PREFACE

The Science Replacement Building Feasibility Study summarizes the results of a programming and planning effort for California State University, Chico.

The Feasibility Study scope includes the following:

- Project Vision
- Space Program Requirements
- Site Analysis
- Design Guidelines
- Integrated Sustainability Approach
- Systems criteria outlines for Civil, Architecture, Laboratory Planning, Structural, Mechanical, Plumbing, Electrical, Audio-Visual and Telecommunications.
- Building Code Analysis

The requirements for the project were developed through a series of interviews and presentations with the project’s Building Committee, Executive Committee, User Groups and via two Town Halls. Programming and space planning information was collected through a series of multi-day workshops attended by the faculty and campus facilities team. Topics concerning the development of the project as a whole were then presented and discussed with the Building Committee, the project’s governing body.

The Feasibility Study is intended for use by CSU Chico to identify the anticipated scope, schedule and cost of the proposed project at the Siskiyou site.
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INTRODUCTION
1.1 EXECUTIVE SUMMARY

PROCESS
The Feasibility Study emphasized an inclusive process of interactive meetings with the following University Stakeholders:

- Building Committee: the project’s governing body
- Executive Committee: Department Chairs, Facilities Management and Services, and Information Technology representing a diverse group of campus stakeholders
- User Groups: faculty members for each department ultimately occupying the facility along with staff from Planning, Design & Construction, Campus Police, Environmental Health Services and Shipping/Receiving.

VISION AND GOALS
Through meetings with the Building and Executive Committees, a series of design goals were generated for the Science Replacement Building. The vision includes the following attributes:

- TIMELESS - embodying resiliency, adaptability and flexibility within campus context
- COLLABORATIVE - blurring the definition of teaching spaces
- TRANSPARENT: encouraging science on display and invites the campus community
- HANDS-ON: promoting student-teacher research projects
- STUDENT-CENTERED: focusing on current pedagogies and multi-modal learning
- SUSTAINABLE: fostering environmental stewardship
- SCIENCE HUB: serving the region, the state and the world
BASELINE SPACE PROGRAM

The Feasibility Study initiated with a Baseline Space Program that had previously been submitted by the University to CSU’s Office of the Chancellor. This baseline program represented the following primary features:

- replacement of the departments in the Physical Sciences Building, namely Physics, Geology and Chemistry, as well as existing lecture rooms
- introduction of a Neuroscience Program that included Psychology, Biology and a Vivarium
- relocation of a campus data center and network operations center (NOC)
- inclusion of limited conference rooms and an existing maintenance shop

The areas provided in this Baseline Space Program were generated via CSU’s standard allocation based on Full-time Equivalent Students (FTES). The intent of the programming process was to validate the Baseline Program against the campus’ specific needs, while remaining closely aligned with its programmatic components.

FEASIBILITY SPACE PROGRAM SUMMARY

During the programming process, adjustments to the Baseline Space Program were made in User Meetings, reviewed with the Executive Committee and approved by the Building Committee. The Feasibility Study Space Program includes the following departments and space allocations:

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**Total Building** 110,676 gsf

Based on the programming process, the Feasibility Study recommends a building that is approximately 110,000 gsf, or 4800 gsf larger than the Baseline Space Program allocated.

GROWTH & FLEXIBILITY COMPONENT

During the Feasibility Study process, the University desired programmatic elements beyond those that could be accommodated within the project’s cost parameters. The initial program for this Growth & Flexibility Component includes additional studio teaching labs, ten future faculty and their associated research space. Implementation of this program would result in a building that is approximately 133,000 gsf, or 22,000 gsf larger than the Feasibility Study Space Program.
DEVELOPMENT OF THE DESIGN GUIDELINES

Design guidelines for the Science Replacement Building were established through a series of visioning and goal-setting sessions with campus leadership. Once the project vision and goals were established, building massing scenarios were created, assessing a wide range of potential development opportunities. These options along with the Space Program and planning test-fits were reviewed with the Building Committee to extrapolate the salient features that would ultimately define the design guidelines. These guidelines are organized around the following topics: Campus, Sustainability, Site, Building and Program.

SITE DEVELOPMENT

At the onset of the feasibility study, the design team evaluated two potential building sites selected by the University: the Siskiyou site, which was the Baseline site submitted to the CSU’s Office of the Chancellor and the AHJ site, an alternate site with proximity to some of the existing campus science facilities. Both sites were analyzed consistently and massing options produced for each. Ultimately, the Building Committee selected Siskiyou as the preferred site.

For the Siskiyou site, five massing scenarios were created, providing a wide range of development opportunities from conservative to more eccentric. (See Figure 1.1) The intent was not to select a preferred solution, but utilize the massing scenarios to assist in defining the design guidelines. During future design phases, it is anticipated that new massing options will be developed in a continued effort to satisfy the guidelines.

SCHEDULE

The Feasibility Study was a 3-month process commencing in November 2016 and concluding in February 2017. Following the Feasibility Study, the Science Replacement Building is anticipated to be delivered via CSU’s Collaborative Design-Build delivery method. Phase 1 of this process (design) is intended to be executed in May 2017. Phase 2 (design-build) is planned to commence January 2018. The project is expected to be completed by July 2020 in time for occupancy by the fall semester.
Figure 1.1 - Massing Scenarios

CANTILEVER

COURTYARD

ROTATE

TISSUE

EARTHFORM
1.2 PROJECT TEAM

The following individuals participated in the development of the Science Replacement Building Programming and Feasibility Study Report and were instrumental in shaping the outcome of the study. Their time and commitment are greatly appreciated.

**Campus Leadership**

Building Committee
- David Hassenzahl, Dean
- Steven Robinow, Associate Dean
- Randy Miller, CHEM
- Julie Monet, SCED
- Sandra Beck, PDC
- Jim Hyatt, VPBF
- Xueli Zou, PHYS
- Mike Ward, Provost
- Gayle Hutchinson, President

Executive Committee
- David Hassenzahl, Dean
- Steven Robinow, Associate Dean
- Jeffrey Bell, Assistant Dean
- Margaret Schmidt, Adv. Director
- Patti Salomon, AA/S
- Mary Brownell, ASC
- Catherine Wiggins, ASC
- Jonathan Day, BIOL
- Randy Miller, CHEM
- Russell Shapiro, GEOS
- Rick Ford, MATH
- Kathryn Silliman, NFSC
- Margaret (Peggy) Rowberg, NURS
- Xueli Zou, PHYS
- Julie Monet, SCED
- Renee Renner, GSM
- Becky Damazo, SIM
- Jennifer Rotnem, CWE
- Stephanie Bianco, CHC
- Kevin Doyle, FMS
- Mike Schilling, IRES
- Kevin Kelley, RESP

**User Groups**

**Chemistry**
- Randy Miller, Chair
- Lisa Ott, Faculty
- Dan Edwards, Faculty
- Carolynn Arpin, Faculty
- Lisa Kendhammer, Faculty
- Blain Wells, Technician

**Physics**
- Xueli Zou, Chair
- Eric Ayars, Faculty
- Hyewon Pechkis, Faculty
- David Brookes, Faculty
- Clare Clifford, Faculty
- Mary Murphy-Waldorf, Technician

**Geological and Environmental Sciences (GEOS)**
- Russell Shapiro, Chair
- Shane Mayor, Faculty
- Sandrine Matiasek, Faculty
- Kristen Kaczynski, Faculty
- Ann Bykerk-Kaufman, Faculty
- Todd Greene, Faculty
- Bill Koperwhats, Technician

**Science Education**
- Julie Monet, Chair
- Carolina Alvarado, Faculty
- Anne Stephens, Faculty
- Ben Van Dusen, Faculty

**Psychology**
- Linda Kline, Chair
- Penelope Kuhn, Faculty
- Dan Worthen, Faculty
- Patrick Johnson, Faculty
- Mike Ennis, Faculty
Design Team

Architecture / SmithGroupJJR
- Roxanne Malek
- Bill Katz
- Jon Riddle

Lab Planning / Research Facilities Design (RFD)
- Sean Towne
- Richard Cate

MEP + Sustainability / Integral Group
- Joseph Wenisch
- Adan Rosillo

Structural / Rutherford + Chekene
- David Bleiman

Landscape / Stephen Wheeler Landscape Arch.
- Stephen Wheeler

Civil / Sherwood Design Engineers
- Karen Bennett
- John Leys

Audiovisual + Telecom. / Charles Salter Assoc.
- Kenneth Graven
- Ryan Raskop

Vivarium
- Dan Worthen, PSYC
- Jonathan Day, BIOL
- Penelope Kuhn, PSYC

Planning, Design + Construction
- Sandra Beck, Director & Campus Architect
- David Wymore, Sr. Project Manager
- Jenna Wright, Capital Planning /Finance Mgr.

IRES/IT
- Mike Schilling, CIO
- Scott Claverie, Director CCSV

Creative Media and Technology (CMT)
- Brent Liotta, Lead Classroom Tech.
- Cale Whitehouse, PM Computing & Commun.
- Mike Magrey, Director CMT

Campus Utilities
- Neil Nunn, Chief Engineer FMS
- Todd Warner, Mgr. Building Maint. FMS
- David Sprague, Assist. Dir. FMS
- Lee Cummings, Telecom. Services

Sustainability
- Fletcher Alexander, Institute for Sustainability
- Jim Pushnik, Institute for Sustainability

Campus Stakeholders
- John Feeney, Police Chief
- Marvin Pratt, Director EHS

Shipping and Receiving
- Dale Wymore, Dir. Business Services
- Sam Zamarron, Lead Shipping & Receiving

Custodial / FMS
- Randy Southall, Supervisor Custodial
- Durban Sayers, Mgr. Custodial & Moving
1.3 PROCESS

The Feasibility Study emphasized an inclusive process of interactive meetings with the following University Stakeholders:

- Building Committee: the project’s governing body
- Executive Committee: Department Chairs, Facilities Management and Services, and Information Technology representing a diverse group of campus stakeholders
- User Groups: faculty members for each department ultimately occupying the facility along with staff from Planning, Design & Construction, Campus Police, Environmental Health Services and Shipping/Receiving.

Programming and space planning information for the Science Replacement Building was collected through three sets of workshops attended by the designated User Groups. To supplement the process, site tours of the following existing facilities were conducted: Physical Sciences, and targeted areas within Holt, Butte and Modoc Halls.

In addition to meetings with the Building Committee, Executive Committee and User Groups, two Town Halls, which were open to the entire campus, were conducted. The first was early in the process, providing attendees with a basic understanding of the project and obtaining feedback around site and programmatic components. The second Town Hall presented the primary conclusions of the feasibility process.

A project-specific workplan was developed at the onset of the process to ensure timely completion of the effort. Key milestones were highlighted at the start of each meeting to ensure a common understanding and establishment of context for each step.

1.4 SCHEDULE

The Feasibility Study was a 3-month process commencing in November 2016 and concluding in February 2017. Following the Feasibility Study, the Science Replacement Building is anticipated to be delivered via CSU’s Collaborative Design-Build delivery method. Phase 1 of this process (design) is intended to be executed in May 2017. Phase 2 (design-build) is planned to commence January 2018. The project is expected to be completed by July 2020 in time for occupancy by the fall semester.
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02
PROJECT VISION
2.1 MISSION STATEMENT

Since its beginnings in 1887, California State University, Chico has provided generations of students with unique educational experiences built upon an inclusive learning community of faculty, staff, and students who live, work, and study within a residential Northern California setting. Today, CSU, Chico is a comprehensive university serving not only the local region, but also the state, the nation, and the world, through instruction, research, and public service.

Today our world faces many challenges, from feeding a growing population to improving individual and public health to using energy more efficiently. Addressing these and many other societal challenges requires individuals with deep training in a range of scientific fields who are able to integrate our understanding across the sciences, can describe complex systems, can collaborate with others to solve complex problems, and who can effectively communicate and teach science, and the scientific process that can inform the important decisions that our society faces.

The College of Natural Sciences supports all of these needs, and does it with a sense of wonder and excitement. To our students, faculty, staff, and partners, science is not a collection of facts, but an approach to understanding the world that allows us to think and decide well.

At the College of Natural Sciences, our students engage science in laboratories and the field. They work in teams to solve mathematical challenges, create new molecules, teach children how to play and eat well, and practice state-of-the-art medical treatment. They collaborate with faculty and each other on research, and present their findings at national conferences. The impact of this direct engagement is reflected in our graduates, who are highly competitive even before they leave campus, and highly successful throughout their careers. It is felt across the CSU Chico campus, where almost every student has taken at least one course in our college. It is found throughout California and beyond, where our graduates teach foundational science and mathematics in public and private schools.

The construction of the new Science Building, to be sited in the heart of the CSU Chico campus, will provide a new state-of-the-art teaching and research facility that will house the College of Natural Sciences departments of Chemistry, Physics, Geology and Environmental Sciences and Science Education. It will bring together faculty and students from Psychology and Biology to establish a new multi-disciplinary Neuroscience program, including a new Vivarium. This new building will be a beacon for science and science education in California and beyond.
2.2 COLLEGE AND DEPARTMENTS

The mission of the College of Natural Sciences is to serve as an anchor institution in Northern California for health, mathematics and the sciences, providing a diverse set of services to our students and the larger community. Our undergraduate, pre-professional, and graduate programs give students the rigorous theoretical and practical training required for professional and personal success. We provide the cornerstones for a wide variety of technical disciplines beyond our college through our foundational service courses. We strive to instill in the wider campus community an understanding of the nature of science and its importance in modern society. We affirm the importance of serving the community beyond our campus as a resource for health, mathematics, and science expertise.

The College of Natural Sciences is composed of seven academic departments (Physics, Chemistry and Biochemistry, Geological and Environmental Sciences, Science Education, Nutrition and Food Science, Mathematics and Statistics, and Biological Sciences) and the School of Nursing. 90 Tenure/Tenure Track faculty members, about 110 temporary faculty members, and about 30 office and technical staff serve around 2500 majors spread across 19 degree programs, and teach over 3000 Full Time Student Equivalents each semester. Faculty offices, labs, and most teaching facilities are located in Holt Hall, the Physical Sciences Building, and Trinity Hall. Our facilities also include the Gateway Science Museum, the Rural Northern California Simulation Center (Nursing), and we are affiliated with the Big Chico Creek Ecological Reserve, the Butte Creek Ecological Preserve, and the Eagle Lake Field Station. The college also hosts the Center for Math and Science Education, the Center for Healthy Communities, and the Center for Water and the Environment.

Some highlights of the college include:

- Faculty in all departments with expertise in health, science, and mathematics education
- A summer research program that hires undergraduates to complete research projects in multiple disciplines
- Faculty with success in securing federal grant support, including the National Science Foundation, National Institutes of Health, Environmental Protection Agency, and Department of Education
- With the colleges of engineering and agriculture, a STEM grant to support our efforts as a Hispanic Serving Institution
- Internships and clinical opportunities for hundreds of students, and
- Leadership across the California State University system in CalFresh outreach, providing resources to food-insecure students.

The Department of Chemistry and Biochemistry (CHEM) has twelve tenure/tenure track faculty, fifteen temporary faculty, and five office/technical support staff. All of CHEM’s faculty offices, dedicated teaching spaces, and research equipment are housed in the Physical Sciences Building. CHEM offers three degree programs: BS in Chemistry, BS in Biochemistry, and BA in Chemistry. They provide service coursework for numerous other programs, in particular nursing and biology. Some highlights of the department include
the Chemistry Summer Research Institute (CSRI), which brings together public and private funds and faculty time to support undergraduate and high school student research opportunities. CHEM graduates are successful in public and private settings, and the department has a strong record of sending students to top graduate programs around the country.

The Department of Geological and Environmental Sciences (GEOS) has ten tenure/tenure track faculty, eight temporary faculty, ten graduate teaching assistants, and two office/technical support staff. All of GEOS' faculty offices, dedicated teaching spaces, and research equipment are housed in the Physical Sciences Building. GEOS offers five degree programs: BS in Geology, BS in Environmental Science, BS in Geosciences, MS in Geology, MS in Environmental Science including Professional Science Master's degree. The department also provides general education coursework in environmental science, oceanography, and other areas. Some highlights of the department include extensive field opportunities and a strong focus on applied science for future professionals. Many GEOS graduates find professional field opportunities in our service area.

The Department of Physics (PHYS) has eleven tenure/tenure track faculty, eight temporary faculty, and three office/technical support staff. Most of PHYS's faculty offices, dedicated teaching spaces, and research equipment are housed in the Physical Sciences Building. PHYS offers one degree program, a BS in Physics. They provide service coursework for numerous other programs, in particular engineering degree programs. Some highlights of the department include an award-winner student chapter of the American Physical Society, success in securing research instruments from private sources, and a number of faculty members with nationally recognized expertise in science education best practices.

The Department of Science Education (SCED) has four tenure/tenure track faculty, four temporary faculty, and one office staff member. SCED's faculty offices, dedicated teaching spaces, and research equipment are mostly housed in Holt Hall, with some in the Physical Sciences Building. SCED offers one degree programs: BA in Natural Science (soon to be renamed Science Education). They provide service coursework for most students in the College of Communications and Education Liberal Studies program. Some highlights of the department include its role in Chico State education students' high pass rates in the math and science portions of their qualifying exams, innovative science education teaching practice, and commitment to supporting current STEM teachers in the region.
2.3 VISION AND GOALS

Through meetings with the Building and Executive Committees, a series of design goals were generated for the Science Replacement Building. This vision includes the following attributes:

- TIMELESS - embodying resiliency, adaptability and flexibility within campus context
- COLLABORATIVE - blurring the definition of teaching spaces
- TRANSPARENT: encouraging science on display and invites the campus community
- HANDS-ON: promoting student-teacher research projects
- STUDENT-CENTERED: focusing on current pedagogies and multi-modal learning
- SUSTAINABLE: fostering environmental stewardship
- SCIENCE HUB: serving the region, the state and the world

See the following pages for imagery and additional narrative on these goals.
2.3.1 TIMELESS

Buildings on University campuses span decades, necessitating a timeless character and resiliency to change. For the Science Replacement Building, the design should reflect the campus context while utilizing contemporary forms and construction methods. Additionally, the campus’ symbiotic relationship between landscape and building should be highlighted to ensure the project seamlessly connects its environment.

Timelessness also extends to the functionality of the project. The design should be flexible, supporting changes in scientific discovery, technological advancements and pedagogies. It should also be able to withstand predictable changes to its surrounding environment.

Figure 2.3.1 - Timeless

**TIMELESS**: embodying resiliency, adaptability and flexibility within campus context
2.3.2 COLLABORATIVE

Today’s students learn everywhere, whether it be via lecture, reading, online, peer-to-peer, research or small group discussions. It is envisioned the project will blur the definition of teaching spaces, creating a collaborative environment where planned and serendipitous interactions contribute to a learning.

These collaborative spaces could be of varying scales allowing for formal discussions as well as localized nooks that are convenient to the teaching labs and faculty suites. Collaborative spaces adjacent to building circulation can be particularly effective in promoting social interaction where peer-to-peer learning occurs.

Figure 2.3.2 - Collaborative

COLLABORATIVE: blurring the definition of teaching spaces
2.3.3 TRANSPARENT

A common theme in 21st century science buildings is placing “science on display.” More unique is coupling this notion with transparency at the building envelope, extending the concept beyond the building’s boundaries. The Science Replacement Project should reach out to the broader campus community while being inspirational for students within the building. Opportunities to extend into exterior spaces such as arcades or courtyards for large-scale or environmental experiments in encouraged.

Figure 2.3.3 - Transparent
2.3.4 HANDS-ON

An emphasis on research within academic science programs has fostered rich “hands-on” environments where students learn science by doing it – and by utilizing equipment they will ultimately use in industry. Retention in applied academics exceeds other learning modes because it is stimulating, active and creative. This pedagogy necessitates flexible spaces that support student-teacher projects as part of the curriculum. Where possible, these research spaces should be modular and shared to allow for future adaptability.

Figure 2.3.4 - Hands-On

HANDS-ON: promoting student-teacher research projects
2.3.5 STUDENT-CENTERED

To meet today’s needs, scientific teaching environments should facilitate active, collaborative learning that improve student retention. The Science Replacement Building space program includes studio teaching labs that support this pedagogy. Students, formed in teams, are given projects to investigate while the instructor is free to roam the classroom – assisting in set-up, providing guidance and answering questions. Technology centers and white boards are available for each group.

The teaching labs should be considered with permanent components, such as sinks and fume hoods at the perimeter, allowing flexibility of seating arrangements that best correspond to the pedagogy being utilized. It is recommended that overhead and floor-based utilities also be modular in distribution to support changing building needs.

Figure 2.3.5 - Student-Centered
2.3.6 SUSTAINABLE

Sustainable design is ultimately inspired by the client’s mission, the balance of program and budget, and the inherent qualities of the site. While the project requires LEED Silver as a basis, the design should reflect a comprehensive whole-building sustainability approach that optimizes system synergies.

The project should seek to implement passive strategies, such as daylighting, solar exposure, efficient fixtures and cohesive planning, to reduce consumption before introducing active strategies, such as on-site renewable energy. The focus should be on an integrated design process that capitalizes on the synergies of building systems, rather than considering each system independently. The design should draw on benchmark systems that offer a specialized focus on building well-being in order to elevate the overall approach. These include the Living Building Challenge, the Well Building Standard, Active Design Guidelines and Labs21.

As an early adopter of the Second Nature Climate Commitment, CSU Chico is a steward of sustainability. The project should highlight this commitment and identify high-value sustainability initiatives that can be incorporated in the scientific curriculum – transforming the building into a living laboratory.

Figure 2.3.6 - Sustainable
2.3.7 SCIENCE HUB

Initiated in 1967, the College of Natural Sciences serves the region, the state and the world. It educates students how to address the many societal challenges we face today – and does it with a sense of wonder and excitement. The Science Replacement Building should reflect this passion, creating a comprehensive science hub that serves its students, is connected to the related departments on campus and engages the broader scientific community.

Figure 2.3.7 - Science Hub

SCIENCE HUB: serving the region, the state and the world
03
PROGRAM
3.1 PROGRAM DEVELOPMENT

The Science Replacement Building programming process began with an existing Baseline Space Program. Through a series of workshops and meetings, this Baseline was reviewed, tested and refined to arrive at the Feasibility Study Space Program on the following pages. Additionally, the University desired programmatic elements beyond those that could be accommodated within the project’s cost parameters. These additional spaces are captured in a Growth & Flexibility Component. Each of these three elements: (1) Baseline Space Program, (2) Feasibility Study Space Program, and (3) Growth & Flexibility Component are described in further detail in the following narrative.

3.2 BASELINE SPACE PROGRAM

The Feasibility Study initiated with a Baseline Space Program that had previously been submitted by the University to CSU’s Office of the Chancellor. This baseline program represented the following primary features:

- replacement of the departments in the Physical Sciences Building, namely Physics, Geology and Chemistry, as well as existing lecture rooms
- introduction of a Neuroscience Program that included Psychology, Biology and a Vivarium
- relocation of a campus data center and network operations center (NOC)
- inclusion of limited conference rooms and an existing maintenance shop

The areas provided in this Baseline Space Program were generated via CSU’s standard allocation based on Full-time Equivalent Students (FTES). The intent of the programming process was to validate the Baseline Program against the campus’ specific needs, while remaining closely aligned with its programmatic components.
### Figure 3.2 - Baseline Program

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65,266 ASF
105,840 GSF
61.66%
61.66%
3.3 FEASIBILITY STUDY SPACE PROGRAM

3.3.1 SPACE PROGRAM SUMMARY

During the programming process, adjustments to the Baseline Space Program were made in User Meetings, reviewed with the Executive Committee and approved by the Building Committee. An Overall Space Summary and Detailed Space List have been prepared and are included on the following pages.

The Space Program is organized around the following primary departments:

- Chemistry
- Geology & Environmental Sciences
- Physics
- Science Education
- Neuroscience
- Psychology
- Biology
- Vivarium
- Interdisciplinary

In addition, the Space Program Summary includes the following information for reference:

- Feasibility Study ASF by Department, percentage of each department as compared to the whole, and the number of student stations as defined by CSU Space Planning Standards.
- Baseline Space Program ASF by Department, percentage of each department as compared to the whole, and the number of student stations as defined by CSU Space Planning Standards.
- Variance between the Baseline Space Program and the Feasibility Study Space Program
- Breakdown of space types (e.g. Teaching Laboratory, Laboratory Support, Classroom, Research, Office, Shared Support, Vivarium, etc.) by square footage and percentage

Based on the programming process, the Feasibility Study recommends a building that is approximately 110,000 gsf, or 4800 gsf larger than the Baseline.

3.3.2 DEFINITIONS

The space list uses the following terms or categories to describe the space requirements:

- Net or Assignable Area (ASF). The area of each space, as measured from interior wall to interior wall. Circulation space to or from the space is excluded, except at open workstations and enclosed offices that are part of a larger office environment or office suite.
- Building Gross Area (GSF). The total area of the building, including all primary circulation routes, shared vertical circulation, exterior walls and all mechanical shafts, plumbing chases, and telecommunications and electrical support spaces.
### 3.3.3 DETAILED SPACE LIST

The Detailed Space List further segregates the primary organizational components into each of its functional space types (e.g. Teaching Lab, Laboratory Support, Research, Office, etc.) Within each sub-group the following have been identified:

- room name
- quantity of each room
- student stations per room
- student stations total based on quantity of rooms
- ASF of each room
- ASF total based on quantity of rooms
- Module quantity (where occurs)
### Figure 3.3.3 - Space Program Detail

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**Interdisciplinary Total:** 180, 8,348 ASF 25.5
3.3.4 NETWORK OPERATIONS CENTER (NOC) / DATA CENTER

The network operations center / data center detailed space list was developed during the programming process. As part of the program evaluation, the University selected utilize this space allocation for science education in lieu of the Data Center / NOC Component. The scope for the Data Center/NOC component has been captured below.

