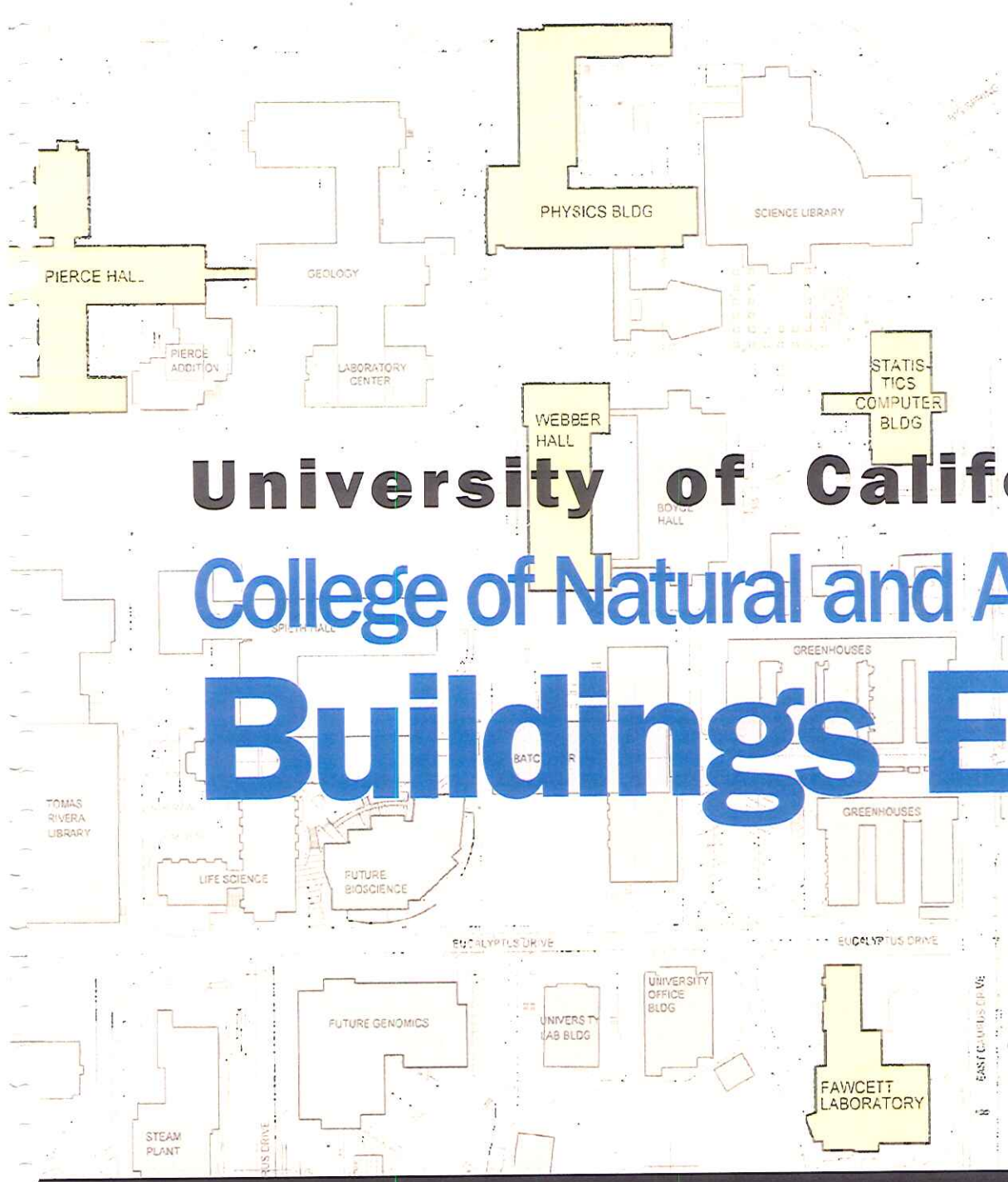

University of California, Riverside

College of Natural and Agricultural Sciences

Buildings Evaluation

October 31, 2003

SRG PARTNERSHIP INC

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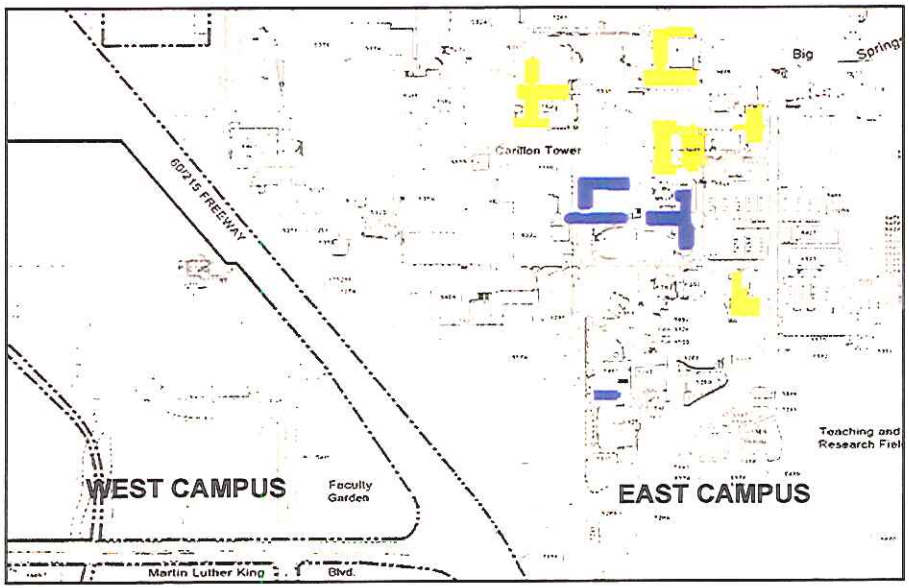
Physical Sciences

Biological and Agricultural Sciences



Campus Map

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A EXECUTIVE SUMMARY

Intent

The purpose of the Buildings Systems Evaluation report is to provide the University of California, Riverside, and the College of Natural and Agricultural Sciences with a strategy for the future and best use of the subject buildings. This report is a conceptual overview of a complex set of considerations that focuses on the buildings' systems that relate primarily to lab use. It is not intended as a holistic systems analysis. The design team recommends the campus continue the evaluation and planning process in more detail prior to embarking on budgeting or implementation of significant improvements.

The intent of the study was for the design team to recommend how the buildings could be utilized to satisfy CNAS' space needs for the next 15 to 20 years and to develop a range of costs to renovate them. In order to determine the most appropriate use, the team conducted a conceptual review of the buildings' systems and potential infrastructure improvements. The result is a brief, focused, technical analysis that examines capacity for use and the cost to complete upgrades in October 2003. The team did not investigate the broader planning issues that include proximity of programs, site utilization, expansion requirements, or the cost to replace these buildings with new structures.

Process

In August, a meeting was convened with representatives of each discipline from the campus Physical Plant, Design, and Construction to discuss the buildings' systems with the persons responsible for those systems. Following this session, tours of each building were conducted for further evaluation. Subsequently, a workshop was convened with the committee to review the preliminary results of the analysis and to determine the best use for each building based on the established criteria.

Criteria

The team developed criteria for contemporary design standards that apply to offices, classrooms, wet and dry research, and teaching laboratory functions. Those standards are defined in Section B. The criteria is applied to each building, and the critical elements are identified.

Existing Buildings

The dates of construction range from 1953 to 1976. The average age is 38 years. The total area of all buildings is approximately 339,000 gross square feet (gsf) and 189,000 assignable square feet (asf).

The HVAC systems in all five buildings, except for Webber Hall, are original. They are at their design capacity and have reached the end of their normal life. This is particularly true for buildings with wet labs.

Seismic upgrades are in the process of being implemented or have been completed for all buildings that require modifications. While ADA improvements have been made to these buildings, more work remains.

Recommended Strategy

The recommended strategy is to upgrade key building infrastructures first, and follow with the renovation of labs, classrooms and offices as space becomes available. This allows an orderly transition from a specific to a more flexible building use and results in a reasonable cost for the renovation of building zones. The team recommends that the addition of emergency power (EP) for all buildings be given priority funding, due to the life safety issue when the fume hoods lose power and fail to evacuate toxic fumes.

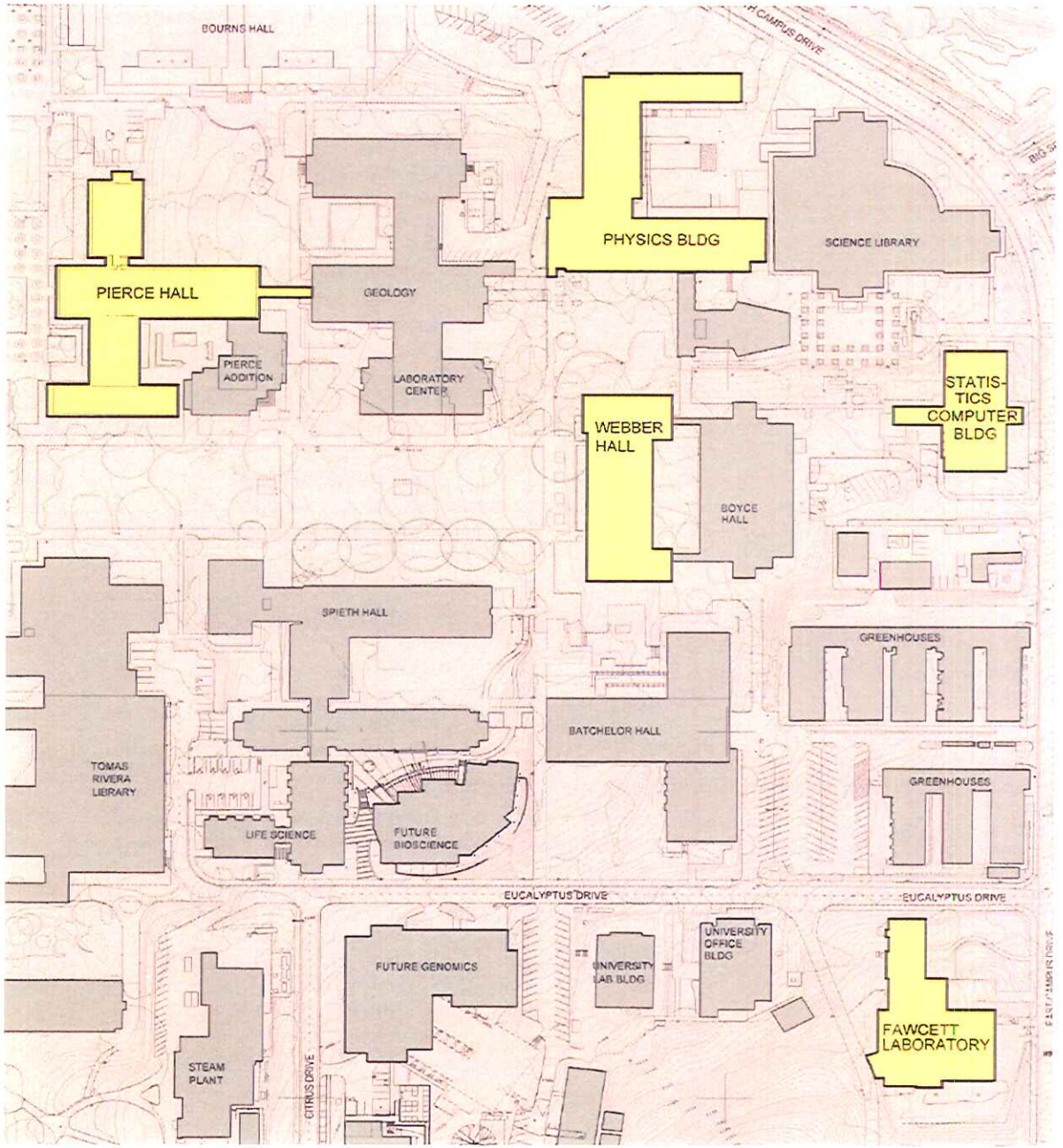
The labs could continue to function in Pierce Hall, Webber Hall and the Physics Building in their present condition with periodic upgrades as long as the demand on the HVAC system does not increase. This is particularly important for Pierce Hall. The Statistics-Computer Building is predominantly a dry lab that is meeting the demands placed on it. Webber Hall has 15% additional HVAC capacity to add fume hoods, but all other systems within the space should be upgraded. Fawcett Laboratory is under-utilizing a prime campus site, and eventually should become surge space, and ultimately be replaced.

As lab use intensifies, the team recommends the infrastructure for each building be upgraded to current design standards. All systems within the renovation zone would then be upgraded when the areas become available.

Costs

It was concluded that infrastructure construction costs for the buildings range from $2 million to $16 million, and the space improvements construction costs range from $20 million to $25 million. The team estimates that the conceptual cost to upgrade all five buildings is in a range of $60 million to $75 million, and is described on the next page and in Section D. These costs are an order-of-magnitude that could vary 10% to 15%, higher or lower than those presented. The Campus has the option to decide on a larger or smaller scope as the expected outcome is defined.

BUILDINGS INCLUDED IN EVALUATION



RECOMMENDATIONS

UTILIZATION STRATEGY

	CURRENT USE	KEY ISSUES	RECOMMENDED USE
Pierce Hall 1966 Constructed 137,304 gsf 66,837 asf	• Chemistry • Mostly research (wet) • Some teaching labs (wet); new renovations on 1st • Offices	– Limited floor-to structure clearance 9' to 10'-8" – No redundant supply air – No emergency generator – Difficult to extend shafts to 1st floor – Restrictive 9' lab module – Poor air filtration – Corridor walls are load-bearing; difficult to modify without careful structural analysis + Manifolded exhaust air + Good existing lab services	• 1st Flr—preferred minimal lab use (highly selective); good for physics (no vibration at slab-on-grade); retain newly renovated teaching labs (2,400 asf) • 2nd Flr—research or teaching labs (chemistry) • 3rd Flr—medium intensity research in wet labs • Offices as needed
Physics Building 1965 Constructed 90,954 gsf 55,559 asf	• Physics • Labs (wet and dry) • Offices • Classrooms • Research and teaching labs	– Limited floor-to-structure clearance 12'-6" – No redundant supply air – Poor air filtration – No emergency generator + Good existing lab services + Meets modest fume hood requirements (1/lab @ 6 AC/hr) + Manifolded exhaust air	• 1st Flr—remain as research (no vibration issues at slab-on-grade) • 2nd Flr—research and teaching labs (vibration is a problem if not on 1st) • 3rd Flr—remains as offices • Replace one-story portion of north wing with larger, taller structure (services enter the two-story portion)
Webber Hall 1953 Constructed 49,570 gsf 27,050 asf	• Bio-Medical; Bio-Chemistry • Wet labs and offices • Research labs • Few teaching labs	– Limited floor-to-structure clearance 11'-7" to 12' – No redundancy – No emergency generator – New shafts required to 2nd floor + 15% spare capacity for ventilation	• 1st Flr—low intensity labs; minimal teaching labs • 2nd Flr—medium intensity research labs • 3rd Flr—medium intensity research labs • Offices
Statistics-Computer 1974 Constructed 42,096 gsf 24,390 asf	• Research/teaching labs (dry) • Minimal offices • Anatomy labs (basement) • Computer center	– 10'-6" floor-to-structure – Emergency generator shared with Boyce Hall and Webber Hall—new unit required + Few wet requirements + Has UPS for computer center	• Current use remains • Potential to add computer space
Fawcett Lab 1976 Constructed 19,076 gsf 14,747 asf	• Plant pathology research • Air Protection Research Center • Wet labs • Offices	– Low site utilization – No mechanical redundancy – No emergency generator – High investment with low return + Open structure—high clearance + Slab-on-grade—minimal vibration + Cold rooms existing	• Short-term – shops/surge space • Long-term – demolish and replace

PROJECT COSTS

SPACE IMPROVEMENTS

		Faculty Office $28/asf	Dry Lab $80/asf	Classroom $40/asf	Research Lab (wet) $200/asf	Typical Wet Lab Bldg Infrastructure Cost $150/gsf (1)	October 2003 Construction Cost (2)	October 2003 Project Cost (3)
Pierce Hall	67,000 asf	11,000	N/A	800	55,000 (8)	Apply 80% of Infrastructure Cost		
	134,604 gsf	**$308,000**		**$32,000**	**$11,000,000**	**$16,100,000**(1)	**±$27,400,000**	**±$32,900,000**
Physics Building	46,000 asf (6)(7)	13,600	30,400 (7)	1,900	N/A	Apply 60% of Infrastructure Cost		
	83,300 gsf (6)(7)	**$380,800**	**$2,400,000**	**$76,000**		**$7,500,000**(1)(5)	**±$10,400,000**	**±$12,500,000**
Webber Hall	27,000 asf	6,600	N/A	N/A	20,300	Apply 60% of Infrastructure Cost		
	49,570 gsf				**$4,000,000**	**$4,500,000**(1)	**± $8,700,000**	**±$10,400,000**
Statistics-Computer Bldg	24,000 asf	13,000	8,700	2,000	N/A	Apply 30% of Infrastructure Cost		
	42,096 gsf	**$364,000**	**$696,000**	**$80,000**		**$1,900,000** (1)	**± $3,000,000**	**± $3,600,000**
Fawcett Lab	15,000 asf	3,600	N/A	N/A	11,200	Apply 100% of Infrastructure Cost		
	19,076 gsf	**$101,000**	**$896,000**(4)		**$2,200,000**(4)	**$2,900,000**(1)	**± $6,100,000**	**± $7,300,000**
	328,646 Total gsf							
						TOTAL	**± $55,600,000**	**± $66,700,000**
							$169/GSF Average	

(1) Infrastructure costs are applied to a percentage of the gross building area, as noted on the matrix. The infrastructure system improvements are limited to mechanical, electrical, plumbing, fire protection and related architectural work only. Envelope upgrades are not included.
(2) Construction Cost includes 15% for G.C. mark-ups, 15% design contingency, and 5% phasing allowance--cumulative value is 39%.
(3) Project Cost includes construction cost plus 20% for indirect costs, per state standards.
(4) Cost does not include process utilities.
(5) The auditorium area is deducted from the building gross for determining the infrastructure upgrade cost.
(6) Does not include Auditorium.
(7) Does not include new lab and infilled mezzanine.
(8) Does not include recently renovated instruction labs of 2,400 asf.
(9) Assumes envelope upgrades are not needed.

B FUNCTIONAL CRITERIA

The criteria identifies five building systems and emphasizes components that are considered the most critical for instructional and research laboratories, as well as an analysis of offices and classrooms.

General

This group includes building code and environmental quality issues such as daylight and view, which should be strongly considered in decisions affecting plan configurations for labs and offices.

Structural

The most important elements are: vibration that affects equipment such as electron microscopes; the clear dimension from the floor to the bottom of the structure (space for new ducts and services), and the structural grid (efficiency of lab layout). The most efficient lab module is from 10.5'-11' wide by 25'- 30' deep. The optimal dimension from the floor to the bottom of structure is >13'-6". Seismic is not listed as UCR has completed, or is in the process of completing, code-required modifications to all buildings in the study.

HVAC

The critical design component in this category is air changes per hour (AC/hr), assuming that heating and cooling requirements are met. AC/hr depends on the quantity and size of fume hoods needed by the users.

All five buildings utilize a single air handler unit (AHU) to supply air. Current lab design practice incorporates the use of multiple, manifolded AHUs to provide redundancy in case of equipment failure, maintenance, and for future growth. The AHUs are now fed only from a normal power feed so in the event of a power failure, the supply air to the building will stop. This can create a life-safety issue because the containment of chemical fumes will not be maintained at the hoods when the exhaust fans are not in operation. Current lab design keeps a portion of the AHUs on emergency power so pressure relationships can be maintained during a power outage. The exhaust air systems for all buildings, except for Pierce Hall and Physics Building, are individual exhaust fans for each fume hood or general exhaust application. Lab design practice is to manifold all hood and general exhaust into a single exhaust system that is operated via multiple exhaust fans. This design philosophy allows for maintenance of equipment failure without affecting system performance.

