COLLEGE OF

NATURAL RESOURCES

University of California, Berkeley

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With the growing focus on issues related to sustainability the College of Natural Resources (CNR) at UC Berkeley has become a leader in addressing the most urgent global environmental and resource issues of our time. The College, with 120 faculty members, includes four departments: Agricultural & Resource Economics (ARE), Environmental Science, Policy, & Management (ESPM), Nutritional Sciences & Toxicology (NST), and Plant & Microbial Biology (PMB). Most of the Colleges' 233,000 assignable square feet (ASF) for research and teaching is located in six buildings in the Northwest Quadrant of campus. Three of the buildings — Wellman, Giannini and Hilgard Halls — comprise the Agriculture Complex, one of the campus's most significant historical Classical Core compositions.

Within recent years total course enrollments have grown and now exceed 5,500 students. However, many of the labs and classrooms were not designed for their current type and intensity of use. A 2001 study by Physical & Environmental Planning (PEP) concluded that while the amount of space was adequate for the current need, the configuration and underlying infrastructure was not usable for modern scientific research and instruction.

Deficiencies included:

- Code and life safety violations
- Seismic risk (Giannini, Mulford, Wellman)
- Unsuitable configuration (Morgan, Mulford)
- Obsolete, inadequate infrastructure (Hilgard, Giannini, Morgan, Mulford, Wellman)

In 2008, VP-APF Koshland and CNR Dean Gilless began to explore the development of a comprehensive, strategic master plan for CNR space and facilities. The plan would use information from the 2001 study, the 2020 Long Range Development Plan and the strategic academic plan to analyze space, facilities and landscape in the context of CNR academic goals. ECPC reviewed this concept in February 2009 and authorized the planning study with goals to address deficiencies and envision a future for facilities that retain their historic identity while providing cutting-edge research spaces for scientists and scholars. Strategic guiding principles for this future include:

- Preservation of the College's historic buildings while improving infrastructure
- Creation of cutting-edge research facilities that are models of sustainability
- Facilitation of internal collaboration and interaction
- Reinforcing sense of community — both locally and globally

Project Overview

The Strategic Facilities Master Plan is based on interviews and discussions with CNR faculty, staff and students as well as technical review of existing building conditions conducted before initial analysis was done on potential options for renovation. The space program of the College — for research, instruction and administration — was carefully assessed and proposed space standards were identified for the College as a whole. Development options were identified to help the College articulate its physical planning vision and to allow the College to shape a comprehensive and integrated approach to development.

Concept Summary

The keystone of the CNR master plan is the renovation and reuse of the Agriculture Complex and Mulford Hall. Laboratory needs would be met through substantial renovation of Hilgard and a renovated or new Mulford. Wellman would be renovated for teaching and administrative purposes. College administration and social science research would continue to be located in Giannini. With Wellman as the student center of the College, new open space connections and places of interaction would provide opportunities for collaboration and community.

There are alternative ways of providing the needed number of laboratories in Hilgard and Mulford - various ways in which renovated historic space can be configured and balanced with new space. However, in order to meet the required number and size of labs, CNR's current preference is to take a more liberal historic approach with the renovation of Hilgard opening up a two-story open "observation gallery" in the center of the building that would become an important college gathering place and public exhibition hall showcasing CNR research. This requires more lab density in Mulford Hall.

In addition to these proposals Morgan would be modernized and improvements would be made to Koshland as needed. There is also potential to increase the quality and number of classrooms and teaching laboratories in the Northwest Quadrant through the renovation of Wellman Hall and the addition of a new Teaching Pavilion.

Key findings that support this concept include:

- Lab space is inadequate and deficient; the

number of research laboratories does not meet CNR needs. Quality is deficient in many of the existing labs.

- Overall assignable square feet (ASF) should increase from approximately 233,000 ASF (existing), to approximately 250,000 ASF (proposed) — an increase of approximately 16,500 ASF.
- Hilgard Hall provides the best opportunity for adaptive re-use to emphasize the historic significance of the Agriculture Complex.
- All building infrastructure, with the exception of that in Koshland Hall, is deficient and requires upgrading.
- All renovated buildings can achieve LEED Silver standard including the historic buildings.

Component Budgets

Overall rough-order-of-magnitude budget for each component of the strategic master plan are shown in the attached summary table. These concept level costs are not based on a defined project and no project schedule was developed as part of this study. It is likely that site planning and campus infrastructure improvements included in the budget would need to be phased and funded alongside some of the first projects.

Summary

Based on this strategic vision and concepts CNR will continue to work with University Relations to develop fundraising materials. Campus coordination is needed regarding possible relocation of CNR and non-CNR occupants in buildings with multiple occupants in Koshland, Mulford and Giannini. The College will continue to conduct further feasibility investigations and acquire needed permissions for individual project components as they are implemented.

Renovation & Additions	Description	Existing CNR *ASF*/GSF*	Option 1 *ASF*/GSF*	Project Cost Range in 2009 $	Option 2 *ASF*/GSF*	Project Cost Range in 2009 $	New Buildings	Project Cost Range in 2009 $
1. Koshland	Entry floor interior renovation	57,700 ASF 151,600 GSF	71,800 ASF 151,600 GSF	$10M–$12M				
2. Morgan	Interior renovation & new penthouse floor	33,000 ASF 56,775 GSF	38,000 ASF 65,000 GSF	$49M–$54M			38,000–42,000 ASF 65,000 GSF	$62M–$68M
3. Giannini	Historic renovation	35,500 ASF 76,500 GSF	37,500 ASF 76,500 GSF	$36M–40M				
4. Wellman	Historic restoration	20,500 ASF 41,000 GSF	19,350 ASF 38,700 GSF	$26M–29M				
5. Hilgard	**Option 1** Historic renovation w/ corridors intact	46,650 ASF 78,000 GSF	43,500 ASF 78,000 GSF	$59M–65M				
	Option 2 Historic renovation w/ observatory gallery	46,650 ASF 78,000 GSF			43,250 ASF 78,000 GSF	$59M–65M		
6. Mulford	**Option 1** Interior renovation & attic level expansion	40,000 ASF 74,000 GSF	52,000 ASF 83,000 GSF	$66M–$73M			63,000–68,000 ASF 100,000 GSF	$88M–$97M
	Option 2 Interior renovation & addition	40,000 ASF 74,000 GSF			63,250 ASF 100,000 GSF	$80M–$88M		
7. Teaching Pavilion	New 4-story building						20,000–23,000 ASF 35,000 GSF	$36M–$40M

Note: *ASF includes CNR Centers, but does not include non-CNR departments or General Assignment Classrooms. GSF is for total building.

Site Improvements			
8. Utility Site Upgrades	Northwest quadrant utility upgrades		$9M–$11M
9. Wellman Courtyard	Renovate historic courtyard	40,000 sf	$8.5M–$9.5M
10. Hilgard/ Morgan Connection	ADA paths		$1M–$1.5M
11. Pat Brown Courtyard	Improve courtyard		$2.5–$3M
Other Construction Costs			
12. Phasing & Staging Allowance	Premium distributed over all projects		$3M

Background

Looking south across mouth of El Paso Creek.
Photo courtesy of Wieslander Vegetation Type Analysis Database

COLLEGE OF NATURAL RESOURCES STRATEGIC VISION

The College of Natural Resources has a preeminent role in providing leadership toward solving the most urgent global environmental issues that affect the 21st Century. With the worldwide focus on issues related to the sustainability of our natural resources, CNR's academic and research programs have attracted increasing numbers of students and anticipates continued growth as the importance of protecting and regenerating our environment becomes a global priority.

The four departments that comprise the College of Natural Resources together embody the College's mission to address biological, physical, social and economic challenges associated with protecting natural resources and the global environment. The four departments are:

- Department of Environmental Science, Policy, & Management (ESPM)
- Department of Nutritional Sciences & Toxicology (NST)
- Department of Agricultural & Resource Economics (ARE)
- Department of Plant & Microbial Biology (PMB)

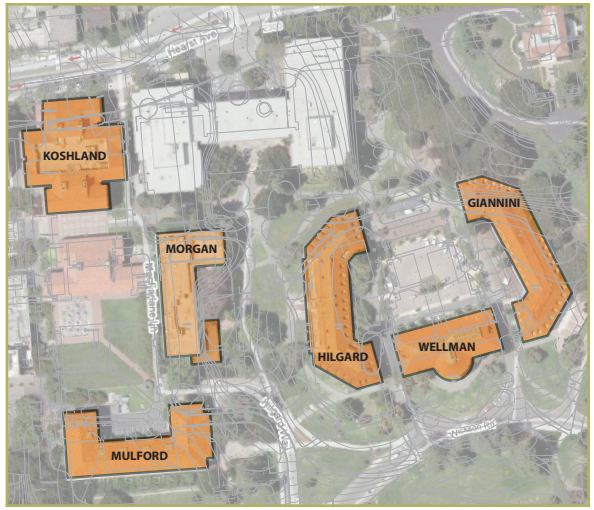
ESPM has three divisions. Because of their disparate space needs, the Division of Society & Environment (S&E) has been specifically identified in this report separately from the combined laboratory needs of the Divisions of Ecosystem Sciences (ES) and Organisms & Environment (O&E). The four CNR departments are primarily dispersed over six buildings in the Northwest precinct of the Berkeley campus.

Building	Date of Construction	Use	Structural Ranking
Giannini Hall	1930	Office	Poor
Wellman Hall	1912	Lab	Poor
Hilgard Hall	1917	Lab	Fair
Mulford Hall	1948	Lab	Poor
Morgan Hall	1953	Lab	Fair
Koshland Hall	1991	Lab	Good

Over the last decade, it has become increasing apparent that five out of six of the CNR buildings have serious deficiencies that are impacting the quality of lab research and teaching, and may soon affect the College's ability to competitively recruit the best research faculty. These deficiencies include:

- Code and life safety violations
- Seismic risk
- Unsuitable plan configuration
- Obsolete infrastructure

The College's vision for facilities improvement goes beyond just "fixing" these deficiencies. The College envisions a future in which cutting-edge modern infrastructure informed by our historic values embodied in our traditional buildings create a new standard of sustainability for research and for our historic structures. The CNR buildings must be significantly transformed so that they will reflect the College's world leadership position and provide a visible, integrated, collaborative center that brings biological, physical and social scientists together in their efforts to identify a sustainable future for society.



Mission and Strategic Vision

From its inception in 1868, the College of Natural Resources, originally the College of Agriculture and UC Berkeley's first college, has continuously addressed the most critical issues of our time, both past and present, "…serving society by generating and disseminating knowledge in the biological, physical, and social sciences in order to provide the tools to both protect the Earth's natural resources and ensure economic and ecological sustainability for future generations." In 1868, recognizing society's reliance on land and agriculture, the UC Regents made the creation of the College its first duty.

Today the work of the College is at the center of solving environmental issues and receiving recognition for "breakthrough" research that will have global impact. CNR is "delivering critical lessons in environmental economics and policy to legislators, regulators, and concerned citizens. It is helping to shape the environmental polices in California and the nation."

This history informs the principles guiding the strategic vision articulated in this plan. These include goals to:

- Preserve the College's historic buildings
- Create cutting-edge research facilities that are models of sustainability
- Facilitate inter-departmental collaboration and interaction
- Create a sense of community — both locally and globally

Based on these goals and the College's mission, this study recognizes that any future development will need to address the following key design issues in order to meet needs over the next 15-20 years:

- Approach to historic building renovation
- Current trends in laboratory design

- Green building concepts
- Structural upgrades

Existing Conditions

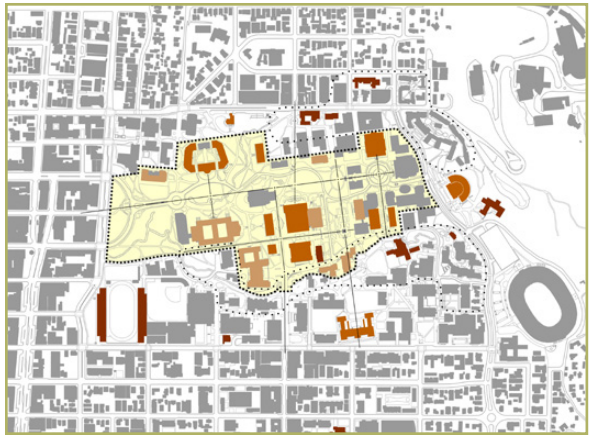
Wellman Hall (completed in 1912) was the College's first building. The College's campus footprint gradually expanded to include Hilgard Hall, Giannini Hall, Mulford Hall, Morgan Hall, and finally Koshland Hall, completed in 1991. These buildings house CNR research and are primarily laboratory buildings, with the exception of Giannini Hall which houses social scientists. Teaching spaces, including general assignment classrooms, are found interspersed throughout all buildings. Wellman, Hilgard, Giannini, and Mulford are located within the classical core as defined by the 2020 Long Range Development Plan (LRDP). Any growth, development or proposed change of CNR space and facilities must be considered within the context of the LRDP.
The LRDP, in regards to the Northwest Quadrant and CNR recognizes that:

- Views to the east/west past Wellman and Mulford must be preserved
- Historic landscape of natural riparian areas must be preserved
- Wellman courtyard and Bio-Health Sciences plaza are outdoor places of social interaction and should be enhanced
- Mulford Hall is a gateway building to the Northwest quadrant
- Mulford is a replacement candidate, or could be expanded to the north
- A fourth new building completing the Wellman courtyard could be considered

The Wellman, Hilgard, and Giannini ensemble, organized around a central courtyard conceived by John Galen Howard, is considered one of the campus' most significant resources and all three buildings are protected by the National Register of Historic Places. The Campus has already obtained a full historic structure report for Giannini Hall and an abbreviated one for Wellman Hall. Those documents are very helpful in understanding the history and significance of Giannini and its features. For both buildings the reports include diagrams indicating the hierarchy of historical significance of exterior elevations and interior spaces. There is no HSR for Hilgard Hall, and it will be very important to prepare such a document before renovation design proceeds. Mulford Hall is classified as not historically significant in the 2020 LRDP, but based on its construction date (1948), architect, and design, it could be seen as an asset with historical value. Morgan Hall (1953) is more than 50 years old and could gain historical interest in the coming decades if it remains unaltered while its contemporaries are demolished or redesigned.

Giannini Hall is currently the formal face of the College. It houses the Dean's office, and many College receptions and rituals occur in the historic front lobby of the building. However, the College lacks a student center or place suitable for a gathering of the entire CNR community. This is especially important since the College's vision includes collaboration and interaction between departments and creating a better sense of community. The Wellman courtyard is important to the historic ensemble and provides a visual focus, but its current function as a parking lot and temporary trailer surge space does not fulfill this need. The secondary entries to Hilgard and Giannini on the courtyard side are equally important to the more formal entries outside of the courtyard as they bring people to and from the courtyard.