**Figure 3.3.4- Network Operations Center (NOC) / Data Center Component Detail**

<table>
<thead>
<tr>
<th>Network Operations Center (NOC) / Data Center</th>
<th>North Core</th>
<th>Data Center</th>
<th>Fire Suppression</th>
<th>Staging / Storage / Work area</th>
<th>Storage</th>
<th>Shared Support</th>
<th>Office</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2660</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2660</td>
</tr>
</tbody>
</table>

**NOC/Data Center Total**

|                                                    | 0           | 2660        |

3.3.5 GROWTH & FLEXIBILITY COMPONENT

As noted in the Program Development Narrative, the University desired programmatic elements beyond those that could be accommodated within the project’s cost parameters. The initial program for this Growth & Flexibility Component includes additional studio teaching labs, ten future faculty and their associated research space. Implementation of this program would result in a building that is approximately 133,000 gsf, or 22,000 gsf larger than the Feasibility Study Space Program. The space inventory for this Growth & Flexibility Component is captured below.

**Figure 3.3.5- Space Program Growth & Flexibility Component Detail**

<table>
<thead>
<tr>
<th></th>
<th>Lecture</th>
<th>Support/Prep</th>
<th>Office</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Studio Teaching Lab - Type 1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Studio Teaching Lab - Type 2</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Vivarium Holding (see vivarium)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Special Instructional - Student Space</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

**Subtotal**

|                                                    | 256       | 630        |

<table>
<thead>
<tr>
<th></th>
<th>Subtotal</th>
<th>Support/Prep</th>
<th>Office</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Subtotal**

|                                                    | 0        | 0           | 0      |

**Growth/Flexibility Total**

|                                                    | 256       | 630        | 0      |

|                                             | 256       | 630        |

SMITHGROUPJR
3.3.6 PROGRAM COMPARISON BY DEPARTMENT

An important component of the programming process was a detailed analysis of the variances in the proposed program as compared to the baseline program. The charts below graphically demonstrate the proportion of each department within the total for both the proposed and baseline programs. As noted earlier, the University selected to house Science Education in the building in lieu of the Data Center / Network Operations Center component. This represents the primary variance between the baseline and proposed space programs. The remainder of the departments remained very consistent.

Figure 3.3.6 - Program by Department comparison pie charts

<table>
<thead>
<tr>
<th>Department</th>
<th>Proposed</th>
<th>Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>20,274</td>
<td>17,835</td>
</tr>
<tr>
<td>Geology + Env Sciences</td>
<td>9,534</td>
<td>9,473</td>
</tr>
<tr>
<td>Physics</td>
<td>11,204</td>
<td>10,343</td>
</tr>
<tr>
<td>Science Education</td>
<td>5,284</td>
<td>0</td>
</tr>
<tr>
<td>Neuroscience</td>
<td>11,732</td>
<td>14,915</td>
</tr>
<tr>
<td>Bio Neuroscience</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Vivarium</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Interdisciplinary</td>
<td>8,348</td>
<td>7,700</td>
</tr>
<tr>
<td>NOC / Data Center</td>
<td>0</td>
<td>5,000</td>
</tr>
<tr>
<td>Shared Support</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Growth/Flexibility</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>66,376</strong></td>
<td><strong>65,266</strong></td>
</tr>
</tbody>
</table>

Program by Department (Current)

**Program by Department (Baseline)**

<table>
<thead>
<tr>
<th>Department</th>
<th>Proposed</th>
<th>Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>20,274</td>
<td>17,835</td>
</tr>
<tr>
<td>Geology + Env Sciences</td>
<td>9,534</td>
<td>9,473</td>
</tr>
<tr>
<td>Physics</td>
<td>11,204</td>
<td>10,343</td>
</tr>
<tr>
<td>Science Education</td>
<td>5,284</td>
<td>0</td>
</tr>
<tr>
<td>Neuroscience</td>
<td>11,732</td>
<td>14,915</td>
</tr>
<tr>
<td>Bio Neuroscience</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vivarium</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Interdisciplinary</td>
<td>8,348</td>
<td>7,700</td>
</tr>
<tr>
<td>NOC / Data Center</td>
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<td>5,000</td>
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<tr>
<td>Shared Support</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Growth/Flexibility</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>66,376</strong></td>
<td><strong>65,266</strong></td>
</tr>
</tbody>
</table>
3.3.7 PROGRAM COMPARISON BY FUNCTION

Similar to the departmental space program analysis, the programming process included a detailed assessment of space types by function to ensure an appropriate ratio was provided. The charts below graphically represent the proportion of each functional space type for both the proposed and baseline space programs. While some variances were discovered during the programming process the general intent of the space types is consistent between them.

Figure 3.3.7 - Program by Function comparison pie charts

**Program by Function (Current)**

<table>
<thead>
<tr>
<th>Function</th>
<th>Space (sq ft)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching Lab</td>
<td>32,760</td>
<td>49%</td>
</tr>
<tr>
<td>Lab Support</td>
<td>9,607</td>
<td>14%</td>
</tr>
<tr>
<td>Research</td>
<td>945</td>
<td>1%</td>
</tr>
<tr>
<td>Office</td>
<td>7,786</td>
<td>12%</td>
</tr>
<tr>
<td>Shared Support</td>
<td>5,513</td>
<td>8%</td>
</tr>
<tr>
<td>Classroom</td>
<td>3,780</td>
<td>6%</td>
</tr>
<tr>
<td>Data Center</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Vivarium</td>
<td>2,835</td>
<td>4%</td>
</tr>
<tr>
<td>Research Neuro</td>
<td>3,150</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>66,376</strong></td>
<td>100%</td>
</tr>
</tbody>
</table>

**Program by Function (Baseline)**

<table>
<thead>
<tr>
<th>Function</th>
<th>Space (sq ft)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching Lab</td>
<td>27,404</td>
<td>42%</td>
</tr>
<tr>
<td>Lab Support</td>
<td>4,345</td>
<td>7%</td>
</tr>
<tr>
<td>Research</td>
<td>1,057</td>
<td>2%</td>
</tr>
<tr>
<td>Office</td>
<td>6,860</td>
<td>11%</td>
</tr>
<tr>
<td>Shared Support</td>
<td>1,700</td>
<td>3%</td>
</tr>
<tr>
<td>Classroom</td>
<td>4,600</td>
<td>7%</td>
</tr>
<tr>
<td>Data Center</td>
<td>5,000</td>
<td>8%</td>
</tr>
<tr>
<td>Museum</td>
<td>2,500</td>
<td>4%</td>
</tr>
<tr>
<td>Vivarium</td>
<td>7,500</td>
<td>11%</td>
</tr>
<tr>
<td>Neuro Research</td>
<td>4,300</td>
<td>7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>65,266</strong></td>
<td>100%</td>
</tr>
</tbody>
</table>
3.4 GRAPHIC PROGRAM

The following is a graphic depiction of the Science Replacement Space Program. Each shape indicates the size and number of each area of assignable square feet included in the program. The size of each space shown is proportional to the amount of area it occupies relative to the other areas in the Building. For clarity, the graphic program is organized by the programmatic departments and color-coded to correspond to the Space Program as well as the planning test-fit in Section 4.

**Figure 3.4 - Graphic Program**

- Chemistry
- Geology + Environmental Sciences
- Physics
- Science Education
- Psychology
- Biology
- Neuroscience Vivarium
- Interdisciplinary
3.5 ROOM DIAGRAMS

A Room Diagram has been completed for most of the spaces identified in the Space Program. The Room Diagrams are intended to be graphic representations of potential room layouts, including equipment, laboratory benches, office furniture, etc. Also indicated on each sheet are preferred overall room dimensions, shown to the inside face of each wall. Detailed room services, such as electrical and data outlets, are intentionally not shown at this time and will be developed during future design phases. These room diagrams are the basis for understanding the capacity of the space program as well as testing the program on the proposed site. They are not intended to be the final layout. Below is a sample room diagram, shown in both plan format and three-dimensional view for additional clarity. The remainder of the Room Diagrams can be found in Appendix B.

Figure 3.5 - Room Diagram Example
3.6 ROOM DATA MATRIX

The Room Data Matrix gives an overview of the functional and utility requirements for each of the typical room types described in the Space Program. Similar to the Space Program, the matrix is categorized by department - e.g. Chemistry, GEOS, etc. The space I.D. number from the program is included in the first column of the matrix.

The Room Data Matrix was prepared initially by the design team based on experience with each room type from similar science education buildings in the CSU system. It was then refined after being reviewed by the user groups and incorporating their comments.

The matrix tracks the following functional and utility requirements:

- Room Air
- Services
- Specialty Gases
- Power
- Communications
- Temperature

See Figure 3.7 Room Data Matrix on the following pages for additional information.

3.7 ROOM FINISHES MATRIX

The Room Finish Matrix gives an overview of the finish, door, lighting and casework requirements for each of the typical room types described in the Space Program. Similar to the Space Program, the matrix is categorized by department - e.g. Chemistry, GEOS, etc. The space I.D. number from the program is included in the first column of the matrix.

The matrix tracks the following functional and utility requirements:

- Room Utilization
- Floor, Base, Wall and Ceiling finishes
- Door requirements
- Lighting requirements
- Casework and Benchtop requirements

See Figure 3.8 Room Finish Matrix on the following pages for additional information.
### Figure 3.6 - Room Data Matrix

<table>
<thead>
<tr>
<th>ID #</th>
<th>Room Name</th>
<th>100% Exhausted</th>
<th>AC Heat/Cooler (Minimum)</th>
<th>AC Heat/Cooler (Maximum)</th>
<th>Room Air</th>
<th>Services</th>
<th>Specialty Gases</th>
<th>Power</th>
<th>Communications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.01</td>
<td>Inorganic Teaching Lab - Small</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.02</td>
<td>Inorganic Teaching Lab - Large</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.03</td>
<td>Organic Teaching Lab - Small</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.04</td>
<td>Organic Teaching Lab - Large</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.05</td>
<td>Biochemistry Teaching Lab - Small</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.06</td>
<td>Special Instruction (Project) - Student Space</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.07</td>
<td>Special Instruction (Project) - Biochem</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>C.08</td>
<td>Special Instruction (Project) - Organic</td>
<td>●</td>
<td></td>
<td></td>
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</tr>
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<td>C.09</td>
<td>Special Instruction (Project) - Other</td>
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<td></td>
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<tr>
<td>C.10</td>
<td>Central Prep</td>
<td>●</td>
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<td>Satellite Prep</td>
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<tr>
<td>C.12</td>
<td>Instrument Lab</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.13</td>
<td>NMR Instrument Room</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ID #</th>
<th>Room Name</th>
<th>100% Exhausted</th>
<th>AC Heat/Cooler (Minimum)</th>
<th>AC Heat/Cooler (Maximum)</th>
<th>Room Air</th>
<th>Services</th>
<th>Specialty Gases</th>
<th>Power</th>
<th>Communications</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.01</td>
<td>Geology - Lower/Upper Div T-Lab</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.02</td>
<td>Environmental Sci - Upper Div T-Lab</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.03</td>
<td>Environmental Sci - Lower Div T-Lab</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.04</td>
<td>Tutoring / Collaborative Area</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.05</td>
<td>Classroom Prep / After Hours Study</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.06</td>
<td>Special Instructional - A Instrument</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.07</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>C.08</td>
<td>NMR Instrument Room</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<table>
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<th>Room Name</th>
<th>100% Exhausted</th>
<th>AC Heat/Cooler (Minimum)</th>
<th>AC Heat/Cooler (Maximum)</th>
<th>Room Air</th>
<th>Services</th>
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<th>Power</th>
<th>Communications</th>
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<tr>
<td>C.02</td>
<td>Environmental Sci - Upper Div T-Lab</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.03</td>
<td>Environmental Sci - Lower Div T-Lab</td>
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<td></td>
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<td></td>
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<tr>
<td>C.04</td>
<td>Tutoring / Collaborative Area</td>
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<tr>
<td>C.05</td>
<td>Classroom Prep / After Hours Study</td>
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</tr>
<tr>
<td>C.06</td>
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<td>C.07</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.08</td>
<td>NMR Instrument Room</td>
<td>●</td>
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</table>

### Notes:
- Required
- Requested - To be discussed further
## Room Data Matrix (continued)

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<th>ID #</th>
<th>Room Name</th>
<th>Room Air</th>
<th>Services</th>
<th>Specialty Gasses</th>
<th>Power</th>
<th>Communications</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.01</td>
<td>General Ed - Lower Div T-Lab</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
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<td>P.02</td>
<td>Advanced Electronics Upper Div T-Lab</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>P.03</td>
<td>Optics Upper Div T-Lab</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>P.04</td>
<td>Special Instruction - Student Space</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>P.05</td>
<td>Special Instruction - SPS Projects</td>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>P.06</td>
<td>Equipment Storage &amp; Prep</td>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>P.07</td>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>S.01</td>
<td>General Teaching Lab</td>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>S.02</td>
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### Figure 3.7 - Room Finishes Matrix (continued)

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**Legend:**
- **Required**
- **Requested - To be discussed further**

### Table Data

- **ID #**
- **Room Name**
- **Utilization**
  - 8 hour / day
  - 14 hour / day
  - 24 hour / day
- **Floor**
  - Sealed Concrete
  - Resilient Tile
  - Seamless Sheet Flooring
  - Ceramic Tile
  - Other
- **Base**
  - 9'6" Smooth Floor
  - Integral with Floor
  - Gyp Bd, Epoxy Paint
  - Gyp Bd, Paint
  - Other
- **Partitions**
  - Open
  - Acoustic Tile
  - Gyp Bd, Door Panel
  - Other
- **Ceiling**
  - 75
  - 50
- **Doors**
  - Single Leaf 8'-0"
  - Single Leaf 10'-0"
  - Pair 8'-0" + 6'-0"
  - Pair 10'-0" + 6'-0"
  - Vision Panel
  - Card
  - Key
  - Security
  - In-Use Warning Light
  - Black-out Capability
- **Lighting**
  - Zoned
  - Warning
- **Casework**
  - Wood Cabinets
  - Metal Cabinets
  - Plastic Laminate
  - Stainless Steel
  - Epoxy Benchtop
  - Stainless Steel
  - Plastic Laminate
- **Benchtops**
  - Wood
  - Metal
  - Plastic Laminate

**Notes:**
- **8 hour / day**
- **14 hour / day**
- **24 hour / day**
- **Sealed Concrete**
- **Resilient Tile**
- **Seamless Sheet Flooring**
- **Concrete**
- **Epoxy**
- **Carpet**
- **Ceramic Tile**
- **Tile**
- **Other**
- **Open**
- **Acoustic Tile**
- **Gyp Bd, Door Panel**
- **Other**
- **Single Leaf 8'-0"**
- **Single Leaf 10'-0"**
- **Pair 8'-0" + 6'-0"**
- **Pair 10'-0" + 6'-0"**
- **Vision Panel**
- **Card**
- **Key**
- **Security**
- **In-Use Warning Light**
- **Black-out Capability**
- **Zoned**
- **Warning**
- **Wood Cabinets**
- **Metal Cabinets**
- **Plastic Laminate**
- **Stainless Steel**
- **Epoxy Benchtop**
- **Stainless Steel**
- **Plastic Laminate**

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- **Date:** 3/3/17
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04
DESIGN GUIDELINES
4.1 SITE CONDITIONS AND BOUNDARIES

4.1.1 SITE LOCATION

The project site is located on Warner Street near the western edge of the core campus. (Figure 4.1.1). The site is bounded to the south by Meriam Library and to north by a service drive that parallels Big Chico Creek. The west side of the site is defined by Warner Street, which separates the main core campus from two major academic buildings across the street, the O’Connell Technology Center and the Langdon Engineering Center. The east side of the site is bounded by a major pedestrian spine that connects the north campus to the main campus, via Mall Bridge, over Big Chico Creek. This spine separates the site from the large landscaped quad between Trinity, Glenn, Colusa and Kendall Halls.

The diagram below highlights the potential site boundary for the Science Replacement Building in red. Setbacks of 100’ and 75’ from Big Chico Creek are shown in white. The recommended creek setback is 100’ as defined in the Campus Masterplan; however, if required a 75’ creek setback may be considered.

Figure 4.1.1 - Siskiyou Site Aerial Photo
4.1.2 SITE CHARACTER

The approximately 1.3 acre site is essentially flat and is currently occupied by Siskiyou Hall. (Figure 4.1.2). Completed in 1957, this single-story building was designed as an industrial arts instructional facility. Current users include Business Services, Veterans Affairs and printing services. The building is set in the middle of the site with major entries on Warner Street to the west and to the pedestrian spine and quad to the east. A small paved service yard is located on the north side of the building and is accessed by the service drive that defines the north edge of the site. A large bike parking area with space for approximately 400 bikes is located on the east side of the building. Smaller bike parking areas are located between the building and Warner Street and adjacent to the service yard. Although the building is surrounded by foundation planting, the majority of the site is paved with concrete to accommodate the bicycle parking and pedestrian circulation. The site contains a number of mature trees, including Magnolias, Elms, Crape Myrtles and two large conifers. The size and density of the trees obscure views of Siskiyou Hall from the quad to the east and provide a foreground views to the four-story O’Connell Technology Center across Warner Street.

Figure 4.1.2 - Connection to Outdoors
4.1.3 VISUAL IMPORTANCE

The project site occupies a prominent place on the core campus (Figure 4.1.3: Existing Forces). Its location on the pedestrian spine between Meriam Library and the north campus makes it highly visible to the many people who pass the site on their way across campus. The site, with its extensive frontage along Warner Street, which cuts across campus, is visible to the larger community who drive on it. The site is also an important visual terminus to the large landscaped quad between Trinity, Glenn, Colusa and Kendall Halls.

The site is located at the intersection of the two main organizational grids on campus. The buildings on the main campus are oriented to follow the grid set established by the historic Kendall and Trinity Halls. The buildings on the north campus, across Big Chico Creek, have a different orientation, following the layout of the adjacent city streets.

Figure 4.1.3 - Existing Forces
4.1.4 SITE CIRCULATION

With its location at the edge of the campus core, between Warner Street and the major north-south pedestrian spine, the project site is well served by a variety of transportation modes. As shown in the Site Circulation Diagram (Figure 4.1.4), major and minor pedestrian pathways surround the site. These pathways connect the main campus to the north campus and also link the campus core, via two existing crosswalks, to the academic buildings across Warner Street. Service access to the site is provided from the service drive located between the north side of the site and Big Chico Creek. Vehicular parking for the site is provided in an on-grade lot behind the O’Connell Technology Center and in a multi-story garage located approximately a block to the south along Warner Street. The site has direct access to bicycle circulation along Warner Street and serves as a terminus and major parking location for riders who commute by bike and are prohibited from riding them into the core campus.

Figure 4.1.4 - Site circulation diagram
4.1.5 SITE OPEN SPACE

The project site has a strong connection to both the formal campus open space system and to the major natural feature on campus, Big Chico Creek (Figure 4.1.5). The site defines the eastern edge of the large landscaped quad between Trinity, Glenn, Colusa and Kendall Halls and has a strong connection to this major open space. The pedestrian spine between the site and the quad creates a strong linkage between the site and the more formal layout of the core campus on First Street as well as to the natural, informal riparian corridor along Big Chico Creek.

Figure 4.1.5 - Open Space Connection

4.1.6 SITE UTILITIES

The project site contains a number of existing utilities. Most of the utilities that serve Siskiyou Hall will no longer be in use and those beneath the footprint of the new building should be removed or filled as described in Sections 4.3.1 and 5.1.1.1. The site is bisected by two 12kV electric lines and an IT line that cross the site to the east of the existing building and connect to Meriam Library. These lines will need to be relocated as noted in Section 5.1.1.1 to open up the site for the new building.
4.2 CLIMATE FACTORS

4.2.1 OVERVIEW

CSU Chico is located at the northeast edge of the Sacramento Valley, adjacent to the foothills of the Cascade and Sierra Nevada mountain ranges. The region has a typically Mediterranean climate with hot, dry summers and cool, wet winters. The area is often sunny, with an average of 250 days of sun per year. July is usually the warmest month, with temperatures averaging in the mid 90’s and often reaching over 100 degrees. January is usually the coldest month, with average temperatures ranging between 35 and 55 degrees. Most of the precipitation falls between December and March, with each month averaging over 4” of rainfall. Winds are generally mild and usually are out of the southeast or the northwest. The strongest winds usually occur in March. The combination of sunny days, relatively mild temperatures and light winds give Chico a very comfortable year-round climate.
4.2.2 SITE SOLAR CONDITIONS

As shown in the solar diagram (Figure 4.2.2), the project site receives most of its sunlight from the southwest, along Warner Street. Given the open character of the campus adjacent to the site, the site is essentially open to the sun on all sides, with Meriam Library providing some potential shading along the south edge of the site. During the summer months, early morning and late afternoon sun will reach the northwestern side of the site; however these areas will receive little direct sun in the winter. During the winter, most of the sun will be concentrated along the southwestern side of the site.
4.2.3 SITE WIND CONDITIONS

The wind analysis diagrams (Figures 4.2.3.1 & 4.2.3.2) show that the prevailing winds during both the summer and winter months are out of either the southeast or the northwest. Given the open character of the campus adjacent to the site, there are few windbreaks to shelter the site from the prevailing winds.

Figure 4.2.3.1 - Summer Wind Rose

Figure 4.2.3.2 - Winter Wind Rose
4.2.4 SUMMARY

Given the generally pleasant climate in Chico, there are opportunities to create outdoor spaces on the site that can support year-round use by the campus community. During the warm months, spaces that provide shade from the sun and are open to a cooling breeze will encourage outdoor use. During the winter, spaces that receive sun and are sheltered from the wind will create the opportunity for use by the community.

4.3 DEMOLITION & SITE PREPARATION

4.3.1 SITE IMPROVEMENTS

Preparation of the site for the science replacement building will require the demolition of Siskiyou Hall and associated site improvements within the project area. These improvements include outdoor plaza areas, bike parking and the service yard. Existing streetscape improvements along Warner Street, including the sidewalk, the brick and concrete walls along the curb, and the street lights, should be retained if possible. The existing curb cuts and crosswalks on Warner Street should also be retained and incorporated into the site circulation design. The major pedestrian walkways on the east and south sides of the site should be preserved as these are part of the campus fabric and extend well beyond the edges of the site. The curb cut and alignment of the service drive along the north side of the site should also be retained. Sections of the drive can be replaced as required to accommodate the loading and service access requirements of the new building. More information on site demolition can be found in Section 5.1.1.1.

4.3.2 SITE UTILITIES

The project site contains a number of existing utilities. Most of the utilities that serve Siskiyou Hall will no longer be in use and those beneath the footprint of the new building should be removed or filled as described in Section 5.1.1.1. The site is bisected by two 12kV electric lines and an IT line that cross the site to the east of the existing building and connect to Meriam Library. These lines will need to be relocated as noted in Section 5.1.1.1 to clear the site for the new building.

4.3.3 NATURAL FEATURES

The project site contains a number of mature trees, many of which will likely need to be removed to open up the site for the new building. The existing trees should be evaluated by the campus arborist at the start of the project design phase to determine which trees are considered of value to the campus and subject to preservation. Those trees designated for preservation should be protected during construction using standard arboricultural tree protection practices. Demolition activities should respect the setbacks along Big Chico Creek and not introduce any deleterious materials into the riparian zone.

4.3.4 SITE PREPARATION

Preparation of the site should follow the requirements outlined in the geotechnical report prepared for the project. Prior to starting demolition and site preparation, the site should be fenced and appropriate pedestrian and traffic controls put in place. More detailed information on site preparation can be found in Section 5.1.
4.4 DESIGN GUIDELINES

4.4.1 DEVELOPMENT OF THE DESIGN GUIDELINES

The design guidelines were established through a series of visioning and goal-setting sessions with campus leadership. Once the project vision and goals were established, building massing scenarios were created, assessing a wide range of potential development opportunities. These options along with the Space Program and planning test-fits were reviewed with the Building Committee to extrapolate the salient features that would ultimately define the design guidelines.

For clarity, the design guidelines are delineated in the following categories and are presented on the following pages.

- Campus
- Sustainability
- Site
- Building
- Program
4.4.2 CAMPUS

CAMPUS CHARACTER

• Reinforce the symbiotic relationship between landscape and architecture that is a defining characteristic of CSU Chico
• Respond to the varied façade materials used on campus

CAMPUS FORM

• Address the transition from the south to the north campus grid
• Reinforce the campus core

CAMPUS EXPERIENCE

• Respect campus view corridors and iconic campus elements (towers, sculptures, etc.)
• Welcome people and encourage flow through the building, connecting Warner Street to Campus
4.4.3 SUSTAINABILITY

SUSTAINABLE DESIGN

• Sustainable Building Plan: Create a comprehensive whole-building sustainability plan to optimize synergies
• Passive Strategies: Plan and design smartly to minimize consumption before supplementing with active strategies
• High-Value Sustainability: Find initiatives of “value” to the campus and be transparent about them to educate students on climate impact
• Waste Stream Management: Track and reduce waste to campus outflow
• Healthy Building: Support occupant comfort with access to natural glare-free daylight, indoor air quality and active building design principles

SUSTAINABLE TARGETS

• Energy Use Intensity (EUI): Set target and aspirational range to inform design decisions. Engage faculty in process
• Building Performance Metering: Monitor and integrate building process into academics (fume hood usage competition, etc.)

SUSTAINABLE STANDARDS

• Labs21: Adopt best practices
• Second Nature Climate Commitment: Maintain campus’ advocacy and leadership towards sustainability
• LEED: Achieve V4 Silver minimum
4.4.4 SITE

BIG CHICO CREEK
- Protect and restore riparian habitat
- Preserve Creekside path

PEDESTRIAN FLOW
- Reinforce library pass-thru and bridge crossing
- Respect east-west quad edge circulation path (on both north + south side of quad)
- Create clearly defined building entries
- Create intuitive and safe connection across Warner/Ivy Street
- Provide safe pedestrian + bicycle access and secure bike parking

CLIMATE
- Respond to Chico’s hot summer conditions by providing shaded outdoor spaces
- Reduce glare by limiting hardscape. Blend into landscape.