Plumbing

Fire sprinklers are a critical system for life and property protection, and they only exist in the basements of all these buildings, except Fawcett, which has no sprinklers. The remaining components are provided locally in the labs (e.g., gases and polished RO/DI water).

Power and Data

Emergency generators are being provided only for life safety, and do not support critical equipment such as fume hoods, freezers and refrigerators. Fume hood issues are discussed in the next section. Telecommunication systems are at capacity but are functioning.

FUNCTIONAL CRITERIA

BUILDING USES

General	Faculty Office	Classroom	Teach/Research Lab (wet)*	Teach/Research Lab (dry)	Comments
Code/Occupancy	B	B/A	B	B	
CBC Construction Type	Flexible	Flexible	Limited	Flexible	
Adjacencies	Near research labs/not ground flr.	Ground floor	Ground floor/sep from teaching	Ground floor/sep from teaching	Teaching at or near ground floor - separate from research
Light and view	View/light critical	Desirable, not critical	Desirable	Desirable	
Service access	Low	Low	High	Moderate	
ADA	Required	Required	Required	Required	
Structural					
Type	Steel or concrete	Steel or concrete	Concrete preferred	Steel or concrete	
Grid	+/- 10'-12' width	+/- 30' x 30'	10.5'-11' x 20-24' (min.)	+/- 30' x 30'	
Vibration	8-10,000 mips	8-10,000 mips	1,000-2,000 mips	2-4,000 mips	Depends on program need
Fl-to-fl height/flr-to-bottom of structure	>12'/10'	>12'/10'	15'-16'/13.5' min. preferred	>12'/10'	Assume the structure depth is ~18"
Live load (lbs/sf)	100	100	125	100	
HVAC					
System redundancy	N/A	N/A	Yes (main supply/exhaust)	Yes	Main supply; exhaust; circ. pumps; heat exchangers (water heating using plant steam)
Air circulation	Recirculating	Recirculating	100% outside air	Recirculating	
Fume hoods - AC/hr (outside air)	20 cfm OSA/person	20 cfm OSA/person	--	--	Access roof exhaust; access to shafts
Low intensity - AC/hr	N/A	N/A	6-8	N/A	Biology lab; varies
Medium intensity - AC/hr	N/A	N/A	8-10	N/A	Biology lab; varies
High intensity - AC/hr	N/A	N/A	10-12 ; 12-15	N/A	Chemistry or biology lab; varies
Chilled water capacity	Based on building area/demand	Based on building area/demand	Based on building area/demand	Based on building area/demand	
Steam capacity	Based on building area/demand	Based on building area/demand	Based on building area/demand	Based on building area/demand	
Plumbing					
Lab waste	Sanitary	Sanitary	Lab waste	Sanitary	
RO/DI	N/A	N/A	Yes (varies)	N/A	Depends on program need
Lab gasses: air, vac, nat gas	N/A	N/A	Yes (varies, A, V, NG)	N/A	
Sys redundancy (air, vac, ICW)	No	No	Yes	N/A	
Industrial cold water (ICW)	N/A	N/A	Yes	N/A	
Fire protection	Light hazard	Light hazard	Ordinary hazard	Light hazard	
Power & Data					
Emergency power	Life safety (L.S.) only	Life safety (L.S.) only	L.S. + Equipment (varies)	L.S. + Equipment (varies)	Equip is HVAC & lab equip
Power capacity	Moderate	Moderate	High with redundancy	High with redundancy	
Data/telecom	High	High	High	High	
UPS	No	No	Yes	Yes	
Fire alarm	Limited	Limited	Full	Full	
Security	Moderate (varies)	Moderate (varies)	High	High	
Access Control	Moderate (varies)	Moderate (varies)	High	High	

*** Labs requiring process, (e.g., laser microscopy)**

C BUILDING EVALUATIONS

Four of the buildings are concrete frame construction with varying floor-to-floor and floor-to-bottom of structure dimensions. The fifth building, Fawcett Laboratory, is a single story, steel-frame structure. The average age of the buildings is 38 years, which attests to the difficulty of the maintenance task. All buildings have had major ADA improvements, and all have a good seismic rating. The Statistics-Computer Building and Webber Hall are currently scheduled to be converted from the current 5kV power source to the 15kV power source, and the other buildings include the upgrade to the 15kV power source as a part of their project costs for infrastructure. None of the buildings with fume hoods have emergency generators for electrical back-up to ensure that the hoods continue to function in a power failure. This is a significant **life safety issue**, since toxic vapors could enter the buildings when the exhaust fans stop.

Pierce Hall

1966 construction
3 stories (partial 3rd)
Total area: 137,304 gsf
66,837 asf
Floor-to-structure: 10'-6" to 9'-2" (3rd)

Services are distributed through vertical shafts on the corridor wall of the labs. Most equipment is original, and exhaust air has been manifolded. The air changes per hour (AC/hr) rate is lower than preferred (6 AC/hr). Air filtration is inadequate, but lab services are good. 2,400 assignable square feet (ASF) of instruction labs were renovated in 2003, including new benches and finishes. The average lab module is 26'-4" wide (bench-to-bench) by 24' - 27' long, which is wider and longer than current standards. The partial third floor allows new fans to be installed on the second floor and third floor roofs allowing ducts to be distributed vertically and horizontally; however, the low structural clearance is a challenge for horizontal distribution. The majority of labs and offices have windows since the corridors are double-loaded. The first floor is slab-on-grade and is ideal for the location of vibration-sensitive equipment. Its partial third floor allows for the effective implementation of adding mechanical equipment on the roof to increase AC/hr.

The Pierce Addition was completed in 2000 and accommodates the more demanding lab functions.

Physics Building

1965 construction
3 stories (partial 3rd)
Total area: 90,954 gsf
55,559 asf
Floor-to-structure: 12'-10" to 13'-9" (labs)

Services are distributed through vertical shafts on the corridor wall of the labs, and exhaust air is being manifolded. The air changes per hour rate is lower than preferred (6 AC/hr), and air filtration is inadequate. The majority of labs and offices have windows since the corridors are double-loaded. The lab module is generally 18' wide by 30' deep, although the benches appear to align both ways in the grid. The third floor is partial and has offices, which makes the concept of new, roof-mounted fans distributing vertically to the first and second floors work well. Research is on the first floor to avoid vibration issues, and instruction is primarily on the second floor. The one story portion of the north wing is under-utilizing a large, prominent site.

Webber Hall

1953 construction
3 stories (partial 3rd)
Total area: 49,570 gsf
27,050 asf
Floor-to-structure: 12'—2nd; 11-7"—3rd

Services are distributed through scattered vertical shafts. The HVAC equipment is new, and the system has the capacity to support 10-15% more hoods of the same sizes that exist. Most of the labs are 18' wide by 28' deep, and the remainder are 25' deep. The majority of labs and offices have windows since the corridors are double-loaded. Its partial third floor allows for the effective implementation of adding mechanical equipment on the roof to increase AC/hr.

Statistics-Computer Building

1974 construction
3 stories (walk-out basement)
Total area: 42,096 gsf
24,390 asf
Floor-to-structure: 10'-6"

Services are distributed through scattered vertical shafts, and computer raised-floor areas are cooled using recirculating units placed on the raised floor. Approximately one half of the building is offices, and one-half of those are on an exterior wall. The remaining space is computer labs and classrooms. There are minimal wet lab requirements, and there is an uninterruptable power supply (UPS) for the large, raised-floor computer space.

Fawcett Laboratory

1976 construction
1 story (w/2 story wing)
Total area: 19,076 gsf
14,747 asf
Floor-to-structure: 13'-6"

This building is primarily a one-story, clear-span, steel frame, slab-on-grade structure, with a small wing and basement. Services are distributed horizontally through the walls. Reinforcement of the seismic connections between the roof diaphragm will be completed in late summer of 2003. Most labs are interior with a module of 20' wide by 22' deep, with few windows. There are large cold rooms for storage, and the interior of the primary space is column-free allowing for flexible plan arrangements. It greatly under-utlilizes (low floor-to-site area ratio) a prominent site on East Campus Drive.

LAB USE INTENSITY

This table defines the range of air changes per hour that exists in the buildings, and how these buildings are proposed to be upgraded. The design criteria is highly dependent on the number of fume hoods required by the program, and by the intensity of the research. The key is to provide additional capacity in the HVAC system, and as the budget allows, to give the Campus latitude in the program types that the building can support.

INTENSITY

	EXISTING	PROPOSED
Pierce Hall	○	◒
Webber Hall	○	◒
Physics Building	○	○
Statistics-Computer Building	○	○
Fawcett Laboratory	○	●

Legend
○ Low (6-8)
◒ Medium (8-10)
● High (10-12)

PIERCE HALL
137,304 gsf

BUILDING USES

Legend ✔ = meets criteria
X = does not meet criteria
N/A = not applicable

General	Existing	Office	Classroom	Teaching Lab (wet)	Research Lab (wet)	Laboratory (dry)	Comments
Code/Occupancy	B?	✔	✔	✔	✔	✔	
CBC Construction Type	Non-Comb	✔	✔	✔	✔	✔	
Adjacencies	?	N/A	N/A	?	?	?	Preferable to have lab types on separate floors
Light and view	Varies	✔	N/A	Partial	Partial	Partial	
Service access	Yes	✔	✔	✔	✔	✔	
ADA	Yes	✔	✔	✔	✔	✔	Check labs for compliance
Structural							
Type	Concrete	✔	✔	✔	✔	✔	
Grid	20'x30.5' & 22'	✔	✔	✔	✔	✔	
Vibration	?	✔	✔	?	?	?	Assume acceptable
Floor-to-structure dimension	10-6"-1st & 2nd;9'-2"-3rd	✔	✔	X	X	X	fl-to-fl: @ 1st= 15'-1"; @ 2nd= 15'-5"
Live load	?	✔	✔	✔ (?)	✔ (?)	✔ (?)	
HVAC							
System redundancy	No	✔	✔	X	X	X	
Air circulation	100% OA	✔	✔	✔	✔	✔	
Air Changes per hour (outside air)	6-10	✔	✔	X	X	✔	*Estimated at selected areas
Fume hoods	manifolded	N/A	N/A	✔	✔	✔	CV limiting; manifolded VAV is flexible
Chilled water capacity	8"	✔	✔	X	X	X	Requires upgrade if use intensifies
Steam capacity	4"	✔	✔	✔	✔	✔	6" available in tunnel
Plumbing							
Lab Waste	Yes	N/A	N/A	✔	✔	N/A	
RO/DI	Yes	N/A	N/A	X	X	N/A	
Lab gasses: air, vac, nat gas	Yes	N/A	N/A	✔	✔	N/A	May require upgrade
Sys Redundancy (air, vac, ICW)	Yes	N/A	N/A	X	X	N/A	Vacuum system only is redundant
Industrial Cold Water (ICW)	Yes	N/A	N/A	✔	✔	N/A	
Fire protection	Partial	X	X	X	X	N/A	Only basement is sprinklered
Power & Data							
Emergency power	L.S. only	✔	✔	X	X	X	
Power capacity	Yes	✔	✔	X	X	X	On campus 5kV; no redundancy; no 480V; xfmrs contain PCBs
Data/telecom	Yes	✔	✔	✔	✔	✔	Security and environment marginal
UPS	No	✔	✔	X	X	X	Point-of-use only
Fire alarm	Yes	✔	✔	✔	✔	✔	Modifications required if area increases
Security	Limited	✔	✔	X	X	X	Modifications required if area increases
Access Control	No	X	X	X	X	X	No internal or external access control

RECOMMENDED USE					
CURRENT CONDITIONS	✔	✔	✔	✔	
UPGRADED/PROPOSED	✔	✔	✔	✔	

✔ Recommended
✔ Selectively Recommended
X Not recommended

PHYSICS BUILDING
90,954 gsf

BUILDING USES

General	Existing	Office	Classroom	Teaching Lab (wet)	Research Lab (wet)	Laboratory (Dry)	Comments
Code/Occupancy	B?	✓	✓	✓	✓	✓	
CBC Construction Type	Non-Comb	✓	✓	✓	✓	✓	
Adjacencies	?	N/A	N/A	?	?	?	
Light and view	Varies	✓	N/A	✓	✓	✓	
Service access	Yes	✓	✓	✓	✓	✓	
ADA	Yes	✓	✓	✓	✓	✓	Check labs for compliance
Structural							
Type	Concrete	✓	✓	✓	✓	✓	
Grid	15'X30' verify	✓	✓	✓	✓	✓	
Vibration	?	✓	✓	✓	✓	✓	
Floor-to-structure dimension	12'-10" to 13-9"'	✓	✓	X	X	X	fl-to-fl avg 15'-5"
Live load	?	✓	✓	✓ (?)	✓ (?)	✓ (?)	
HVAC							
System redundancy	No	✓	✓	X	X	X	
Air circulation	100% OA	✓	✓	✓	✓	✓	Auditorium and 3rd flr unit have return air
Air changes per hour (outside air)	6	✓	✓	X	X	✓	Estimated
Fume hoods	Manifolded	N/A	N/A	✓	✓	✓	Manifolding under construction
Chilled water capacity	6"	✓	✓	X	X	X	Req. upgrade if use intensifies
Steam capacity	4"	✓	✓	✓	✓	✓	6" available at tunnel; req. upgrade if use intensifies
Plumbing							
Lab Waste	Yes	N/A	N/A	✓	✓	N/A	
RO/DI	No	N/A	N/A	X	X	N/A	
Lab gasses: air, vac, nat gas	Yes	N/A	N/A	✓	✓	✓	May require upgrade
Sys Redundancy (air, vac, ICW)	No	N/A	N/A	X	X	X	Vacuum pump not in service
Industrial Cold Water (ICW)	Yes	N/A	N/A	✓	✓	N/A	Also Industrial Hot Water - (steam water heater)
Fire protection	Partial	X	X	X	X	X	Only basement sprinklered
Power & Data							
Emergency power	L.S. only	✓	✓	X	X	X	
Power capacity	Yes	✓	✓	X	X	X	5kV (12kV in future renov?); no redundancy; xfmrs contain PCBs
Data/telecom	Yes	✓	✓	✓	✓	✓	Security and environment marginal
UPS	No	✓	✓	X	X	X	Point-of-use only
Fire alarm	Yes	✓	✓	✓	✓	✓	Modifications required when area increases
Security	Limited	✓	✓	X	X	X	Modifications required if area increases
Access Control	No	X	X	X	X	X	No internal or external access control

Legend ✓ = meets criteria
X = does not meet criteria
N/A = not applicable

RECOMMENDED USE	Office	Classroom	Teaching Lab (wet)	Research Lab (wet)	Laboratory (Dry)
CURRENT CONDITIONS	✓	✓			✓
UPGRADED/PROPOSED	✓	✓			✓

✓ Recommended
✓ Selectively Recommended
X Not recommended

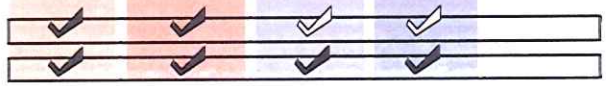
WEBBER HALL
49,570 gsf

BUILDING USES

Legend ✔ = meets criteria
X = does not meet criteria
N/A = not applicable

General	Existing	Office	Classroom	Teaching Lab (wet)	Research Lab (wet)	Laboratory (Dry)	Comments
Code/Occupancy	B?	✔	✔	✔	✔	✔	
CBC Construction Type	Non-Comb	✔	✔	✔	✔	✔	
Adjacencies	?	N/A	N/A	?	?	?	
Light and view	Varies	✔	N/A	✔	✔	✔	
Service access	from Boyce	✔	✔	✔	✔	✔	
ADA	Yes	✔	✔	✔	✔	✔	Check labs for compliance
Structural							
Type	Concrete	✔	✔	✔	✔	✔	
Grid	15'X30' verify	✔	✔	✔	✔	✔	
Vibration	?	✔	✔	?	?	?	Assume acceptable
Floor-to-structure dimension	12' -2nd; 11-7" -3rd	✔	✔	X	X	X	fl-to-fl avg 15'-5"
Live load	?	✔	✔	✔ (?)	✔ (?)	✔ (?)	
HVAC							
System redundancy	No	✔	✔	X	X	X	
Air circulation	100% OA	✔	✔	✔	✔	✔	
Air changes per hour (outside air)	6	✔	✔	X	X	X	Estimated
Fume hoods	Indiv Const Vol	N/A	N/A	✔	✔	✔	CV limiting; manifolded VAV is flexible
Chilled water capacity	2-8"	✔	✔	X	X	X	Requires upgrade if use intensifies
Steam capacity	5"	✔	✔	X	X	X	
Plumbing							
Lab Waste	Yes	N/A	N/A	✔	✔	N/A	
RO/DI	Yes	✔	✔	X	X	N/A	
Lab gasses: air, vac, nat gas	Yes	N/A	N/A	✔	✔	✔	May require upgrade
Sys Redundancy (air, vac, ICW)	No	✔	✔	X	X	X	
Industrial Cold Water (ICW)	Yes	N/A	N/A	✔	✔	N/A	Also Industrial Hot Water - (steam water heater)
Fire protection	Partial	X	X	X	X	X	Only basement is sprinklered; from Boyce
Power & Data							
Emergency power	L.S. only	✔	✔	X	X	X	Generator currently shared w/ Boyce & Stat-Comp
Power capacity	Yes	✔	✔	✔	✔	✔	5kV; no redundancy; old secondary section; marginal pwr for lab use
Data/telecom	Yes	✔	✔	✔	✔	✔	Security and environment marginal
UPS	No	✔	✔	X	X	X	Point-of-use only
Fire alarm	Yes	✔	✔	✔	✔	✔	Modifications required when area increases
Security	Limited	✔	✔	X	X	X	Modifications required if area increases
Access Control	No	X	X	X	X	X	No internal or external access

RECOMMENDED USE



✔ Recommended
✔ Selectively Recommended
X Not recommended

STATISTICS-COMPUTER BUILDING
42,096 gsf

BUILDING USES

Legend ✔ = meets criteria
✘ = does not meet criteria
N/A = not applicable

General	Existing	Office	Classroom	Teaching Lab (wet)	Research Lab (wet)	Laboratory (Dry)	Comments
Code/Occupancy	B?	✔	✔	✔	✔	✔	
CBC Construction Type	Non-Comb	✔	✔	✔	✔	✔	
Adjacencies	?	N/A	N/A	?	?	?	
Light and view	Varies	✔	N/A	✔	✔	✔	
Service access	Yes	✔	✔	✔	✔	✔	
ADA	Yes	✔	✔	✔	✔	✔	Check labs for compliance
Structural							
Type	Concrete	✔	✔	✔	✔	✔	
Grid	25'x25'	✔	✔	✔	✔	✔	
Vibration	?	✔	✔	?	?	?	Assume acceptable
Floor-to-structure dimension	10'-6"	✔	✔	✘	✘	✘	fl-to-fl 11'-1"
Live load	?	✔	✔	N/A	N/A	✔ (?)	
HVAC							
System redundancy	No	✔	✔	✘	✘	✘	
Air circulation	100% OA	✔	✔	✔	✔	✔	
Air changes per hour (outside air)	6	✔	✔	✘	✘	✘	Estimated
Fume hoods	Indiv Const Vol	N/A	N/A	✔	✔	✔	
Chilled water capacity	4"	✔	✔	✘	✘	✘	Requires upgrade if use intensifies
Steam capacity	3"	✔	✔	✘	✘	✘	Requires upgrade if use intensifies
Plumbing							
Lab Waste	No	N/A	N/A	✘	✘	N/A	
RO/DI	No	N/A	N/A	✘	✘	N/A	
Lab gasses: air, vac, nat gas	Yes	N/A	N/A	✔	✔	✔	May require upgrade
Sys Redundancy (air, vac, ICW)	No	N/A	N/A	✘	✘	✘	
Industrial Cold Water (ICW)	No	N/A	N/A	✘	✘	N/A	
Fire protection	Partial	✘	✘	✘	✘	✘	Only basement is sprinklered
Power & Data							
Emergency power	L.S. only	✔	✔	✘	✘	✘	Gen. now shared w/Boyce & Webber; may have dedicated in future
Power capacity	Yes	✔	✔	✔	✔	✔	On campus 5kV; no redundancy; old secondary section
Data/telecom	Yes	✔	✔	✔	✔	✔	Security and environment marginal
UPS	Yes	✔	✔	✘	✘	✘	Currently:point-of-use & UPS unit for computer room; larger in future?
Fire alarm	Yes	✔	✔	✔	✔	✔	Modifications required when area increases
Security	Limited	✔	✔	✘	✘	✘	Modifications required if area increases
Access Control	No	✘	✘	✘	✘	✘	No internal or external access control