There are multiple pedestrian paths that go around the CNR buildings and many more informal patterns that weave between them that should be recognized and improved. Connections between the buildings have not been well-considered. The plaza surrounded by the Genetics & Plant Biology Building, the new Bio-Medical Health Sciences Building, and service sides of Mulford



Cultural & Architectural Resources

- Classical Core
- National Register: Classical Buildings
- National Register: Other Buildings
- Contributing Buildings: Classical Core
- Picturesque Ensemble

Places of Interaction

- Places of Interaction
- Places of Relaxation
- Play fields
- Major Pedestrian Routes
- Alternate Night Routes
- Major Campus Entrances

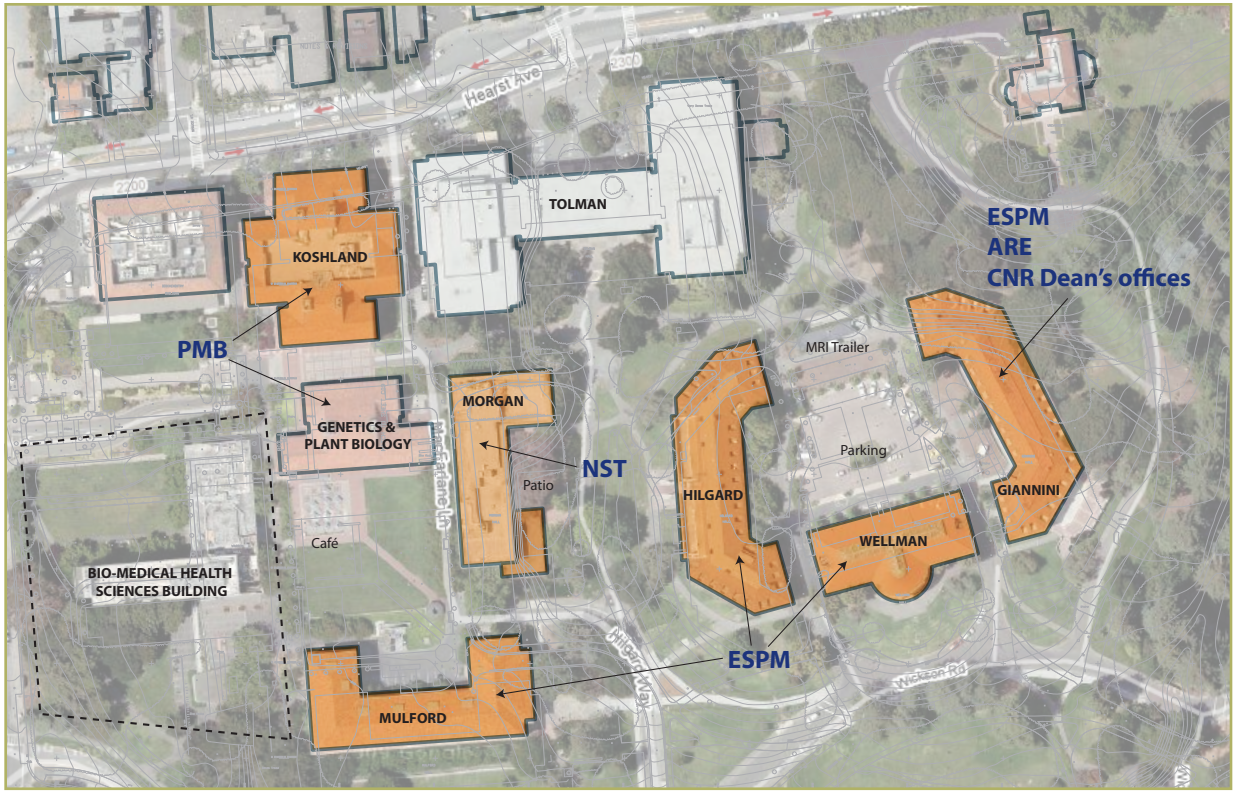
SITE CONTEXT

College of Natural Resources Departments

- ESPM
- ARE
- NST
- PMB

CNR Centers:

- Center for Forestry
- Geospatial Innovation Facility
- Center for Fire, Research & Outreach
- Leopold Library
- ICP Facility
- Rangeland Grass Collection
- Center for Sustainable Resource Development
- Atkins Center for Weight & Health



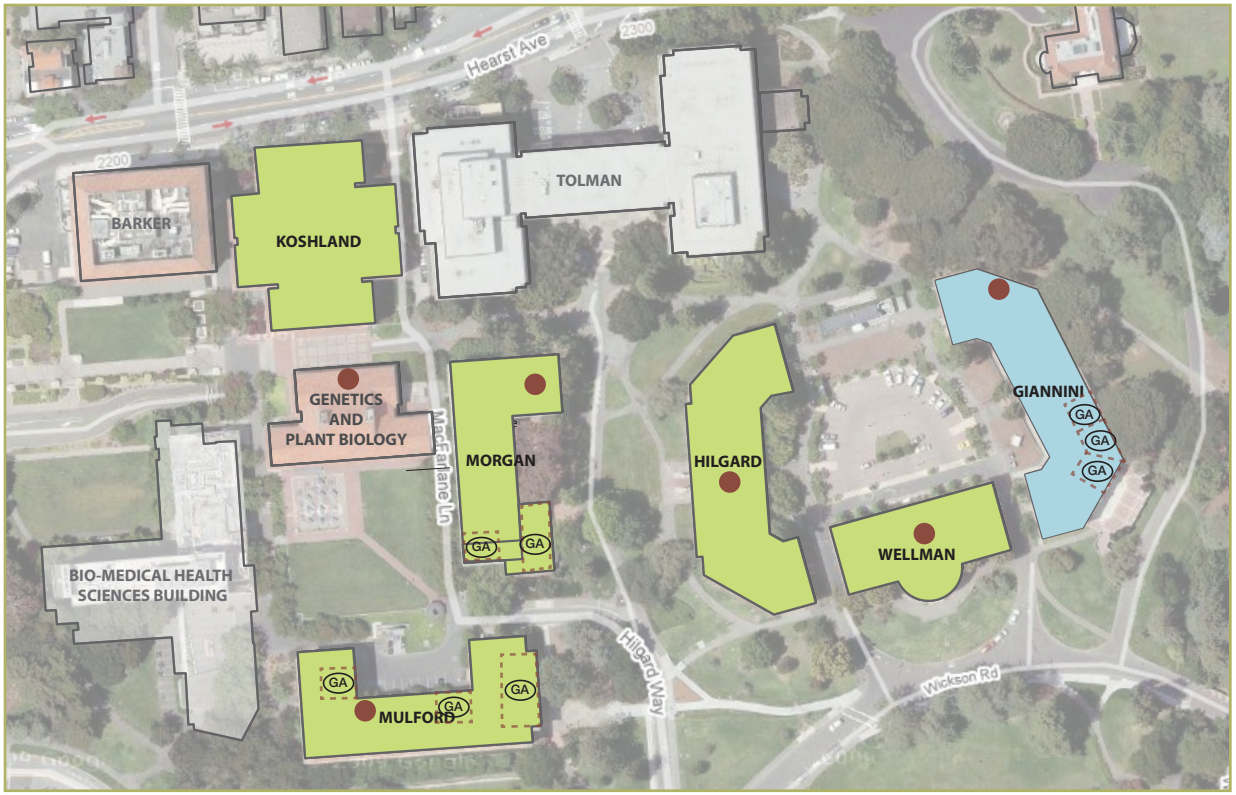
Hall and Morgan Hall has potential for greater student activity. It provides a contrast to the Wellman Courtyard as it is more contemporary, spacious and defined by eclectic building edges. Vehicular through access is limited between the CNR buildings. In addition to the parking at Wellman Courtyard, there is a service area and some parking on the North side of Mulford Hall.

Existing CNR spaces

A previous CNR Facility Study, completed in January 2002 by UC Campus Physical & Environmental Planning, surmised that the amount of CNR space on campus is adequate for its program needs, provided the infrastructure is improved to modern standards. One of the goals of this study is to further examine this premise in light of growth in CNR, and to better define departmental needs. For the purpose of this study, a preliminary space program has been developed based upon interviews with each Department and with the Dean's office to identify space deficiencies, needs, and standards. CNR's student enrollment has tripled in the last few years. It is expected that the number of CNR faculty will remain generally the same over the next 10-15 years; newly recruited faculty will replace retiring faculty. The number of faculty projected has a direct relationship to the amount of space required. Each faculty member requires a dedicated research space and a faculty office. Research wet labs, social scientist research space, and faculty offices currently comprise approximately 77% of CNR's assignable space.

Labs

The College of Natural Resources has research expertise in three broad areas: molecular/chemical programs and organismal/ecological programs which require labs, and social science/computer based programs, housed in Giannini, which do not. In general the existing CNR research labs, with the exception of those in Koshland, are inconsistently sized, squeezed into inefficient plan configurations, and over time, have become a patchwork of spaces where it is rare if a single researcher's lab space is contiguous. The number of fume hoods is insufficient, lab support is often insufficient, and faculty offices are not always near their associated laboratory.



College of Natural Resources Building Use

- Labs
- Office
- GA General Assignment classrooms
- Teaching labs
  - Computer classroom (Mulford: Room 124)
  - Wildlife teaching lab (Mulford: Room 136)
  - (3) Wet teaching labs (Hilgard: Room 33, Wellman: Room 306 and Room 410)
  - Statistics lab (Giannini: Room 236)
  - Dietetics classroom (Morgan: Room 144)
  - Genetics & Plant Biology building (GPB)

General Assignment Classrooms

There are currently seven General Assignment classrooms located within the CNR building facilities. These must either remain where they are, or be relocated within the complex of buildings. The Genetics & Plant Biology Building adjacent to Koshland houses most of the teaching spaces and labs for PMB. No change is proposed for this building. The existing teaching labs must remain in the concept program. These are listed in the Building Use legend above.

CNR Centers

There are several centers that are under the umbrella of the College. These centers can be relocated, but will remain within the College facilities. They are listed on page 10.

Existing Infrastructure

All of the CNR buildings, with the exception of Koshland Hall require new mechanical systems, primary and secondary electrical systems, new lighting, and new plumbing systems because they have reached their useful life. All buildings are space heated via steam baseboard heaters provided with steam from the central plant, and there is no cooling except for a few offices and server rooms. Existing fume hood exhaust typically does not meet current code, flues terminating too close to the roof, and lab ventilation also does not meet current standards. Koshland Hall is the only building with full fire sprinkler protection and back-up emergency power. Back up emergency power is essential at lab buildings in order to protect research work — backing up cold rooms, freezers, and fume hood exhaust.

However, it is fortunate that the historic buildings Wellman, Hilgard and Giannini, and Mulford also, have heavy-mass walls, clay tile roofs and operable windows. This type of building envelope is inherently energy-efficient because the mass acts like a “battery” storing cooling during the night and releasing it during the day; operable windows further enhance the opportunity for natural cross-ventilation at office and classroom uses (typically not allowed for labs).

EXISTING CONDITIONS

Giannini Hall

- Historic status: National Register
- Date of completion: 1930
- Structural status: Poor
- Mechanical system: Fair
  High mass construction
  Natural ventilation/operable windows
  Radiant steam heat
  A few rooms with cooling
- ADA access deficiencies:
  Elevator upgrade
  Toilet rooms
  Primary entry & path of travel
- Primary users:
  Social scientists — ARE/ESPM - S&E
  Dean's suite & CNR administration
  CNR centers
- Non-CNR users:
  MCB administrative support
  Howard Hughes Medical Institute Office
  L&S Electron Microscopy Facility
  Henry H. Wheeler, Jr. Brain Imaging Center

Wellman Hall

- Historic status: Historic National Register
  Tiered lecture room demolished
- Date of completion: 1912
- Structural status: Poor
- Mechanical system: Poor
  High mass construction
  Natural ventilation/operable windows
  Some cooling
  Radiant steam heat
  12 fume hoods
- ADA access deficiencies:
  New elevator
  Toilet rooms
  Primary entry & path of travel
- Primary user:
  ESPM lab research
- Non-CNR users:
  Essig Museum (in process of moving to VLSB)

Hilgard Hall

- Historic status: Historic National Register
  Original entry stair demolished
- Date of completion: 1917
  Renovated 1960-61
- Structural status: Fair
- Mechanical system: Poor
  High mass construction
  Natural ventilation/operable windows
  Radiant steam heat
  Non-compliant fume exhaust
  35 fume hoods
- ADA access status:
  Elevator upgrade
  Toilet rooms
  Primary path of travel
- Primary users:
  ESPM lab research

Mulford Hall

- Historic status:
  Contributing Building within Classical Core
- Date of completion: 1948
- Structural status: Poor
- Mechanical system: Poor
  High mass construction
  Natural ventilation/operable windows
  Radiant steam heat
  Non-compliant fume exhaust
  4 fume hoods
- ADA access status:
  New elevator
  Toilet rooms
  Primary entry & path of travel
- Primary users:
  ESPM lab research
  CNR centers
  Berkeley Institute of the Environment
- Non-CNR users:
  Public Health

Morgan Hall

- Historic status: Non-Historic
- Date of completion: 1953
- Structural status: Fair
- Mechanical system: Poor
  Natural ventilation/operable windows
  Radiant steam heat
  No cooling
  27 fume hoods
- ADA access status:
  New elevator
  Toilet rooms
  Primary path of travel
- Primary users:
  NST

Koshland Hall

- Historic status: Non-Historic
- Date of completion: 1990
- Structural status: Good
- Mechanical system: Good
  Forced air heat/ventilation
  Cooling-water cooled chiller
  Emergency power
  51 fume hoods
- ADA access status:
  Minor upgrades to be determined
- Primary users:
  PMB
- Non-CNR users:
  MCB

Approach

Methodology

A concept space program was developed for the purpose of assessing the future space needs of the College that is based upon:

- Department interviews with department heads and key faculty representatives,
- Meetings with the Dean and Assistant Deans to review and provide an overview for an appropriate space program,
- Observations of the existing building conditions and mapping of existing uses for each building, and
- An understanding of the College and University's long-range goals.

Our efforts to arrive at an appropriate space program are also based upon space standard guidelines published by the College and generally accepted lab research standards for academic institutions. The "Guidelines for Space Allocation — College of Natural Resources" document was developed November 1998, then reaffirmed Nov. 2004 by the College Space Committee.

The proposed program that is included in this report is based on our understanding of the College's expressed needs, but it is not intended to be an ideal space program, or even one that has the consensus of all departments. It should be viewed as a work in progress, a reasonable program from which a space test fit of the College's space needs can be based. The 2001 CNR Facility Study, concluded that the CNR facilities on the core campus are adequate for its program needs as long as the infrastructure is improved to modern standards. Our report findings, although not exact, are similar. The projected faculty numbers for each department are as follows:

1. ESPM: No change to number of faculty: (66) total
2. NST: Add one faculty: (14) total
3. ARE: Add one faculty: (23) total
4. PMB: No change to number of faculty: (28) total

Lab Research Spaces

It should be noted that the concept program does not take into account actual building configurations and the inefficiencies of the historic buildings. The concept program is derived from a proposed quantity of each space type, and a standard unit area for each type of space. Our programming assumptions begin with a projected number of faculty members since this number will generate the number of labs and associated faculty offices. For planning purposes, each researcher has the same amount of space in order to arrive at a total area allocation. In reality, the amount of dedicated lab space for a single researcher will be variable, as is the case now. Wet labs as defined in this study allow for research in molecular biology and chemistry. The eco-labs support organismal and ecological science research. The College estimates that the faculty count will essentially remain the same over the next 10-15 years. Currently, approximately 70% of the total existing assignable CNR area is made up of research wet and ecology labs and associated faculty offices and lab support. The concept program also arrives at approximately the same ratio for these uses. In general, the concept space program for all departments maintained the same area of lab space, lab support and faculty office, with the exception of ESPM. While the net combined area for ESPM lab support and faculty offices is almost the same for both existing and concept

CNR Lab Standards

One lab per faculty member

ESPM/NST/PMB Research

Academic faculty office	120 ASF
Wet lab	1,480 ASF
Total	1,600 ASF/faculty

(Includes grad work space and associated lab support)

ESPM Research

Academic faculty office	120 ASF
Eco-lab	980 ASF
Total	1,100 ASF/faculty

(Includes grad work space and associated lab support)

S&E /ARE Research

Academic faculty office	120 ASF
Social science research office	400 ASF
Total	520 ASF/faculty

(Includes grad work space)

Shared Lab Support

Approximately 20% of lab space

Teaching Lab

1,300 ASF for 24 students

PROGRAM

CONCEPT SPACE PROGRAM

Department	Existing Area *(ASF)*		Concept Program *(ASF)*
A. College of Natural Resources			
1. Dean's offices	8,829	Giannini	8,829
2. Student resource center	2,467	Mulford	2,500
3. CNR centers	5,850		5,818
Subtotal	17,146		17,147
B. Department of Environmental Science, Policy, & Management			
Administration offices	7,539	Mulford	7,500
Teaching labs and department classrooms	8,926	Mulford Hilgard Wellman	9,592
Social space/commons	0	-	500
Observatory gallery		-	
Research labs (includes grad area)	62,005	Mulford Hilgard Wellman	63,940
Lab support	6,710	Mulford Hilgard Wellman	12,788
Faculty offices-other divisions	12,318	Mulford Hilgard Wellman	7,080
S&E faculty offices	8,210	Giannini	1,560
S&E computing office and grad space	included above	Giannini	5,680
Faculty conference rooms (non-S&E)	1,074		1,080
Subtotal	106,782		109,720
C. Department of Agricultural & Resource Economics			
Administration offices	3,117		3,117
Teaching labs and department classrooms	601		2,750
Giannini Library	3,791		2,525
Student spaces	0		500
Research computer labs	10,089		9,200
Conference	355		350
Faculty offices	included above		3,360
Subtotal	17,953	Giannini	21,802

Department	Existing Area *(ASF)*		Concept Program *(ASF)*
D. Nutritional Science & Toxicology			
Administration offices	4,033		4,033
Teaching labs and department classrooms	1,560		3,640
Student spaces	0		0
Research labs (includes grad area)	19,787		20,720
Lab support	4,208		4,144
Faculty offices	3,210		2,040
Faculty conference rooms	357		700
Subtotal	33,155	Morgan	35,277
E. Plant & Microbial Biology			
Administration offices	2,335		2,335
Teaching labs and department classrooms	0	Genetics & Plant Biology	2,580
Student spaces	103		590
Research labs (includes grad area)	35,396		41,608
Lab support (inc growth chamber)	14,296		12,176
Faculty offices	3,711		3,552
Faculty conference rooms	832		832
Bio-Imaging facility	1,018		1,460
Subtotal	57,691	Koshland	65,133
Total Net Area	**232,727 ASF**		**249,078 ASF**
Rounded Net Area	*233,000 ASF*		*250,000 ASF*

Existing General Assignment (GA) Classrooms	
Mulford: Room 159	1,493
Mulford: Rooms 6, 7, & 240	1,188
Giannini: Room 141	872
Morgan: Room 101	1,555
Morgan: Room 103	706
Giannini: Room 201	672
Giannini: Room 332	441
Total Net Area	**6,927 ASF**

program, the concept lab support space increases and the concept area for faculty offices is significantly reduced. This is largely because existing offices typically far exceed their space standard.