WARNER STREET
- Develop appropriate scale, identity and visibility
- Avoid “canyon effect”
4.4.5 BUILDING

IDENTITY

• Define western edge of campus quad
• Promote exterior teaching opportunities (e.g. Science Row)
• Capitalize on relationship with creek.

VISIBILITY

• Consider all building facades to have a front face (no back door).
• Ease of transfer between interior and exterior.
• Meet ground plane in a pedestrian-friendly way

SCALE

• Optimize site area (~110K gsf)

MASSING

• Maintain compatibility with neighboring structures – specifically Meriam Library, O’Connell and related quad buildings.

MATERIALITY

• Utilize existing campus material palette – brick, concrete, glass, metal panel.

SERVICE

• Provide safe and functional distribution point for building service and loading that does not conflict with pedestrian flow
4.4.6 PROGRAM

- **Active Learning**: Provide environments that support current team-based teaching pedagogies and multi-modal learning
- **Flexible**: Design student-centered learning spaces that adapt to evolving teaching styles
- **Hands-On**: Teach students with equipment used in the profession
- **Collaboration**: Incorporate open zones on every floor for students to gather adjacent to circulation
- **Research**: Allocate spaces for student-teacher research projects
- **Faculty Offices**: Locate near student and research spaces to foster interaction and scientific discovery.
- **Faculty-Student Engagement**: Associate faculty waiting areas with student spaces.
- **Neurosciences**: Unite Neurosciences disciplines from across multiple buildings and departments
- **Interdisciplinary**: Share resources and promote cross-pollination of ideas among departments
- **Comprehensive**: Meet overall College of Natural Sciences program requirements and engage non-science majors across campus (kinesiology, etc.)
4.4.7 CAMPUS VOCABULARY

The following photographs represent some of the most prominent architectural features of the campus context and should be influence the design of the Science Replacement Building.

Figure 4.4.7.1 - Campus Vocabulary

Pedestrian-scaled arcades create comfortable outdoor areas for collaboration and protection from sun or rain.

Historic campus core buildings provide inspiration for materials + textures. New campus structures should have a dialogue through framed views and building scale.

Interiors become inviting beacons at dusk. Careful selection of interior finishes and lighting will have a dramatic impact on the exterior building appearance.

Building texture and scale can help identify clear building entries and circulation flows.
The integration of built form and landscape features are unique campus amenities. Historic buildings create focal points on campus.

Art and architecture on campus should have a symbiotic relationship.

Outdoor covered walkways and adjacent courtyards create gateways and opportunities to connect indoor to outdoor.
Figure 4.4.7.3 - Campus Vocabulary

Mixed brick palette is primary campus material.

Glazing appears at various scales relating to pedestrian experience.

Iconic campus building forms provide visual focal points and maximize vistas above campus tree line.

Varied campus tree palette inspires site development and color.
Big Chico Creek natural stone and varied vegetation inform materiality + color palette.

Inviting buildings create a dynamic relationship between campus open space and building collaboration spaces through the use of glazing.
4.5 LANDSCAPE CONCEPTS

4.5.1 OVERVIEW

The landscape concepts for the new science facility are based upon a number of factors. These include; the design guidelines established by the team during the planning and feasibility study process, the building program, the specific elements of the site, the landscape character of the campus, and sustainability.

4.5.2 GUIDELINES AND GUIDING PRINCIPLES

Developed in conjunction with the campus, and described in more detail Section 2.3, the guidelines and guiding principles establish goals and objectives for the project that address the building and site program, the relationship of the project to the existing character and fabric of the campus, and the development opportunities of the project site. The guiding principles for the site include:

- Protect and enhance the Big Chico Creek riparian corridor
- Reinforce and enhance existing pedestrian flow through and adjacent to the site
- Improve pedestrian and visual connections to the academic buildings located across Warner Street
- Provide bicycle access and secure parking while minimizing conflicts with pedestrians
- Provide a functional service area that does not conflict with pedestrian flow

4.5.3 BUILDING PROGRAM

The program goals and principles developed for the building, and described in detail in Sections 2 and 3 of this report, include a number that inform the design and development of the site and landscape concepts. These program elements include:

- Create environments that support active learning
- Provide areas for student gathering and collaboration
- Create a facility that ‘looks like science’ and opens up the building activities to the larger campus community

4.5.4 SITE ELEMENTS

The landscape concept should be developed in response to the site-specific conditions, such as site location and character, visual importance, circulation and open space, and climate. These conditions are described more fully in Sections 4.1 and 4.2. and include:

- Recognize and enhance the visual importance of the site within the campus and along the Warner Street corridor
- Reinforce and enhance existing pedestrian flow through and adjacent to the site
- Enhance the connection of the site to the campus open space system
- Take advantage of the Chico climate to create outdoor spaces that can support year-round use by the campus community
• Enhance the connection of the site to the campus open space system
• Define the west edge of the quad while inviting the open space into the building site
• Create safe connections to the academic buildings across Warner Street
• Reinforce existing pedestrian circulation along the north side of the quad
• Retain the major pedestrian mall and amenities at the east edge of the site
• Create a variety of usable outdoor spaces adjacent to building entries
• Integrate the building program and teaching mission into the site
• Frame views of the quad and historic buildings from within the site
• Provide multiple, convenient locations for bike parking
• Screen service areas from off-site views
• Retain views to the site from the Mall Bridge over Big Chico Creek
• Preserve the Big Chico Creek riparian corridor.

4.5.5 CAMPUS LANDSCAPE CHARACTER
The CSU Chico campus has a well-established landscape character that has developed since the campus was founded in 1887 on 8 acres of cherry orchard donated by the Bidwell family. The core campus is structured with a network of open spaces and pedestrian pathways that provide the framework for the siting and linkage of buildings and facilities. The campus is heavily landscaped and features open quads, numerous small-scale gathering areas, an arboretum-like collection of mature specimen trees and a well-established vocabulary of paving materials, lighting, and site furniture. Big Chico Creek, which bisects the campus, brings a natural, riparian character that stands in contrast to the more orderly, developed campus landscape. Refer to Section 4.4.3.2 for more detailed information on the campus landscape.

4.5.6 SUSTAINABILITY
One of the goals for the project is to develop a building and site design that will foster environmental stewardship. Described below, and in more detail in Section 5.1, sustainable practices for the landscape include:

• Select plant materials that will conserve water
• Develop on-site solutions for treatment or recharge of rain and storm water
• Use local and recycled materials where possible
• Select paving materials that will reduce heat-island effects
• Use light fixtures that will minimize light pollution and preserve the night sky
4.5.7 SITE PERIMETER

The development of the perimeter of the project site should reflect the differing conditions and requirements for each side of the site:

- The west edge of the site along Warner Street should reinforce the character of the streetscape and use the smaller scale spaces at the building setbacks and entry to create outdoor gathering
- The north side of the site should respect the natural character of Big Chico Creek and all service and bike areas should be well screened from view
- The east side of the site should open up to the quad, so that while the space flows into the building courtyard, the east façade of the building forms a strong visual terminus to this important campus open space. The adjacent pedestrian mall should be retained and integrated as part of the connection between the quad and the new building landscape
- The south edge of the site should reinforce the existing walkway between the project and Meriam Library

4.5.8 COURTYARD

The potential for a courtyard as part of the building design offers the opportunity to program a rich, vibrant space that can support the building's mission of creating spaces for active learning, student gathering and active collaboration. The design of the courtyard should:

- Accommodate pedestrian circulation between the wings of the building as well as through traffic between the east quad and Warner Street
- Facilitate gathering and use by small groups for informal or programmed collaboration
- Reflect the programs being taught within the facility
- Provide seating in areas that offer sun or shade to encourage year-round use

4.5.9 BIKE PARKING

Given the location of the site on the edge of the bike-free core campus, the project will need to provide easily accessible and secure bike parking for building users as well as the larger campus community.

- Bike parking areas could be located adjacent to Warner Street and to the service drive along the north edge of the site. These two locations facilitate access from off-campus and allow riders to park at the edge of the bike-free pedestrian areas
- Bike parking areas should be efficiently laid out using the campus standard racks and lit to provide safety and security during evening hours

4.5.10 SERVICE AREA

The service area is an important component of the building and site program. The service area will likely be accessed from Warner Street along the service drive next to Big Chico Creek. Given its location on the service drive, which also serves pedestrian and bicycle traffic, and its proximity to the creek, the service yard should be well screened from view. Screening could be accomplished by a combination of walls, fences and dense planting.
4.6 MASSING SCENARIOS

At the onset of the feasibility study, the design team evaluated two potential building sites selected by the University: the Siskiyou site, which was the Baseline site submitted to the CSU’s Office of the Chancellor, and the AHJ site, an alternate site with proximity to some of the existing campus science facilities. Both sites were analyzed consistently and massing options produced for each. Ultimately, the Building Committee selected Siskiyou as the preferred site. For additional information on the site selection process, see Appendix D.

For the Siskiyou site, five massing scenarios were created, providing a wide range of development opportunities from conservative to more eccentric. (Figure 4.6.2) The intent was not to select a preferred solution but utilize the massing scenarios to assist in defining the design guidelines.

During future design phases, it is anticipated that new massing options will be developed in a continued effort to satisfy the guidelines.

For the purposes of the feasibility study, one of the massing options, identified as "rotate" was selected for further development and to test planning strategies. On the following pages are a series diagrams depicting the evolution of the massing concept.

Figure 4.6.1 - Existing Site
Figure 4.6.2 - Massing Scenarios

- CANTILEVER
- COURTYARD
- ROTATE
- TISSUE
- EARTHFORM
Figure 4.6.3 - Removal of existing Siskiyou building, bike parking and loading zone

Figure 4.6.4 - Proposed massing scale (110,000 gsf)
Figure 4.6.5 - Separate mass into narrow floor plates for improved day lighting

Figure 4.6.6 - Carve lower mass to connect Warner Street to campus
Figure 4.6.7 - Rotate mass to align with north campus grid, hold alignment with south grid

Figure 4.6.8 - Step massing down at Warner Street
Figure 4.6.9 - Extend ends for presence

Figure 4.6.10 - Sculpt mass for improved day lighting and courtyard experience
Figure 4.6.11 - Landscape connectivity to the campus quad

Figure 4.6.12 - Separate ground level and extend existing path through to crosswalk
Figure 4.6.13 - Insert collaboration and circulation hub at intersection of masses

Figure 4.6.14 - Full volume with parapet
4.7 PLANNING TEST-FIT

In order to validate the proposed space program, a departmental test-fit diagram was completed based on the "rotate" massing scenario (Figure 4.7.2). With input from the faculty and campus leadership the following planning concepts were derived:

- Create central hub of circulation and collaboration that provides opportunity for casual interaction between students and faculty
- House all of the Neuroscience components (Psychology, Biology and Vivarium) located adjacent to each other and together on one floor.
- Maintain adjacency between Science Education and GEOS since they share spaces.
- Locate Interdisciplinary active learning classrooms and teaching labs on the ground level.
- Chemistry can span across two floors if needed (The space program includes a satellite prep room in addition to the central chemistry stock room to allow this flexibility.)
- Distribute faculty offices across the upper levels of the building.
- Locate research labs near faculty offices and collaboration spaces near faculty waiting to promote serendipitous interaction.
- Transparency that puts the science on display.

The space program and planning concepts were implemented and further tested via a 3D stacking and functional space diagram/model (Figures 4.7.3 through 4.7.7). During future design phases, it is anticipated that additional planning concepts will be developed in a continued effort to satisfy the guidelines.
Figure 4.7.1 - Departmental stacking and planning concept
Figure 4.7.2 - Functional stacking diagram: Level 1
Figure 4.7.3 - Functional stacking diagram: Level 2
Figure 4.7.4 - Functional stacking diagram: Level 3
Figure 4.7.5 - Functional stacking diagram: Level 4
Figure 4.7.6 - Functional stacking diagram: Axonometric showing all levels
05

SYSTEMS APPROACH
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5.1 INTEGRATED SUSTAINABILITY

5.1.1 INTRODUCTION

CSU Chico is a beacon for local and international students and has a tremendous opportunity to engage and educate students, staff and the community about sustainability, and aspires to lead-by-example. The University has adopted several policies and practices for sustainable development and operations of the campus. This section aims to confirm these policies as well as establish new goals and benchmarks for improved performance.

Sustainable design is the philosophy of designing physical objects, the built environment, and services to comply with the principles of social, economic, and ecological sustainability. As described in Section 2, one of the primary goals of the Science Replacement Building is to integrate sustainable practices into the project from earliest conception. This attitude is critical for success in developing cost-effective energy management and sustainability strategies.

Early in the design process, the sustainability goals and energy targets should be established. These include implementing the state of California and the California State University sustainability policies along with the ultimate goal of reaching stretch targets beyond these minimum requirements.

An approach of integrating the needs of the teaching and research that happens within the building and developing a complementary building design will be essential to meeting the sustainability goals of the project. With this integrated approach in mind, the project’s sustainability strategies have been woven throughout this Feasibility Study Report.

5.1.2 POLICIES AND COMMITMENTS

The California State University (CSU) system set forth their first Energy Policy in 1978 and it continues to guide the sustainable practices at the campuses. In 2006, Executive Order No. 987 Policy Statement on Energy Conservation, Sustainable Building Practice, and Physical Plant Management for the CSU was adopted requiring the installation of clean cogeneration, renewable energy generation, a Renewable Portfolio Standard of 20% by 2010. It also stipulates that all new construction is to outperform Title 24 standards by at least 15%, and all major renovations are outperform Title 24 by 10%. In 2014, the CSU Sustainability Policy was revised to include specific performance metrics, target additional facility operations and expand the policy to include procurement and food operations.
In 2007, the CSU Chico President released a Climate Commitment requiring the development of a comprehensive institutional action plan to achieve climate neutrality as soon as possible, creating institutional structures to develop and implement this plan, and to complete a comprehensive inventory of all greenhouse gas emissions to be updated every year. This Climate Commitment also initiated several tangible actions to reduce greenhouse gases such as, requiring all new construction to be built to at least USGBC LEED silver, adopting an energy-efficiency appliance purchasing policy, begin purchasing at least 15% of the University’s electricity consumption from renewable sources, and paying for the the offset of greenhouse gas emissions associated with air travel.

The CSU Sustainability Policy establishes goals for sustainable practices including:

- Integrate sustainability into the academic curriculum
- Reduce greenhouse gas emissions system wide
- Reduce consumption of fossil fuels and promote energy independence
- Water conservation
- Waste management

5.1.3 ENERGY MODELING

The intent of this section is to assess the appropriate and feasible sustainability goals and objectives of the project and recommend a design strategy in order to achieve the targets. This document is provided for coordination within the consultant team, for preliminary costing to confirm budget, and for client sign off at a programming level.

The University’s sustainability goals include setting and meeting EUI targets, LEED Silver minimum certification, and meeting Title 24 compliance margins. Energy modeling will identify which of these goals will be the most stringent and which can be more readily achieved, allowing the project team to prioritize and focus efforts for maximum impact and best outcomes.

The objectives of the energy modeling are as follows:

- Identify project priorities and goals and assess feasibility
- Create whole building energy simulations to test current conditions and identify energy efficiency measures that will be most effective
- Recommend passive strategies that will reduce the size of the mechanical systems
- Recommend high efficiency mechanical systems to meet reduced demands and support meeting the project’s energy goals

5.1.4 SITE INFORMATION

The CSU Chico campus resides in an arid microclimate within a suburban context and is further characterized in Section 4. The local building climate can reveal opportunities for passive design strategies, and can set constraints on the proposed building design.
5.1.4 SITE TEMPERATURE

Weather data is sourced from Red Bluff Municipal Airport. The Chico, California climate (ASHRAE 3B) is a typical Central Valley Mediterranean climate characterized by dry, hot summers and cool, rainy winters. Annually there are more days with heating demand which will have a larger impact on the overall energy consumption and pose a greater risk toward meeting energy goals. Based on the climate, the project will need to identify minimum envelope and HVAC performances to deal with these conditions in an energy efficient manner.

5.1.5 ENERGY PERFORMANCE

5.1.5.1 EUI BENCHMARKS

The building measurements are shown in energy use intensity (EUI) values. EUI is a measure of a buildings annual energy use divided by the buildings gross-square-footage. This normalized metric is used primarily in architecture and city benchmarking programs to compare properties across type, region, age and use. The units are presented here in kBtu/sf per year for both electricity and gas.

In the table shown below, there are two different sources of benchmark EUI data for two building program types. The first set of benchmark data comes from the Benchmark-based Whole-building Energy Performance Targets for New Buildings study done by Rashmi Sahai on eight UC and CSU campuses using measured energy use. The UC Davis campus data was used as a benchmark for this study due to it being located in a similar climate. The second set of benchmark data comes from the EnergyIQ benchmarking tool which uses data collected from the Commercial Buildings Energy Consumption Survey of existing buildings. The same building types used in the previous campus study were entered into EnergyIQ to get another set of benchmark EUIs. An average of these two benchmark EUI sources was used for this study.
Recommended EUI Benchmarks are:

- Admin/Academic: 66 kbtu/sf
- Lab: 225 kbtu/sf

5.1.5.2 EUI TARGETS

Two sets of recommended Target Design EUIs were developed for CSU Chico Science Replacement Building based on data from other projects, sources, and benchmarks etc. By setting a EUI target for a building, it does not limit innovation in energy efficiency measures. It allows the designer of the building as well as the future occupants to look holistically at a building to find the most effective energy efficiency measures, with the goal to meet or beat the physical target. Meeting a lower EUI target can have many benefits such as lower operating/energy costs and lower total cost of ownership, more efficient mechanical equipment that tends to result in higher quality equipment which lasts longer, and a lower campus carbon footprint which will help achieve the Climate Commitment goals. If achieved through excellent envelope and passive design strategies benefits can also include a more thermally comfortable space which can enhance students learning experience. Recommended EUI Targets are:

![Figure 5.1.5.2 Baseline Target EUI by Space Type](image)
Baseline Target

- Admin/Academic: 39 kBu/sf
- Lab: 188 kBu/sf

Alternate Target

- Admin/Academic: 29 kBu/sf
- Lab: 141 kBu/sf

5.1.5.3 OVERALL BUILDING EUI

Using the EUI information broken down by building program type, overall building EUI benchmark and targets were calculated based on a weighted average of academic/admin spaces and lab spaces in the current program breakdown.

- Existing Building Benchmark: 238 kBu/sf
- Baseline Target: 143 kBu/sf
Leveraging experience in designing university laboratory classrooms, The Design Team has compiled a range of expected energy savings based on implementing different efficiency measures to aid in targeting energy goals for CSU Chico Science Replacement Building, as illustrated below. Using this previous project experience informed the target energy performance.

5.1.5.4 BUILDING ON-SITE RENEWABLE ENERGY GENERATION

Once conservation measures are maximized, renewable energy systems can be used to offset grid energy. The maximum rooftop PV capacity has been calculated to give guidance on the project’s ‘energy budget’. The roof was measured to be about 33,700 ft². For access and spacing requirements of Title 24, the available roof area was assumed to be between 60% and 75% of the roof area, with 20,220 ft² to 25,275 ft² for renewables.

Scenario 1: 60% Roof 20,220 ft²
This scenario can fit a 377 KW PV system on the available roof and be able to generate 565,801 kWh. This can offset 16 kBtu/sf-yr of building energy use.

Scenario 2: 75% Roof 25,275 ft²
This scenario can fit a 471 KW PV system on the available roof and be able to generate 707,252 kWh. This can offset 19 kBtu/sf-yr of building energy use.

5.1.5.4 BUILDING ENERGY EFFICIENCY & SYSTEM TRADE-OFFS

FAÇADE SYSTEMS

Supplemental façade technologies may further balance the energy and comfort demands on the building skin. Exposure to solar heat gain, potential visual discomfort due to glare, energy consumption, and overall mechanical system size will all be defined by the performance of the perimeter skin. We recommend pursuing active façade solutions that may transfer cost from mechanical systems into the façade systems, bringing both comfort and performance benefits.

Interior automated shades on all façade glazing would ensure visual comfort, keeping direct sun patterns from visually disturbing interior activities. By including the equipment and automated control protocols to deploy the shades when direct sun strikes the glass, the perimeter zones would also see a slight benefit in reduced solar heat gain to the spaces. Additionally, the otherwise sun-struck hot inside surface of glass would be covered by the shade, moderately reducing the radiant transfer of heat to perimeter zone occupants.

Exterior automated shades would perform very similarly to interior shades, though be constructed of very durable exterior grade materials. And while the visual performance would be nearly identical to interior shades, the solar gains thought the glass would be nearly eliminated. Either exterior fabric or exterior venetian blind style shades could provide this relief, reduce the total tonnage of the air conditioning system, and lower the overall energy consumption of the building. Note the southeast and southwest are the most thermally exposed facades to solar gain – a potential hybrid solution of interior automated shade on northeast and northwest glass with exterior automated shades on southeast and southwest glass could be the most economical approach.
Recommended products to study in detail include:

The building skin directly influences the size and complexity of HVAC systems. A well-tuned skin can allow for simpler HVAC system design and overall reductions in system size, cost, and complexity.

Flexible HVAC systems tend to be decoupled in ventilation and comfort conditioning, are often integrated into architectural ceilings, walls or floors, and provide a limited amount of cooling. For example, a radiant paneled ceiling can only cover so much of the ceiling when built out.

**Utilize a low-capacity cooling limit to inform façade design.** The best example of this is a passive design, requiring no active systems or controls. This approach can keep design iterations moving quickly, providing a target for ‘how complicated’ or ‘how simple’ future HVAC systems will need to be. A high cooling load may mean 2 systems are required. A low capacity means the building could simplify the HVAC and potentially reduce the overall complexity.

Shown here are HVAC system options from air to hydronic systems, active to passive, for comfort conditioning. The colors and bars represent the differences between them in their ability to provide cooling. As an example, air system can scale to any size, yet can be large and more complicated traditionally. A hydronic system, while constrained in heat removal, are often more elegant solutions overall.

**Targeted Parameters for Flexible HVAC Selection**

In all hot or warm climates, the selection criteria for HVAC is picked to best provide cooling. This can
be through moving cold air or making cold radiant panels or surfaces. While some engineers will say ‘anything is possible’, the sweet spot of designing for specific thresholds can greatly simplify building systems. Aiming for these tipping points based on system capacity is recommended.

Having a façade tuned to utilize a simple HVAC system means fewer controls, fewer items to break, often smaller systems and even shorter floor to floor heights with less space dedicated to HVAC systems. The goal being, how can a building design transfer complexity and cost from the short-life HVAC (15 to 20 years) to the long-life building façade and structure (40 to 75 years).

5.1.5.6 NIGHT FLUSH VENTILATION

Chico has a typical Central Valley Mediterranean climate with hot, dry summers reaching an average high of 98°F during the day. But for over 3,600 hours in the year and including summer nights, the temperature dips below 65°F, giving the site a daily temperature swing of at least 28°F. This large temperature swing combined with the heavy mass construction makes it ideal for a night flush ventilation strategy.

Night flush ventilation blows the cool air into the building to precool the building at night. This “coolth” or cool energy is stored in the concrete and released during the day. The more exposed mass the building has, more coolth is stored, reducing the need for mechanical cooling.

The charts above compare the temperatures and heat fluxes of a night flush / high thermal mass scenario and a no night flush / low thermal mass scenario in an office in Mountain View. The average temperatures are slightly cooler in Davis compared to Mountain View but with similar temperature swings.
As shown in the charts, without any mechanical cooling, night flush coupled with high thermal mass alone can stabilize and maintain the room temperature at a lower level (on average 5°F lower than the alternative), significantly reducing the need for mechanical cooling.

5.1.5.7 ENERGY EFFICIENCY IN INDOOR BUILDING DESIGN

- Optimize the active MEP systems through low-energy, Passive building design to reduce loads.
- Active system optimization results in reduced lighting power, reduced receptacle loads and more efficient HVAC system.
- Application of efficient lighting systems and day lighting controls.
- Heating and cooling loads should be met with the moderate temperature systems. This means cooling systems with 55 to 60°F water and heating systems with 110-130°F water. Radiant panels, thermally active building slabs (TABS), chilled sails and chilled beams all take advantage of medium temperature chilled water for low-energy cooling.
- HVAC systems which utilize heat pumps, systems that can transfer heat from the air or from ground coupling. These systems make lower hot water temperatures than traditional HVAC, 100 to 120°F compared with 150 to 180°F. These heat pumps can be coupled with key technologies such as radiant floors, or radiators along windows.
- Thermally zoned VAV airside systems, no-reheat systems, low pressure drop design, demand control ventilation and underfloor/displacement ventilation systems all provide opportunities for energy efficiency within the building.

5.1.5.8 THERMAL + DAY LIGHTING ENVELOPE STRATEGIES

- Appropriate building massing and orientation to maximize beneficial solar exposure.
- Incorporate Passive, low-energy exterior building design to reduce building loads.
- Building envelopes should be better than code with optimal levels of insulation for the walls and roofs.
- Careful use of glazing area and type, with 40% window-to-wall ratio being the code prescriptive maximum.
- Appropriate external shading for solar heat gain control, while providing an enhanced level of daylight penetration (e.g. Vertical fins on the east/west facades and horizontal overhangs on the south facade).

5.1.5.9 INTERIOR ENVIRONMENT GUIDELINES

- If additional ventilation is required, especially during the heating months, outside air can be pre-heated with exhaust air. Heat recovery systems should be designed to still allow for economizing and preferably with bypasses to reduce fan power when heat recovery is not needed.
- Passive strategies will harness natural daylight and employ mixed-mode natural ventilation.

