPP identifies potential sources of pollution and describes runoff controls that will be implemented both during construction and after the building is complete to avoid impacts to water quality. The contractor would also be required to implement erosion and sediment control measures for hillside grading during the rainy season, as specified in LRDP Mitigation HYD-2B. Because the project would be subject to these requirements, the potential short-term construction water quality impacts of the project would be less than significant.

Long-Term Operational Water Quality, Increased Runoff and Flooding

The proposed project would not result in an increase in indoor water use at the site and therefore the volume of wastewater discharged from the site would/would not increase. The project would not change the types of activities and uses of the site. Therefore, there is no reason to expect the quality of the wastewater discharged to the sewer system to change.

The proposed project would increase the total building footprint and hardscape area on the site by approximately 3,100 sf, including the optional elevated pathway to Residence Halls C and D. Approximately 3,200 sf of this area would be surfaced by pervious or semi-pervious materials such as permeable concrete, concrete pavers or stabilized decomposed granite. Thus, the Project would result in a net reduction in impervious surface of approximately 100 sf. The volume and rate of storm water runoff from these pervious or semi-pervious surfaces will depend on the specific type of surface that is selected and the infiltration properties of the underlying soil.

The project would not add substantial new sources of runoff pollutants. Runoff from the new parking spaces and drop-off area would flow to a rain garden at the center of the Merrill Circle; soil in the rain garden would filter the runoff to remove pollutants such as oil and grease and heavy metals.

LRDP Mitigations HYD-3C and HYD-3D are applicable to and incorporated into the proposed Project. These mitigations require that post-development storm water runoff peak flow rates not exceed pre-development rates, and that every development project include design measures to maximize infiltration and dissipation of runoff near its source. In addition, all Campus projects must comply with the following requirements of Campus Standards:

- Storm drainage design shall insure the post-construction storm water flow rate will not cause excessive erosion. . If the flow rate is greater than 20 percent of the 2-year storm, the designer shall demonstrate the project will not cause excessive erosion. Each project shall also include design measures to avoid or minimize the increase in the volume of runoff discharged from the site to the maximum extent feasible.[13]
- Post project runoff volumes shall not exceed pre project runoff volumes for the 2 year storm for projects that add less than 5,000 sf of impervious surface and the 2, 5, and 10 year storm for projects 5,000 sf and over. If the specified volume reduction is not feasible or appropriate due to site conditions provide documentation from a licensed professional.

In addition to the standards described above, each project must include design measures to avoid or minimize the increase in the volume of runoff discharged from the site to the maximum extent feasible. The Campus has developed a low-impact-development (LID) protocol that is applicable to the proposed

[13] This is an interim hydromodification standard adopted by the Campus pursuant to its Storm Water Management Plan (SWMP) (UC Santa Cruz 2009). Hydromodification refers to changes in the magnitude and frequency of stream flows as a result of urbanization, and the resulting impacts on the receiving channels in terms of erosion, sedimentation and degradation of instream habitat. The degree to which a channel will erode is a function of the increase in driving forces (shear stress), the resistance of the channel (critical shear stress), the change in sediment delivery, and the geomorphic condition of the channel. Critical shear stress is the stress threshold above which erosion occurs. Only those flows that are large enough to generate shear stress in excess of the critical shear stress of the bank and bed materials cause erosion. This increases the shear stress exerted on the channel by stream flows and can trigger erosion in the form of incision (channel downcutting) or widening (bank erosion) or both. Increases in flow below critical shear stress levels have little or no effect on the channel. The Campus standard is based on an order issued by the San Francisco Bay Regional Water Quality Control Board to the San Francisco Public Utilities Commission for controlled release operations, in which threshold of flow that would cause excessive erosion was defined as 20 percent of the 2-year storm (Order No. <R2-2008-XXX>).

project. LID is an approach to storm water management that manages storm water at the source by integrating site hydrologic and environmental functions into the development design. By minimizing directly connected impervious area and promoting infiltration, LID features such as vegetated roofs, bioswales, and bioretention areas, and pervious pavement, mimic natural hydrologic conditions to counteract the hydrologic effects of development. The end hydrological results are a reduction in runoff volume, an increased time of concentration, reduced duration and peak rate of flows, and improved water quality. Because more water is retained on-site and in distributed facilities, the rate of discharge is less critical for LID facilities, since different facilities will discharge into the stream system at different times.

LID elements that have been incorporated into the proposed Project include: the rain garden at the Merrill Circle, pervious or semi-pervious pavement in some areas, service road widths limited to the minimum required for fire protection, and impervious surfaces graded to drain by sheetflow to adjacent unpaved areas.

The Campus requires that design consultants submit runoff calculations during the detailed design phase, to demonstrate that the Project will meet the Campus Standards. For areas where pervious and semi-pervious paving are proposed, these must take into account the infiltration properties of the underlying soil. For the proposed Project, amendment of soils underlying the pervious/semi-pervious pavement and within proposed landscaped areas on the site may be required to meet the standards. However, since the Project would not result in a net increase in impervious surface, and a large portion of the site would be available for infiltration, the Campus expects that the Campus standards can be achieved without construction of off-site storm water or retention ponds or vaults. The storm water management system for the proposed project would be consistent with Campus Standards, as well as with LRDP Mitigations HYD-3C and HYD-3D. The increase in runoff from the proposed project would not result in flows that would increase erosion and sedimentation in Gully G or Gully H or result in flooding, and the impact would be less than significant.

g-j) The proposed project has no potential to result in impacts with respect to 100-year flood hazard areas, dam or levee failure, or inundation by seiche, tsunami, or mudflow. The project site is not within a 100-year flood hazard area and is outside the inundation hazard area that could be affected by a failure of levees or dams, including Newell Creek Dam. The main campus is not in an area subject to inundation by seiche, tsunami, or mudflow. The project would not result in impacts related to any of these hazards.

Summary

LRDP Mitigations HYD-2B, HYD-3C and HYD-3D are applicable to and incorporated into the Project. Accordingly, the Project would result in less-than-significant impacts related to hydrology and water quality and no project specific mitigation is required.

6.10 LAND USE & PLANNING

LAND USE & PLANNING Would the project…	Potentially Significant Impact	Project Impact Adequately Analyzed in LRDP EIR	Less than Significant with Project-Level Mitigation Incorporated	Less than Significant Impact	No Impact
a) Physically divide an established community?	☐	☐	☐	☐	☑
b) Conflict with any 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?	☐	☐	☐	☐	☑
d) Result in development of land uses that are substantially incompatible with existing adjacent land uses or with planned uses?	☐	☐	☐	☐	☑

Land use background and issues relevant to LRDP development are described in Volume II, Section 4.9, of the 2005 LRDP EIR (UCSC 2006).

a,b,d) The applicable land use plan for the campus is UCSC's 2005 Long Range Development Plan (2005 LRDP). The project site is located in the central UC Santa Cruz campus. Land use designation for the project site is Colleges and Student Housing. The existing use of the site is consistent with this land use designation. The Project would not change the use of the site.

c) 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 impacts would occur.

Summary

The proposed project would not result in any impacts related to land use.

6.11 MINERAL RESOURCES

MINERAL RESOURCES Would the project…	Potentially Significant Impact	Project Impact Adequately Analyzed in LRDP EIR	Less than Significant with Project-Level Mitigation Incorporated	Less than Significant Impact	No Impact
a) Result in the loss of availability of a known mineral resource that would be of 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?	❑	❑	❑	❑	☑

a,b) The campus is within a Zone 3 Mineral Resource Zone, according to California Geologic Survey (CGS) maps. The CGS does not consider development in a Zone 3 area as a significant impact to mineral resources under CEQA (Hill 1997). The project site is not within an area designated as a mineral resource on city or county planning maps. Therefore, the proposed project would not result in any mineral resources impacts.

6.12 NOISE

NOISE Would the project result in…	Potentially Significant Impact	Project Impact Adequately Analyzed in LRDP EIR	Less than Significant with Project-Level Mitigation Incorporated	Less than Significant Impact	No Impact
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 groundborne vibration or groundborne 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?	☐	☐	☑	☐	☐

Noise issues and programmatic mitigation measures applicable to LRDP development are described in Volume II, Section 4.10, of the 2005 LRDP EIR (UCSC 2006). The following, previously adopted LRDP EIR mitigations for potential noise impacts are applicable to and included in the project (the full text of the mitigation measures is included in Appendix C):

LRDP EIR Mitigation NOIS-1 (construction noise mitigation requirements)

LRDP EIR Mitigation NOIS-2 (requirement that contractor truck trips use only City-designated truck routes)

a-d) **Operational Noise.** The proposed project does not include any new stationary noise sources. As discussed in Section 6.14, below, the proposed project operations would generate no more than ten new vehicle trips per day to campus and this would not result in a noticeable increase in traffic noise. The project would not result in any long term or permanent generation of noise in excess of campus thresholds, or any permanent increase in local noise. Further, the installation of double-paned windows will result in reductions in noise from exterior sources for building occupants. No impact would occur.

Construction Noise.

Assessment of whether the project would result in a substantial temporary or periodic increase in ambient-noise levels in the project vicinity above levels existing without the project is based on the following thresholds for maximum acceptable noise levels:

– 80 dBA Leq (8h)[14] daytime and evening (7 AM to 10 PM)

– 70 dBA Leq (8h) nighttime (10 PM to 7 AM)

Potential noise effects from construction activities for the proposed project were assessed using a standard reference for construction noise (U.S. Environmental Protection Agency [EPA] 1971). The EPA has compiled data related to the noise-generating characteristics of specific types of construction equipment, and noise levels that can be achieved with implementation of feasible control measures, as measured in decibels (dBA), on a frequency-dependent rating scale that relates to the noise frequency sensitivity of the human ear. Noise levels generated by heavy equipment can range from approximately 70 dB(A) to noise levels in excess of 100 dB(A) when measured at a distance of 50 feet from the noise source. EPA noise generation data for the types of equipment that might be used for construction of the proposed project are presented in Table 6.12-1.

Table 6.12-1
Noise Levels and Abatement Potential of Construction Equipment Noise at 50 and 100 Feet

Equipment	Noise Level at 50 Feet		Noise Level at 100 Feet	
	Without Controls	With Controls[a]	Without Controls	With Controls[a]
Earthmoving	dBA			
Front Loaders	79	75	73	69
Backhoes	85	75	79	69
Dozers	80	75	74	69
Tractors	80	75	74	69
Graders	85	75	79	69
Pavers	89	80	83	74
Trucks	82	75	76	69
Materials Handling				
Concrete Mixers	85	75	79	69
Concrete Pump	82	75	76	69
Crane	83	75	77	69
Concrete Crushers	85	75	79	69
Stationary				
Pumps	76	75	70	69
Generator	78	75	72	69
Compressors	81	75	75	69
Impact				
Jack Hammers	88	75	82	69
Pneumatic Tools	86	80	80	74
Other				
Saws	78	75	72	69
Vibrators	76	75	70	69

Source: U.S. EPA 1971.

Note: (a) Noise levels that can be achieved with implementation of feasible noise controls. Feasible noise controls include selecting quieter procedures or machines and implementing noise-control features requiring no major redesign or extreme cost (e.g., improved mufflers, equipment redesign, use of silencers, shields, shrouds, ducts, and engine enclosures).

As shown on Table 6.12-1, without implementation of noise reduction measures the various types of heavy construction equipment that might be used in construction of the proposed project can generate noise levels ranging from approximately 76 dBA to 85 dBA when measured at 50 feet from the source,

[14] $L_{eq(8h)}$ is an average measurement over an eight-hour period.

and 70 dBA to 80 dBA when measured at 100 feet from the source. The noisiest pieces of equipment that may be used during construction would be pneumatic tools, jackhammers and pavers. As with all noise, construction noise levels diminish rapidly with distance from the construction site, with a decrease of approximately 6 dBA per doubling of distance.

Housing, childcare and medical facilities, parks and academic buildings are considered to be noise-sensitive receptors. There are no childcare or medical facilities or parks in the immediate vicinity of the project site. Housing and classrooms within Merrill College would not be occupied during the summers of 2013 and 2014 but would be occupied during the 2013-14 academic year. The Merrill Academic and Administration buildings would be occupied throughout the construction period. The sensitive receptors nearest to the construction site are the Merrill Academic building and Residence Halls A and B, which are all adjacent to the project site.

The estimated noise levels associated with construction of the proposed project are provided below in Table 6.12-2. The noise levels are presented for equipment without noise controls and with noise controls. The noise levels with controls represent noise levels that can be achieved with implementation of feasible noise controls, including selecting quieter procedures or machines and implementing noise control-features requiring no major redesign or extreme cost (e.g., improved mufflers, equipment redesign, use of silencers, shields, shrouds, ducts, and engine enclosures). The noise technical analysis is presented in Appendix D.

As required by LRDP Mitigation NOIS-1, which is applicable to and included in the proposed Project, the Campus must implement a construction noise mitigation plan for all construction projects on the campus. The noise mitigation plan must include the requirement that all construction equipment be equipped with feasible noise reduction devices, and also must require noticing of loud construction activities and place certain constraints on the scheduling of such activities.

As shown in Table 6.12-2, that receptors in nearby campus buildings could be exposed to temporary noise levels up to 85 dBA, with the use of noise controls on equipment. This would exceed the 80 dBA threshold of significance during the daytime or evening at the nearest sensitive receptors when construction equipment is operated within 100 feet of sensitive receptors. This is considered a potentially significant impact. This impact would be reduced to a less-than-significant level with implementation of Merrill Mitigation NOIS-1. This mitigation requires that the contractor provide a temporary sound barrier, which would reduce the noise level at receptors outside the construction site by at least 5 dBA.

Table 6.12-2
Estimated Maximum Construction Noise Levels

Construction Phase	Noise Levels without Controls[1] Leq dB(A)	Noise Levels with Controls[1] Leq dB(A)
Demolition	87	80
Grading and Fine Grading	86	79
Paving	93	84
Building Construction	92	85
Architectural Coating	81	76

Source: Impact Sciences, Inc.

[1] *The loudest construction equipment would be in use at the same time at an average of 50 feet from the noise sensitive receptors and the remaining equipment would be in use at the same time at 100 feet from the noise sensitive receptors.*

Merrill Mitigation NOIS-1: The construction contractor shall provide a temporary noise curtain or barrier with a Sound Transmission Classification (STC) rating of 25 or greater with a height that blocks the line-of-sight between the noise source and receiver when construction equipment would operate within 100 feet of occupied residential or academic buildings.

Project construction would not include pile driving, blasting or other construction activity that would generate substantial vibration or groundborne noise. The results from vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibrations at moderate levels, to slight structural damage at the highest levels. Site ground vibrations from construction activities very rarely reach the levels that can damage structures, but they can achieve the audible range and be felt in buildings very close to the site. Vibration or groundborne noise levels that exceed the FTA acceptable level threshold of 83 VdB[15] would be considered a potentially significant impact. Loaded trucks, the equipment which would create the greatest amount of vibration during construction, are capable of producing approximately 80 VdB at 50 feet. Although construction activity would take place within 50 feet of occupied buildings, trucks would not remain at any one location for an extended period of time and would, on average, be used more than 50 feet from the nearest occupied buildings, construction activities would not exceed the FTA ground-borne vibration threshold for the nearest sensitive land uses. Vibrations from loaded trucks and other equipment would be less than 80 VdB at the nearest commercial land uses located to the west, north, and east of the project site and impacts would be considered less than significant.

Summary

Because the project incorporates LRDP Mitigation NOIS-1 and with the adoption of Merrill Mitigation NOIS-1, all noise impacts of the proposed Project would be less than significant.

[15] Vibration is measured in vibration decibels (VdB). The human threshold of perception is around 65 VdB; the dividing line between barely perceptible and distinctly perceptible is around 75 VdB; and vibration levels are acceptable at 85 VdB if there are an infrequent number of events per day.

6.13 POPULATION & HOUSING

POPULATION & HOUSING Would the project…	Potentially Significant Impact	Project Impact Adequately Addressed in LRDP EIR	Less than Significant with Project-Level Mitigation Incorporated	Less than Significant Impact	No Impact
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?	❑	❑	❑	❑	☑
d) Create a demand for housing that cannot be accommodated by local jurisdictions?	❑	❑	❑	❑	☑

More detail on population and housing issues related to development under the campus' 2005 LRDP are described in Volume II, Section 4.11 of the 2005 LRDP EIR (UCSC 2006).

a,d) The proposed project would reconfigure existing building space to provide up to 61 new bed spaces for students enrolled at UC Santa Cruz. Enrollment growth at the campus is not dependent on the construction of campus housing and new campus housing would not trigger enrollment growth. The project would not require or trigger any infrastructure expansion that could indirectly induce population growth. Therefore, the proposed project would not have the potential to cause substantial population growth, nor does it have the potential to create a demand for housing that would not be met by existing housing. No impact would occur.

b,c) The Project would not displace existing housing or people. No impact would occur.

Summary

The proposed project would not result in significant impacts related to population and housing.

6.14 PUBLIC SERVICES

PUBLIC SERVICES Would the project…	Potentially Significant Impact	Project Impact Adequately Addressed in LRDP EIR	Less than Significant with Project-Level Mitigation Incorporated	Less than Significant Impact	No Impact
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 public facilities?	❑	❑	❑	☑	❑

Public services issues relevant to development under the campus' 2005 LRDP, of which the proposed project is an element, are described in Volume II, Section 4.12 of the 2005 LRDP EIR (UCSC 2006).

a) i-ii) The proposed project would construct up to 61 additional student bed spaces. The project would not generate significant new demand for City or County fire or police projection, since the UC Santa Cruz fire and police departments provide first-response services on the campus. The project would increase the resident population served by the UC Santa Cruz police and fire departments, but this would not result in the need for new on or off-campus police or fire protection facilities whose construction could result in significant environmental impacts, and the impact with respect to fire and police services therefore would be less than significant.

iii) The project would house undergraduate students and therefore would not create new demand for City schools. No impact would occur.

iv) Merrill College and the campus in general provide recreational facilities and open lands, libraries, and similar public services that serve the campus residents, so the project would not generate substantial increased demand for or use of City parks, libraries or other public services. The impact would be less than significant.

Summary

The proposed project would not create any significant impacts related to public services.

6.15 RECREATION

RECREATION Would the project…	Potentially Significant Impact	Project Impact Adequately Addressed in LRDP EIR	Less than Significant with Project-Level Mitigation Incorporated	Less than Significant Impact	No Impact
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?	❑	❑	❑	❑	☑

Recreation issues relevant to development under the campus' 2005 LRDP are described in Volume II, Section 4.12, of the 2005 LRDP EIR (UCSC 2006), from which the analysis presented below is tiered.

a) The proposed project would provide housing for up to 61 additional enrolled students but would not result in additional student enrollment or additional population living off-campus in the City of Santa Cruz. While students residing on campus could use off-campus recreational facilities, they are more likely to use the similar facilities available on campus. Therefore the project would not be expected to result in substantial increased use or physical deterioration of off-campus recreational facilities. Campus recreational facilities have adequate capacity to serve the small number of additional student residents associated with the proposed project. The impact would be less than significant.

b) The proposed project does not include construction or expansion of recreational facilities. No impact would occur.

Summary

The proposed project would not create any significant impacts associated with recreational facilities.

6.16 TRAFFIC, CIRCULATION AND PARKING

TRAFFIC, CIRCULATION, & PARKING Would the project…	Potentially Significant Impact	Project Impact Adequately Addressed in LRDP EIR	Less than Significant with Project-Level Mitigation Incorporated	Less than Significant Impact	No Impact
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths and mass transit?	❑	❑	❑	☑	❑
b) Conflict with applicable congestion management program, including, but not limited to, level of service standards and travel demand measures, or other standards 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) Conflict with applicable adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	❑	❑	❑	☑	❑

Traffic and transportation issues relevant to development under the campus' 2005 LRDP are described in Volume II, Section 4.13, of the 2005 LRDP EIR (UCSC 2006). That section also provides detail on program-level mitigation measures. The following, previously adopted LRDP EIR mitigations for potential impacts to transportation and circulation are applicable to and included in the project (the full text of the mitigation measures is included in Appendix C):

LRDP EIR Mitigation TRA-4A (monitoring of transit service and other alternative modes of transportation to assess the need for improvements in campus circulation)

LRDP EIR Mitigation TRA-4B (measures to maintain and improve the efficiency and capacity of the public transit system serving University facilities)

LRDP EIR Mitigation TRA-4C (measures to maintain transit travel times)

LRDP EIR Mitigation TRA-4D (coordination of campus roadway and circulation improvements with the pace of campus development)

a) The project site is served by campus transit and the Metro bus system, and by pedestrian paths. There is no bike lane on McLaughlin Drive or the Merrill College access road. The proposed project would create up to 61 new bedspaces in existing residence halls, which are occupied almost exclusively by first- and second-year undergraduate students. With rare exceptions, first- and second-year students living in campus housing are prohibited from purchasing campus parking permits of any kind and therefore would not be driving to and from the campus. Therefore, the project would not result in any measurable increase in commute traffic and would result in a negligible number of new daily trips to and from the campus. The impact on vehicle traffic and congestion would be within the range of existing daily traffic variation and would be less than significant. Students and residential staff at Merrill College population are subject to the campus' existing Transportation Demand Management (TDM) programs and would continue to be served by and subject to these programs under the proposed project.

Construction would generally occur Mondays through Fridays between 7:30 am and 7:30 pm. Construction traffic would include construction worker vehicles, dump trucks, concrete trucks, and truck trips associated with material deliveries and general debris hauling. Demolition of the Taqueria and Student Activities buildings would involve approximately 5 round-trip truck trips per day for off-haul of demolition debris for a period of approximately 20 days. Grading for site improvements and construction of the Plaza Building would result in approximately of 3,750 cubic yards of surplus soil. Off-haul of this soil would require an average of 10 round trips per day for four weeks. Construction workers typically arrive at the job site before the AM peak hour and leave before the PM peak hour, and off-haul and delivery trips would be spread out over the course of the work day. Demolition and mass grading, which would generate the largest number of truck trips, would take place during the summer, when the number of vehicle trips to and within the campus is much smaller than during the academic year. Therefore, Project construction would not result in a significant impact to the peak-hour level of service of any intersection.

Construction of a storm water detention system in a parking lot approximately 400 feet south of the Merrill Project site as part of the IIP 2 Project is also planned for the summer of 2013, and would also involve a substantial amount of soil offhaul. However the mass grading that would generate most of the surplus soil from the Merrill Project, as well as construction of the detention system, would take place during the summer months. As explained above, truck trips would be spread throughout the day. Therefore, construction of the two projects concurrently will result in a less-than-significant cumulative adverse impact on traffic congestion.

b) There is no Congestion Management Agency for the City or County of Santa Cruz. For the reasons discussed under a), above, the proposed project would not conflict with level of service standards at any intersection, road or highway, and is consistent with the campus' TDM programs. No impact would occur.

c) The campus is not within an air safety zone that would require restrictions on development and there are no airports in the campus vicinity. The proposed project has no potential to affect air traffic patterns.

d) The proposed project would include modifications to Merrill's internal vehicle circulation route to improve ADA accessibility. During construction, controlled vehicle circulation for service vehicles and residential move-in and move-out would be maintained. However, construction could temporarily increase traffic hazards related to conflicts between construction traffic and other motor vehicle/ bicycle/ pedestrian circulation. Consistent with LRDP Mitigation HAZ-9A and Campus Standards, the construction contractor would be required to clearly designate detours and alternate routes when normal vehicle, pedestrian and bicycle routes are blocked; and to provide fencing, appropriate hazard warning signs, and flag persons as needed. For these reasons, the project would not result in significant hazards related to traffic conflicts would be less than significant.

e) Some of Merrill College's internal roadways and paths would be blocked intermittently or temporarily during construction. As discussed in Section 6.8, above, and consistent with LRDP Mitigation HAZ-9A, which is included in the proposed project, Campus Standards require that contractors provide notification two weeks in advance of any road closure, clearly designate alternate routes, and keep fire hydrants accessible at all times. These provisions, which would be a requirement of construction contract specifications, would ensure that construction does not interfere with emergency access. The project impact would be less than significant.

f) The proposed project includes new bicycle parking that would accommodate the potential demand from up to 61 additional residents. The site is well served by pedestrian pathways and transit stops. The proposed project would improve pedestrian connections throughout the site, particularly with respect to ADA-accessible circulation routes. These facilities are consistent with UCSC's adopted policies in support of alternative transportation.

Transit Capacity. New residents at Merrill College would contribute to the increasing campus-wide demand for campus shuttle and Metro bus capacity. However, the increase in residents at this location would be small, and the increase in transit demand at the Merrill transit stops would be spread out over the day and the week. Consistent with LRDP Mitigation TRA-4A, UC Santa Cruz tracks ridership trends and loading data annually to identify peak travel periods and routes for campus transit and Santa Cruz Metropolitan Transit District (SCMTD) transit service and other alternative modes of transportation. The campus also regularly consults with SCMTD planning staff for feedback on travel delays experienced by SCMTD routes passing through the campus, to assess the need for improvements in campus circulation to accommodate changes in campus-related circulation demands. Consistent with LRDP Mitigation TRA-4B, the Campus uses the results of this annual monitoring to improve the operational efficiency and capacity of the campus transit system as needed to maintain transit cycle time. Campus and University Housing Services also pays an annual fee per occupied bedspace to TAPS for the cost of nighttime campus transit service. The campus also will continue to work with SCMTD and other agencies to maintain and improve efficiency and capacity of the public transit system serving University facilities. Because of these ongoing programs, the small increase in transit demand associated with increase in students accommodated by the proposed project would not result in a significant impact with respect to transit capacity or other alternative transportation service.

Pedestrian Traffic and Transit Delays. Under LRDP Mitigation TRA-4C, the Campus has committed to implement measures, including physical and operational improvements, that will ensure that transit travel times between the two most widely-separated colleges does not exceed the time interval between class periods. The campus' recently-instituted crossing-guard program, designed to minimize "swarm behavior at pedestrian crossings of roadways, has proven effective in minimizing transit delays associated with pedestrian crossings. The campus would continue to implement this program at the crossing of McLaughlin Drive closest to Merrill College, as under existing conditions. As a result, the small increase in pedestrian crossings associated with the proposed project would not result in increased transit delays. Under LRDP Mitigation TRA-4D, the campus has committed to ensure that campus roadway and other traffic infrastructure improvements keep pace with other campus development. The proposed project includes improvements to internal circulation within Merrill College for motor vehicles and pedestrians, and would not result in significant new circulation demands that would require roadway improvements outside of the college's internal roadways

Summary

The campus continues to implement LRDP EIR mitigations TRA-4A, -4B, -4C, and -4D. With these measures, the small increase in transit demand and the small contribution to transit delays associated with new bedspace created by the proposed project would not result in conflicts with alternative transportation or increase traffic hazards. Campus Standards and LRDP Mitigation Measures HAZ-9A, which are

included in the proposed project, would ensure that project construction does not result in conflicts among vehicles, pedestrians and bicycles, or impede emergency access. With the inclusion of these measures, all transportation and circulation impacts of the proposed project would be less than significant.

6.17 UTILITIES & SERVICE SYSTEMS

UTILITIES & SERVICE SYSTEMS Would the project…	Potentially Significant Impact	Project Impact Adequately Addressed in LRDP EIR	Less than Significant with Project-Level Mitigation Incorporated	Less than Significant Impact	No Impact
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 stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☑	☐
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☐	☑
e) 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 providers existing commitments?	☐	☐	☐	☐	☑
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☑	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☐	☑
h) Require or result in the construction or expansion of electrical, natural gas, chilled water, or steam facilities, which would cause significant environmental impacts?	☐	☐	☐	☑	☐
i) Require or result in the construction or expansion of telecommunication facilities, which would cause significant environmental impacts?	☐	☐	☐	☐	☑

Utility issues and programmatic mitigation measures relevant to development under the campus' 2005 LRDP are described in Volume II, Section 4.14, of the 2005 LRDP EIR (UCSC 2006). The following, previously adopted LRDP EIR mitigations for potential impacts related to utilities are applicable to and included in the project (the full text of the mitigation measures is included in Appendix C):

LRDP EIR Mitigation UTIL-4 (improvements to recycling and waste reduction programs)

LRDP EIR Mitigation UTIL-9A (continuation of various current water conservation strategies)

LRDP EIR Mitigation UTIL-9B (pilot programs for high-efficiency plumbing, and adoption of effective fixtures into campus standards)

LRDP EIR Mitigation UTIL-9H (retrofit of all plumbing fixtures in student housing to meet efficiency standards current in 2005)

a) This issue is addressed in Section 6.8, *Hydrology and Water Quality*.

b,d,e) The discussion of these impact areas are addressed in separate sections for domestic water and wastewater.

Domestic Water

The proposed Project would replace the existing 3.5 gallon-per-flush (gpf) toilets with dual flush (1.6-gpf/0.8-gpf) fixtures. Even with the addition of up to 61 new student beds, this would result in a reduction in indoor water use at Merrill College of about 5,300 gallons per day (gpd), or 1.9 million gallons per year (gpy).[16] The Plaza building would house existing uses in the two buildings that would be removed, and office that are currently located in the residence halls. Therefore, the new building would not create new water demand. Irrigation water use for the new lawn is estimated at approximately 233,000 gpy.[17] Even with this new water use, the project would still result in a net reduction in water use of more than 1.7 million gpy.

Wastewater

As explained above, the Project would reduce indoor water use and therefore would reduce the amount of wastewater generated at the site. No impact would occur.

c) As discussed in Section 6.9, above, the proposed Project would not 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.

f,g) The proposed project would result in a small increase in solid waste generation through the increase in the residential population of the college. The 2005 LRDP EIR (Vol. 2, pp. 4.15-24 to 4.15-25). estimated that at full development under the 2005 LRDP the campus would dispose of a total of 3,585 tons per year. During the lifetime of the 2005 LRDP, Campus waste would constitute approximately two percent of the remaining capacity of the City's landfill in 2005. Furthermore, to further reduce the less-than-significant LRDP impact, the Campus implements LRDP Mitigation UTIL-4, which requires that the Campus continue to improve its recycling and waste reduction programs and identify additional means of reducing waste. UC Santa Cruz has steadily increased the percentage of its waste stream that is recycled, from 24 percent in 2002 to 59 percent in FY 2010-2011 (74 percent if construction waste is taken into account (University of California, Santa Cruz, 2012). Since the landfill has adequate capacity to handle projected waste disposal volumes generated from campus growth under the 2005 LRDP, including the

[16] Estimate is based on US Green Building Council water use reduction guidance for LEED water efficiency credits, February 1, 2012.