Providing an adequate amount of lab support space is very important to the function of a lab, but can be highly variable. More intensive labs might require a 1:1 to 1:2 ratio for lab to lab support space. In our concept program, lab support spaces are assumed to be smaller, separate, shared spaces for procedures, tissue culture, autoclaves, glass wash, and cold rooms. Given the finite amount of existing space, we have aimed for a smaller ratio goal of 1:5 or for every 1,000 SF of lab space, there should be 200 SF of lab support.

Social Science Research/ Computer lab Spaces

ARE and ESPM/S&E are both located at Giannini Hall and will remain there. ARE makes heavy use of computer modelling in its research and teaching therefore requires adequate primary and back-up power and reliable temperature controls. ARE in particular expressed a need for video conferencing rooms. However, the spatial and infrastructure requirements are much less stringent than wet lab requirements.

Teaching Spaces and Social Gathering Spaces

As the nature of research becomes more collaborative and inter-disciplinary, spaces for interaction have become more important for both formal and informal gatherings. All departments expressed a need for more social spaces, both dedicated and perhaps ones that can be shared by the entire CNR community. Currently there is an undergraduate student resource center located at Mulford Hall which remains in the concept program. NST's Morgan Hall also has an existing conference room that opens out to a patio and is shared by the College for receptions and ceremonial events. This space could be larger.

NST, in particular, is in need of additional teaching lab space. Currently, the lack of space has affected the department's ability to fulfill its teaching requirements. The concept program adds two additional wet teaching labs.

In addition to conference rooms used primarily by researchers, at a minimum, it is desirable to retain the number of existing small seminar rooms and classrooms. These can be shared by all departments.

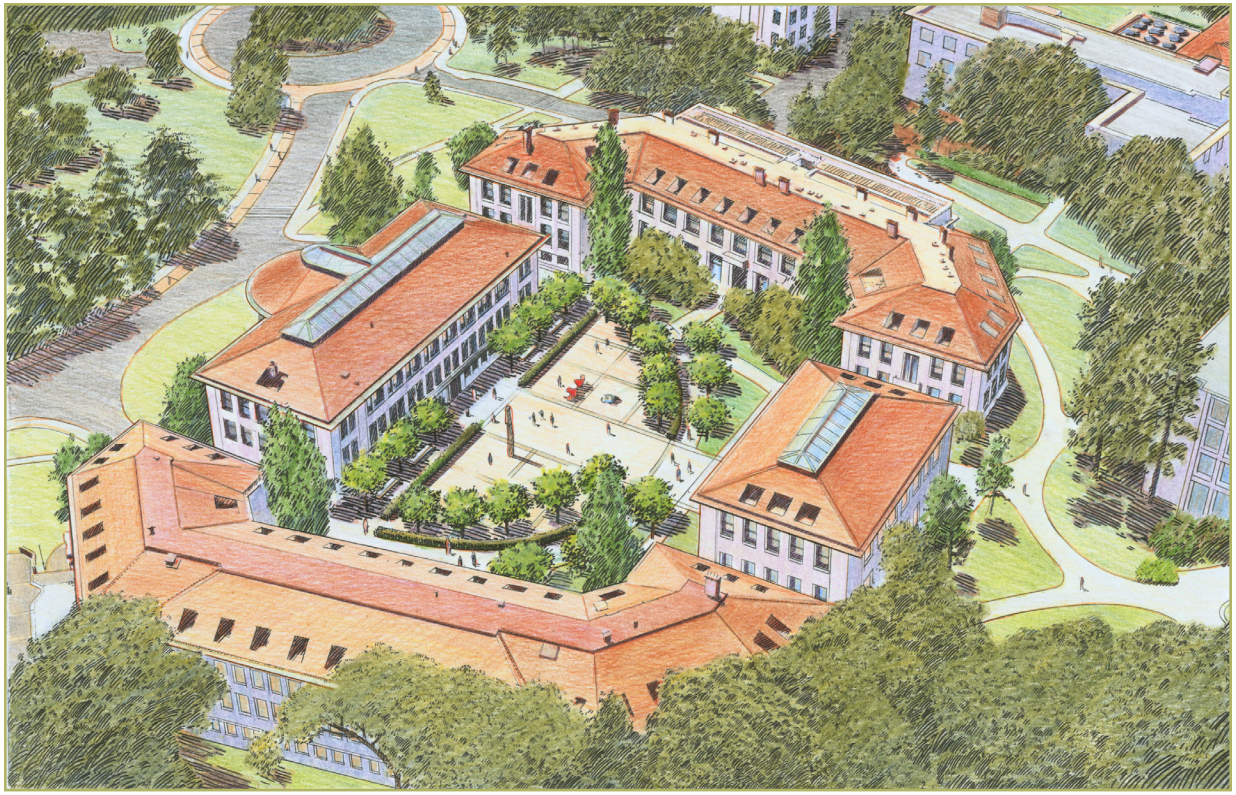
General Assignment Classrooms (GA)

General Assignment classrooms are campus-wide utilized classrooms. The proposed program does not change the number of existing GA classrooms and assumes that they will remain the same size. Square footage for GA classrooms is based on existing capacity and further study on appropriate size and scheduling should be conducted in future phases.

Administrative Offices

Currently, each department has its own set of dedicated administrative offices, in addition to the College's administrative offices which include the Dean's offices. For the purposes of the master plan, we have assumed that the size of the administrative offices would remain largely the same. However, the consolidation, reduction and interdepartmental sharing of administrative offices and support space is a viable option given the finite amount of available space in each building. Due to State budget cuts, the number of administrative staff is also expected to be reduced in the future.

Historic Approach



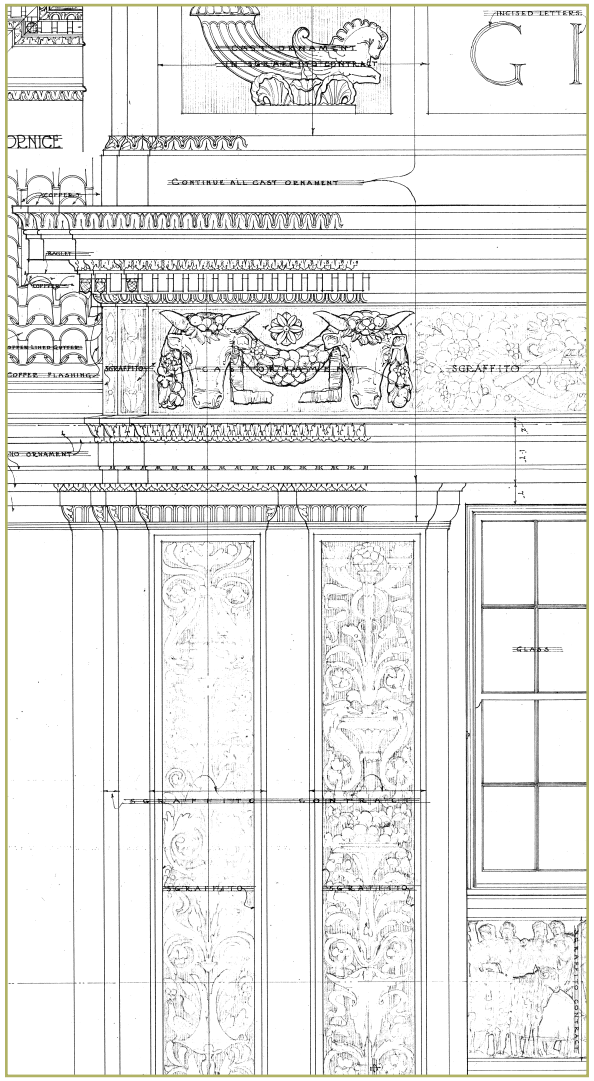
As general background, California law and University policies treat properties which are eligible to the California Register of Historic Resources as valuable to the public. (Any property which is eligible to the National Register of Historic Places is *ipso facto* eligible to the California Register.) State law does not require a specific treatment in terms of preservation, but does require that projects include consideration of historical issues. University policy favors retaining the historical integrity of resources where feasible within the overall framework of the academic mission. While demolition of a historic resource is the least desirable outcome, complying with the Secretary of the Interior's Standards for Rehabilitation is commonly considered to be an appropriate level of preservation. The University has a very collaborative working relationship with the State Historic Preservation Office (SHPO) so that extent of renovation to historic properties on the Berkeley campus is determined in a collegial way.

For all three buildings in the historic Natural Resources cluster, the following general principles are worth considering:

- The buildings were consciously designed as a group, and the landscape surrounding them — especially the courtyard they create — is of primary historical importance.
- The historically-inspired rendering above shows a fourth building enclosing the courtyard on the north side. The Secretary's Standards allow additions to historic groupings like this one, and an appropriate new building in that location would be acceptable as part of a preservation approach — as would construction under the courtyard itself.
- The entire exterior of each building has considerable historical significance — there are no hidden sides or rear elevations on these buildings where alterations and additions can be made at will.
- The buildings are relatively low and their roofs are prominent; this makes conspicuous rooftop additions and alterations problematic.
- All three buildings have simple, clear circulation patterns and spatial organization — Removing or significantly altering character-defining features such as entries, lobbies, and stairways, or re-organizing the interior of a building to execute a new architectural concept is quite unlikely to conform to the Secretary's Standards.
- The interiors of the buildings have been altered in many ways and places; the Secretary's Standards generally allow much more leeway in the treatment of an altered space than for one that is still in its historic condition.
- A number of the individual spaces within each building are of relatively low hierarchical importance, as the significance diagrams for Wellman and Giannini Halls show. The Secretary's Standards do allow partition changes and alteration or removal of historic features in spaces which are not hierarchically important, although wholesale gutting clearly would not conform to the Standards.

The first Standard is the injunction to select an appropriate use for a building. These buildings were designed as science facilities, so the project is starting with a very important goal that is fully in keeping with the core purpose of preservation. Current lab requirements

are very likely to require some alterations — such as fume hoods on the roofs — which would not normally conform with the Secretary's Standards. However, the Standards will allow the greatest flexibility for change when it is required in order to maintain the original designed use of a building.



Hilgard Hall historical elevation drawing detail

Recreating known spaces and features which have been lost, such as the auditorium in Wellman Hall, is encouraged by the Secretary's Standards, although it is not required. Ideally, these can be true restorations — accurate reconstruction of the original design guided by documentation of what existed historically.

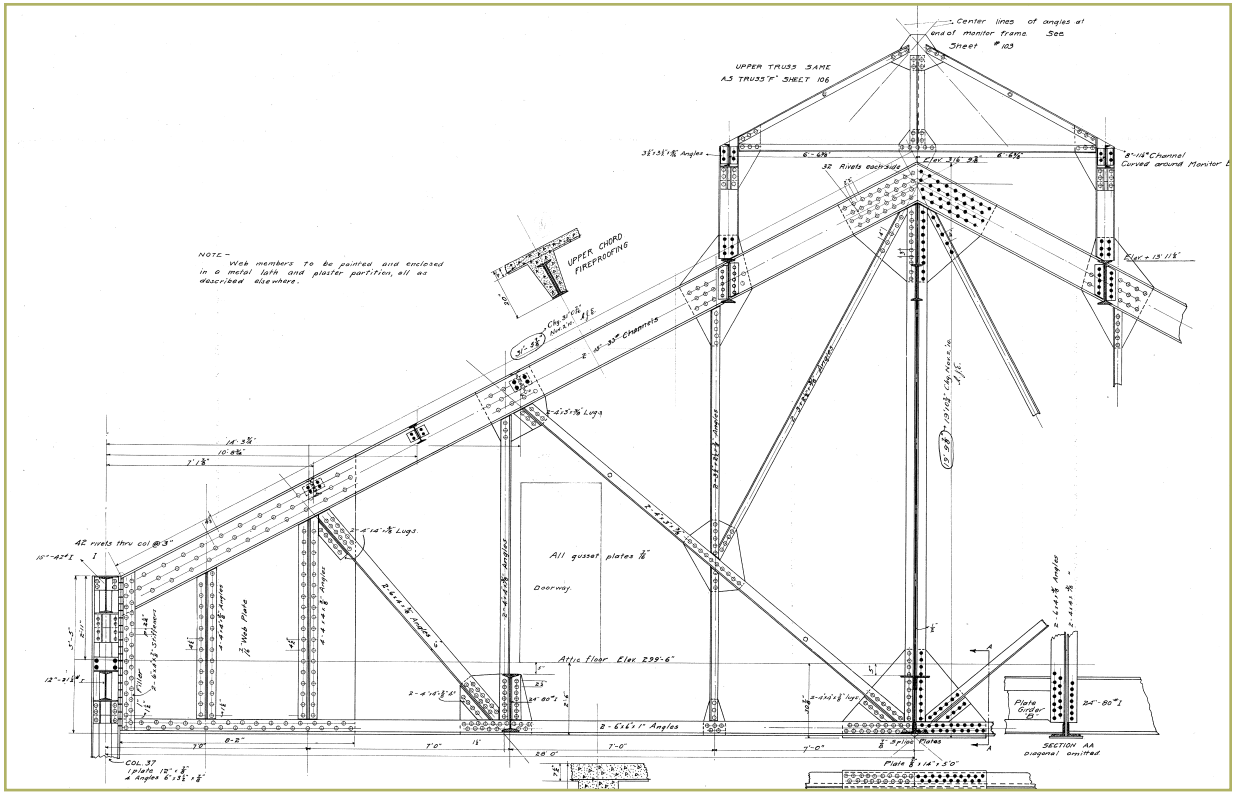
Our proposed approach for the historic ensemble, would be to restore the existing exterior facades of all three buildings, and to minimize any exterior changes. The current exterior condition of all three buildings is excellent. Exterior changes might be limited to required ADA access to a courtyard entry to the building, designed in a way to meet the Secretary's Standards, and repair to spalling concrete. We also recommend a more complete restoration of Wellman Hall to its original condition, including the reconstruction of the tiered lecture auditorium. If modern, more intensive lab uses are removed from Wellman, it will be easier to restore the historic character of the building. Giannini Hall would also be renovated in a way that preserves the integrity of much of the existing interior, keeping existing main corridors and the main entry lobby intact. It will not be difficult to retain the significant historic features identified in the historic structures report. For Hilgard Hall, preparing an HSR before making design decisions is crucial. Most likely, it can be assumed that the Secretary of the Interior guidelines will allow limited changes to the main corridors, the general spatial organization of the interior, or to sizeable or well-located spaces which are original, especially spaces with fine finishes and distinctive features. However, the College is interested in considering more dramatic spatial changes to the entry level, such as creating a two story open exhibit gallery or central college community gathering lobby. If it is possible to consider the three building ensemble as an entity, and if Wellman and Giannini receive a more restorationist approach, then the University may decide that more latitude is possible with Hilgard. An approach such as this should be reviewed with SHPO for their comment when subsequent design phases commence.