5.1.6 DAYLIGHT
As a high performance building, day lighting is a key design strategy to meet the sustainability and energy goals of the new CSU Chico building. Considering daylight as the primary source of illumination aims to save energy by reducing or eliminating the need for electric lighting systems during daylight hours, and aims to maximize human health and comfort through visual connectivity to the sky and natural exterior environment. Ideally, day lighting will serve as the primary light source in the building, with electric lighting as supplement.

The treatment of the exterior skin and its possible shading will also be a key driver for day lighting performance and overall visual comfort. As the team refines the building envelope, the design will be tuned to admit useful daylight into the spaces.

5.1.6.1 DAYLIGHTING PERFORMANCE EVALUATION CRITERIA

To evaluate the efficacy of the day lighting design and highlight opportunities for further refinement, the following metrics provide useful benchmarks:

- **Daylight Autonomy** - typical performance over the course of a year, indicating how often the building can operate with no electric lights. These results directly inform the predicted lighting load reductions in our energy model
- **Illuminance Levels from Daylight** - footcandle levels on work surfaces under typical clear sunny sky conditions, and also dark overcast sky conditions
- **Daylight and Visual Comfort** - how an occupant may perceive the luminous environment, and understand the potential for glare conditions

5.1.6.2 DAYLIGHT AUTONOMY

Daylight Autonomy (DA) is an annual calculation which summarizes hourly illumination levels over a typical year, and calculates the percentage of time when daylight is the only necessary light source, given a minimum illuminance threshold. Not only does this calculation describe the efficacy of a daylight design, it also describes the potential energy savings a building can realize from reduced electric lighting loads.

Additionally, the day lighting credit in LEED v4 is based on Spatial Daylight Autonomy (sDA), requiring a certain percentage of space to meet a minimum daylight autonomy of 50%. LEED v4 requires 30 footcandles as a minimum illuminance threshold for the autonomy calculation, and these studies also use 30 footcandles as a minimum threshold.

While there is no minimum code requirement for day lighting, LEED v4 provides a range of compliance points in describing day lighting performance. As a minimum 55% of the regularly occupied spaces must meet a 50% level of Daylight Autonomy at a minimum threshold of 30 footcandles (55% sDA30fc/50%). The building should meet this baseline requirement.

To achieve all possible LEED v4 day lighting points, 75% of the regularly occupied spaces must meet the sDA requirements of 30 footcandles for 50% of the occupied hours. With proper tuning of the building and massing, this is an achievable day lighting performance target.

As a stretch target, the team could expand the LEED requirements, and aim for 75% of the regularly occupied spaces to achieve Daylight Autonomy levels of 70%. While the massing and programmatic con-
constraints may limit access to daylight for some areas, those with high illumination levels could stretch to achieve even more annual hours above the 30-footcandle threshold.

5.1.6.3 ILLUMINANCE LEVELS FROM DAYLIGHT
While Daylight Autonomy results compile thousands of annual hours into a comprehensive result, simulations that describe day lighting performance at single points in time provide context for experienced illumination levels. Single point in time simulations aim to show what an occupant could expect given climatically typical sky conditions.

Illuminance level calculations underpin metrics like Daylight Autonomy and describe how much light falls on a given surface, however the human eye responds to luminance, or how bright objects are in the visual field.

5.1.6.4 DAYLIGHT AND VISUAL COMFORT
Luminance simulations can generate both rendered images and false color luminance maps, providing qualitative feedback of a visual scene and quantitative feedback of brightness as it relates to glare potential.

As the design progresses, day lighting experience will be evaluated by High Dynamic Range (HDR) simulation images. These data rich images contain photometric information in every pixel, and can generate a variety of outputs. While traditional digital images are limited in their ability to show a range of brightness comparable to the range a human eye can see, HDR images are not.

To understand the visual environment and predict the likelihood of visual comfort, processed HDR simulation outputs will use a tone mapping algorithm to mimic how the human eye will truly perceive a scene, and also map the data with a false color scale to show surface brightness.

The rendered images generate artifacts which account for potential veiling glare, saturation losses due to low or high luminous conditions, and detail losses or highlights due to contrast ratios. The false color luminance maps show how bright each pixel is in the image, and uses a logarithmic scale to illustrate a dynamic range of luminance values similar to what a human eye can decode instantaneously.

5.1.5.5 SPECIFICATIONS SUPPORTING EFFECTIVE DAYLIGHT STRATEGIES
Key to successful day lighting performance is the specification of the daylight apertures, the window glazing and interior shades. The glazing specification has a direct impact on the thermal, visual, and aesthetic experience of the building. Our goal is to balance the design intent of the facade with the thermal heat gain requirements of the mechanical system and the visual requirements for high levels of light transmission. Reference Section 5.3 Architecture for detailed information.

5.1.7 PLUG LOAD STUDY (RECOMMENDED ADDITIONAL TASK)
A plug load study of the existing science building conducted by CSU Chico is highly recommended.
This study shall include surveying and metering of process or plug load energy consumptions and is useful because plug load information is often overlooked by designers and energy modelers. Plug load information directly informs an energy model and will likely impact the mechanical system size.

The example project illustrated here had gone through an extensive plug load study and had identified significant potential reductions for both the design equipment heat assumption and operating equipment energy cost. The results reflected an estimated annual energy consumption reduction of approximately 20%.

Because the Science Replacement Project is replacing an existing similarly used science building, a plug load study is very well suited for CSU Chico and can provide valuable information that will likely have a direct impact on mechanical equipment sizing and costs.

5.1.8 WATER

5.1.8.1 WATER MANAGEMENT STRATEGY

The current water demands on the campus are being met by metered connections to Cal Water for potable (domestic and fire suppression) water requirements. Cal Water is the local water retailer that obtains water from local groundwater sources for distribution in Chico. This is supplemented by a campus owned and operated non-potable system for irrigation with a well and pump station located on the north side of Big Chico Creek, behind Butte Station. There is no “purple pipe” system in any building or on campus, i.e., a parallel pipe system for non-potable plumbing needs such as toilet flushing or laundry does not exist. Retrofit of existing facilities to add purple pipe is generally not considered economically feasible under current conditions. While it is assumed that the capacity of the irrigation system and pump station is ample to supply the irrigation needs of the campus for the foreseeable future, further study is required to identify whether this pumping presents an unacceptable risk to groundwater levels, or to examine the economic viability of developing alternative non-potable sources. Given the concerns at the state level driving new interest in water conservation and reuse, it may be worthwhile to research alternative...
water supplies such as wastewater treatment and reuse and identify what foreseeable conditions would tip the balance such that capture, treatment and reuse of rainwater or wastewater on site would become worthwhile. During the design phase of this project, consideration of whether it is worthwhile to install non-potable pipes for future use should be considered.

5.1.9 STORM WATER MANAGEMENT

Big Chico Creek provides significant benefits to the campus and the community, in terms of flood protection, groundwater retention, and habitat that supports a broadly diverse ecosystem, which in turn provides shade and vegetation that moderates local climate conditions. The creek provides an aesthetically pleasant environment for the campus as well as opportunities for research activities and as an environmental science laboratory. Storm water management is required to protect the water quality in Big Chico Creek and downstream receiving waters (Sacramento River/San Francisco Bay) and to protect the natural morphology of the creek. Failure to implement a storm water management program on the campus puts the University at risk of degrading this critical natural resource within the campus and degrading the ecological value of the creek and water quality to downstream beneficiaries.

Historically, storm water management on the campus has been to collect storm water in catch basins and area drains into an underground pipe system that discharges directly to Big Chico Creek. Efforts have been made to inform the campus community that storm drains flow to the creek and to discourage improper dumping. Current trends in sustainable management of storm water include low-impact development practices that facilitate infiltration to groundwater, provide natural biological treatment swales and ponds to improve water quality, and slow discharges to receiving waters to reduce flood risk and sediment transport due to associated erosion. It is highly recommended that the University develop a storm water management plan to guide the implementation of storm water best management practices with a goal of eventually achieving storm water management on a campus-wide scale. Development of a campus storm water management plan will aid in aligning campus planning with the regulatory objectives of the Central Valley Regional Water Quality Control Board which is charged with permitting and monitoring discharges to local surface water bodies, such as storm water discharges to Big Chico Creek.

This project presents an opportunity to integrate sustainable storm water management into the building design in ways that enhance the student experience, with highly visible and functional system elements that are beautifully integrated into the campus environment and provide teaching opportunities; especially appropriate to the Environmental Science and Environmental Education users of the building. This will provide a significant step toward implementation of a future campus-wide storm water management program. The specific storm water management elements appropriate to this site are described in greater detail in Section 5.2.

5.1.10 GREEN BUILDING STANDARDS

5.1.10.1 CALIFORNIA TITLE 24 ENERGY CODE

California’s Building Energy Efficiency Standards (Title 24 Energy Code) are designed to ensure new buildings and additions will achieve energy efficiency and preserve outdoor and indoor environmental quality. In 2008, California set energy-use reduction goals, targeting zero net energy (ZNE) use in all commercial
buildings by 2030. The ZNE goal means new buildings must use a combination of improved efficiency and distributed renewable energy generation to meet 100 percent of their annual energy need.

The 2016 Standards are currently enforced. Some changes from the previous 2013 version include:

- Door and Window Interlocks - required sensors on doors and windows adjust the thermostat to turn off the heating or cooling if a door or window is left open for more than five minutes
- Direct Digital Controls - required controls enable communication between the HVAC system and the energy management system
- Elevators - efficient ventilation fans and lighting sources required to be installed within the elevator, along with controls that turn off the cab lighting and fans when the elevator is empty
- Outdoor Lighting - the power allowance for outdoor lighting has been lowered requiring the use of newer, more efficient luminaires
- The most significant efficiency improvements to the nonresidential Standards include alignment with the ASHRAE 90.1-2013 national standard; a substantial increase in energy efficiency requirements from the previously referenced 2010 version

5.1.10.2 LEED™ RATING SYSTEM

Leadership in Energy and Environmental Design (LEED) is a consensus-based national green building rating system developed and administered by the non-profit U.S. Green Building Council. The four levels of LEED certification, from lowest to highest, are Certified, Silver, Gold, and Platinum. The LEED ratings system that is applicable to the Science Replacement Building is the LEED for New Construction (LEED-NC) which applies to new buildings and major renovations of existing buildings. The Science Replacement Building must comply with LEED Silver certification requirements at a minimum.

A preliminary LEED Scorecard for LEED-NC v4 rating systems have been provided on the following pages. At this early stage in the process, we anticipate the project can obtain LEED v4 Silver (53 points with an additional 35 maybes). All of the assumptions made, for example Construction and Demolition Waste Management, will need to be verified in future phases of design.

5.1.10.3 LABS 21 ENVIRONMENTAL PERFORMANCE CRITERIA

Labs21 is a voluntary partnership program that offers training and resources to support the design and operation of high-performance laboratories. Labs21 is co-sponsored by the Department of Energy and the Environmental Protection Agency. The Labs21 Environmental Performance Criteria (EPC) is a rating system that consists of prerequisites and credits in several laboratory-specific areas, including laboratory equipment water use, chemical management, and ventilation. Labs21 EPC is designed as a complement to LEED.
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*Figure 5.1.10.1 Proposed Baseline LEED v4 Checklist (pg.1)*
## LEED v4 for BD+C: New Construction and Major Renovation

Project Name: CSU Chico Science Replacement Building  
Date: 15 February 2017

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### Totals

| 53 | 35 | 22 | TOTALS | 110 |

Possible Points: 110

Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110

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Figure 5.1.10.2 Proposed Baseline LEED v4 Checklist (pg.2)
5.2 CIVIL ENGINEERING

Proposed site civil design guidelines include the following:

- Provide outdoor classroom opportunities within the Big Chico Creek corridor and avoid building within the setback.
- Direct water away from the building for the full perimeter of the building with appropriate site grading.
- Provide substantial quantity of secure bicycle parking as allowed by the overall site development.
- Consider pervious pavement options that reduce the visual and thermal retention properties of traditional hardscape where feasible.
- Develop a storm water management plan for the site that includes consideration of long-term campus-wide storm water management goals.
- Maximize storm water infiltration and/or treatment best management practices in a way that provides visibility, educational and research opportunities and integrates well into the campus landscape.
- Connect utility services to the new building at the same location as the previous connections from Siskiyou Hall whenever feasible to minimize the disruption to the utility corridor along the adjacent major pedestrian corridors.
- Existing 12kV transmission lines and IT/data lines cutting diagonally across the project site will likely need to be rerouted around proposed building foundation.
- In keeping with the concept that the new building “has no back”, appurtenances for utility connections such as back flow preventers, meters and transformers should be screened, upgraded or disguised to blend in with the landscape, architectural and/or environmental features.
- The preferred sanitary sewer connection is to the city main line in Warner Street. Further analysis of the capacity of this line is required and, if overcapacity, construction of an additional or parallel line may be required for up to 2 blocks to the intersection at West 2nd Street.

5.2.1 EXISTING SITE CONDITIONS

5.2.1.1 BIG CHICO CREEK SETBACK

The project site is immediately adjacent to Big Chico Creek. Appropriate protection of the creek, both during construction and as an ongoing critical asset of the University, is of prime importance. An erosion control plan including containment of soils and sediment during construction should be written into the construction contract. Storm water management and integration of riparian habitat with the landscape, site improvements, and project programming that draws educational linkages between the creek and the classroom should be included in the project design. A building set back of 100 ft. from the creek centerline has been recommended to preserve the riparian corridor for habitat protection and public access. The creek presents virtually no flood risk, as the upstream control structures divert major flows to Lindo...
Channel, which studies have demonstrated to have a capacity of up to 16,000 cubic feet per second (cfs). (The 100-year event in Big Chico Creek is 10,000 cfs). Only if a blockage occurs at a bridge constriction, such as if a large tree were to fall into the creek during an exceptionally large storm event, would there be a risk of localized flooding. Periodic inspection of the creek corridor by a qualified arborist and removal of identified dangers will virtually eliminate this risk.

5.2.1.2 DEMOLITION

Demolition will involve the removal of existing hardscape and landscape furnishings near the proposed improvements. Some trees along the western edge of the site may need to be removed and stumps ground to accommodate construction of the new building. Identification of trees to be removed and those to be protected in place should be addressed during project design. Demolished materials should be separated to recover recyclable materials and transported off site. Reuse of crushed materials may be an option at the direction of the geotechnical engineer. It is not anticipated that over excavation or significant import of fill material will be required.

Existing utilities beneath the footprint of the proposed building may interfere with or pose a risk to the proposed foundation. It is recommended that all utility piping beneath the proposed structure be removed. Two 12kV lines and an IT line cross diagonally below the open area east of the existing building will need to be relocated. These lines connect to Meriam Hall. As-built drawings of these lines should be provided to the electrical and IT design consultant for design of relocating these lines.

5.2.1.3 SITE GRADING AND DRAINAGE

The project site slopes gently from the northwest corner of the site near the entrance of the service road at Warner Street (at almost 196 ft. elevation) to the southeast where the rims of several drainage inlets are at approximately 192 ft. elevation. The finished floor of the existing Siskiyou Hall is recorded at 193.76 ft. Grading at the service area of the existing building currently directs surface water toward the building which maintenance staff have attempted to redirect toward the existing storm drain in the service area with limited success. The grading for the new building should regrade the area between the service road and the building to assure surface water flows away from the building and toward/into self-retaining areas or storm water treatment elements.

5.2.2 PAVING

A primary pedestrian corridor leads from Meriam Library to the pedestrian bridge over Big Chico Creek leading to Plumas Hall. A perpendicular pedestrian corridor provides passage from Central Campus across Warner to Langdon and O’Connell. An additional passage is proposed “through” the new Replacement Science Building. A significant amount of bicycle parking is being disrupted and would ideally be replaced as part of this project. It is recommended that the civil design be well coordinated with the landscape design to visually break up large paving areas and provide more intimate and inviting functional adjacencies that include secure bike parking, inviting building entrance access, outdoor teaching spaces and maintain clear pedestrian corridors.

Various forms of pervious pavement should be considered, including types that are ADA compliant for building access and through corridor areas, and the type that integrates grasses with the paving. This
later type of paving may be especially appropriate for bike parking areas and will assist in mitigating storm water management requirements and the heat island effect typical of traditional pavements.

All pavement shall be designed to meet the requirements of the project’s Geotechnical Report. At tree planting areas within paved conditions provide structural soil corridors or other structural systems that allow adequate room for natural root growth. The size of the structural systems should allow for adequate soil quantities required by the tree species to reach their natural and mature form.

5.2.3 STORM WATER MANAGEMENT

The storm water management approach supports the historical local ecology and CSUC’s long-term process of building a sustainable campus environment. It can do this by incorporating landscape based infrastructure to collect and infiltrate water, supporting ecological functions and habitat. The nearby Big Chico Creek is an essential component of the campus’ culture, ecology and history. It provides a number of ecological functions that are well worth preserving, including supporting native habitat, biological diversity, maintaining groundwater levels and moderating local temperatures. Low Impact Development (LID) refers to systems and practices that use or mimic natural processes that result in the infiltration, evapotranspiration or use of storm water in order to protect water quality and associated aquatic habitat.

Rather than channeling roof and surface runoff to direct discharge to the creek, the University can implement Low Impact Development strategies related to water, soil, and plants, and design with native plant species and landscape elements. The aim is to mimic pre development functions of detention, infiltration and biological treatment to slow the release of storm water to the creek while providing pretreatment functions provided by soils and plants prior to discharge to the creek.

LID storm water systems support the “Living Lab” concept of incorporating learning opportunities into the built environment. Living Lab opportunities include, among other things, a chance to study and learn about LID best management practices, levels of water quality improvement through the use of LID’s, a chance to observe and analyze ecological functions in a somewhat controlled manner, and a study of how landscape design can improve ecologic functions.
5.2.4 UTILITIES

The adjacent pedestrian corridors to the east and south of the existing building serve double duty as utility corridors. A large number of pipelines and conduits lay under the sidewalks. This has two important implications for the construction of a new building in the area: 1) All utilities are available nearby, but 2) the congestion of these utility lines must be well understood by the designer and the construction contractor to affect an efficient design and construction process. The design of site utilities should minimize the impact to continuing services to other buildings and maintain a compact utility footprint in order to accommodate ease of design and construction of future facilities.

5.2.4.1 DOMESTIC WATER, FIRE WATER, IRRIGATION

Cal Water supplies domestic water to the campus via several connections that are individually metered. Fire water and domestic water is taken from the same distribution system. Water pressure everywhere on campus is generally between 50 psi and 70 psi as that is the range which Cal Water maintains in their system. Water flow and pressure should be verified at the point of connection prior to finalizing design of the building water systems by the plumbing engineer.

There are existing Cal Water lines to the west (in Warner St.), to the north (north side of the service road) and to the east of Siskiyou Hall. There is a water meter and double check valve at the northwest corner of Glenn Hall and a 3” campus water line after that check valve feeds both Glenn Hall and Siskiyou Hall. According to the drawings, it then tee’s to a 4” line to Siskiyou Hall. This should be verified. It is recommended that the domestic water connection be made at this location to eliminate the need for additional metering. A shut off valve to the building should be installed outside the proposed building at the point of connection to the building.

Irrigation water on campus is sourced from a groundwater well on the north side of the creek and is untreated. What appears to be a 3” irrigation line crosses the creek just upstream from the Warner Street bridge and runs near the sidewalk down Warner street to the west of Siskiyou Hall. This line can be tapped for landscape water at the site.

5.2.4.2 SANITARY SEWER

An existing 6” sanitary sewer runs under the pedestrian corridor south of the site between Siskiyou and Meriam Library. It is recommended that new service be connected to the existing manhole near the southwest corner of the Siskiyou Hall. It is unclear that the city sewer in Warner St. has adequate capacity to carry additional flows. It carries flows from Glenn Hall, Siskiyou, Meriam, Center for Continuing Education, part of Colusa Hall, on the east side of Warner and takes all flows from O’Connell and Langdon on the west side of Warner. Additional study is required to determine if additional capacity in Warner from the new building to West Second St. (roughly 2 blocks) will be required.

5.2.4.3 CHILLED WATER AND STEAM

A 14” chilled water line is located in the pedestrian corridor between Siskiyou and Glenn Hall. It is recommended that the point of connection for the proposed building be hot tapped directly into this line. A valve vault should be installed downstream of the hot tap.
An 8" steam line (and 4" condensate return) is located in the same corridor as the chilled water, between Siskiyou and Glenn Halls and the current connection is at a vault northeast of the building. It is recommended that the new service be connected at the same vault.

5.2.4.4 GAS

A 3" campus gas line runs between Siskiyou and Meriam. A 1 ¼" gas line is located at the northeast corner of the existing building. The current connection to Siskiyou Hall is made from this smaller line. However, if the smaller gas line is not adequate for anticipated use at the proposed building, anticipating greater demand for gas in the Replacement Science Building than for Siskiyou Hall, a connection can be made at the south end of the building. Regardless of the location of the connection, a means of disguising the gas meter or incorporating it behind landscape elements or within the architecture should be considered.

5.2.4.5 POWER, COMMUNICATIONS

There are two existing 12kV electrical vaults east of the existing Siskiyou Hall. The newer of the two, the northwestern most vault has adequate spares for the proposed building. It is recommended to connect at this vault. Normally, a transformer, on a concrete pad, would be located adjacent to the building within the service area at the northeast corner of the proposed building. However, it is hoped that the new building will be built without an obvious service area. Therefore, through coordination with the Landscape Architect, the building Architect and the Electrical Engineer the transformer should be located and either screened or incorporated into the landscape or architecture to eliminate the visual impression of a traditional service yard.

There is a data center in Meriam Library. It is recommended that the point of connection for the data/IT service to the proposed building be taken from this data center and connect to the south end of the new building.
Figure 5.2.1 Proposed Civil Site Plan

SUGGESTED LOCATIONS FOR RAIN GARDEN, FLOW THROUGH PLANTER OR OTHER STORMWATER TREATMENT FEATURE

LEGEND
PROPOSED UTILITY CONNECTIONS

WATER, ALL POTABLE
DOMESTIC WATER
FIRE WATER
STORM DRAIN

SANITARY SEWER
CHILLED WATER
STEAM
ELECT

COMMS/IT
GAS
LIMIT OF WORK (APPROX.)
5.3 ARCHITECTURE

5.3.1 EXTERIOR CLADDING

The exterior skin system for the planned building will be durable, water-resistant, compatible with the surrounding context, cost-effective and appropriate for the intended use.

A limited material palette of finishes will be evaluated and considered for the exterior skin system. The primary cladding materials will be brick with glazing. Secondary cladding materials will include concrete and metal panels.

Several types of metal and window systems are available within varying cost allowances and different materials will be analyzed for their cost effectiveness to meet the budget. The final choice of systems will be made during the Schematic Design phase of work. Contrast and texture in the use of exterior materials will be studied carefully for visual interest and for the relationship to the interior function of the building. Careful attention will be given to avoid water and moisture intrusion at areas where different materials or building systems are joined, such as at exterior windows and door conditions. The minimum R-value for exterior walls will be R-19.

Glazing will be utilized to provide natural light into the occupied building areas and to provide views outwards into the surrounding campus. Sun shading, screening and glazing types will be studied to limit the effects of undesirable heat gain and visual glare. The window system may be painted aluminum, structural curtain wall or other appropriate quality system and will be investigated during design. In parts of the façade, smaller punched openings will be developed where less light is required within the adjacent spaces. Careful consideration will be given to the location of exterior windows with respect to interior furniture and specialty equipment placement.

At exterior door entries, canopies or recessed entries will provide the necessary protection for inclement weather. The features at the entries, canopy or other, should also be used to give the building presence and as a way-finding tool.

5.3.2 ROOFING & WATERPROOFING

The selection of roofing systems will be considered to reduce heat island effect and to limit glare if visible from occupied spaces. The roofing system will also be selected to withstand the long-term effects of sun, wind and rain, and to accommodate on-going roofing maintenance and eventual replacement. The roofing system will provide thermal insulation having a minimum value of R-30. Acceptable roofing membranes include single-ply TPO, PVC, EPDM and Multi-Ply SBS-Modified Bitumen Membrane systems.

In schematic design, the locations of the air-handling units and exhaust fans will be studied - it located on the roof, the will be installed with vibration isolation. Exposed, roof-mounted equipment will be located behind a parapet wall or equipment screen, screened from view and kept to a minimum. Roof-mounted equipment will be grouped together and rest upon common curbs to the extent possible. The rooftop equipment shall be well organized visually and functionally. Roof penetrations for piping and ductwork will be minimized and appropriately detailed. The roof area will be evaluated for its potential to accommodate photovoltaic (PV) panel arrays.
5.3.3 STAIRS & ELEVATORS

The stairs and elevators will be located to maximize flexibility for future internal space changes and to comply with the building’s exiting requirements. Stairs and elevators shall be designed to meet all applicable standards and codes, particularly the Americans with Disabilities Act.

5.3.3.1 STAIRS

Two code-required widely separated interior stairs are proposed to serve all occupied floor levels. These are intended to be basic, design-build stairs. In addition to the code-required stairs, a third interaction stair has been introduced to aid in visual connection and interaction among the building’s occupants. One of the fire stairs will go to the roof for access.

5.3.3.2 ELEVATORS

Two elevators (both of which are service) are proposed. It is intended that they serve both passenger and for the delivery of materials and chemicals from shipping/receiving to the research laboratories. One of the elevators will serve the roof level for maintenance personnel. The elevators will be machine room less (MRL) type units and shall conform to accessibility requirements.

5.3.4 GLAZING

A key indicator of excellent glass is the ratio of light transmission to the solar heat gained. The more Light to Solar Gain (LSG), the better. Solarban 72 on Starphire glass is an example of industry leading high performance glass, with a VLT of 0.71 and an SHGC of 0.30. This resultant LSG of 2.37 is unparalleled by other glass types, and is the most visually clear double pane low-e IGU on the market.