[17] The area of the new lawn would be approximately 11,000 sf. The estimate assumes that irrigation demand would be approximately 34 inches per year (Maddaus Water Management, 2007).

proposed project, no expansion of the landfill would be required and the project impact would be less than significant.

h,i) The buildings affected by the Project are not served by chilled water, heating hot water, or steam distribution systems and the Project would not construct any such systems. The Project would improve the energy efficiency of the existing buildings by installing "cool" roofs at residence halls A and B, by replacing single-glazed windows with dual-glazed windows, and replacing all light fixtures with more efficient lighting. The proposed Project would increase the building area that requires heating and lighting, by enclosing roof decks to create lounges. The new elevators at three of the residence halls would also create new electricity demand. The replacement of the existing café and Student Activities buildings (a total of 2,250 sf) with the new Plaza building (7,200 sf), would add 4,950 sf of new building space. However, the increase in energy use resulting from the new residential building space, the new elevators, and the Plaza building would be offset by a 10- to 15-percent reduction in energy use in the existing residence halls. Overall, the natural gas and electricity demand at Merrill College is expected to be approximately the same as under existing conditions.

The Project would not require any new electrical lines or other upgrades to the Campus electrical distribution system or to the PG&E service to the campus. Natural gas service would be provided to the new Plaza building, but on- and off-campus natural gas distribution systems have adequate capacity to serve this new building. The construction-related impacts of installing natural gas service to this building are analyzed in sections 6.3, 6.4, 6.5, and 6.9 (*Air Quality*, *Biological Resources*, *Cultural Resources*, *Hydrology and Water Quality*). As discussed in those sections, construction impacts in these areas would be reduced to a less-than-significant level with mitigation. The existing buildings are not air conditioned, and the Project would not provide new air conditioning. The Project would not require any new telecommunications distribution lines; all improvements to telecommunications systems would be interior. No other impacts would occur with respect to electrical, natural gas and telecommunications systems.

Summary

The project incorporates LRDP EIR mitigations UTIL-4, UTIL-9A and UTIL-9B, and therefore all impacts of the proposed project related to utilities would be less than significant. No project specific mitigation is required.

6.18 MANDATORY FINDINGS OF SIGNIFICANCE

MANDATORY FINDINGS OF SIGNIFICANCE Would the project…	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
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 prehistory?	❑	❑	☑	❑
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 that will cause substantial adverse effects on human beings, either directly or indirectly?	❑	☑	❑	❑

a) As discussed in Section 6.4, above, the project site generally lacks suitable habitat for most special-status wildlife species known from the UC Santa Cruz campus and surrounding region. The project may have impacts on maternity roosts of the long-legged myotis bat, which is a special-status species. This impact would be reduced to a less-than-significant level with implementation of LRDP EIR Mitigations 13A and 13B, which require field surveys for active roosts of special-status bats if tree removal or grading activity commences on a project site during the breeding season of native bat species (April 1 through August 31), and avoidance measures if roosting bats are found. Construction activities and vegetation removal during the nesting season could potentially result in the destruction, abandonment, or failure of nests for non-listed bird species that are protected under the Migratory Bird Treaty Act and the state Fish and Game Code. The project may also adversely affect native nesting birds which are protected by state and federal laws during the breeding season. The Project includes previously adopted LRDP EIR Mitigation BIO-11, which requires pre-construction surveys for nesting birds and avoidance measures if active nests are found, ensuring that the impact would be less than significant. The project would not have adverse impacts to special-status plants.

b) The adverse environmental effects of the project would be limited to construction phase impacts, including construction-related emissions of air pollutants and greenhouse gases, and disturbance of nesting birds or bat maternity roosts. The only other project that may be under construction in the vicinity would be Infrastructure Project Phase 2, which includes construction of a storm water detention system in a parking lot approximately 400 feet south of the Merrill Project site. As discussed in Section 4.3, above, the emissions of fugitive dust (PM_{10}) from the two projects would not result in a significant cumulative air quality impact. Both projects would involve off-haul of soil. However, for both projects, excavation would take place during the summer months when traffic on the campus is relatively light. Therefore, the two projects would not result in a significant cumulative traffic impact.

c) As discussed in Section 6.12, above, construction noise impacts of the project upon residents of Merrill College and upon people working in the academic buildings would be potentially significant. The impact would be temporary and, because the Project incorporates LRDP Mitigation NOIS-1 and with the adoption of Merrill Mitigation NOIS-1, the impact would be less than significant.

7 FISH & GAME DETERMINATION

Based on the information presented in this Initial Study, the project does have a potential to adversely affect wildlife or the habitat upon which wildlife depend. Therefore, a filing fee will be paid.

____ Certificate of Fee Exemption

__X__ Pay Fee

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9 AGENCIES & PERSONS CONSULTED

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Appendix A

Proposed Mitigated Negative Declaration

PROPOSED MITIGATED NEGATIVE DECLARATION

Lead Agency:	University of California
Project Proponent:	University of California Santa Cruz
Project Location:	The project site is within Merrill College, which is located near the northeast corner of the central campus, north of McLaughlin Drive. The buildings with the project site are Residence Halls A, B, C, and D;, the Guzman Apartments; the Merrill Taqueria; and the Student Activities office building. The project site also includes approximately 1 acre of land that is developed with roads, paths, and landscaped open spaces; and a total of approximately 1 acre of wooded land interspersed throughout the site.
Project Description:	The Merrill Residence Halls Capital Renewal Project (Project) consists of two major components. The first component is major maintenance and renovation of four residence halls and one student apartment building, and improvements to internal building accessibility. The second component consists of improvements to the pedestrian circulation system and outdoor gathering spaces within Merrill College to provide accessible routes throughout the Merrill College center and between the buildings in the college center to the Crown College Dining Commons; improved community spaces; and enhanced visual and physical connectivity within the college. In order to achieve the gradients required for ADA compliant paths of travel, the Taqueria and Student Activities building would be demolished and replaced with a single building (the Plaza Building) in slightly different location.
Mitigation Measures:	Merrill Mitigation NOIS-1 requires the installation of a noise-reducing barrier between areas under construction and occupied buildings within and adjacent to the site.
Determination:	In accordance with CEQA, an Initial Study has been prepared by UC Santa Cruz that evaluates the environmental effects of the proposed project. On the basis of the project's Initial Study the campus has determined that, with implementation of the mitigation measures listed above, the proposed project would not have a potentially significant effect on the environment.
Public Review:	In accordance with Section 15073 of the CEQA Guidelines, the Initial Study for the project will be circulated for public and agency review from June 8, 2012 to July 9, 2012.

Appendix B

2005 LRDP Mitigation Measures

Incorporated as Part of the Proposed Project

2005 LRDP EIR Mitigation Measures Incorporated in the Proposed Project	
4.1 Aesthetics	
AES-5A	Prior to design approval of development projects under the 2005 LRDP, the UC Santa Cruz Design Advisory Board shall review project designs for consistency with the valued elements of the visual landscape identified in the 2005 LRDP, and the character of surrounding development so that the visual character and quality of the project area are not substantially degraded.
AES-5C	Campus development shall be designed and construction activities shall be undertaken in a manner that shall minimize removal of healthy and mature trees around new projects, except where the proximity of adjacent mature trees to new development is expected to result in a safety hazard or the ultimate decline of the trees.
AES-5F	Trees identified for removal will be evaluated for their aesthetic value as part of the environmental review process of individual projects. Individual construction projects that result in the removal of large oak trees or other large unique trees considered to be aesthetically valuable components of the landscape shall replace such trees at a 1-to-1 ratio, either on site, or elsewhere on campus via a contribution to the campus's Site Stewardship program for planting replacement trees.
AES-6B	Lighting for new development projects shall be designed to include directional lighting methods shielded to minimize light spillage and minimize atmospheric light pollution. This lighting should be compatible with the visual character of the project site and meet the UC Regents' Green Building Policies.
AES-6C	As part of the design review process, the UC Santa Cruz Design Advisory Board shall consider project-related light and glare and the Campus shall require the incorporation of measures into the project design to limit both to the extent allowed by code.
AES-6E	As part of the design review process, UC Santa Cruz Design Advisory Board shall review outdoor lighting fixtures for roads, pathways, and parking facilities to ensure that the minimum amount of lighting needed to achieve safe routes is used, and to ensure that the proposed illumination limits adverse effect on nighttime views.
4.3 Air Quality	
AIR-1	The Campus shall apply standard MBUAPCD-recommended mitigation measures during construction of new facilities under the 2005 LRDP, as appropriate: • Water all active construction areas at least twice daily. • Prohibit all grading activities during periods of high wind (over 15 mph). • Apply chemical soil stabilizers on inactive construction areas (disturbed lands within construction projects that are unused for at least four consecutive days). • Apply non-toxic binders (e.g., latex acrylic copolymer), as appropriate, to exposed areas after cut and fill operations and hydroseed area. • Require haul trucks to maintain at least 2 feet of freeboard. • Cover all trucks hauling dirt, sand, or loose materials. • Plant vegetative ground cover in disturbed areas as soon as possible. • Cover inactive storage piles. • Install wheel washers at the entrances to construction sites for all exiting trucks. • Pave all roads on construction sites. • Damp-sweep streets if visible soil material is carried out from the construction site.

	• Post a publicly visible sign that specifies the telephone number and person to contact regarding dust complaints. This person shall respond to complaints and take corrective action within 48 hours. The phone number of the Monterey Bay Unified Air Pollution Control District shall be visible to ensure compliance with Rule 402. • Each project shall limit the area under construction at any one time.
AIR-2A	The Campus shall incorporate in each new project design and construction features that conserve natural gas and/or minimize air pollutant emissions from space and water heating. Specific measures that will be considered for each project include, but are not limited to the following: • Orientation of buildings to optimize solar heating and natural cooling; • Use of solar or low-emission water heaters in new buildings; and/or • Installation of best available wall and attic insulation in new buildings
AIR-6	The Campus will minimize construction emissions by implementing measures such as those listed below: • Require the use of cleaner fuels (e.g., natural gas, ethanol) in construction equipment • Require that construction contractors use electrical equipment where possible • Require construction contractors to minimize the simultaneous operation of multiple pieces equipment at a construction site • Minimize idling time to a maximum of 5 minutes when construction equipment is not in use • Schedule operations of construction equipment to minimize exposure to emissions from construction equipment
AIR-7	UC Santa Cruz will continue its efforts in the area of TAC emission reduction.
4.4 Biological Resources	
BIO-6	To avoid or minimize the introduction or spread of noxious weeds, sudden oak death or pitch canker into uninfested areas, UC Santa Cruz shall incorporate the following measures into project plans and specifications for work on the north campus to be conducted under the 2005 LRDP. • Only certified, weed-free materials shall be used for erosion control. • UC Santa Cruz shall identify appropriate best management practices to avoid the dispersal of noxious weeds, sudden oak death and pitch canker. The Campus shall then include appropriate practices in Campus Standards for construction to be implemented during construction in all north campus areas. Typical best management practices include the use of weed-free erosion control materials and revegetation of disturbed areas with seed mixes that include native species and exclude invasive non-natives. Best management practices to avoid the spread of sudden oak death and pitch pine canker will be determined in consultation with the California Department of Forestry. • In uninfested areas, topsoil removed during excavation shall be stockpiled and used to refill the trench on site if it is suitable as backfill
BIO-11	Prior to construction or site preparation activities, a qualified biologist shall be retained to conduct nest surveys at each site that has appropriate nesting habitat. The survey shall be required for only those projects that will be constructed during the nesting/breeding season of sharp-shinned hawk, golden eagle, northern harrier, long-eared owl, or white-tailed kite (typically February 1 through August 31). • The survey area shall include all potential nesting habitat, including mixed evergreen forest, redwood forest, and isolated trees that are within 200 feet of the proposed project grading boundaries. The survey shall be conducted no more than 14 days prior to commencement of construction activities. • If active nests of sharp-shinned hawk, Cooper's hawk, golden eagle, northern harrier, Vaux's swift, long-eared owl, and white-tailed kite (or other species protected under the Migratory Bird Treaty Act and the California Fish and Game Code) are present in the construction zone or within 200 feet of the construction zone, a temporary fence shall be erected at a distance of 200 feet around the nest site (or less if determined to be appropriate by the biologist according to the species and site conditions). Clearing and construction within the fenced area shall be postponed until juveniles have fledged and there is no evidence of a second nesting attempt as determined by the biologist.
BIO-13A	If tree removal or grading activity commences on a project site in the north campus during the breeding season of native bat species (April 1 through August 31), a field survey shall be conducted by a qualified biologist to determine whether active roosts of special-status bats (pallid bat, Pacific Townsend's big-eared bat, western red bat, long-eared myotis,

	fringed myotis, long-legged myotis, yuma myotis, or greater western mastiff bat) are present on the project site or in areas containing suitable roosting habitat within 50 feet of the project site. Field surveys shall be conducted in late April or early May in the season before construction begins, when bats are establishing maternity roosts but before pregnant females give birth. If no roosting bats are found, no further mitigation would be required.
BIO-13B	If roosting bats are found, disturbance of the maternity roosts shall be avoided by halting construction until either (1) the end of the breeding season or, (2) a qualified biologist removes and relocates the roosting bats in accordance with CDFG requirements.
4.5 Cultural Resources	
CULT-1A	As early as possible in the project planning process, the Campus shall define the project's area of potential effects (APE) for archaeological resources based on the extent of ground disturbance and site modifications anticipated for the proposed project. The Campus shall also review confidential resource records[1] to determine whether complete intensive archaeological survey has been performed on the site and whether any previously recorded cultural resources are present.
CULT-1B	Where native soils will be disturbed, the Campus shall provide and shall require contractor crews to attend an informal training session prior to the start of earth moving, regarding how to recognize archaeological sites and artifacts. In addition, campus employees whose work routinely involves disturbing the soil shall be informed how to recognize evidence of potential archaeological sites and artifacts. Prior to disturbing the soil, contractors shall be notified that they are required to watch for potential archaeological sites and artifacts and to notify the campus if any are found. In the event of a find, the Campus shall implement LRDP Mitigation CULT-1G, below.
CULT-1G	If an archaeological resource is discovered during construction (whether or not an archaeologist is present), all soil disturbing work within 100 feet of the find shall cease. The Campus shall contact a qualified archaeologist to provide and implement a plan for survey, subsurface investigation as needed to define the extent of the deposit, and assessment of the remainder of the site within the project area to determine whether the resource is significant and would be affected by the project. LRDP Mitigation CULT-1F shall also be implemented.
CULT-2B	As early as possible in the project planning process, the Campus shall define the project's area of potential effects (APE) for historic structures. The Campus shall determine the potential for the project to result in impacts to or alteration of historic structures, based on the extent of site and building modifications anticipated for the proposed project.
CULT-4C	In the event of a discovery on campus of human bone, suspected human bone, or a burial, the Campus shall ensure that all excavation in the vicinity halts immediately and the area of the find is protected until a qualified archaeologist determines whether the bone is human. If the qualified archaeologist determines the bone is human, or if a qualified archaeologist is not present, the Campus will notify the Santa Cruz County Coroner of the find and protect the find without further disturbance until the Coroner has made a finding relative to PRC 5097 procedures. If it is determined that the find is of Native American origin, the Campus will comply with the provisions of PRC §5097.98 regarding identification and involvement of the Native American Most Likely Descendant (MLD).
CULT-5A	During project planning, the Project Manager shall consult the most recent Campus Soils and Geology map to determine whether the proposed project is underlain by a formation that is known to be sensitive for paleontological resources.
CULT-5C	In the event of a discovery of a paleontological resource on campus, work within 50 feet of the find shall halt until a qualified paleontologist has examined and assessed the find and, if the resource is determined to be a unique paleontological resource, the resource is recovered. The Campus shall ensure that all finds are adequately documented, analyzed, and curated at an appropriate institution.
CULT-5D	In the event that a proposed project would result in impacts to a unique paleontological resource, the project planning team shall work together to reduce impacts to the find through design and construction modifications, to the extent feasible.
4.7 Hazards and Hazardous Materials	
HAZ-7	The Campus shall survey buildings for potential contamination before any demolition or renovation work is performed. If

[1] Monterey Bay Archaeological Archives, Department of Anthropology, UC Santa Cruz and California Historical Resources Information System. Northwest Information Center, Sonoma State University.

	contamination is discovered, appropriate remediation will be completed.
HAZ-9A	The Campus shall continue to include the following requirements in its Campus Standards and implement them under the 2005 LRDP: • Construction work shall be conducted so as to ensure the least possible obstruction to traffic. • Contractors shall notify the University's Representative at least two weeks before any road closure. • When paths, lanes, or roadways are blocked, detour signs must be installed to clearly designate an alternate route. Fire hydrants shall be kept accessible to fire fighting equipment at all times. To ensure adequate access for emergency vehicles when construction projects would result in temporary lane or roadway closures, Physical Plant and Physical Planning and Construction shall continue to require that construction and maintenance project managers notify campus police and fire departments and the campus dispatchers of the closures and alternative travel routes.
4.8 Hydrology and Water Quality	
HYD-2B	No grading shall be conducted on hillsides (sites with slopes greater than 10 percent) during the wet season (October 1 through May 31) unless controls that prevent sediment from leaving the site are implemented. Erosion control measures, such as erosion control blankets, seeding or other stabilizing mechanisms shall be incorporated into the project erosion control plan or SWPPP and applied to graded hillside prior to predicted storm events.
HYD-3C	Each new capital project proposed under the 2005 LRDP that creates new impervious surface shall include design measures to ensure that post-development peak flows from 2-, 5- and 10-year storms do not exceed the 2-, 5-, and 10-year pre-development peak flows and that post-development peak flows from a 25-year storm do not exceed the pre-development peak flow from a 10-year storm.
HYD-3D	The Campus shall require each new capital project to include design measures to minimize, to the maximum extent practicable, the increase in the volume of storm water runoff discharged from the project site to sinkholes or natural drainages. These design measures shall include features that maximize infiltration and dissipation of runoff, preferably near the area where new runoff is generated, and may include, but will not be limited to: vegetated swales, bioretention areas, infiltration trenches and basins, level spreaders, permeable pavement, minimizing directly connected impervious surfaces, storage and re-use of roof runoff, and green roofs. Within one year following approval of the 2005 LRDP, the Campus shall provide a protocol for design consultants to use in demonstrating that measures to reduce runoff are included in the project design to the maximum extent practicable
4.10 Noise	
NOIS-1	Prior to initiation of construction of a specific development project, the Campus shall approve a construction noise mitigation program that shall be implemented for each construction project. This shall include but not be limited to the following: • Construction equipment used on campus is properly maintained and has been outfitted with feasible noise-reduction devices to minimize construction-generated noise. • Laydown and construction vehicle staging areas shall be located at least 100 feet away from noise-sensitive land uses as feasible. • Stationary noise sources such as generators or pumps shall be located at least 100 feet away from noise-sensitive land uses as feasible. • Notices of the dates and hours of anticipated construction shall be posted in academic, administrative, and residential buildings within 100 feet of construction noise sources at least a week before the start of each construction project. • Loud construction activity (i.e., construction activity such as jackhammering, concrete sawing, asphalt removal, and large-scale grading operations) within 100 feet of a residential or academic building shall not be scheduled during finals week. • Loud construction activity as described above within 100 feet of an academic or residential use shall, to the extent feasible, be scheduled during holidays, Thanksgiving break, Christmas break, Spring break, or Summer break. • Loud construction activity within 100 feet of a residential building shall be restricted to the hours between 7:30 AM and 7:30 PM, Monday through Saturday. • Loud construction activity within 100 feet of an academic building shall be scheduled to the extent feasible on weekends.
NOIS-2	Campus Standards shall be amended to include a requirement to be imposed on all campus contracts that only City-designated truck routes shall be used for contractor truck trips accessing the campus.

4.14 Traffic, Circulation, and Parking	
TRA-4A UC Santa Cruz shall monitor campus and Metro transit service and other alternative modes of transportation on an annual basis, to assess the need for improvements in campus circulation to accommodate changes in campus-related circulation demands.	
TRA-4B	Based on results of LRDP Mitigation TRA-4A, the Campus shall improve the operational efficiency and capacity of the campus transit system as needed to maintain transit cycle time, and shall work with SCMTD and other agencies to maintain and improve efficiency and capacity of the public transit system serving University facilities.
TRA-4C	Based on the results of LRDP Mitigation TRA-4A, the Campus shall implement measures, including physical and operational improvements, that will ensure that transit travel times between the two most widely-separated colleges does not exceed the time interval between class periods. These measures may include, but are not limited to; channelization of pedestrian crossings, installation of signal-controlled pedestrian crossings, and grade-separated pedestrian crossings where appropriate.
TRA-4D	The Campus shall coordinate implementation of needed campus roadway and circulation improvements identified in the 2005 LRDP with the pace of campus development.
4.14 Utilities	
UTIL-4	The Campus will continue to improve its recycling and waste reduction programs and identify additional means of reducing waste.
UTIL-9A	The Campus shall continue to implement and improve all current water conservation strategies to reduce demand for water, including the following: • Continue the leak detection and repair program. • Install an individual water meter in each new employee housing unit to encourage residential water conservation. • Install waterless urinals in all new buildings. • Require that new contracts for washing machines in student residences be certified by the Consortium on Energy Efficiency 6 to have a water factor of 5.5 or less or meet an equivalent standard. New washing machines purchased for use in athletic facilities shall meet applicable standards for water-efficiency for institutional machines. • Incorporate water-efficient landscaping practices in all new landscape installations. Water-conservative landscaping practices shall include, but will not be limited to the following: use of water-efficient plants, temporary irrigation systems for plant establishment areas where mature plants will be able to survive without regular irrigation, grouping of plants according to their water requirements, design of planting areas to maximize irrigation pattern efficiency, and mulch covering in planting areas. • To facilitate monitoring of water usage in all new development, the Campus shall: (1) install separate meters on water lines for individual buildings and (2) install meters on irrigation lines where one point of connection irrigates 1 acre or more.
UTIL-9B	As new technologies become available, the Campus shall continue to conduct pilot programs for high-efficiency plumbing fixtures including, but not limited to, dual-flush toilets. If a piloted technology proves to be successful (i.e., the high-efficiency fixtures are effective in water savings and do not require more frequent or expensive maintenance than the existing standard), the Campus shall revise its standards to require use of the fixtures in all new buildings and in existing buildings as existing fixtures need to be replaced.
UTIL-9H	Within five years following approval of the 2005 LRDP, the Campus shall complete the retrofit of all plumbing fixtures in student housing not meeting the efficiency standards current in 2005 (1.6 gallons per flush for toilets). The new fixtures installed under the retrofit program shall conform to the campus standard for new buildings current at the time of the retrofit.

	temporary irrigation systems for plant establishment areas where mature plants will be able to survive without regular irrigation, grouping of plants according to their water requirements, design of planting areas to maximize irrigation pattern efficiency, and mulch covering in planting areas. • To facilitate monitoring of water usage in all new development, the Campus shall: (1) install separate meters on water lines for individual buildings and (2) install meters on irrigation lines where one point of connection irrigates 1 acre or more.
UTIL-9B	As new technologies become available, the Campus shall continue to conduct pilot programs for high-efficiency plumbing fixtures including, but not limited to, dual-flush toilets. If a piloted technology proves to be successful (i.e., the high-efficiency fixtures are effective in water savings and do not require more frequent or expensive maintenance than the existing standard), the Campus shall revise its standards to require use of the fixtures in all new buildings and in existing buildings as existing fixtures need to be replaced.
UTIL-9H	Within five years following approval of the 2005 LRDP, the Campus shall complete the retrofit of all plumbing fixtures in student housing not meeting the efficiency standards current in 2005 (1.6 gallons per flush for toilets). The new fixtures installed under the retrofit program shall conform to the campus standard for new buildings current at the time of the retrofit.

Appendix C

Proposed Mitigation Monitoring Plan

PROPOSED MITIGATION MONITORING PROGRAM

CEQA requires that the Lead Agency establish a program to report on and monitor measures adopted as part of the environmental review process to mitigate or avoid significant effects on the environment. This Mitigation Monitoring Program (MMP) is designed to ensure that the project-specific mitigation measures identified in this Initial Study are implemented.

The MMP for the proposed project, as outlined in the following table, describes monitoring and reporting procedures, monitoring responsibilities, and monitoring schedules for the project-specific mitigation measures identified in the Initial Study. Once completed, all monitoring actions will be reported in writing to or by the UC Santa Cruz Physical Planning and Construction, which will maintain mitigation-monitoring records for the proposed project. The MMP will be considered by the University in conjunction with project review and will be included as a condition of project approval.

The components of the MMP include:

a) **Mitigation Measure:** The mitigation measures provide mitigation for the proposed project.

b) **Monitoring and Reporting Procedure:** Identifies the actions that must be completed for the mitigation measures to be implemented.

c) **Mitigation Timing:** Identifies the timing for implementation of each action associated with the mitigation measures in order to effectively accomplish the intended outcome.

d) **Monitoring Responsibilities:** Identifies the UC Santa Cruz entity responsible for undertaking the required action and monitoring the mitigation measure.

Merrill Residence Halls Capital Renewal Mitigation Monitoring Program

Project-Specific Mitigation Measure	Monitoring and Reporting Procedure	Mitigation Timing	Mitigation Responsibility
Merrill Mitigation NOIS-1: The construction contractor shall provide a temporary noise curtain or barrier with a Sound Transmission Classification (STC) rating of 25 or greater with a height that blocks the line-of-sight between the noise source and receiver when construction equipment would operate within 100 feet of occupied residential or academic buildings.	1) Include requirement for noise barrier in bid documents 2) Document installation and maintenance of the barrier.	Before project goes out to bid. Quarterly during construction.	PP&C Project Manager

Appendix D

Construction Health Risk Assessment and Noise Technical Analysis

UNIVERSITY OF CALIFORNIA, SANTA CRUZ

MERRILL COLLEGE MAJOR MAINTENANCE/CAPITAL RENEWAL PROJECT

Construction Screening Health Risk and Noise/Vibration Assessment

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May 2012

SUMMARY

This technical report discusses and evaluates the potential for construction-related health risk and noise/vibration impacts from construction activity associated with the proposed University of California, Santa Cruz ("UCSC" or "University") Merrill College Major Maintenance/Capital Renewal Project ("project" or "proposed project") located in Santa Cruz County, California. The proposed project consists of construction activity that will take place during the summer months when campus residential buildings on or near Merrill College will not be occupied and activity that will take place during the academic period when campus residential buildings will be occupied. Academic buildings will be occupied during both the summer and academic periods. The construction activity that will take place on the Merrill College campus during the summer months includes the following: all demolition of a small café building, roads, paths, and pedestrian bridges; all major grading and excavation, including excavation for elevator pits, bridge foundations, building pad, and road widening; and asphalt paving. The construction activity that will take place during the academic period include the following: elevator shaft construction; fine grading for paths, plazas, and patios; landscaping; bench construction; construction of elevated paths and plaza stairs; path and plaza surfacing; and construction of a new 7,100 square foot building. The new 7,100 square foot building will be constructed on two levels with one floor at the level of the new pedestrian bridges and the second floor at the level of the service road located adjacent to Residence Halls A and B.

The nearest off-campus sensitive receptors to the project site are located east of State Route 9, approximately three-quarters of a mile away. Off-campus sensitive receptors are also located northeast of the campus on Empire Grade; however, they are in excess of one mile from the project site. Thus, no off-campus sensitive receptors are located in the vicinity of the project site and would not be impacted by construction activity. Additionally, operation of the project would not introduce new sources of air toxics or noise/vibration that have not already been adequately addressed and evaluated in the UCSC 2005 Long Range Development Plan (LRDP) Environmental Impact Report (EIR). Therefore, air quality-related health impacts or noise/vibration impacts would not occur due to operation of the project. Accordingly, this assessment focuses on construction activity that will occur during the summer and academic period when Merrill College and other nearby buildings will be occupied and the associated air quality-related health impacts and noise/vibration impacts that could result at these nearby sensitive receptors.

For the purposes of the assessment, construction is assumed to begin in summer of 2013 and be completed in 2014. The air quality-related health impacts associated with construction of the proposed project were compared to the thresholds of significance in the Monterey Bay Unified Air Pollution Control District (MBUAPCD) *CEQA Air Quality Guidelines*, which are a carcinogenic risk greater than 10 in one million and a non-carcinogenic Hazard Index greater than 1.0. The noise/vibration impacts

associated with construction of the proposed project were compared to the thresholds of significance established in the 2005 LRDP EIR, which are construction noise greater than 80 A-weighted decibels (dB(A)) over an equivalent 8-hour period (Leq (8-hours)) during daytime or evening hours or 70 dB(A) Leq (8-hours) during nighttime hours at noise sensitive receptors.

Based on the results of the assessment, construction of the project would emit air toxic emissions that would result in a carcinogenic risk less than 10 in one million and a non-carcinogenic chronic Hazard Index less than 1.0 at sensitive receptors. Therefore, construction the project would result in a less than significant air-quality-related health impact. The acute Hazard Index for construction is driven by acrolein emissions from off-road equipment. However, the California Air Resources Board (CARB) has stated that the analytical method used to estimate acrolein emissions is highly unreliable, that a reliable test method does not currently exist, and that the test method used may over- or underestimate the actual emission factor. A conclusion cannot be made with respect to the acute impacts from acrolein emissions during construction because of the uncertainties. Nonetheless, the project is required to implement the mitigation measure that was recommended in the LRDP EIR to minimize construction TAC emissions to the maximum extent feasible.

Construction of the project would potentially exceed 80 dB(A) Leq during the daytime or evening hours at noise sensitive receptors. However, mitigation measures would be required and implemented to reduce the noise levels to less than significant. Construction-related vibration impacts would be less than significant.

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1.0 INTRODUCTION

This technical report discusses and evaluates the potential for construction-related health risk and noise/vibration impacts from construction activity associated with the proposed University of California, Santa Cruz ("UCSC" or "University") Merrill College Major Maintenance/Capital Renewal Project ("project" or "proposed project") located in Santa Cruz County, California. The proposed project consists of construction activity that will take place during the summer months when campus residential buildings on or near Merrill College will not be occupied and activity that will take place during the academic period when campus residential buildings will be occupied. Academic buildings will be occupied during both the summer and academic periods. The construction activity that will take place during the summer months and academic period are summarized in **Table 1, Summary of Construction Activities**.