Much of the above could also apply to Mulford Hall, even though Mulford is not on the historic register, but could ultimately be deemed a contributing building in the historical framework of the campus. One can assume that if the rehabilitation of the building entails few changes to the design of the important exterior elements, it will probably not elicit great concerns about historical impacts. This is especially likely if the treatment of the three buildings listed in the National Register is historically sensitive. Since Mulford Hall has not been classified as historic, a major renovation that almost completely changes the interior would likely be less controversial than at the historic triptych. Even if the building were determined eligible to the California Register, an appropriate addition on the north side of the building could conform to the Secretary's Standards.

While Morgan Hall is not classified as historic and is not very likely to raise concerns even if the Master Plan proposes to change it significantly, it would be wise to discern what its original character and design intent were, and how they might be retained where possible, in case it is deemed significant at a later date.

Summary of Official Historic Status	
Wellman Hall **1912**	• National Register of Historic Places • California State Register • City of Berkeley Landmark
Hilgard Hall **1917**	• National Register of Historic Places • California State Register • City of Berkeley Landmark
Giannini Hall **1930**	• National Register of Historic Places • California State Register • City of Berkeley Landmark
Mulford Hall **1948**	Not presently listed on any formal register. Age (over 50 years) could call for historic evaluation to be done before major alterations.
Morgan Hall **1953**	Not presently listed on any formal register. Age (over 50 years) could call for historic evaluation to be done before major alterations.

Structural Upgrade Approach



Wellman, Giannini and Mulford Hall have been rated structurally poor. A poor rating indicates a significant hazard to life in a major seismic event. All three structures qualify for State retrofit funding and have priority for State funding, but it is uncertain when these funds will become available given the current uncertain economic climate. If structural retrofit work was to be completed today, it would be required to conform to the 2007 CBC which is less restrictive than what is required for new construction. We were cognizant of new work possibly triggering a seismic upgrade to meet current code, even if an existing building was rated fair. New construction must conform to current code, the 2007 California Building Code (CBC). Our study has made assumptions for a structural approach for each of the six buildings housing CNR departments given the extent of renovation and intended for the purposes of cost estimating. These assessments are based on similar structural building types, the review of previous structural reports and original drawings when available, and best engineering judgment based on the information available. No formal analysis has been completed. Our structural approach for each building is as follows:

Giannini Hall

In 2005/6, Giannini Hall was selected for seismic upgrade. At that time a structural design along with programmatic plan changes was completed to a design development level. Subsequently, that effort was put on hold. Now that the 2007 CBC code has been accepted, it is possible that a structural design completed today would result in reduced scope of structural work. However, this study relies on the previous design work for cost estimating. The structural design intent was to keep the historic exterior façade intact and to locate new shear walls interior to the building. The recommended structural upgrade was composed of new transverse and longitudinal interior shear walls that start at the basement level, with new spread footings, and extend to the bottom of the third floor structure. No shear walls were shown at the third floor. It appears that the concrete roof diaphragm is adequate and adequately connects to the third floor. In order to preserve existing interior historic finishes, especially along the corridor, we have assumed 12" thick concrete shotcrete applied to one side of existing walls. Steel collectors at each floor are added to drag lateral forces to the new shear walls.

Hilgard Hall

The building structural system, plan and section geometry are very similar to Giannini Hall. However, most likely because there are more existing redundant concrete shear walls located perpendicular to the main corridor, Hilgard is ranked fair. "Fair" is defined as likely to sustain irreparable damage, but not a collapse hazard and allows safe exit from the building. Even though seismic upgrade could be considered "voluntary" given the amount of investment proposed for a historic renovation, it is recommended that the work include a seismic upgrade to elevate the building to "good". "Good" is defined as more likely to be repairable after an earthquake. For the purposes of conservative cost estimating, we have assumed structural work similar to what is proposed for Giannini Hall — transverse and longitudinal shotcrete shear walls and associated spread footings at the interior of the building, keeping the exterior walls as is. However, it is possible that this work can be reduced. Already, the existing clay tiles have been seismically anchored to the roof in a recent roofing renovation.

Adhering to historic character aside, it is possible to cut

openings into the floor slab in order to create two story spaces. This would require additional steel beams to reinforce the new openings.

Wellman Hall

Wellman Hall will require major structural work to bring it up to a fair rating. This will most likely include interior transverse and longitudinal concrete shear walls similar to Giannini located so as to minimize disruption to historic finishes. No structural work is anticipated for the historic exterior except for the removal and re-anchoring of clay tile roofing and exterior stone finish at the walls. The existing skylight opening at the roof would require strengthening and connection to the concrete roof diaphragm. The reconstruction of the original tiered lecture seating would be done with steel.

Mulford Hall

A seismic retrofit of Mulford Hall could also be similar to the Giannini approach: new interior shear walls both transverse and longitudinal starting from the basement and extending, in this case, thru the attic to the roof since the roof is a wood diaphragm. If shear walls are thick and long enough, it may not be necessary to re-sheath the roof. Mulford has one set of columns running along the existing corridor which would receive the new concrete shear walls. If new additions are added to Mulford, seismic joints could be added to separate the new from the existing. Separation allows the existing structure to be analyzed without the additional load of the new structure which might trigger more stringent code requirements.

Morgan Hall

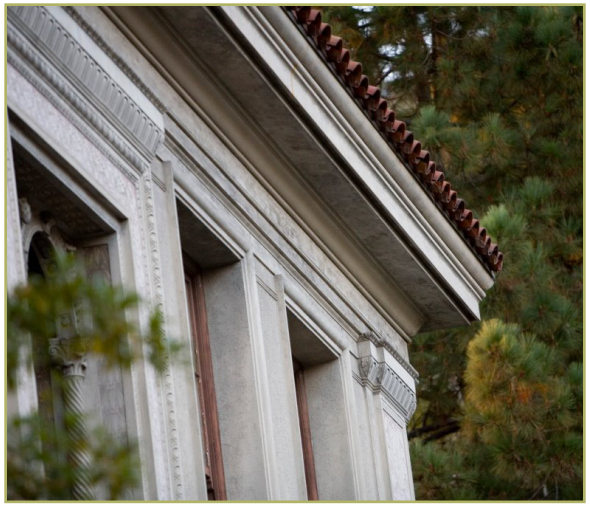
Even though Morgan Hall is rated as fair, an analysis of the existing building at the time of design, may require some structural upgrade. For the purposes of cost estimating, we have assumed a structural upgrade to achieve “good”, which would be voluntary. This would require transverse and longitudinal concrete shear walls spanning from basement through 3rd floor. If a new full 4th level is proposed that would replace the existing lightweight steel penthouse over half the third floor, this would also be a light frame steel structure that would minimize the new load, and would not increase the overall mass of the building by more than 5%. If this is achieved, then triggering a mandatory structural upgrade to meet current code for the entire building would be avoided.

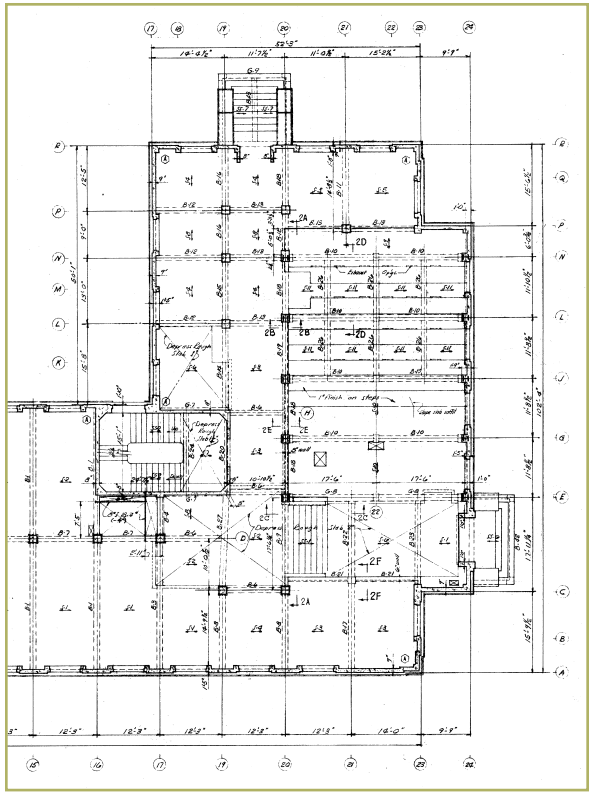
Koshland Hall

Since proposed work is so limited to this building, no structural work is anticipated. In the future, if more major work is proposed, it must also comply with 2007 CBC.

New Replacement buildings

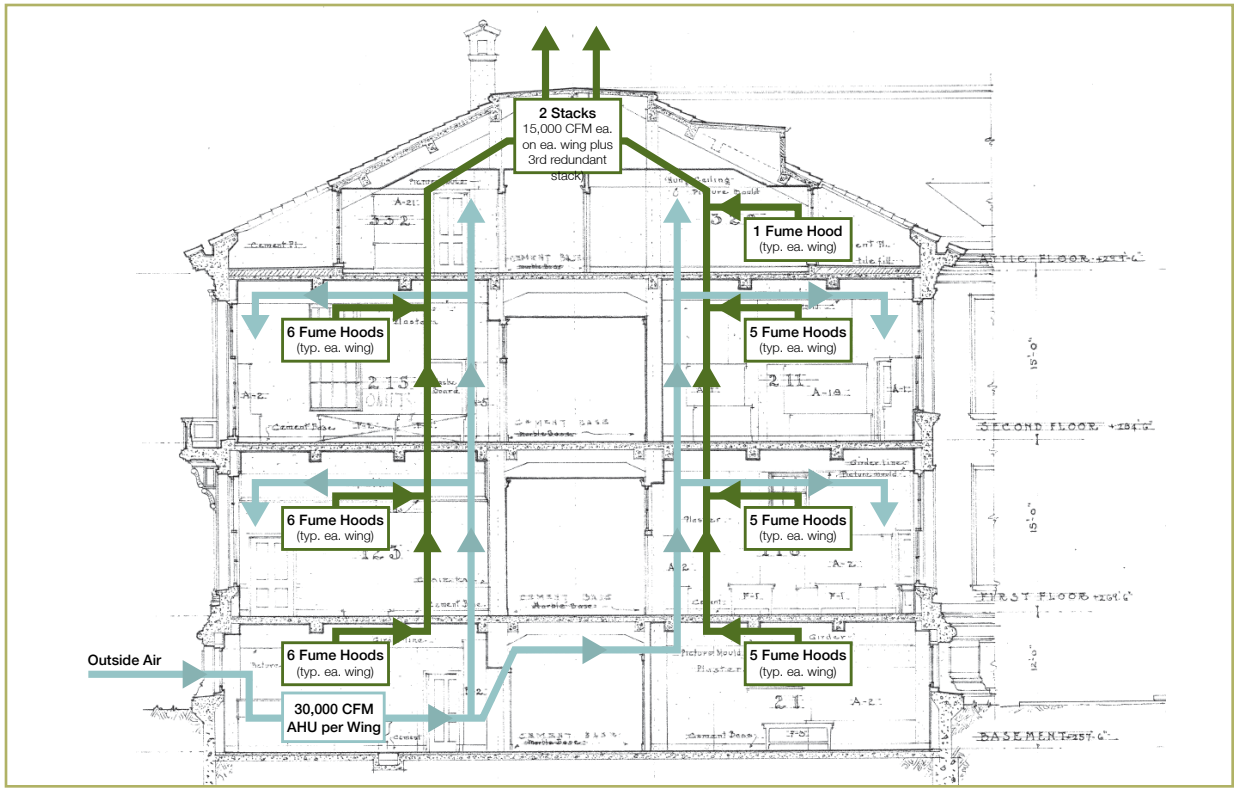
For the purposes of cost estimating, we have assumed that all new construction is a steel structure with steel brace frames to resist lateral forces (un-bonded braces) with shallow spread footings, metal floor decks and topping slabs. Heavy steel tonnage is assumed since the campus is in an earthquake fault zone.

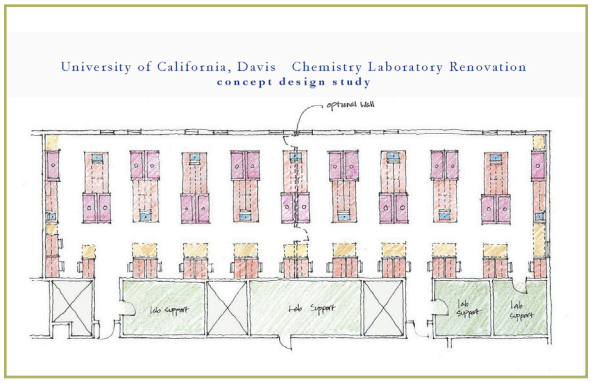




Mulford Hall framing plan

Laboratory Design Approach





The design approach toward an optimum lab renovation is usually driven by the preference of faculty, and the context of the existing building. Some faculty prefer segmented labs that they can better control, while others may prefer more open suites. Some researchers prefer their office to be adjacent to their labs, others prefer office suites grouped together and do not mind being more remote from their labs. One of the current trends in laboratory design is toward large open suites made up of bench modules for maximum flexibility and collaboration. Although this approach can be more challenging within existing buildings, most of the CNR departments expressed a desire for this level of flexibility. Ideally a researcher's lab will be able to shrink and grow, and the option to share lab space will improve. Since the nature of science will continue to change, the balance of different activities will also change. Computer and electrical use is up, while plumbing requirements are down. Already in the Department of Plant & Microbial Biology computer "benches" are replacing wet lab benches. In one lab, one half of their benches are wet lab benches and the other half are computer benches. At CNR, field-based research has increased which also influences lab planning. In all CNR departments the focus of research has become more lab-based. In line with this focus on high tech lab work the College intends ecology labs and wet chemistry labs to be somewhat interchangeable. As such there is a need for structural flexibility. While ecology labs have the least infrastructure intensive requirements and chemistry labs have the most intensive both formats can be structured in a flexible way that allows for both. Traditional, entirely fixed, bolted-down lab benches and furniture give way to more modular, movable units. Sinks and fume hoods will be fixed, but otherwise, benches and walls can be modular and adjustable.

Fume Hood Design

Ideally, a new lab building might have 3-4 fume hoods for each intensive wet lab, and an eco-lab might have two each. Given the existing CNR building geometries, it will be difficult to fully achieve these numbers without giving up assignable lab space. This report assumes that the number of existing hoods are accommodated in the new test fits plans with approximately sized vertical duct shafts. However, if additional hoods are required, more shaft and mechanical space will also be required.

In the next design phases, it will be important to carefully assess and balance the number of fume hoods, with the number of labs and amount of assignable space. The sharing of fume hoods might be considered as a way of reducing the overall number of hoods. A green building approach would not over-design for fume hoods as they are energy intensive, requiring more conditioned air.

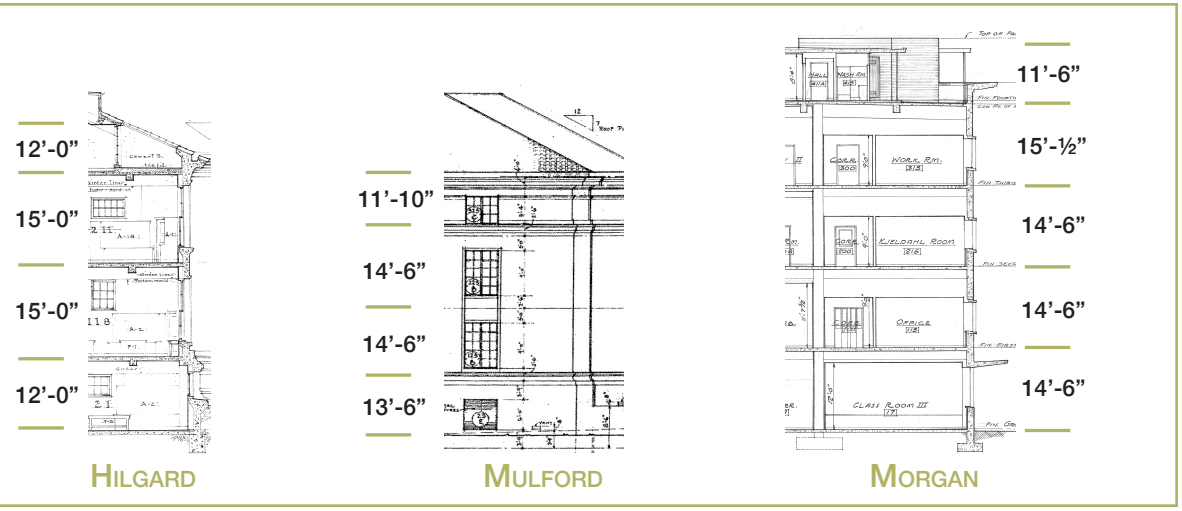
Code compliant fume hoods must extend at least 10'-0" above the highest point of the roof. For Hilgard Hall, this will not comply with historic guidelines, but will be required and most likely accepted in order to comply with life safety requirements. There will be at least two stacks that rise 10 feet above the roof of Hilgard.