While the final glazing specification may be driven more by the SHGC requirement than the VLT, choosing a glass type that achieves a LSG of at least 2.1 is recommended.

Figure 5.3.4 Glass sample comparison. Solarban 70xl on Clear (left) and Solarban 72 on Starphire (right)
5.3.5 INTERIOR PARTITIONS AND DOORS

5.3.5.1 INTERIOR PARTITIONS

Metal stud and gypsum board partitions shall be used as the primary interior partition system. Metal stud partitions shall be designed to withstand a minimum lateral force of 5 psf. Where appropriate, partitions shall extend through the ceiling full height to the underside of the structure for acoustic and/or fire-rated separations where required. Partitions that do not extend to the structure shall be braced to the structure above. Connections to the structure above shall be designed to accommodate the anticipated range of structural movement of the floor/ceiling structure.

Gypsum board shall be 5/8” thick, Type X where required for fire-resistive construction, and comply with the requirements of ASTM C36. Partitions in wet areas shall be designed according to the degree of exposure to moisture. Water-resistant gypsum board shall be used in restrooms and toilets. In areas subject to high exposure to moisture, such as showers, fiberglass mesh mortar panels (cement board) shall be used. Cement board shall be 1/2” thick minimum.

Where heavy equipment or casework is to be mounted on partitions, structural backing appropriate to the loading shall be installed on the loaded side of the partition. The backing shall consist of metal backing plates anchored to the metal studs. The anticipated maximum load shall be calculated to determine the backing type, size, gauge, and spacing of the metal studs.

5.3.5.2 DOORS AND FRAMES

Doors may be solid core wood, hollow metal or structural glass construction. Preference should be given to utilizing wood doors in public areas, offices, general storage spaces with low volume of traffic. Typical locations for use of glass doors include exterior doors that serve as primary entrances and doors within curtain wall systems and special interior locations where vision is desired. Hollow metal doors should be used in locations that require panic exit hardware, service-related and back of house doors, and doors that need 90-minute fire ratings or more. If required for acoustic separation of spaces, specialty acoustical doors with a Sound Transmission Coefficient (STC) of 45+ can be incorporated into the project.

5.3.6 INTERIOR FINISHES

Overall finishes will be considered for aesthetics, acoustics, durability, ease of cleaning, and sustainable qualities appropriate to the areas in which they will be installed.

5.3.6.1 FLOORS

Finish flooring materials shall be slip-resistant and comply with the requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG). Various floor material will be considered during the Schematic Design phase. The selection of materials will be based on the acoustical, visual and vibration needs of each space as well as the material’s sustainability qualities. Among the materials that will be studied are exposed polished concrete, sheet rubber, sheet vinyl or linoleum, ceramic or porcelain tile at restrooms, carpet tile at offices and others.

5.3.6.2 WALLS
All partitions shall be finished with gypsum board to a smooth finish (Level 4), ready for paint. Storage rooms and building support spaces shall be finished in a light texture (Level 3) and ready for paint. Above finished ceilings and at concealed spaces a fire-taped level of finish is acceptable. All gypsum board wall surfaces exposed to view shall be painted. Where ceramic tile, concrete, concrete unit masonry or metal surfaces occur, those surfaces may be left unpainted and their natural finish exposed. Latex enamel interior paint with a satin finish will be the typical paint used at partitions.

5.3.6.3 CEILINGS

Finished ceilings may not be appropriate for all spaces and will be omitted where a ceiling system is neither necessary nor desirable. Finished ceilings may be omitted for aesthetic effect in public areas such as the building lobby, office areas, or possibly some laboratories. Consideration will be given to the nature of adjacent spaces when determining whether the finish ceiling may be omitted. Finished ceilings will be provided in utility spaces that adjoin and may be visible on a regular basis from high profile public areas. Acoustics in the areas where open ceilings occur will be studied to achieve appropriate sound levels. Finished ceilings will be omitted in mechanical rooms, electrical rooms, telephone/data room, and other similar spaces.

Where the control of noise or vibration is necessary, the ceiling design may be required to include additional layers of gypsum board, 3-1/2” acoustical batt insulation laid above the ceiling, and/or vibration isolated hanger devices.

Gypsum board ceilings shall be installed primarily in toilets, locker rooms and showers, and other areas where there will be exposure to water vapor. Gypsum board ceilings shall also be installed as required to control noise and vibration in spaces with high levels of equipment or fixture-generated noise or where aesthetic effects are warranted. All gypsum board ceilings shall be constructed with ceiling framing independent of walls and columns and be attached with resilient channels or resilient hangers to the structure above. All joints between walls and ceilings shall have an acoustic seal.

Gypsum board ceilings in spaces with little to no exposure to water vapor, such as public areas, offices, or other similar spaces where gypsum board is used solely for noise control or aesthetic effect, shall be constructed with standard gypsum board. Standard gypsum board shall be 5/8” thick and comply with the requirements of ASTM C36.

Gypsum board used on ceilings shall be finished smooth (Level 4), ready for paint. Satin finish, latex enamel interior paint shall be applied to ceilings in general use spaces where there is little or no exposure to vapor. Semi-gloss finish, latex enamel interior paint shall be applied to ceilings in areas with low to moderate exposure to vapor. Semi-gloss finish, alkyd enamel paint shall be applied to ceiling above showers and other spaces with high exposure to water vapor.

Exposed structure with concrete elements, structural steel elements, and metal deck exposed to view may be painted or left unfinished as appropriate for aesthetic effect.

5.3.6.4 INTERIOR FABRIC SHADES

For a majority of the building, motorized and automated fabric shades at the windows are recommended to control unwanted direct sun and to ensure maximum useful daylight saturation of the interior spaces.
Automatically controlled motorized shades will provide substantial benefits to teaching labs, research labs, open workplaces, meeting rooms, private offices, and public environments, contributing to both visual comfort and useful daylight penetration. The automated shade system should:

- Use software to move the shades according to the position of the sun in the sky such that no direct sun pattern falls on an occupant’s desk or laboratory bench. The software will take into account shadows from surrounding buildings, façade shade elements, and interior light shelf geometry to maximize the annual hours for the automated shades to remain open. Automatic shade movements not to exceed one adjustment every 5 minutes.

- Use a rooftop pyranometer to distinguish clear skies from overcast skies. Under typical overcast sky conditions, automatically retract the shades to the full open position.

- Efficiently deploy motors to maximize the area of shade cloth controlled by individual motors.

- Provide manual override wall switches at or near the glass wall for localized occupant adjustments. Balance the efficient deployment of shade motors with rational groupings of manual override. After a period of 3 hours, return manually overridden shades to the automated protocol.

- [OPTIONAL] Under very bright overcast sky conditions, automatically lower the shades to prevent visual discomfort due to bright sky glare.

If a fabric shade system is pursued, the following shade fabric specifications to maximize performance shall be met:

- PVC-free shade cloth material

- Medium to light grey or medium-light tone in color (avoid whites that become too bright when struck by direct sun, and avoid dark colors and black that do not diffuse sufficient ambient daylight into the space when struck by direct sun).

- 1% openness factor on east and west facades

- 3% openness factor on south facade

- 5% openness factor on north façade
5.4 LABORATORY PLANNING

5.4.1 MODULAR PLANNING

The Science Replacement Building laboratory space should be organized based on modular planning principles. The modular planning is used as an organizational tool to allocate space within a building. The module establishes a grid of standardized units or dimensions by which structural columns, walls and partitions are located. The modular planning provides flexibility of laboratory space allowing future modifications that may be required by changes in laboratory designation, equipment or departmental organization.

The planning modules could be combined to produce large, open laboratories or could be subdivided to produce small instrument or special-use laboratories without requiring reconstruction of structural or mechanical building elements. The modular planning concept is illustrated below.

Modular Planning of Laboratory Space
By utilizing the laboratory planning module as the basis for the structural grid design, it is possible to provide laboratory spaces which are not obstructed by columns.

The laboratory planning module dimensions should result from analyzing the laboratory bench space, equipment and circulation space.

- The bench dimensions should accommodate student and work stations, instruments, and procedures.
- The space between benches is designed to allow students to work back-to-back at adjacent benches, allowing accessibility for disabled persons and movement of faculty and laboratory carts in the aisle.
- The module should provide adequate open space for floor standing equipment where benches do not occur.

The laboratory planning module for the Integrative Genomics Building is recommended to be 10’-6” wide. The length of the planning module includes 30’-0” clear within the Laboratory and 10’-6” from center of bench or wall to center of bench or wall as shown in Figure 2.
Island benches are recommended to be 5'-0" deep. Wall benches should be 2'-6" deep.

5'-0" minimum aisle space between benches is recommended to minimize circulation conflicts and reduce potential safety hazards.

5.4.2 LABORATORY PLANNING CONCEPTS

Teaching Laboratories for the Science Replacement Building have been planned for flexibility and multidiscipline use wherever practical. Ongoing design consideration shall be given to the maximizing cross discipline use of all teaching spaces. Each Teaching Laboratory has been organized as an efficient space allocation to accommodate a prescribed number of student work stations, equipment use, material storage and safety.

Teaching Laboratories have been planned with movable tables where piped services are not required for student stations. Multiple arrangements of lab tables provides flexibility for faculty and students for a range of learning pedagogies.
Student – Faculty Project Laboratories for Science Replacement Building have been developed as shared facilities for us by students for advanced project work or undergraduate research as well as faculty with grant sponsored research.

Design consideration should be given to developing Laboratory neighborhoods focused on student learning and faculty – student project work in the new building. Laboratory neighborhoods should include Teaching Laboratories, Project Laboratories, Laboratory Support Spaces and Collaboration Spaces as intentional collections of facilities to foster collaboration and provide scaled spaces for interactions.

5.4.3 CIRCULATION

The design of the Science Replacement Building should assure effective external circulation for people accessing the building, delivery of materials and equipment, and the removal of the laboratory waste on regular basis.

Internal building circulation should provide safe pedestrian egress from each individual laboratory and laboratory support space through an uncomplicated path of egress to the building exterior at grade. The circulation system should accommodate the preferred adjacencies identified for the relationships between laboratories and prep rooms and between laboratories, classrooms and offices.

At least one door into each laboratory space should be oversized to accommodate the frequent transport of materials on carts and large equipment. Consideration should be given to single and double oversized door configurations with a minimum clear dimension of 40”. This can be achieved with a single 42” wide door, or a pair of doors including unequal leaf configurations. A common solution for an unequal leaf accommodation is a pair of doors with a 3’-0” active leaf and a 1’-6” inactive leaf.

Equipment lists should be carefully reviewed to verify that individual pieces of equipment can be transported and maneuvered between spaces. Future equipment should be anticipated.
Interior circulation corridors are recommended to be a minimum width of 8'-0" with pocketed doors to avoid swings into the path of travel. Where students may queue up for classes or labs a corridor width of 10'-0" is recommended. Consideration should be given to accommodating corridor gathering areas with seating and interaction opportunities for students.

Circulation within laboratory spaces should be coordinated with the placement of fume hoods to preclude primary exiting in front of the fume hoods. Consideration should be given to student use of sinks, fume hoods and other equipment within the laboratories when determining appropriate clearances.

5.4.4 ACCESSIBILITY

The Science Replacement Building must conform to applicable local, state and federal regulations for providing universal access to persons with disabilities. Early considerations should be given to the following accessibility aspects:

- All parts of the building should be accessible by persons with disabilities. An accessible path of travel shall be provided to, into and throughout every space in the building including laboratories and laboratory support spaces.
- 18" clearance on the pull side and 12" clearance on the push side of the strike side of doors is required for interior doors.
- Where safety stations including eyewash and safety showers are provided they shall be fully accessible.
- All teaching laboratories shall be fully accessible including accessible student work stations, fume hoods, sinks, fixtures, fitting and receptacles.
- All Student – Faculty project laboratories shall be fully accessible including project work stations, fume hoods, sinks, fixtures, fitting and receptacles.

General criteria and guidelines for accessible work stations in laboratories are as follows:

- Work stations, sinks, fume hoods shall be made accessible in the minimum ration of 1:20 within each laboratory.
- Work surfaces 30" - 34" above floor with 27" minimum vertical wheelchair clearance below. Adjustable work surfaces can provide a range of possible height adjustments.
- Laboratory service controls and equipment controls should be placed within easy reach for persons with limited mobility. Controls should have single-action levers or blade handles for easy operation.

Aisle widths and clearances adequate for maneuvers of wheelchair bound individuals. Aisles 5'-0" wide are recommended with turnaround areas.
5.4.5 NOISE CONTROL

The design of the structural, mechanical and electrical systems should address and mitigate the airborne and structure-borne transmission of noise from building sources. The most significant sources of noise are:

- Elevator equipment: motor/winch lifting assemblies and motor/generator sets of traction elevators or motor/tank/pump assemblies of the hydraulic elevators.
- Rotating and reciprocating equipment such as fans, compressors, pumps, and chillers.
- Fan noise transmitted through the building structure or through the duct systems.
- Duct noise generated by pressure fluctuations caused by fan instability or turbulence resulting from abrupt changes of direction in the duct systems.
- Noise generated by air flowing past dampers, turning vanes, and terminal device louvers.
- Water circulation system noise caused by high velocities or sudden pressure changes.
- Magnetostrictive hum associated with the operation of electric motors, transformers, switchgear, lighting ballasts and dimmers.

The noise reduction methods should include:

- Sound absorption partitions
- Selection quiet equipment
- Selection of adequate velocities in piping and duct systems
- Flexible pipe, duct or conduit paths or connections
- Sound absorption and vibration isolating equipment
- Isolated pipe and duct supports
The recommended NC levels for various spaces in non-occupied rooms with laboratory equipment off are presented in Table N1.

### Recommended NC Levels in Laboratory Facilities

<table>
<thead>
<tr>
<th>Area</th>
<th>NC Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research laboratories</td>
<td>40-45</td>
</tr>
<tr>
<td>36 inches in front of fume hoods</td>
<td>50</td>
</tr>
<tr>
<td>Audiology and pathology laboratories</td>
<td>25</td>
</tr>
<tr>
<td>Offices</td>
<td>35</td>
</tr>
<tr>
<td>Conference rooms</td>
<td>25-30</td>
</tr>
<tr>
<td>Corridors and support areas</td>
<td>45</td>
</tr>
</tbody>
</table>

#### 5.4.6 VIBRATION

Potential sources of vibration in the Science Replacement Building are the adjacent road traffic, footfall traffic on supported floors and mechanical equipment. Minimizing vibration from these sources should be implemented by structural and mechanical design. Special structural consideration may be required for specific areas of the building.

The uniform live load should not be less than the minimum uniformly distributed loads required by structural code. For vibration considerations, laboratory areas should be designed for 100 psf uniform live load. Concentrated loads may produce a greater load effect.

Human activities and operating machines are the most significant sources of vibration at above-grade building levels. Footfall-induced vibrations and steady-state operating machine vibrations should be alleviated by:

- Increasing the stiffness of the floor by combinations of floor mass and depth
- Confining heavily traveled areas to regions near column lines
- Separating structural spans in which corridors occur from laboratory structural spans
- Placing sensitive equipment near columns
- Placing the equipment away from heavily traveled areas
- Minimizing the length of spans
- Cast-in-place concrete floor solutions

Equipment and instruments that are extremely sensitive to vibration should be identified during the early stages of design and located on slab-on-grade to minimize the transient structure-borne vibration. Provisions of an isolated slab should be considered. Pneumatic and piezoelectric isolations should be used, as required, on specified highly sensitive equipment.
Building mechanical systems are major source of vibration. Air handling equipment and ductwork should be selected and installed to minimize vibration. Supply and exhaust air fans, compressors, pumps, and other noise and vibration producing equipment should be located in mechanical rooms with protective wall construction. Equipment should be isolated from supporting structure with resilient mounts. Vibration isolators should be selected based on floor stiffness, span extension, equipment power and operating speed.

Vibration criteria for areas intended to accommodate sensitive equipment are based on the root mean squared (rms) Velocity Level as measured in one-third octave bands of frequency over the range of 8-100 Hz. Generic Vibration Criterion (VC) curves have been developed for different types of equipment. The results are shown in Table V1.

Criterion curves VC-A through VC-E are applicable to science facilities. International Standards Organization (ISO) criteria for human exposure to vibration are also shown.

**It is recommended that the structural floor system of the laboratory areas of the Science Replacement Building be designed to meet either the VC-A or the ISO Op Theatre criterion.** Considerations should be given to the raised floor stiffness needs relative to the expected use of microscopes and the specific program plan. A Vibration Control Plan should be developed to overlay the program plan and structural system grid to evaluate the enhanced vibration control zones near columns. The final structural design should provide options within the building for VC-A level zones.

The design should follow the AISC Guidelines of Design for Sensitive Equipment.

Seismic stabilization of the structure should be addressed. Natural frequency of floor and building structure should be determined in function of the Seismic Zone of the construction site. Building natural frequency below 8 Hz is recommended. Seismic, or other criteria, may require lower natural frequency.
### Table V1 - Design Criteria for Sensitive Instrumentation and Equipment not otherwise Vibration-Isolated

<table>
<thead>
<tr>
<th>Criterion Curve</th>
<th>Vrms Velocity Level</th>
<th>Detail Size (µm)</th>
<th>5.4.6.1 Description of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshop (ISO)</td>
<td>32,000 (µin/s) 90 (dB)</td>
<td>N/A</td>
<td>Distinctly felt vibration. Appropriate to workshops and non-sensitive areas.</td>
</tr>
<tr>
<td>Office (ISO)</td>
<td>16,000 (µin/s) 84 (dB)</td>
<td>N/A</td>
<td>Felt vibration. Appropriate to offices and non-sensitive areas.</td>
</tr>
<tr>
<td>Residential Day (ISO)</td>
<td>8,000 (µin/s) 78 (dB)</td>
<td>75</td>
<td>Barely felt vibration. Sleep areas in most instances. Probably adequate for computer equipment, probe test equipment and low-power microscopes (to 20X).</td>
</tr>
<tr>
<td>Op.Theatre (ISO)</td>
<td>4,000 (µin/s) 72 (dB)</td>
<td>25</td>
<td>Vibration not felt. Suitable for sensitive sleeping areas. Suitable in most instances for microscopes to 100X and for other equipment of low sensitivity.</td>
</tr>
<tr>
<td>VC-A</td>
<td>2,000 (µin/s) 66 (dB)</td>
<td>8</td>
<td>Adequate in most instances for optical microscopes to 400X, microbalances, optical balances, proximity and projection aligners, etc.</td>
</tr>
<tr>
<td>VC-B</td>
<td>1,000 (µin/s) 60 (dB)</td>
<td>3</td>
<td>Optical microscopes to 1000x, inspection and lithography equipment (including steppers) to 3 micron-meter line widths.</td>
</tr>
<tr>
<td>VC-C</td>
<td>500 (µin/s) 54 (dB)</td>
<td>1</td>
<td>A good standard for most inspection equipment and lithography to 1 micron-meter detail size.</td>
</tr>
<tr>
<td>VC-D</td>
<td>250 (µin/s) 48 (dB)</td>
<td>0.3</td>
<td>Suitable in most instances for the most demanding equipment including electron microscopes (TEMs, SEMs, AFMs) and E-Beam systems, operating to the limits of their capacity.</td>
</tr>
<tr>
<td>VC-E</td>
<td>125 (µin/s) 42 (dB)</td>
<td>0.1</td>
<td>A difficult criterion to achieve in most instances. Assumed to be adequate for the most demanding of sensitive systems including long path, laser-based, small target systems and other systems.</td>
</tr>
</tbody>
</table>

Note: Detail Size represents the minimum width of fabrication details or size of research particles that could be handled at a specific criterion value.
5.4.7 VIVARIUM

PLANNING ANIMAL RESEARCH FACILITIES

Planning the animal research facility must accommodate efficient and economical flow of materials, cages, animals, and personnel. Adjacencies should be planned to maximize operational affinities and minimize travel distances. Relationships among zones and spaces should be optimized.

Animal research facility zones include delivery, animal receiving, food and bedding, quarantine, housing, procedure rooms, storage, cage wash, staff gowning and administration. The scale of the proposed animal facility for this project dictates a dual clean & dirty single corridor system which will rely on protocol and schedule for contamination control.

Vivarium Zoning Plan

ANIMAL FACILITY CONSTRUCTION FEATURES

Walls and ceilings

Walls and ceilings surface should be smooth, waterproof, vapor permeable and free of imperfect junctions. Surface materials should be capable of withstanding scrubbing with detergents and disinfectants and of withstanding the impact of 180 degree water under high pressure. The recommended materials for walls are non-flex gypsum board or concrete masonry units (CMU). Ceilings should be non-flex gypsum board. Walls and ceilings coating should be high-build epoxy paint and a semi-gloss to gloss urethane top coat to prevent yellowing.
Walls should be protected by guard rails to prevent damage by movable equipment. The location of valves and dampers above the ceiling should be coordinated to avoid cutting in removable access panels.

**Floors**

Floors should be smooth, waterproof, non-absorbent, non-slip, wear-resistant, acid and solvent-resistant, not susceptible to the adverse effects of detergents and disinfectants, and capable of supporting racks, equipment, and storage areas without becoming gouged, cracked or pitted. Depending on the functions carried on in specific areas, floor materials will be monolithic or have a minimum of joints. Recommended flooring materials are epoxy resin and methyl methacrylate (MMA) with integral cove base.

**Corridors**

Corridors should be at least 6 ft. wide to facilitate the movement of personnel and equipment. Floor-wall junctions should be coved. Guardrails or bumpers should be provided in high-low configuration. Exposed corners should be protected with durable corner guards.

**Doors and windows**

Doors should be damage resistant, foam insulated hollow coated metal, stainless steel, or fiberglass-reinforced polyester (FRP). Door dimensions should be minimum 42 inches wide and 84 inches high to permit easy passage of racks and equipment. Doors should fit tightly within their frames and both should be completely sealed. Door frames should be grout filled welded metal, stainless steel, or FRP, with hospital stops at the bottom. The doors should open into the animal rooms. The doors should be designed with recessed hardware, should be self-closing and self-locking, and should open from the inside without key. Each door leaf should be equipped with a continuous, heavy-duty 14 gauge stainless steel hinge. All doors should have kick-plates. Doors should be provided with spring loaded sweeps to seal when closed. Vision panels should be provided as required. Vision panels may require light-tight covers.

Exterior windows and skylights should not be provided in animal rooms. Exterior windows from spaces not involving animal presence should be non-operable.
NOISE AND VIBRATION

Excessive levels of noise and vibration can produce detrimental effects on research on animals. Measures to control vibration and noise transmitted into the animal facility space include:

- Locating the animal facility on grade.
- If elevated the structural system should be relatively stiff so that any transmitted vibration occurs at high frequencies.
- If elevated the structural system should have relatively short column spacing.
- Animal facility spaces should be located away from sources of vibration.
- On framed floors, corridors and animal facility spaces should not be combined in the same structural bay.
- Animal holding rooms should be located away from building sources of noise or vibration such as elevators or mechanical rooms.
- Cage washing and refuse disposal should be carried out in rooms separated from those for animal housing.
- Magnetostrictive hum associated with fluorescent lighting ballasts, transformers or electric motors should be minimized.

HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

The HVAC systems should be reliable, redundant, and operate without interruption providing adequate environmental quality for animal research including:

- Odor control
- Control of airborne contaminants
- Prevention of cross contamination
- Temperature and humidity control
- Energy conservation

The HVAC system should be independent from other building HVAC systems. Dedicated air-handling units and exhaust fans should provide redundancy. The system should be designed to accommodate flexible housing of any species in the facility in every animal holding room. Supply and exhaust air systems should be designed to minimize the noise level.

Supply air should be 100% fresh air, pre-filtered with MERV 8 (35%) efficiency with final filtration at MERV 13 (95%) efficiency. Terminal booster humidification maybe required.
Recirculation of air in an animal facility is not permitted.

Exhaust from animal rooms should be 100% discharged to the outdoors.

Ventilation flow rates should result from one of the following criteria:

- Room heat gain from animals and equipment and other sources.
- Minimum air change requirements.

Minimum air changes per hour, verified by practice of being efficient in controlling the air quality, vary depending on animal housing method. Housing of animals in non-ventilated cages may be satisfied by 10-12 changes per hour. Rooms accommodating ventilated racks could be designed to operate at 4-6 air changes per hour in addition to air exchanged through micro-isolators.

The indoor design conditions in animal spaces should satisfy the animal comfort range shown in Table A1.

Table A1- Animal species indoor design conditions

<table>
<thead>
<tr>
<th>Animal</th>
<th>Temperature (°F)</th>
<th>Relative Humidity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouse</td>
<td>65-80</td>
<td>40-70</td>
</tr>
<tr>
<td>Hamster</td>
<td>65-80</td>
<td>40-70</td>
</tr>
<tr>
<td>Guinea Pig</td>
<td>65-80</td>
<td>40-70</td>
</tr>
<tr>
<td>Rabbit</td>
<td>60-68</td>
<td>40-70</td>
</tr>
</tbody>
</table>
POWER AND LIGHTING

Normal Power

Each animal room should be supplied by a separate power panel located in the corridor. Power distribution within the new facility should be in conduit and wired from a main distribution panel to the room panel. Conduits in animal facilities should be concealed. All outlets should be standard type with waterproof covers to allow for cleaning. Surface metal raceway with snap-on covers should not be used in an animal facility.

Standby and Emergency Power

Standby and emergency power should be provided to maintain the operation of the critical building systems even at reduced capacity, in event of failure of the primary system. Standby power should cover the animal room lighting, animal room ventilation, ventilated animal cages and cage systems, operating rooms, animal watering system and data gathering system. Lighting and alarms associated with the life safety requirements will be provided with emergency power. Standby and emergency power will be provided by a local generator. The capacity of the generator and fuel supply should be discussed with Animal facility Director.