Table 1
Summary of Construction Activities

Construction During Summer	Construction During Academic Period
• Demolition of a small building, roads, paths, and pedestrian bridges; • All major grading and excavation, including excavation for elevator pits, bridge foundations, building pad, and road widening; • Asphalt paving.	• Elevator shaft construction; • Fine grading for paths, plazas, and patios; • Landscaping; • Bench construction; • Construction of elevated paths and plaza stairs; • Path and plaza surfacing; • Construction of a new 7,100 square foot building.

Source: University of California, Santa Cruz, Physical Planning and Construction.

The new 7,100 square foot building will be constructed on two levels with one floor at the level of the new pedestrian bridges and the second floor at the level of the service road located adjacent to Residence Halls A and B.

The nearest off-campus sensitive receptors to the project site are located east of State Route 9, approximately three-quarters of a mile away. Off-campus sensitive receptors are also located northeast of the campus on Empire Grade; however, they are in excess of one mile from the project site. Thus, no off-campus sensitive receptors are located in the vicinity of the project site and would not be impacted by construction activity. Additionally, operation of the project would not introduce new sources of air toxics or noise/vibration that have not already been adequately addressed and evaluated in the UCSC 2005 Long Range Development Plan (LRDP) Environmental Impact Report (EIR). Therefore, air quality-related health impacts or noise/vibration impacts would not occur due to operation of the project. Accordingly,

this screening assessment focuses on construction activity that will occur during the summer and academic period when Merrill College and other nearby buildings will be occupied and the associated air quality-related health impacts and noise/vibration impacts that could result at these nearby receptors.

2.0 ENVIRONMENTAL SETTING

2.1 Air Quality

2.1.1 Meteorological and Topographical Conditions

The proposed project is located in the North Central Coast Air Basin (NCCAB), which consists of Monterey, Santa Cruz, and San Benito counties. The project site is situated in the northwest sector of the Air Basin, in an area topographically dominated by the Santa Cruz Mountains.

The topography and climate of the NCCAB combine to make it an area with smog potential. During summer and fall months, onshore air currents push a marine layer of fog and relatively cool air into the coastal valleys. A warm air mass known as an inversion layer will frequently descend over the lower marine air layer, acting as a cap and inhibiting air pollutants generated near the ground from dispersing upward. Light summer and fall winds and surrounding mountains further limit the horizontal dispersal of the pollutants. Concentrating volumes of pollutants in this manner allows the summer and fall sunlight to generate high levels of smog. In the winter and spring, the general absence of deep, persistent inversion layers and occasional storms usually result in good air quality for the NCCAB.

2.1.2 Construction Toxic Air Contaminants

The project site vicinity is characterized by campus facilities, including student residences, academic offices and classrooms, and research facilities, as well as open space. Wind generally blows air across the site from west to east, giving the site some of the best air quality in the NCCAB. The air pollutants relative to this assessment and of concern in the NCCAB include inhalable particulate matter (PM10) and fine particulate matter (PM2.5). Construction-related toxic air contaminants (TACs) are the result of diesel particulate matter (DPM) emissions. According to CARB, the vast majority of DPM exhaust is emitted as PM2.5.[1] The California Emissions Estimator Model (CalEEMod), which was used to model construction emissions in this assessment and is described later, generally assumes that all DPM from construction

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1 California Air Resources Board, "California Emissions Inventory and Reporting System (CEIDARS), Particulate Matter (PM) Speciation Profiles, February 29, 2012." 2012. Available from the following website: http://www.arb.ca.gov/ei/speciate/dnldopt.htm. According to the file, 92 percent of diesel vehicle exhaust is emitted as PM2.5 and 100 percent is emitted as PM10.

equipment is composed of PM2.5. Therefore, for the purposes of this assessment, the DPM emissions from construction equipment are equal to the estimated PM2.5 exhaust emissions obtained using CalEEMod.

2.2 Noise

2.2.1 Fundamentals of Environmental Noise

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise can be defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level is the most common descriptor used to characterize the loudness of an ambient sound level. The decibel (dB) scale is used to quantify sound intensity. Because sound pressure can vary enormously within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level. The human ear is not equally sensitive to all frequencies in the entire spectrum, so noise measurements are weighted more heavily for frequencies to which humans are sensitive in a process called "A-weighting," written "dB(A)." The A-weighted sound level is measured on a logarithmic scale such that a doubling of sound energy results in a 3.0 dB(A) increase in noise level.[2] In general, changes in a community noise level of less than 3.0 dB(A) are not typically noticed by the human ear.[3] Changes from 3.0 to 5.0 dB(A) may be noticed by some individuals who are extremely sensitive to changes in noise.[4] A greater than 5.0 dB(A) increase is readily noticeable, while the human ear perceives a 10.0 dB(A) change in sound level to be a doubling or halving sound.[5]

Different types of metrics are used to characterize the time-varying nature of sound. These metrics include the equivalent sound level (Leq), the minimum and maximum sound levels (Lmin and Lmax), the day-night sound level (Ldn), and the community noise equivalent level (CNEL). Below are brief definitions of these metrics and other terminology used in this chapter:

- **Decibel (dB).** A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.

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2 U.S. Department of Transportation, Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, (2006) 2-3.

3 U.S. Department of Transportation, Federal Highway Administration, *Highway Noise Fundamentals*, (1980) 81.

4 U.S. Department of Transportation, Federal Highway Administration, *Highway Noise Fundamentals*, (1980) 81.

5 U.S. Department of Transportation, Federal Highway Administration, *Highway Noise Fundamentals*, (1980) 81.

- **A-Weighted Decibel (dB(A)).** An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.

- **Equivalent Sound Level (Leq).** The equivalent steady state sound level that in a stated period of time would contain the same acoustical energy.

- **Maximum Sound Level (Lmax).** The maximum sound level measured during the measurement period.

- **Minimum Sound Level (Lmin).** The minimum sound level measured during the measurement period.

- **n-Percent Exceeded Level (Ln)**. The sound level exceeded for n percent of the time. For instance, L50 is the noise level that was exceeded for a cumulative 50 percent of the time during a measurement period (e.g., 30 minutes during a 1-hour measurement period).

- **Day-Night Level (Ldn).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring during the period from 10:00 PM to 7:00 AM.

- **Community Noise Equivalent Level (CNEL).** The energy average of the A-weighted sound levels occurring during a 24-hour period with 5 dB added to the A-weighted sound levels occurring during the period from 7:00 PM to 10:00 PM and 10 dB added to the A-weighted sound levels occurring during the period from 10:00 PM to 7:00 AM.

Ldn and CNEL values differ by less than 1 dB. As a matter of practice, Ldn and CNEL values are considered to be equivalent and are treated as such in this assessment.

2.2.2 Fundamentals of Environmental Vibration

Vibration consists of waves transmitted through solid material. Ground-borne vibration propagates from the source through the ground to adjacent buildings by surface waves. Vibration may be a single pulse, a series of pulses, or a continuous oscillatory motion. The frequency of a vibrating object describes how rapidly it is oscillating, measured in Hertz (Hz). Most environmental vibrations consist of a composite, or "spectrum," of many frequencies, and are generally classified as broadband or random vibrations. The normal frequency range of most ground-borne vibration that can be felt generally starts from a low frequency of less than 1 Hz to a high of about 200 Hz. Vibration is often measured in terms of the peak particle velocity (PPV) in inches per second (in/sec), because it is related to the stresses that are experienced by buildings. Vibration is also measured in vibration decibels (VdB). The human threshold of perception is around 65 VdB; the dividing line between barely perceptible and distinctly perceptible is

around 75 VdB; and vibration levels are acceptable at 85 VdB if there are an infrequent number of events per day.[6]

Ground-borne vibration is generally limited to areas within a few hundred feet of certain types of construction activities, especially pile driving. Road vehicles rarely create enough ground-borne vibration to be perceptible to humans unless the road surface is poorly maintained and there are potholes or bumps.[7] If traffic, typically heavy trucks, induces perceptible vibration in buildings, such as window rattling or shaking of small loose items, then it is most likely an effect of low-frequency airborne noise or ground characteristics. Human annoyance by vibration is related to the vibration energy and the number and duration of events, as well as the setting in which the person experiences the vibration. As discussed in the paragraph above, vibration can be amplified by the structural resonances of the walls and floors of buildings. The more events or the greater the duration, the more annoying it will be to humans.

2.2.3 Ambient Noise Levels

The primary existing noise source in the project vicinity is motor vehicle traffic. In particular, buses are a large contributor to motor vehicle noise because they represent a relatively high percentage of the vehicle fleet mix in the project vicinity. Within the UCSC campus core area, noise from the Central Heating Plant cooling towers at the north end of the central campus contributes to ambient noise. Secondary intermittent sources of noise include distant aircraft noise, sounds from parking lots, and noise from recreational activities. An ambient noise level survey was completed at various locations on the UCSC campus as part of the 2005 LRDP EIR. The noise survey included a short-term measurement in the vicinity of the project site. According to Section 4.10, Noise, of the 2005 LRDP EIR:[8]

> *The short-term measurements were made with a tripod-mounted Type 1 Brüel & Kjaer Type 2231 sound level meter. The sound-measuring instruments were set on slow time response using the A-weighted decibel (dB(A)) scale for all of the noise measurements. To ensure accuracy, the laboratory calibration of the instruments was field checked before and after each measurement period using an acoustical calibrator. The accuracy of the acoustical calibrator is maintained through a program established by the manufacturer, and is traceable to the National Institute of Standards and Technology. The sound measurement instruments meet the requirements of the American National Standard S1.4-1983 and the International Electrotechnical Commission Publications 804 and 651. In all cases, the microphone height was 5 feet above the ground and the*

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6 U.S. Department of Transportation, Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, (2006), 7-8.

7 U.S. Department of Transportation, Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, (2006), 7-9.

8 University of California, Santa Cruz, *2005 Long Range Development Plan, Environmental Impact Report, Section 4.10, Noise*, (2005) 4.10-8.

microphone was equipped with a windscreen. The sound level meter/analyzer samples the ambient noise levels over the duration of the measurement and calculates an equivalent noise level Leq.

The short-term noise measurements were made to calculate Leq noise levels during busy traffic hours. The measurement taken in the vicinity of the project site is denoted in the 2005 LRDP EIR as "ST-3" and was taken on February 22, 2005 at 8:45 AM at the Crown Merrill Apartments, adjacent to a parking lot. A summary of the noise measurement data at this location is provided in **Table 2, Short-Term Noise Measurement Data Summary**. According to the data, the equivalent noise level during the 15-minute measurement period was 57.9 dB(A) and the noise level exceeded 63.0 dB(A) for 10 percent of the time or a cumulative duration of 1 minute and 30 seconds.

Table 2
Short-Term Noise Measurements Data Summary
(2005 LRDP EIR, Crown Merrill Apartments)

Site ID	Location	Measurement Period			Noise Sources	Measurement Results (dB(A))					
		Date	Time	Duration		Leq	Lmax	Lmin	L90	L50	L10
ST-3	Crown Merrill Apartments, adjacent to parking lot	2/22/05	8:45 AM	15 minutes	Distant aircraft overhead, bell tower, trash truck, security truck, parking lot activities	57.9	71.1	41.9	45.0	50.5	63.0

Source: University of California, Santa Cruz, 2005 LRDP EIR, Section 4.10, Noise, *(2005) 4.10-10.*

3.0 REGULATORY SETTING

3.1 Air Quality

3.1.1 California Air Resources Board

On August 27, 1998, CARB designated DPM emissions from diesel-fueled engines as a TAC because some of the exhaust constituents that make up DPM are known to cause cancer in humans. Exposure to DPM also can cause non-cancer health effects, including respiratory symptoms, changes in lung function, and cardiovascular disease. A TAC is defined by California Health and Safety Code Section 39655:

"Toxic air contaminant" means an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health. A substance that is listed as a hazardous air pollutant pursuant to subsection (b) of Section 112 of the federal act (42 U.S.C. Sec. 7412(b)) is a toxic air contaminant.

As previously discussed, DPM is a form of PM10 and PM2.5. Therefore, CARB's designation of DPM as a TAC is relevant to the analysis of this project.

3.1.2 Monterey Bay Unified Air Pollution Control District

The MBUAPCD has jurisdiction over the NCCAB for matters related to air quality planning. The MBUAPCD is responsible for bringing and/or maintaining air quality in the NCCAB with federal and State air quality standards. Specifically, the MBUAPCD has the responsibility to monitor ambient air pollutant levels throughout the NCCAB and to develop and implement attainment strategies to ensure that future emissions will be within federal and State standards.

MBUAPCD Rules and Regulations

The MBUAPCD is responsible for regulating the amount of emissions that can be generated throughout the NCCAB by various stationary, area and mobile sources. Specific rules and regulations have been adopted by the MBUAPCD Governing Board, which limit the emissions that can be generated by various uses/activities and that identify specific pollution reduction measures, which must be implemented in association with various uses and activities. These rules not only regulate the emissions of the federal and State criteria pollutants but also TACs and acutely hazardous materials. The rules are also subject to ongoing refinement by MBUAPCD.

Among the MBUAPCD rules applicable to the proposed project are Rule 403 (Particulate Matter) and Rule 439 (Building Removal). Rule 403 limits the emissions of particulate matter for sources operating within the MBUAPCD. Rule 439 limits particulate emissions from the removal of buildings within the MBUAPCD through the application of emissions reductions measures provided in the rule.

MBUAPCD CEQA Air Quality Guidelines

In 2008, the MBUAPCD prepared an update to its *CEQA Air Quality Guidelines* (CEQA Guidelines).[9] The CEQA Guidelines provide lead government agencies, consultants, and project proponents with uniform procedures for assessing air quality impacts in the NCCAB and preparing the air quality sections of environmental documents for projects subject to CEQA. The CEQA Guidelines is an advisory document and local jurisdictions are not required to use the methodology outlined therein. The document describes the criteria that the MBUAPCD uses when reviewing and commenting on the adequacy of environmental documents. It recommends thresholds for use in determining whether projects would have significant

[9] Monterey Bay Unified Air Pollution Control District, "2008 CEQA Air Quality Guidelines," http://www.mbuapcd.org/mbuapcd/pdf/mbuapcd/pdf/CEQA_full.pdf. 2008.

adverse environmental impacts, identifies methodologies for predicting project emissions and impacts, and identifies measures that can be used to avoid or reduce air quality impacts. The University, as its own lead agency, may utilize other guidelines for determining the significance of air quality impacts for its projects; however, the University generally seeks to conform to local regulations and planning guidelines. Therefore, because the MBUAPCD is a recognized agency with scientific expertise in assessing air quality impacts, the construction screening health risk assessment (HRA) was prepared in accordance with the recommendations of the MBUAPCD CEQA Guidelines.

3.2 Noise

3.2.1 State of California

There are no federal noise requirements or regulations that bear directly on local actions of UCSC. The project would result in construction activity at the Merrill College and could generate temporary construction-related noise at nearby campus residences and academic buildings. Since the project could result in a temporary increase in noise levels at these campus uses, an acoustical analysis based on pertinent state regulations concerning construction noise standards is warranted. No other local (city or county) plans and policies apply as the project would not result in noise that would affect off-campus uses.

3.2.2 UCSC Long Range Development Plan

The LRDP is the applicable land use plan for the UCSC campus. The LRDP EIR includes guidelines for evaluating construction-related noise impacts. According to the LRDP EIR, the criterion noise level for determining the impact significance of construction noise on sensitive receptors varies according to the time of day. Construction noise would be considered a significant impact if it is greater than 80 dB(A) Leq (8-hours) during daytime or evening hours (7:00 AM to 10:00 PM) or 70 dB(A) Leq (8-hours) during nighttime hours (10:00 PM to 7:00 AM) at noise sensitive land uses.[10]

4.0 METHODOLOGY

Construction of the proposed project would generate air quality emissions of DPM and noise/vibration, which could result in health and noise/vibration impacts to sensitive receptors. The nearest sensitive receptors are Residence Halls A and B, which are located approximately 25 feet to the north and east of the main project construction area at its closest point (excluding construction of the elevator shafts, which

10 University of California, Santa Cruz, *2005 Long Range Development Plan, Draft Environmental Impact Report, Section 4.10, Noise*, (2005) 4.10-12.

would be adjacent to the Residence Halls A and B, and pedestrian stair and pathway construction, which would be adjacent to Residence Halls B). Academic buildings are located to the south and west of the main project construction area. The administrative building to the south is adjacent to the main construction area while the academic buildings to the south and east would be approximately 25 feet from the main construction area at its closest point. The cultural center and housing offices to the west would be adjacent to the main construction area and the computer lab to the east would be adjacent to pedestrian pathway construction.

The methodology used to evaluate the health impacts from DPM emissions is based on the MBUAPCD CEQA Guidelines,[11] the CalEEMod air quality emissions model,[12] and information provided in the *CalEEMod User's Guide*.[13] The CalEEMod air quality emissions model is the most updated emissions model and utilizes the EMFAC emissions factor model for on-road motor vehicle sources and the OFFROAD emissions factor model for off-road equipment. The DPM emissions were estimated based on estimated construction phasing and equipment activity levels and specifications provided by CalEEMod. Dispersion modeling was used to determine the concentration of DPM at maximum exposed individual (MEI) and guidance from the Office of Environmental Health Hazard Assessment (OEHHA) was used to determine the associated carcinogenic risk and non-carcinogenic hazard index at the MEI.

The construction noise impacts were estimated using data from the U.S. Environmental Protection Agency (EPA). The U.S. EPA has compiled data on the noise-generating characteristics of specific types of construction equipment.[14] Noise levels generated by heavy equipment can range from approximately 70 dB(A) to noise levels in excess of 100 dB(A) when measured at a distance of 50 feet from the noise source. The noise levels diminish rapidly with distance at a rate of approximately 6.0 to 7.5 dB(A) per doubling of distance for acoustically hard and soft sites, respectively. An example of an acoustically hard site would be a parking lot while an acoustically soft site would be a field or park. Assuming an acoustically soft site, a noise level of 75 dB(A) measured at 50 feet from the noise source would be reduced to 67.5 dB(A) at 100 feet and to 60 dB(A) at 200 feet. Construction noise levels at receptors would tend to vary based on the location of construction activity and the number of equipment in operation. The project would involve the use of multiple pieces of construction equipment. However, the equipment would not all be in use at the same location because of physical space and safety limitations. For the purposes of this analysis, it

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11 Monterey Bay Unified Air Pollution Control District, "2008 CEQA Guidelines," http://www.mbuapcd.org/mbuapcd/pdf/mbuapcd/pdf/CEQA_full.pdf. 2008.

12 Available from the following website: http://www.caleemod.com.

13 Ibid.

14 U.S. Environmental Protection Agency, *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, (1971).

was assumed that the loudest construction equipment would be in use at the same time closest to noise sensitive receptors and the remaining equipment would be in use at the same time 100 feet further away. This is considered a reasonable worst-case assumption. Construction is assumed to not take place during the nighttime hours, per LRDP EIR Mitigation Measure **NOIS-1**, which restricts construction activity within 100 feet of a residential building to the hours of 7:30 AM and 7:30 PM. Vibration impacts are assessed based on Federal Transit Administration (FTA) guidelines.[15] Emission calculations conducted for the project are provided in **Appendix A** and noise calculations are provided in **Appendix B**.

5.0 THRESHOLDS OF SIGNIFICANCE

5.1 Construction Screening Health Risk Assessment

Construction activity that may cause or substantially contribute to the violation of State or federal ambient air quality standards or that could emit TACs (carcinogenic or non-carcinogenic) could result in temporary significant health impacts. With regard to TACs, significance thresholds vary according to the toxicity of each particular TAC and are dependent on the level that would cause an adverse health impact at an offsite receptor.

According to the MBUAPCD CEQA Guidelines, projects that may cause or substantially contribute to the violation of other State or federal standards or that could emit TACs (carcinogenic or non-carcinogenic) could result in health impacts. Equipment or processes that emit non-carcinogenic TACs could result in significant impacts if emissions would exceed a Hazard Index of 1.0 for non-cancer impacts. Emissions of carcinogenic TACs that could result in a lifetime cancer incidence of one per 100,000 population or 10 in one million would also be considered significant. While these thresholds are usually applied to operational impacts, these will be used to assess the potential significance of the project's construction-related health impacts.

5.2 Construction Noise/Vibration Assessment

The LRDP EIR includes guidelines for evaluating construction-related noise impacts. According to the LRDP EIR, the criterion noise level for determining the impact significance of construction noise on sensitive receptors varies according to the time of day. Construction noise would be considered to result in a significant impact if the noise levels are greater than 80 dB(A) Leq (8-hours) during daytime or

15 Federal Transit Administration, *Transit Noise and Vibration Impact Assessment, Chapter 8, Vibration Impact Criteria*, (2006).

evening hours (7:00 AM to 10:00 PM) or 70 dB(A) Leq (8-hours) during nighttime hours (10:00 PM to 7:00 AM) at noise sensitive land uses.

Construction vibration that would exceed the levels recommended in the FTA guidelines would be considered a potentially significant impact. Vibration or groundborne noise levels that exceed the FTA acceptable level threshold of 65 VdB for buildings where low ambient vibration is essential for interior operations (such as hospitals and recording studios), 72[16] or 80[17] VdB for residences and buildings where people normally sleep, including hotels, and 75[16] or 83[17] VdB for institutional land uses with primary daytime use (such as churches and schools) could be considered a significant impact. Construction associated with the project would result in substantially less than 70 vibration events per day at any location and would be considered infrequent vibration events.[18] In addition, because construction would not take place during the nighttime hours, a threshold of 83 VdB is appropriate for institutional land uses with primary daytime use.

6.0 IMPACT ANALYSIS

6.1 Construction Toxic Air Contaminants

6.1.1 Emissions Calculations

Emissions of TACs during construction were estimated using CalEEMod. Emissions would occur from diesel engines that would be used during construction. These TAC emissions would be in the form of DPM. For the purposes of this assessment, it was assumed that construction would be continuous and begin in the summer of 2013 and be completed in 2014. The construction duration was generally based on recommended subphase lengths in CalEEMod. The project site is approximately 1 acre in area. Thus, for building construction and architectural coating subphases, recommended subphase durations for a 1 acre site were used. For grading and fine site grading activities, the subphase duration was increased from the CalEEMod recommended duration (an increase from one week to approximately one month) in order to ensure a conservative assessment. Additionally, for demolition and paving activities, the subphase durations were increased from the CalEEMod recommended duration (an increase from 10 days to 20 days and 5 days to 10 days, respectively) in order to ensure a conservative assessment.

16 For frequent vibration events, defined as greater than 70 vibration events per day.

17 For infrequent vibration events, defined as less than 70 vibration events per day.

18 A vibration event refers to the number of times the piece of vibratory equipment would be operated per day.

Similarly, the numbers of types of construction equipment used in the analysis were based on recommended equipment lists in CalEEMod. The equipment that was modeled included: a concrete/industrial saw, rubber tired dozer, and three tractors/loaders/backhoes during demolition; a cement/mortar mixer, paver, paving equipment, roller, and tractor/loader/backhoe during paving; a grader, rubber tired dozer, and tractor/loader/backhoe during grading and fine grading; a crane, two forklifts, and two tractors/loaders/backhoes during building construction, and an air compressor during architectural coating. Additional pieces of equipment were added to the CalEEMod recommended equipment lists to account for the construction of specialty infrastructure. These include an aerial lift for elevator shaft construction, and paving equipment and a concrete/mortar mixer for the construction and surfacing of elevated paths and plaza stairs. The resulting exhaust emissions from CalEEMod were used to represent the construction TAC emissions. As previously discussed, CalEEMod assumes that DPM from construction equipment is composed of PM2.5. Therefore, the PM2.5 emissions from CalEEMod were used to represent the construction TAC emissions. According to the modeling results, construction would result in approximately 190.70 pounds of DPM over the full duration of construction activity. Emissions from off-site haul and vendor trucks, while relatively minimal, are included in the emissions in order to provide a conservative assessment.

6.1.2 Dispersion Modeling Approach

In order to calculate the incremental increase in health risk from construction, dispersion modeling is used to determine the ground-level concentration of construction TACs at nearby sensitive receptors. The CARB-approved Industrial Source Complex Short Term 3 (ISCST3) dispersion model was used for this assessment. ISCTST3 is a Gaussian dispersion model that can predict pollutant concentrations based on screening or actual meteorological data. The emissions that were calculated using CalEEMod were converted to appropriate units for use in the dispersion model. Unlike stationary sources that emit TACs from fixed locations, construction activity would not remain at any one location for the entire duration. Therefore, there is no reasonable way to model the effects of construction activities without making certain simplifying assumptions. While the location of certain construction activities are somewhat defined, such as construction of the proposed 7,100 square foot building, other activities such as fine grading could occur at any location. For the purposes of this assessment, the construction TAC emissions were averaged over the project site area. While construction activities would occur at different locations at different times, this is an appropriate modeling representation of the construction activities because health risks associated with construction DPM is based on long-term (i.e., annual) exposures. As such, it is appropriate to distribute the construction activities (and associated emissions) throughout the project site.

The meteorological data from the monitoring station located at De Laveaga in the Santa Cruz area was used in the analysis. The meteorological data were obtained from CARB for the year 1995 (the most recent year for which data is available by CARB for dispersion modeling purposes). The surface wind directions are presented graphically in a polar diagram generated by the Wind Rose software. This diagram is shown in **Figure 1, Wind Rose for the De Laveaga (Santa Cruz area) Monitoring Station**.

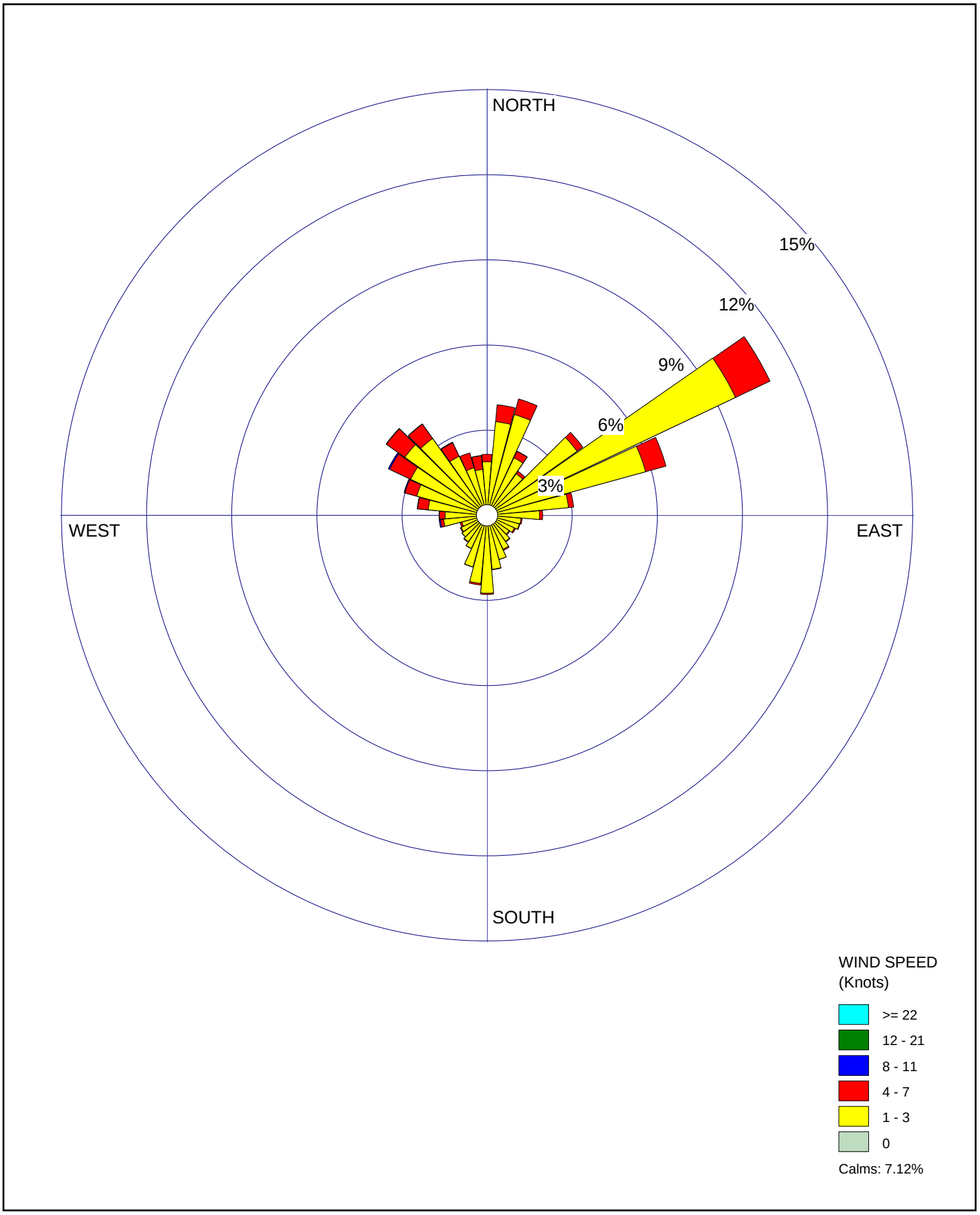
The dispersion model split the project site into 10 area sources in order to avoid calculation errors that may result from creating any area source with an aspect ratio greater than 10 to 1. The dispersion model requires that for area sources, a release height and emission rate in units of grams per second per meter squared be specified. A release height of 4.15 meters was used, which is the typical height of construction equipment exhaust. Since health risks associated with construction DPM are based on annual exposures, the total DPM emissions were amortized over a year. Based on the total emissions of 190.70 pounds of DPM, a total source area of 3,909.5 square meters, and exposure to DPM for 8 hours per work day (weekdays only) for a year, the resulting emissions rate is 2.105×10^{-6} grams per second per square meter. These parameters were entered into the dispersion model for each of the 10 defined area sources.

A discrete Cartesian receptor grid was used to determine the impacts in the vicinity of the project site. Receptors were placed at 5-meter intervals on campus buildings, where sensitive receptors would be located. Open space areas were not included as receptor points as a person would not be located in such an area for a long duration. The receptor grid would allow the modeling analysis to determine the maximum concentrations at nearby sensitive receptors. A graphical representation of this receptor grid is presented in **Figure 2, Dispersion Model Receptor Grid**.