RECOMMENDED USE						
CURRENT CONDITIONS	✔	✔				✔
UPGRADED/PROPOSED	✔	✔				✔

✔ Recommended
✔ Selectively Recommended
✘ Not recommended

FAWCETT LABORATORY
109,462 gsf

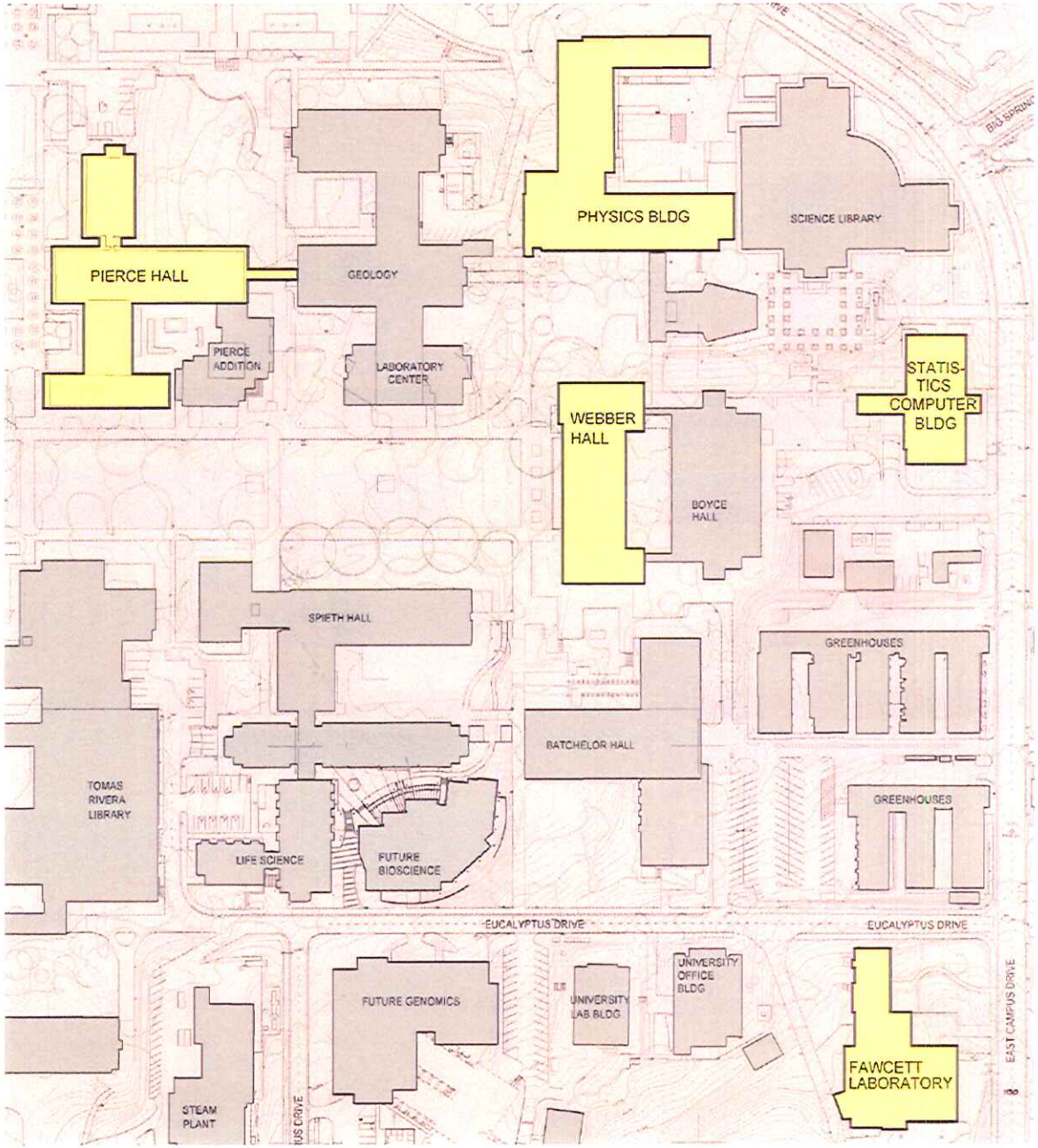
BUILDING USES

Legend ✔ = meets criteria
X = does not meet criteria
N/A = not applicable

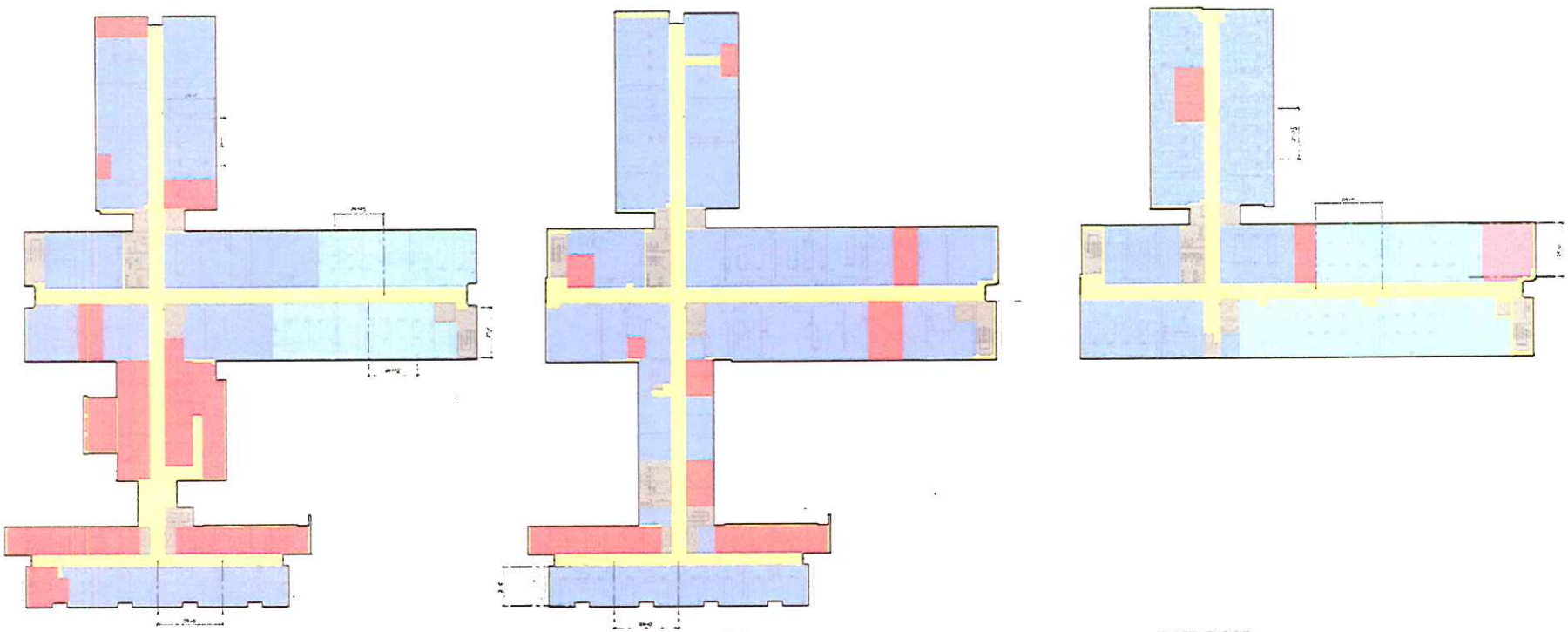
General	Existing	Office	Classroom	Teaching Lab (wet)	Research Lab (wet)	Laboratory (Dry)	Comments
Code/Occupancy	B?	✔	✔	✔	✔	✔	
CBC Construction Type	Non-Comb	✔	✔	✔	✔	✔	
Adjacencies	?	N/A	N/A	?	?	?	
Light and view	Varies	✔	N/A	✔	✔	✔	
Service access	Yes	✔	✔	✔	✔	✔	
ADA	Varies	✔	✔	✔	✔	✔	
Structural							
Type	Steel frame	✔	✔	✔	✔	✔	
Grid	20'x25'	✔	✔	✔	✔	✔	
Vibration	?	✔	✔	?	?	✔	Assume acceptable
Floor-to-structure dimension	13'-6"	✔	✔	✔	✔	✔	One story
Live load	?	✔	✔	✔ (?)	✔ (?)	N/A	
HVAC							
System redundancy	No	N/A	N/A	X	X	X	
Air circulation	100% OA	✔	✔	✔	✔	✔	
Air changes per hour (outside air)	6	N/A	N/A	X	X	X	Estimated
Fume hoods	Indiv Const Vol	N/A	N/A	✔	✔	✔	CV limiting; manifolded VAV is flexible
Chilled water capacity	4"	✔	✔	X	X	X	
Steam capacity	3"	✔	✔	X	X	X	
Plumbing							
Lab Waste	Yes	N/A	N/A	X	X	N/A	
RO/DI	Yes (campus loop)	N/A	N/A	X	X	N/A	
Lab gasses: air, vac, nat gas	Yes	N/A	N/A	✔	✔	✔	May require upgrade; no vacuum system
Sys Redundancy (air, vac, ICW)	No	N/A	N/A	X	X	N/A	
Industrial Cold Water (ICW)	No	N/A	N/A	X	X	N/A	Also Industrial Hot Water - (gas-fired water heater)
Fire protection	No	X	X	X	X	X N/A	
Power & Data							
Emergency power	No	✔	✔	X	X	X	No generator backup
Power capacity	Yes	✔	✔	✔	✔	✔	On campus 5kV; no redundancy; old equipment; no 480V?
Data/telecom	Yes	✔	✔	✔	✔	✔	
UPS	No	✔	✔	X	X	X	Point-of-use only
Fire alarm	Yes	✔	✔	✔	✔	✔	Modifications required when area increases
Security	Limited	✔	✔	X	X	X	Modifications required if area increases
Access Control	No	X	X	X	X	X	No internal or external access control
RECOMMENDED USE							
CURRENT CONDITIONS		✔	✔	✔	✔		
UPGRADED/PROPOSED		✔	✔	✔	✔		

✔ Recommended
✔ Selectively Recommended
X Not recommended

FLOOR PLANS


PHYSICS BLDG
SCIENCE LIBRARY
PIERCE HALL
GEOLOGY
PIERCE ADDITION
LABORATORY CENTER
STATIS-TICS COMPUTER BLDG
WEBBER HALL
BOYCE HALL
SPIETH HALL
GREENHOUSES
BATCHELOR HALL
TOMAS RIVERA LIBRARY
GREENHOUSES
LIFE SCIENCE
FUTURE BIOSCIENCE
EUCALYPTUS DRIVE
EUCALYPTUS DRIVE
UNIVERSITY OFFICE BLDG
FUTURE GENOMICS
UNIVERSITY LAB BLDG
FAWCETT LABORATORY
STEAM PLANT
EAST CAMPUS DRIVE

PIERCE HALL



FIRST FLOOR

SECOND FLOOR

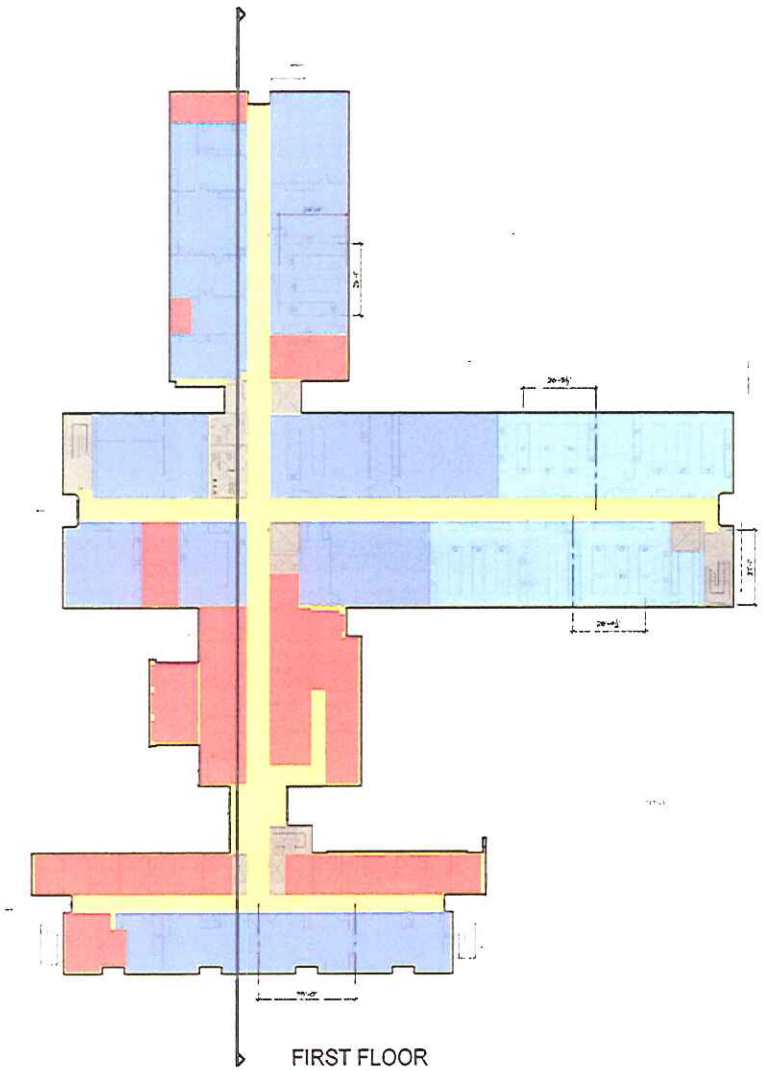
THIRD FLOOR

FUNCTION LEGEND

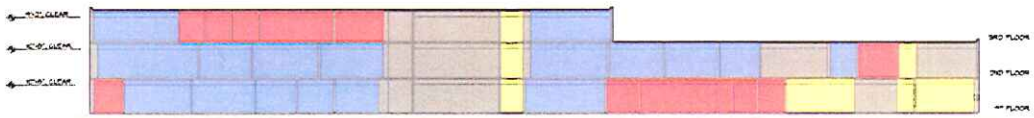
	LABORATORY	42, 464 sf
	TEACHING LAB	11, 897 sf
	OFFICE	11, 270 sf
	CLASSROOM	780 sf
	BUILDING SERVICE	

SCALE

PIERCE HALL



FIRST FLOOR



BUILDING SECTION

SCALE:

PHYSICS BUILDING

FIRST FLOOR

SECOND FLOOR

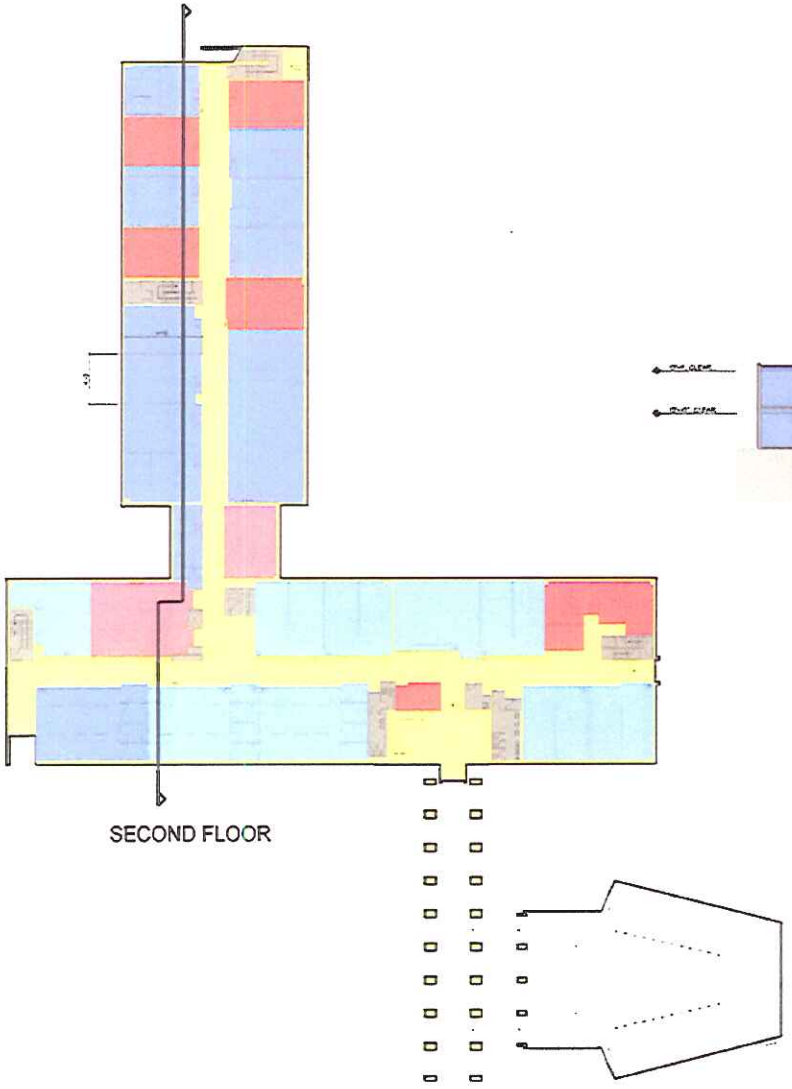
THIRD FLOOR

FUNCTION LEGEND

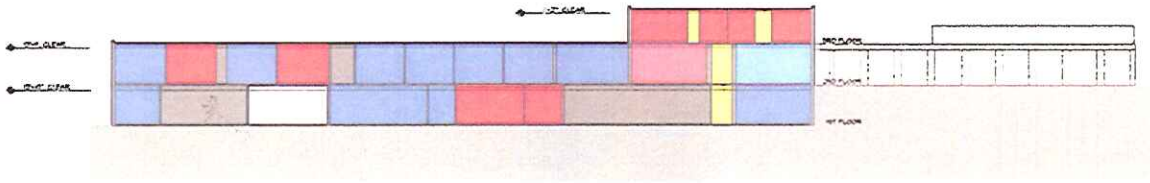
LABORATORY	30, 145 sf
TEACHING LAB	7, 522 sf
OFFICE	13, 624 sf
CLASSROOM	1,889 sf
BUILDING SERVICE	

SCALE: 1"