Lighting

Lighting in animal facilities should be dimmable and should have time-of-day programmable automatic control to facilitate controlled environment studies, with the ability to program the light levels to step up or down to better mimic nature.

In addition to white lights, red lighting is commonly provided in holding rooms. Red lighting allows researchers to observe rodents during the night cycle without disturbing the animals. This is often achieved by using one red-sleeved lamp (with separate control) within each 3-lamp fixture in the holding rooms.

25 to 75 foot-candle lighting levels should be considered for planning the animal facility.

The electrical system should provide sufficient power outlets and safety lighting. Light fixtures should be waterproof, recessed, ceiling mounted, sealed and caulked to prevent vermin influx.
Ventilation

Holding room ventilation systems should maintain the relative pressure relationship with adjacent spaces. In general, the holding rooms should operate at negative air pressure relative to clean corridors and other non-animal spaces. Changes of research programs may require positive pressure relative to the corridor. Pressure relationship should be changed without modifying the supply air flow.

Ventilation flow rates must control the odor propagation and remove the sensible and latent heat from the animals as well as heat generated by room equipment and other sources.

Air will be conditioned from 100% fresh air and should be supplied to the room at constant volume with terminal reheat. Local booster humidification may be required.

Supply air temperature should not be lower than 60°F. Temperature difference between supply and return air is recommended to be maintained below 7°F.

Temperature should be controlled by one room thermostat inside each animal holding room connected to the reheat coil control valve to maintain dry bulb conditions.

If required, the room humidity should be controlled by a room humidistat connected to the control valve of the individual room humidifier placed in the supply air duct. Steam humidification is recommended.

Room air distribution should not cause drafts on research animals directly exposed to the room environment. Ceiling mounted, low velocity, low throw, stainless steel diffusers should be used.

The exhaust air grilles should be stainless steel ceiling mounted. Joints around diffusers and grilles should be sealed and gasketed. In cases of large animal and rabbit caging low mounted grilles could be considered. The grilles should be minimum 8 inches above the floor and provided with 30% efficiency disposable filters.

Exposed ductwork must be avoided. Supply and exhaust air systems should be sized to minimize noise levels.

Minimum ventilation rate should be 10 air changes per hour for non-ventilated caging for odor control.
5.5 STRUCTURAL SYSTEMS

5.5.1 PROJECT DESCRIPTION

The proposed New Science Replacement Building will be approximately 105,000 gross square feet. This new facility will be a 4-story steel building with a mix of brick, glass and metal panel exterior wall systems. This new facility will house a variety of Physical Sciences programs including Neurosciences Biology, Neurosciences Vivarium, Neurosciences Psychology, Chemistry, Physics, Science Ed, and Geoscience. It will be an active learning and teaching center in addition to provide laboratory space for teaching and research. The mass of the building is based on a sculpted rotated mass for improved daylighting and courtyard experience.
Circulation through the building is a signature concept that has a significant impact on the design of the structural system for this facility. At the ground level there is a desire to provide free circulation maintaining existing pedestrian pathways. The structural system for this building will need to allow for a clear, column free space below major portions of the program space, as indicated in the diagram below.

FIGURE 5.5.1.2 – SITE CIRCULATION
5.5.2 BUILDING FRAMING SYSTEMS

**Material Selection:** The challenges presented in this design make the selection of the building material straightforward. An lightweight, open steel frame system is the logical choice for a building with significant cantilevers and large clear spans. Steel framing also provide for future flexibility and greater freedom for future remodels in the laboratory spaces, where creating new shafts and plumbing connections through floors and walls are common place requirements. Concrete, while ideal in many instances for laboratory or academic facility, is in this case not feasible.

**Steel Framing Solutions for Cantilevered Masses:**

A vierendeel truss is a truss system that uses closely spaced columns and griders to create a stiff planar moment frame. This type of system provides structural performance similar to a regular truss, but without the diagonal braces. By wrapping the vierendeel around the facades at the inside and outside corners of the building we can provide a stiff gravity frame and a column free space below.

![Figure 5.5.2.1 – Exterior Vierendeel Truss System](image-url)
5.5.2.2 – EXTERIOR DEEP GIRDER SYSTEM

The truss has a clear span of approximately 140 feet on the outside face and wraps back approximately 32’ where it forms a back span for the cantilever. On the opposite face the clear span is less, approximately 60 feet and can be accomplished with deep girders.

Another option for achieving these clear spans is roof trusses that follow the edges of the building and form a similar function as the vierendeel truss, except it is a traditional truss mounted on the roof. This system becomes cumbersome to frame where, as is in our design, the truss would need to wrap around the corner. However, it remains a viable option that should be explored further in the next phase of the project.

With a vierendeel truss in the floor framing it becomes important to limit inter-story drift so that the seismic movement does not engage the truss moment frame. A brace frame system provides stiffness compatible with the vierendeel truss and is also a very economical system to employ. In addition, because of the steps in the height of floors as well as many locations where columns do not go to ground a special moment frame system is not compatible with this project’s massing system.

5.5.2.3 – BUCKLING RETRAINED BRACES

5.5.2.4 BUCKLING RESTRAINED BRACES

Floor Framing

The floor framing systems should follow traditional laboratory spacing based on columns modules of approximately 32’x21’. Using lightweight fill over metal deck will enhance the floor vibration characteristics and
reduce seismic demand as well. Since this facility is both a teaching and research lab the floors will likely need to be designed to meet vibrations standards between 6,000 and 8,000 Mips. The specific vibration characteristics should be determined once the lab equipment has been selected.

5.5.2.5 TYPICAL FLOOR FRAMING

Foundations

In absence of a geotechnical report we assume that the foundations will be traditional continuous and isolated spread footings supported by geopiers that are located below each foundation element and penetrate to the firm soil below.
5.5.4 DESIGN CRITERIA

Live Loads:

- Laboratory Floors: 100 psf
- Classrooms: 50 psf + 15 partitions
- Office Floors: 50 psf + 15 psf for partitions
- Stairs and Exit Corridors: 100 psf
- Roof (areas without equipment): 20 psf
- Mechanical Areas: 100 psf or weight of equip. + 50 ps

Vibration (Walker-induced floor velocity):

- Laboratory Floors (U.O.N.): TBD μ-inches/sec
- Laboratory Support Space: TBD μ-inches/sec
- On-grade areas (As designated): 125 μ-inches/sec
- Offices: 0.005 G (acceleration)


Seismic USGS & CSU BSE2 Guidelines:

- Latitude/Longitude: 39.72731°N/121.84768°W
- Short Period Spectral Accel. \( S_s = 0.616 \text{ USGS} / 0.58 \text{ CSU} \)
- 1 Second Period Spect. Accel. \( S_1 = 0.274 \text{ USGS} / 0.21 \text{ CSU} \)
- Site Class: D (TBD)
- Short Period Site Coefficient: \( F_s = 1.307 \text{ USGS} / 1.4 \text{ CSU} \)
- Long Period Site Coefficient: \( F_v = 1.851 \text{ USGS} / 2.0 \text{ CSU} \)
- MCE Short Period Spect. Accel.: \( S_{ms} = 0.806 \text{ USGS} / 0.812 \text{ CSU} \)
- MCE 1 Sec. Period Spect. Accel.: \( S_{m1} = 0.508 \text{ USGS} / 0.42 \text{ CSU} \)
- Design Short Per. Spect. Accel.: \( S_{ds} = 0.537 \text{ USGS} / 0.5413 \text{ CSU} \)
Design 1 Sec. Per. Spect. Accel.: $S_{D1} = 0.339 \text{ USGS} / 0.2747 \text{ CSU}$

Risk Category: II (Assumes hazardous contents limited, TBD)

Seismic Importance Factor: $I_e = 1.0 \text{ (TBD)}$

Seismic Design Category: D (TBD)

R Factor: $R = 8 \text{ (Buckling Restrained Braces)}$

Wind:

Wind Speed: $V_{3S} = 110 \text{ mph}$

Exposure: C

5.5.5 MATERIALS

Concrete Compressive Strength

- Suspended Slabs, Columns, Walls: 5,000 psi
- Slab on Grade, Foundations: 4,000 psi
- LWC Fill over Metal Deck: 5,500 psi

Steel

- W-Shapes: ASTM 992, Grade 50
- Angles, Channels and Bent Plates: ASTM A36
- Square Round or Rectangular Tubes: ASTM A500, Grade B
- Buckling Retrained Braces: $P_{yse} = 30 \text{ to } 44 \text{ ksi}$
  Strain at 2% story drift = 1.80% Max
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5.6 MECHANICAL SYSTEMS

5.6.1 INTRODUCTION

This report examines the feasibility of a few mechanical system options for the new science facility being considered by the CSU Chico State. The new building will include teaching laboratories, offices spaces, and a vivarium. System concepts are described and preliminary sizing criteria is provided.

5.6.2 BACKGROUND INFORMATION

The proposed building describe in this report will be located at the current Siskiyou Hall site; the current building will be demolish and replace with a new structure featuring 4 floors with an estimated area of 110,000 GSF and 26,250 SF footprint. The feasibility study will use 110,000 GSF as basis of estimates. Future growth may increase the total area to 132,000 GSF and will lead to increase in equipment sizes.

5.6.3 PROJECT GOALS

PROVIDE A SAFE, HIGH QUALITY, AND COMFORTABLE LEARNING ENVIRONMENT FOR STUDENTS AND FACULTY.

- Optimize use of daylight for both visual comfort and energy impact
- Monitor contaminant level in laboratory spaces and vivarium
- Optimize minimal required outdoor air into indoor space for safety and energy impact
- Provide superior thermal comfort for building occupants.

MINIMIZE LONG TERM ENVIRONMENTAL (CARBON, ENERGY, AND WATER) IMPACT

- High Efficient building envelope design for reducing equipment size and energy consumption.
- Reduce first cost and Total Cost of Ownership
- Eliminate wasteful reheating or air streams in HVAC air distribution systems
- Minimize the use of refrigerants. Typical refrigerants have more than 1000x global warming potential compared to CO2.
- Achieve LEEDv4 Silver certification

DESIGN A RESILIENT BUILDING THAT PROVIDES THERMAL COMFORT TO OCCUPANTS DURING NORMAL AND EMERGENCY OPERATIONS

- High Efficient Building envelope design, including optimized building orientation, exterior solar control, superior glazing specification, continuous exterior insulation, and minimal thermal bridge
- High thermal mass for a more resilient design, flattening load curve during normal operation

REFERENCES AND CODES

- 2016 California Mechanical Code (Effective 2017-01-01)
- 2016 California Plumbing Code (Effective 2017-01-01)
- 2016 California Energy Code (Effective 2017-01-01)
- AAALAC – American Association for Accreditation of Laboratory Animal Care
- 2016 ASHRAE 62.1 - Ventilation for Acceptable Indoor Air Quality
OUTDOOR DESIGN CRITERIA

Chico Exp Station is the closest weather location in Title 24-2016 Joint Appendix.

<table>
<thead>
<tr>
<th>Outdoor Design Temperature</th>
<th>Cooling 0.5% Drybulb condition (Load calculation)</th>
<th>102F DB / 69 WB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cooling 0.5% Wetbulb condition (Equipment selection)</td>
<td>71F WB</td>
</tr>
<tr>
<td></td>
<td>Heating 0.2% Drybulb condition (Both)</td>
<td>27F DB</td>
</tr>
</tbody>
</table>

Note: Monthly cooling load calculation will require monthly ASHRAE weather data. Red Bluff, CA weather station is the most appropriate nearby weather station. Because climate in Red Bluff is slightly more extreme than Chico, outdoor condition will be adjusted down by Title 24’s data. See Energy Modeling Section for Psychrometric Chart of local climate.

INDOOR DESIGN CONDITION

<table>
<thead>
<tr>
<th>Space Type</th>
<th>Summer Set point</th>
<th>Winter Set point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Laboratory</td>
<td>78F DB, Max DP: 62F</td>
<td>68F DB, Max DP: 62F</td>
</tr>
<tr>
<td>Lab Support</td>
<td>78F DB, Max DP: 62F</td>
<td>68F DB, Max DP: 62F</td>
</tr>
<tr>
<td>Teaching Laboratory</td>
<td>78F DB, Max DP: 62F</td>
<td>68F DB, Max DP: 62F</td>
</tr>
<tr>
<td>Office</td>
<td>78F DB, Max DP: 62F</td>
<td>68F DB, Max DP: 62F</td>
</tr>
<tr>
<td>Non-Lab Classroom</td>
<td>78F DB, Max DP: 62F</td>
<td>68F DB, Max DP: 62F</td>
</tr>
<tr>
<td>Vivarium</td>
<td></td>
<td>See Vivarium Section</td>
</tr>
<tr>
<td>MEP Rooms</td>
<td></td>
<td>Cooling only, 85F DB</td>
</tr>
</tbody>
</table>

DESIGN VENTILATION CFM/SF TABLE

The following table is based on 10ft high ceiling. All design ventilation rates are preliminary in nature and will be confirmed during the design process when more information is available. The number and the size of chemical fume hoods may also affect these estimates.

<table>
<thead>
<tr>
<th>Space Type</th>
<th>Purge</th>
<th>Occupied Max</th>
<th>Occupied Min</th>
<th>Unoccupied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Laboratory</td>
<td>1.5 CFM/SF, 9 ACH</td>
<td>1 CFM/SF, 6ACH</td>
<td>0.33 CFM/SF, 2 ACH</td>
<td>0.33 CFM/SF, 2 ACH</td>
</tr>
<tr>
<td>Lab Support</td>
<td>1.5 CFM/SF, 9 ACH</td>
<td>1 CFM/SF, 6ACH</td>
<td>0.33 CFM/SF, 2 ACH</td>
<td>0.33 CFM/SF, 2 ACH</td>
</tr>
</tbody>
</table>
### Teaching Laboratory
- 1.5 CFM/SF, 9 ACH
- 1 CFM/SF, 6 ACH
- 0.33 CFM/SF, 2 ACH
- 0.33 CFM/SF, 2 ACH

### Office
- N/A
- 0.35 CFM/SF,
- 0.15 CFM/SF

### Non-Lab Classroom
- N/A
- 0.5 CFM/SF,
- 0.38 CFM/SF

### Vivarium
- See Vivarium Section

### MEP Room
- N/A
- 0.15 CFM/SF

#### DESIGN ROOM NOISE CRITERIA
Designs shall be based on the ASHRAE recommendations regarding noise criterion (NC) for each occupancy type. The design will target the following average noise levels. The average noise levels in laboratory areas are based on measurements taken three feet in front of a six-foot biological safety cabinet (BSC) or chemical fume hood (CFH). Noise levels indicated do not account noise from equipment or personnel located within these spaces. Actual noise levels may exceed design levels due to the actual type of equipment procured, installation compromises, and workmanship. Refer to Noise Control section to see recommended NC level.

#### GENERAL SIZING STRATEGY
For all equipment serving lab spaces and vivarium, N+1 redundancy is required. Additionally, the following equipment will be on emergency power and be equipped with variable frequency drive:

- Air Handling Units
- Exhaust System
- Pumps
- Chillers
- Cooling Towers
- Boilers
- Steam system
- DDC Control System

#### 5.6.4 SITE UTILITIES

### CHILLED WATER LOOP
Underground chilled water piping runs parallel to the East side of the current Siskiyou Hall (building No5 in the figure) site. Although, the existing building is not connected to the chilled water loop, the new building will since it will be very close to this loop. The connection will involve installing isolation valves in the existing loop and running underground piping to the new facility. Water flow and pressure should be enough since the central utility plant is nearby.
STEAM CONNECTION

The closest steam manhole to Siskiyou Hall has a capped and valved steam line. It is located east of the current site. The steam line is 8” and condensate return line is 4” in diameter. This is likely more than sufficient to serve the new facility if steams required. The steam pressure is to be confirmed by the campus. Because a cap and valve connection is existing, there will likely be only minor or no interruptions for other buildings during construction.
5.6.5 HEATING AND COOLING SYSTEMS

BASELINE COOLING SYSTEM - CONNECTING TO CAMPUS CHILLED WATER LOOP

Connecting to the existing chilled water loop is the baseline method of providing cooling to the new science building. Under this option the new science building will be shut down during regular central plant maintenance periods. To avoid affecting the balance of the campus CHW system, the connection to the new building would be decoupled by a common leg. Isolation valves are to be provided at the campus loop tee and at the building entrance to minimize interruption during future work.

Equipment and material list:

(2) Chilled water Pumps each sized for 50% of building peak load

(1) Expansion tank

(1) Air separator
Vivarium will require 24/7 operation. See Vivarium section for vivarium dedicated chilled water system.

FIGURE 5.6.5 - SCIENCE BUILDING CONNECTION TO CAMPUS CHW LOOP

BASELINE HEATING SYSTEM – CONNECTING TO STEAM LOOP
Connecting to the existing steam loop is the proposed baseline approach to provide heating for the new building. A pressure reducing station and a steam to hot water heat exchanger located in the building will provide space heating. Condensate will be collected and equalized via a flash tank and pumped back to the campus condensate return line. On the building side, hot water will provide heating to occupied spaces via a variable flow hydronic loop.

Equipment and material list:

(2) Heating Hot Water Pumps each sized for 50% of building peak load

(1) Expansion tank

(1) Air separator

Vivarium will require 24/7 operation. See Vivarium section for vivarium dedicated hot water system.
ALTERNATE COOLING SYSTEM - DEDICATED WATER COOLED CHILLER PLANT

To reduce operating costs, the campus Central Utility Plant is shutdown periodically throughout the year while the campus is not occupied, i.e. 3-day weekends during summer. Although it will likely be more cost effective to operate campus chilled water plant 24/7 rather than installing building level chilled water plant, this may be not practical for the proposed science building. Under this alternative a dedicated chilled water plant will be installed in the new building to provide cooling.

The new chiller plant is estimated to be larger than 300 Tons, therefore an air-cooled chiller is not considered an acceptable option per California Energy Code. The Design Team proposes a water cooled chiller plant along with cooling towers. The new plant will require a dedicated refrigeration machinery room with an approved refrigerant exhaust system. The plant proposed will feature a magnetic bearing centrifugal chiller, which is cost effective over the lifetime of a typical academic building, especially when considering the increased efficiency and the advantage of an oil free machine. Cooling towers are to be designed with low approach (4F) to lower chiller lift and to increase chiller efficiency. The vivarium load will be added to the building chiller plant system in this alternative, assuming the redundancy is met.

Figure 1.6.5.2 - Water Cooled Chiller Plant with Cooling Tower at Science Building
EQUIPMENT AND MATERIAL LIST:

(3) Open cooling towers with independent cell operation, each sized for 50% of building peak load

(3) Condenser water pumps each sized for 50% of building peak load

(3) Water cooled magnetic bearing chillers, each sized for 50% of building peak load

(2) Plate and frame heat exchanger (316L stainless steel), each sized for 50% of building peak load

(3) Chilled water pumps, each sized for 50% of building peak load

(1) Expansion tank

(1) Air separator

ALTERNATIVE HEATING SYSTEM - CONDENSING BOILERS HOT WATER PLANT

Correspondingly, this alternative proposes on site hot water generation, independent of the campus steam loop. High efficient condensing boilers design for low supply hot water temperature and a primary variable hydronic loop will provide heating for all occupied spaces. This alternative requires a dedicated boiler room which will operate under neutral pressure. At a low hot water temperature design (100°F), water vapor from the exhaust flue can easily condense and transfer larger amounts of energy to the hot water return flow allowing the boiler to reduce energy waste, run more efficiently and lower the gas cost of the new building. The vivarium load will be added to the building hot water plant system in this alternative, assuming the redundancy is met.

Equipment and material list:

(3) Gas-fired condensing boiler, each sized for 50% of building peak load

(3) Heating Hot Water Pumps each sized for 50% of building peak load

(1) Expansion tank

(1) Air separator
CONTROLS

All controls, unless otherwise noted, will feature a full DDC web-based system for remote control and monitoring. The new DDC system shall be fully compatible with the existing Building Automation System utilized by the campus and shall meet the security requirements of the existing campus protocols. The DDC system shall be provided with UPS to ensure no interruption to normal operations if utility power goes out. When emergency power starts up, equipment shall start on the fly.

The control system shall monitor and control all MEP systems noted, monitor process equipment status, lab equipment status, and provide an alarm if systems are out of control range. A lighting control system is to be integrated with building automation system for occupancy sensor status (BAS shall read lighting occupancy sensor status).

The building shall have an easily accessible and interactive user interface for monitoring power and water usage. The dashboard server must be able to read monitored data from the Building Automation System (BAS), energy and water meters, weather station, lighting system, and fire alarm system. The dashboard will have four levels of permissions (public, employee, facility, full access). It will be accessible from an internet browser and from a dedicated information kiosk located in the lobby. Energy by end use (heating, cooling, fan, pumps, etc.) will be sub-metered and trended (measured in kWh and BTU) through the BAS and displayed on the building dashboard. Through metering, consumption will be documented and trends will be developed to show not only areas of improvement, but also to showcase successful energy and water strategies.

5.6.6 CENTRAL AIR DISTRIBUTION SYSTEM

BASELINE AIR DISTRIBUTION SYSTEM

Current programming phase includes many laboratories, in particular the chemistry section. Chemistry laboratories typically include chemical fume hoods which increases the building outdoor air flow demand. The Design Team proposes dedicated outside air system (DOAS) AHUs for the laboratory spaces with chemical usage and high ventilation rate.

Non-laboratory classrooms, administrative areas, and offices are to be served with recirculating air handling unit system to minimize outdoor air. Note that this will require careful space planning.
AHU shall supply sufficient cold air for space cooling requirements and reheat coil will warm the supply air as needed per zone.

The Vivarium will require more stringent temperature and humidity control. See Vivarium section.

Equipment and material list:

Labs:

(4) Custom dedicated outdoor air unit, each AHU to be sized for 40,000 CFM, max 250 FPM air velocity

(1) Separate manifold heat recovery system with four exhaust fan, each sized for 40,000 CFM. Exhaust fans shall be of spark proof construction and coated with baked phenolic coating for superior chemical resistance. Heat recovery coil at each exhaust fan is to be connected to heat recovery coil at AHU.

(1) Pressure independent supply air terminal for each zone (venturi type)

(1) Hot water reheat coil for each zone

(1) Pressure independent general exhaust phenolic coated air terminal for each zone (venturi type)

(1) Pressure independent exhaust phenolic coated air terminal for each chemical fume hood (venturi type)

(1) Additional pressure independent supply air terminal for each chemical fume hood (venture type)

Offices:

(2) Custom air handing unit with air economizer and powered exhaust fan, each AHU to be sized for 25,000 CFM, max 250 FPM air velocity

(1) Pressure independent supply air terminal for each zone

(1) Hot water reheat coil for each zone
ALTERNATE AIR DISTRIBUTION SYSTEM

Instead of individual DOAS systems for laboratory areas and a separate recirculating air handling units for non-laboratory spaces, a single DOAS system can serve the entire building, the DOAS system will be sized for ventilation requirement only. The DOAS will supply tempered ventilation air to provide adequate air change rates and to provide make-up air for chemical fume hoods. Zone heating and cooling systems will be used to provide heating and cooling to each space. Advantages of this alternative includes,

- DOAS minimizes reheat, which minimizes wasteful consumption.
- DOAS allows for the decoupling of the ventilation and cooling/heating load. This promotes the usage of a hydronic system, which is a more efficient heat transfer medium.
- DOAS provides a quieter and healthier space because no supply air is “used” by mixing with recirculated air.

The Vivarium will require more stringent temperature and humidity control. See Vivarium section.
FIGURE 5.6.6.2 - DOAS AHU FOR ALL SPACES

Equipment and material list:

Labs:

(4) Custom dedicated outdoor air unit, each AHU to be sized for 42,500 CFM, max 250 FPM air velocity

(1) Separate manifold heat recovery system with four exhaust fan, each sized for 42,500 CFM. Exhaust fans shall be of spark proof construction and coated with baked phenolic coating for superior chemical resistance. Heat recovery coil at each exhaust fan is to be connected to heat recovery coil at AHU.

(1) Pressure independent supply air terminal for each zone (venturi type)

(1) Hot water reheat coil for each zone

(1) Pressure independent general exhaust phenolic coated air terminal for each zone (venturi type)

(1) Pressure independent exhaust phenolic coated air terminal for each chemical fume hood (venturi type)

(1) Additional pressure independent supply air terminal for each chemical fume hood (venturi type)

Offices:

(1) Pressure independent supply air terminal for each zone

(1) Hot water reheat coil for each zone

(1) Pressure independent exhaust air terminal for each zone
5.6.7 HEAT RECOVERY EXHAUST SYSTEM

BASELINE EXHAUST SYSTEM

Room air from chemistry laboratories is potentially odorous, toxic, or otherwise unsuitable for re-use. Laboratories requiring exhaust shall connect to a common air plenum and a redundant exhaust fan system shall exhaust air from this plenum. The air plenum is to be doubled walled construction for acoustical isolation. Exhaust fans shall be of spark proof construction and coated with baked phenolic coating for superior chemical resistance. Each exhaust fan is to be provided with heavy duty isolation dampers and a variable speed drive to modulate fan speed to maintain static pressure.

A make-up air inlet with motorized stainless steel heavy duty dampers is required to increase the air flow through the exhaust fans to maintain stack velocity during a purge event.

A dedicated heat recovery loop operates by extracting heat (sensible only) from the exhaust air stream with a water coil and then pumps the water to a second coil in the supply air stream. This heat recovery configuration isolates the potentially undiluted corrosive chemical exhaust air stream from the supply air stream and also results in space savings compared to other heat recovery options. The heat recovery loop will reduce the heating plant load during winter operation.

The exhaust discharge stack should be sized and located based on the air quality assessment from the wind consultant such that the minimum stack discharge velocity is maintained at all time. This location is to be approved by the architect and owner. The fan staging is designed such that additional fans are staged on when there is enough exhaust air to satisfy the minimum stack velocity of each exhaust fan that is running.