Terrain heights were derived from digital terrain elevations developed by the U.S. Geological Survey (USGS) by using its Digital Elevation Model (DEM). The DEM data provides terrain elevations with 1-meter vertical resolution and 10-meter or 30-meter horizontal resolution based on a Universal Transverse Mercator (UTM) coordinate system. The UTM coordinates are referenced to an appropriate map projection as needed (e.g., North American Datum of 1927 (NAD 27), NAD 83, or World Geodetic System of 1984 (WGS 84)).

The ISCST3 model was run using regulatory default options. Additional modeling options are listed below:

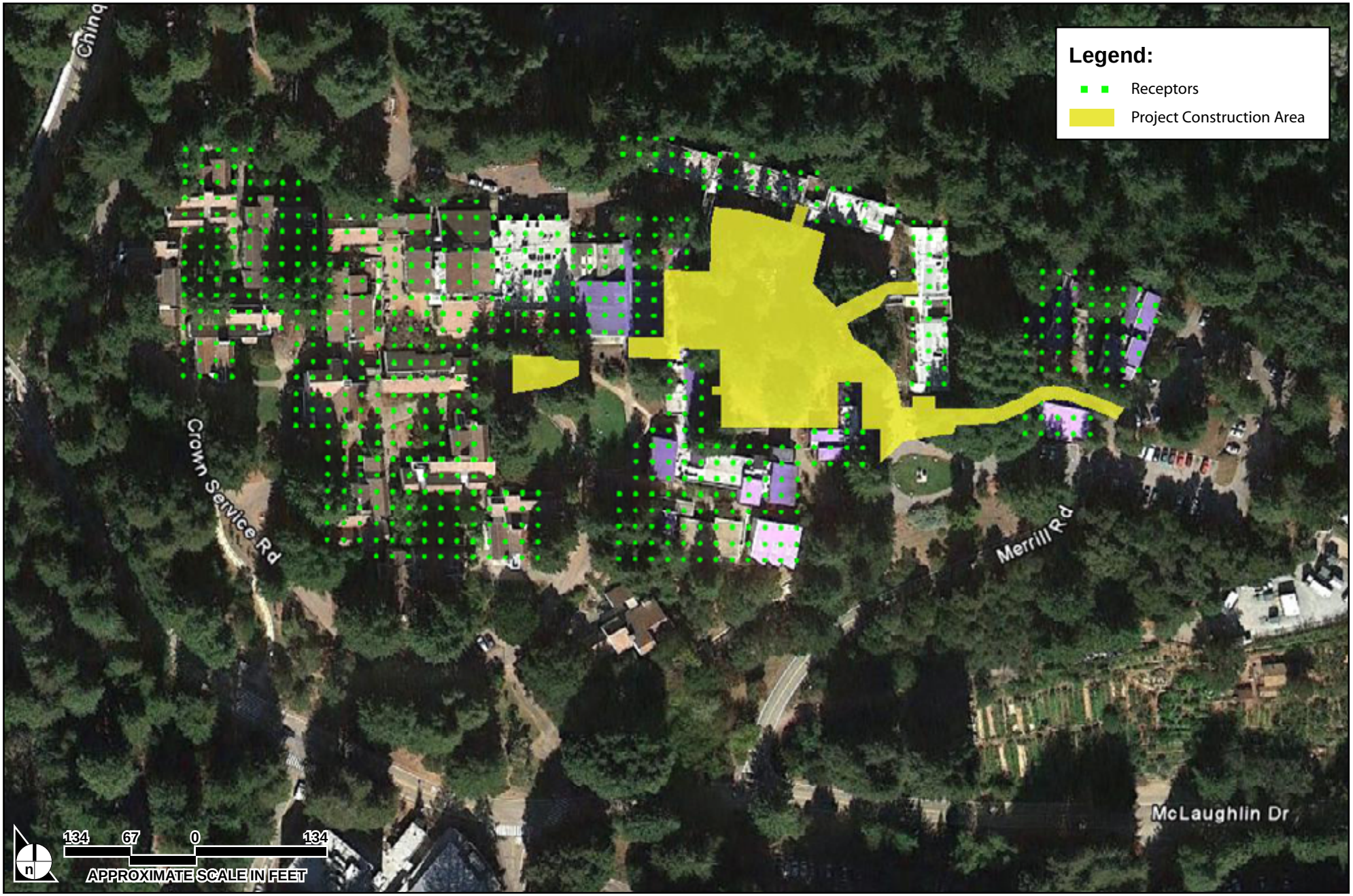
- Dispersion coefficient: Urban;
- Averaging period: Annual;
- Flagpole receptor height: 0 meter (corresponding to ground-level concentrations);
- Deposition: Off; and
- No building downwash (no point sources modeled).



SOURCE: Impact Sciences, Inc. – May 2012

FIGURE **1**

Wind Rose for the De Laveaga (Santa Cruz area) Monitoring Station



SOURCE: Impact Sciences, Inc. – May 2012

FIGURE **2**

Dispersion Model Receptor Grid

0680-015•05/12

6.1.3 Dispersion Modeling Results

Cancer Risk

The health impacts are based on the methodologies described in the OEHHA Guidance.[19] The following equations are used to calculate the cancer risk due to inhalation using the modeled DPM concentrations:[20]

Equation 1: Risk = Dose Inhalation × Inhalation Potency Factor

where:

Equation 2: $\text{Dose Inhalation} = C_{AIR} \times DBR \times A \times EF \times ED \times 10^{-6} / AT$

where:

C_{AIR} = concentration in microgram per cubic meter
DBR = breathing rate in liter per kilogram of body weight per day
A = inhalation absorption factor (1 for DPM)
EF = exposure frequency in days per year
ED = exposure duration in years
AT = averaging period over which exposure is averaged in days (25,550 days for 70 years)

In accordance with CARB policy,[21] a breathing rate equal to the 80th percentile should be used in single-point risk management decisions, such as those subject to a threshold or standard, for which the cancer risk is entirely associated with inhalation and residential cancer risk are being evaluated. These two criteria are met for this assessment. Thus, a breathing rate of 302 liters per kilogram of body weight per day was used for the residential cancer risk calculations. The breathing rate for workers is different because typical workers do not engage in strenuous activities and thus a lower breathing rate should be used, according to the OEHHA Guidance. Therefore, a breathing of 149 liters per kilogram of body weight per day was used for workplace cancer risk calculations.

The risk is calculated by multiplying the dose by inhalation potency factor. The Unit Risk Value for DPM recommended by the Scientific Review Panel is 3.0×10^{-4} per microgram per cubic meter ($\mu g/m^3$).[22] This

19 Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*, (2003).

20 Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*, (2003).

21 Office of Environmental Health Hazard Assessment, *Recommended Interim Risk Management Policy for Inhalation-Based Residential Cancer Risk*, (2003).

22 Office of Environmental Health Hazard Assessment, *Initial Statement of Reasons for Rulemaking, Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant*, (1998).

value corresponds to a Cancer Potency Factor (CPF) of 1.1 per milligram/kilogram (body weight) per day (mg/kg-day). The Unit Risk Value means that for receptors with an annual average concentration of 1 μg/m^3 in the ambient air, the probability of contracting cancer over a 70-year lifetime of exposure is 300 in 1 million. This Unit Risk Value considers exposure via inhalation only. The potential exposure through other pathways (e.g., ingestion) requires substance and site-specific data, and the specific parameters for diesel exhaust are not known for these pathways.[23] The Unit Risk Value also assumes that a person is exposed continuously for 70 years. This approach is intended to result in conservative (i.e., health protective) estimates of health impacts and is used for the sensitive receptors previously identified.

Table 3, Summary of Construction Cancer Risks, shows the maximum modeled cancer risk for the maximally exposed individual resulting from the project-related DPM emissions. According to the modeled results, the MEI for the residential evaluation was located at the southern portion of Residence Hall B.[24] The MEI for the workplace evaluation was located at an administrative building at the southern end of the project site.[25] The values shown in **Table 3** indicate that the cancer risks, as a result of construction of the proposed project, would be less than 10 in one million for residents and workers. This is considered a less than significant impact.

Table 3
Summary of Construction Cancer Risks

Receptor	Modeled DPM Concentration (micrograms/cubic meter)	Cancer Risk (in 1 million)	Significance Threshold	Exceeds Threshold?
University Residents	6.69E-01	3.04	10 in 1 million	NO
Workers	8.50E-01	1.34	10 in 1 million	NO

*Source: Impact Sciences, Inc. Detailed calculations are available in **Appendix A** of this report.*

The cancer risk analysis conservatively assumes that the university residents would be exposed to construction TAC emissions during both the summer and academic period. In reality, Residence Halls A and B would not be occupied during the summer and residents would not be exposed to the

23 California Air Resources Board, *Report to the Air Resources Board on the Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant, Part A Exposure Assessment (as approved by the Scientific Review Panel)*, (1998).

24 Modeled Receptor #284 with Universal Transverse Mercator (UTM) coordinates of Zone 10, 584,280 Easting, 4,095,270 Northing.

25 Modeled Receptor #262 with UTM coordinates of Zone 10, 584,260 Easting, 4,095,265 Northing.

corresponding construction TAC emissions during the summer. Therefore, the risk to university residents would likely be lower than shown in **Table 3**.

Chronic Hazard Index

In addition to the potential cancer risk, DPM has the potential to result in chronic (i.e., long term) non-cancer health impacts. The chronic non-cancer Hazard Index for the proposed project was calculated by dividing the maximum modeled annual average concentrations of DPM by the Reference Exposure Level (REL). OEHHA has recommended an ambient concentration of 5 micrograms per cubic meter ($\mu g/m^3$) as the chronic inhalation REL for DPM exhaust. The REL is the concentration at or below which no adverse health effects are anticipated. The inhalation REL for acute (i.e., short-term) effects from DPM is currently under study and OEHHA has not determined a value to be used to estimate acute DPM health impacts. Therefore, acute health impacts have not been estimated.

The maximum chronic Hazard Indices at the MEIs are shown in **Table 4, Summary of Construction Non-Cancer Chronic Health Impacts**. The results are based on the highest concentrations at any receptor point. Therefore, the results are considered to be conservative. As shown, the chronic Hazard Indices at the MEIs are less than the significance threshold of 1 for non-cancer health impacts. This is considered a less than significant impact.

Table 4
Summary of Construction Non-Cancer Chronic Health Impacts

Receptor	Modeled DPM Concentration (micrograms/cubic meter)	Maximum Chronic Hazard Index	Significance Threshold	Exceeds Threshold?
University Residents	6.69E-01	0.134	1	NO
Workplace	8.50E-01	0.170	1	NO

*Source: Impact Sciences, Inc. Detailed calculations are available in **Appendix A** of this report.*

The chronic Hazard Index analysis conservatively assumes that the university residents would be exposed to construction TAC emissions during both the summer and academic period. In reality, Residence Halls A and B would not be occupied during the summer and residents would not be exposed to the corresponding construction TAC emissions during the summer. Therefore, the chronic Hazard Index to university residents would likely be lower than shown in **Table 4**.

Acute Hazard Index

The UCSC 2005 LRDP EIR[26] provides an analysis of TAC emissions associated with LRDP development. The LRDP EIR assessed non-carcinogenic health effects from worst-case construction-related TAC emissions. As noted earlier, the inhalation REL for acute (i.e., short-term) effects from DPM is currently under study and OEHHA has not determined a value to be used to estimate acute DPM health impacts. According to the LRDP EIR, the acute Hazard Index for construction is driven by acrolein emissions from off-road equipment.[27] However, CARB has stated that the analytical method used to estimate acrolein emissions is highly unreliable, that a reliable test method does not currently exist, and that the test method used may over- or underestimate the actual emission factor.[28] Despite the uncertainties, the LRDP EIR analyzed acrolein from construction and calculated a potential Hazard Index greater than 1 but did not conclude the significance of the impact due to the uncertainty with respect to the results. The LRDP EIR indicated that the results were speculative; however, a mitigation measure was included in the LRDP EIR to minimize construction TAC emissions to the maximum extent feasible. The uncertainties with acrolein continue to be true according to the most recent update to the CARB website for the California Air Toxics Emission Factor Database (CATEF), which states that "the sampling method puts the acrolein emission factors in doubt and… the ARB does not recommend using these emission factors."[29] The MBUAPCD CEQA Guidelines also indicate that the MBUAPCD Board suspended application of the REL for acute impacts of acrolein in June 2007 due to the delay by OEHHA in adopting a revised REL. Therefore, an analysis of acute impacts from acrolein is not warranted Nonetheless, the project would comply with the mitigation measure that was recommended in the LRDP EIR to minimize construction TAC emissions to the maximum extent feasible. The mitigation measure is presented later in **Section 7.0** of this assessment.

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26 University of California, Santa Cruz, *2005 Long Range Development Plan, Draft Environmental Impact Report*, Section 4.3, Air Quality, (2005).

27 University of California, Santa Cruz, *2005 Long Range Development Plan, Draft Environmental Impact Report*, Section 4.3, Air Quality, (2005) 4.3-38.

28 University of California, Santa Cruz, *2005 Long Range Development Plan, Draft Environmental Impact Report*, Section 4.3, Air Quality, (2005) 4.3-37, -38.

29 California Air Resources Board, "CATEF – California Air Toxics Emission Factor Database," http://www.arb.ca.gov/ei/catef/catef.htm. The webpage was last reviewed by CARB on February 11, 2009 and was accessed for this assessment on May 1, 2012.

6.2 Noise/Vibration

6.2.1 Construction Noise

Noise levels generated by heavy equipment can range from approximately 70 dB(A) to noise levels in excess of 100 dB(A) when measured at a distance of 50 feet from the noise source. The noise levels diminish rapidly with distance at a rate of approximately 6.0 to 7.5 dB(A) per doubling of distance for acoustically hard and soft sites, respectively. For the purposes of this analysis, an attenuation rate of 6.0 was used. Construction noise levels at receptors would tend to vary based on the location of construction activity and the number of equipment in operation. The project would involve the use of multiple pieces of construction equipment. However, the equipment would not all be in use at the same location because of physical space and safety limitations. Construction of the project would include: a concrete/industrial saw, rubber tired dozer, and three tractors/loaders/backhoes during demolition; a cement/mortar mixer, paver, paving equipment, roller, and tractor/loader/backhoe during paving; a grader, rubber tired dozer, and tractor/loader/backhoe during grading and fine grading; a crane, two forklifts, and two tractors/loaders/backhoes during building construction, and an air compressor during architectural coating. Additional equipment during construction would include aerial lift for elevator shaft construction, and paving equipment and a concrete/mortar mixer for the construction and surfacing of elevated paths and plaza stairs. Pneumatic hand tools may also be used.

For the purposes of this analysis, it was assumed that the loudest construction equipment would be in use at the same time at an average of 50 feet from the noise sensitive receptors and the remaining equipment would be in use at the same time at 100 feet from the noise sensitive receptors. Construction is assumed to not take place during the nighttime hours, in accordance with the LRDP EIR Mitigation Measure **NOIS-1**.

The noise levels associated with construction of the proposed project are provided below in **Table 5, Estimated Construction Noise Levels**. The noise levels are presented for equipment without noise controls and with noise controls. The noise levels with controls represent noise levels that can be achieved with implementation of feasible noise controls, including selecting quieter procedures or machines and implementing noise control-features requiring no major redesign or extreme cost (e.g., improved mufflers, equipment redesign, use of silencers, shields, shrouds, ducts, and engine enclosures).

The noise levels in **Table 5** indicate that receptors in nearby campus buildings could be exposed to temporary noise levels that exceed the 80 dB(A) threshold of significance even with noise controls. It should be noted that if all construction equipment with noise controls are operating 100 feet or more from the sensitive receptors, noise levels would not exceed the threshold of significance. Therefore,

construction activities could potentially exceed 80 dB(A) during the daytime or evening at the nearest sensitive receptors when construction equipment is operated within 100 feet of sensitive receptors. This is considered a potentially significant impact requiring mitigation.

Table 5
Estimated Maximum Construction Noise Levels

Construction Activity	Noise Levels without Controls[1] Leq dB(A)	Noise Levels with Controls[1] Leq dB(A)
Demolition	87	80
Grading and Fine Grading	86	79
Paving	93	84
Building Construction	92	85
Architectural Coating	81	76

*Source: Impact Sciences, Inc. Noise calculations are provided in **Appendix B**.*

[1] *The loudest construction equipment would be in use at the same time at an average of 50 feet from the noise sensitive receptors and the remaining equipment would be in use at the same time at 100 feet from the noise sensitive receptors.*

6.2.2 Construction Vibration

Persons working in the area surrounding the project could be exposed to ground-borne vibration or ground-borne noise levels related to construction activities. The results from vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibrations at moderate levels, to slight structural damage at the highest levels. Site ground vibrations from construction activities very rarely reach the levels that can damage structures, but they can achieve the audible range and be felt in buildings very close to the site. **Table 6, Vibration Levels for Construction Equipment**, lists vibration source levels for typical construction equipment.

Table 6
Vibration Levels for Construction Equipment

Equipment	Approximate VdB			
	25 Feet	50 Feet	75 Feet	100 Feet
Compressor	81	75	71	69
Loaded trucks	86	80	76	74
Small Bulldozer	58	52	48	46
Backhoe	80	74	70	68
Paver	84	78	74	72

Source: Federal Transit Administration, (2006).

Vibration or groundborne noise levels that exceed the FTA acceptable level threshold of of 83 VdB would be considered a potentially significant impact. As indicated in **Table 6**, loaded trucks, which would create the greatest amount of vibration for equipment to be used during construction, are capable of producing approximately 80 VdB at 50 feet. Construction activity would not remain at any one location for the entire duration. While the locations of certain construction activities are somewhat defined, such as construction of the proposed 7,100 square foot building, other activities such as fine grading would occur throughout the project site. The proposed 7,100 square foot building is located in excess of 50 feet from nearby campus buildings. Thus, given that the construction equipment, including loaded trucks, would be used in excess of 50 feet on average from the nearest buildings and the infrequent number of vibration events per day, construction activities would not exceed the FTA ground-borne vibration threshold for the nearest sensitive land uses. Vibrations from loaded trucks and other equipment would be less than 80 VdB at the nearest commercial land uses located to the west, north, and east of the project site and impacts would be considered less than significant.

7.0 IMPACTS AND MITIGATION MEASURES

7.1 Construction Toxic Air Contaminants

Impact: Construction activities associated with the project would result in a less than significant cancer risk and chronic Hazard Index to campus occupants from long-term exposures to TACs. Acute acrolein factors cannot be used per CARB and MBUAPCD direction. Nonetheless, the project will comply with the LRDP EIR mitigation measure listed below to reduce TAC exposures.

Significance: Less than significant

Mitigation Measure 1: The project will implement LRDP Mitigation Measure **AIR-6** which requires that the Campus minimize construction TAC emissions by implementing measures such as those listed below:

- Require the use of cleaner fuels in construction equipment;
- Require that construction contractors use electrical equipment where possible;
- Require construction contractors to minimize the simultaneous operation of multiple pieces of equipment at a construction site;
- Discourage idling of construction equipment and vehicles;
- Schedule operations of construction equipment to minimize exposure as much as possible.

Residual Significance: Less than significant.

7.2 Construction Noise

Impact: Construction activities associated with the project would potentially expose nearby sensitive receptors to excessive airborne noise but not to excessive groundborne vibration or groundborne noise. This is considered a potentially significant impact. The project will comply with the LRDP EIR mitigation measure listed below to reduce construction noise as well an additional measure recommended for this project.

Significance: Potentially significant.

Mitigation Measure 2: The project will implement LRDP Mitigation Measure **NOIS-1**, which requires that prior to initiation of construction, the Campus shall approve a construction noise mitigation program. The program shall include, but not be limited to, the following:

- Construction equipment used on campus is properly maintained and has been outfitted with feasible noise-reduction devices to minimize construction-generated noise;
- Stationary source noises such as generators or pumps are located at least 100 feet away from noise-sensitive land uses as feasible;
- Laydown and construction vehicle staging areas are located at least 100 feet away from noise-sensitive land uses as feasible
- Whenever possible, academic, administrative, and residential areas that will be subject to construction noise will be informed in writing at least a week before the start of each construction project;
- Loud construction activity (i.e. construction activity such as jackhammering, concrete sawing, asphalt removal, and large-scale grading operations) within 100 feet of a residential or academic building shall not be scheduled during finals week;
- Loud construction activity as described above within 100 feet of an academic or residential use shall, to the extent feasible, be scheduled during holidays, Thanksgiving break, Christmas break, Spring break, or Summer break;
- Loud construction activity within 100 feet of a residential building shall be restricted to the hours between 7:30 AM and 7:30 PM, Monday through Saturday;
- Loud construction activity within 100 feet of an academic building shall be scheduled to the extent feasible on weekends.

Mitigation Measure 3: The construction contractor shall provide a temporary noise curtain or barrier with a Sound Transmission Classification (STC) rating of 25 or greater with a height that blocks the line-of-sight between the noise source and receiver when

construction equipment would operate within 100 feet of occupied residential or academic buildings.

Residual Significance: Mitigation Measure 3 would reduce noise levels by a minimum of 5 dBA. The impact would be mitigated to a less than significant level.

8.0 CONCLUSION

This technical report discusses and evaluates the potential for construction-related health risk and noise/vibration impacts from construction activity associated with the proposed UCSC Merrill College Major Maintenance/Capital Renewal Project located in Santa Cruz County, California. This assessment focuses on construction activity that will occur during both the summer and academic periods.

Based on the results of the assessment, construction of the project would result in a carcinogenic risk less than 10 in one million and a non-carcinogenic chronic Hazard Index less than 1.0 at sensitive receptors. Therefore, construction of the project would result in a less than significant air-quality-related health impact.

Construction of the project would potentially exceed 80 dB(A) Leq during the daytime or evening hours at noise sensitive receptors. However, mitigation measures would be required and implemented to reduce the noise levels to less than significant. Construction-related vibration impacts would be less than significant.

APPENDIX A

Construction Screening Health Risk Assessment Calculations

Merrill College Maintenance/Capitol Renewal Project

Santa Cruz County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
User Defined Educational	7100	User Defined Unit

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Utility Company**	Pacific Gas & Electric Company
Climate Zone	4	**Precipitation Freq (Days)**	61		

1.3 User Entered Comments

Project Characteristics -

Land Use - Project area conservatively estimated at up to 2 acres; Construction of a 7,100 sqft new building.

Construction Phase - Activities during Summer: Demolition (20 days), Grading (20 days), Paving (10 days); Activities during Academic Year: Fine Grading (20 days), Building/Elevator/Bench/Path/Plaza Construction (100 days), Coating (5 days).

Off-road Equipment - Architectural Coating: 1 air compressor (CalEEMod default).

Off-road Equipment - Bldg, etc. Construction: 1 crane, 2 forklift, 2 tractor/loader/backhoe, 1 aerial lift, 1 cement/mortar mixer, 1 paving equip. (Default, plus add'l equip. for elevator, bench, surfacing activity); Load factors adjusted per OFFROAD2011.

Off-road Equipment - Demolition: 1 concrete/industrial saw, 1 rubber tired dozer, 3 tractor/loader/backhoe (CalEEMod default for 2 acre site, Table 3.2 of User's Guide); Load factors adjusted per OFFROAD2011.

Off-road Equipment - Fine Grading: 1 grader, 1 rubber tired dozer, 1 tractor/loader/backhoe (CalEEMod default for 2 acre site, Table 3.2 of User's Guide); Load factors adjusted per OFFROAD2011.

Off-road Equipment - Asphalt Paving: 1 cement/mortar mixer, 1 paver, 1 paving equipment, 1 roller, 1 tractor/loader/backhoe (CalEEMod default for 2 acre site, Table 3.2 of User's Guide); Load factors adjusted per OFFROAD2011.

Off-road Equipment - Site Preparation not a part of the analysis.

Trips and VMT - Worker/Vendor Trip Rates: 2 x 1.25 x # construction equipment (CalEEMod default) plus worker/vendor trips for 7,100 sq.ft building (CalEEMod default).

Grading - Project site conservatively estimated up to 2 acres.

Off-road Equipment - Grading: 1 grader, 1 rubber tired dozer, 1 tractor/loader/backhoe (CalEEMod default for 2 acre site, Table 3.2 of User's Guide); Load factors adjusted per OFFROAD2011.

Demolition - Demolition amount based on a 5,000 sqft structure.

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2013						0.08	0.19		0.08	0.13						
2014						0.01	0.02		0.01	0.01						
Total						**0.09**	**0.21**		**0.09**	**0.14**						

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2013						0.08	0.18		0.08	0.13						
2014						0.01	0.01		0.01	0.01						
Total						**0.09**	**0.19**		**0.09**	**0.14**						

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area						0.00	0.00		0.00	0.00						
Energy						0.00	0.00		0.00	0.00						
Mobile						0.00	0.00		0.00	0.00						
Waste						0.00	0.00		0.00	0.00						
Water						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area						0.00	0.00		0.00	0.00						
Energy						0.00	0.00		0.00	0.00						
Mobile						0.00	0.00		0.00	0.00						
Waste						0.00	0.00		0.00	0.00						
Water						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Demolition - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust						0.00	0.00		0.00	0.00						
Off-Road						0.02	0.02		0.02	0.02						
Total						**0.02**	**0.02**		**0.02**	**0.02**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.2 Demolition - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust						0.00	0.00		0.00	0.00						
Off-Road						0.02	0.02		0.02	0.02						
Total						**0.02**	**0.02**		**0.02**	**0.02**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.3 Grading - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust						0.00	0.05		0.00	0.02						
Off-Road						0.01	0.01		0.01	0.01						
Total						**0.01**	**0.06**		**0.01**	**0.03**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.3 Grading - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust						0.00	0.05		0.00	0.02						
Off-Road						0.01	0.01		0.01	0.01						
Total						**0.01**	**0.06**		**0.01**	**0.03**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.4 Paving - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road						0.01	0.01		0.01	0.01						
Paving						0.00	0.00		0.00	0.00						
Total						**0.01**	**0.01**		**0.01**	**0.01**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.4 Paving - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road						0.01	0.01		0.01	0.01						
Paving						0.00	0.00		0.00	0.00						
Total						**0.01**	**0.01**		**0.01**	**0.01**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.5 Fine Grading - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust						0.00	0.05		0.00	0.02						
Off-Road						0.01	0.01		0.01	0.01						
Total						**0.01**	**0.06**		**0.01**	**0.03**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.5 Fine Grading - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust						0.00	0.05		0.00	0.02						
Off-Road						0.01	0.01		0.01	0.01						
Total						**0.01**	**0.06**		**0.01**	**0.03**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.6 Building Construction - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road						0.04	0.04		0.04	0.04						
Total						**0.04**	**0.04**		**0.04**	**0.04**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.01		0.00	0.00						
Total						**0.00**	**0.01**		**0.00**	**0.00**						

3.6 Building Construction - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road						0.04	0.04		0.04	0.04						
Total						**0.04**	**0.04**		**0.04**	**0.04**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.6 Building Construction - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road						0.01	0.01		0.01	0.01						
Total						**0.01**	**0.01**		**0.01**	**0.01**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.6 Building Construction - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road						0.01	0.01		0.01	0.01						
Total						**0.01**	**0.01**		**0.01**	**0.01**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.7 Architectural Coating - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating						0.00	0.00		0.00	0.00						
Off-Road						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.7 Architectural Coating - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating						0.00	0.00		0.00	0.00						
Off-Road						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

Merrill College Maintenance/Capitol Renewal Project

Santa Cruz County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
User Defined Educational	7100	User Defined Unit

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Utility Company**	Pacific Gas & Electric Company
Climate Zone	4	**Precipitation Freq (Days)**	61		

1.3 User Entered Comments

Project Characteristics -

Land Use - Project area conservatively estimated at up to 2 acres; Construction of a 7,100 sqft new building.

Construction Phase - Activities during Summer: Demolition (20 days), Grading (20 days), Paving (10 days); Activities during Academic Year: Fine Grading (20 days), Building/Elevator/Bench/Path/Plaza Construction (100 days), Coating (5 days).

Off-road Equipment - Architectural Coating: 1 air compressor (CalEEMod default).

Off-road Equipment - Bldg, etc. Construction: 1 crane, 2 forklift, 2 tractor/loader/backhoe, 1 aerial lift, 1 cement/mortar mixer, 1 paving equip. (Default, plus add'l equip. for elevator, bench, surfacing activity); Load factors adjusted per OFFROAD2011.

Off-road Equipment - Demolition: 1 concrete/industrial saw, 1 rubber tired dozer, 3 tractor/loader/backhoe (CalEEMod default for 2 acre site, Table 3.2 of User's Guide); Load factors adjusted per OFFROAD2011.

Off-road Equipment - Fine Grading: 1 grader, 1 rubber tired dozer, 1 tractor/loader/backhoe (CalEEMod default for 2 acre site, Table 3.2 of User's Guide); Load factors adjusted per OFFROAD2011.

Off-road Equipment - Asphalt Paving: 1 cement/mortar mixer, 1 paver, 1 paving equipment, 1 roller, 1 tractor/loader/backhoe (CalEEMod default for 2 acre site, Table 3.2 of User's Guide); Load factors adjusted per OFFROAD2011.

Off-road Equipment - Site Preparation not a part of the analysis.

Trips and VMT - Worker/Vendor Trip Rates: 2 x 1.25 x # construction equipment (CalEEMod default) plus worker/vendor trips for 7,100 sq.ft building (CalEEMod default).

Grading - Project site conservatively estimated up to 2 acres.

Off-road Equipment - Grading: 1 grader, 1 rubber tired dozer, 1 tractor/loader/backhoe (CalEEMod default for 2 acre site, Table 3.2 of User's Guide); Load factors adjusted per OFFROAD2011.

Demolition - Demolition amount based on a 5,000 sqft structure.