PHYSICS BUILDING



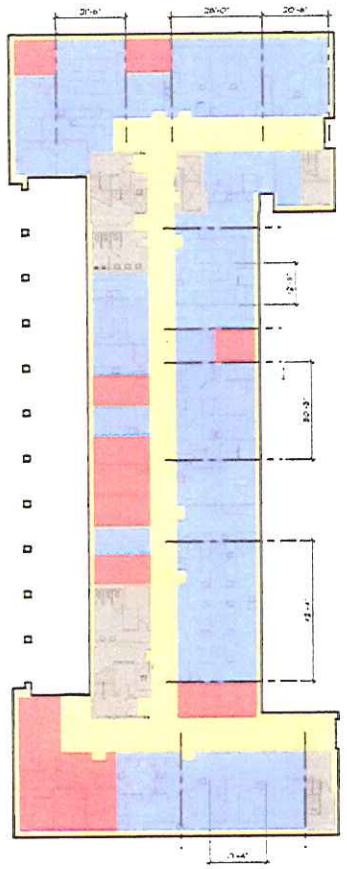
SECOND FLOOR



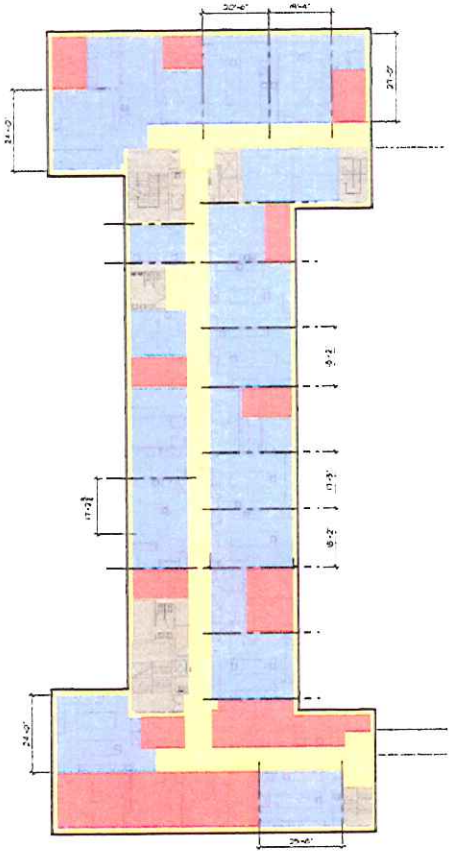
BUILDING SECTION

SCALE:

WEBBER HALL



FIRST FLOOR



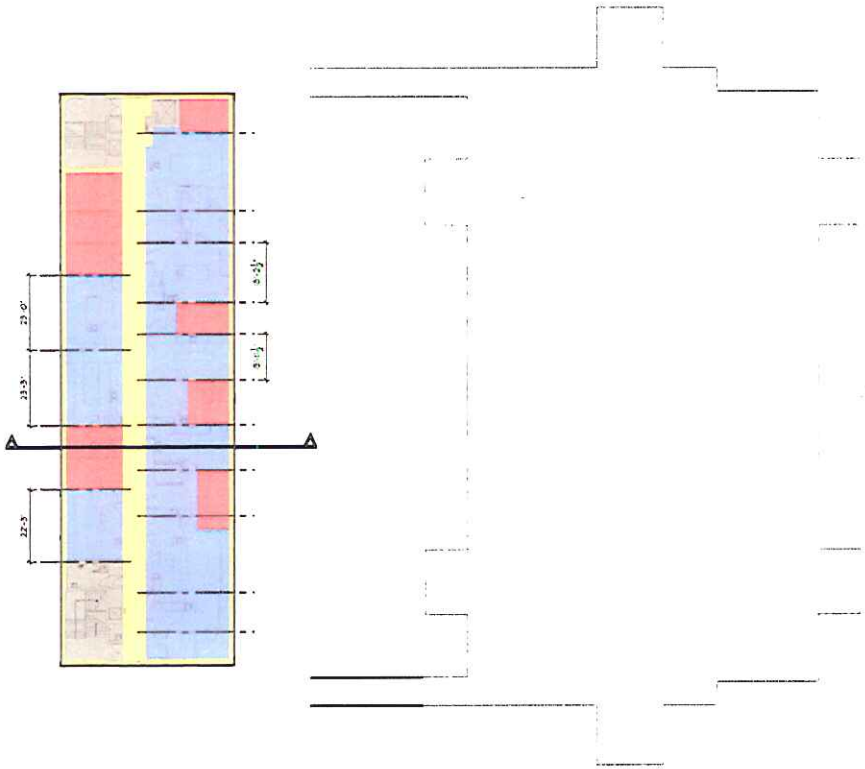
SECOND FLOOR

FUNCTION LEGEND

	LABORATORY (WET)	20, 306 sf
	TEACHING LAB	
	OFFICE	6, 565 sf
	CLASSROOM	
	BUILDING SERVICE	

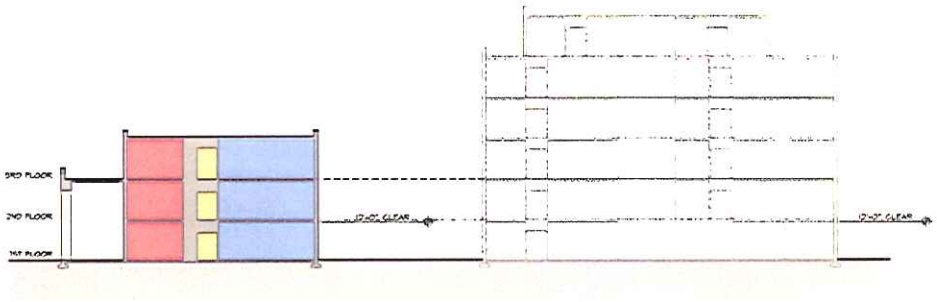
SCALE:

WEBBER HALL



THIRD FLOOR

WEBBER HALL BOYCE HALL

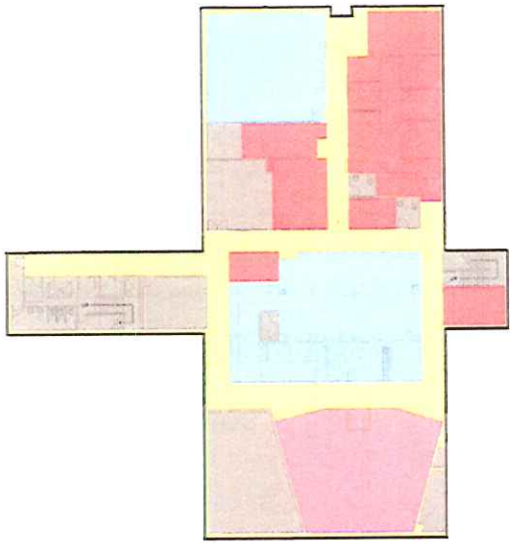


WEBBER HALL BOYCE HALL

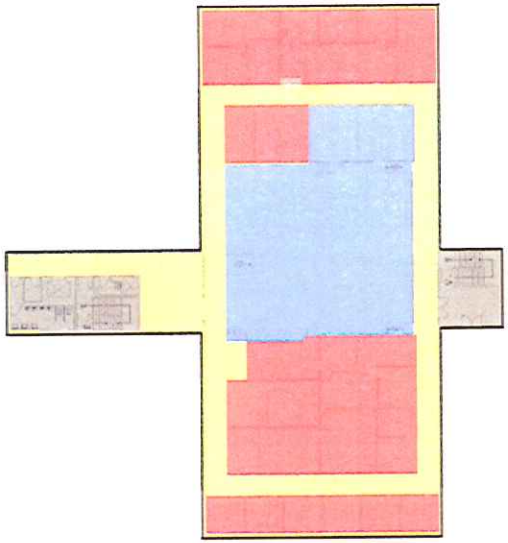
BUILDING SECTIONS

SCALE:

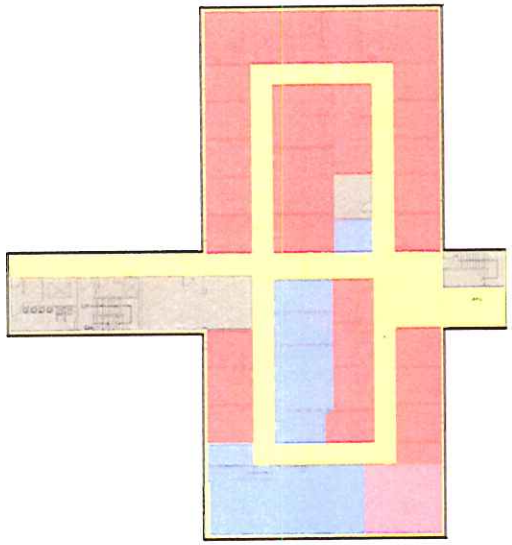
STATISTICS-COMPUTER BUILDING



BASEMENT



FIRST FLOOR



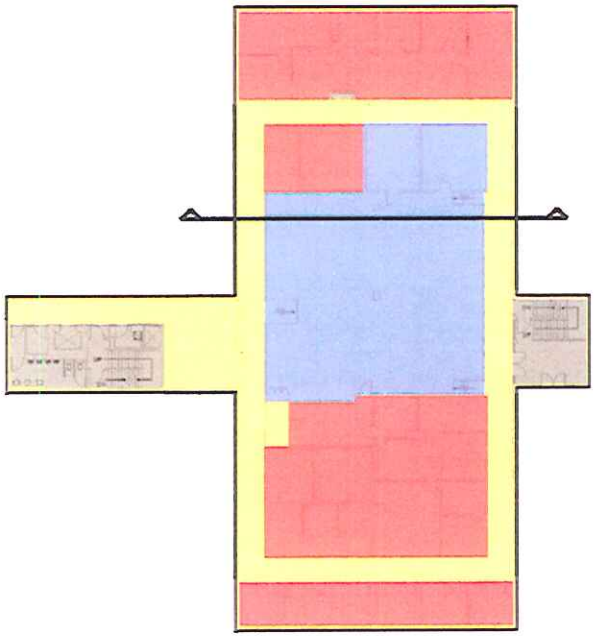
SECOND FLOOR

FUNCTION LEGEND

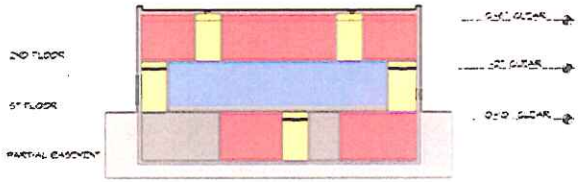
LABORATORY (DRY)	5, 514 sf
TEACHING LAB	3, 207 sf
OFFICE	13, 006 sf
CLASSROOM	2, 048 sf
BUILDING SERVICE	

SCALE:

STATISTICS-COMPUTER BUILDING



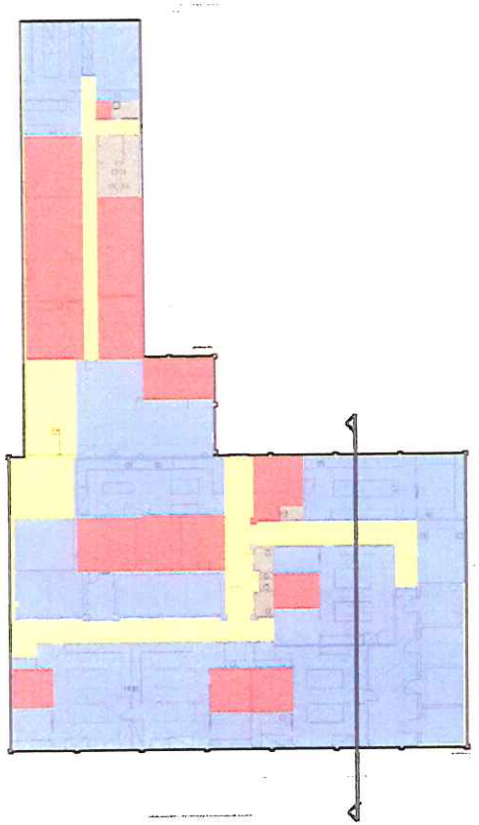
FIRST FLOOR



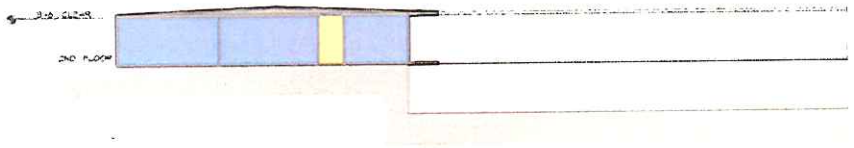
BUILDING SECTION

SCALE:

FAWCETT LABORATORY



SECOND FLOOR



BUILDING SECTION

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D PROJECT COST

The costs are based on August 2003 and were developed through discussions between the design team, Physical Plant, and APB. Costs are order-of-magnitude, and should be further studied to develop a comprehensive design analysis and cost estimate before a funding and implementation strategy is developed.

Strategy

The strategy is that the infrastructure would be upgraded first to allow individual spaces to be renovated to current standards as they become available.

Concept

The cost per square foot for infrastructure is applied to a percentage (noted on the cost matrix for infrastructure) of the building gross to acknowledge the degree of difficulty or extent. Roof-mounted equipment would be ducted vertically and/or horizontally (as for Pierce Hall) to the floors below the roof, or adjacent to the roof, by the use of interior and/or exterior shafts.

Cost Definitions

The infrastructure cost is based on new building construction plus a 30% premium for renovation. Included are mechanical, electrical, plumbing, fire sprinklers, and related architectural work only. The construction cost includes 15% for general contractor mark-ups, 15% design contingency, and a 5% phasing allowance - the accumulated value is 39%.

The office cost is based on replacing the floor finish (including VAT abatement) with VCT and painting. Lighting is generally new and will not be replaced.

The dry lab and classroom cost includes demolition, paint, VAT abatement, new VCT, ceilings, light fixtures, casework (lab only), and chalkboards (classroom only).

The wet lab cost includes demolition, Type I equipment, casework, paint, seamless vinyl floors, and light fixtures. Generally, there are no ceilings in the labs, where ducts are exposed and lights are surface-mounted, or suspended from the concrete slab.

Cost in the Infrastructure Costs

- Chilled water from central campus distribution into building as needed
- Steam and condensate from central campus system into building as needed
- New air handlers for the upper floors - manifolded system with multiple AHU
- New Exhaust fans for the upper floors - manifolded system with multiple exhaust fans
- Main duct risers vertically through the building. New double ended switchgear
- Main branch ducting on each floor
- Upgrade from 5kV, single feed to a 15kV parallel power feed
- New feeders to new distribution panels
- New plumbing equipment (Air compressor, vacuum pump, water heaters and RO/DI water as needed
- Main risers vertically through the building
- Main branch lab piping on each floor
- Fire sprinkler main, PIV, stand pipes and main branch piping
- Fire alarm system connection to campus system, annunciator panel, vertical and horizontal distribution of communications backbone
- Tele/data connection to building, MDF and IDF, vertical and horizontal distribution of communications backbone
- Upgrade lighting in public/circulation spaces, including lighting controls
- Exterior access control for security
- Upgrade emergency generator to support life safety systems, building systems and user power needs
- Associated hangers, seismic support, installation, insulation, testing, start-up and controls for the noted systems

Costs in the Building Fit-out

- Duct connection to floor branch, air terminal device, low pressure ductwork, and diffuser or grilles for both supply and exhaust air systems
- Electrical distribution from distribution panels to point of use receptacles on lab benches
- Lab piping from floor branch piping into each lab and to the point of use fixture
- Fire protection sprinkler distribution piping and heads for all renovated areas
- Fire alarm devices required for all renovated areas and connection back to head-end equipment
- Tele/data receptacles and connections to head-end equipment
- Upgrade lighting in lab/office/classroom areas, including lighting controls
- Interior access control for security
- Distribution of emergency power to support life safety items, building systems, and user power needs in the lab/classroom and office areas
- Associated hangers, seismic support, installation, insulation, testing, start-up, and controls for the noted systems

Excluded Work

The following items are not included in this estimate and will require more study: site electrical upgrade to 12kV; site telecommunications; Type II and III equipment; structural modifications for roof-mounted equipment; additional ADA modifications; UBC/CBC mandated upgrades (based on renovation as a percentage of replacement cost); seismic modifications; program-generated improvements; large-scale hazardous material abatement (other than VAT) such as fume hoods, ducts and transite counters (the campus has experienced an average cost of $2/gsf to abate these hazardous materials, that could be an additional $600,000).

PROJECT COSTS

SPACE IMPROVEMENTS

		Faculty Office $28/asf	Dry Lab $80/asf	Classroom $40/asf	Research Lab (wet) $200/asf	Typical Wet Lab Bldg Infrastructure Cost $150/gsf (1)	October 2003 Construction Cost (2)	October 2003 Project Cost (3)
Pierce Hall	67,000 asf	11,000	N/A	800	55,000 (8)	Apply 80% of Infrastructure Cost		
	134,604 gsf	**$308,000**		**$32,000**	**$11,000,000**	**$16,100,000**(1)	**±$27,400,000**	**±$32,900,000**
Physics Building	46,000 asf (6)(7)	13,600	30,400 (7)	1,900	N/A	Apply 60% of Infrastructure Cost		
	83,300 gsf (6)(7)	**$380,800**	**$2,400,000**	**$76,000**		**$7,500,000**(1)(5)	**±$10,400,000**	**±$12,500,000**
Webber Hall	27,000 asf	6,600	N/A	N/A	20,300	Apply 60% of Infrastructure Cost		
	49,570 gsf				**$4,000,000**	**$4,500,000**(1)	**± $8,700,000**	**±$10,400,000**
Statistics-Computer Bldg	24,000 asf	13,000	8,700	2,000	N/A	Apply 30% of Infrastructure Cost		
	42,096 gsf	**$364,000**	**$696,000**	**$80,000**		**$1,900,000** (1)	**± $3,000,000**	**± $3,600,000**
Fawcett Lab	15,000 asf	3,600	N/A	N/A	11,200	Apply 100% of Infrastructure Cost		
	19,076 gsf	**$101,000**	**$896,000**(4)		**$2,200,000**(4)	**$2,900,000**(1)	**± $6,100,000**	**± $7,300,000**
	328,646 Total gsf							
						TOTAL	**± $55,600,000**	**± $66,700,000**
							$169/GSF Average	

(1) Infrastructure costs are applied to a percentage of the gross building area, as noted on the matrix. The infrastructure system improvements are limited to mechanical, electrical, plumbing, fire protection and related architectural work only. Envelope upgrades are not included.
(2) Construction Cost includes 15% for G.C. mark-ups, 15% design contingency, and 5% phasing allowance–cumulative value is 39%.
(3) Project Cost includes construction cost plus 20% for indirect costs, per state standards.
(4) Cost does not include process utilities.
(5) The auditorium area is deducted from the building gross for determining the infrastructure upgrade cost.
(6) Does not include Auditorium.
(7) Does not include new lab and infilled mezzanine.
(8) Does not include recently renovated instruction labs of 2,400 asf.
(9) Assumes envelope upgrades are not needed.

APPENDIX

The following information was developed during the briefing provided by personnel from Physical Plant and Design and Construction, and from the tour made by Physical Plant and AEI on the first day of the workshop.

PIERCE HALL

Electrical

1. Electrical service is single-feed 5kV from the campus utility tunnel that appears to have some capacity. There is no 480V service, and there have been problems starting the equipment after a shutdown.
2. The transformers contain PCBs.
3. Some distribution panels are three-phase without a neutral leg.
4. Two diesel electrical generators are sized and configured to only serve life safety loads. The generator on the roof serves the Pierce Hall, and the generator in the basement serves the Pierce Hall plus the Pierce Addition.
5. The fire alarm system has been upgraded to Simplex, with a fiber optic connection. While there is limited coverage, the system is expandable.
6. There is no central UPS system. UPS loads are met by local units at the point-of-use, and are provided by the users.
7. There is no exterior access control.

Mechanical

1. Three air-handling units (AHU) serve the building:
   - AHU-1 serves the two-story portion of the building. The AHU is configured for a hot/cold deck system and operates on 100% outside air (OSA) on a constant volume (CV) basis. A variable frequency drive (VFD) is not provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
   - AHU-2 serves the three-story, northern portion of the building. The AHU is configured for a cold/cold deck system and operates on 100% OSA on a CV basis. A VFD is not provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
   - AHU-3 serves the three-story, southern portion of the building. The AHU is configured for a cold/cold deck system and operates on 100% OSA on a CV basis. A VFD is not provided for the AHU fan and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
2. The exhaust air system has the following characteristics:
   - The south portion of the building has manifolded both the hood and general exhaust, and has capacity 4 to 6 6' hoods. The system has some redundancy, but is not connected to emergency power. This is a concern for the life safety of the occupants.
   - The central and north sections of the building have manifolded both the hood and general exhaust requirements and have additional capacity 4 to 6 6' hoods. The system has some redundancy but is not connected to emergency power. This is a concern for the life safety of the occupants.
   - Dedicated exhaust fans serve special exhaust requirements such as radioisotope hoods. No redundancy is provided, and the fans are not connected to emergency power.
3. Fewer fume hoods are anticipated as chemistry personnel move into the Pierce Annex.
4. All shafts are full of duct and piped services.
5. The chilled water system has new pumps and is meeting the needs of the building.
6. The steam and heating hot water system for the south portion of the building has new pumps and is meeting the current needs of the building.
7. The steam and heating hot water system for the central and north portions of the building are meeting the current needs of the building.
8. The northern and central portions of the building have been upgraded to a DDC control system while the southern portion of the building is operating on the existing pneumatic control system.
9. The process chilled water system is located on the roof of the center portion of the building and is piped throughout the building.