The non-laboratory spaces will be exhausted through a separate common plenum and exhaust fan system. No dedicated heat recovery loop will be used for this system. Refer to the system diagram shown in baseline air system.

Figure 5.6.7 - Laboratory Exhaust System
ALTERNATE EXHAUST SYSTEM
All different space types will share a common return plenum and exhaust system. This will require additional VAV boxes on the non-laboratory exhaust ducts. Refer to the system diagram shown an alternate air system.

5.6.8 DUCTWORK AND PIPING SIZING CRITERIA

AIR DISTRIBUTION SYSTEM
Supply and exhaust ducts will be sized for maximum pressure drop of 0.05 inches w.g. per 100 feet of duct and maximum velocity of 1500 FPM.

Ductwork between chemical fume hoods/biosafety cabinets and exhaust mains are to be constructed with continuously welded 316L stainless steel up to mains for chemical and corrosion resistance. Ductwork located outdoors is also to be constructed with continuously welded 316L stainless for weather resistance and must be pitched to allow drainage.

All supply and exhaust ductwork systems shall be constructed in accordance with the SMACNA standard. All supply and exhaust ductwork systems shall be tested on the high pressure side (between air terminal and fan) per SMACNA’s HVAC Air Duct Leakage Test Manual for pressure test and leakage test. Ducts shall comply with the requirement for leakage Class 3 for round and flat-oval ducts and leakage Class 6 for rectangular duct. Remake leaking joints and re-test until leakage is equal or less than the maximum allowable. All supply ducts are to be insulated per SMACNA and Title 24 requirements.

WATER DISTRIBUTION SYSTEM
Piping will be sized for maximum pressure drop of 2.5 feet w.g. per 100 feet of pipe and maximum velocity of 6 FPS.

The building’s chilled and heating hot water piping system will utilize copper (type L) for up to 2” and schedule 40 welded carbon steel piping for larger than 2”. All CHW, HW, ERW, steam and condensate pipe are to be insulated with rigid rock wool insulation and aluminum jacketing per latest version of California Energy Code.

5.6.9 LABORATORY ZONE SYSTEMS
Laboratory spaces will be provided with lab grade pressure independent venturi type supply and exhaust air terminals for accurate air flow control.

Pressurization is an integral part of an HVAC system to provide secondary protection to users. Airflow offset will be utilized to maintain the pressure relationships between any two rooms. Active pressure control is not anticipated in this project.

BASELINE LABORATORY ZONE SYSTEM
A reheat coil will be provided to each air terminal to maintain space temperature. Supply air will provide both the ventilation and the cooling/heating load requirement to individual spaces. See schematics in Central Air System - Baseline option.
ALTERNATE LABORATORY ZONE SYSTEM
No reheat coil is provided. Only tempered ventilation air is brought to the space and it does not impact the heating or cooling load. 4-pipe fan coil units will provide the cooling and heating needs of individual spaces. See schematics in Central Air Distribution System - Alternate option.

5.6.10  NON-LAB CLASSROOMS, ADMIN AND OFFICES ZONE SYSTEMS

BASELINE NON-LABORATORY ZONE SYSTEM
A central air handling unit will provide supply air to the occupied space. Each thermal zone will be furnished with standard pressure independent VAV air terminals for air flow control. A reheat coil will maintain space temperature. Supply air will provide both the ventilation and the cooling/heating load requirement to individual spaces. See schematics in Central Air Distribution System - Baseline option.

ALTERNATE NON-LABORATORY ZONE SYSTEM
A central air handling unit with a dedicated outside air system will provide conditioned air to occupied spaces. Each thermal zone will be furnished with standard pressure independent VAV air terminal for air flow control. No reheat coil will be required. Only tempered ventilation air is brought to the space and it does not impact the heating or cooling load of the space. 4-pipe fan coil units provide the cooling and heating need of thermal zone. See schematics in Central Air Distribution System - Alternate option.

5.6.11  VIVARIUM

ASSUMPTIONS
CSU Chico is planning for vivarium space within the new science building. Vivarium offers a space where students, faculty and lab animals can coexist in a safe and controlled setting. Preliminary floor plan currently shows 2,550 SF of space in vivarium, including:

(1) Holding Bird room – (4) cage racks each
(3) Holding Rodent room – (3) cage racks each
(1) Large Holding Rodent room – (4) cage racks each and (1) transfer station
(1) Cage Wash Room – (1) Autoclave and (1) Cage Washer

Currently, there is not consideration for any infectious diseases or containment/barrier issues. No biosafety cabinets are planned. Aquatic animals may be added to the program, The Design Team is not currently considering planning for aquatics.

INDOOR DESIGN CONDITION

<table>
<thead>
<tr>
<th>Space Type</th>
<th>Heating Set Point</th>
<th>Cooling Set Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vivarium (Rodent)</td>
<td>68F DB, RH 30-70%</td>
<td>72F DB, RH 30-70%</td>
</tr>
</tbody>
</table>
VENTILATION CFM/SF TABLE
The following table is based on 10ft high ceilings. These preliminary ventilation rates are to be confirmed when the design is further along based on load condition. The number and the size of chemical fume hood may also affect these estimates.

<table>
<thead>
<tr>
<th>Space Type</th>
<th>Purge</th>
<th>Occupied Max</th>
<th>Occupied Min</th>
<th>Unoccupied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vivarium</td>
<td>2 CFM/SF, 12 ACH</td>
<td>1.5 CFM/SF,</td>
<td>1 CFM/SF,</td>
<td>0.67 CFM/SF,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9 ACH</td>
<td>6 ACH</td>
<td>4 ACH</td>
</tr>
</tbody>
</table>

The load characteristic of a vivarium is more stringent compared to university laboratories and requires much more care and coordination. Because of specialized need, vivarium mechanical systems are to be separate from the base building mechanical systems.

Estimated quantity of cages is not available at this phase. For the purpose of this report, The Design Team applied a conservative average of 2 CFM/SF, (roughly equal to 12 ACH, depending on ceiling height), which should be sufficient to satisfy the heat load of the space.

Cage racks are assumed to draw room air to ventilate cages. This can help keep cages negatively pressurized with respect to the room and help with odor control and dander. Exhausting air from the cage is assumed to be connected to the exhaust air system via a thimble connection. Autoclave and cage wash will require “clean” steam (NOT pharmaceutical grade) which will need to be generated. Two options are listed in the steam sections.

Equipment lists below are based on estimated 14 zones, 3,000 SF is assumed for changes for design flexibility.

HEATING AND COOLING PLANT DESIGN
Equipment and material list:

(2) Air cooled chiller, providing 100% redundancy

(2) CHW Pumps, providing 100% redundancy

(2) Condensing Boiler providing 100% redundancy

(2) HHW Pumps, providing 100% redundancy

Each hydronic loop shall be provided with expansion tank, air separator and individual make up water connections.
If the alternate option for the building central plant is chosen, the vivarium load can be added to the central system, provided redundancy requirements are met.

AIR SYSTEM AND DISTRIBUTION SYSTEM DESIGN

Equipment and material list:

(1) Custom dedicated outdoor air unit shall be provided with septum dividing airflow to 6,000 CFM each, providing 100% redundancy. Total 12,000 CFM. 250 FPM is the max design air velocity.

(1) Separate manifold heat recovery system with two exhaust fan, each sized for 6,000 CFM, providing 100% redundancy. Exhaust fans shall be of spark proof construction and coated with baked phenolic coating for superior chemical resistance. Heat recovery coil at each exhaust fan is to be connected to heat recovery coil at AHU.

(1) Pressure independent supply air terminal for each zone (venturi type)

(1) Hot water reheat coil for each zone

(1) Pressure independent general exhaust phenolic coated air terminal for each zone (venturi type)

(1) Pressure independent cage rack and snorkel exhaust phenolic coated air terminal for each zone (venturi type)

All exhaust duct serving vivarium shall be constructed with continuously welded 316L stainless steel ductwork.

BASELINE CLEANING STEAM GENERATION – LOCAL GAS STEAM GENERATOR

Gas fired steam generators will be provided to generate steam for use by autoclaves and cage washing. This can either be integral to the autoclave and cage wash or steam generators can be provided separately.

Equipment and material list:

(2) Gas fired steam generators

RO/DI Water connection

Condensate traps and associated steam accessories for each autoclave or cage wash

Chilled water supply and return for condensate quenching

Continuously welded 316L stainless steel exhaust ductwork
ALTERNATE CLEANING STEAM GENERATION – LOCAL ELECTRIC STEAM GENERATOR
An alternate to gas fired steam generators is an electric steam generation system. This can either be integral to autoclave and cage wash or steam generators can be provided separately.

Equipment and material list:

(2) Electric steam generators

RO/DI Water connection

Condensate traps and associated steam accessories for each autoclave or cage wash

Chilled water supply and return for condensate quenching

Continuously welded 316L stainless steel exhaust ductwork

Figure 5.6.11.1 - ELECTRIC Supplied Clean Steam Generator
<table>
<thead>
<tr>
<th>Baseline</th>
<th>Supply Air system</th>
<th>Exhaust Air system</th>
<th>Zone control</th>
<th>CHW Plant</th>
<th>HW Plant</th>
<th>Autoclave/Cage wash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratories</td>
<td>DOAS AHU with ERW, CHW and HW coil</td>
<td>Exhaust fans with ERW Coil and 10' stack above parapet</td>
<td>VAV with reheat</td>
<td>Campus CHW connection</td>
<td>Campus Steam to building HW HX</td>
<td>N/A</td>
</tr>
<tr>
<td>Non-Laboratories</td>
<td>Recirculating AHU with CHW and HW coil</td>
<td>Plenum return and exhaust fans</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vivarium</td>
<td>Dedicated DOAS AHU with CHW, HW and Steam humidifier</td>
<td>Exhaust fans with ERW Coil and 10' stack above parapet</td>
<td>VAV with reheat</td>
<td>Air cooled chiller plant</td>
<td>Condensing boiler plant</td>
<td>Locally gas-fired steam generator</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alternate</th>
<th>Supply Air system</th>
<th>Exhaust Air system</th>
<th>Zone control</th>
<th>CHW Plant</th>
<th>HW Plant</th>
<th>Autoclave/Cage wash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratories</td>
<td>DOAS AHU with ERW, CHW, and HW coil</td>
<td>Exhaust fans with ERW coil and 10' stack above parapet</td>
<td>4-Pipe FCU</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Non-Laboratories</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vivarium</td>
<td>Dedicated DOAS AHU with ERW, CHW, HW and Steam humidifier</td>
<td>Exhaust fans with ERW coil and 10' stack above parapet</td>
<td>VAV with reheat</td>
<td></td>
<td>Condensing boiler plant</td>
<td>Locally electric steam generator</td>
</tr>
</tbody>
</table>
5.7 PLUMBING SYSTEMS

5.7.1 INTRODUCTION
This study examines the feasibility and plumbing system options for building a new science facility at CSU Chico State. The new building will include mostly teaching laboratories, classrooms and offices spaces. A separate lab water supply and waste system will be provided to meet the requirements of lab fixtures and equipment. Gas distribution will include natural gas, centralized vacuum and centralized compressed air/lab air. The study have described anticipated systems and provided preliminary equipment sizes, which will be confirmed during the design process.

5.7.2 BACKGROUND INFORMATION
Siskiyou Hall is located in the south west section of the Chico State’s campus. Siskiyou Hall will be replaced by the proposed science building. The new building features 4 floors with an estimated area of 110,000 GSF. The feasibility study will use 110,000 GSF as basis of estimates. Future growth may increase the total area by 22000 GSF which mainly consists of classroom and office. It can lead to increase in equipment and piping sizes while not anticipated to have significant impact on the lab plumbing systems.

5.7.3 REFERENCES AND CODES
• 2016 California Mechanical Code
• 2016 California Plumbing Code
• 2016 California Energy Code
• California Fire Code
• California Building Code
• California Green Building Standards Code
• ANSI American National Standards Institute
• NFPA National Fire Protection Association
• ADA Americans with Disabilities Act Accessibility Guidelines

5.7.4 PROJECT GOALS
Providing a clean and reliable facility for the occupants will be the overriding and primary goal of the plumbing design. The secondary focus of the plumbing design will be to reduce water consumption, the resulting wastewater production, and reducing energy use. Low-flow fixtures will be provided to reduce domestic water load and Laboratory fixtures and equipment will be provided with flow restrictors and other strategies to reduce process water use and process wastewater generation. Rainwater, condensate drain and RO reject could be sources for collection and reuse.

5.7.5 SITE UTILITIES
Campus water and gas lines are close to the northeastern part of the building. Sewer lines are available on almost all sides while campus storm drain is located to the east of the building. New POC locations are provided to meet project building and existing site conditions.
5.7.6 DOMESTIC POTABLE WATER

The Domestic Cold Water will be provided to all restroom fixtures, breakroom fixtures and emergency shower/eye wash. The domestic water supply will connect to the site utility main provided by Civil and enter the building on Level 1 into the plumbing room. The site utility water meter and reduced pressure backflow preventer will be provided at the exterior of the building by Civil.
Available site water pressure data is not currently provided and has been requested. If the incoming water service pressure is not adequate to feed the last fixture, a booster pump will be provided. Alternatively a pressure reducing station will be provided to limit the available incoming water pressure to meet code maximum pressure requirements to fixtures.

Domestic cold water system will be sized with a maximum velocity of 6 ft/sec.

Domestic water piping will be Type L copper for above ground with wrought copper fittings and soldered or brazed joints. Type K copper with brazed joints shall be provided for underground. All domestic water pipe, fittings and couplings shall be manufactured in the United States and shall be lead-free. All Domestic Cold Water piping will be insulated.

5.7.7 LAB / INDUSTRIAL COLD WATER

A dedicated lab cold water system will be provided to serve all laboratory fixtures, equipment. A reduced pressure backflow preventer located shall be provided to separate the lab water system from the domestic water system from cross connection. The lab water system will be distributed throughout the building with shutoff valves to isolate systems into zones to allow flexibility and minimize disruption.

Industrial cold water will be provided to supply makeup water to mechanical equipment. A reduced pressure backflow preventer will be provided locally where required to separate the industrial makeup water system from the lab water system from cross connection.

Lab/Industrial cold water system will be sized with a maximum velocity of 6 ft/sec.

Lab/Industrial water piping will be Type L copper for above ground with wrought copper fittings and soldered or brazed joints. Type K copper with brazed joints shall be provided for underground. All domestic water pipe, fittings and couplings shall be manufactured in the United States and shall be lead-free. All Lab Lab/Industrial Cold Water piping will be insulated.

5.7.8 DOMESTIC HOT WATER

Domestic Hot Water shall be generated from a condensing gas tank water heater, along with circulation pump, aquastat, timer, condensate neutralization kit, and concentric flue vent kit. Stainless water heater exchanger shall be specified to avoid efficiency loss due to lime scale buildup. Water heater preliminary sizing is based on 8 lavatories, 2 breakroom sinks and 2 service sinks are assumed for every floor. The heater size is anticipated to be 150 MBH/90 gallon storage. No redundancy will be provided.

Domestic hot water system will be sized with a maximum velocity of 4 ft/sec for supply and return.

Domestic hot water piping will be Type L copper with wrought copper fittings and soldered or brazed joints. All domestic water pipe, fittings and couplings shall be manufactured in the United States and shall be lead-free. All Domestic Hot Water Supply and Return piping will be insulated.
5.7.9 LAB HOT WATER

Lab Hot Water shall be generated from a condensing gas tank water heater, along with circulation pump, aquastat, timer, condensate neutralization kit, and concentric flue vent kit. Stainless water heater exchanger shall be specified to avoid efficiency loss due to lime scale buildup. One standby unit will be provided for full redundancy.

<table>
<thead>
<tr>
<th>System</th>
<th>DEMAND</th>
<th>QTY</th>
<th>Capacity (EA)</th>
<th>Remarks</th>
<th>System Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Water Heater</td>
<td>Anticipated (Full Buildout)</td>
<td>285 MBH/120 gal storage</td>
<td>2 water heaters active 1 down, 1 provides 60% capacity</td>
<td>1. redundancy for lab hot water 2. 20% Safety Factor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+20% For Flexibility/Or Safety Factor</td>
<td>290 MBH</td>
<td>290 MBH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Lab hot water system will be sized with a maximum velocity of 4 ft/sec for supply and return.

Lab hot water piping will be Type L copper with wrought copper fittings and soldered or brazed joints. All domestic water pipe, fittings and couplings shall be manufactured in the United States and shall be lead-free. All Lab Hot Water Supply and Return piping will be insulated.

5.7.10 WATER SOFTENER

Based on the latest water quality report (2015) from California Water Service (Cal Water), Chico district water hardness level is at 126 ppm which is considered moderately hard. Both lab hot water and domestic hot water systems will be provided with a water softener to protect pipes, fixtures and water heaters from mineral buildup. Extract from the water report is provided below for reference.

<table>
<thead>
<tr>
<th>Inorganic Chemicals</th>
<th>Year Tested</th>
<th>Unit</th>
<th>SMCL</th>
<th>PHG MCL/Q</th>
<th>Exceeded Standard?</th>
<th>Range</th>
<th>Average</th>
<th>Source of Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>2015-2015</td>
<td>ppm</td>
<td>n/a</td>
<td>n/a</td>
<td>No</td>
<td>17-53</td>
<td>24.7</td>
<td>Erosion of natural deposits</td>
</tr>
<tr>
<td>Chloride</td>
<td>2015-2015</td>
<td>ppm</td>
<td>500</td>
<td>n/a</td>
<td>No</td>
<td>1.7-59</td>
<td>10.2</td>
<td>Erosion of natural deposits; seawater influence</td>
</tr>
<tr>
<td>Color</td>
<td>2015-2015</td>
<td>Units</td>
<td>15</td>
<td>n/a</td>
<td>No</td>
<td>ND-5</td>
<td>0.4</td>
<td>Naturally occurring organic matter</td>
</tr>
<tr>
<td>Hardness</td>
<td>2015-2015</td>
<td>ppm</td>
<td>n/a</td>
<td>n/a</td>
<td>No</td>
<td>83-270</td>
<td>128</td>
<td>Erosion of natural deposits</td>
</tr>
<tr>
<td>Iron</td>
<td>2015-2015</td>
<td>ppb</td>
<td>300</td>
<td>n/a</td>
<td>No</td>
<td>ND-48</td>
<td>1.8</td>
<td>Leaching from natural deposits; industrial wastes</td>
</tr>
</tbody>
</table>

5.7.11 SANITARY WASTE AND VENT SYSTEM

A complete sanitary waste and vent system will be provided to serve all domestic fixtures within the building. The sanitary sewer system will slope by gravity and connect to the site sewer system, by Civil. All fixtures and drains, shall be trapped and vented. Floor drains, floor sinks and hub drains shall be provided with trap primer.

Each condensing boiler and each condensing water heater will be provided with a neutralization canister to protect the sanitary waste system. Neutralization systems will discharge to the sanitary system via an indirect waste connection.
Sanitary sewer and vent piping will be no-hub cast iron pipe and fittings with heavyweight couplings for underground and above ground installation. All sanitary waste and vent pipe, fittings and couplings shall be manufactured in the United States. Cast iron shall conform to CISPI standards.

The sanitary sewer system will slope by gravity and a sewage ejector system is not anticipated for the project.

5.7.12 LAB WASTE AND VENT SYSTEM

A complete lab waste and vent system will be provided to serve all laboratory fixtures and equipment within the building. The lab waste system will slope by gravity and connect to the sanitary sewer building drain at the exterior of the building downstream of the sampling port. All fixtures and drains shall be trapped and vented. Lab benches shall be provided with umbilical for vent pipes and other services. Vents shall be routed up through the roof and shall not be connected to the sanitary vent piping. Floor drains and floor sinks shall be provided with trap primers.

Lab waste and vent piping will be schedule 40 corrosion resistant, flame retardant polypropylene piping with drainage pattern socket fusion fittings for underground and aboveground installation. 316L stainless steel with push fitting can be used as an alternate for polypropylene.

Lab waste discharge will be tempered down to 140°F maximum prior to discharging to the lab waste piping system. A minimum of twenty five (25) feet of 316L stainless steel piping shall be provided to accept any high temperature discharge to a point of dilution before transitioning to polypropylene.

5.7.13 STORM DRAINAGE SYSTEM (SD & OD)

A complete storm drainage system will be provided to convey rainwater away from the building roof areas and areaways. Separate main and overflow drains will be provided with parallel drainage piping system. The main storm drainage piping will connect to the site underground vault drain management system provided by Civil, below grade. The overflow storm drainage piping will daylight and terminate at the building exterior above grade.

The storm drainage system will slope by gravity and a sump pump system is not anticipated for the project.

Storm drainage piping will be no-hub pipe and fittings with heavyweight couplings will be provided for underground and above ground installation. All storm drainage pipe, fittings and couplings shall be manufactured in the United States. Cast iron shall conform to CISPI standards.

5.7.14 NATURAL GAS

Natural gas will be provided to serve gas water heater, boiler and lab gas outlets. The supply main will connect to the campus gas utility main. A gas meter and regulator with BMS connection will be provided at the building exterior. A shutoff valve and emergency seismic valve will be provided downstream of the gas meter before the gas supply enters the building on Level 1.
Natural gas will be distributed throughout the building with shutoff valves to isolate systems into zones to allow flexibility and minimize disruption. An accessible emergency shutoff valve will be provided for each lab area as required by code.

Natural gas piping will be black steel with threaded or welded joints, galvanized steel for exterior applications above grade. All natural gas pipe, fittings and couplings shall be manufactured in the United States.

5.7.15 LAB VACUUM
A central lab vacuum system will be provided to serve all lab outlets and lab equipment at 24 in. Hg. Lab vacuum will be distributed throughout the lab areas with shutoff valves to isolate systems into zones to allow flexibility and minimize disruption.

Lab vacuum will be generated using factory packaged, skid mounted, expandable duplex to triplex rotary vane pumps (two pumps being provided, with the space available to expand to three pumps) and a receiver. Each vacuum pump is anticipated to be 10hp/480V/3 phase.

Lab vacuum piping will be copper Type L with wrought copper soldered joints or DWV with drainage pattern fittings. All vacuum pipe, fittings and couplings shall be manufactured in the United States.

5.7.16 FIRE PROTECTION
A fire flow test is needed to determine if there is adequate pressure and flow for the building. A fire pump may be provided if there is inadequate site pressure.

5.7.17 PURIFIED WATER (ASTM II)
A central Purified Water system will be provided to serve all lab fixtures and equipment requiring purified water. Point-of-use polishers will be provided at each lab sink for high grade purification.

PW system will consist of Pretreatment, Reverse Osmosis (RO) makeup unit, DI mixed bed, HDPE PW storage tank (300 gallon), distribution pumps, UV light and post filters. The system will be configured as a serpentine loop to minimize dead legs. PW piping will be polypropylene with socket fusion joints.

5.7.18 SHOP COMPRESSED AIR
A central compressed air system will be provided to serve college shop outlets and distributed at 100 psi. Local pressure regulators will be provided, where required.

Shop Compressed Air will be generated using a factory packaged, oil-free, duplex skid mounted piston air compressors, expandable to three (3) units, with refrigerated dryers and ASME 200-gallon vertical receiver. Lab air compressor is anticipated to be 2 hp each for a total of 4hp expandable to 6hp/480V/3 phase. The shop compressed air system will be distributed throughout the building with sectional valves to isolate systems into zones to allow flexibility and minimize disruption. Piping will be ACR Type L copper
with brazed joints. All shop compressed air pipe, fittings and couplings shall be manufactured in the United States. All piping will be above grade.

**5.7.19 LAB COMPRESSED AIR**

A central compressed air system will be provided to serve all laboratory outlets and lab equipment within the building and distributed to provide 100 psi at the outlets. Local pressure regulators will be provided by the Lab Planner within the lab areas, where required.

Lab compressed air will be generated using a factory packaged, oil-less, skid mounted modular four (4) unit scroll air compressors, expandable to six (6) units, with redundant heatless desiccant dryers and ASME 200-gallon vertical receiver. Lab air compressor is anticipated to be 5 hp each for a total of 20hp expandable to 30hp/480V/3 phase.

The lab compressed air system will be distributed throughout the building with sectional valves to isolate systems into zones to allow flexibility and minimize disruption. Piping will be ACR Type L copper with brazed joints. All lab compressed air pipe, fittings and couplings shall be cleaned and bagged and manufactured in the United States. All piping will be above grade.

**5.7.20 LAB SPECIALTY GASES**

Specialty gas cylinders will be provided locally where required. It will be under Lab Planner scope of work.

**5.7.21 PLUMBING FIXTURES**

Low-flow plumbing fixtures will be selected for this project for water conservation and efficiency. Water closets with 1.1 gallon per flush (gpf) with hardwired electronic sensor will be provided for all restrooms. Urinals with 0.125 gpf with hardwired electronic sensor will be provided for all restrooms. Restroom lavatories will be provided with single lever faucets, with 0.35 gpm flow restrictors.
5.7.22 METERING

Metering will be provided to monitor building usage of domestic hot and cold water, lab hot and cold water, pure water system, natural gas and mechanical water makeup. Additional meters will be provided to monitor the electrical demand of the central lab vacuum and lab compressed air systems. Through metering, consumption will be documented and trends will be developed to show areas of improvement and environmental strategies.
5.8 ELECTRICAL SYSTEMS

5.8.1 PROJECT ELECTRICAL GOALS

5.8.1.1 ENERGY EFFICIENCY
Energy efficiency will be accomplished within the design through responsive lighting controls, daylighting elements, and sensitivity towards equipment selection. The electrical engineer will work closely with the design team and owners to optimize specifications of the most energy efficient equipment and energy saving type devices. Every effort will be made to ensure that the electrical building system utilizes efficient, sustainable design strategies for progressive green building practices while keeping costs in line with traditional construction and provisions for future capacity.