Code

Even though Hilgard and Wellman are on the National Historic Register and have some code leniency in some areas due to the desire to preserve the original building character, the Campus Fire Marshal will enforce all life-safety code requirements regardless of historic status. For example, proper ventilation within a lab, protection of combustible materials, and exiting must be made code compliant. Fire sprinklers as a minimum must be installed and no cross ventilation is allowed across corridors between labs. Current code does not allow offices to exit through a lab space. Thus, offices must have direct access to the corridor.

The new 2007 California Building Code (CBC) has added an occupancy type L for lab use in addition to occupancy type B. Even though type L at first might seem to allow greater quantities of flammable and corrosive materials, it is our recommendation that any new or renovated CNR lab building project be designed to a B occupancy. Given the type of lab research at the College, and the size of the existing buildings, B occupancy is achievable. Type L occupancy is appropriate for buildings over approximately 200,000 sf; it is more expensive than a type B occupancy due to stricter chemical containment, mechanical system shut off requirements, and additional panic hardware. Determining the amount of chemicals used by each lab building is critical to establishing a code interpretation, from the occupancy type to the size of the emergency generator. A hazardous materials inventory must be made by the College, then presented to the Fire Marshal.

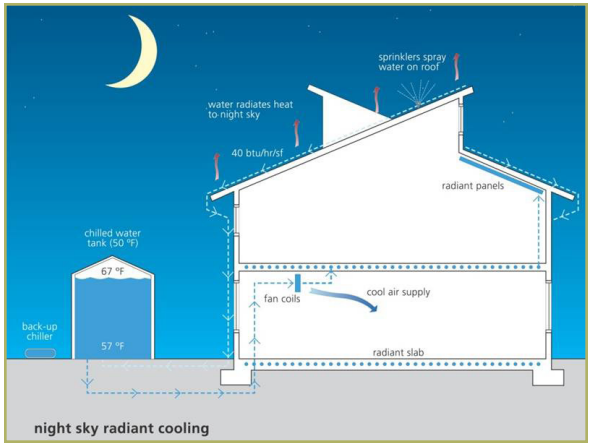
Existing lab floor-to-floor heights



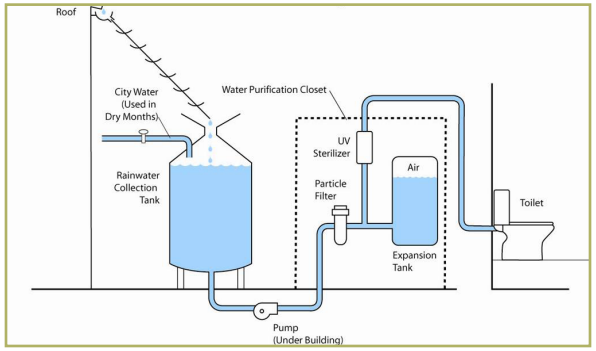
Historic Buildings

The vision of the College is to transform its historic buildings into cutting edge laboratories. Optimally efficient modern labs have a clarity of organization. As a rule of thumb, a good interior planning module for a new lab would be 11'-0" x 11'-0" with a minimum width of 22 feet (and minimum 30 feet length), and a minimum floor-to-floor height of 16'-0" (10'-0 clear from floor to ceiling). Using these guideline, we assessed the existing geometries of the CNR lab buildings. Both Hilgard and Mulford were originally designed as lab buildings. If most of the interior partitions can be removed, new labs can be redesigned to be open, contiguous and more efficient. It is fortunate that the lower 3 floors of Hilgard are approximately 24 feet in width each side of the corridor and the 4 lower floors of Mulford have approximately 24 feet of width on one side of the corridor. Less than optimum floor heights for both buildings will require more vertical shafts for mechanical ductwork and fume hoods. However, if new mechanical systems incorporate more green technologies and can separate the ventilation from the cooling system, ductwork can be significantly reduced in size. Minimizing the number of required fume hoods will also economize on ductwork and shaft size. Routing new plumbing, electrical and data infrastructure will not be a problem.

Renovation of these buildings should also consider the modern team-based scientific research and consider ways that faculty can informally interact. The College has expressed a preference for small clustering of faculty offices on the same floor as their associated research labs so that the opportunity for busy colleagues to see each other is built in. However, at Hilgard, another option is for most offices to be located at the top floor because of its narrower geometry and sloping ceilings that are more suited for office use. Informal open gathering places for both faculty and students to meet are also desirable, similar to the UCSF Mission Bay lab building model. There is great potential and opportunity to give CNR's historic buildings a new life, providing a model for lab renovation in historic buildings.



night sky radiant cooling



Mechanical, Electrical and Plumbing Systems

There are generally three types of spaces housed in the CNR buildings, each requiring different infrastructure needs. These assumptions are the basis for the projected construction cost estimates for mechanical, electrical and plumbing.

Offices and classrooms:

- Heating and ventilation only, no cooling
- Normal power and data

Large Classrooms and Lecture rooms:

- Heating, ventilation and cooling
- Normal power and data

Research Labs and Teaching Labs:

- Heating, ventilation and cooling
- Fume hood exhaust
- Lab sinks
- More intensive power and data
- Back-up emergency generator power

Since essentially all of the building infrastructure must be removed, and all mechanical, electrical, plumbing and fire sprinklers must be new, it is the opportune time to upgrade these buildings to exceed current energy standards, and become models for sustainable building. Currently, the University requires that all new and major renovation projects attain a LEED silver minimum rating. It is the goal of the College to go beyond this minimum, maximizing the energy efficiency of its facilities, going to the extent of establishing new metrics for lab buildings in historic buildings.

Offices, Classrooms and Other Non-Lab Spaces

It is suggested that all non-lab spaces be naturally ventilated (operable windows). For heating, steam radiators would be replaced by hot hydronic fin tube convectors at the perimeter; hot water for these heated by the central plant steam.

Labs

In order to achieve the goal of occupant comfort and health in a super-low energy building, several innovative mechanical systems must be incorporated into the building design. Even though existing CNR labs do not have air conditioning (cooling), most state-of-the art labs provide it and we recommend that it be incorporated into the lab renovations. However, designing energy efficient modern lab spaces are most challenging because they typically require 100% outside air for both cooling and ventilation. This usually requires large air handlers and ducts and large amounts of energy to reheat large amounts of outside air supplied to labs at the coldest worst case temperature. This wastes both heating and cooling energy.

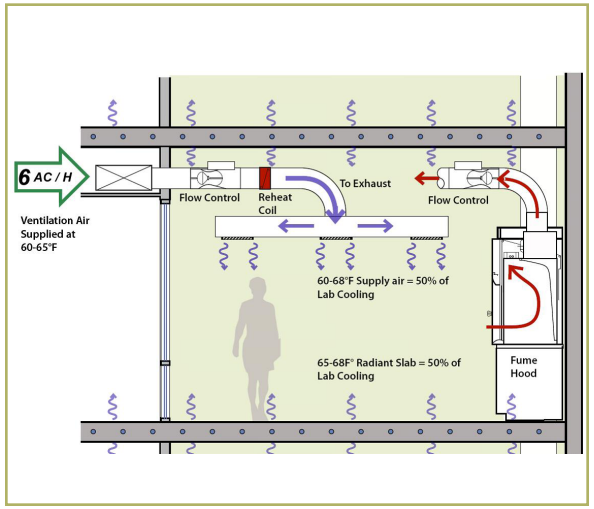
Key Issues

- New infrastructure should reflect the College's commitment to sustainable use of our global resources
- Lab buildings are typically high energy and water use buildings. Planning should incorporate cutting edge technologies and reduce resource consumption within a framework of longevity, ease of use, and maintenance.
- UCB mandate for LEED Silver rating and compliance with "Labs 21"
- Historic buildings: High mass structures are inherently energy-efficient but historical aspect makes it more difficult to achieve LEED Platinum level. Explore alternate quantification systems to demonstrate sustainability and reduced carbon footprint.
- Goal: Establish new metrics for laboratory use in historic buildings
- New buildings: LEED Platinum level is possible. Carbon Neutral is unlikely due to lack of space for renewable energy resources.

Our approach would be to deliver thermal comfort and ventilation independently. De-coupling these systems will permit optimized heating and cooling at the same time as optimized ventilation. Since the existing floor to ceiling heights are very limited, smaller ducts sizes will translate into more usable space. We suggest a system is described as follows:

- 100% outside air ventilation air handler for minimum safety required ventilation of 6 air changes per hour.
- "Chilled beams" integrated into the ceiling for additional cooling. A chilled beam system is a forced air system that has air passing over chilled water cooling coils. There is a 50% reduction in duct size relative to traditional systems.
- Chilled water would be provided by a cooling tower and a thermal energy storage tank most of the year, preferably underground. It may make more sense for multiple buildings to share a cooling tower & tank. For example Mulford, Hilgard and Wellman could share one cooling tower and tank sensitively located on grade, or below grade.

Chilled beams



- Steam radiators replaced by hydronic fin tube convectors at the perimeter; hot water for these is heated by the central plant system.
- Combined fume hood and general lab exhaust- this improves the indoor air quality and safety. Combining exhaust dilutes contaminants should anyone be exposed to exhaust air.

Summary of primary energy efficiency strategies

- 75% reduction in air movement fan energy for office levels and 50% reduction in air movement fan energy for lab levels.
- Separation of cooling from ventilation system
- Eliminate reheat of ventilation air
- Heat recovery ventilation
- Natural ventilation at non-lab spaces
- Hydronic radiant heating
- Nighttime cooling for non-lab spaces for buildings with attic spaces.
- Low pressure drop design - reducing friction in ducts and pipes which reduces fan/pump energy required.

Other sustainable and renewable systems approaches:

- Daylighting and low energy lighting
- Rainwater catchment system-recycling stormwater to toilets
- Low flow and dual flush plumbing fixtures
- Photovoltaics and solar collectors- this application most likely would be limited due to the existing tight site constraints, limited roof area, and protected historic character
- Ground source heat pumps for cooling — might be possible for buildings with more surrounding site area for bore holes. (One 25" bore hole can provide one ton of cooling.)
- Many other green technologies could provide demonstration and educational value.

Historic buildings

The first and foremost strategy for energy efficiency is to create the most effective envelope possible for reducing heat gain and loss for a building's inhabitants whether it is new construction or renovation. It is also important to acknowledge that "reusing" existing buildings has high sustainable value and will receive LEED credit for 95% building structure reuse and possibly 50% of the interior non-structural elements. Considering the site capacity for reducing heat gain surrounding a structure is also a factor. Fortunately, the concrete heavy mass walls and roof of Giannini, Wellman and Hilgard create an excellent envelope that is inherently efficient and more environmentally stable. Strategies for improving the building envelope include:

- Upgrading existing glazing to double glazing and improved shading coefficient, or adding a second interior window at historic buildings.
- Improving or adding wall and roof insulation
- Reducing infiltration at all doors and windows
- Provide addition landscaping to provide shading at west and south elevations and at Wellman Courtyard.
- Replace paving at Wellman Courtyard to reduce heat island effect.

Sea salt

Existing Buildings and Test Fits

EXISTING

Giannini Hall is in the best apparent condition of the historic CNR buildings. It has a beautiful entrance lobby with elegant light fixtures, elaborate stair railings and many other original features still in good condition. The rooms on the main floors have high ceilings and large windows. There is elaborate decorative detailing in metal and concrete on both the interior and exterior. Some exterior concrete details at windows and corners are cracked or broken off, but most are in relatively good repair.

The interior hallways on the first and second levels have been preserved in something like their original form, with high ceilings and large operable transom windows over wooden doors. Most of the windows in the building are operable, and are extensively used by the occupants for natural ventilation.

The shape of the building results in some inequalities in the rooms within: the offices off the central, straight part of the main hall are very large, but many of those at either end are peculiar triangular shapes that are difficult to use. Some third floor offices, tucked under the straight part of the sloping roof, have windows into recessed light wells that provide them with both daylight and views. The space under the roof eaves can only be used for storage.

- Office
- Admin
- Classroom, Conference, Student Commons
- Center, Library

Summary:

- Gross building area: 76,500 GSF
- Total ASF area: 46,300 ASF
- Efficiency factor: 60%
- Non-CNR: 8,775 ASF

PROPOSED

Office
Computer/Research Office
Administration
Classroom, Conference, Student Commons
Center, Library

Summary:

- Gross building area: 76,500 GSF
- Total ASF area: 44,500 ASF

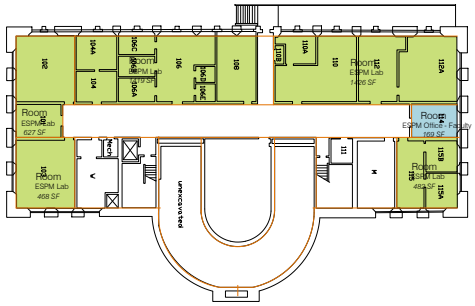
Renovation Scope:

- No change to footprint
- Seismic upgrade from POOR to GOOD
- Historic renovation
- Upgrade electrical
- Explore new HVAC, no cooling, heat/ventilation only

Program Description:

- CNR Dean's offices remain
- (13) S&E faculty offices and research offices
- (22) ARE faculty offices and research offices
- Giannini Foundation Library smaller
- Proposed plan relocates Howard Hughes, Wheeler Imaging Center & Electron Microscopy. Relocation is to be confirmed.

EXISTING



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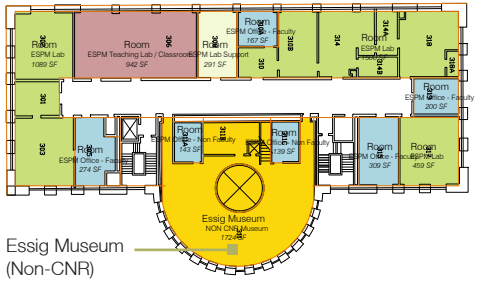

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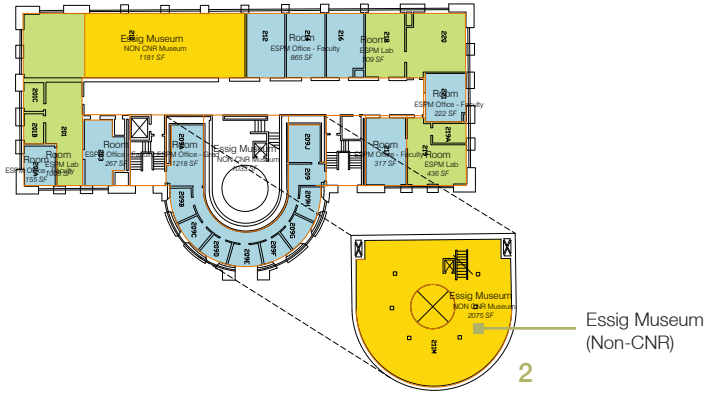

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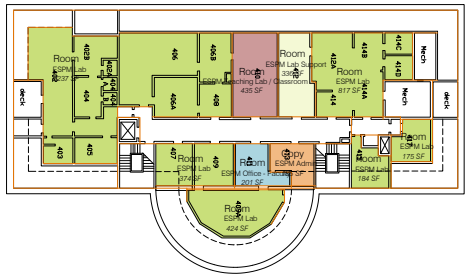

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Wellman Hall represents a great opportunity for the College of Natural Resources. With its prominent hilltop location, its grand entrance door facing across to the Life Sciences Building, its distinctive central cylinder shape and continuous monitor skylight, it has the potential to be developed into a signature building that would increase the visibility of the College on campus.

Currently, the prominent and memorable front door is locked, and serves as the back side of a graduate student cubicle. Entrance to the building in front is from either side of the drum, into small stair landings. From the back it is along an unremarkable service ramp off of the courtyard. The back entrance is accessible, but enters the building at a low, dark basement hallway.

Much of the space in the lower level is taken up by long banks of closed wooden cabinets.

The monitor skylight is completely invisible on the building interior, covered by a suspended ceiling in the top floor rooms and hallway. The great drum in the center, once a single tiered lecture hall filled with natural light from the high windows in the curved wall, has been divided into multiple low, cramped interior levels used for the storage of entomological samples in closed metal boxes.