Plumbing

1. A lab waste system exists.
2. A pure water system (RO/DI) exists and is being fed from the campus loop; level of purity could not be determined during the survey.
3. Lab gas piping (Air/Vac/Gas) exists, and upgrades will most likely be required.
4. There is an existing air compressor and redundant reciprocating vacuum pumps.
5. Industrial cold water is available.
6. Only the basement level is sprinklered.

PHYSICS BUILDING

Electrical

1. Electrical service is single feed 5kV that appears to have some capacity. This building might be scheduled to be upgraded to the campus 12kV service.
2. The first floor contains horizontal bus duct that runs through the labs.
3. Some transformers contain PCBs.
4. The life safety loads are backed-up by a diesel electrical generator that also handles geology and science lab life safety loads.
5. The fire alarm system was noted as having been upgraded to Simplex with a fiber optic connection. While there is only limited coverage, the system is expandable.
6. There is no central UPS system. UPS loads are met by local units at the point-of-use and are provided by the users.
7. There is no exterior access control.

Mechanical

1. Five air-handling units (AHU) serve the building:
   - AHU-1 serves the first floor. The AHU is configured for a hot/cold deck system, and operates on 100% outside air (OSA), on a constant volume (CV) basis. A variable frequency drive (VFD) is not provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
   - AHU-2 serves the third floor. The AHU is configured for a hot/cold deck system, and operates on mixture of return air (RA) and OSA, on a constant volume (CV) basis. A variable frequency drive (VFD) is not provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
   - AHU-3 serves the first floor. The AHU is configured for a hot/cold deck system, and operates on 100% outside air (OSA), on a constant volume (CV) basis. A variable frequency drive (VFD) is not provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
   - AHU-4 serves the second floor. The AHU is configured for a hot/cold deck system, and operates on 100% outside air (OSA), on a constant volume (CV) basis. A variable frequency drive (VFD) is not provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
   - AHU-5 serves the auditorium. The AHU is configured for a hot/cold deck system, and operates on mixture of (RA), and OSA on a constant volume (CV) basis. A variable frequency drive (VFD) is not provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
2. The exhaust air system is described as follows:
   - A project is currently underway to modify the existing dedicated fan-per-hood system to a manifolded system. These systems have redundancy, but are not connected to emergency power. This is a concern for the life-safety of the occupants.
   - The auditorium has is own exhaust air system that is not connected to emergency power.
3. The chilled water system utilizes the existing pumps and is meeting the building needs.
4. The steam and heating hot water system utilizes the existing pumps and is meeting the current building needs.
5. The building is operating on the existing pneumatic control system.
6. All process chilled water loads are being met by the campus chilled water system, but are kept separate via a plate and frame heat exchanger.

Plumbing

1. A lab waste system exists.
2. There is no pure water system.
3. Lab gas piping (Air/Vac/Gas) exists, and upgrades will most likely be required.
4. There is an existing air compressor and reciprocating vacuum pumps. The vacuum pump is not in service.
5. Industrial Cold Water is available.
6. Industrial Hot Water is supplied by a steam water heater.
7. Only the basement level is sprinklered.

WEBBER HALL

Electrical

1. Electrical service is single-feed 5 kV that appears to have some capacity. Primary mains and transformers appeared to be relatively new. Secondary switchboard equipment appears to be old.
2. The transformers do not contain PCBs.
3. A diesel electrical generator is installed in Boyce Hall, and serves life-safety loads for Boyce Hall, Webber Hall, and the Statistics-Computer Building.
4. The fire alarm system has been upgraded to Simplex, with a fiber optic connection. While there is only limited coverage, the system is expandable.
5. There is no central UPS system. UPS loads are met by local units at the point-of-use, and are provided by the users.
6. There is no exterior access control.

Mechanical

1. Two air-handling units (AHU) currently serve the building:
   - AHU-1 is configured for a hot/cold deck system, and operates on 100% outside air (OSA) on a constant volume (CV) basis. A variable frequency drive (VFD) is provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
   - AHU-2 is configured for a hot/cold deck system, and operates on 100% outside air (OSA) on a constant volume (CV) basis. A variable frequency drive (VFD) is provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
2. The building is served by the dedicated fan-per-hood exhaust system. These systems have no redundancy, and are not connected to emergency power. This is a concern for the life safety of the occupants.
3. The chilled water system utilizes new pumps and is meeting the needs of the building.
4. The steam and heating hot water system utilizes new pumps and is meeting the needs of the building.
5. The building is operating on a pneumatic control system, except for the AHU controls that are on a DDC system.
6. There is no process chilled water system.

Plumbing

1. A lab waste system exists.
2. A pure water system (RO/DI) exists, and is being fed from the campus loop—level of purity could not be determined.
3. Lab gas piping exists; upgrades will most likely be required.
4. There is no system redundancy.
5. Industrial Cold Water is available.
6. Industrial Hot Water is supplied by a steam water heater.
7. Only the basement level is sprinklered, and is supplied from Boyce Hall.

STATISTICS-COMPUTER BUILDING

Electrical

1. Electrical service is single-feed 5kV that appears to have some capacity.
2. The transformers do not contain PCBs.
3. A diesel electrical generator is installed in Boyce Hall that serves life-safety loads for Boyce Hall, Webber Hall and the Statistics-Computer Building. The Statistics-Computer Building could be getting a dedicated generator, but not date is known.
4. The fire alarm system has been upgraded to Simplex with a fiber optic connection. While there is limited coverage, the system is expandable.
5. There is no central UPS system. An existing UPS unit that served the central computer lab area was not working at the time of the evaluation. A larger UPS unit will be installed in late summer to serve the central computer lab area. All other UPS loads are met by local units at the point of use and are provided by the users.
6. There is no exterior access control.

Mechanical

1. Four air-handling systems (AHU) serve the building:
   - AHU-1 serves the first floor and is new. It is configured for a hot/cold deck system, and operates on 100% outside air (OSA), on a constant volume (CV) basis. A variable frequency drive (VFD) is provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
   - AHU-2 serves the second floor. The AHU is configured for a hot/cold deck system, and operates on 100% outside air (OSA), on a constant volume (CV) basis. A variable frequency drive (VFD) is not provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
   - AHU-3 serves the first floor. The AHU is configured for a hot/cold deck system, and operates on a mixture of return air (RA), and OSA on a constant volume (CV) basis. A variable frequency drive (VFD) is not provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
   - AHU-4 serves the second floor. The AHU is configured for a hot/cold deck system, and operates on mixture of return air (RA), and OSA on a constant volume (CV) basis. A variable frequency drive (VFD) is not provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
2. The building is currently served by the existing dedicated fan-per-hood exhaust fan system. These systems have no redundancy and are not connected to emergency power. This is a concern for the life safety of the occupants.
3. The chilled water system utilizes the existing pumps, and is meeting the building needs.
4. The steam and heating hot water system utilizes the existing pumps, and is meeting the building needs.
5. The building is operating on the existing pneumatic control system.
6. There is no process chilled water system.

Plumbing

1. There is no lab waste system.
2. There is no pure water system (RO/DI).
3. Lab gas piping exists, but upgrades will most likely be required.
4. There is no system redundancy.
5. No Industrial Cold Water is available.
6. The building is partially sprinklered only at the basement level.

FAWCETT LABORATORY

Electrical

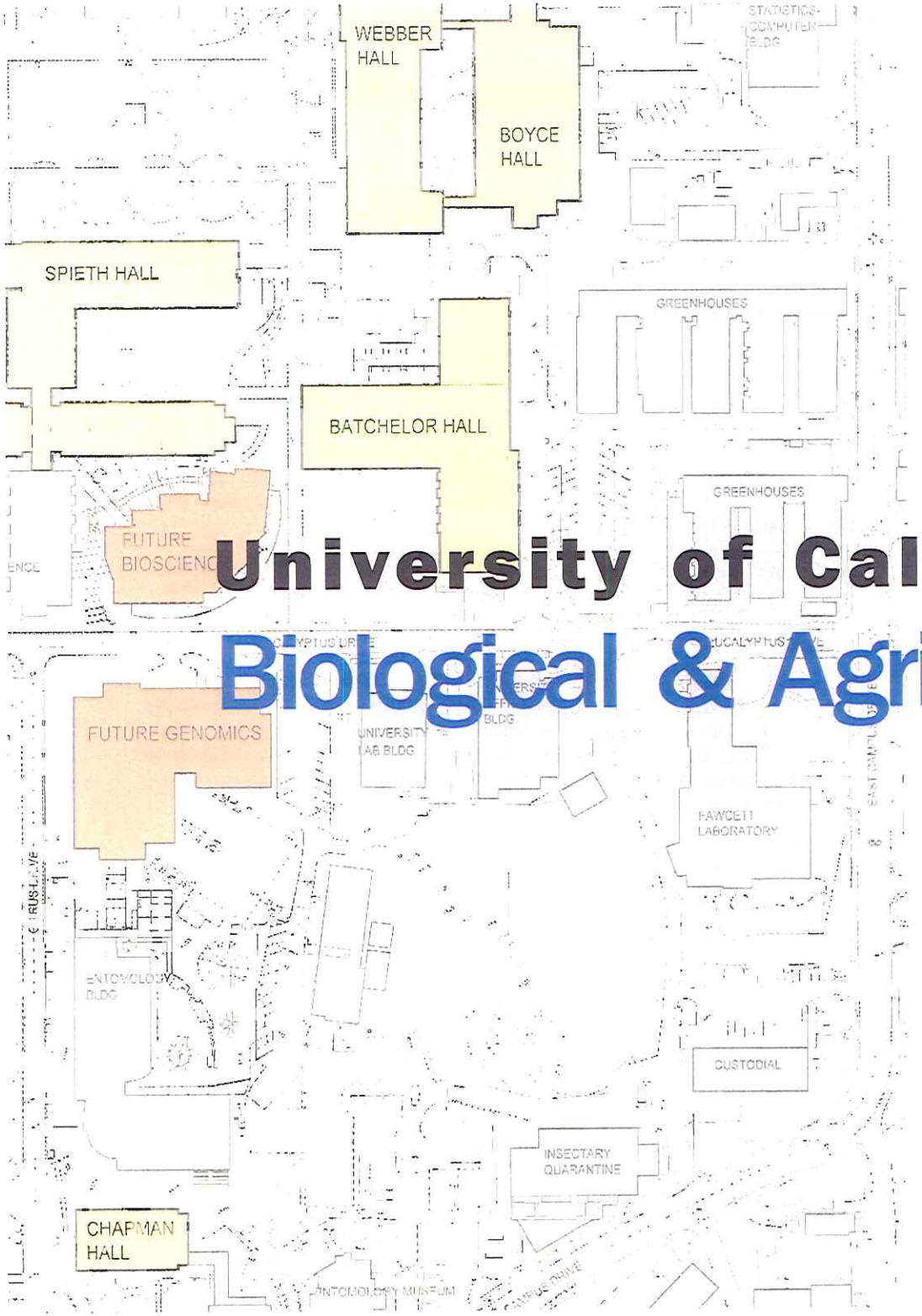
1. Electrical service is single-feed 5kV that is near capacity, and the main electrical equipment is old.
2. There is no electrical generator backup.
3. The fire alarm system has been upgraded to Simplex with a fiber optic connection. While there is only limited coverage, the system is expandable.
4. There is no central UPS system. UPS loads are met by local units at the point-of-use, and are provided by the users.
5. There is no exterior access control.

Mechanical

1. Seven air-handling units (AHU) serve the building:
   - AHU-1 serves the first floor. The AHU is configured for a hot/cold deck system and operates on 100% outside air (OSA), on a constant volume (CV) basis. A variable frequency drive (VFD) is not provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
   - AHU-2 serves the second floor. The AHU is configured for a hot/cold deck system, and operates on 100% outside air (OSA), on a constant volume (CV) basis. A variable frequency drive (VFD) is not provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
   - AHU-3 to 6 serves the second floor lab areas. The AHU are configured for a single deck system with reheat, and operates on 100% OSA, on a CV basis. A VFD is not provided for the AHU fans, and there is no redundancy in the system capacity. The AHU are not connected to emergency power.
   - AHU-7 serves a portion of the second floor. The AHU is a package DX unit, and operates on 100% recirculation, on a constant volume (CV) basis. A variable frequency drive (VFD) is not provided for the AHU fan, and there is no redundancy in the system capacity. The AHU is not connected to emergency power.
2. The exhaust air system for each fume hood or lab area has a dedicated exhaust fan. A total of 24 individual exhaust fans are mounted on the roof. These systems have no redundancy, and are not connected to emergency power. These are concerns for the life safety of the occupants.
3. The chilled water system has new pumps and is meeting the needs of the building.
4. The steam and heating hot water system has new pumps and is meeting the building needs.
5. The building operates on the existing pneumatic control system.
6. There is no process chilled water system.

Plumbing

1. A lab waste system exists.
2. A pure water system (RO/DI) exists, and is being fed from the campus loop—the level of purity could not be determined.
3. Lab gas piping exists—air and vacuum only; upgrades will most likely be required.
4. There is no system redundancy.
5. Industrial Cold Water is available.
6. The building is not sprinklered.



University of California, Riverside

Biological & Agricultural Sciences

A EXECUTIVE SUMMARY

Intent

The purpose of this Secondary Effects report is to provide the College of Natural and Agricultural Sciences with a strategy for re-assessing space vacated as a result of the occupancy of the Biological Sciences and Genomics buildings. This report is a conceptual overview of a complex set of considerations, which focuses on the building systems that relate to lab use. It is not intended as a holistic building systems analysis. The design team recommends that the campus continues the evaluation and planning process in more detail prior to embarking on budgeting or implementation of significant improvements.

The intent of the study was for the design team to recommend how the specific vacated space be utilized and to develop a range of costs to refurnish the spaces. In order to determine the most appropriate use, the team felt it was important to gain an understanding of each building's condition and capacity, which led to a conceptual review of building systems and potential infrastructure improvements.

Process

A meeting was convened in January with representatives for each discipline from Physical Plant. The buildings were discussed, and a matrix of critical systems was created. The building evaluations in this report evolved from that matrix. The team spent a day walking through the buildings with personnel from Physical Plant who are responsible for the systems. Subsequently, a workshop was convened to review the preliminary results of the analysis and to determine the highest and best use for each building, based of the established criteria.

Criteria

The team created criteria for contemporary design standards that apply to office, classroom and laboratory functions. Those standards are defined in Section B. The criteria are applied to each building, and the critical elements are identified.

Existing Buildings

The dates of construction range from 1931 to 1974, or an average age of 47 years. Approximately 56,000 assignable square feet (asf) will be vacated, including 36,000 asf of laboratory—the remainder are offices and classrooms. The total area of all buildings is approximately 387,000 gross square feet (gsf) and 216,000 asf.

The HVAC systems in Spieth Hall and Batchelor Hall are original, at their design capacity, and have reached the end of their normal life. Boyce Hall's HVAC system is scheduled to be upgraded in the summer of 2003, and when completed, will have the capacity to support 50% more demand, according to the design engineer. Webber Hall's HVAC equipment is new, and has the capacity to support 10-15% more demand. Chapman Hall was not designed to accommodate labs, and its systems are inadequate at best.

Seismic upgrades have been completed or are in the process of being implemented for all buildings that require modifications.

Recommended Strategy

The recommended strategy is to upgrade key building infrastructures first and follow with the renovation of labs and offices as space is vacated, thus allowing an orderly transition from a limited to a more flexible building, and results in a reasonable cost for the renovation of individual spaces.

Following the planned 2003 upgrade, Boyce Hall will have the capacity to support approximately 50% more fume hoods and Webber Hall has 15% additional HVAC capacity to add fume hoods. All other systems within the space should be upgraded as the space is vacated.

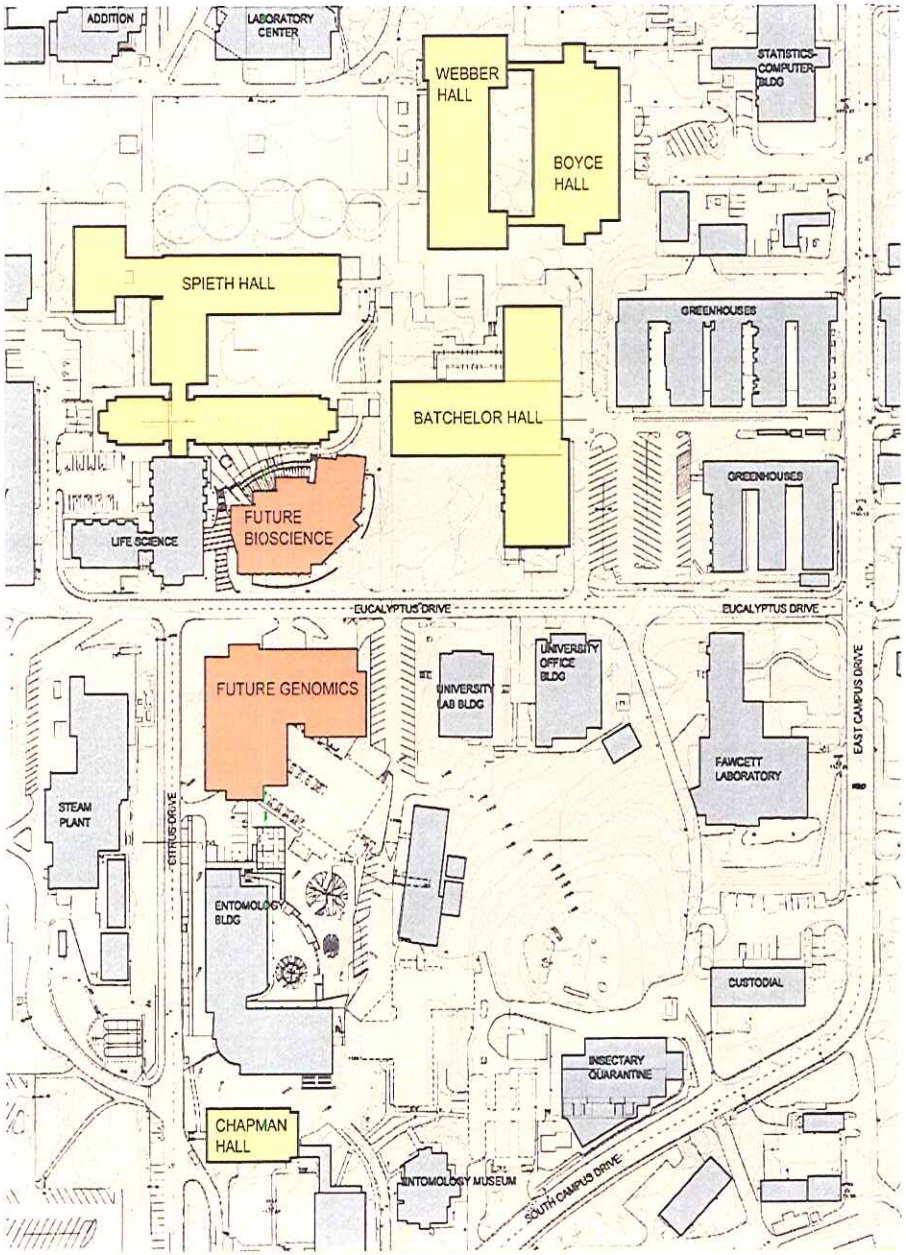
The labs could continue to function in Spieth and Batchelor Halls in their present condition with periodic upgrades, as long as the demand on the HVAC system does not increase. As lab use intensifies, we recommend that approximately half of the total building area (upper floors) be upgraded to current HVAC design standards and the remaining space (lower floors) be used less intensely. All other systems within the space should be upgraded as the space is vacated.