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2013						1.72	5.62		1.72	3.38						
2014						1.01	1.32		1.01	1.02						
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2013						1.72	5.52		1.72	3.38						
2014						1.01	1.02		1.01	1.02						
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area						0.00	0.00		0.00	0.00						
Energy						0.00	0.00		0.00	0.00						
Mobile						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area						0.00	0.00		0.00	0.00						
Energy						0.00	0.00		0.00	0.00						
Mobile						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Demolition - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust						0.00	0.25		0.00	0.00						
Off-Road						1.70	1.70		1.70	1.70						
Total						**1.70**	**1.95**		**1.70**	**1.70**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.02	0.56		0.02	0.02						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.01	0.18		0.01	0.01						
Total						**0.03**	**0.74**		**0.03**	**0.03**						

3.2 Demolition - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust						0.00	0.25		0.00	0.00						
Off-Road						1.70	1.70		1.70	1.70						
Total						**1.70**	**1.95**		**1.70**	**1.70**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.02	0.02		0.02	0.02						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.01	0.01		0.01	0.01						
Total						**0.03**	**0.03**		**0.03**	**0.03**						

3.3 Grading - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust						0.00	4.62		0.00	2.48						
Off-Road						0.89	0.89		0.89	0.89						
Total						**0.89**	**5.51**		**0.89**	**3.37**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.11		0.00	0.01						
Total						**0.00**	**0.11**		**0.00**	**0.01**						

3.3 Grading - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust						0.00	4.62		0.00	2.48						
Off-Road						0.89	0.89		0.89	0.89						
Total						**0.89**	**5.51**		**0.89**	**3.37**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.01		0.00	0.01						
Total						**0.00**	**0.01**		**0.00**	**0.01**						

3.4 Paving - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road						1.08	1.08		1.08	1.08						
Paving						0.00	0.00		0.00	0.00						
Total						**1.08**	**1.08**		**1.08**	**1.08**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.01	0.18		0.01	0.01						
Total						**0.01**	**0.18**		**0.01**	**0.01**						

3.4 Paving - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road						1.08	1.08		1.08	1.08						
Paving						0.00	0.00		0.00	0.00						
Total						**1.08**	**1.08**		**1.08**	**1.08**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.01	0.01		0.01	0.01						
Total						**0.01**	**0.01**		**0.01**	**0.01**						

3.5 Fine Grading - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust						0.00	4.62		0.00	2.48						
Off-Road						0.89	0.89		0.89	0.89						
Total						**0.89**	**5.51**		**0.89**	**3.37**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.11		0.00	0.01						
Total						**0.00**	**0.11**		**0.00**	**0.01**						

3.5 Fine Grading - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust						0.00	4.62		0.00	2.48						
Off-Road						0.89	0.89		0.89	0.89						
Total						**0.89**	**5.51**		**0.89**	**3.37**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.01		0.00	0.01						
Total						**0.00**	**0.01**		**0.00**	**0.01**						

3.6 Building Construction - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road						1.11	1.11		1.11	1.11						
Total						**1.11**	**1.11**		**1.11**	**1.11**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.01		0.00	0.01						
Worker						0.01	0.31		0.01	0.02						
Total						**0.01**	**0.32**		**0.01**	**0.03**						

3.6 Building Construction - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road						1.11	1.11		1.11	1.11						
Total						**1.11**	**1.11**		**1.11**	**1.11**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.01		0.00	0.01						
Worker						0.01	0.02		0.01	0.02						
Total						**0.01**	**0.03**		**0.01**	**0.03**						

3.6 Building Construction - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road						1.00	1.00		1.00	1.00						
Total						**1.00**	**1.00**		**1.00**	**1.00**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.01		0.00	0.00						
Worker						0.01	0.31		0.01	0.02						
Total						**0.01**	**0.32**		**0.01**	**0.02**						

3.6 Building Construction - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road						1.00	1.00		1.00	1.00						
Total						**1.00**	**1.00**		**1.00**	**1.00**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.01	0.02		0.01	0.02						
Total						**0.01**	**0.02**		**0.01**	**0.02**						

3.7 Architectural Coating - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating						0.00	0.00		0.00	0.00						
Off-Road						0.24	0.24		0.24	0.24						
Total						**0.24**	**0.24**		**0.24**	**0.24**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.01		0.00	0.00						
Total						**0.00**	**0.01**		**0.00**	**0.00**						

3.7 Architectural Coating - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating						0.00	0.00		0.00	0.00						
Off-Road						0.24	0.24		0.24	0.24						
Total						**0.24**	**0.24**		**0.24**	**0.24**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

Merrill College Maintenance/Capitol Renewal Project

Santa Cruz County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
User Defined Educational	7100	User Defined Unit

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Utility Company**	Pacific Gas & Electric Company
Climate Zone	4	**Precipitation Freq (Days)**	61		

1.3 User Entered Comments

Project Characteristics -

Land Use - Project area conservatively estimated at up to 2 acres; Construction of a 7,100 sqft new building.

Construction Phase - Activities during Summer: Demolition (20 days), Grading (20 days), Paving (10 days); Activities during Academic Year: Fine Grading (20 days), Building/Elevator/Bench/Path/Plaza Construction (100 days), Coating (5 days).

Off-road Equipment - Architectural Coating: 1 air compressor (CalEEMod default).

Off-road Equipment - Bldg, etc. Construction: 1 crane, 2 forklift, 2 tractor/loader/backhoe, 1 aerial lift, 1 cement/mortar mixer, 1 paving equip. (Default, plus add'l equip. for elevator, bench, surfacing activity); Load factors adjusted per OFFROAD2011.

Off-road Equipment - Demolition: 1 concrete/industrial saw, 1 rubber tired dozer, 3 tractor/loader/backhoe (CalEEMod default for 2 acre site, Table 3.2 of User's Guide); Load factors adjusted per OFFROAD2011.

Off-road Equipment - Fine Grading: 1 grader, 1 rubber tired dozer, 1 tractor/loader/backhoe (CalEEMod default for 2 acre site, Table 3.2 of User's Guide); Load factors adjusted per OFFROAD2011.

Off-road Equipment - Asphalt Paving: 1 cement/mortar mixer, 1 paver, 1 paving equipment, 1 roller, 1 tractor/loader/backhoe (CalEEMod default for 2 acre site, Table 3.2 of User's Guide); Load factors adjusted per OFFROAD2011.

Off-road Equipment - Site Preparation not a part of the analysis.

Trips and VMT - Worker/Vendor Trip Rates: 2 x 1.25 x # construction equipment (CalEEMod default) plus worker/vendor trips for 7,100 sq.ft building (CalEEMod default).

Grading - Project site conservatively estimated up to 2 acres.

Off-road Equipment - Grading: 1 grader, 1 rubber tired dozer, 1 tractor/loader/backhoe (CalEEMod default for 2 acre site, Table 3.2 of User's Guide); Load factors adjusted per OFFROAD2011.

Demolition - Demolition amount based on a 5,000 sqft structure.

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2013						1.72	5.62		1.72	3.38						
2014						1.01	1.32		1.01	1.02						
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2013						1.72	5.52		1.72	3.38						
2014						1.01	1.02		1.01	1.02						
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area						0.00	0.00		0.00	0.00						
Energy						0.00	0.00		0.00	0.00						
Mobile						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area						0.00	0.00		0.00	0.00						
Energy						0.00	0.00		0.00	0.00						
Mobile						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Demolition - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust						0.00	0.25		0.00	0.00						
Off-Road						1.70	1.70		1.70	1.70						
Total						**1.70**	**1.95**		**1.70**	**1.70**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.02	0.56		0.02	0.02						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.01	0.18		0.01	0.01						
Total						**0.03**	**0.74**		**0.03**	**0.03**						

3.2 Demolition - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust						0.00	0.25		0.00	0.00						
Off-Road						1.70	1.70		1.70	1.70						
Total						**1.70**	**1.95**		**1.70**	**1.70**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.02	0.02		0.02	0.02						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.01	0.01		0.01	0.01						
Total						**0.03**	**0.03**		**0.03**	**0.03**						

3.3 Grading - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust						0.00	4.62		0.00	2.48						
Off-Road						0.89	0.89		0.89	0.89						
Total						**0.89**	**5.51**		**0.89**	**3.37**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.11		0.00	0.01						
Total						**0.00**	**0.11**		**0.00**	**0.01**						

3.3 Grading - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust						0.00	4.62		0.00	2.48						
Off-Road						0.89	0.89		0.89	0.89						
Total						**0.89**	**5.51**		**0.89**	**3.37**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.01		0.00	0.01						
Total						**0.00**	**0.01**		**0.00**	**0.01**						

3.4 Paving - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road						1.08	1.08		1.08	1.08						
Paving						0.00	0.00		0.00	0.00						
Total						**1.08**	**1.08**		**1.08**	**1.08**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.01	0.18		0.01	0.01						
Total						**0.01**	**0.18**		**0.01**	**0.01**						

3.4 Paving - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road						1.08	1.08		1.08	1.08						
Paving						0.00	0.00		0.00	0.00						
Total						**1.08**	**1.08**		**1.08**	**1.08**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.01	0.01		0.01	0.01						
Total						**0.01**	**0.01**		**0.01**	**0.01**						

3.5 Fine Grading - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust						0.00	4.62		0.00	2.48						
Off-Road						0.89	0.89		0.89	0.89						
Total						**0.89**	**5.51**		**0.89**	**3.37**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.11		0.00	0.01						
Total						**0.00**	**0.11**		**0.00**	**0.01**						

3.5 Fine Grading - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust						0.00	4.62		0.00	2.48						
Off-Road						0.89	0.89		0.89	0.89						
Total						**0.89**	**5.51**		**0.89**	**3.37**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.01		0.00	0.01						
Total						**0.00**	**0.01**		**0.00**	**0.01**						

3.6 Building Construction - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road						1.11	1.11		1.11	1.11						
Total						**1.11**	**1.11**		**1.11**	**1.11**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.01		0.00	0.01						
Worker						0.01	0.31		0.01	0.02						
Total						**0.01**	**0.32**		**0.01**	**0.03**						

3.6 Building Construction - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road						1.11	1.11		1.11	1.11						
Total						**1.11**	**1.11**		**1.11**	**1.11**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.01		0.00	0.01						
Worker						0.01	0.02		0.01	0.02						
Total						**0.01**	**0.03**		**0.01**	**0.03**						

3.6 Building Construction - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road						1.00	1.00		1.00	1.00						
Total						**1.00**	**1.00**		**1.00**	**1.00**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.01		0.00	0.00						
Worker						0.01	0.31		0.01	0.02						
Total						**0.01**	**0.32**		**0.01**	**0.02**						

3.6 Building Construction - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road						1.00	1.00		1.00	1.00						
Total						**1.00**	**1.00**		**1.00**	**1.00**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.01	0.02		0.01	0.02						
Total						**0.01**	**0.02**		**0.01**	**0.02**						

3.7 Architectural Coating - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating						0.00	0.00		0.00	0.00						
Off-Road						0.24	0.24		0.24	0.24						
Total						**0.24**	**0.24**		**0.24**	**0.24**						

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.01		0.00	0.00						
Total						**0.00**	**0.01**		**0.00**	**0.00**						

3.7 Architectural Coating - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating						0.00	0.00		0.00	0.00						
Off-Road						0.24	0.24		0.24	0.24						
Total						**0.24**	**0.24**		**0.24**	**0.24**						

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling						0.00	0.00		0.00	0.00						
Vendor						0.00	0.00		0.00	0.00						
Worker						0.00	0.00		0.00	0.00						
Total						**0.00**	**0.00**		**0.00**	**0.00**						

4.0 Mobile Detail

4.1 Mitigation Measures Mobile

University of California, Santa Cruz
Merrill College Maintenance/Capitol Renewal Project
Dispersion Model Source Parameters

Table HRA-1
Construction Emissions Estimates

Year	Primary Activities	Source	Duration (days)	Daily DPM Emissions (pounds/day)	Total DPM Emissions (pounds)
2013	Demolition	On-Site Diesel	20	1.70	34.00
2013	Demolition	Off-Site Diesel	20	0.02	0.40
2013	Grading	On-Site Diesel	20	0.89	17.80
2013	Paving	On-Site Diesel	10	1.08	10.80
2013	Fine Grading	On-Site Diesel	20	0.89	17.80
2013	Building Construction	On-Site Diesel	70	1.11	77.70
2013	Building Construction	Off-Site Diesel	70	0.01	0.70
2014	Building Construction	On-Site Diesel	30	1.00	30.00
2014	Building Construction	Off-Site Diesel	30	0.01	0.30
2014	Architectural Coating	On-Site Diesel	5	0.24	1.20
				Total Emissions (TE)	190.70

Source: Diesel particulate matter emissions were obtained from CalEEMod.

Table HRA-2
Workday Annual Average Emission Rate (Grams per Second)

Source	EF (g/s)	TE (pounds)	Unit Conversions				
			Years	Days/year	Hours/day	Seconds/hour	Grams/pound
Construction	8.2287E-03	190.70	1.00	365	8	3,600	453.5924

Equation: Emission Factor (EF) = TE ÷ Exposure Duration (years) ÷ 365 days/year ÷ 8 hours/day ÷ 3600 seconds/hour × 453.5924 grams/pound

Table HRA-3
Dipsersion Model Sources, DPM

Model Source	Release Height (m)	Source Area (m^2)	Emission Rate ($g/s/m^2$)
PAREA1	4.15	2,718.3	2.105E-06
PAREA2	4.15	80.5	2.105E-06
PAREA3	4.15	25.5	2.105E-06
PAREA4	4.15	542.5	2.105E-06
PAREA5	4.15	85.2	2.105E-06
PAREA6	4.15	40.5	2.105E-06
PAREA7	4.15	54.5	2.105E-06
PAREA8	4.15	87.4	2.105E-06
PAREA9	4.15	93.1	2.105E-06
PAREA10	4.15	182.0	2.105E-06
	Total Area	3,909.5	

University of California, Santa Cruz
Merrill College Maintenance/Capitol Renewal Project
Health Risk Calculations

Table HRA-4
Maximum Individual Cancer Risk (MICR)

Receptor	Pollutant	CPF	$C_{AIR,ANN}$	DBR	A	EF	ED	AT	Dose	ASF	MICR	Threshold	Over?
Workplace	DPM	1.10E+00	8.50E-01	149	1	245	1	25550	1.21	1	1.34	10	NO
University Residents	DPM	1.10E+00	6.69E-01	302	1	350	1	25550	2.77	1	3.04	10	NO

Exposure factors used to calculate cancer risk:

CPF	Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$.
$C_{AIR,ANN}$	Annual concentration ($\mu g/m^3$). The US EPA recommends multiplying the SCREEN3 1-hour concentrations by 0.03 to determine annual average concentrations
DBR	Daily breathing rate (L/kg (body weight) per day).
	DBR Sources:
	1. California Air Resources Board and Office of Environmental Health Hazard Assessment, *Recommended Interim Risk Management Policy for Inhalation-Based Residential Cancer Risk*, (2003).
	2. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*, (2003).
	3. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, Integrated Risk Assessment Section, *Guidance for School Site Risk Assessment Pursuant to Health and Safety Code Section 901(f): Guidance for Assessing Exposures and Health Risks at Existing and Proposed School Sites*, (2003).
A	Inhalation absorption factor (default = 1).
EF	Exposure frequency (days/year).
ED	Exposure duration (years).
AT	Average time period over which exposure is averaged in days (days).
Dose	Dose = DBR × A × EF × ED / AT.
ASF	Age sensitivity factor, 1 for adults and 10 for children

Table HRA-5
Maximum Non-carcinogenic Hazards / Toxicological Endpoints*

Receptor Group	Pollutant	CREL	$C_{AIR,ANN}$	HQ	RESP	CNS/PNS	CV/BL	IMMUN	KIDN	GI/LV	REPRO	EYES	Threshold	Over?
Workplace	DPM	5.00E+00	8.50E-01	1.70E-01	1.70E-01	-	-	-	-	-	-	-	1	NO
University Residents	DPM	5.00E+00	6.69E-01	1.34E-01	1.34E-01	-	-	-	-	-	-	-	1	NO

Where:

CREL	Chronic Reference Exposure Level
HQ	Hazard Quotient
HI	Health Index
MEI	Maximally Exposed Individual