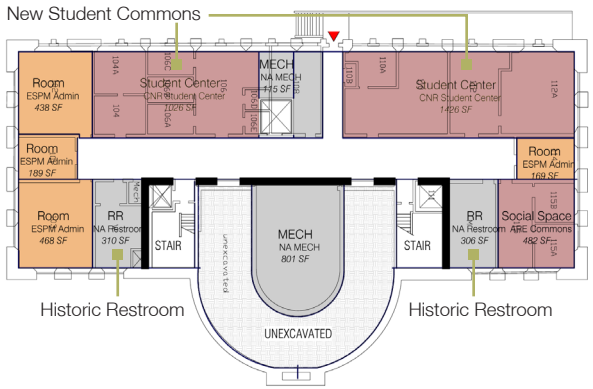
The spaces in the building that most closely retain their original historic materials and character are some of the restrooms, which, while attractive, do not conform with modern building code or accessibility requirements.

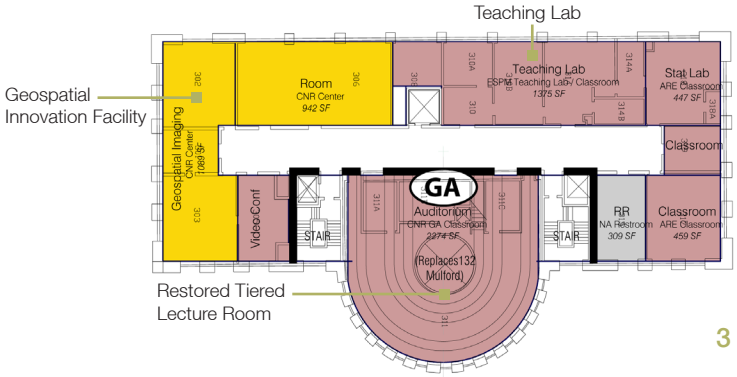
- Lab
- Lab Support
- Office
- Administration
- Classroom, Conference, Student Commons
- Museum

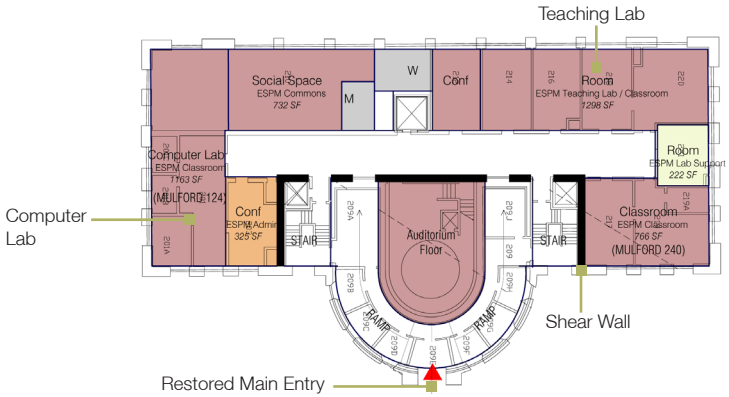
Summary:

- Gross building area: 41,150 GSF
- Total ASF area: 26,675 ASF
- Efficiency factor: 65%

PROPOSED







- Lab Support
- Administration
- Classroom, Conference, Student Commons
- Center

Summary:

- Gross building area: 38,700 GSF
- Total ASF area: 21,625 ASF

Renovation Scope:

- No change to footprint
- Seismic upgrade from POOR to GOOD
- High level of historic preservation
- Restore tiered lecture theater
- New HVAC, upgrade electrical, cooling in teaching labs, remote UG cooling tower, new emergency generator

Program Description:

- Restored lecture theater to replace Mulford 132
- (2) Teaching Labs @1,300 SF each
- (4) Classrooms
- CNR Student Commons
- Proposed plan contingent on approval to relocate Essig Museum

EXISTING

Hilgard Hall has an elaborately decorated exterior and a grand, though infrequently used, front door. The main stair is flanked by stanchions topped with ornate light fixtures. In practice, the primary entry is the central stair on the back of the building, facing into the courtyard enclosed on two other sides by Wellman Hall and Giannini. The accessible entrance is underneath the central back stair, into the lower level.

The interior hallways are wide and still retain many historic features, including original wooden doors and display cabinets. They are visually dominated, however, by retrofitted overhead ductwork. The ducts fill the entire overhead space in the hallways and enter the rooms through the glass transoms over the doors. Dim lighting contributes to a cramped and subterranean impression.

The lower level hallway is filled on both sides by solid wooden cabinets containing hundreds of soil samples in metal bins. On the upper floors there are glass-fronted cabinets displaying soil samples in glass jars, but they are difficult to see due to the low light levels.

The office spaces on the third floor are unusual and appealing. On one side of the hall they have outer walls of glass, and doors into sunken rooftop courts that bring natural light deep into the rooms. On the other side, smaller light wells recessed into the sloping roof serve as intimate balcony spaces attached to some of the rooms.

- Lab
- Lab Support
- Office
- Administration
- Classroom, Conference, Student Commons

Summary:

- Gross building area: 78,275 GSF
- Total ASF area: 46,675 ASF
- Efficiency factor: 60%
- Upper level most appropriate for offices
- Historic stair removed and ductwork added in 1960

PROPOSED: OPTION ONE

Historic Renovation

- Lab
- Lab Support
- Office
- Center

Summary:

- Gross building area: 78,275 GSF
- Total ASF area: 45,380 ASF

Renovation Scope:

- No change to footprint
- Structural improvement from FAIR to GOOD
- Historic Renovation
  Keep historic corridors
  Remove corridor ductwork
  Restore historic entry stair
- New HVAC, upgrade electrical
- Cooling in labs, remote UG cooling tower, new emergency generator
- Contiguous, flexible lab space

Program Description

- (17) Wet Labs @1,480 SF each
- (10) Eco-labs @ 980 each
- (27) Faculty offices
- Office suites each floor near labs
- Short on lab support space

FLOOR PLANS

Hilgard Hall

EXISTING

PROPOSED: OPTION TWO

Observatory Gallery

- Lab
- Lab Support
- Office
- Classroom, Conference, Student Commons
- Center

Summary:

- Gross building area: 78,275 GSF
- Total ASF area: 45,575 ASF

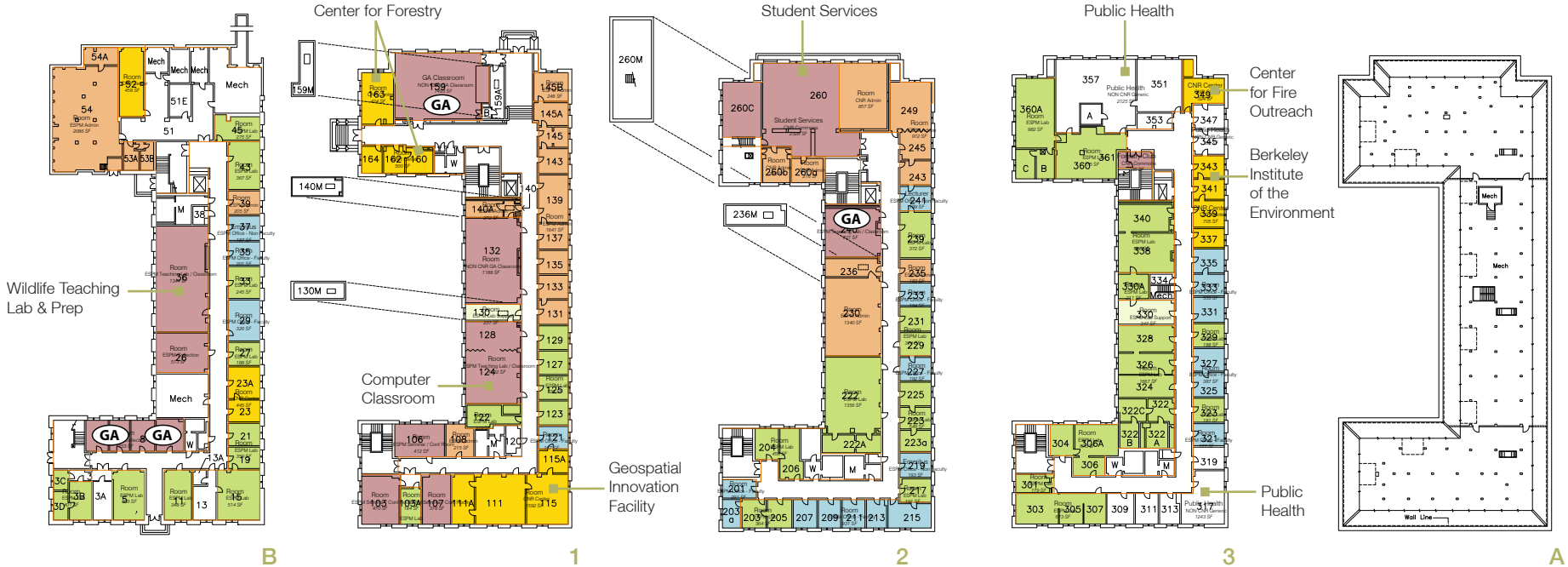
Renovation Scope:

- No change to footprint
- Structural improvement from FAIR to GOOD
- Historic Renovation with some latitude
  Remove corridor ductwork
  Restore historic entry stair
- Open up corridors at 2 levels for observation gallery
- New HVAC, upgrade electrical
- Cooling in labs, remote UG cooling tower, new emergency generator
- Contiguous, flexible lab space

Proposed Program Description:

- Open Gallery/two story space
- (15) Wet Labs @1,480 SF each
- (5) Eco-labs @ 980 each
- (20) Faculty offices clustered at 3rd level
- Short on lab support space

EXISTING



Mulford Hall contains some attractive recently renovated spaces, including a Student Affairs Office and computer lab on the first floor, and a natural history classroom on the lower level. The main hallway on the first floor is wide and well lit, and decorated with an educational display of planks from dozens of different species of trees. There is an elegant wood-paneled entrance area outside the entrance to the largest classroom.

The conditions in the rest of the building are much less appealing. The basement level hallway, in particular, is low and poorly lit. The lab spaces are crowded.

The environmental conditions in the building can be very uncomfortable. There are small offices on the sunny side of the building that are prone to overheating. On the exterior of the building there are individual cooling units visible projecting from many of the upper level windows, where they have been retrofitted in an attempt to improve comfort in those rooms.

An unusual feature of the building is its relatively tall and spacious attic, currently used for mechanical equipment and some electrical and telephone wiring, but largely empty. With some modifications, this space represents an opportunity to add some usable square footage to the building.

- Lab
- Lab Support
- Office
- Administration
- Classroom, Conference, Student Commons
- Center

Summary:

- Gross building area: 74,250 GSF
- Total ASF area: 46,600 ASF
- Efficiency factor: 66%
- High attic space- used for mechanical only

PROPOSED: OPTION ONE

Attic Expansion

- Lab
- Lab Support
- Office
- Administration
- Classroom, Conference, Student Commons
- Center

Summary:

- Gross building area: 83,000 GSF
- Total ASF area: 56,800 ASF

Renovation Scope:

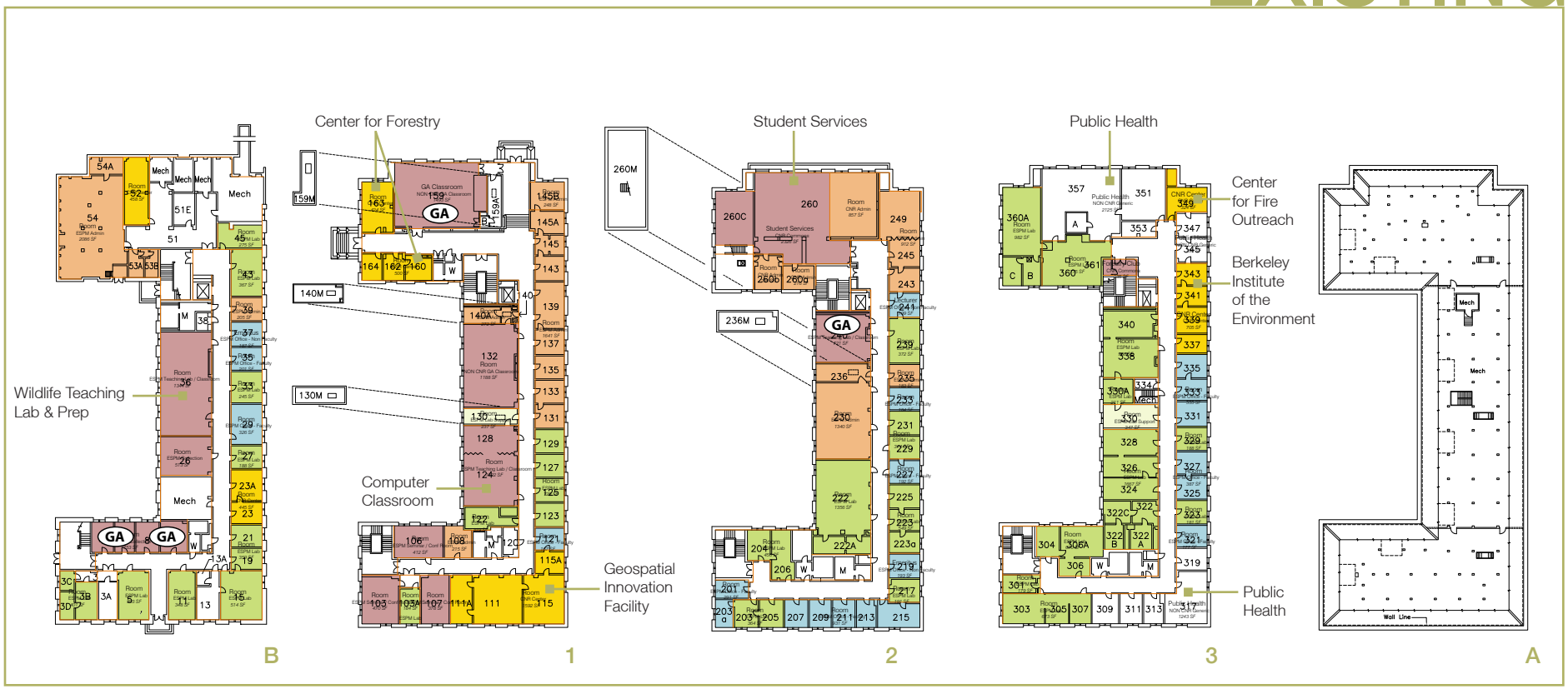
- No change to footprint
- Attic Expansion for new labs
- Seismic upgrade from POOR to GOOD
- Gut interior
- Contiguous, flexible lab space
- New HVAC, upgrade electrical
- Cooling in labs,
  Rooftop cooling tower
  New emergency generator

Program Description:

- (14) Wet Labs @1,480 SF each
- (12) Eco-labs @ 980 SF each
- (27) Faculty offices
- GA Classroom 159 remains
- Wildlife classroom remains
- Proposed ESPM plan contingent on Public Health approval and ability to relocate

FLOOR PLANS
Mulford Hall

EXISTING



PROPOSED: OPTION TWO

Addition

- Lab
- Lab Support
- Office
- Administration
- Classroom, Conference, Student Commons
- Center

Summary:

- Gross building area: 100,000 GSF
- Total ASF area: 67,400 ASF
- Addition footprint: 6,500 GSF

Renovation Scope:

- Mulford North Addition with light well
- Seismic upgrade from POOR to GOOD
- Gut interior
- Contiguous, flexible lab space
- New HVAC, upgrade electrical
- Cooling in labs,
  Rooftop cooling tower
  New emergency generator

Program Description:

- (10) Wet Labs @1,480 SF each
- (23) Eco-labs @ 980 each
- (33) Faculty offices
- New Student Gallery at north side
- Proposed ESPM plan contingent on Public Health approval and ability to relocate

EXISTING

Morgan Hall has a central location, accessible ground -level entrances, and some spaces that are currently being renovated to modern laboratory standards. It also has a couple of large classrooms, and more meeting and gathering space than the other College buildings.

A primary asset of the building is the large ground level patio, which contains mature trees and is bordered by an interesting decorative screen. A couple of meeting rooms open onto the patio, and together with it can be used for large College functions or breakout space from events.