All of Chapman Hall is being vacated, so a full remodel to classrooms, offices or dry labs should be considered.

The team believes that Spieth Hall would be the most economical to convert to contemporary labs, because it has two- and three-floor wings with proportionally larger roof areas than the other buildings. This means that shorter shafts are required to reach the floors.

Costs

It was concluded that infrastructure construction costs for the complete renovation of the buildings range from $2 million to $10.5 million, and the space improvements construction costs range from $2.6 to $19.4 million. We believe that the conceptual cost to upgrade all four (excludes Webber Hall, and is included in the CNAS Buildings Systems Evaluation Report) buildings is in the range of $61 to $75 million and is described in this section, and in Section D.



Secondary Effects Buildings

Vacated Space (ASF)

	Batchelor	Webber	Boyce	Spieth	Chapman	Total asf by Department
Botany & Plant Sciences	8,330					8,330
Biochemistry			2,500			2,500
Bio-Medical			1,650			1,650
Plant Pathology		8,980	3,350			12,330
Entomology					8,500	8,500
Nemotology				1,880		1,880
Biology				7,030		7,030
Cell Biology & Neurosciences			13,000	930		13,930
Total asf by Building	8,330	8,980	20,500	9,840	8,500	56,150

RECOMMENDATIONS

	BUILDING	VACATED SPACE
Boyce Hall 1974 114,000 gsf/64,000 asf 20,500 asf vacated	• Continue to utilize for research labs • Upgrade planned for summer 2003 to achieve 10 air changes per hour (AC/hr) • Concentrate higher lab intensity uses on the upper lab floors (4th and 5th) • 24 - 6' fume hoods exist; upgrade will increase capacity to approximately 37 - 6' hoods	• Fume hood use density can increase by approximately 50% building-wide, more in selected space(s) for intense lab use • Limit labs to low to medium intensity use on 1st and 2nd floors (research or instruction) as demand exceeds system capacity
Webber Hall 1953 49,750 gsf/27,050 asf 9,000 asf vacated	• Continue to utilize for research labs • HVAC equipment is new; system demand is at 85-90% of capacity • Concentrate higher intensity uses on the upper (2nd and 3rd) floors until upgrade	• Increase the lab use intensity on the 2nd and 3rd floors by 10-15% (within existing capacity) • Limit labs to low to medium intensity use on the 1st floor (research or instruction) as demand increases
Batchelor Hall 1965 109,500 gsf/57,740 asf 8,300 asf vacated	• Focus on lower intensity lab use, and reduce quantity of fume hoods to increase air changes/hr • HVAC equipment is original and requires significant upgrades	• Utilize labs for low intensity functions: offices, lab support, and classrooms
Spieth Hall 1958 100,500 gsf/60,000 asf 9,900 asf vacated	• Continue to utilize for research labs • HVAC equipment is original and requires significant upgrades • Concentrate higher intensity uses on the upper (3rd and 2nd) floors with upgrade • Limit fume hoods to existing quantity until upgrades occur	• Increase the ventilation capacity on the 2nd and 3rd floors • Limit labs to low to medium intensity use on the 1st floor (research or instruction)
Chapman Hall 1931 12,700 gsf/8,500 asf 8,500 asf vacated	• Convert to dry labs, classrooms, conference rooms or offices	• Address interior accessibility and the requirement for an elevator

PROJECT COSTS

SPACE IMPROVEMENTS

		Faculty Office $28/asf	Dry Lab $80/asf	Classroom $40/asf	Research Lab (wet) $200/asf	Building Infrastructure $150(1)	2003 Construction Cost (2)	2003 Project Cost (3)
Boyce Hall	59,100 asf	12,500	N/A	N/A	46,600	Apply 50% of Infrastructure Cost		
	108,400 gsf	**$350,000**			**$9,300,000**(6)	**$8,100,000**(1)(4)	± $17,800,000	± $21,400,000
Batchelor Hall	57,470 asf	19,370	N/A	N/A	38,100	Apply 50% of Infrastructure Cost		
	109,500 gsf	**$542,000**			**$7,600,000**	**$8,200,000**(1)	± $16,300,000	± $19,600,000
Spieth Hall	54,870 asf	10,370	N/A	2,000	42,500	Apply 70% of Infrastructure Cost		
	94,800 gsf	**$290,000**		**$80,000**	**$8,500,000**(6)	**$9,900,000**(1)	± $18,800,000	± $22,600,000
Chapman Hall	8,500 asf	N/A	4,000	4,500	N/A	Apply 100% of Infrastructure Cost		
	12,700 gsf		**$320,000**(5)	**$180,000**		**$2,100,000** (1)	± $2,600,000	± $3,100,000
	325,400 Total gsf				TOTAL		± $55,500,000	± $66,700,000
							$171 /GSF Average	

Webber Hall costs are included in the CNAS Building Systems Evaluation Report.

(1) Infrastructure costs are applied to a percentage of the gross building area, as noted on the matrix. The infrastructure system improvements are limited to mechanical, electrical, plumbing, fire protection and related architectural work only. Envelope upgrades are not included.
(2) Construction Cost includes 15% for G.C. mark-ups, 15% design contingency, and 5% phasing allowance–cumulative value is 39%.
(3) Project Cost includes construction cost plus 20% for indirect costs per state standards.
(4) The HVAC infrastructure cost does not include the anticipated work on Boyce to be completed summer 2003.
(5) Cost does not include process utilities.
(6) Vivariums are not included in building gross or assignable areas. Refer to the 2002 Vivaria Master Space Plan.

B FUNCTIONAL CRITERIA

The criteria identifies five building systems and emphasizes components that are considered the most critical for instructional and research laboratories, and includes an analysis of offices and classrooms.

General

This group includes building code and environmental quality issues, such as daylight and view, which should be strongly considered in decisions affecting plan configurations for labs and offices.

Structural

The most important elements are: vibration which affects equipment such as electron microscopes; the clear dimension from the floor to the bottom of the structure (for new ducts and services), and the structural grid (efficiency of lab layout). The most efficient lab module is from 10.5'-11' wide by 25'- 30' deep. The optimal dimension from the floor to the bottom of structure is 13'-6". Seismic is not listed since UCR has completed, or is in the process of finishing, code-required modifications to three buildings. Chapman and Webber Halls rated high enough in the UCR seismic evaluation to not require seismic modification.

HVAC

The critical design component in this category is air changes per hour (AC/hr), assuming that heating and cooling requirements are met. AC/hr depends on the quantity and size of fume hoods needed by the users. Even a biology lab could be in the range of 12-15 AC/hr for anatomy or physiology, since they often work with preserved specimens; however, the more typical biology lab is in the range of 8-10 AC/hr.

Plumbing

Fire sprinklers are a critical system for life and property protection, and they only exist in the basements of these buildings. The remaining components are provided locally in the labs (gases and polished RO/DI water).

Power and Data

Emergency generators are provided only for life safety and do not support critical equipment, such as freezers and refrigerators—this is a significant exposure that could mean the loss of materials and experiments representing years of study. Building power is in the process of being upgraded campus-wide from 5kV to 12kV.

Telecommunication systems are at capacity but are functioning.

FUNCTIONAL CRITERIA

BUILDING USES

General	Faculty Office	Classroom	Instructional Lab (wet)	Research Lab (wet)	Comments
Code/Occupancy	B	B/A	B	B	
CBC Construction Type	Flexible	Flexible	Limited	Limited	
Adjacencies	Near research labs/not ground flr.	on ground floor	on ground floor/sep from research	ground floor/sep from instruction	
Light and view	View/light critical	Desirable, not critical	Desirable	Very desirable	
Service access	Low	Low	Moderate	High	
ADA	Required	Required	Required	Required	
Structural					
Type	Steel or concrete	Steel or concrete	Concrete preferred	Concrete preferred	
Grid	+/- 10'-12' width	+/- 30' x 30'	10.5'-11' x 30'	10.5'-11' x 20-24' (min.)	
Vibration	8-16,000 mips	8-16,000 mips	2,000 mips (varies)	2,000 mips	Depends on program need
Floor to floor height	12'+	12'+	15'-16' preferred	15'-16' preferred	Assume the structure depth is ~30"
Live load (lbs/sf)	100	100	125	125	
HVAC					
System redundancy	N/A	N/A	Yes (main supply/exhaust)	Yes (main supply/exhaust)	Main supply; exhaust; circ. Pumps
Air circulation	Recirculating	Recirculating	100% outside air	100% outside air	
Fume hoods - Air Changes/hr (outside air)	20 cfm OSA/person	20 cfm OSA/person	--	--	Access roof exhaust; access to shafts
Low Intensity - AC/hr.	N/A	N/A	6-8	6-8	Biology lab; varies
Medium Intensity - AC/hr.	N/A	N/A	8-10	8-10	Biology lab; varies
High Intensity - AC/hr.	N/A	N/A	10-12 ; 12-15	10-12 ; 12-15	Chemistry or biology lab ; varies
Chilled water capacity	based on building area/demand	--	--	--	
Steam capacity	based on building area/demand	--	--	--	
Plumbing					
Waste	Sanitary	Sanitary	Lab waste	Lab waste	
RO/DI	N/A	N/A	Yes (varies, limited)	Yes (varies)	Depends on program need
Lab gasses: air, vac, nat gas, O_2, CO_2	N/A	N/A	Yes	Yes (varies, A, V, NG)	
Sys Redundancy (air, vac, indust H_2O)	No	No	Yes	Yes	
Fire protection	Light hazard	Light hazard	Ordinary hazard	Ordinary hazard	
Power & Data					
Emergency power	Life safety (L.S.) only	Life safety only	L.S. + Equipment (varies)	L. S. + Equipment	Equip is HVAC & lab equip
Power capacity	Moderate	Moderate	Medium (possible redundancy)	High w/redundancy	
Data/telecom	High	High	High	High	
UPS	No	No	Varies	Yes	
Fire alarm	Limited	Limited	Full	Full	
Security	Moderate (varies)	Moderate (varies)	Varies	High	

C BUILDING EVALUATIONS

All five of the buildings are of concrete frame construction with varying floor structure depths and floor to bottom of structure dimensions. The average age of the buildings is 47 years, and that attests to the difficulty of the maintenance task for Spieth and Batchelor Halls that also have original systems.

Boyce Hall

1974 construction
6 stories
20,500 asf vacated area
Total area: 114, 000 gsf; 64,000 asf
Floor to structure: 12.0'

Boyce Hall has a large, vertical mechanical/service distribution shaft between labs that is close to capacity. It is the largest building in the group, has been seismically upgraded, and has a vivarium on the sixth floor. Work is scheduled for summer 2003 to replace fan motors and convert to a VAV system. When the upgrade is complete, the system will achieve a building average of approximately 10 AC/hr. One half of the labs have a module depth of 22' and the remainder are 30'. Most offices and approximately half of the labs have exterior windows.

Webber Hall

1953 construction
3 stories
9,000 asf vacated area
Total area: 50,000 gsf; 27,000 asf
Floor to structure: 11.6'

Services are distributed through scattered vertical shafts. The HVAC equipment is new, and the system has the capacity to support 10-15% more hoods of the same sizes that exist. It is not required to be seismically upgraded. Most of the labs are 28' deep, and the remainder are 25' deep. Since the corridors are double-loaded most labs and offices have windows.

Batchelor Hall

1965 construction
4 stories
8,300 asf vacated area
Total area: 110,000 gsf; 57,000 asf
Floor to structure: 9.3'

Batchelor Hall has a vertical mechanical/service distribution shaft in the center of two wings, and the third wing (north) has duct shafts. It has been seismically upgraded. Mechanical equipment for those wings with vertical interstitial space is original from 1965. Offices and labs in the north wing were renovated within the last year, and new HVAC equipment was installed to support those spaces. The lab module depth in the west wing is 19' and not efficient; the depth in the south wing is 25' and is marginally efficient, as 30' is preferred. In addition, the dimension from the floor to the bottom of the structure is 9'-4", which is not conducive to adding new duct runs. The existing ducts and lights are inside and flush to the bottom of the concrete pan structure. Only about 15% of the labs have windows, while all offices have windows.

Spieth Hall

1958 construction
2 stories (north wing); 3 stories (south wing)
9,900 asf vacated area
Total area: 100,500 gsf; 60,000 asf
Floor to structure: 11.0'

Services are distributed through shafts on the corridor wall of the labs. The mechanical equipment is original from 1958. Spieth Hall is in the process of being seismically upgraded. Most lab modules have a 25' depth. The primary advantage for Spieth is that it is two and three stories, which makes adding rooftop units and duct shafts to serve labs cost-effective. Additionally, the south wing has two story buildings on both sides, and ducts could be distributed horizontally. Since the corridors are double-loaded, most labs and offices have exterior windows. We acknowledge the existence of vivariums in the basement, and this evaluation does not consider applicable regulations; however, the campus has studied the requirements and recommends refurbishment.

Chapman Hall

1931 construction
2 stories
8,500 asf vacated area
Total area: 12,700 gsf; 8,500 asf
Floor to structure: 11.5'

Mechanical services are distributed through shafts from roof-mounted equipment. Chapman Hall needs significant renewal for all systems, and it is not required to be seismically upgraded. Since there is no elevator, accessibility is an issue between floors, as is access to the second floor from the exterior. The corridors are double-loaded so most labs and offices have windows. The entire building is being vacated.

LAB USE INTENSITY

These tables define the range of air changes per hour that might be found in a typical lab type and how the buildings rate in relation to the recommended upgrade. The design criteria; however, is highly dependent on the number of fume hoods required by the specifications, by the intensity of the research, and other equipment requiring exhaust. The key is to provide capacity in the HVAC system, as the budget allows, to give the University latitude in the program types that the building can support. The Capacity Table shows existing and proposed air changes per hour (AC/HR).

INTENSITY

AC/HR	EXISTING	PROPOSED LOWER FLOORS	PROPOSED UPPER FLOORS
Boyce Hall	○	◒ floors 1, 2 & 3	● floors 4 & 5
Webber Hall	○	◒ floor 1	● floors 2 & 3
Batchelor Hall	○	○ floors 1 & 2	◒ floors 3 & 4
Spieth Hall	○	● all floors	● all floors
Chapman Hall	N/A	N/A	N/A

Legend
○ Low (6-8)
◒ Medium (8-10)
● High (10-12)

CAPACITY

Biology	LOW (6-8)	MEDIUM (8-10)	HIGH (10-12)	Comments
Research		●	●	
Physiology			●	Potentially 12-15
Anatomy			●	Potentially 12-15
Instruction	●	●		
Bio-Chemistry				
Research		●	●	
Instruction		●	●	
Chemistry				
Research		●	●	
Instruction		●	●	

WEBBER HALL
49,750 gsf

BUILDING USES

49,570 GSF

Legend ✔ = meets criteria
X = does not meet criteria
N/A = not applicable

General	Existing	Office	Classroom	Instruction Lab	Research Lab	Comments
Code/Occupancy	B?	✔	✔	✔	✔	
CBC Construction Type	Non-Comb	✔	✔	✔	✔	
Adjacencies	?	N/A	N/A	?	?	Preferable to have lab types on separate floors
Light and view	Varies	✔	N/A	✔	✔	
Service access	from Boyce	✔	✔	✔	✔	
ADA	Yes	✔	✔	✔	✔	Check labs for compliance
Structural						
Type	Concrete	✔	✔	✔	✔	
Grid	15'X30' verify	✔	✔	✔	✔	
Vibration	?	✔	✔	?	?	Assume acceptable
Floor-to-structure dimension	12'-2nd; 11.7'-3rd	✔	✔	✔	✔	12.7' fl-to-fl; Add shafts for 10-12; OK for 8?
Live load	?	✔	✔	✔ (?)	✔ (?)	
HVAC						
System redundancy	No	✔	✔	X	X	
Air circulation	100% OA	100% OA X	100% OA X	✔	✔	
Air changes per hour (outside air)	6?	N/A	N/A	X	X	
Fume hoods	Indiv Const Vol	N/A	N/A	✔	✔	CV limiting; manifolded VAV is flexible
Chilled water capacity	2-8" (gpm/sf?)	✔	✔	✔	✔	Requires upgrade if use intensifies
Steam capacity	5"	✔	✔	✔	✔	Add heat recovery
Plumbing						
Waste	Yes	N/A	N/A	✔	✔	
RO/DI	Yes	N/A	N/A	X	X	
Lab gasses: air, vac, nat gas	Yes	N/A	N/A	✔	✔	May require upgrade
Sys Redundancy (air, vac, indust H_2O)	No	✔	✔	X	X	
Fire protection	Partial	X	X	X	X	Only basement sprinklered; from Boyce
Power & Data						
Emergency power	L.S. only	✔	✔	X	X	
Power capacity	Yes	✔	✔	✔	✔	No redundancy; 5 KV
Data/telecom	Yes	✔	✔	✔	✔	Security and environment marginal
UPS	No	N/A	N/A	X	X	Point-of-use only
Fire alarm	Yes	✔	✔	✔	✔	Modifications required when area increases
Security	Limited	✔	✔	✔	✔	Modifications required when area increases
CURRENT CONDITIONS		✔	✔	✔	✔	
UPGRADED/PROPOSED		✔	✔	✔	✔	

✔ Recommended
✔ Selectively Recommended
X Not recommended

BOYCE HALL
113,750 asf

BUILDING USES

Legend ✔ = meets criteria
✘ = does not meet criteria
N/A = not applicable

	Existing	Office	Classroom	Instruction Lab	Research Lab	Comments
General						
Code/Occupancy	B?	✔	✔	✔	✔	
CBC Construction Type	Non-Comb	✔	✔	✔	✔	
Adjacencies	?	N/A	N/A	?	?	Preferable to have lab types on separate floors
Light and view	Varies	✔	N/A	Partial	Partial	
Service access	✔	✔	✔	✔	✔	
ADA	Yes	✔	✔	✔	✔	Check labs for compliance
Structural						
Type	Concrete	✔	✔	✔	✔	
Grid	20'x30.5' & 22'	✔	✔	✔	✔	
Vibration	?	✔	✔	?	?	Assume acceptable
Floor-to-structure dimension	12'	✔	✔	✔	✔	12.5' fl-to-fl
Live load	?	✔	✔	✔ (?)	✔ (?)	
HVAC						
System redundancy	No	✔	✔	✘	✘	
Air circulation	100% OA	100% OA ✘	100% OA ✘	✔	✔	Converting from CV to VAV ~2005
Air Changes per hour (outside air)	*10	N/A	N/A	✘	✘	115,000 cfm total; *to be upgraded summer 2003 to 10 AC/hr.
Fume hoods	Indiv Const Vol	N/A	N/A	✔	✔	CV limiting; manifolded VAV is flexible
Chilled water capacity	12" (gpm/sf?)	✔	✔	✔	✔	Requires upgrade if use intensifies
Steam capacity	8"	✔	✔	✔	✔	Add heat recovery
Plumbing						
Waste	Yes	N/A	N/A	✔	✔	
RO/DI	Yes	N/A	N/A	✘	✘	
Lab gasses: air, vac, nat gas	Yes	N/A	N/A	✔	✔	May require upgrade
Sys Redundancy (air, vac, indust H_2O)	No	N/A	N/A	✘	✘	
Fire protection	Partial	✘	✘	✘	✘	Only basement sprinklered
Power & Data						
Emergency power	L.S. only	N/A	N/A	✘	✘	
Power capacity	Yes	✔	✔	✔	✔	No redundancy; 5kV
Data/telecom	Yes	✔	✔	✔	✔	Security and environment marginal
UPS	No	N/A	N/A	✘	✘	Point-of-use only
Fire alarm	Yes	✔	✔	✔	✔	Modifications required when area increases
Security	Limited	✔	✔	✔	✔	Modifications required when area increases