* Key to Toxicological Endpoints

RESP	Respiratory System.
CNS/PNS	Central/Peripheral Nervous System.
CV/BL	Cardiovascular/Blood System.
IMMUN	Immune System.
KIDN	Kidney.
GI/LV	Gastrointestinal System/Liver.
REPRO	Reproductive System.
EYES	Eye irritation and/or other effects.

```
* ISCST3 (02035): C:\ISC-Aermod\680.15\HRA\CHRA.isc
* MODELING OPTIONS USED:
*  CONC                    URBAN ELEV         DFAULT
*         PLOT FILE OF PERIOD VALUES FOR SOURCE GROUP: ALL
*         FOR A TOTAL OF   730 RECEPTORS.
*         FORMAT: (3(1X,F13.5),1X,F8.2,2X,A6,2X,A8,2X,I8.8,2X,A8)
*        X             Y      AVERAGE CONC   ZELEV     AVE     GRP      NUM HRS   NET ID
*  ____________  ____________  ____________  ______  ______  ________  _________  _________
  584115.00000 4095215.00000       0.06283   239.10  PERIOD  ALL       00008760     NA
  584120.00000 4095215.00000       0.06594   239.80  PERIOD  ALL       00008760     NA
  584125.00000 4095215.00000       0.06941   239.80  PERIOD  ALL       00008760     NA
  584130.00000 4095215.00000       0.07338   240.10  PERIOD  ALL       00008760     NA
  584135.00000 4095215.00000       0.07786   240.10  PERIOD  ALL       00008760     NA
  584140.00000 4095215.00000       0.08269   240.10  PERIOD  ALL       00008760     NA
  584145.00000 4095215.00000       0.08757   240.10  PERIOD  ALL       00008760     NA
  584150.00000 4095215.00000       0.09225   240.10  PERIOD  ALL       00008760     NA
  584155.00000 4095215.00000       0.09668   239.80  PERIOD  ALL       00008760     NA
  584160.00000 4095215.00000       0.10107   239.80  PERIOD  ALL       00008760     NA
  584165.00000 4095215.00000       0.10575   239.30  PERIOD  ALL       00008760     NA
  584190.00000 4095215.00000       0.13928   237.60  PERIOD  ALL       00008760     NA
  584195.00000 4095215.00000       0.14802   236.80  PERIOD  ALL       00008760     NA
  584200.00000 4095215.00000       0.15762   236.80  PERIOD  ALL       00008760     NA
  584205.00000 4095215.00000       0.16794   236.30  PERIOD  ALL       00008760     NA
  584210.00000 4095215.00000       0.17855   236.30  PERIOD  ALL       00008760     NA
  584215.00000 4095215.00000       0.18883   236.00  PERIOD  ALL       00008760     NA
  584220.00000 4095215.00000       0.19824   236.00  PERIOD  ALL       00008760     NA
  584225.00000 4095215.00000       0.20654   235.80  PERIOD  ALL       00008760     NA
  584230.00000 4095215.00000       0.21368   236.10  PERIOD  ALL       00008760     NA
  584235.00000 4095215.00000       0.21979   236.10  PERIOD  ALL       00008760     NA
  584240.00000 4095215.00000       0.22522   236.30  PERIOD  ALL       00008760     NA
  584245.00000 4095215.00000       0.23057   236.30  PERIOD  ALL       00008760     NA
  584100.00000 4095220.00000       0.05591   238.30  PERIOD  ALL       00008760     NA
  584105.00000 4095220.00000       0.05900   238.30  PERIOD  ALL       00008760     NA
  584110.00000 4095220.00000       0.06216   239.10  PERIOD  ALL       00008760     NA
  584115.00000 4095220.00000       0.06541   239.10  PERIOD  ALL       00008760     NA
  584120.00000 4095220.00000       0.06883   239.80  PERIOD  ALL       00008760     NA
  584125.00000 4095220.00000       0.07257   239.80  PERIOD  ALL       00008760     NA
  584130.00000 4095220.00000       0.07686   240.10  PERIOD  ALL       00008760     NA
  584135.00000 4095220.00000       0.08187   240.10  PERIOD  ALL       00008760     NA
  584140.00000 4095220.00000       0.08752   240.10  PERIOD  ALL       00008760     NA
  584145.00000 4095220.00000       0.09346   240.10  PERIOD  ALL       00008760     NA
  584150.00000 4095220.00000       0.09927   240.10  PERIOD  ALL       00008760     NA
  584155.00000 4095220.00000       0.10474   240.10  PERIOD  ALL       00008760     NA
  584160.00000 4095220.00000       0.11003   239.80  PERIOD  ALL       00008760     NA
  584165.00000 4095220.00000       0.11559   239.80  PERIOD  ALL       00008760     NA
  584190.00000 4095220.00000       0.15469   237.60  PERIOD  ALL       00008760     NA
  584195.00000 4095220.00000       0.16424   237.60  PERIOD  ALL       00008760     NA
  584200.00000 4095220.00000       0.17472   236.80  PERIOD  ALL       00008760     NA
  584205.00000 4095220.00000       0.18631   236.80  PERIOD  ALL       00008760     NA
  584210.00000 4095220.00000       0.19872   236.30  PERIOD  ALL       00008760     NA
  584215.00000 4095220.00000       0.21119   236.30  PERIOD  ALL       00008760     NA
  584220.00000 4095220.00000       0.22300   236.00  PERIOD  ALL       00008760     NA
  584225.00000 4095220.00000       0.23383   236.00  PERIOD  ALL       00008760     NA
  584230.00000 4095220.00000       0.24364   236.10  PERIOD  ALL       00008760     NA
  584235.00000 4095220.00000       0.25231   236.10  PERIOD  ALL       00008760     NA
  584240.00000 4095220.00000       0.25994   236.30  PERIOD  ALL       00008760     NA
  584245.00000 4095220.00000       0.26695   236.30  PERIOD  ALL       00008760     NA
  584100.00000 4095225.00000       0.05711   239.80  PERIOD  ALL       00008760     NA
  584105.00000 4095225.00000       0.06067   239.80  PERIOD  ALL       00008760     NA
  584110.00000 4095225.00000       0.06426   240.80  PERIOD  ALL       00008760     NA
  584115.00000 4095225.00000       0.06792   240.80  PERIOD  ALL       00008760     NA
  584120.00000 4095225.00000       0.07171   241.60  PERIOD  ALL       00008760     NA
  584125.00000 4095225.00000       0.07575   241.60  PERIOD  ALL       00008760     NA
  584130.00000 4095225.00000       0.08031   242.10  PERIOD  ALL       00008760     NA
  584135.00000 4095225.00000       0.08572   242.10  PERIOD  ALL       00008760     NA
  584140.00000 4095225.00000       0.09211   242.30  PERIOD  ALL       00008760     NA
  584145.00000 4095225.00000       0.09916   242.30  PERIOD  ALL       00008760     NA
  584150.00000 4095225.00000       0.10630   242.30  PERIOD  ALL       00008760     NA
  584155.00000 4095225.00000       0.11305   242.10  PERIOD  ALL       00008760     NA
  584160.00000 4095225.00000       0.11947   242.10  PERIOD  ALL       00008760     NA
  584165.00000 4095225.00000       0.12614   241.60  PERIOD  ALL       00008760     NA
  584190.00000 4095225.00000       0.17304   240.00  PERIOD  ALL       00008760     NA
  584195.00000 4095225.00000       0.18359   239.10  PERIOD  ALL       00008760     NA
  584200.00000 4095225.00000       0.19487   239.10  PERIOD  ALL       00008760     NA
  584205.00000 4095225.00000       0.20757   238.30  PERIOD  ALL       00008760     NA
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584220.00000	4095225.00000	0.25136	237.80	PERIOD	ALL	00008760	NA
584225.00000	4095225.00000	0.26544	237.80	PERIOD	ALL	00008760	NA
584230.00000	4095225.00000	0.27901	238.10	PERIOD	ALL	00008760	NA
584235.00000	4095225.00000	0.29177	238.10	PERIOD	ALL	00008760	NA
584240.00000	4095225.00000	0.30312	238.60	PERIOD	ALL	00008760	NA
584245.00000	4095225.00000	0.31279	238.60	PERIOD	ALL	00008760	NA
584100.00000	4095230.00000	0.05778	239.80	PERIOD	ALL	00008760	NA
584105.00000	4095230.00000	0.06193	239.80	PERIOD	ALL	00008760	NA
584110.00000	4095230.00000	0.06612	240.80	PERIOD	ALL	00008760	NA
584115.00000	4095230.00000	0.07033	240.80	PERIOD	ALL	00008760	NA
584120.00000	4095230.00000	0.07460	241.60	PERIOD	ALL	00008760	NA
584125.00000	4095230.00000	0.07903	241.60	PERIOD	ALL	00008760	NA
584130.00000	4095230.00000	0.08387	242.10	PERIOD	ALL	00008760	NA
584135.00000	4095230.00000	0.08955	242.10	PERIOD	ALL	00008760	NA
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584145.00000	4095230.00000	0.10463	242.30	PERIOD	ALL	00008760	NA
584150.00000	4095230.00000	0.11324	242.30	PERIOD	ALL	00008760	NA
584155.00000	4095230.00000	0.12153	242.30	PERIOD	ALL	00008760	NA
584160.00000	4095230.00000	0.12931	242.10	PERIOD	ALL	00008760	NA
584165.00000	4095230.00000	0.13726	242.10	PERIOD	ALL	00008760	NA
584190.00000	4095230.00000	0.19464	240.00	PERIOD	ALL	00008760	NA
584195.00000	4095230.00000	0.20669	240.00	PERIOD	ALL	00008760	NA
584200.00000	4095230.00000	0.21892	239.10	PERIOD	ALL	00008760	NA
584205.00000	4095230.00000	0.23257	239.10	PERIOD	ALL	00008760	NA
584210.00000	4095230.00000	0.24849	238.30	PERIOD	ALL	00008760	NA
584215.00000	4095230.00000	0.26605	238.30	PERIOD	ALL	00008760	NA
584220.00000	4095230.00000	0.28397	237.80	PERIOD	ALL	00008760	NA
584225.00000	4095230.00000	0.30194	237.80	PERIOD	ALL	00008760	NA
584230.00000	4095230.00000	0.32038	238.10	PERIOD	ALL	00008760	NA
584235.00000	4095230.00000	0.33911	238.10	PERIOD	ALL	00008760	NA
584240.00000	4095230.00000	0.35659	238.60	PERIOD	ALL	00008760	NA
584245.00000	4095230.00000	0.37089	238.60	PERIOD	ALL	00008760	NA
584100.00000	4095235.00000	0.05759	241.50	PERIOD	ALL	00008760	NA
584105.00000	4095235.00000	0.06245	241.50	PERIOD	ALL	00008760	NA
584110.00000	4095235.00000	0.06743	242.60	PERIOD	ALL	00008760	NA
584115.00000	4095235.00000	0.07243	242.60	PERIOD	ALL	00008760	NA
584120.00000	4095235.00000	0.07741	243.60	PERIOD	ALL	00008760	NA
584125.00000	4095235.00000	0.08242	243.60	PERIOD	ALL	00008760	NA
584130.00000	4095235.00000	0.08765	244.10	PERIOD	ALL	00008760	NA
584135.00000	4095235.00000	0.09356	244.10	PERIOD	ALL	00008760	NA
584140.00000	4095235.00000	0.10087	244.30	PERIOD	ALL	00008760	NA
584145.00000	4095235.00000	0.10992	244.30	PERIOD	ALL	00008760	NA
584150.00000	4095235.00000	0.12008	244.30	PERIOD	ALL	00008760	NA
584155.00000	4095235.00000	0.13017	244.30	PERIOD	ALL	00008760	NA
584160.00000	4095235.00000	0.13961	244.30	PERIOD	ALL	00008760	NA
584165.00000	4095235.00000	0.14903	244.10	PERIOD	ALL	00008760	NA
584190.00000	4095235.00000	0.21923	242.30	PERIOD	ALL	00008760	NA
584195.00000	4095235.00000	0.23362	241.50	PERIOD	ALL	00008760	NA
584200.00000	4095235.00000	0.24736	241.50	PERIOD	ALL	00008760	NA
584205.00000	4095235.00000	0.26213	240.80	PERIOD	ALL	00008760	NA
584210.00000	4095235.00000	0.27979	240.80	PERIOD	ALL	00008760	NA
584215.00000	4095235.00000	0.30033	240.30	PERIOD	ALL	00008760	NA
584220.00000	4095235.00000	0.32201	240.30	PERIOD	ALL	00008760	NA
584225.00000	4095235.00000	0.34447	240.10	PERIOD	ALL	00008760	NA
584230.00000	4095235.00000	0.36885	240.30	PERIOD	ALL	00008760	NA
584235.00000	4095235.00000	0.39532	240.30	PERIOD	ALL	00008760	NA
584240.00000	4095235.00000	0.42146	240.60	PERIOD	ALL	00008760	NA
584245.00000	4095235.00000	0.44330	240.60	PERIOD	ALL	00008760	NA
584100.00000	4095240.00000	0.05626	241.50	PERIOD	ALL	00008760	NA
584105.00000	4095240.00000	0.06176	241.50	PERIOD	ALL	00008760	NA
584110.00000	4095240.00000	0.06763	242.60	PERIOD	ALL	00008760	NA
584115.00000	4095240.00000	0.07371	242.60	PERIOD	ALL	00008760	NA
584120.00000	4095240.00000	0.07980	243.60	PERIOD	ALL	00008760	NA
584125.00000	4095240.00000	0.08580	243.60	PERIOD	ALL	00008760	NA
584130.00000	4095240.00000	0.09174	244.10	PERIOD	ALL	00008760	NA
584135.00000	4095240.00000	0.09799	244.10	PERIOD	ALL	00008760	NA
584140.00000	4095240.00000	0.10545	244.30	PERIOD	ALL	00008760	NA
584145.00000	4095240.00000	0.11515	244.30	PERIOD	ALL	00008760	NA
584150.00000	4095240.00000	0.12687	244.30	PERIOD	ALL	00008760	NA
584195.00000	4095240.00000	0.26312	242.30	PERIOD	ALL	00008760	NA
584200.00000	4095240.00000	0.27954	241.50	PERIOD	ALL	00008760	NA
584205.00000	4095240.00000	0.29629	241.50	PERIOD	ALL	00008760	NA
584210.00000	4095240.00000	0.31607	240.80	PERIOD	ALL	00008760	NA

584215.00000	4095240.00000	0.34016	240.80	PERIOD	ALL	00008760	NA
584220.00000	4095240.00000	0.36646	240.30	PERIOD	ALL	00008760	NA
584225.00000	4095240.00000	0.39444	240.30	PERIOD	ALL	00008760	NA
584230.00000	4095240.00000	0.42633	240.30	PERIOD	ALL	00008760	NA
584235.00000	4095240.00000	0.46236	240.30	PERIOD	ALL	00008760	NA
584240.00000	4095240.00000	0.49863	240.60	PERIOD	ALL	00008760	NA
584245.00000	4095240.00000	0.52964	240.60	PERIOD	ALL	00008760	NA
584100.00000	4095245.00000	0.05369	243.10	PERIOD	ALL	00008760	NA
584105.00000	4095245.00000	0.05955	243.10	PERIOD	ALL	00008760	NA
584110.00000	4095245.00000	0.06611	244.30	PERIOD	ALL	00008760	NA
584115.00000	4095245.00000	0.07328	244.30	PERIOD	ALL	00008760	NA
584120.00000	4095245.00000	0.08084	244.80	PERIOD	ALL	00008760	NA
584125.00000	4095245.00000	0.08846	244.80	PERIOD	ALL	00008760	NA
584130.00000	4095245.00000	0.09584	245.60	PERIOD	ALL	00008760	NA
584135.00000	4095245.00000	0.10297	245.60	PERIOD	ALL	00008760	NA
584140.00000	4095245.00000	0.11060	246.10	PERIOD	ALL	00008760	NA
584145.00000	4095245.00000	0.12046	246.10	PERIOD	ALL	00008760	NA
584150.00000	4095245.00000	0.13349	246.10	PERIOD	ALL	00008760	NA
584195.00000	4095245.00000	0.29203	243.60	PERIOD	ALL	00008760	NA
584200.00000	4095245.00000	0.31236	243.60	PERIOD	ALL	00008760	NA
584205.00000	4095245.00000	0.33298	243.10	PERIOD	ALL	00008760	NA
584210.00000	4095245.00000	0.35603	243.10	PERIOD	ALL	00008760	NA
584215.00000	4095245.00000	0.38392	242.60	PERIOD	ALL	00008760	NA
584220.00000	4095245.00000	0.41531	242.60	PERIOD	ALL	00008760	NA
584225.00000	4095245.00000	0.45020	242.30	PERIOD	ALL	00008760	NA
584230.00000	4095245.00000	0.49301	242.50	PERIOD	ALL	00008760	NA
584235.00000	4095245.00000	0.54121	242.50	PERIOD	ALL	00008760	NA
584240.00000	4095245.00000	0.58753	242.80	PERIOD	ALL	00008760	NA
584245.00000	4095245.00000	0.62660	242.80	PERIOD	ALL	00008760	NA
584250.00000	4095245.00000	0.65389	243.00	PERIOD	ALL	00008760	NA
584255.00000	4095245.00000	0.66897	243.00	PERIOD	ALL	00008760	NA
584260.00000	4095245.00000	0.67337	243.10	PERIOD	ALL	00008760	NA
584265.00000	4095245.00000	0.65972	243.10	PERIOD	ALL	00008760	NA
584100.00000	4095250.00000	0.05016	243.10	PERIOD	ALL	00008760	NA
584105.00000	4095250.00000	0.05592	243.10	PERIOD	ALL	00008760	NA
584110.00000	4095250.00000	0.06262	244.30	PERIOD	ALL	00008760	NA
584115.00000	4095250.00000	0.07038	244.30	PERIOD	ALL	00008760	NA
584120.00000	4095250.00000	0.07916	244.80	PERIOD	ALL	00008760	NA
584125.00000	4095250.00000	0.08872	244.80	PERIOD	ALL	00008760	NA
584130.00000	4095250.00000	0.09851	245.60	PERIOD	ALL	00008760	NA
584135.00000	4095250.00000	0.10786	245.60	PERIOD	ALL	00008760	NA
584140.00000	4095250.00000	0.11657	246.10	PERIOD	ALL	00008760	NA
584145.00000	4095250.00000	0.12620	246.10	PERIOD	ALL	00008760	NA
584195.00000	4095250.00000	0.31690	244.80	PERIOD	ALL	00008760	NA
584200.00000	4095250.00000	0.34053	243.60	PERIOD	ALL	00008760	NA
584205.00000	4095250.00000	0.36619	243.60	PERIOD	ALL	00008760	NA
584210.00000	4095250.00000	0.39433	243.10	PERIOD	ALL	00008760	NA
584215.00000	4095250.00000	0.42535	243.10	PERIOD	ALL	00008760	NA
584220.00000	4095250.00000	0.45885	242.60	PERIOD	ALL	00008760	NA
584225.00000	4095250.00000	0.49886	242.60	PERIOD	ALL	00008760	NA
584230.00000	4095250.00000	0.55613	242.50	PERIOD	ALL	00008760	NA
584235.00000	4095250.00000	0.61915	242.50	PERIOD	ALL	00008760	NA
584240.00000	4095250.00000	0.67393	242.80	PERIOD	ALL	00008760	NA
584245.00000	4095250.00000	0.71736	242.80	PERIOD	ALL	00008760	NA
584250.00000	4095250.00000	0.74828	243.00	PERIOD	ALL	00008760	NA
584255.00000	4095250.00000	0.76373	243.00	PERIOD	ALL	00008760	NA
584260.00000	4095250.00000	0.76491	243.10	PERIOD	ALL	00008760	NA
584265.00000	4095250.00000	0.73784	243.10	PERIOD	ALL	00008760	NA
584090.00000	4095255.00000	0.03782	242.50	PERIOD	ALL	00008760	NA
584095.00000	4095255.00000	0.04167	243.10	PERIOD	ALL	00008760	NA
584100.00000	4095255.00000	0.04616	244.10	PERIOD	ALL	00008760	NA
584105.00000	4095255.00000	0.05143	244.30	PERIOD	ALL	00008760	NA
584110.00000	4095255.00000	0.05769	244.80	PERIOD	ALL	00008760	NA
584115.00000	4095255.00000	0.06518	244.80	PERIOD	ALL	00008760	NA
584120.00000	4095255.00000	0.07412	246.30	PERIOD	ALL	00008760	NA
584125.00000	4095255.00000	0.08469	246.30	PERIOD	ALL	00008760	NA
584130.00000	4095255.00000	0.09673	247.10	PERIOD	ALL	00008760	NA
584135.00000	4095255.00000	0.10949	247.10	PERIOD	ALL	00008760	NA
584140.00000	4095255.00000	0.12161	247.80	PERIOD	ALL	00008760	NA
584145.00000	4095255.00000	0.13240	247.80	PERIOD	ALL	00008760	NA
584200.00000	4095255.00000	0.36126	246.50	PERIOD	ALL	00008760	NA
584205.00000	4095255.00000	0.39084	245.60	PERIOD	ALL	00008760	NA
584210.00000	4095255.00000	0.42284	245.60	PERIOD	ALL	00008760	NA
584215.00000	4095255.00000	0.45545	244.80	PERIOD	ALL	00008760	NA
584250.00000	4095255.00000	0.80567	244.60	PERIOD	ALL	00008760	NA

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584260.00000	4095255.00000	0.81961	244.50	PERIOD	ALL	00008760	NA
584265.00000	4095255.00000	0.78328	244.30	PERIOD	ALL	00008760	NA
584315.00000	4095255.00000	0.38132	243.00	PERIOD	ALL	00008760	NA
584320.00000	4095255.00000	0.35293	243.00	PERIOD	ALL	00008760	NA
584325.00000	4095255.00000	0.32253	241.30	PERIOD	ALL	00008760	NA
584330.00000	4095255.00000	0.29130	241.10	PERIOD	ALL	00008760	NA
584335.00000	4095255.00000	0.26356	239.80	PERIOD	ALL	00008760	NA
584090.00000	4095260.00000	0.03469	242.50	PERIOD	ALL	00008760	NA
584095.00000	4095260.00000	0.03811	242.50	PERIOD	ALL	00008760	NA
584100.00000	4095260.00000	0.04208	244.10	PERIOD	ALL	00008760	NA
584105.00000	4095260.00000	0.04673	244.10	PERIOD	ALL	00008760	NA
584110.00000	4095260.00000	0.05224	244.80	PERIOD	ALL	00008760	NA
584115.00000	4095260.00000	0.05883	244.80	PERIOD	ALL	00008760	NA
584120.00000	4095260.00000	0.06685	246.30	PERIOD	ALL	00008760	NA
584125.00000	4095260.00000	0.07668	246.30	PERIOD	ALL	00008760	NA
584130.00000	4095260.00000	0.08875	247.10	PERIOD	ALL	00008760	NA
584135.00000	4095260.00000	0.10316	247.10	PERIOD	ALL	00008760	NA
584140.00000	4095260.00000	0.11902	247.80	PERIOD	ALL	00008760	NA
584145.00000	4095260.00000	0.13390	247.80	PERIOD	ALL	00008760	NA
584205.00000	4095260.00000	0.40866	246.50	PERIOD	ALL	00008760	NA
584210.00000	4095260.00000	0.44510	245.60	PERIOD	ALL	00008760	NA
584215.00000	4095260.00000	0.47850	245.60	PERIOD	ALL	00008760	NA
584260.00000	4095260.00000	0.84340	244.50	PERIOD	ALL	00008760	NA
584315.00000	4095260.00000	0.32572	243.80	PERIOD	ALL	00008760	NA
584320.00000	4095260.00000	0.30418	243.00	PERIOD	ALL	00008760	NA
584325.00000	4095260.00000	0.28695	243.00	PERIOD	ALL	00008760	NA
584330.00000	4095260.00000	0.26540	241.10	PERIOD	ALL	00008760	NA
584335.00000	4095260.00000	0.24382	241.10	PERIOD	ALL	00008760	NA
584090.00000	4095265.00000	0.03158	243.00	PERIOD	ALL	00008760	NA
584095.00000	4095265.00000	0.03458	244.10	PERIOD	ALL	00008760	NA
584100.00000	4095265.00000	0.03805	244.10	PERIOD	ALL	00008760	NA
584105.00000	4095265.00000	0.04208	244.80	PERIOD	ALL	00008760	NA
584110.00000	4095265.00000	0.04680	245.30	PERIOD	ALL	00008760	NA
584115.00000	4095265.00000	0.05239	246.30	PERIOD	ALL	00008760	NA
584120.00000	4095265.00000	0.05908	246.60	PERIOD	ALL	00008760	NA
584125.00000	4095265.00000	0.06720	247.10	PERIOD	ALL	00008760	NA
584130.00000	4095265.00000	0.07721	248.10	PERIOD	ALL	00008760	NA
584135.00000	4095265.00000	0.08965	248.10	PERIOD	ALL	00008760	NA
584140.00000	4095265.00000	0.10469	248.80	PERIOD	ALL	00008760	NA
584145.00000	4095265.00000	0.12067	248.80	PERIOD	ALL	00008760	NA
584205.00000	4095265.00000	0.42026	248.60	PERIOD	ALL	00008760	NA
584210.00000	4095265.00000	0.46655	248.60	PERIOD	ALL	00008760	NA
584215.00000	4095265.00000	0.50591	247.60	PERIOD	ALL	00008760	NA
584260.00000	4095265.00000	0.84959	245.60	PERIOD	ALL	00008760	NA
584320.00000	4095265.00000	0.25310	243.30	PERIOD	ALL	00008760	NA
584055.00000	4095270.00000	0.01704	242.10	PERIOD	ALL	00008760	NA
584060.00000	4095270.00000	0.01819	242.10	PERIOD	ALL	00008760	NA
584065.00000	4095270.00000	0.01946	242.10	PERIOD	ALL	00008760	NA
584070.00000	4095270.00000	0.02088	242.00	PERIOD	ALL	00008760	NA
584090.00000	4095270.00000	0.02853	243.00	PERIOD	ALL	00008760	NA
584095.00000	4095270.00000	0.03112	243.00	PERIOD	ALL	00008760	NA
584100.00000	4095270.00000	0.03409	244.10	PERIOD	ALL	00008760	NA
584105.00000	4095270.00000	0.03752	244.10	PERIOD	ALL	00008760	NA
584110.00000	4095270.00000	0.04150	245.30	PERIOD	ALL	00008760	NA
584115.00000	4095270.00000	0.04614	245.30	PERIOD	ALL	00008760	NA
584120.00000	4095270.00000	0.05161	246.60	PERIOD	ALL	00008760	NA
584125.00000	4095270.00000	0.05808	246.60	PERIOD	ALL	00008760	NA
584130.00000	4095270.00000	0.06579	248.10	PERIOD	ALL	00008760	NA
584135.00000	4095270.00000	0.07500	248.10	PERIOD	ALL	00008760	NA
584140.00000	4095270.00000	0.08596	248.80	PERIOD	ALL	00008760	NA
584145.00000	4095270.00000	0.09821	248.80	PERIOD	ALL	00008760	NA
584205.00000	4095270.00000	0.42156	249.30	PERIOD	ALL	00008760	NA
584210.00000	4095270.00000	0.48195	248.60	PERIOD	ALL	00008760	NA
584215.00000	4095270.00000	0.53437	248.60	PERIOD	ALL	00008760	NA
584260.00000	4095270.00000	0.84512	245.60	PERIOD	ALL	00008760	NA
584280.00000	4095270.00000	0.66852	245.50	PERIOD	ALL	00008760	NA
584285.00000	4095270.00000	0.59171	245.50	PERIOD	ALL	00008760	NA
584290.00000	4095270.00000	0.51342	244.80	PERIOD	ALL	00008760	NA
584340.00000	4095270.00000	0.16927	239.00	PERIOD	ALL	00008760	NA
584345.00000	4095270.00000	0.15915	239.00	PERIOD	ALL	00008760	NA
584055.00000	4095275.00000	0.01564	243.80	PERIOD	ALL	00008760	NA
584060.00000	4095275.00000	0.01666	243.80	PERIOD	ALL	00008760	NA
584065.00000	4095275.00000	0.01778	243.10	PERIOD	ALL	00008760	NA

584070.00000	4095275.00000	0.01902	243.10	PERIOD	ALL	00008760	NA
584090.00000	4095275.00000	0.02562	243.10	PERIOD	ALL	00008760	NA
584095.00000	4095275.00000	0.02782	244.00	PERIOD	ALL	00008760	NA
584100.00000	4095275.00000	0.03033	244.10	PERIOD	ALL	00008760	NA
584105.00000	4095275.00000	0.03319	245.30	PERIOD	ALL	00008760	NA
584110.00000	4095275.00000	0.03649	245.30	PERIOD	ALL	00008760	NA
584115.00000	4095275.00000	0.04029	246.60	PERIOD	ALL	00008760	NA
584120.00000	4095275.00000	0.04471	246.60	PERIOD	ALL	00008760	NA
584125.00000	4095275.00000	0.04987	248.10	PERIOD	ALL	00008760	NA
584130.00000	4095275.00000	0.05589	248.30	PERIOD	ALL	00008760	NA
584135.00000	4095275.00000	0.06293	248.80	PERIOD	ALL	00008760	NA
584140.00000	4095275.00000	0.07111	248.80	PERIOD	ALL	00008760	NA
584145.00000	4095275.00000	0.08035	248.80	PERIOD	ALL	00008760	NA
584205.00000	4095275.00000	0.39316	249.30	PERIOD	ALL	00008760	NA
584210.00000	4095275.00000	0.46268	248.60	PERIOD	ALL	00008760	NA
584215.00000	4095275.00000	0.53635	248.60	PERIOD	ALL	00008760	NA
584280.00000	4095275.00000	0.64270	245.50	PERIOD	ALL	00008760	NA
584285.00000	4095275.00000	0.56555	245.50	PERIOD	ALL	00008760	NA
584290.00000	4095275.00000	0.49035	244.80	PERIOD	ALL	00008760	NA
584320.00000	4095275.00000	0.22010	243.30	PERIOD	ALL	00008760	NA
584325.00000	4095275.00000	0.19766	243.30	PERIOD	ALL	00008760	NA
584330.00000	4095275.00000	0.18094	241.60	PERIOD	ALL	00008760	NA
584335.00000	4095275.00000	0.16873	241.60	PERIOD	ALL	00008760	NA
584340.00000	4095275.00000	0.15785	238.50	PERIOD	ALL	00008760	NA
584345.00000	4095275.00000	0.14601	238.50	PERIOD	ALL	00008760	NA
584350.00000	4095275.00000	0.13218	236.80	PERIOD	ALL	00008760	NA
584055.00000	4095280.00000	0.01431	243.80	PERIOD	ALL	00008760	NA
584060.00000	4095280.00000	0.01520	243.80	PERIOD	ALL	00008760	NA
584065.00000	4095280.00000	0.01618	243.80	PERIOD	ALL	00008760	NA
584070.00000	4095280.00000	0.01726	243.10	PERIOD	ALL	00008760	NA
584090.00000	4095280.00000	0.02292	243.10	PERIOD	ALL	00008760	NA
584095.00000	4095280.00000	0.02478	243.10	PERIOD	ALL	00008760	NA
584100.00000	4095280.00000	0.02688	244.10	PERIOD	ALL	00008760	NA
584105.00000	4095280.00000	0.02927	244.10	PERIOD	ALL	00008760	NA
584110.00000	4095280.00000	0.03199	245.30	PERIOD	ALL	00008760	NA
584115.00000	4095280.00000	0.03513	245.30	PERIOD	ALL	00008760	NA
584120.00000	4095280.00000	0.03876	246.60	PERIOD	ALL	00008760	NA
584125.00000	4095280.00000	0.04300	246.60	PERIOD	ALL	00008760	NA
584130.00000	4095280.00000	0.04803	248.30	PERIOD	ALL	00008760	NA
584135.00000	4095280.00000	0.05409	248.30	PERIOD	ALL	00008760	NA
584140.00000	4095280.00000	0.06156	248.80	PERIOD	ALL	00008760	NA
584145.00000	4095280.00000	0.07069	248.80	PERIOD	ALL	00008760	NA
584280.00000	4095280.00000	0.60938	245.50	PERIOD	ALL	00008760	NA
584285.00000	4095280.00000	0.53177	245.50	PERIOD	ALL	00008760	NA
584290.00000	4095280.00000	0.46066	244.80	PERIOD	ALL	00008760	NA
584315.00000	4095280.00000	0.23678	244.10	PERIOD	ALL	00008760	NA
584320.00000	4095280.00000	0.21284	243.30	PERIOD	ALL	00008760	NA
584325.00000	4095280.00000	0.19261	243.30	PERIOD	ALL	00008760	NA
584330.00000	4095280.00000	0.17578	241.60	PERIOD	ALL	00008760	NA
584335.00000	4095280.00000	0.16128	241.60	PERIOD	ALL	00008760	NA
584340.00000	4095280.00000	0.14763	238.50	PERIOD	ALL	00008760	NA
584345.00000	4095280.00000	0.13433	238.50	PERIOD	ALL	00008760	NA
584350.00000	4095280.00000	0.12059	236.80	PERIOD	ALL	00008760	NA
584055.00000	4095285.00000	0.01305	243.80	PERIOD	ALL	00008760	NA
584060.00000	4095285.00000	0.01383	243.80	PERIOD	ALL	00008760	NA
584065.00000	4095285.00000	0.01468	243.80	PERIOD	ALL	00008760	NA
584070.00000	4095285.00000	0.01562	243.80	PERIOD	ALL	00008760	NA
584075.00000	4095285.00000	0.01665	243.10	PERIOD	ALL	00008760	NA
584080.00000	4095285.00000	0.01778	242.50	PERIOD	ALL	00008760	NA
584085.00000	4095285.00000	0.01905	243.10	PERIOD	ALL	00008760	NA
584090.00000	4095285.00000	0.02046	243.10	PERIOD	ALL	00008760	NA
584095.00000	4095285.00000	0.02204	244.10	PERIOD	ALL	00008760	NA
584100.00000	4095285.00000	0.02382	244.10	PERIOD	ALL	00008760	NA
584105.00000	4095285.00000	0.02584	245.10	PERIOD	ALL	00008760	NA
584110.00000	4095285.00000	0.02815	245.60	PERIOD	ALL	00008760	NA
584115.00000	4095285.00000	0.03083	246.30	PERIOD	ALL	00008760	NA
584120.00000	4095285.00000	0.03398	246.30	PERIOD	ALL	00008760	NA
584125.00000	4095285.00000	0.03774	248.30	PERIOD	ALL	00008760	NA
584130.00000	4095285.00000	0.04235	248.30	PERIOD	ALL	00008760	NA
584135.00000	4095285.00000	0.04816	248.60	PERIOD	ALL	00008760	NA
584140.00000	4095285.00000	0.05556	248.60	PERIOD	ALL	00008760	NA
584145.00000	4095285.00000	0.06475	249.00	PERIOD	ALL	00008760	NA
584150.00000	4095285.00000	0.07575	249.00	PERIOD	ALL	00008760	NA
584155.00000	4095285.00000	0.08861	249.00	PERIOD	ALL	00008760	NA
584160.00000	4095285.00000	0.10555	249.00	PERIOD	ALL	00008760	NA

584165.00000	4095285.00000	0.12652	249.00	PERIOD	ALL	00008760	NA
584170.00000	4095285.00000	0.14820	248.80	PERIOD	ALL	00008760	NA
584175.00000	4095285.00000	0.16967	249.00	PERIOD	ALL	00008760	NA
584180.00000	4095285.00000	0.19052	249.00	PERIOD	ALL	00008760	NA
584185.00000	4095285.00000	0.21172	249.00	PERIOD	ALL	00008760	NA
584190.00000	4095285.00000	0.23298	249.00	PERIOD	ALL	00008760	NA
584195.00000	4095285.00000	0.25231	249.00	PERIOD	ALL	00008760	NA
584200.00000	4095285.00000	0.27345	248.60	PERIOD	ALL	00008760	NA
584280.00000	4095285.00000	0.57017	245.50	PERIOD	ALL	00008760	NA
584285.00000	4095285.00000	0.49547	245.50	PERIOD	ALL	00008760	NA
584290.00000	4095285.00000	0.42838	244.80	PERIOD	ALL	00008760	NA
584315.00000	4095285.00000	0.21979	243.10	PERIOD	ALL	00008760	NA
584320.00000	4095285.00000	0.19869	241.60	PERIOD	ALL	00008760	NA
584325.00000	4095285.00000	0.18073	241.60	PERIOD	ALL	00008760	NA
584330.00000	4095285.00000	0.16473	240.00	PERIOD	ALL	00008760	NA
584335.00000	4095285.00000	0.14992	240.00	PERIOD	ALL	00008760	NA
584340.00000	4095285.00000	0.13611	237.60	PERIOD	ALL	00008760	NA
584345.00000	4095285.00000	0.12334	237.60	PERIOD	ALL	00008760	NA
584350.00000	4095285.00000	0.11084	236.10	PERIOD	ALL	00008760	NA