The majority of the building, however, has comparatively primitive infrastructure and overloaded facilities. Space is at such a premium in the labs that it is literally difficult to walk through some of the rooms. Student desks are fitted in wherever possible, usually right next to lab equipment and chemical storage. The electrical system relies on obsolete fuses, and there is no backup emergency power. Building users have taped cardboard over ventilation grilles in some locations to avoid the fine grit delivered, with the air, through the mechanical system.

An unusual feature of the building is the top level penthouse apartment. The top floor cannot be reached from the elevator, or even the main stair. It is an isolated rooftop house, complete with kitchen, living room, bedrooms and space for a rooftop garden, originally created for performing experiments in a controlled home environment. The rooms are currently used by the Atkins Center for Weight & Health.

- Lab
- Lab Support
- Office
- Administration
- Classroom, Conference, Student Commons

SUMMARY:

- Gross building area: 56,775 GSF
- Total ASF area: 35,400 ASF
- Efficiency factor: 62%

PROPOSED

- Lab
- Lab Support
- Office
- Administration
- Classroom, Conference, Student Commons

Summary:

- Gross building area: 65,750 GSF
- Total ASF area: 40,500 ASF

Renovation Scope:

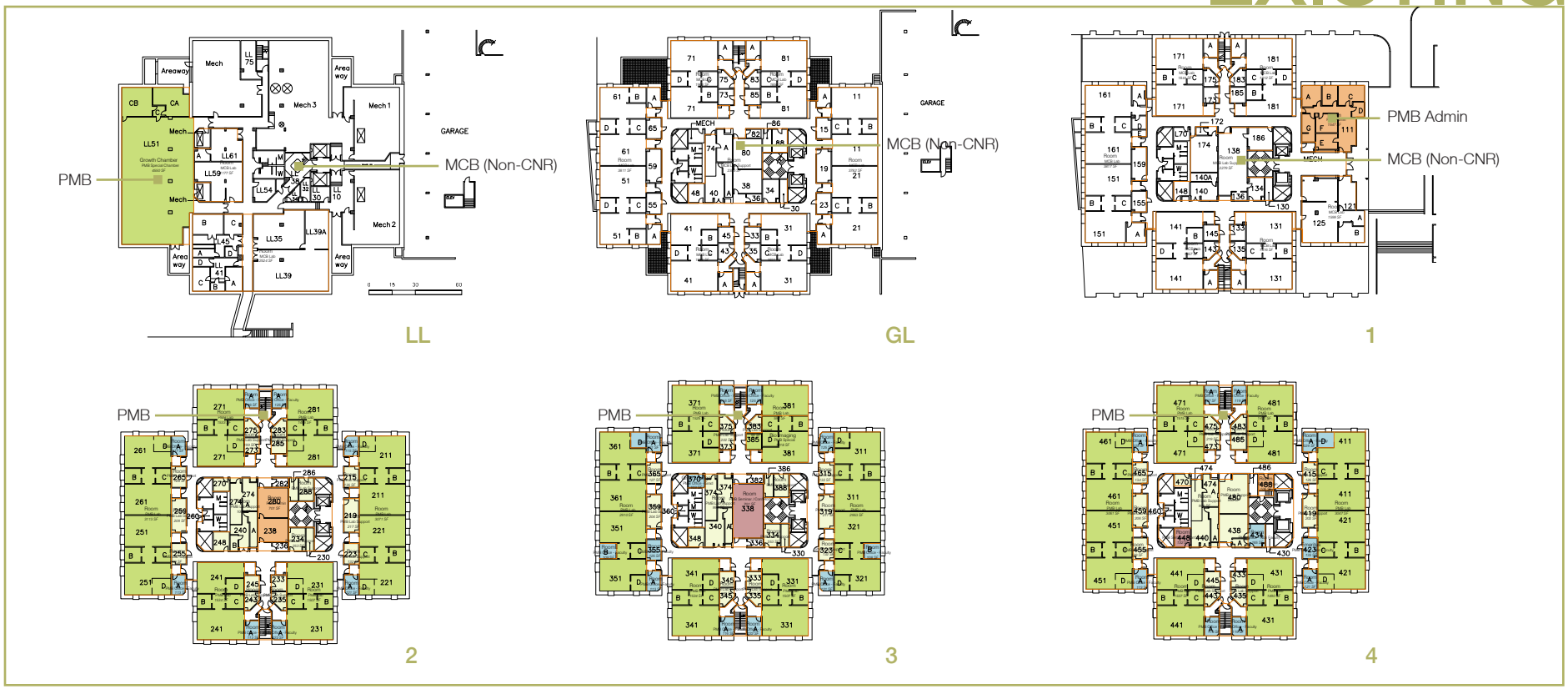
- No change to footprint
- New 5th floor Penthouse
- Additional floor above GA classroom
- Structural Improvements from FAIR to GOOD
- New HVAC, upgrade electrical
- Cooling in labs
  Rooftop cooling tower
  New emergency generator

Program Description:

- New Penthouse Addition — (4) new labs
- Expand NST lounge
- (14) Wet Labs @ 1,480 SF each
- (14) Faculty offices
- (2) New teaching labs

Koshland Hall

EXISTING



Koshland Hall is the most modern of the CNR buildings and comes the closest to meeting the programmatic needs of the College in its current condition. It is well lit and well organized, and easy to navigate. The main entrance is accessible at ground level. The dramatic stairwells are full of daylight. Lab support spaces are functional and logically arranged in central locations.

While it functioning acceptably, the part of the building assigned to CNR is currently at its absolute capacity. Lab spaces designed for two faculty members are being shared by three or four; every bench is filled with equipment, and every cubic foot of space is in use. There are only a few meeting spaces available in the building, and these are intensively used.

The electrical system is unique among the CNR buildings in having backup emergency power, but users report that it is operating at its maximum possible level of demand. A great deal of power is required for the continuous operation of the growth chambers in the building's lower levels. There are small supplementary cooling units mounted on countertops throughout the building, suggesting that the environmental systems are not quite adequate to the current need.

- Lab
- Office
- Administration
- Classroom, Conference, Student Commons

Summary:

- Gross building area: 151,600 GSF
- Total ASF area: 95,440 ASF
- Efficiency factor: 63%
- No teaching spaces at Koshland

PROPOSED

Entry Level

- Lab
- Lab Support
- Office
- Administration
- Classroom, Conference, Student Commons

Summary:

Note: 16,700 ASF is currently assigned to MCB at the entry level. Proposed PMB expansion is contingent upon MCB approval and ability to relocate

Renovation Scope:

- No change to footprint
- No structural work
- New labs replace existing at same location
- New lab casework and infrastructure connections
- New meeting rooms located at core
- HVAC and electrical adjustments at new labs

Program Description:

- PMB Admin remains
- (6) Wet Labs @1,480 SF each
- (6) Faculty offices
- Add dedicated classroom
- Add central social space
- Add central small meeting rooms

Summary of Options

Mangrove restoration project in Senegal

SUMMARY OF OPTIONS

The concept program developed in this master plan study suggests that the projected assignable area for the College should increase from approximately 233,000 ASF (existing), to approximately 250,000 ASF (proposed) — a relatively minor increase of approximately 16,500 ASF.

Our recommended approach to improving CNR's facilities and accommodating the proposed additional assignable area is very practical and straightforward. The CNR buildings fall into three categories:

1. Minimal Scope

There is general agreement that Koshland Hall, which houses Plant Microbial Biology (PMB) has acceptable infrastructure and any expansion of PMB could be made within the existing building geometry if space becomes available.

2. National Historic Register

Since Giannini, Wellman and Hilgard are on the National Register for Historic Places, our renovation approach is to provide new infrastructure without substantially changing the basic corridor configurations, and protecting the exterior facades. The site is so constrained that new additions to these buildings are not being considered.

3. Major Renovation

Mulford Hall and Morgan Hall are not historically protected buildings thus additions and/or entire replacement are both viable alternatives. Both buildings can accommodate more intensive laboratory use since more extensive renovation is possible and can more easily accommodate the associated infrastructure.

In all cases, in order to optimize the existing available building area, our master plan goals are to:

- Maximize existing available area by relocating non-CNR departments if possible
- Consolidate and share departmental spaces, in particular administrative office space
- Reconfigure existing available space so that it is more functional, flexible and multipurpose
- Maximize research lab space and lab support space
- Provide modern building infrastructure that is energy efficient and maximizes the amount of assignable space

CONCEPT MASTER PLAN OPTIONS

Koshland Hall, Morgan Hall, and Giannini Hall can each be considered "stand-alone" projects. Each building houses a complete department: Koshland houses PMB; Morgan Hall houses NST; Giannini houses both ARE and ESPM-S&E. Each generally does not depend on other building spaces for research use. The one exception to this is that NST currently uses the ESPM teaching labs located in Hilgard Hall. However, the renovation project for Morgan Hall proposes new additions adequate to provide NST with two new teaching labs.

Currently, Wellman, Hilgard and Mulford together house the laboratory-based divisions of ESPM (ES and O&E). It is not possible to locate all of the required wet labs into one building. Thus, it is necessary to consider all three of these buildings together, although it is not required that they be constructed all at once. It has long been discussed, and this study concurs, that Wellman would be best suited to become a student and administrative center requiring the removal of its existing research labs. Its plan configuration, size, and historic restrictions make it difficult to provide modern labs. Wellman is considered one of the most treasured architectural gems on campus, and the symbolic gateway to the Northwest quadrant. The restoration of the original tiered classroom and the addition of a curved south-facing terrace at a newly restored south entry would all enhance Wellman's place as the heart of the CNR community. The renovation of Wellman Hall could also take a restorationist approach that more strictly follows the Secretary of the Interior Guidelines.

Once all of the research labs are removed from Wellman, Hilgard and Mulford must then fit all of them, along with lab support space and faculty researcher offices. Since it is assumed that historic Hilgard Hall will not be expanded, it follows that any expansion requirement will depend on Mulford Hall. This study proposes two options for the renovation of Hilgard and Mulford.

Building Projects:

- Koshland **$10-12 M**
- Giannini **$36-40 M**
- Hilgard & New Terrace *27 Labs* **$59-65 M**
- Morgan Renovation & Addition *14 labs* **$49-54 M**
- Wellman Student Center & New Patio **$26-29 M**
- Mulford Renovation & Expansion *26 Labs* **$66-73 M**

Option 1

This option maximizes the number of research labs in both buildings. Hilgard's historic corridors remain intact. The Mulford plan is completely reconfigured for maximum labs, and renovates the existing attic space on the North side thus increasing the building area by approximately 9,000 gross SF. There is no change to the footprint of Mulford.

Site Improvements:

1. Wellman Courtyard **$8.5-9.5 M**
2. Pat Brown Courtyard **$2.5-3 M**
3. Morgan-Hilgard Link **$1-1.5 M**

Site Utility phased upgrades for entire Quad **$9-11 M**

SITE DIAGRAMS

Option 2

Building Projects:

- Koshland **$10-12 M**
- Giannini **$36-40 M**
- Morgan Renovation & Addition *14 labs* **$49-54 M**
- Hilgard w/Observation Gallery & New Terrace *20 Labs* **$59-65 M**
- Wellman Student Center & New Patio **$26-29 M**
- Mulford Renovation & Expansion *33 Labs* **$80-88 M**

Option 2

This option takes a more lenient approach to the historic renovation of Hilgard. Upon entry, a two-story open "observation gallery" is envisioned that would become an important college gathering place, a public exhibition hall showcasing CNR research. This approach reduces the amount of lab space at Hilgard. As a result, Mulford must pick up the rest of the required lab count. Option 2 Mulford proposes a new four story addition on the north side of the existing building, without an attic expansion. The proposed plan also provides additional student social spaces and a prominent entry connection to the north plaza. The addition adds approximately 6,500 GSF of footprint, and 26,000 GSF total.

Site Improvements:

1. Wellman Courtyard **$8.5-9.5 M**
2. Pat Brown Courtyard **$2.5-3 M**
3. Morgan-Hilgard Link **$1-1.5 M**

Site Utility phased upgrades for entire Quad **$9-11 M**

Building Projects:

- New Teaching Pavilion **$36-40 M**
- New Morgan **$62-68 M**
- New Mulford **$88-97 M**

New Construction and Replacement Buildings

New buildings will be designed to meet current code and also to meet a LEED Silver rating required for all UCB projects. During the concept phase, options for a higher rating will be explored. A new building Gold might add 2-5% more cost. Platinum will carry a premium cost of 5% minimum, and if the project is a high profile project including features such as rainwater retention, windmills, or ground source heat pumps, the cost premium could go as high as 25%.

A building replacement option is included for the purposes of comparison to the renovation schemes. The new building size for Morgan Hall matches the size of the renovation and expansion option, and a new Mulford Hall matches the area of Option 2 renovation and addition. Both new buildings assume the same number of floors as the existing buildings.

AREA SUMMARY

College Recommendation

In summary, there are renovation projects proposed in the master plan for all six buildings that house CNR departments, from the more modest Koshland Hall improvements, to the major addition to Mulford Hall. However, the prioritization of projects is driven by the College's strategic vision — its desire to build upon the legacy of its historic structures and to further critical research centered around global environmental issues. There are three projects that float to the top:

1. **Hilgard Hall:** A renovation that will be a sustainable model for historic buildings and modern research labs (option 1 or 2)
2. **Wellman Hall:** A historic restoration that will transform Wellman into a new student and administration center
3. **Mulford Hall:** A renovation or replacement project for cutting-edge research that aims for a LEED Platinum rating (option 1, 2 or new building)

The College is recommending to the University that the Hilgard Hall renovation project, option 2, be its first priority in the master plan and the first phase to be implemented. Hilgard is in the greatest need for lab improvement and has immense potential to become a sustainable model for lab research in historic buildings. The renovation of Mulford or the construction of a new Mulford Hall would be required as a subsequent phase in order to accommodate ESPM's lab requirements.

Department	Existing Area *(ASF)*		Concept Program *(ASF)*	Option 1	Option 2	Location
A. College of Natural Resources						
1. Dean's offices	8,829	Giannini	8,829	6,150	6,150	Giannini
2. Student Resource Center	2,467	Mulford	2,500	2,452	2,452	Wellman
3. CNR Centers	5,850		5,818	6,498	5,890	Varies
Subtotal	17,146		17,147	15,100	14,492	
B. Department of Environmental Science, Policy, & Management						
Administration offices	7,539	Mulford	7,500	6,952	6,952	Wellman
Teaching labs and dept classrooms	8,926	Mulford Hilgard Wellman	9,592	10,345	11,753	Mulford Wellman
Social space/commons	0	-	500	732	2,049	Mulford Wellman
Observatory Gallery		-		0	2,050	Hilgard
Research labs (includes grad area)	62,005	Mulford Hilgard Wellman	63,940	64,654	66,226	Mulford Hilgard
Lab support	6,710	Mulford Hilgard Wellman	12,788	10,942	12,283	Mulford Hilgard
Faculty offices-other divisions	12,318	Mulford Hilgard Wellman	7,080	10,898	12,835	Mulford Hilgard
Faculty offices - S&E	8,210	Giannini	1,560	2,630	2,630	Giannini
S&E computing office + grad space	incl. above	Giannini	5,680	5,383	5,383	Giannini
Faculty conf. rooms	1,074		1,080	1172	2,608	
Subtotal	106,782		109,720	113,708	124,769	
C. Department of Agricultural & Resource Economics						
Administration offices	3,117		3,117	3,122		
Teaching labs and dept classrooms	601		2,100	2,824		
Grad student instructors	0		650	756		
Giannini Library	3,791		2,525	2,746		
Student commons	0		500	482		
Research computer labs	10,089		9,200	9,232		
Conference	355		350	346		
Faculty offices (including p/t)	incl. above		3,360	4,728		
Subtotal	17,953	Giannini	21,802	24,236	same as Option 1	Giannini

Department	Existing Area *(ASF)*		Concept Program *(ASF)*	Option 1	Option 2	Location
D. Nutritional Science & Toxicology						
Admin offices & conf. rm 114	4,033		4,033	3,915		
Teaching labs and dept classrooms	1,560		3,640	4,786		
Student spaces	0		0	0		
Research labs (w/grad area)	19,787		20,720	20,679		
Lab support	4,208		4,144	4,866		
Faculty offices	3,210		2,040	2,843		
Faculty conf. rooms	357		700	976		
Subtotal	33,155	Morgan	35,277	38,065	same as Option 1	Morgan
E. Plant & Microbial Biology						
Administration offices	2,335		2,335	2,355		
Teaching labs and dept classrooms	0	Genetics & Plant Biology	2,580	1,600		
Student spaces	103		590	2,423		
Research labs (w/grad area)	35,396		41,608	48,396		
Lab support (inc growth chamber)	14,296		12,176	15,646		
Faculty offices	3,711		3,552	4,359		
Faculty conf. rooms	832		832			
Bio Imaging facility	1,018		1,460	1,018		
Subtotal	57,691	Koshland	65,133	71,797	same as Option 1	Koshland
TOTAL NET AREA	**232,727**	**ASF**	**249,078**	**262,906**	**273,359**	

General Assignment (GA) Classrooms	Existing	Program	Option 1 and 2
Mulford Rm. 159	1,493	1,493	1,750
Mulford Rm. 6, 7 & 240	1,188	1,188	deleted
Giannini Rm. 141	872	872	872
Morgan Rm. 101	1,555	1,555	1,555
Morgan Rm. 103	706	706	706
Giannini Rm. 201	672	672	672
Giannini Rm. 332	441	441	441
Wellman restored tiered classroom			2,275
	6,927 ASF	6,927	8,271

Paradermal section of Quercus leaf showing tufted trichomes.
Image courtesy of Uma Ganesan of the Jackson Lab.