	Office	Classroom	Instruction Lab	Research Lab
CURRENT CONDITIONS	✔	✔	✔	✔
UPGRADED/PROPOSED	✔	✔	✔	✔

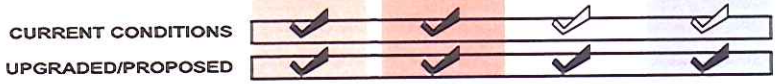
✔ Recommended
✔ Selectively Recommended
✘ Not recommended

SPIETH HALL
100,553 gsf

BUILDING USES

Legend ✔ = meets criteria
✘ = does not meet criteria
N/A = not applicable

	Existing	Office	Classroom	Instruction Lab	Research Lab	Comments
General						
Code/Occupancy	B?	✔	✔	✔	✔	
CBC Construction Type	Non-Comb	✔	✔	✔	✔	
Adjacencies	?	N/A	N/A	?	?	Preferable to have lab types on separate floors
Light and view	Varies	✔	N/A	✔	✔	
Service access	Yes	✔	✔	✔	✔	
ADA	Yes	✔	✔	✔	✔	Check labs for compliance
Structural						
Type	Concrete	✔	✔	✔	✔	
Grid	25'x25'	✔	✔	✔	✔	
Vibration	?	✔	✔	?	?	Assume acceptable
Floor-to-structure dimension	11'	✔	✔	✔	✔	12.5 fl-to-fl
Live load	?	✔	✔	✔ (?)	✔ (?)	
HVAC						
System redundancy	No	✔	✔	✘	✘	
Air circulation	100% OA	✔	✔	✔	✔	
Air changes per hour (outside air)	6?	N/A	N/A	✘	✘	
Fume hoods	Indiv Const Vol	N/A	N/A	✔	✔	Requires upgrade if use intensifies; CV limiting; manifolded VAV is flexible
Chilled water capacity	5" (gpm/sf?)	✔	✔	✔	✔	Requires upgrade if use intensifies
Steam capacity	4"	✔	✔	✔	✔	Add heat recovery
Plumbing						
Waste	Yes	N/A	N/A	✔	✔	
RO/DI	Yes	N/A	N/A	✘	✘	
Lab gasses: air, vac, nat gas	Yes	N/A	N/A	✔	✔	May require upgrade
Sys Redundancy (air, vac, indust H_2O)	No	N/A	N/A	✘	✘	
Fire protection	Partial	✘	✘	✘	✘	Only basement sprinklered
Power & Data						
Emergency power	L.S. only	✔	✔	✘	✘	
Power capacity	Yes	✔	✔	✔	✔	No redundancy; 5 kV; no 480V
Data/telecom	Yes	✔	✔	✔	✔	Security and environment marginal
UPS	No	N/A	N/A	✘	✘	Point-of-use only
Fire alarm	Yes	✔	✔	✔	✔	Modifications required when area increases
Security	Limited	✔	✔	✔	✔	Modifications required when area increases



✔ Recommended
✔ Selectively Recommended
✘ Not recommended

CHAPMAN HALL
12,681 gsf

Legend ✔ = meets criteria
✘ = does not meet criteria
N/A = not applicable

General	Existing	Office	Classroom	Instruction Lab	Research Lab	Comments
Code/Occupancy	B?	✔	✔	✔	✔	
CBC Construction Type	Non-Comb	✔	✔	✔	✔	
Adjacencies	?	N/A	N/A	?	?	Preferable to have lab types on separate floors
Light and view	Varies	✔	N/A	✔	✔	
Service access	Yes	✔	✔	✔	✔	
ADA	Varies	Depends on Floor				Restrooms are non-compliant; requires elevator
Structural						
Type	Concrete	✔	✔	✔	✔	
Grid	20'x25'	✔	✔	✔	✔	
Vibration	?	✔	✔	?	?	Assume acceptable
Floor-to-structure dimension	11.5'	✔	✔	✔	✔	fl-to-fl 13'
Live load	?	✔	✔	✔ (?)	✔ (?)	
HVAC						
System redundancy	No	N/A	N/A	✘	✘	
Air circulation	100% OA	✔	✔	✔	✔	
Air changes per hour (outside air)	6?	N/A	N/A	✘	✘	Some fume hoods not connected properly
Fume hoods	Indiv Const Vol	N/A	N/A	✔	✔	Requires upgrade if use intensifies
Chilled water capacity	4" (gpm/sf?)	✔	✔	✔	✔	Requires upgrade if use intensifies
Steam capacity	4"	✔	✔	✔	✔	Add heat recovery
Plumbing						
Waste	Yes	N/A	N/A	✔	✔	
RO/DI	Yes (campus loop)	N/A	N/A	✘	✘	
Lab gasses: air, vac, nat gas	Yes (no ind H^2O)	N/A	N/A	✘	✘	May require upgrade
Sys Redundancy (air, vac, indust H_2O)	No	N/A	N/A	✘	✘	
Fire protection	No	✘	✘	✘	✘	Only basement sprinklered
Power & Data						
Emergency power	L.S. only	✔	✔	✘	✘	
Power capacity	Yes	✔	✔	✔	✔	No redundancy; 5 kV; no 480V
Data/telecom	Yes	✔	✔	✔	✔	Marginal, security and environment marginal
UPS	No	N/A	N/A	✘	✘	Point-of-use only
Fire alarm	Yes	✔	✔	✔	✔	Modifications required when area increases
Security	Limited	✔	✔	✔	✔	Modifications required when area increases

CURRENT CONDITIONS	✔	✔	✘	✘
UPGRADED/PROPOSED	✔	✔	✘	✘

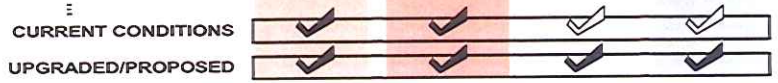
✔ Recommended
✔ Selectively Recommended
✘ Not recommended

BATCHELOR HALL
109,462 gsf

BUILDING USES

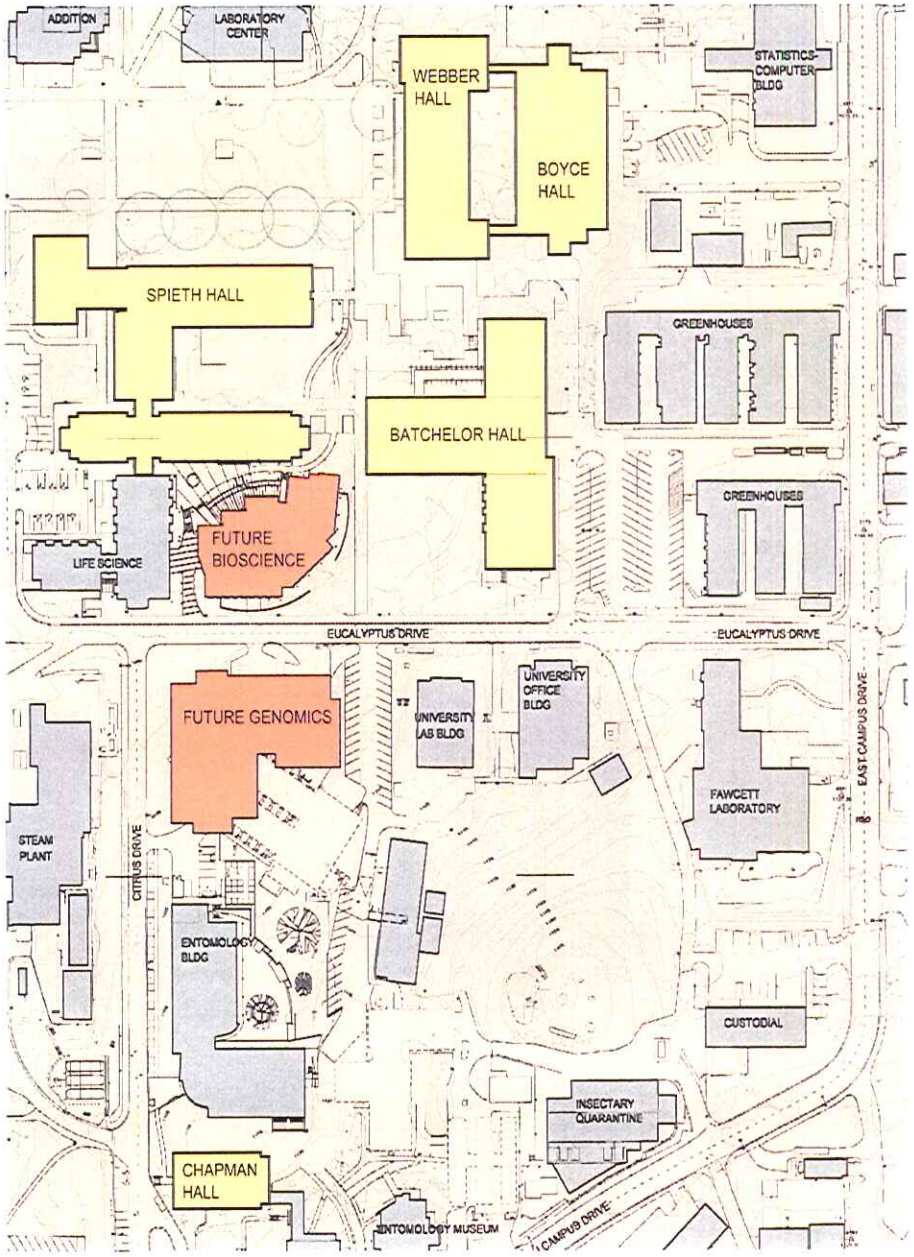
Legend ✔ = meets criteria
✘ = does not meet criteria
N/A = not applicable

	Existing	Office	Classroom	Instruction Lab	Research Lab	Comments
General						
Code/Occupancy	B?	✔	✔	✔	✔	
CBC Construction Type	Non-Comb	✔	✔	✔	✔	
Adjacencies	?	N/A	N/A	?	?	Preferable to have lab types on separate floors
Light and view	Varies	✔	N/A	✘	✘	
Service access	Yes	✔	✔	✔	✔	Verify longevity
ADA	Yes	✔	✔	✔	✔	Check labs for compliance
Structural						
Type	Concrete	✔	✔	✔	✔	
Grid	18'X19'; 18'x25'	✔	✔	✔	✔	
Vibration	?	✔	✔	?	?	Assume acceptable
Floor-to-structure dimension	9.25'	✔	✔	✘	✘	11.5' fl-to-fl
Live load	?	✔	✔	✔ (?)	✔ (?)	
HVAC						
System redundancy	No	✔	✔	✘	✘	
Air circulation	Partial Recirc	✔	✔	✔ (varies)	✔ (varies)	Converting from CV to VAV ~2005; ~140,000 cfm
Air changes per hour (outside air)	6?	N/A	N/A	✘	✘	
Fume hoods	Indiv Const Vol	N/A	N/A	✔	✔	Requires upgrade if use intensifies; CV limiting; manifolded VAV is flexible
Chilled water capacity	1-8"; 1-4" (gpm/sf?)	✔	✔	✔	✔	Requires upgrade if use intensifies
Steam capacity	1-4"	✔	✔	✔	✔	Add heat recovery
Plumbing						
Waste	Yes	N/A	N/A	✔	✔	
RO/DI	Yes	N/A	N/A	✘	✘	
Lab gasses: air, vac, nat gas	Yes	N/A	N/A	✔	✔	May require upgrade
Sys Redundancy (air, vac, indust H_2O)	No	N/A	N/A	✘	✘	
Fire protection	Partial	✘	✘	✘	✘	Only basement sprinklered
Power & Data						
Emergency power	L.S. only	✔	✔	✘	✘	
Power capacity	Yes	✔	✔	✔	✔	No redundancy; 5 kV; no 480V
Data/telecom	Yes	✔	✔	✔	✔	Security and environment marginal
UPS	No	N/A	N/A	✘	✘	Point-of-use only
Fire alarm	Yes	✔	✔	✔	✔	Modifications required when area increases
Security	Limited	✔	✔	✔	✔	Modifications required when area increases

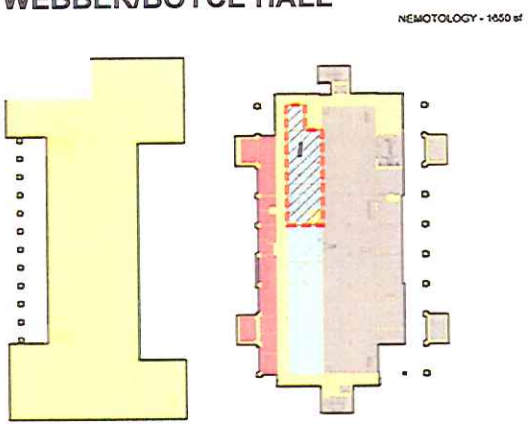


✔ Recommended
✔ Selectively Recommended
✘ Not recommended

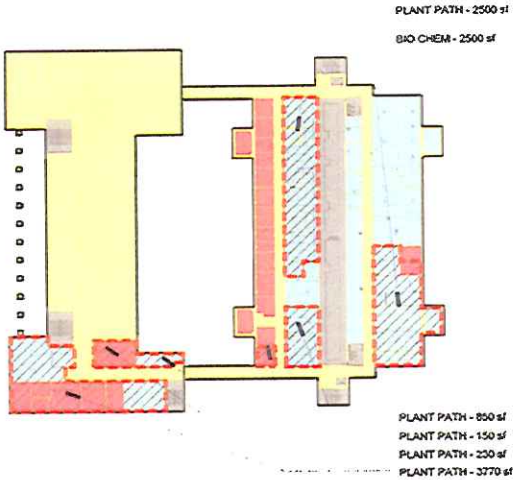
FLOOR PLANS


ADDITION
LABORATORY CENTER
WEBBER HALL
BOYCE HALL
STATISTICS-COMPUTER BLDG
SPIETH HALL
GREENHOUSES
BATCHELOR HALL
GREENHOUSES
FUTURE BIOSCIENCE
LIFE SCIENCE
EUCALYPTUS DRIVE
EUCALYPTUS DRIVE
FUTURE GENOMICS
UNIVERSITY LAB BLDG
UNIVERSITY OFFICE BLDG
FAWCETT LABORATORY
EAST CAMPUS DRIVE
STEAM PLANT
CITRUS DRIVE
ENTOMOLOGY BLDG
CUSTODIAL
INSECTARY QUARANTINE
CHAPMAN HALL
ENTOMOLOGY MUSEUM
CAMPUS DRIVE

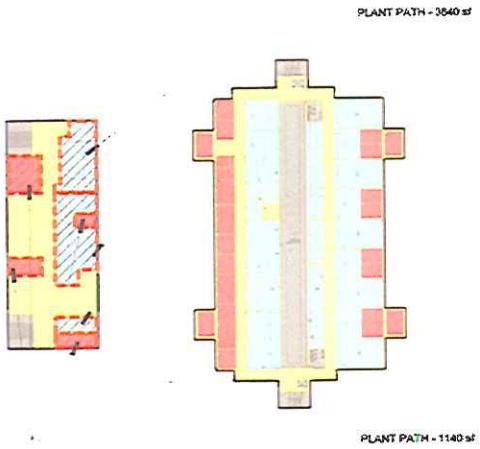
WEBBER/BOYCE HALL



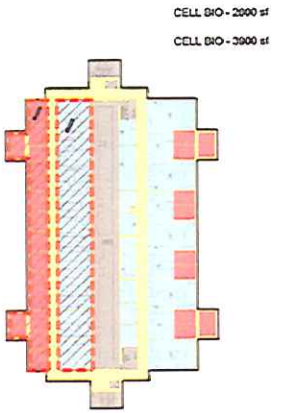
WEBBER HALL BOYCE HALL
FIRST FLOOR



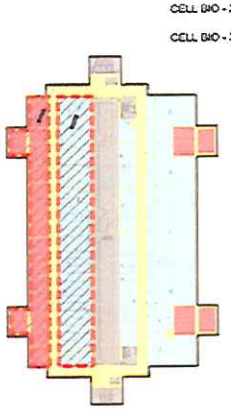
WEBBER HALL BOYCE HALL
SECOND FLOOR



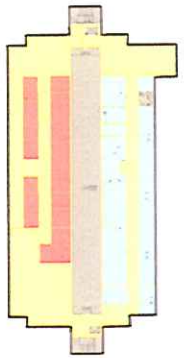
WEBBER HALL BOYCE HALL
THIRD FLOOR



WEBBER HALL BOYCE HALL
FOURTH FLOOR



WEBBER HALL BOYCE HALL
FIFTH FLOOR



WEBBER HALL BOYCE HALL
SIXTH FLOOR

FUNCTION LEGEND

- OFFICE
- RESEARCH LAB
- TEACHING LAB
- BUILDING SUPPORT
- VACATED SPACE

AREA SUMMARY

PLANT PATHOLOGY
12,480 sf VACATED

NEMOTOLOGY
1,650 sf VACATED

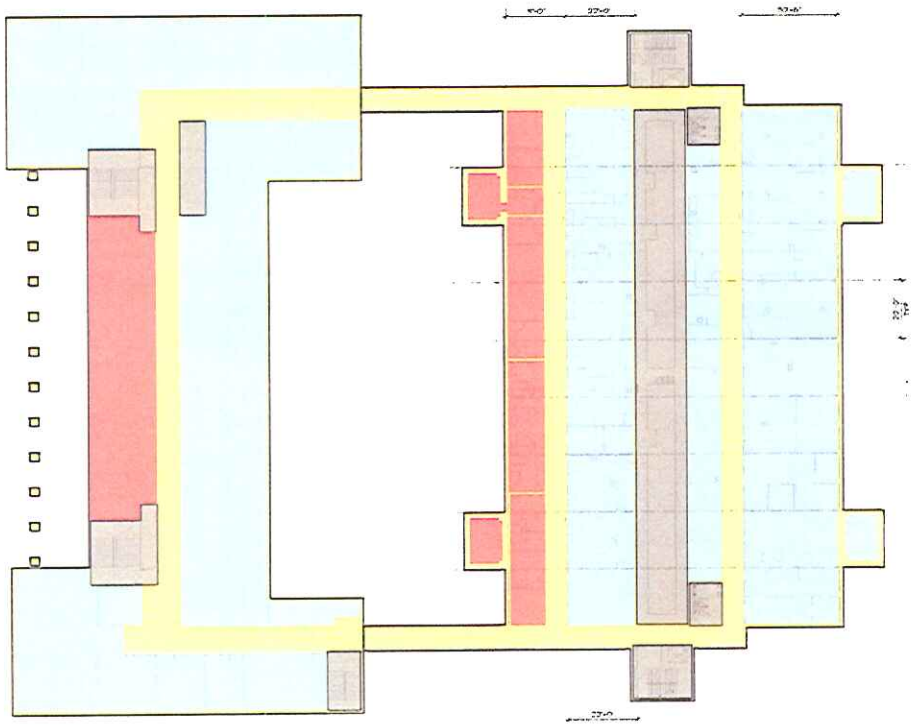
BIO CHEMISTRY
2,500 sf VACATED

CELL BIOLOGY
NEUROSCIENCE
13,000 sf VACATED

UNIVERSITY OF CALIFORNIA RIVERSIDE
SECONDARY EFFECTS
MAY 2, 2003

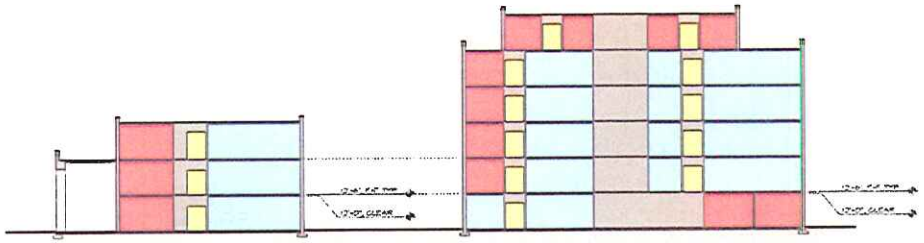
SCALE:

WEBBER/BOYCE HALL



WEBBER HALL BOYCE HALL

SECOND FLOOR



WEBBER HALL BOYCE HALL

BUILDING SECTIONS

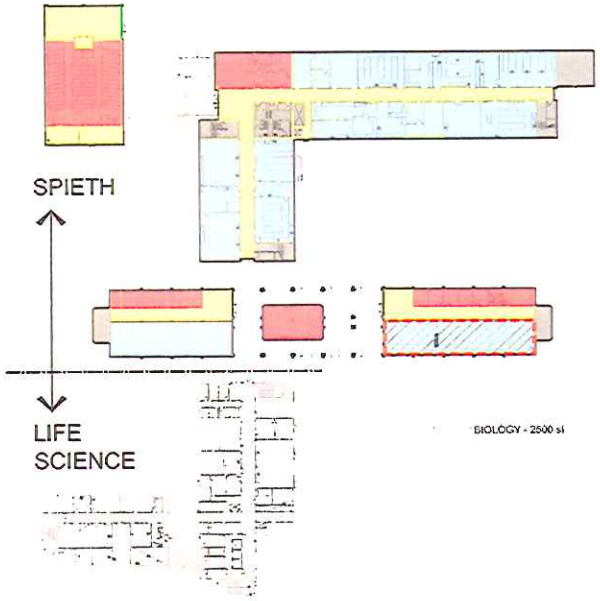
FUNCTION LEGEND

- LABORATORY
- OFFICE
- BUILDING SERVICE

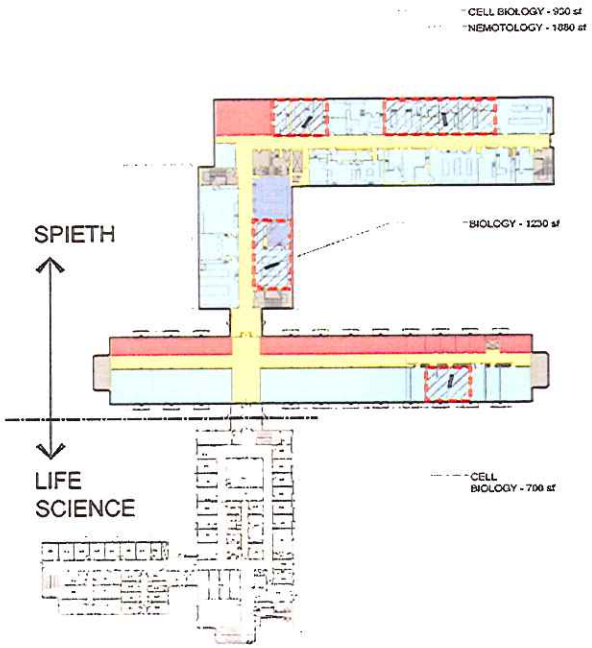
UNIVERSITY OF CALIFORNIA RIVERSIDE
SECONDARY EFFECTS
MAY 2, 2003

SCALE:

SPIETH/CHAPMAN HALL



FIRST FLOOR



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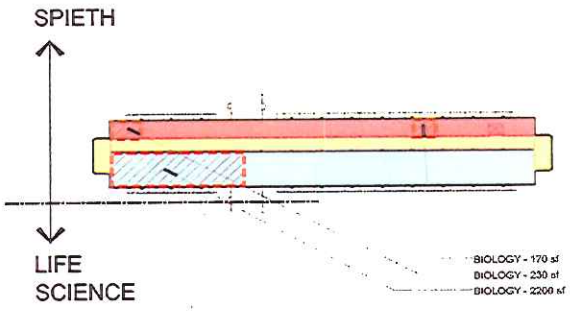
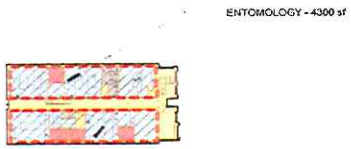
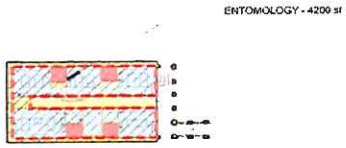


THIRD FLOOR



CHAPMAN
FIRST FLOOR



CHAPMAN
SECOND FLOOR

FUNCTION LEGEND

- OFFICE
- RESEARCH LAB
- TEACHING LAB
- BUILDING SUPPORT
- VACATED SPACE

AREA SUMMARY

BIOLOGY
7,030 sf VACATED

ENTOMOLOGY
8,500 sf VACATED

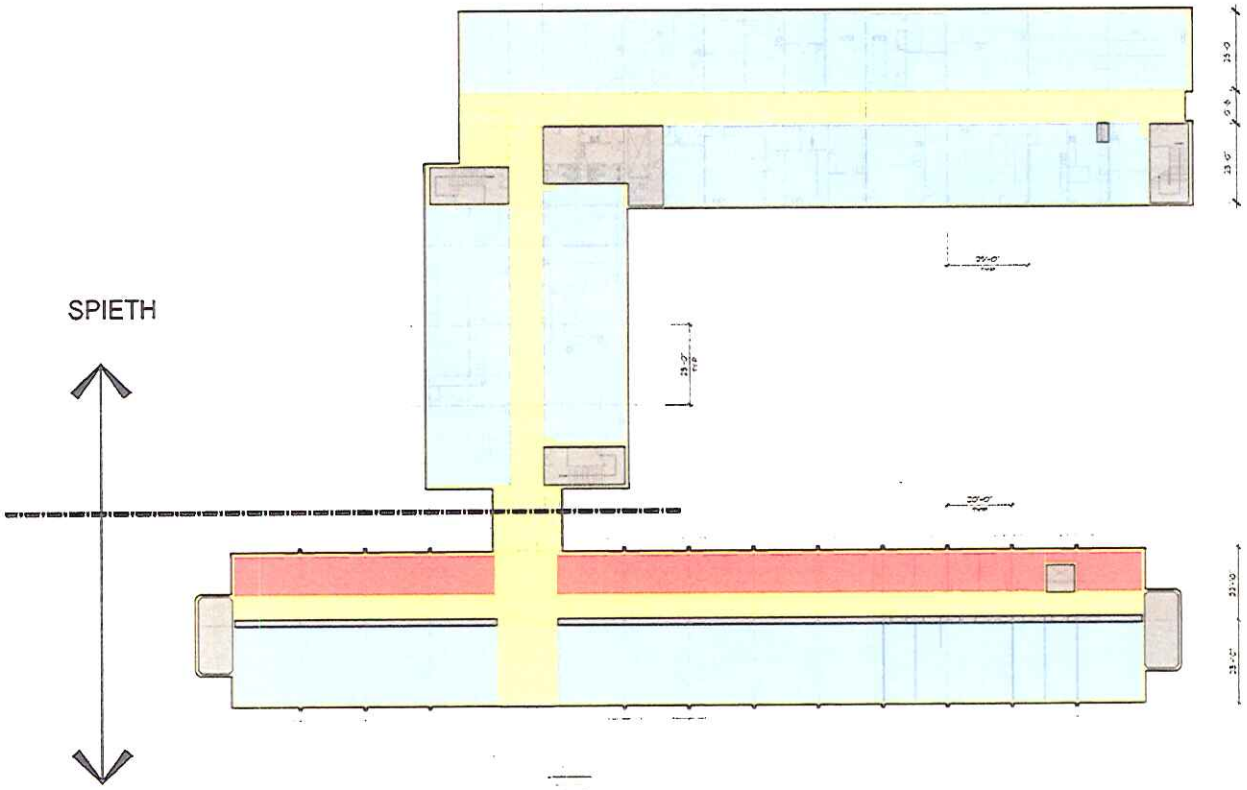
NEMOTOLOGY
1,880 sf VACATED

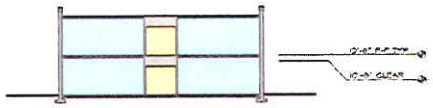
CELL BIOLOGY
NEUROSCIENCE
930 sf VACATED

UNIVERSITY OF CALIFORNIA RIVERSIDE
SECONDARY EFFECTS
MAY 2, 2003

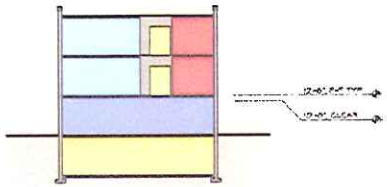
SCALE

SPIETH/LIFE SCIENCE





SPIETH HALL
BUILDING SECTION



SPIETH HALL
BUILDING SECTION

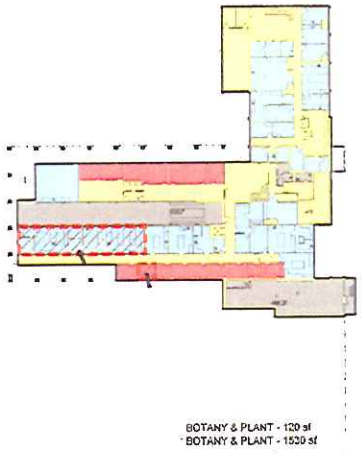
FUNCTION LEGEND

- LABORATORY TEACHING
- LABORATORY
- OFFICE
- BUILDING SERVICE

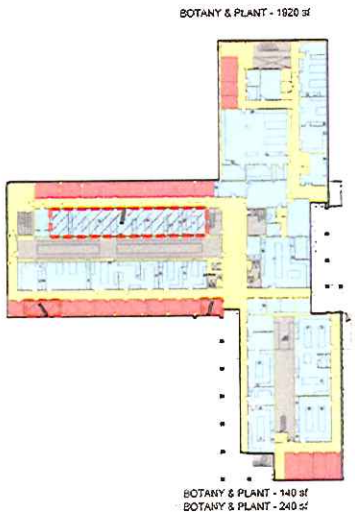
UNIVERSITY OF CALIFORNIA RIVERSIDE
SECONDARY EFFECTS
MAY 2, 2003

SCALE:

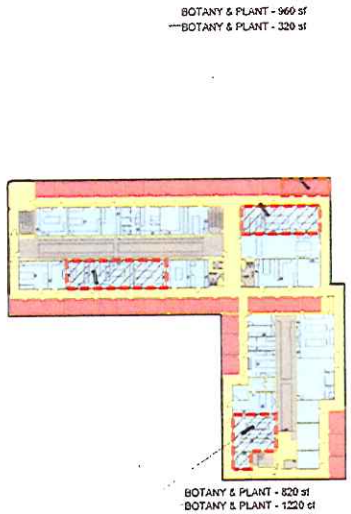
BATCHELOR HALL



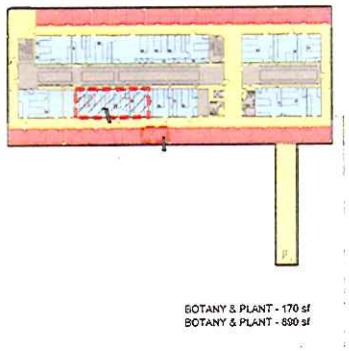
BATCHELOR
FIRST FLOOR



BATCHELOR
SECOND FLOOR



BATCHELOR
THIRD FLOOR



BATCHELOR
FOURTH FLOOR

AREA SUMMARY

BOTANY & PLANT SCIENCES
8,330 sf VACATED

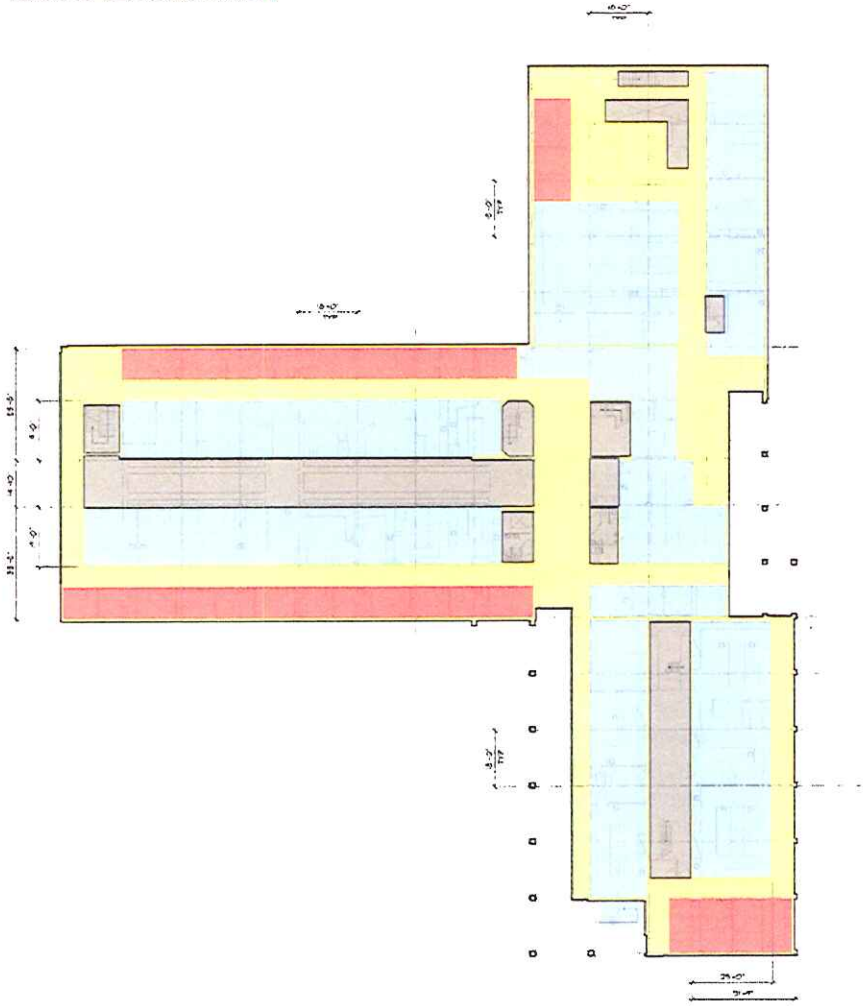
FUNCTION LEGEND

- OFFICE
- RESEARCH LAB
- TEACHING LAB
- BUILDING SUPPORT
- VACATED SPACE

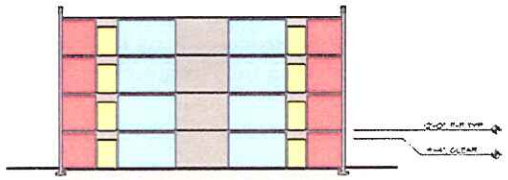
SCALE:

UNIVERSITY OF CALIFORNIA RIVERSIDE
SECONDARY EFFECTS
MAY 2, 2003

BATCHELOR HALL



BATCHELOR
SECOND FLOOR



BATCHELOR HALL
BUILDING SECTION

FUNCTION LEGEND

- LABORATORY
- OFFICE
- BUILDING SERVICE

UNIVERSITY OF CALIFORNIA RIVERSIDE
SECONDARY EFFECTS
MAY 2, 2003

SCALE:

D PROJECT COSTS

The costs are based on May 2003, and were developed through discussions between the design team and the Secondary Effects Committee. Costs are order-of-magnitude, and should be further studied to develop a comprehensive design analysis and cost estimate before a funding and implementation strategy is developed.

Strategy

The strategy is that the infrastructure would be upgraded first, so that individual spaces can be renovated to current standards as they are vacated.

Concept

The cost per square foot for infrastructure is applied to half of the building gross (except for Chapman where both floors are included, and Spieth where there are three floors in the south wing) in order to recognize that a new HVAC system will serve the upper two or three floors, and the lower floors will use the existing system at a lower intensity. Roof-mounted equipment would be ducted vertically and/or horizontally (as for Spieth Hall) to the floors below the roof, or adjacent to the roof, by the use of interior or exterior shafts.

Cost Definitions

The infrastructure cost is based on new building construction, plus a 30% premium for renovation. Included are mechanical, electrical, plumbing, fire sprinklers, and related architectural work only. The construction cost includes 15% for general contractor mark-ups, 15% design contingency, and a 5% phasing allowance—the accumulated value is 39%.

Infrastructure costs are applied to 50% of the gross building area only, excluding Chapman Hall, which also includes an elevator.

The costs for Space Improvements include distribution of the MEP services.

The office cost is based on replacing the floor finish (including VAT abatement) with VCT, and painting. Lighting is generally new, and will not be replaced.

The classroom and dry lab costs apply to Chapman Hall, and include demolition, paint, VAT abatement, new VCT, ceilings (only Chapman), light fixtures, partitions, casework (lab only), and chalkboards (classroom only).

The wet lab cost includes demolition, Type I equipment, casework, paint, seamless vinyl floors, and light fixtures. Generally, there are no existing ceilings except in Chapman Hall. All ducts are exposed, and lights are surface-mounted on the concrete slab or are suspended from the slab.

Excluded Work

The following items are not included in this estimate, and will require more study:

- Site electrical upgrade to 12kV
- Telecommunications
- Type II and III equipment
- Structural modifications for roof-mounted equipment
- Fire alarm upgrade
- ADA modifications (elevator is included for Chapman)
- Central gases
- UBC/CBC mandated upgrades based on renovation as a percentage of replacement cost
- Seismic modifications
- Program-generated improvements
- Large-scale hazardous material abatement (other than VAT), such as fume hoods, ducts and transit counters
  (The campus has experienced an average cost of $2/gsf to abate these hazardous materials, which could be an additional $1 million)

PROJECT COSTS

SPACE IMPROVEMENTS

		Faculty Office $28/asf	Dry Lab $80/asf	Classroom $40/asf	Research Lab (wet) $200/asf	Building Infrastructure $150(1)	2003 Construction Cost (2)	2003 Project Cost (3)
Boyce Hall	59,100 asf	12,500	N/A	N/A	46,600	Apply 50% of Infrastructure Cost		
	108,400 gsf	**$350,000**			**$9,300,000**(6)	**$8,100,000**(1)(4)	± **$17,800,000**	± **$21,400,000**
Batchelor Hall	57,470 asf	19,370	N/A	N/A	38,100	Apply 50% of Infrastructure Cost		
	109,500 gsf	**$542,000**			**$7,600,000**	**$8,200,000**(1)	± **$16,300,000**	± **$19,600,000**
Spieth Hall	54,870 asf	10,370	N/A	2,000	42,500	Apply 70% of Infrastructure Cost		
	94,800 gsf	**$290,000**		**$80,000**	**$8,500,000**(6)	**$9,900,000**(1)	± **$18,800,000**	± **$22,600,000**
Chapman Hall	8,500 asf	N/A	4,000	4,500	N/A	Apply 100% of Infrastructure Cost		
	12,700 gsf		**$320,000**(5)	**$180,000**		**$2,100,000** (1)	± **$2,600,000**	± **$3,100,000**
	325,400 Total gsf							
						TOTAL	± **$55,500,000**	± **$66,700,000**
							$171 /GSF Average	

Webber Hall costs are included in the CNAS Building Systems Evaluation Report.

(1) Infrastructure costs are applied to a percentage of the gross building area, as noted on the matrix. The infrastructure system improvements are limited to mechanical, electrical, plumbing, fire protection and related architectural work only. Envelope upgrades are not included.
(2) Construction Cost includes 15% for G.C. mark-ups, 15% design contingency, and 5% phasing allowance--cumulative value is 39%.
(3) Project Cost includes construction cost plus 20% for indirect costs per state standards.
(4) The HVAC infrastructure cost does not include the anticipated work on Boyce to be completed summer 2003.
(5) Cost does not include process utilities.
(6) Vivariums are not included in building gross or assignable areas. Refer to the 2002 Vivaria Master Space Plan.