584055.00000	4095290.00000	0.01187	244.60	PERIOD	ALL	00008760	NA
584060.00000	4095290.00000	0.01255	243.80	PERIOD	ALL	00008760	NA
584065.00000	4095290.00000	0.01329	243.80	PERIOD	ALL	00008760	NA
584070.00000	4095290.00000	0.01410	243.80	PERIOD	ALL	00008760	NA
584075.00000	4095290.00000	0.01499	243.80	PERIOD	ALL	00008760	NA
584080.00000	4095290.00000	0.01597	242.50	PERIOD	ALL	00008760	NA
584085.00000	4095290.00000	0.01706	242.50	PERIOD	ALL	00008760	NA
584090.00000	4095290.00000	0.01828	243.10	PERIOD	ALL	00008760	NA
584095.00000	4095290.00000	0.01965	243.10	PERIOD	ALL	00008760	NA
584100.00000	4095290.00000	0.02120	244.10	PERIOD	ALL	00008760	NA
584105.00000	4095290.00000	0.02297	244.10	PERIOD	ALL	00008760	NA
584110.00000	4095290.00000	0.02502	245.60	PERIOD	ALL	00008760	NA
584115.00000	4095290.00000	0.02742	245.60	PERIOD	ALL	00008760	NA
584120.00000	4095290.00000	0.03029	246.30	PERIOD	ALL	00008760	NA
584125.00000	4095290.00000	0.03378	246.30	PERIOD	ALL	00008760	NA
584130.00000	4095290.00000	0.03814	248.30	PERIOD	ALL	00008760	NA
584135.00000	4095290.00000	0.04361	248.30	PERIOD	ALL	00008760	NA
584140.00000	4095290.00000	0.05040	248.60	PERIOD	ALL	00008760	NA
584145.00000	4095290.00000	0.05876	248.60	PERIOD	ALL	00008760	NA
584150.00000	4095290.00000	0.06919	249.00	PERIOD	ALL	00008760	NA
584155.00000	4095290.00000	0.08142	249.00	PERIOD	ALL	00008760	NA
584160.00000	4095290.00000	0.09680	249.00	PERIOD	ALL	00008760	NA
584165.00000	4095290.00000	0.11508	249.00	PERIOD	ALL	00008760	NA
584170.00000	4095290.00000	0.13249	248.80	PERIOD	ALL	00008760	NA
584175.00000	4095290.00000	0.14910	248.80	PERIOD	ALL	00008760	NA
584180.00000	4095290.00000	0.16657	249.00	PERIOD	ALL	00008760	NA
584185.00000	4095290.00000	0.18660	249.00	PERIOD	ALL	00008760	NA
584190.00000	4095290.00000	0.20991	249.00	PERIOD	ALL	00008760	NA
584195.00000	4095290.00000	0.23323	249.00	PERIOD	ALL	00008760	NA
584200.00000	4095290.00000	0.25529	248.60	PERIOD	ALL	00008760	NA
584280.00000	4095290.00000	0.51603	245.50	PERIOD	ALL	00008760	NA
584285.00000	4095290.00000	0.45328	245.50	PERIOD	ALL	00008760	NA
584290.00000	4095290.00000	0.39239	244.80	PERIOD	ALL	00008760	NA
584315.00000	4095290.00000	0.20040	243.10	PERIOD	ALL	00008760	NA
584320.00000	4095290.00000	0.18151	241.60	PERIOD	ALL	00008760	NA
584325.00000	4095290.00000	0.16537	241.60	PERIOD	ALL	00008760	NA
584330.00000	4095290.00000	0.15073	240.00	PERIOD	ALL	00008760	NA
584335.00000	4095290.00000	0.13705	240.00	PERIOD	ALL	00008760	NA
584340.00000	4095290.00000	0.12445	237.60	PERIOD	ALL	00008760	NA
584345.00000	4095290.00000	0.11295	237.60	PERIOD	ALL	00008760	NA
584350.00000	4095290.00000	0.10195	236.10	PERIOD	ALL	00008760	NA
584355.00000	4095290.00000	0.09168	236.10	PERIOD	ALL	00008760	NA
584055.00000	4095295.00000	0.01078	244.60	PERIOD	ALL	00008760	NA
584060.00000	4095295.00000	0.01137	243.80	PERIOD	ALL	00008760	NA
584065.00000	4095295.00000	0.01202	243.80	PERIOD	ALL	00008760	NA
584070.00000	4095295.00000	0.01273	243.80	PERIOD	ALL	00008760	NA
584075.00000	4095295.00000	0.01351	243.80	PERIOD	ALL	00008760	NA
584080.00000	4095295.00000	0.01437	242.30	PERIOD	ALL	00008760	NA
584085.00000	4095295.00000	0.01533	243.10	PERIOD	ALL	00008760	NA
584090.00000	4095295.00000	0.01641	243.30	PERIOD	ALL	00008760	NA
584095.00000	4095295.00000	0.01762	244.10	PERIOD	ALL	00008760	NA
584100.00000	4095295.00000	0.01901	244.10	PERIOD	ALL	00008760	NA
584105.00000	4095295.00000	0.02060	245.60	PERIOD	ALL	00008760	NA
584110.00000	4095295.00000	0.02245	245.60	PERIOD	ALL	00008760	NA
584115.00000	4095295.00000	0.02465	245.60	PERIOD	ALL	00008760	NA
584120.00000	4095295.00000	0.02729	245.80	PERIOD	ALL	00008760	NA

584125.00000	4095295.00000	0.03051	248.30	PERIOD	ALL	00008760	NA
584130.00000	4095295.00000	0.03446	248.30	PERIOD	ALL	00008760	NA
584135.00000	4095295.00000	0.03927	248.30	PERIOD	ALL	00008760	NA
584140.00000	4095295.00000	0.04511	248.30	PERIOD	ALL	00008760	NA
584145.00000	4095295.00000	0.05247	248.30	PERIOD	ALL	00008760	NA
584150.00000	4095295.00000	0.06163	248.30	PERIOD	ALL	00008760	NA
584155.00000	4095295.00000	0.07185	248.30	PERIOD	ALL	00008760	NA
584160.00000	4095295.00000	0.08421	248.30	PERIOD	ALL	00008760	NA
584165.00000	4095295.00000	0.09890	248.30	PERIOD	ALL	00008760	NA
584170.00000	4095295.00000	0.11333	248.10	PERIOD	ALL	00008760	NA
584175.00000	4095295.00000	0.12744	248.10	PERIOD	ALL	00008760	NA
584180.00000	4095295.00000	0.14245	248.10	PERIOD	ALL	00008760	NA
584185.00000	4095295.00000	0.16054	248.10	PERIOD	ALL	00008760	NA
584190.00000	4095295.00000	0.18412	248.10	PERIOD	ALL	00008760	NA
584195.00000	4095295.00000	0.21078	248.10	PERIOD	ALL	00008760	NA
584200.00000	4095295.00000	0.23571	248.10	PERIOD	ALL	00008760	NA
584280.00000	4095295.00000	0.44080	245.10	PERIOD	ALL	00008760	NA
584285.00000	4095295.00000	0.39538	245.10	PERIOD	ALL	00008760	NA
584290.00000	4095295.00000	0.34724	244.00	PERIOD	ALL	00008760	NA
584320.00000	4095295.00000	0.16443	239.60	PERIOD	ALL	00008760	NA
584325.00000	4095295.00000	0.14994	239.60	PERIOD	ALL	00008760	NA
584330.00000	4095295.00000	0.13677	237.80	PERIOD	ALL	00008760	NA
584335.00000	4095295.00000	0.12458	237.80	PERIOD	ALL	00008760	NA
584340.00000	4095295.00000	0.11349	236.30	PERIOD	ALL	00008760	NA
584345.00000	4095295.00000	0.10340	236.30	PERIOD	ALL	00008760	NA
584350.00000	4095295.00000	0.09382	235.10	PERIOD	ALL	00008760	NA
584355.00000	4095295.00000	0.08483	235.10	PERIOD	ALL	00008760	NA
584055.00000	4095300.00000	0.00980	244.60	PERIOD	ALL	00008760	NA
584060.00000	4095300.00000	0.01032	243.80	PERIOD	ALL	00008760	NA
584065.00000	4095300.00000	0.01089	243.80	PERIOD	ALL	00008760	NA
584070.00000	4095300.00000	0.01152	243.80	PERIOD	ALL	00008760	NA
584075.00000	4095300.00000	0.01222	243.80	PERIOD	ALL	00008760	NA
584080.00000	4095300.00000	0.01299	242.30	PERIOD	ALL	00008760	NA
584085.00000	4095300.00000	0.01385	242.30	PERIOD	ALL	00008760	NA
584090.00000	4095300.00000	0.01481	243.30	PERIOD	ALL	00008760	NA
584095.00000	4095300.00000	0.01591	243.30	PERIOD	ALL	00008760	NA
584100.00000	4095300.00000	0.01716	244.10	PERIOD	ALL	00008760	NA
584105.00000	4095300.00000	0.01861	244.10	PERIOD	ALL	00008760	NA
584110.00000	4095300.00000	0.02030	245.60	PERIOD	ALL	00008760	NA
584115.00000	4095300.00000	0.02232	245.60	PERIOD	ALL	00008760	NA
584120.00000	4095300.00000	0.02473	245.80	PERIOD	ALL	00008760	NA
584125.00000	4095300.00000	0.02761	245.80	PERIOD	ALL	00008760	NA
584130.00000	4095300.00000	0.03106	248.30	PERIOD	ALL	00008760	NA
584135.00000	4095300.00000	0.03517	248.30	PERIOD	ALL	00008760	NA
584140.00000	4095300.00000	0.04023	248.30	PERIOD	ALL	00008760	NA
584145.00000	4095300.00000	0.04670	248.30	PERIOD	ALL	00008760	NA
584150.00000	4095300.00000	0.05437	248.30	PERIOD	ALL	00008760	NA
584155.00000	4095300.00000	0.06254	248.30	PERIOD	ALL	00008760	NA
584160.00000	4095300.00000	0.07213	248.30	PERIOD	ALL	00008760	NA
584165.00000	4095300.00000	0.08375	248.30	PERIOD	ALL	00008760	NA
584170.00000	4095300.00000	0.09586	248.10	PERIOD	ALL	00008760	NA
584175.00000	4095300.00000	0.10813	248.10	PERIOD	ALL	00008760	NA
584180.00000	4095300.00000	0.12147	248.10	PERIOD	ALL	00008760	NA
584185.00000	4095300.00000	0.13796	248.10	PERIOD	ALL	00008760	NA
584190.00000	4095300.00000	0.15943	248.10	PERIOD	ALL	00008760	NA
584195.00000	4095300.00000	0.18553	248.10	PERIOD	ALL	00008760	NA
584200.00000	4095300.00000	0.21413	248.10	PERIOD	ALL	00008760	NA
584285.00000	4095300.00000	0.33349	245.10	PERIOD	ALL	00008760	NA
584290.00000	4095300.00000	0.29778	244.00	PERIOD	ALL	00008760	NA
584320.00000	4095300.00000	0.14855	239.60	PERIOD	ALL	00008760	NA
584325.00000	4095300.00000	0.13566	239.60	PERIOD	ALL	00008760	NA
584330.00000	4095300.00000	0.12395	237.80	PERIOD	ALL	00008760	NA
584335.00000	4095300.00000	0.11322	237.80	PERIOD	ALL	00008760	NA
584340.00000	4095300.00000	0.10353	236.30	PERIOD	ALL	00008760	NA
584345.00000	4095300.00000	0.09474	236.30	PERIOD	ALL	00008760	NA
584350.00000	4095300.00000	0.08641	235.10	PERIOD	ALL	00008760	NA
584055.00000	4095305.00000	0.00893	243.80	PERIOD	ALL	00008760	NA
584060.00000	4095305.00000	0.00940	243.80	PERIOD	ALL	00008760	NA
584065.00000	4095305.00000	0.00991	243.80	PERIOD	ALL	00008760	NA
584070.00000	4095305.00000	0.01048	243.00	PERIOD	ALL	00008760	NA
584075.00000	4095305.00000	0.01110	243.00	PERIOD	ALL	00008760	NA
584080.00000	4095305.00000	0.01180	241.80	PERIOD	ALL	00008760	NA
584085.00000	4095305.00000	0.01258	243.30	PERIOD	ALL	00008760	NA
584090.00000	4095305.00000	0.01346	243.50	PERIOD	ALL	00008760	NA
584095.00000	4095305.00000	0.01445	244.10	PERIOD	ALL	00008760	NA

584100.00000	4095305.00000	0.01560	244.30	PERIOD	ALL	00008760	NA
584105.00000	4095305.00000	0.01693	244.80	PERIOD	ALL	00008760	NA
584110.00000	4095305.00000	0.01849	245.10	PERIOD	ALL	00008760	NA
584115.00000	4095305.00000	0.02033	245.80	PERIOD	ALL	00008760	NA
584120.00000	4095305.00000	0.02250	246.10	PERIOD	ALL	00008760	NA
584125.00000	4095305.00000	0.02504	247.00	PERIOD	ALL	00008760	NA
584130.00000	4095305.00000	0.02802	247.00	PERIOD	ALL	00008760	NA
584135.00000	4095305.00000	0.03160	247.30	PERIOD	ALL	00008760	NA
584140.00000	4095305.00000	0.03612	247.30	PERIOD	ALL	00008760	NA
584145.00000	4095305.00000	0.04177	247.30	PERIOD	ALL	00008760	NA
584150.00000	4095305.00000	0.04810	247.30	PERIOD	ALL	00008760	NA
584155.00000	4095305.00000	0.05462	247.30	PERIOD	ALL	00008760	NA
584160.00000	4095305.00000	0.06217	247.30	PERIOD	ALL	00008760	NA
584165.00000	4095305.00000	0.07151	247.30	PERIOD	ALL	00008760	NA
584170.00000	4095305.00000	0.08183	247.10	PERIOD	ALL	00008760	NA
584175.00000	4095305.00000	0.09275	247.10	PERIOD	ALL	00008760	NA
584180.00000	4095305.00000	0.10505	247.10	PERIOD	ALL	00008760	NA
584185.00000	4095305.00000	0.12031	247.10	PERIOD	ALL	00008760	NA
584190.00000	4095305.00000	0.14016	246.80	PERIOD	ALL	00008760	NA
584195.00000	4095305.00000	0.16587	246.80	PERIOD	ALL	00008760	NA
584200.00000	4095305.00000	0.19652	246.80	PERIOD	ALL	00008760	NA
584205.00000	4095305.00000	0.23070	246.80	PERIOD	ALL	00008760	NA
584210.00000	4095305.00000	0.26756	246.60	PERIOD	ALL	00008760	NA
584280.00000	4095305.00000	0.32484	243.80	PERIOD	ALL	00008760	NA
584285.00000	4095305.00000	0.28800	243.80	PERIOD	ALL	00008760	NA
584290.00000	4095305.00000	0.25640	242.30	PERIOD	ALL	00008760	NA
584320.00000	4095305.00000	0.13403	236.50	PERIOD	ALL	00008760	NA
584325.00000	4095305.00000	0.12270	236.50	PERIOD	ALL	00008760	NA
584330.00000	4095305.00000	0.11241	235.30	PERIOD	ALL	00008760	NA
584335.00000	4095305.00000	0.10304	235.30	PERIOD	ALL	00008760	NA
584055.00000	4095310.00000	0.00818	243.80	PERIOD	ALL	00008760	NA
584060.00000	4095310.00000	0.00861	243.80	PERIOD	ALL	00008760	NA
584065.00000	4095310.00000	0.00908	243.80	PERIOD	ALL	00008760	NA
584070.00000	4095310.00000	0.00959	243.00	PERIOD	ALL	00008760	NA
584075.00000	4095310.00000	0.01016	243.00	PERIOD	ALL	00008760	NA
584080.00000	4095310.00000	0.01080	241.80	PERIOD	ALL	00008760	NA
584085.00000	4095310.00000	0.01151	241.80	PERIOD	ALL	00008760	NA
584090.00000	4095310.00000	0.01232	243.50	PERIOD	ALL	00008760	NA
584095.00000	4095310.00000	0.01325	243.50	PERIOD	ALL	00008760	NA
584100.00000	4095310.00000	0.01431	244.30	PERIOD	ALL	00008760	NA
584105.00000	4095310.00000	0.01555	244.30	PERIOD	ALL	00008760	NA
584110.00000	4095310.00000	0.01698	245.10	PERIOD	ALL	00008760	NA
584115.00000	4095310.00000	0.01865	245.10	PERIOD	ALL	00008760	NA
584120.00000	4095310.00000	0.02058	246.10	PERIOD	ALL	00008760	NA
584125.00000	4095310.00000	0.02281	246.10	PERIOD	ALL	00008760	NA
584130.00000	4095310.00000	0.02545	247.00	PERIOD	ALL	00008760	NA
584135.00000	4095310.00000	0.02871	247.00	PERIOD	ALL	00008760	NA
584140.00000	4095310.00000	0.03282	247.30	PERIOD	ALL	00008760	NA
584145.00000	4095310.00000	0.03774	247.30	PERIOD	ALL	00008760	NA
584150.00000	4095310.00000	0.04299	247.30	PERIOD	ALL	00008760	NA
584155.00000	4095310.00000	0.04832	247.30	PERIOD	ALL	00008760	NA
584160.00000	4095310.00000	0.05451	247.30	PERIOD	ALL	00008760	NA
584165.00000	4095310.00000	0.06234	247.30	PERIOD	ALL	00008760	NA
584170.00000	4095310.00000	0.07149	247.10	PERIOD	ALL	00008760	NA
584175.00000	4095310.00000	0.08161	247.10	PERIOD	ALL	00008760	NA
584180.00000	4095310.00000	0.09314	247.10	PERIOD	ALL	00008760	NA
584185.00000	4095310.00000	0.10706	247.10	PERIOD	ALL	00008760	NA
584190.00000	4095310.00000	0.12493	246.80	PERIOD	ALL	00008760	NA
584195.00000	4095310.00000	0.14875	246.80	PERIOD	ALL	00008760	NA
584200.00000	4095310.00000	0.17852	246.80	PERIOD	ALL	00008760	NA
584205.00000	4095310.00000	0.21323	246.80	PERIOD	ALL	00008760	NA
584210.00000	4095310.00000	0.24915	246.60	PERIOD	ALL	00008760	NA
584280.00000	4095310.00000	0.28865	243.80	PERIOD	ALL	00008760	NA
584285.00000	4095310.00000	0.25375	243.80	PERIOD	ALL	00008760	NA
584290.00000	4095310.00000	0.22415	242.30	PERIOD	ALL	00008760	NA
584055.00000	4095315.00000	0.00755	239.30	PERIOD	ALL	00008760	NA
584060.00000	4095315.00000	0.00794	239.30	PERIOD	ALL	00008760	NA
584065.00000	4095315.00000	0.00837	240.10	PERIOD	ALL	00008760	NA
584070.00000	4095315.00000	0.00885	240.30	PERIOD	ALL	00008760	NA
584075.00000	4095315.00000	0.00938	241.80	PERIOD	ALL	00008760	NA
584080.00000	4095315.00000	0.00997	242.10	PERIOD	ALL	00008760	NA
584085.00000	4095315.00000	0.01064	243.50	PERIOD	ALL	00008760	NA
584090.00000	4095315.00000	0.01141	243.80	PERIOD	ALL	00008760	NA
584095.00000	4095315.00000	0.01228	244.30	PERIOD	ALL	00008760	NA
584100.00000	4095315.00000	0.01328	244.60	PERIOD	ALL	00008760	NA

584105.00000	4095315.00000	0.01442	245.10	PERIOD	ALL	00008760	NA
584110.00000	4095315.00000	0.01574	245.10	PERIOD	ALL	00008760	NA
584115.00000	4095315.00000	0.01725	246.10	PERIOD	ALL	00008760	NA
584120.00000	4095315.00000	0.01899	246.10	PERIOD	ALL	00008760	NA
584125.00000	4095315.00000	0.02101	246.30	PERIOD	ALL	00008760	NA
584130.00000	4095315.00000	0.02345	246.30	PERIOD	ALL	00008760	NA
584135.00000	4095315.00000	0.02650	246.50	PERIOD	ALL	00008760	NA
584140.00000	4095315.00000	0.03025	246.50	PERIOD	ALL	00008760	NA
584145.00000	4095315.00000	0.03455	246.50	PERIOD	ALL	00008760	NA
584150.00000	4095315.00000	0.03899	246.50	PERIOD	ALL	00008760	NA
584155.00000	4095315.00000	0.04352	246.50	PERIOD	ALL	00008760	NA
584160.00000	4095315.00000	0.04886	246.50	PERIOD	ALL	00008760	NA
584165.00000	4095315.00000	0.05576	246.50	PERIOD	ALL	00008760	NA
584170.00000	4095315.00000	0.06419	246.30	PERIOD	ALL	00008760	NA
584175.00000	4095315.00000	0.07380	246.30	PERIOD	ALL	00008760	NA
584180.00000	4095315.00000	0.08466	246.10	PERIOD	ALL	00008760	NA
584185.00000	4095315.00000	0.09729	246.10	PERIOD	ALL	00008760	NA
584190.00000	4095315.00000	0.11292	245.80	PERIOD	ALL	00008760	NA
584195.00000	4095315.00000	0.13342	245.80	PERIOD	ALL	00008760	NA
584200.00000	4095315.00000	0.15927	245.80	PERIOD	ALL	00008760	NA
584205.00000	4095315.00000	0.19033	245.80	PERIOD	ALL	00008760	NA
584210.00000	4095315.00000	0.22308	245.50	PERIOD	ALL	00008760	NA
584270.00000	4095315.00000	0.32728	242.30	PERIOD	ALL	00008760	NA
584280.00000	4095315.00000	0.25434	240.60	PERIOD	ALL	00008760	NA
584285.00000	4095315.00000	0.22430	240.60	PERIOD	ALL	00008760	NA
584290.00000	4095315.00000	0.19818	239.30	PERIOD	ALL	00008760	NA
584055.00000	4095320.00000	0.00702	239.00	PERIOD	ALL	00008760	NA
584060.00000	4095320.00000	0.00739	239.30	PERIOD	ALL	00008760	NA
584065.00000	4095320.00000	0.00779	239.30	PERIOD	ALL	00008760	NA
584070.00000	4095320.00000	0.00825	240.30	PERIOD	ALL	00008760	NA
584075.00000	4095320.00000	0.00875	240.30	PERIOD	ALL	00008760	NA
584080.00000	4095320.00000	0.00932	242.10	PERIOD	ALL	00008760	NA
584085.00000	4095320.00000	0.00996	242.10	PERIOD	ALL	00008760	NA
584090.00000	4095320.00000	0.01069	243.80	PERIOD	ALL	00008760	NA
584095.00000	4095320.00000	0.01152	243.80	PERIOD	ALL	00008760	NA
584100.00000	4095320.00000	0.01246	244.60	PERIOD	ALL	00008760	NA
584105.00000	4095320.00000	0.01353	244.60	PERIOD	ALL	00008760	NA
584110.00000	4095320.00000	0.01476	245.10	PERIOD	ALL	00008760	NA
584115.00000	4095320.00000	0.01615	245.10	PERIOD	ALL	00008760	NA
584120.00000	4095320.00000	0.01776	246.10	PERIOD	ALL	00008760	NA
584125.00000	4095320.00000	0.01966	246.10	PERIOD	ALL	00008760	NA
584130.00000	4095320.00000	0.02200	246.30	PERIOD	ALL	00008760	NA
584135.00000	4095320.00000	0.02490	246.30	PERIOD	ALL	00008760	NA
584140.00000	4095320.00000	0.02835	246.50	PERIOD	ALL	00008760	NA
584145.00000	4095320.00000	0.03214	246.50	PERIOD	ALL	00008760	NA
584150.00000	4095320.00000	0.03599	246.50	PERIOD	ALL	00008760	NA
584155.00000	4095320.00000	0.04000	246.50	PERIOD	ALL	00008760	NA
584160.00000	4095320.00000	0.04483	246.50	PERIOD	ALL	00008760	NA
584165.00000	4095320.00000	0.05113	246.50	PERIOD	ALL	00008760	NA
584170.00000	4095320.00000	0.05899	246.30	PERIOD	ALL	00008760	NA
584190.00000	4095320.00000	0.10371	245.80	PERIOD	ALL	00008760	NA
584195.00000	4095320.00000	0.12187	245.80	PERIOD	ALL	00008760	NA
584200.00000	4095320.00000	0.14386	245.80	PERIOD	ALL	00008760	NA
584205.00000	4095320.00000	0.16955	245.80	PERIOD	ALL	00008760	NA
584210.00000	4095320.00000	0.19800	245.50	PERIOD	ALL	00008760	NA
584250.00000	4095320.00000	0.37778	244.60	PERIOD	ALL	00008760	NA
584255.00000	4095320.00000	0.37205	244.60	PERIOD	ALL	00008760	NA
584260.00000	4095320.00000	0.34542	243.80	PERIOD	ALL	00008760	NA
584265.00000	4095320.00000	0.31106	243.80	PERIOD	ALL	00008760	NA
584270.00000	4095320.00000	0.27836	242.30	PERIOD	ALL	00008760	NA
584275.00000	4095320.00000	0.24874	242.30	PERIOD	ALL	00008760	NA
584280.00000	4095320.00000	0.22209	240.60	PERIOD	ALL	00008760	NA
584285.00000	4095320.00000	0.19780	240.60	PERIOD	ALL	00008760	NA
584290.00000	4095320.00000	0.17599	239.30	PERIOD	ALL	00008760	NA
584055.00000	4095325.00000	0.00659	238.60	PERIOD	ALL	00008760	NA
584060.00000	4095325.00000	0.00695	238.60	PERIOD	ALL	00008760	NA
584065.00000	4095325.00000	0.00734	240.30	PERIOD	ALL	00008760	NA
584070.00000	4095325.00000	0.00778	240.30	PERIOD	ALL	00008760	NA
584075.00000	4095325.00000	0.00827	242.10	PERIOD	ALL	00008760	NA
584080.00000	4095325.00000	0.00882	242.30	PERIOD	ALL	00008760	NA
584085.00000	4095325.00000	0.00944	243.80	PERIOD	ALL	00008760	NA
584090.00000	4095325.00000	0.01015	244.00	PERIOD	ALL	00008760	NA
584115.00000	4095325.00000	0.01534	245.80	PERIOD	ALL	00008760	NA
584120.00000	4095325.00000	0.01688	245.80	PERIOD	ALL	00008760	NA
584125.00000	4095325.00000	0.01875	245.80	PERIOD	ALL	00008760	NA

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  584130.00000 4095325.00000       0.02104   245.80  PERIOD  ALL       00008760     NA
  584135.00000 4095325.00000       0.02380   245.80  PERIOD  ALL       00008760     NA
  584140.00000 4095325.00000       0.02698   245.80  PERIOD  ALL       00008760     NA
  584145.00000 4095325.00000       0.03037   245.80  PERIOD  ALL       00008760     NA
  584240.00000 4095325.00000       0.32951   243.10  PERIOD  ALL       00008760     NA
  584245.00000 4095325.00000       0.33261   243.10  PERIOD  ALL       00008760     NA
  584250.00000 4095325.00000       0.32799   241.80  PERIOD  ALL       00008760     NA
  584255.00000 4095325.00000       0.31561   241.80  PERIOD  ALL       00008760     NA
  584260.00000 4095325.00000       0.29036   240.50  PERIOD  ALL       00008760     NA
  584265.00000 4095325.00000       0.26319   240.50  PERIOD  ALL       00008760     NA
  584270.00000 4095325.00000       0.23797   238.80  PERIOD  ALL       00008760     NA
  584275.00000 4095325.00000       0.21499   238.80  PERIOD  ALL       00008760     NA
  584055.00000 4095330.00000       0.00626   236.30  PERIOD  ALL       00008760     NA
  584060.00000 4095330.00000       0.00661   238.60  PERIOD  ALL       00008760     NA
  584065.00000 4095330.00000       0.00700   238.60  PERIOD  ALL       00008760     NA
  584070.00000 4095330.00000       0.00743   240.30  PERIOD  ALL       00008760     NA
  584075.00000 4095330.00000       0.00791   240.30  PERIOD  ALL       00008760     NA
  584080.00000 4095330.00000       0.00846   242.30  PERIOD  ALL       00008760     NA
  584085.00000 4095330.00000       0.00907   242.30  PERIOD  ALL       00008760     NA
  584090.00000 4095330.00000       0.00975   244.00  PERIOD  ALL       00008760     NA
  584215.00000 4095330.00000       0.19767   244.30  PERIOD  ALL       00008760     NA
  584220.00000 4095330.00000       0.22422   244.30  PERIOD  ALL       00008760     NA
  584225.00000 4095330.00000       0.25279   244.30  PERIOD  ALL       00008760     NA
  584230.00000 4095330.00000       0.27711   244.00  PERIOD  ALL       00008760     NA
  584235.00000 4095330.00000       0.29342   244.00  PERIOD  ALL       00008760     NA
  584240.00000 4095330.00000       0.29941   243.10  PERIOD  ALL       00008760     NA
  584245.00000 4095330.00000       0.29750   243.10  PERIOD  ALL       00008760     NA
  584250.00000 4095330.00000       0.28928   241.80  PERIOD  ALL       00008760     NA
  584255.00000 4095330.00000       0.27259   241.80  PERIOD  ALL       00008760     NA
  584260.00000 4095330.00000       0.24941   240.50  PERIOD  ALL       00008760     NA
  584055.00000 4095335.00000       0.00602   238.30  PERIOD  ALL       00008760     NA
  584060.00000 4095335.00000       0.00637   238.30  PERIOD  ALL       00008760     NA
  584065.00000 4095335.00000       0.00675   240.30  PERIOD  ALL       00008760     NA
  584070.00000 4095335.00000       0.00718   240.30  PERIOD  ALL       00008760     NA
  584075.00000 4095335.00000       0.00767   242.30  PERIOD  ALL       00008760     NA
  584200.00000 4095335.00000       0.11911   242.80  PERIOD  ALL       00008760     NA
  584205.00000 4095335.00000       0.13778   242.80  PERIOD  ALL       00008760     NA
  584210.00000 4095335.00000       0.15991   242.10  PERIOD  ALL       00008760     NA
  584215.00000 4095335.00000       0.18337   242.10  PERIOD  ALL       00008760     NA
  584220.00000 4095335.00000       0.20769   241.30  PERIOD  ALL       00008760     NA
  584225.00000 4095335.00000       0.23290   241.30  PERIOD  ALL       00008760     NA
  584230.00000 4095335.00000       0.25234   240.30  PERIOD  ALL       00008760     NA
  584235.00000 4095335.00000       0.26332   240.30  PERIOD  ALL       00008760     NA
  584240.00000 4095335.00000       0.26598   239.30  PERIOD  ALL       00008760     NA
  584245.00000 4095335.00000       0.26276   239.30  PERIOD  ALL       00008760     NA
  584250.00000 4095335.00000       0.25429   237.80  PERIOD  ALL       00008760     NA
  584055.00000 4095340.00000       0.00585   236.30  PERIOD  ALL       00008760     NA
  584060.00000 4095340.00000       0.00620   238.30  PERIOD  ALL       00008760     NA
  584065.00000 4095340.00000       0.00659   238.30  PERIOD  ALL       00008760     NA
  584070.00000 4095340.00000       0.00702   240.30  PERIOD  ALL       00008760     NA
  584075.00000 4095340.00000       0.00750   240.30  PERIOD  ALL       00008760     NA
  584190.00000 4095340.00000       0.08554   243.60  PERIOD  ALL       00008760     NA
  584195.00000 4095340.00000       0.09792   243.60  PERIOD  ALL       00008760     NA
  584200.00000 4095340.00000       0.11169   242.80  PERIOD  ALL       00008760     NA
  584205.00000 4095340.00000       0.12780   242.80  PERIOD  ALL       00008760     NA
  584210.00000 4095340.00000       0.14661   242.10  PERIOD  ALL       00008760     NA
  584215.00000 4095340.00000       0.16607   242.10  PERIOD  ALL       00008760     NA
  584220.00000 4095340.00000       0.18589   241.30  PERIOD  ALL       00008760     NA
  584225.00000 4095340.00000       0.20614   241.30  PERIOD  ALL       00008760     NA
  584230.00000 4095340.00000       0.22185   240.30  PERIOD  ALL       00008760     NA
  584190.00000 4095345.00000       0.08141   240.80  PERIOD  ALL       00008760     NA
  584195.00000 4095345.00000       0.09214   240.80  PERIOD  ALL       00008760     NA
  584200.00000 4095345.00000       0.10401   239.60  PERIOD  ALL       00008760     NA
  584205.00000 4095345.00000       0.11779   239.60  PERIOD  ALL       00008760     NA
** CONCUNIT ug/m^3
** DEPUNIT g/m^2
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APPENDIX B

Construction Noise/Vibration Assessment Calculations

University of California, Santa Cruz
Noise Source Levels for Construction Equipment

Noise Attenuation: 6

Demolition Phase Construction Equipment	Number of Units	Noise Level @ 50 Feet[1] (dBA)	Equipment Distance (Feet)	Noise Shielding[2] (dBA)	Without Noise Shielding Noise Level @ Distance (dBA)	With Noise Shielding Noise Level @ Distance (dBA)
Backhoe	1	85	50	10	85	75
Concrete Saw	1	78	100	3	72	69
Dozer	1	80	50	5	80	75
Front End Loader	1	79	100	4	73	69
Tractor	1	80	50	5	80	75
Total Construction Noise Level					**87**	**80**

Sources:

1. U.S. Environmental Protection Agency, *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, (1971).
2. The noise levels with controls represent noise levels that can be achieved with implementation of feasible noise controls including selecting quieter procedures or machines and implementing noise control-features requiring no major redesign or extreme cost (e.g., improved mufflers, equipment redesign, use of silencers, shields, shrouds, ducts, and engine enclosures).

University of California, Santa Cruz
Noise Source Levels for Construction Equipment

Noise Attenuation: 6

Paving Phase Construction Equipment	Number of Units	Noise Level @ 50 Feet[1] (dBA)	Equipment Distance (Feet)	Noise Shielding[2] (dBA)	Without Noise Shielding Noise Level @ Distance (dBA)	With Noise Shielding Noise Level @ Distance (dBA)
Backhoe	1	85	100	10	79	69
Drum Mixer	1	85	100	10	79	69
Paver	2	89	50	9	92	83
Roller	1	85	50	10	85	75
Total Construction Noise Level					**93**	**84**

Sources:

1. U.S. Environmental Protection Agency, *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, (1971).
2. The noise levels with controls represent noise levels that can be achieved with implementation of feasible noise controls including selecting quieter procedures or machines and implementing noise control-features requiring no major redesign or extreme cost (e.g., improved mufflers, equipment redesign, use of silencers, shields, shrouds, ducts, and engine enclosures).

University of California, Santa Cruz
Noise Source Levels for Construction Equipment

Noise Attenuation: 6

Paving Phase Construction Equipment (all at 100 feet)	Number of Units	Noise Level @ 50 Feet[1] (dBA)	Equipment Distance (Feet)	Noise Shielding[2] (dBA)	Without Noise Shielding Noise Level @ Distance (dBA)	With Noise Shielding Noise Level @ Distance (dBA)
Backhoe	1	85	100	10	79	69
Drum Mixer	1	85	100	10	79	69
Paver	2	89	100	9	86	77
Roller	1	85	100	10	79	69
Total Construction Noise Level					**88**	**79**

Sources:

1. U.S. Environmental Protection Agency, *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, (1971).
2. The noise levels with controls represent noise levels that can be achieved with implementation of feasible noise controls including selecting quieter procedures or machines and implementing noise control-features requiring no major redesign or extreme cost (e.g., improved mufflers, equipment redesign, use of silencers, shields, shrouds, ducts, and engine enclosures).

University of California, Santa Cruz
Noise Source Levels for Construction Equipment