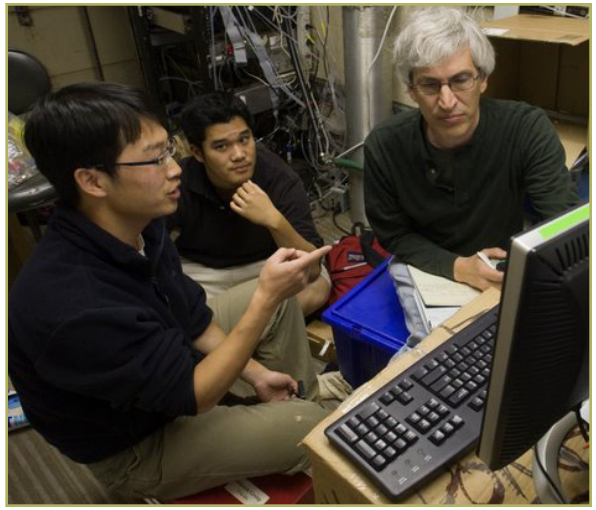
Project Budget

PROJECT BUDGET

Conceptual Budget Assumptions

The construction cost estimates presented in this master plan report are for the purposes of project budgeting and are intended for use as a guide for future planning and fundraising. They take into account as much detail as is available about the project at this time, and are based on discussions with the College, the conditions of the existing buildings, the concept test fit plans, and assumptions for:

- Structural upgrade
- ADA and other code upgrades
- Historic restoration/renovation
- New mechanical, electrical and plumbing infrastructure
- New research lab requirements including built-in bench casework, fume hoods, autoclaves, washers, cold rooms, freezers
- Architectural quality and character
- Site improvements
- LEED Silver



Other Project Costs

In order to properly plan for a project budget, it is important to include all of the project costs in addition to site and building construction costs. These costs typically include as a minimum:

- Construction and Project Contingency
- Professional fees for design and engineering
- Construction management fees
- Owner costs including soils report, surveys, permits, testing & inspections, utility connection fees, historic structures report, preconstruction services, commissioning
- Furniture Fixtures & Equipment (FF&E) including movable lab equipment, audio-visual equipment, and telecommunications equipment
- Temporary surge facilities and moving costs
- Parking replacement fees
- Premium for phased construction

Escalation

The project budget is based on a construction cost estimate stated in 2009 dollars. Escalation is not included in the project costs but should be added to the cost estimate, starting at the end of 2009 and extending to the estimated time of bidding when a project is approved to move forward. At this point in time, an escalation factor of 2-3% per year would be appropriate for the next 1-2 years. By 2012, escalation is likely to return to 4-5% per year. Escalation factors should be reviewed as the project progresses and should be updated to reflect actual market conditions. Higher levels of escalation are expected for lab buildings. It should be noted that if a project was approved to proceed today (2010), it could be at least two years of design and approval process before construction would commence.

Conceptual Estimates

PROPOSED PROJECTS
Construction
Prime construction contract (O/L)
Other non-prime contract construction
Site clearance, development, utilities beyond prime contract
Non-construction project costs
Arch/eng fees, management, inspection, surveys, testing, planning, CEQA, agency fees, commissioning, preconstruction services, BIM, value engineering
Contingency
Subtotal, 2009
Furniture, fixtures, equipment allowance (E)
Total, 2009
Parking replacement at Wellman courtyard (38 of 42 spaces assumed)
Recommended budget range for above items, 2009

State Funding for Seismic

State funding for seismic renovation of campus buildings that are ranked “poor” has been available at campus discretion in terms of amount and priority. There is significant uncertainty when there will be funding for these projects in the future and how much it will be.

In the draft 2009 Capital Plan, CNR-occupied facilities are projected to receive state funding as shown on the Budget Funding Timeline on the following page.

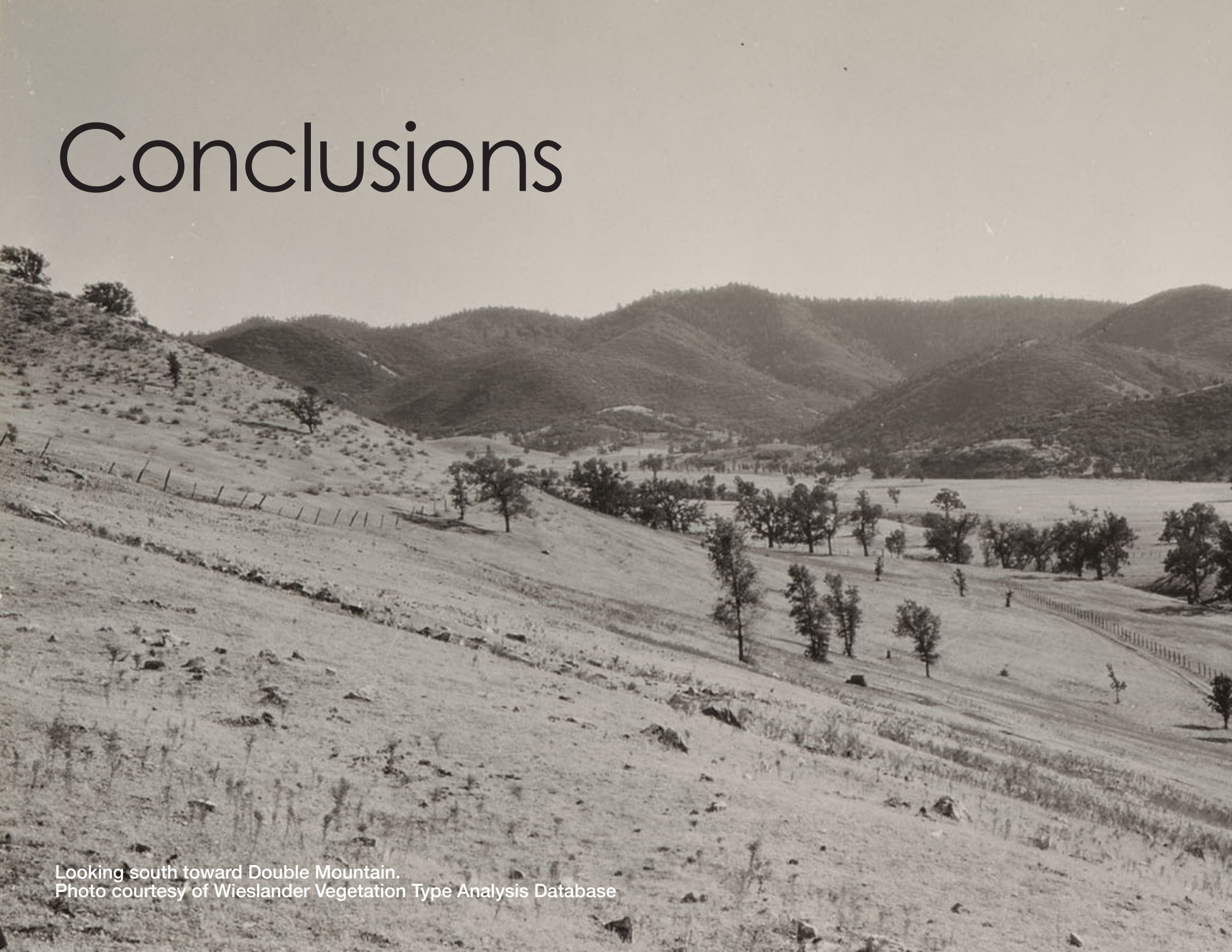
	Giannini Hall Renovation	Wellman Hall Renovation and Terrace	Hilgard Hall Renovation and Terrace Option 1	Mulford Hall Renovation and Expansion Option 1	Hilgard Hall Renovation and Terrace Option 2	Mulford Hall Renovation and Addition Option 2	Morgan Hall Renovation and Expansion	Koshland Hall Minor Modifications	Mulford Hall Replacement	Morgan Hall Replacement	Teaching Pavilion	Hardscape-Landscape Improvements*	Site utilities: phasing and upgrades
	77,000 GSF	*39,000 GSF*	*78,000 GSF*	*83,000 GSF*	*78,000 GSF*	*100,000 GSF*	*65,000 GSF*	*25,000 GSF*	*100,000 GSF*	*65,000 GSF*	*35,000 GSF*		
	25M	**18M**	**43M**	**47M**	**43M**	**59M**	**34M**	**7M**	**65M**	**44M**	**25M**	**8M**	**7M**
	22M	15M	37M	41M	37M	52M	31M	6M	59M	39M	22M	Wellman C - 4M H-M Conn - 1M P. Brown C - 2M	6M
	2M	2M	4M	4M	4M	5M	2M	1M	4M	3M	2M	1M	0
	1M	1M	2M	2M	2M	2M	1M		2M	2M	1M		1M
	10M	**7M**	**15M**	**18M**	**15M**	**20M**	**13M**	**3M**	**22M**	**17M**	**10M**	**3M**	**3M**
	7M	5M	10M	12M	10M	13M	9M	2M	14M	10M	7M	2M	2M
	3M	2M	5M	6M	5M	7M	4M	1M	8M	7M	3M	1M	1M
	35M	**25M**	**58M**	**65M**	**58M**	**79M**	**47M**	**10M**	**87M**	**61M**	**35M**	**11M**	**10M**
	2M	2M	3M	3M	3M	3M	3M	1M	4M	3M	2M		
	37M	**27M**	**61M**	**68M**	**61M**	**82M**	**50M**	**11M**	**91M**	**64M**	**37M**	**11M**	**10M**
												Wellman C - 2M	
	36M to 40M	**26M to 29M**	**59M to 65M**	**66M to 73M**	**59M to 65M**	**80M to 88M**	**49M to 54M**	**10M to 12M**	**88M to 97M**	**62M to 68M**	**36M to 40M**	**12M to 14M**	**9M to 11M**

Building Funding Timeline

Building	Date	Budget Amount
Mulford	2014-2019	$49.2M
Wellman	2014-2019	$23.3M
Giannini	timeline pending	not identified in plan

Note: projects are identified in ranges in second 5 years of 10-year plan; since little money is anticipated this year or next you may want to assume at least 2 years of lag time (e.g. 2017-2019).

Conclusions



Looking south toward Double Mountain.
Photo courtesy of Wieslander Vegetation Type Analysis Database

CONCLUSIONS

This plan represents a range of possibilities for future physical development at CNR, providing a framework to guide on-going discussions about the school's needs. The plan was developed through an interactive process of interviews and focus groups. That process yielded a detailed analysis of program deficiencies as well as a range of options that seek to address those deficiencies. All of the options align with the mission to serve "society by generating and disseminating knowledge in the biological, physical, and social sciences in order to provide the tools to both protect the Earth's natural resources and ensure economic and ecological sustainability for future generations.. " and the strategic goals to:

- Preserve the College's historic buildings
- Create cutting-edge research facilities that are models of sustainability
- Facilitate inter-departmental collaboration and interaction
- Create a sense of community — both locally and globally

The renovation projects proposed in this strategic master plan cover all six buildings that house CNR departments, from the more modest Koshland Hall improvements to a major addition to or new construction of Mulford Hall. Their priority is driven by the College's strategic vision — its desire to build upon the legacy of its historic structures and to further critical research centered around global environmental issues.

The three potential projects/funding opportunities that most clearly aligned with strategic goals and priorities are:

1. Hilgard Hall: A renovation that will be a sustainable model for historic buildings and modern research labs (Option 1 or 2)
2. Wellman Hall: An historic restoration that will transform Wellman into a new student and administration center
3. Mulford Hall: A renovation or replacement project for cutting-edge research that aims for a LEED Platinum rating (Option 1, 2 or New Building)

While the College might choose to pursue other components of the strategic vision as funding and research dictates, of the projects the Hilgard Hall renovation option 2, appears to have the clearest alignment with the strategic vision and is a stated goal of current CNR administration as a first priority in the phasing of the master plan components followed by Mulford and Wellman. Hilgard is in the greatest need for lab improvement and has immense potential to become a sustainable model for lab research in historic buildings.

It is expected that over the coming months and years, the ideas presented in this plan will be tested, evaluated and modified, but will continue to serve as a vision and framework for the on-going design process — aligning CNR's strategic academic vision with their facilities and further establishing CNR as a preeminent and transformational leader on global environmental issues.

Next Steps

As the planning process moves forward, the following items are suggested as next steps. The tasks can be sequential, overlap or be undertaken simultaneously as the ideas in this plan continue to be tested, refined and developed. Once approved and funded, the identified projects could proceed through final design and campus approvals and begin construction.

1. Refined Strategic Facilities Plan
    - Finalize unresolved items, assumptions, program modifications and other parameters that may have changed.
    - Refine basic phasing implications; refine costs.
    - Prepare additional presentation materials, graphics and models to educate stakeholders and engage potential donors.
    - Prepare a detailed concept plan and phasing analysis that considers issues including surge options, construction operations and schedules and the academic calendar year.
    - Refine estimate of construction costs for each phase of construction.
2. Additional Technical Assessment
    - Conduct formal Historic Structures Report (HSR) on Hilgard and additional historic evaluation on Mulford.
    - Conduct chemical inventory to determine occupancy type.
    - Conduct more robust technical due diligence including MEP, fire protection, ADA, life safety and other Building Code assessments of the existing buildings. Confirm that existing conditions coincide with baseline assumptions. Propose strategies to correct any existing deficiencies as part of the master plan elements.
    - Prepare accurate “as-built” drawings in AutoCAD based on the original construction documents and confirmed in the field.
3. Planning, Programming, and Schematic Design for Projects
    - Develop detailed program with department users, confirming lab requirements including number of hoods, and defining lab support space.
    - Begin concept design on Hilgard, Wellman, or Mulford projects.
    - Determine physical limitations for the extent of potential North addition for Mulford Hall (i.e. locate existing underground garage structure, determine required vehicular access, etc).
    - Detailed Structural Analysis to develop extent of structural upgrades.
    - Hold a sustainability workshop to clearly identify sustainable building initiatives and establish a set of goals that inform the design.

“To Rescue for Human Society the Native Values of Rural Life.”

The attic of the west elevation was planned to contain an inscription which President (Benjamin) Wheeler and (John Galen) Howard at first wanted to apply to the work of Professor Eugene Hilgard, the first Dean of the College of Agriculture (1874-1904), but they could not come up with an appropriate motto. In April (1918), Howard suggested, "Given by the People of the State of California A.D. 1915," and in May Wheeler suggested, "To bring food for the peoples from the breast of the earth." Wheeler change his mind and in September suggested, "To (help) rescue for human society the moral values of rural life," which was changed to "To Rescue for Human Society the Native Values of Rural Life." Formal dedication ceremonies took place on Saturday, October 13, 1917.

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Construction Cost Estimating
Oppenheim Lewis
Scott Lewis

Appendix
(CD attached)

- Program Data Sheets and Summary
- Meeting Notes (April 2009 to October 2009)
- Mechanical Systems Approach by Rumsey Engineers
- Detailed Cost Estimate and Cost Assumptions
- Previous Works
  - UC Documents
    - Working Paper Report by UC Capital Projects (2002)
    - CNR Existing Plans
    - CNR Space Standards (1998)
    - FDX Area Calculations
  - Giannini Schematic Plans by EHDD (2005)
  - Historic Resources Summary (2009)
    - Giannini Hall
    - Wellman Hall
  - Bibliography of Previous Studies