Noise Attenuation: 6

Grading and Fine Grading Phases Construction Equipment	Number of Units	Noise Level @ 50 Feet[1] (dBA)	Equipment Distance (Feet)	Noise Shielding[2] (dBA)	Without Noise Shielding Noise Level @ Distance (dBA)	With Noise Shielding Noise Level @ Distance (dBA)
Dozer	1	80	50	5	80	75
Grader	1	85	50	10	85	75
Tractor	1	80	100	5	74	69
Total Construction Noise Level					**86**	**79**

Sources:

1. U.S. Environmental Protection Agency, *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, (1971).
2. The noise levels with controls represent noise levels that can be achieved with implementation of feasible noise controls including selecting quieter procedures or machines and implementing noise control-features requiring no major redesign or extreme cost (e.g., improved mufflers, equipment redesign, use of silencers, shields, shrouds, ducts, and engine enclosures).

University of California, Santa Cruz
Noise Source Levels for Construction Equipment

Noise Attenuation: 6

Building Construction Phase / Construction Equipment	Number of Units	Noise Level @ 50 Feet[1] (dBA)	Equipment Distance (Feet)	Noise Shielding[2] (dBA)	Without Noise Shielding: Noise Level @ Distance (dBA)	With Noise Shielding: Noise Level @ Distance (dBA)
Backhoe	1	85	100	10	79	69
Concrete Mixer	1	85	100	10	79	69
Crane	1	83	100	8	77	69
Front End Loader (Forklift)	2	79	50	4	82	78
Man Lift	1	81	50	6	81	75
Paver	1	89	50	9	89	80
Pneumatic Tools	1	86	50	6	86	80
Tractor	1	80	100	5	74	69
Total Construction Noise Level					**92**	**85**

Sources:

1. U.S. Environmental Protection Agency, *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, (1971).
2. The noise levels with controls represent noise levels that can be achieved with implementation of feasible noise controls including selecting quieter procedures or machines and implementing noise control-features requiring no major redesign or extreme cost (e.g., improved mufflers, equipment redesign, use of silencers, shields, shrouds, ducts, and engine enclosures).

University of California, Santa Cruz
Noise Source Levels for Construction Equipment

Noise Attenuation: 6

Building Construction Phase Construction Equipment (all at 100 feet)	Number of Units	Noise Level @ 50 Feet[1] (dBA)	Equipment Distance (Feet)	Noise Shielding[2] (dBA)	Without Noise Shielding Noise Level @ Distance (dBA)	With Noise Shielding Noise Level @ Distance (dBA)
Backhoe	1	85	100	10	79	69
Concrete Mixer	1	85	100	10	79	69
Crane	1	83	100	8	77	69
Front End Loader (Forklift)	2	79	100	4	76	72
Man Lift	1	81	100	6	75	69
Paver	1	89	100	9	83	74
Pneumatic Tools	1	86	100	6	80	74
Tractor	1	80	100	5	74	69
Total Construction Noise Level					**88**	**80**

Sources:

1. U.S. Environmental Protection Agency, *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, (1971).
2. The noise levels with controls represent noise levels that can be achieved with implementation of feasible noise controls including selecting quieter procedures or machines and implementing noise control-features requiring no major redesign or extreme cost (e.g., improved mufflers, equipment redesign, use of silencers, shields, shrouds, ducts, and engine enclosures).

University of California, Santa Cruz
Noise Source Levels for Construction Equipment

Noise Attenuation: 6

Architectural Coating Phase Construction Equipment	Number of Units	Noise Level @ 50 Feet[1] (dBA)	Equipment Distance (Feet)	Noise Shielding[2] (dBA)	Without Noise Shielding Noise Level @ Distance (dBA)	With Noise Shielding Noise Level @ Distance (dBA)
Compressor (air)	1	81	50	5	81	76
Total Construction Noise Level					**81**	**76**

Sources:

1. U.S. Environmental Protection Agency, *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, (1971).
2. The noise levels with controls represent noise levels that can be achieved with implementation of feasible noise controls including selecting quieter procedures or machines and implementing noise control-features requiring no major redesign or extreme cost (e.g., improved mufflers, equipment redesign, use of silencers, shields, shrouds, ducts, and engine enclosures).

Appendix E

Greenhouse Gas Emissions Calculations

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Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name:

Project Name: Merrill Capital Renewal

Project Location: Santa Cruz County

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

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	CO2
2012 TOTALS (tons/year unmitigated)	108.34
2012 TOTALS (tons/year mitigated)	108.34
Percent Reduction	0.00
2013 TOTALS (tons/year unmitigated)	10.24
2013 TOTALS (tons/year mitigated)	10.24
Percent Reduction	0.00

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

CO2

4/30/2012 9:53:05 AM

2012	108.34
Demolition 06/18/2012-07/13/2012	14.41
Fugitive Dust	0.00
Demo Off Road Diesel	7.00
Demo On Road Diesel	6.36
Demo Worker Trips	1.05
Mass Grading 07/16/2012-08/10/2012	23.53
Mass Grading Dust	0.00
Mass Grading Off Road Diesel	22.47
Mass Grading On Road Diesel	0.00
Mass Grading Worker Trips	1.05
Building 08/13/2012-01/11/2013	46.87
Building Off Road Diesel	45.12
Building Vendor Trips	0.22
Building Worker Trips	1.53
Fine Grading 08/13/2012-09/07/2012	23.53
Fine Grading Dust	0.00
Fine Grading Off Road Diesel	22.47
Fine Grading On Road Diesel	0.00
Fine Grading Worker Trips	1.05

2013	10.24
Building 08/13/2012-01/11/2013	4.18
Building Off Road Diesel	4.02
Building Vendor Trips	0.02
Building Worker Trips	0.14
Coating 01/14/2013-01/18/2013	0.06
Architectural Coating	0.00
Coating Worker Trips	0.06
Asphalt 06/17/2013-06/28/2013	6.01
Paving Off-Gas	0.00
Paving Off Road Diesel	4.90
Paving On Road Diesel	0.19
Paving Worker Trips	0.92

Phase Assumptions

Phase: Demolition 6/18/2012 - 7/13/2012 - Default Demolition Description

Building Volume Total (cubic feet): 21600

Building Volume Daily (cubic feet): 10800

On Road Truck Travel (VMT): 150

Off-Road Equipment:

1 Concrete/Industrial Saws (10 hp) operating at a 0.73 load factor for 8 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 1 hours per day

2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 6 hours per day

Phase: Fine Grading 8/13/2012 - 9/7/2012 - Default Fine Site Grading Description

Total Acres Disturbed: 2

Maximum Daily Acreage Disturbed: 0.5

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 6 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Mass Grading 7/16/2012 - 8/10/2012 - Default Mass Site Grading Description

Total Acres Disturbed: 2

Maximum Daily Acreage Disturbed: 0.5

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 6 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Paving 6/17/2013 - 6/28/2013 - Default Paving Description

Acres to be Paved: 0.5

Off-Road Equipment:

4 Cement and Mortar Mixers (10 hp) operating at a 0.56 load factor for 6 hours per day

1 Pavers (100 hp) operating at a 0.62 load factor for 7 hours per day

1 Rollers (95 hp) operating at a 0.56 load factor for 7 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

4/30/2012 9:53:05 AM

Phase: Building Construction 8/13/2012 - 1/11/2013 - Default Building Construction Description

Off-Road Equipment:

1 Cranes (399 hp) operating at a 0.43 load factor for 4 hours per day

2 Forklifts (145 hp) operating at a 0.3 load factor for 6 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

Phase: Architectural Coating 1/14/2013 - 1/18/2013 - Default Architectural Coating Description

Rule: Residential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 100

Rule: Residential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Mitigated

	CO2
2012	108.34
Demolition 06/18/2012-07/13/2012	14.41
Fugitive Dust	0.00
Demo Off Road Diesel	7.00
Demo On Road Diesel	6.36
Demo Worker Trips	1.05

Mass Grading 07/16/2012-08/10/2012	23.53
Mass Grading Dust	0.00
Mass Grading Off Road Diesel	22.47
Mass Grading On Road Diesel	0.00
Mass Grading Worker Trips	1.05
Building 08/13/2012-01/11/2013	46.87
Building Off Road Diesel	45.12
Building Vendor Trips	0.22
Building Worker Trips	1.53
Fine Grading 08/13/2012-09/07/2012	23.53
Fine Grading Dust	0.00
Fine Grading Off Road Diesel	22.47
Fine Grading On Road Diesel	0.00
Fine Grading Worker Trips	1.05

2013	10.24
Building 08/13/2012-01/11/2013	4.18
Building Off Road Diesel	4.02
Building Vendor Trips	0.02
Building Worker Trips	0.14
Coating 01/14/2013-01/18/2013	0.06
Architectural Coating	0.00
Coating Worker Trips	0.06
Asphalt 06/17/2013-06/28/2013	6.01
Paving Off-Gas	0.00
Paving Off Road Diesel	4.90
Paving On Road Diesel	0.19
Paving Worker Trips	0.92

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Fine Grading 8/13/2012 - 9/7/2012 - Default Fine Site Grading Description

For Soil Stablizing Measures, the Apply soil stabilizers to inactive areas mitigation reduces emissions by:

PM10: 84% PM25: 84%

For Soil Stablizing Measures, the Replace ground cover in disturbed areas quickly mitigation reduces emissions by:

PM10: 5% PM25: 5%

For Soil Stablizing Measures, the Water exposed surfaces 2x daily watering mitigation reduces emissions by:

PM10: 55% PM25: 55%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

The following mitigation measures apply to Phase: Mass Grading 7/16/2012 - 8/10/2012 - Default Mass Site Grading Description

For Soil Stablizing Measures, the Apply soil stabilizers to inactive areas mitigation reduces emissions by:

PM10: 84% PM25: 84%

For Soil Stablizing Measures, the Replace ground cover in disturbed areas quickly mitigation reduces emissions by:

PM10: 5% PM25: 5%

For Soil Stablizing Measures, the Water exposed surfaces 2x daily watering mitigation reduces emissions by:

PM10: 55% PM25: 55%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

The following mitigation measures apply to Phase: Architectural Coating 1/14/2013 - 1/18/2013 - Default Architectural Coating Description

For Nonresidential Architectural Coating Measures, the Nonresidential Exterior: Use Low VOC Coatings mitigation reduces emissions by:

ROG: 10%

For Nonresidential Architectural Coating Measures, the Nonresidential Interior: Use Low VOC Coatings mitigation reduces emissions by:

ROG: 10%

Project: Merrill Residence Halls Capital Renewal

Spreadsheet to Calculate Construction CO2-Equivalent Emissions from URBEMIS2007 Output

	CONSTRUCTION CO2 EMISSIONS FROM URBEMIS:	CH4 EMISSIONS: CO2 EQUIV.	N2O EMISSIONS CO2 EQUIV.
Construction emissions 2012 (tons)	116.29		
Construction emissions 2013 (tons)	10.24		
Total construction emissions 2012 and 2013 (tons)	126.53	0.63	0.34
TOTAL CONSTRUCTION C02 EQUIVALENT (tons)	**127.50**		
TOTAL CONSTRUCTION C02 EQUIVALENT (tonnes)	**115.00**		

Sources and Notes:

CH4 and N2O emission factors from Table B in BAAQMD's "Source Inventory of Bay Area Greenhouse Gas Emissions", Updated February 2010

CH4 assumed to have a Global Warming Potential of 21 times that of CO2.

N2O assumed to have a Global Warming Potential of 310 times that of CO2.

Memorandum on Loss of Sequestered Carbon from Tree Removal
Merrill Residence Halls Capital Renewal Project
May 16, 2012
Alisa Klaus, UCSC Physical Planning and Construction

Methodology

The greenhouse gas (GHG) emissions that would result from the removal of trees as part of the proposed project were estimated through the following steps:

1) An inventory of the trees proposed for removal, including diameter at breast height (DBH) and height, was conducted by a Registered Professional Forester.
2) Calculating the above-ground and below-ground biomass of the trees that would be removed, using the baseline inventory methodology presented in the Climate Action Reserve's Forest Project Protocol, version 3.2 (August 2010);
3) Projecting the potential increase in the biomass of these trees that would occur over the next 30 years if they were not removed, based on a professional forester's estimate of the site's productivity (Staub, personal communication May 16, 2012);
4) Calculating the fraction of the existing and potential future biomass that consists of carbon by multiplying by a factor of 0.5 (CAR, 2010);
5) Converting the carbon to CO2 by multiplying by the ratio 44/12, which is the molecular weight ratio of CO2 to elemental carbon.

Above-ground biomass: Existing above-ground biomass was calculated for each tree, following the protocol presented in the CAR Forest Project Protocol and using species-specific equations developed by the United States Forest Service Forest Inventory and Analysis (FIA) National Program.[1] The biomasses of the bole, bark, and live crown were calculated separately and added together to derive the total above-ground biomass. To calculate bole biomass, it was necessary first to calculate the cubic foot volume of the total stem, from ground to tip (CVTS). The following equations were used, where DBH is diameter at breast height and HT is height:

Cubic-foot volume:[2]

Redwood: $\mathbf{CVTS} + exp(-6.2597+1.9967*ln(DBH)+0.9642*ln(HT))$

Douglas fir: CVTS = (CV4 * TERM)/ (BA - 0.087266)

[TERM = ((1.033 * (1.0 + 1.382937 * EXP(-4.015292 * (DBH/10.0)))) * (BA + 0.087266) - 0.174533)
BA = DBH**2 * 0.005454154
CF4 = 0.248569 + 0.0253524*(HT/DBH) - 0.0000560175*(HT**2/ DBH)
IF(CF4 < 0.3) CF4=0.3
IF(CF4 > 0.4) CF4=0.4]

Bigleaf Maple: $\mathbf{CVTS} = 0.0101786350*DBH^{2.22462}*HT^{0.57561}$

Coast Live Oak: $\mathbf{CVTS} = 0.0065261029*DBH^{2.31958}*HT^{0.62528}$

Liquid Amber and Unknown Ornamental:[3] $\mathbf{CVTS} = 0.0072695058*DBH^{2.14321}*HT^{0.74220}$

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[1] United States Forestry Service, Forestry Inventory and Analysis Program, FIA Volume Equation Documentation, updated March 22, 2010; United States Forestry Service, Forestry Inventory and Analysis Program, Regional Biomass Equations Used by FIA to Estimate Bole, Bark, and Branches, updated January 13, 2010
[2] The equations for CVTS use DBH in inches and HT in feet, and yield results in cubic feet. Bole biomass is then calculated in tons and converted to kilograms. Bark and live crown biomass are calculated using DBH in centimeters and HT in feet and yield results in kilograms.
[3] The equation for unknown hardwood was used.

Bole biomass:

Biomass of the tree stem (in tons**) =** (CVTS * wood density[4]) / 2000

Bark biomass (BB):

Redwood (DBH > 39.37 cm): BB=**(**exp(7.189689+1.5837*ln(*DBH))/1000*

Redwood (DBH < 39.37 cm): BB=0.336+0.00058**DBH*^{2}**HT*

Douglas fir: BB = exp(-4.3103+2.4300*ln(*DBH))*

Coast live oak: NA

Bigleaf maple: NA

Liquid amber and unknown ornamental: BB=exp(- 4.6424+2.4617*ln(*DBH*))

Biomass of Live Branches (BLB):

Redwood: BLB=0.199+0.00381**DBH*^{2}**HT*

Douglas fir: BLB=exp(-3.6941+2.1382*ln(*DBH*))

Coast live oak: NA

Bigleaf maple: NA

Liquid amber and unknown ornamental: BLB+exp(-4.5648+2.6232*ln(*DBH*))-*BF*

where: BF= ((exp)-4.5648+2.6232*ln(DBH))/(2.7638+0.062*DBH$^{1.3364}$)

Below-ground biomass: Below-ground biomass (BBD) was estimated as a function of the total above-ground biomass per hectare (ABD), using the following equation (Climate Action Reserve 2010):

BBD = exp(-0.7747 + 0.9936 * ln(ABD))

Lost future sequestration: In the absence of the project, the existing trees would continue to grow and sequester additional carbon. This is especially true for redwood, which maintains high growth rates over long time periods relative to nearly any other species. Therefore, future growth projected out 30 years was estimated for the existing trees along with the associated carbon sequestration. The board-foot growth rate of the existing redwood trees on the site was estimated at 2 percent per year by a professional forester, based on the site class; over the next 30 years, the growth rate would be expected to decline to approximately 1.5 percent.[5] This growth rate applies to the tree stem only, and does not include bark, crown, or below-ground biomass. In the absence of standard methods for projecting growth in total biomass, a growth rate of 2 percent per year was applied to the total existing tree biomass at the site.

Conversion to CO_2 emissions

The total existing and projected future biomass was converted to carbon by multiplying by a factor of 0.5 (CAR 2010). The carbon was then converted to CO2 by multiplying by the ratio 44/12, which is the molecular weight ratio of CO2 to elemental carbon.

[4] The following densities were used, from US Forest Service, January 2010 (lbs/ft^3): Douglas fir, 28.7; redwood, 21.22; coast live oak, 49.92; bigleaf maple, 27.46; liquid amber and unknown ornamental, 28.08.

[5] Steve Staub, Staub Forestry and Environmental Consulting, personal communication, May 16, 2012.

Calculations

Table 1 lists the numbers of trees of each species that would be removed for project construction, including those that would be removed for construction of the optional elevated walkway to residence Halls C and D.

Table 1

Trees Proposed for Removal

Species/Tree Type	**Number of Trees**
Redwood	130
Douglas fir	1
Bigleaf maple	5
Coast live oak	2
Liquid amber	1
Ornamental (unknown species)	1

Table 2 presents the calculations of above-ground biomass. Table 3 presents the calculations of below-ground biomass, and the conversions of biomass to carbon and CO_2. Table 4 presents the calculations of projected future increase in biomass over the next 30 years.

Table 2
Calculation of Above-Ground Biomass

DBH (in)	DBH (cm)	HT (ft)	HT (m)	CVTS (ft3)	Bole biomass (tons)	Bole biomass (kg)	Bark biomass (kg)	Live branch biomass (kg)	total above-ground biomass (kg)
Redwood									
16	40.64	50	15.24	21.08	0.22	202.90	468.32	96.10	767.32
16	40.64	56	17.07	23.51	0.25	226.33	468.32	107.61	802.25
16	40.64	61	18.59	25.53	0.27	245.78	468.32	117.20	831.30
16	40.64	75	22.86	31.16	0.33	299.96	468.32	144.05	912.33
16	40.64	75	22.86	31.16	0.33	299.96	468.32	144.05	912.33
16	40.64	78	23.77	32.36	0.34	311.52	468.32	149.80	929.64
16	40.64	83	25.30	34.36	0.36	330.76	468.32	159.39	958.47
17	43.18	32	9.75	15.47	0.16	148.93	515.51	69.49	733.92
17	43.18	46	14.02	21.95	0.23	211.32	515.51	99.80	826.63
17	43.18	56	17.07	26.54	0.28	255.45	515.51	121.45	892.41
17	43.18	71	21.64	33.36	0.35	321.13	515.51	153.93	990.58
17	43.18	84	25.60	39.24	0.42	377.65	515.51	182.08	1075.24
17	43.18	87	26.52	40.59	0.43	390.65	515.51	188.57	1094.74
17	43.18	89	27.13	41.48	0.44	399.30	515.51	192.90	1107.72
17	43.18	90	27.43	41.93	0.44	403.63	515.51	195.07	1114.21
17	43.18	93	28.35	43.28	0.46	416.59	515.51	201.57	1133.67
17	43.18	102	31.09	47.31	0.50	455.40	515.51	221.05	1191.97
18	45.72	56	17.07	29.75	0.32	286.33	564.36	136.14	986.82
18	45.72	59	17.98	31.28	0.33	301.11	564.36	143.42	1008.88
18	45.72	80	24.38	41.96	0.45	403.86	564.36	194.40	1162.61
18	45.72	83	25.30	43.47	0.46	418.45	564.36	201.68	1184.48
18	45.72	103	31.39	53.53	0.57	515.28	564.36	250.23	1329.87
19	48.26	44	13.41	26.26	0.28	252.80	614.81	119.20	986.81
19	48.26	82	24.99	47.87	0.51	460.74	614.81	221.98	1297.53
19	48.26	89	27.13	51.80	0.55	498.60	614.81	240.91	1354.33
19	48.26	94	28.65	54.60	0.58	525.58	614.81	254.44	1394.83
19	48.26	95	28.96	55.16	0.59	530.97	614.81	257.14	1402.93
19	48.26	97	29.57	56.28	0.60	541.75	614.81	262.55	1419.11
20	50.8	71	21.64	46.15	0.49	444.24	666.84	212.98	1324.05
20	50.8	86	26.21	55.52	0.59	534.41	666.84	257.93	1459.18
20	50.8	87	26.52	56.14	0.60	540.40	666.84	260.93	1468.16
20	50.8	92	28.04	59.25	0.63	570.32	666.84	275.91	1513.06
20	50.8	94	28.65	60.49	0.64	582.27	666.84	281.90	1531.01
20	50.8	95	28.96	61.11	0.65	588.24	666.84	284.90	1539.97
20	50.8	96	29.26	61.73	0.65	594.21	666.84	287.90	1548.94
20	50.8	98	29.87	62.97	0.67	606.14	666.84	293.89	1566.87
20	50.8	99	30.18	63.59	0.67	612.10	666.84	296.89	1575.83
20	50.8	101	30.78	64.83	0.69	624.02	666.84	302.88	1593.74
20	50.8	102	31.09	65.45	0.69	629.98	666.84	305.88	1602.69
20	50.8	110	33.53	70.39	0.75	677.55	666.84	329.85	1674.24
21	53.34	69	21.03	49.49	0.53	476.39	720.40	228.18	1424.97
21	53.34	71	21.64	50.88	0.54	489.69	720.40	234.79	1444.88
21	53.34	75	22.86	53.64	0.57	516.27	720.40	248.00	1484.67
21	53.34	79	24.08	56.39	0.60	542.79	720.40	261.22	1524.41
21	53.34	85	25.91	60.52	0.64	582.49	720.40	281.04	1583.93
21	53.34	85	25.91	60.52	0.64	582.49	720.40	281.04	1583.93
21	53.34	90	27.43	63.94	0.68	615.49	720.40	297.56	1633.46

Table 2
Calculation of Above-Ground Biomass

DBH (in)	DBH (cm)	HT (ft)	HT (m)	CVTS (ft3)	Bole biomass (tons)	Bole biomass (kg)	Bark biomass (kg)	Live branch biomass (kg)	total above-ground biomass (kg)
21	53.34	99	30.18	70.10	0.74	674.73	720.40	327.30	1722.44
21	53.34	102	31.09	72.15	0.77	694.44	720.40	337.21	1752.05
21	53.34	107	32.61	75.55	0.80	727.23	720.40	353.73	1801.37
22	55.88	89	27.13	69.42	0.74	668.16	775.48	322.93	1766.58
22	55.88	102	31.09	79.17	0.84	762.03	775.48	370.07	1907.59
22	55.88	103	31.39	79.92	0.85	769.23	775.48	373.70	1918.41
22	55.88	109	33.22	84.40	0.90	812.40	775.48	395.46	1983.33
23	58.42	68	20.73	58.52	0.62	563.29	832.04	269.71	1665.04
23	58.42	69	21.03	59.35	0.63	571.28	832.04	273.67	1676.99
23	58.42	84	25.60	71.75	0.76	690.59	832.04	333.12	1855.75
23	58.42	110	33.53	93.05	0.99	895.65	832.04	436.17	2163.86
24	60.96	95	28.96	87.95	0.93	846.55	890.06	410.17	2146.78
24	60.96	103	31.39	95.08	1.01	915.19	890.06	444.69	2249.94
24	60.96	103	31.39	95.08	1.01	915.19	890.06	444.69	2249.94
26	66.04	97	29.57	105.29	1.12	1013.42	1010.35	491.48	2515.24
26	66.04	111	33.83	119.90	1.27	1154.10	1010.35	562.38	2726.83
27	68.58	86	26.21	101.09	1.07	973.00	1072.58	469.91	2515.49
27	68.58	102	31.09	119.16	1.26	1147.00	1072.58	557.30	2776.87
27	68.58	106	32.31	123.67	1.31	1190.33	1072.58	579.15	2842.06
28	71.12	78	23.77	98.93	1.05	952.28	1136.17	458.36	2546.80
28	71.12	92	28.04	116.00	1.23	1116.58	1136.17	540.59	2793.34
29	73.66	87	26.52	117.90	1.25	1134.80	1201.09	548.38	2884.27
30	76.2	116	35.36	166.48	1.77	1602.45	1267.34	782.38	3652.17
33	83.82	79	24.08	139.05	1.48	1338.36	1473.83	644.76	3456.95
33	83.82	111	33.83	193.00	2.05	1857.73	1473.83	905.84	4237.41
35	88.9	98	29.87	192.50	2.04	1852.87	1617.77	899.63	4370.28
42	106.68	109	33.22	306.96	3.26	2954.57	2159.32	1440.76	6554.65
7	17.78	22	6.71	1.83	0.02	17.65	1.57	8.28	27.49
7	17.78	23	7.01	1.91	0.02	18.42	1.62	8.64	28.68
7	17.78	31	9.45	2.55	0.03	24.56	2.07	11.58	38.21
8	20.32	30	9.14	3.23	0.03	31.07	2.53	14.58	48.18
8	20.32	21	6.40	2.29	0.02	22.03	1.87	10.27	34.16
8	20.32	42	12.80	4.46	0.05	42.97	3.40	20.34	66.71
9	22.86	27	8.23	3.69	0.04	35.51	2.83	16.58	54.92
9	22.86	38	11.58	5.13	0.05	49.37	3.85	23.26	76.47
9	22.86	38	11.58	5.13	0.05	49.37	3.85	23.26	76.47
9	22.86	47	14.33	6.30	0.07	60.60	4.68	28.72	93.99
10	25.4	16	4.88	2.75	0.03	26.46	2.16	12.19	40.81
10	25.4	21	6.40	3.57	0.04	34.39	2.73	15.93	53.06
10	25.4	28	8.53	4.72	0.05	45.39	3.53	21.18	70.09
10	25.4	32	9.75	5.36	0.06	51.62	3.99	24.17	79.78
10	25.4	38	11.58	6.33	0.07	60.92	4.67	28.67	94.26
10	25.4	38	11.58	6.33	0.07	60.92	4.67	28.67	94.26
10	25.4	42	12.80	6.97	0.07	67.10	5.13	31.67	103.89
10	25.4	46	14.02	7.61	0.08	73.25	5.58	34.66	113.49
10	25.4	60	18.29	9.83	0.10	94.64	7.18	45.15	146.97
11	27.94	41	12.50	8.24	0.09	79.30	5.99	37.37	122.66
11	27.94	46	14.02	9.21	0.10	88.60	6.68	41.90	137.19

Table 2
Calculation of Above-Ground Biomass

DBH (in)	DBH (cm)	HT (ft)	HT (m)	CVTS (ft3)	Bole biomass (tons)	Bole biomass (kg)	Bark biomass (kg)	Live branch biomass (kg)	total above-ground biomass (kg)
11	27.94	48	14.63	9.59	0.10	92.31	6.96	43.71	142.99
11	27.94	68	20.73	13.42	0.14	129.16	9.72	61.84	200.72
12	30.48	24	7.32	5.85	0.06	56.29	4.28	26.09	86.66
12	30.48	26	7.92	6.32	0.07	60.81	4.61	28.25	93.67
12	30.48	28	8.53	6.79	0.07	65.32	4.93	30.41	100.66
12	30.48	29	8.84	7.02	0.07	67.56	5.10	31.49	104.15
12	30.48	57	17.37	13.47	0.14	129.62	9.70	61.69	201.01
13	33.02	28	8.53	7.96	0.08	76.63	5.73	35.65	118.02
13	33.02	41	12.50	11.50	0.12	110.69	8.24	52.11	171.04
13	33.02	50	15.24	13.93	0.15	134.04	9.97	63.51	207.52
13	33.02	54	16.46	15.00	0.16	144.36	10.74	68.57	223.68
13	33.02	81	24.69	22.17	0.24	213.42	15.95	102.76	332.13
13	33.02	81	24.69	22.17	0.24	213.42	15.95	102.76	332.13
13	33.02	84	25.60	22.96	0.24	221.04	16.53	106.56	344.12
13	33.02	95	28.96	25.86	0.27	248.88	18.65	120.49	388.02
14	35.56	53	16.15	17.08	0.18	164.39	12.18	78.03	254.61
14	35.56	56	17.07	18.01	0.19	173.36	12.85	82.43	268.64
14	35.56	58	17.68	18.63	0.20	179.32	13.30	85.37	277.99
14	35.56	60	18.29	19.25	0.20	185.28	13.75	88.31	287.34
14	35.56	71	21.64	22.64	0.24	217.93	16.21	104.46	338.60
14	35.56	71	21.64	22.64	0.24	217.93	16.21	104.46	338.60
14	35.56	76	23.16	24.18	0.26	232.71	17.33	111.80	361.84
14	35.56	96	29.26	30.28	0.32	291.50	21.80	141.17	454.47
15	38.1	35	10.67	13.14	0.14	126.46	9.32	59.20	194.98
15	38.1	55	16.76	20.31	0.22	195.53	14.45	92.91	302.90
15	38.1	60	18.29	22.09	0.23	212.65	15.73	101.34	329.72
15	38.1	75	22.86	27.40	0.29	263.69	19.58	126.63	409.91
15	38.1	78	23.77	28.45	0.30	273.86	20.35	131.69	425.90
15	38.1	80	24.38	29.15	0.31	280.62	20.87	135.06	436.55
16	40.64	89	27.13	36.75	0.39	353.78	468.32	170.90	993.00
16	40.64	81	24.69	33.56	0.36	323.07	468.32	155.56	946.94
16	40.64	78	23.77	32.36	0.34	311.52	468.32	149.80	929.64
17	43.18	79	24.08	36.98	0.39	355.95	515.51	171.25	1042.72
18	45.72	95	28.96	49.52	0.53	476.64	564.36	230.81	1271.80
23	58.42	94	28.65	79.96	0.85	769.69	832.04	372.75	1974.49
Coast Live Oak									
6	15.24	22	6.71	2.88	0.07	65.16	0.00	0.00	65.16
11	27.94	16	4.88	9.62	0.24	217.82	0.00	0.00	217.82
Bigleaf Maple									
10	25.4	41	12.50	14.48	0.20	180.31	0.00	0.00	180.31
11	27.94	40	12.19	17.64	0.24	219.75	0.00	0.00	219.75
11	27.94	47	14.33	19.36	0.27	241.13	0.00	0.00	241.13
12	30.48	37	11.28	20.47	0.28	254.98	0.00	0.00	254.98
12	30.48	38	11.58	20.79	0.29	258.92	0.00	0.00	258.92
Douglas fir									
20	50.8	97	29.57	87.72	1.26	1141.93	187.63	15.05	1344.61

Table 2
Calculation of Above-Ground Biomass

DBH (in)	DBH (cm)	HT (ft)	HT (m)	CVTS (ft3)	Bole biomass (tons)	Bole biomass (kg)	Bark biomass (kg)	Live branch biomass (kg)	total above-ground biomass (kg)
Liquid Amber									
10	25.4	39	11.89	15.33	0.24	221.30	27.68	43.65	292.63
Unknown (ornamental)**									
6	15.24	19	5.79	3.01	0.05	43.42	7.87	10.63	61.92

*** not in density table, used value for unknown hardwood**
****used values for unknown hardwood**
+ used equation for unknown hardwood

Table 3
Conversion from Above-Ground Biomass to CO2e Emissions

Existing Biomass	
Total above-ground biomass (kg)	149,239.51
Total above-ground biomass (MT)	149.24
Above-groundbiomass (MT/hectare)	1,920.59
Below-ground biomass (MT)	30.28
Total existing biomass	**179.52**
Increase in biomass over 30 years (MT)	***145.65***
Total existing and future biomass (MT)	**325.17**
Carbon biomass (MT)	***162.58***
Total one-time emissions of CO2e (MT)	**596.14**
Total emissions annualized over 30 years (MT/year)	**19.87**

Table 4
Projected Future Increase in Biomass of Existing Trees

Year	Projected Total Biomass (MT)
0	179.52
1	183.11
2	186.77
3	190.51
4	194.32
5	198.20
6	202.17
7	206.21
8	210.34
9	214.54
10	218.83
11	223.21
12	227.67
13	232.23
14	236.87
15	241.61
16	246.44
17	251.37
18	256.40
19	261.53
20	266.76
21	272.09
22	277.53
23	283.08
24	288.74
25	294.52
26	300.41
27	306.42
28	312.55
29	318.80
30	325.17
Net Increase	**145.65**