5.8.1.2 CONVENIENCE
The electrical design will strategically implement a sensible, sustainable system that provides ease of maintenance, flexibility, and capacity for future modifications.

5.8.1.3 SETTING AN EXAMPLE
Every effort shall be made to ensure that designs and equipment used within the building are replicable for deployment into future buildings so this building can serve as a notable example of feasible sustainable design strategies.

5.8.1.4 VISUAL FEEDBACK
A recommended a detailed monitoring system featuring clear graphics of where and how much electric energy is being used can be incorporated into the electrical system. This monitoring system can help both the facilities staff and users understand where energy is being used in order to develop potential strategies to reduce it.

5.8.2 ELECTRICAL CODES AND STANDARDS

5.8.2.1 CODES
- 2016 California Building Code (CBC)
- 2016 California Electrical Code (CEC)
- 2016 California Mechanical Code (CMC)
- 2016 California Plumbing Code (CPC)
- 2016 California Energy Code
- 2016 California Fire Code (CFC)
- 2016 California Green Code (CGC)
- 2016 California Referenced Standards Code
- 2010 NFPA 72 National Fire Alarm Code
- ADA Standards for Accessible Design- Code of Regulations (Including Amendments)
- State of California Title 24 Energy Code (Title 24)
- State of California Public Utilities Commission (CPUC)
5.8.2.2 STANDARDS

- Occupational Safety and Health Administration (OSHA)

5.8.2.3 DESIGN CRITERIA

Distribution equipment and feeder capacity shall be designed in accordance with the California Electrical Code. Note that power densities shown below do not reflect electrical demand or usage values but rather as criteria to size electrical distribution equipment per electrical codes.

Load Densities: Lighting and Receptacles (Volt-Amperes/Sq. Ft.)

Classrooms, Lobby: Lighting 1.5; Receptacles 3.0

Electrical Room: Lighting 1.0; Receptacles 1.0

Communications Room: Lighting 1.0; Receptacles/IT 90.0

Mechanical and Equipment Rooms: Lighting 1.0; Receptacles 1.0

Toilets: Lighting 1.0; and Receptacles 0.5

Storage Rooms: Lighting 1.0; and Receptacles 0.5

Teaching Labs: Lighting 1.0; and Receptacles 2.0

Research Labs: Lighting 1.5; and Receptacles 2.0

Vivarium: Lighting 1.5; and receptacles 1.0

20% future/spare Capacity
5.8.3 ELECTRICAL SYSTEMS DESCRIPTION

The design will strategically implement a sensible and sustainable electrical system that provides ease of maintenance, flexibility, and capacity for future modifications. Energy efficiency will be accomplished within the building design through responsive lighting controls, daylighting elements, and sensitivity towards equipment selection.

Distribution equipment will have the capability of implementing Lock-out/Tag-out (LOTO) procedures. Surge protective devices will be provided in the main switchboard and panelboards serving telecommunication, server, and other sensitive equipment loads. Power circuit breakers with arch flash reduction capabilities, zone selective interlocking strategies, and other methods will be incorporated into the design to mitigate Arc Flash levels.

5.8.3.1 ELECTRICAL SERVICE

Main service for the new building will be 4000 Amp, 277/480V, 3 phase, 4 wire. This is based on the 15 watts/Sq. Feet for total 133984 Sq. Feet as the growth for the new building + 20% future/spare capacity buildings such as this typically have a peak demand load of 30-40% of connected load.

The new building will have four floors. There will be one Main Electrical room on the first floor Electrical room and will have electrical rooms in each of the three on each floor.

The size of the Main Electrical Room on the first floor will be 25 feet by 12 feet this electrical room will house the main switchgear, the main switchgear bus shall be sized at 4000A to accommodate PV system interconnection, Emergency/ stand by switchgear, ATS both for the life safety and standby, transformers, Fire alarm, security and other Misc. panels such as plug load panels, lighting panel and lighting control panel for the first floor.

The sizes of the electrical rooms on the second floor thru fourth floor will be 15 feet by 12 feet and these Electrical Rooms should be stacked on each floor. These electrical rooms will house the man switchboard, transformers, and other Misc. panels such as plug load panels, lighting panel and lighting control panel for each floor.

5.8.3.2 ELECTRICAL DISTRIBUTION

Separate wires in conduit will be provided for each of the following loads:

5.8.3.3 HVAC AND PLUMBING SYSTEMS

480V, 208V, 3 phase, 3 wire + ground, 60 hertz.
208V, 1 phase, 2 wire + ground, 60 hertz.
120V, 1 phase, 2 wire + ground, 60 hertz.

5.8.3.4 LIGHTING

277V, 1 phase, 2 wire + ground, 60 hertz.

5.8.3.5 GENERAL PURPOSE RECEPTACLES

120V, 1 phase, 3 wire, 60 hertz.
5.8.3.6 COMPUTER EQUIPMENT AREAS
120V, 1 phase, 3 wire, 60 hertz.

5.8.3.7 CIRCUIT DESIGN
Branch circuit design shall not exceed a maximum of 1,600 volt amperes per 20 ampere, 120 volt circuit for general areas.

Motors of 1/2 horsepower and larger will be served at 208 volt service, 3 phase, 3 wire + ground. Motors less than 1/2 horsepower will be served at 120 volt service, 1 phase, 2 wire + ground.

For server equipment and computer stations, conditioned power is required. Transient Voltage Surge Suppressors shall specified and installed on all electrical service equipment feeding computer, server and sensitive electronic equipment loads.

All multi wire branch circuits shall be installed with dedicated neutrals.

5.8.3.8 PLUG LOAD CONTROL
General purpose receptacles, for circulation, common areas, offices, and administration areas, will be provided. Receptacles in private offices, administrative areas, and other rooms with controllable loads, will be interlocked with occupancy sensors. When the occupant is not present, these receptacles will be switched off and become inactive. Receptacles for equipment, such as computers, will remain unswitched to avoid improper shutdown and consequent damage to computer equipment or electronic files currently active on such equipment. Switched receptacles will be marked as such so that occupants can properly identify outlets.

As another plug load reduction strategy, USB-type receptacles will be provided in locations such as private office and open office cubicles, allowing occupants to charge and/or power ancillary devices such as phones, tablets, and fans more efficiently.

Remote circuit breakers will be interconnected to the security system such that when the building is armed and unoccupied, the remote circuit breakers will turn off. When the security system is disarmed, the remote circuit breakers will turn on. Loads will be further explored in the design phase.
5.8.3.9 SWITCHGEAR / SWITCHBOARD

The main switchgear/switchboard will be completely assembled, free standing, and with aluminum bus bars, full neutral bus, and separate copper ground bus. All bus work will be braced to withstand 65kAIC amperes RMS symmetrical. Protective devices will be provided with approved barrier between sections and extended load terminals. Protective devices will consist of circuit breakers.

Circuit breaker selection will utilize molded case type; be rated for application in their intended enclosure; include solid state tripping with adjustable long time, instantaneous, short time, and ground fault.

Surge protection shall be provided on the incoming service.

Additional spare branch feeder breakers will be provided for future capacity; Refer to Single Line Diagram.

Eaton Cutler Hammer, GE, Siemens or approved

5.8.3.10 PANELBOARDS

Panelboards will consist of door-in-door construction for accessibility, 42-pole circuit capacity, and copper bussing. Transient Voltage Surge Suppressors will be used on all panelboards serving telecommunication rooms (MPOE, MDF, IDF, Site Cores, etc) and labs. For pricing purposes, 277/480V panelboard bus work will be braced to withstand 42kAIC amperes RMS symmetrical; 120/208V panelboard bus work will be braced to withstand 22kAIC amperes RMS symmetrical. Additionally, for pricing purposes, five remote circuit breakers are anticipated in each panelboard. Panelboards will be Square D, Eaton Cutler Hammer, GE, or approved equal.

5.8.3.11 TRANSFORMERS

Electrical Code inherently requires transformers to be oversized for the load it is serving. Transformers are inefficient when lightly loaded, which is typical of office applications (less than 20% loading of name plate rating). Lightly loaded transformers create no-load, core losses, or vampire losses, and given off as heat dissipation. This heat dissipation will require mechanical ventilation and/or cooling. To limit "waste" in the form of heat dissipation, transformers with the highest efficiency throughout the efficiency curve will be considered. Transformers will be Powersmith E-Saver 2016 or approved.

5.8.3.12 EQUIPMENT CONNECTIONS

Electrical power connections will be made to all mechanical equipment, such as fans, pumps, etc. Electrical division shall furnish all associated electrical devices not furnished under other divisions (architectural, civil, mechanical, etc.). Examples of such associated devices are disconnect switches, contactors, magnetic or manual starters, lock-out switches, etc.

5.8.3.13 CONDUIT AND WIRING

Conductors will be copper, THHN or THWN-2; galvanized rigid steel (GRS) conduit in exterior or exposed interior work up to eight feet above finished floor, and for work embedded in concrete; rigid non-metallic conduit (HDPE) for all underground exterior work; electrical metallic tubing (EMT) for interior concealed work or above eight feet exposed; flexible metal conduit (FMC) for interior work in short lengths or liquid tight flexible metal conduit.
(LFMC) wherever moisture may be present for the connection of recessed luminaires, motors, separate building structures and any vibrating equipment

5.8.3.14 GROUNDING
Grounding will be accomplished by using rods, and connections to active cold water pipe and building steel. A ground ring shall be installed around the building with ground rod test wells.

A single point grounding system will be established via main ground bus located in the main electrical room. The main ground bus will function as a connection point for the grounding and bonding systems within the room. There will be a ground bus located in each secondary electrical room, and shall be connected to the main ground bus.

Within the main electrical room, a ground loop will be established and connected to the main ground bus. Flush ground plates will be exothermically welded to the ground loop and will bond the electrical equipment enclosures to the ground loop.

Separately derived systems will be grounded per CEC requirements. Grounding of emergency generators will conform to CEC 250.30 – Grounding Separately Derived Alternating Current Systems.

A telecommunications ground bus will be installed in all telecommunication rooms. The ground bus will include stainless steel mounting brackets, an insulator, and a pre-drilled copper bus bar. Isolated ground buses will be provided in distribution equipment serving telecommunication rooms.

5.8.3.15 EMERGENCY POWER / STANDBY DISTRIBUTION SERVICE
The baseline system for standby power for the building will be provided via 400kW/500kVA diesel generator set.

The generator set will include the following:
- Active Diesel Particulate Filter
- Weatherproof and sound attenuated enclosure
- Sub-base fuel storage tank for minimum 24 hours of continuous run-time at full load
- Bypass Isolation Automatic Transfer Switches; one for Life Safety the other for Standby
- Remote annunciator panel
- Battery charger
- Remote load bank

Life Safety Loads shall include the following:
- Egress lighting and exit signs
- Fire Alarm

Standby Loads shall include the following:
- Select HVAC equipment
- Vivarium load
- Select Telecommunication Equipment
- Security and Access Control Panel
- BMS Control Panel
- SCADA Control Panel
5.8.3.16 TELECOM SYSTEMS

Backbone distribution cable will consist of Multi pair copper cable and 18 – strand Multi Mode 50 micron fiber optic cable routed from the new building Telecommunication Room (IDF) to the campus MDF. The district is standardized on VoIP and will provide all handsets and licenses. All cable distribution from the IDF to telecom outlet plates will be category 6 and will be terminated to modular type connectors on both ends. Both outlet plates and patch panels will receive RJ45 8-pin 8- contact connectors. Each classroom will receive 7 category 6 cable drops (2 for teachers, 2 for students, 2 for wireless access points and 1 for wall mounted flat screen). Provide one outlet plate at the front of the classroom with power / data / HDMI. Science classrooms will receive 1 category 6 cable drop (above counter) at each student workstation location, 2 for teachers, 2 for wireless access points and 1 for wall mounted flat screen. Computer classroom will have a wall mounted Telecommunications enclosure to facilitate cross-connecting one category 6 cable drop for up to 30 students, 2 for teachers, 2 for wireless access points and 1 for wall mounted flat screen. Computer classroom will have the capability to be wired for 30 computer work stations.

The Telecommunication Room (IDF) shall be at least 8’ x 8’ on each floor and will contain multiple free standing 19” x 84” equipment racks for terminating backbone and station cable and housing district provided network equipment. Overhead cable runway for routing cable and providing seismic bracing for equipment rack will be installed. Horizontal and vertical wire managers will be included to organize termination of Cat 6 cable and patch cords. The IDF will have convenience power outlets on three walls and dedicated power outlets for network equipment and specialty systems like security, paging, and special systems.

5.8.3.17 CLASSROOM AUDIO VISUAL SYSTEM

Each classroom will have a wall mounted flat screen on the teaching wall. Each flat screen will be 80” in size and have the proper backing in the wall to accommodate that size screen. Behind each flat screen there will be a Power / Data / HDMI / VGA outlet plate connected to an outlet plate near the teacher’s desk. There will be an Extron (or approved equivalent) A/V system to facilitate control of the flat screen content and ceiling mounted audio speakers.

5.8.3.18 SECURITY

Bosh (GE) or whatever is the standard for the Chico State intrusion alarm system will be used. Motion detectors will be placed near windows and doors to detect forced entry into the building. Each building will have a Keypad to disarm the system during normal hours of operation. Provide conduit with ring and string for all security devices on the project. Provide wiring, pathways, back boxes, faceplates, devices, keypads, and other miscellaneous equipment for the intrusion system. The security system shall include remote monitoring via automatic dialer. Surveillance will include IP cameras places in locations to best cover student gathering areas. Surveillance equipment (assume 12 cameras) will be provided by the district. Pathway and cable will be provided by the contractor.

5.8.3.19 TELECOM CONDUIT AND WIRING

Conductors shall be THHN or THWN-2, with PVC insulation; galvanized rigid steel (GRS) conduit in exterior or exposed interior work up to eight feet above finished floor, and for work embedded in concrete; rigid non-metallic conduit (PVC) for all underground exterior work; electrical metallic tubing (EMT) for interior concealed work or
above eight feet exposed; flexible metal conduit (Greenfield) for interior work in short lengths or liquid tight flexible metal conduit (Sealtight) wherever moisture may be present for the connection of recessed lighting fixtures, motors, separate building structures and any vibrating equipment.

Data, communications, security and CATV wiring in inaccessible concealed spaces, exposed in unfinished areas below eight feet above finished floor or exposed in finished areas shall be run in dedicated conduit. Data, communications, security and CATV wiring in accessible concealed spaces or unfinished areas over eight feet above finished floor can be distributed via j-hooks or cable trays, with individual systems bundled separately. Plug Load Control

General purpose receptacles, for circulation, common areas, offices, and administration areas, shall be provided. Fifty percent of receptacles in administrative areas, and other rooms with controllable loads, shall be interlocked with occupancy sensors. When the occupant is not present, these receptacles will be switched off and become inactive. Receptacles for equipment, such as computers, shall remain unswitched to avoid damage to computer equipment. Switched receptacles shall be marked as such so that occupants can properly identify outlets.

5.8.3.20 FIRE ALARM (COORDINATE WITH FIRE ALARM SYSTEM)
Provide and install a Class B, automatic alarm and addressable fire alarm system as required per the California Fire Alarm code. The fire alarm system shall be connected with two active telephone wires and monitored by a UL listed supervisory station. All fire alarm system wiring will run in dedicated conduit.

5.8.3.21 LIGHTING SYSTEM
Lighting will be LED, with continuous dimming, and capable of dimming down to 10%. Benefit of LED include higher efficiency when dimmed, longer lamp life, and near equivalent lumens per watt when compared to other lamp sources, such as linear fluorescent.

Lighting selection will employ various strategies to uniformly match architectural configurations in a seamless manner Tamper resistant light fixtures to prevent vandalism will be employed in areas where vandalism can occur. Additional luminaries near vertical walls can also help enhance surface brightness. Suspended light sources below the ceiling plane allow such spaces to be illuminated “indirectly” by shining light up to ceiling and “bouncing” light back to the work plane. This strategy heightens the sense of brightness in the space as well as providing an even layer of light throughout the space. No “night light” or 24/7 lighting will be allowed. Emergency lighting will be provided along the path of egress.

Classrooms: 30FC.

Labs: 30FC

Lobby: 30 FC

Back of House: 20-30FC

Restrooms: 10-15FC.
Stairs: 15FC.

Exterior: 1FC.

5.8.3.22 LIGHTING CONTROLS
An addressable lighting control system will have the ability for granular control and monitoring of each luminaire and associated lighting control device, load monitoring, and automatic demand response (ADR) capability. Addressable lighting controls will be Lutron Quantum, Encelium, Enlighted, or Fifth Light. As the project progresses, we will also consider PoE and DC lighting and lighting controls. All other systems shall be carefully considered and approved by Chico State Facilities.

The addressable lighting control system will be controlled via software based controls, residing on a dedicated head-end server, which allows integration with the campus energy management system via BACnet protocol. The lighting control head-end will have capability of control and monitoring of any space in a cluster by area or zone and set schedules/presets. Each luminaire or group of luminaires will be controlled and monitored by individually addressable drivers and/or interface devices. Such a system can be implemented in the form of a graphical user interface (GUI).

The primary method of controlling interior luminaires while conserving energy in the building will be achieved through the use of occupancy sensors and manual override switches. Lighting control devices will be integrated into an addressable system. These devices will be provided in offices, support spaces, and storage rooms. Occupancy sensors will be set to “manual on/auto off” in offices, conference rooms, and classrooms; “auto on/auto off” for restrooms and support areas. Enclosed stairs will also include occupancy sensor controls to reduce the lighting within the stair (by a minimum of 50%) when it is not occupied. Occupancy sensors that control stairs and emergency egress lighting will be bypassed to provide 100% illumination in the event of normal power failure.

Additional photosensors will dim luminaires based on available daylighting. The lighting control system and software shall seamlessly integrate automatic shades as required to provide manual over-ride control of the automating device.

Astronomical time clock controls, occupancy sensors, and/or photosensors will be provided for exterior, site, and landscape lighting applications. Lighting will automatically turn on or off as appropriate throughout the course of the day. Photosensors will allow dimming based on scheduled times, occupancy sensor control overrides at night, and adjustment based on available daylight levels.

Daylight harvesting assemblies and controls will be designed to reduce energy where natural daylight occurs and provide sufficient illumination levels. Spaces, receiving sufficient, natural sunlight from glazing, will be equipped with a dimmable lighting system to automatically adjust the amount of electric light against available and constantly fluctuating daylight. This continuously dimming system consists of photocells, daylight dimming control modules, and dimmable 0-10VDC or digital electronic drivers for each space. In general, the daylight dimming system will be set to maintain a minimum of 30 foot-candles in all occupied spaces.
5.8.3.23 METERING AND ENERGY MONITORING

A main building meter will be provided at the main switchgear. Sub-meters will be provided at the panelboard level and for equipment 60A and above. Sub-meters will be web-enabled and data shall be transmitted, logged, and trended at the building management system. Data shall be displayed in two distinctly different user interfaces, (1) network enabled for facility and operations staff, (2) dashboard and web enabled for general employee and public. The metering system shall have the capability for monitoring loads on an end use. Loads will be segregated at the panelboard level as follows:

- HVAC
- Domestic Water Systems
- Telecom
- Plug Load
- Lighting
- Renewable Energy

Distribution panels will be provided with stand-alone meters for each feeder upstream of the distribution panel. Meters will connect in a daisy chain configuration. Meters will communicate via TCP/IP, RS-232, or RS-485; sending data to the associated server and reporting the following minimum criteria:

- Frequency (in hertz).
- THD (as a percentage).
- Power factor (as a percentage).
- Voltage (in volts).
- Current (in amps).
- Real power (in KW).
- Reactive power (in KVAR).
- Apparent power (in KVA).
- Energy usage (in KWh) of all connected loads.
It is anticipated that distributed UPS topology will be used. Rack mounted and local UPS will be provided at telecommunication rooms and critical lab equipment. In the next stage of design, the engineer shall evaluate the potential use of a central UPS system.

5.8.4 RENEWABLE SYSTEMS

Photovoltaic System

A photovoltaic (PV) system will be installed for the building to provide supplemental power, offset normal power usage, and achieve net zero energy, meaning the system will produce equal to the amount of energy the building consumes. The PV system will include an associated disconnect, inverter(s), and PV module arrays. The PV system components needed to be PV ready.

Highest efficiency solar panels such as SunPower 345W Modules X21-345 shall be specified to maximize the power density for available solar areas. String Inverter with DC optimizer or MPPT devices shall be used to improve total output of the system by allowing each panel to maximize its production capability, independent of the performance of other panels in the system. System performance degradation will be reduced due to individual panel variation, shading, dirt and clouds.

5.8.5 ELECTRICAL SYSTEM PRELIMINARY EQUIPMENT LIST

Refer to Single Line Diagram for additional information.
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5.9 AUDIOVISUAL

5.9.1 GENERAL

This report discusses the technology requirements for both audiovisual and telecommunications systems within the building.

Technology should help foster both collaborative and focused learning throughout the building, including classroom labs, active learning classrooms and “Third Spaces” for student socializing.

With ever-improving wireless technology and constantly new emerging mobile devices and apps, learning no longer occurs solely in a classroom seat or the study hall. The new paradigm is that learning can occur anywhere. This new building should build upon this paradigm and leverage the technologies that are woven into the lives of the post-millennial generation.

Any successful audiovisual project needs to carefully consider acoustics, lighting, wireless infrastructure, network connectivity, and other systems of the building trades.

5.9.2 OVERALL REQUIREMENTS

The following requirements list the general audiovisual system throughout the building:

- Rooms having dual displays will require matrix switching and touch panel controller for compare-and-contrast viewing
- Projection screens are to be in 16:9 aspect ratio with motorized low-voltage control capability
- Infrastructure for lecture capture to installed in all classrooms and labs although only a select few will initially have these systems installed
- The University has standardized around Extron for AV equipment (control and switching). They have used Extron equipment as a basis to do custom active learning spaces
- The University is currently using Ad Astra as its course scheduling platform
- Provide strong Wi-Fi (802.11AC) coverage throughout new building
- Provide a single Cat6A cable to each Wireless Access Point (WAP)
- Accessible ceilings with cable trays should readily allow for future cabling for additional and emerging (802.11ad – Wireless Gigabit) Wireless Access Points
- Provide ADA assistive listening systems in all classrooms and other rooms with amplified sound
- Conference rooms should have junction box above display to display backbox
- No free-air cabling or J-hooks permitted, place conduits back to the nearest cable tray
- Instructor desk positions will either be fixed or mobile, AV infrastructure will follow with either a floor box or wall box to accommodate this on a room-by-room basis

5.9.2.1 INFRASTRUCTURE REQUIREMENTS

For audiovisual and telecommunications systems to be effective, careful coordination with other disciplines and trades should occur throughout all design and construction phases. The following lists the issues that concern audiovisual systems:

- Acoustics
- Lighting & Shade Control
• Electrical Coordination
• Structural Coordination
• Mechanical Coordination
• Network Convergence (multiple building systems on a single network)
• Network Security
• Wi-Fi and wireless presentation
• Making technology more sustainable

5.9.3 ROOM-BY-ROOM REQUIREMENTS

1. C.02 – Inorganic Large Teaching Labs (24 Seats)
   a. Two large (approximately 9’ wide) adjacent or opposite screens at teaching wall (media surfaces) for both redundant and compare-and-contrast viewing (requires a minimum 2 output video matrix switcher)
   b. Projection screen configuration should allow for use of large whiteboard while at least one screen is down
   c. Provide conduit stub w/ pull-string to lab benches for possible future cabling (e.g. fiber optic to the desktop)
   d. Fixed instructor station with integral AV equipment rack and the following:
      - Desktop PC + HDMI for laptop (Cable Cubby)
      - Touch panel controller inset at angled counter top
      - Outlet receptacles for connection of AV equipment and computers to campus network
   e. AV consolidation point above ceiling, can add future cabling to instructor station
   f. Ceiling-mounted loudspeakers
   g. Lecture capture desired with following:
      - Ceiling-mounted beam-forming microphone
      - Lavalier microphone for instructor
      - Pan/tilt/zoom video camera
      - Lecture capture device in equipment rack

2. C.01 – Inorganic Small Teaching Lab
   a. Provide similar AV capability as C.02 Large Teaching Lab
   b. As room is smaller only one display may be needed. Provide two displays if compare-and-contrast capability is determined necessary

3. P.06 Computational Physics
   a. Provide similar AV capability as C.02 - Large Teaching Lab
   b. Reconfigurable chairs and benches
   c. Consider switching to laptops at student lab benches
   d. Floorboxes located at each end of labs for power and data (total of 4)
   e. Floor box with AV capabilities at Instructor’s station
   f. Possibly two screens, (1) for student sharing (1) for instructor
   g. Provide ability to show any student’s screen at the projection screens via screen-sharing or wireless collaboration hub (e.g. Extron ShareLink)
   h. Additional floorbox dedicated to instructor workstation (AV only at instructor location)

4. P.02 Studio Teaching
   a. May be divisible
b. Dedicated AV equipment rack, serviceable from outside of the classroom to minimize class disruptions

c. Four motorized projection screen (approximately 10' wide), each capable of displaying its own independent image source (four-output video matrix)

d. Four wireless collaboration hubs to allow students to display four separate images from mobile devices to four projection screens

e. Wireless data only for students

f. Ten (10) floorboxes for power only

g. Touch panel controller on south wall

h. Lecture capture with two beam-forming microphones and two cameras to cover the larger area

i. AV input plate with data at front of room (below touch panel) for hardwire (HDMI) connections

5. S.01 Interview Room

a. Treat as small conference room with wall-mounted flat-panel display (no projection screen) and floorbox connections

b. Web conferencing / capture infrastructure camera

c. Small AV switcher in pedestal leg of table

d. Hard-wire data at workstations from wall

6. S.01 – Science Education Large

a. Similar AV functionality as C.02 – Inorganic Large Teaching Lab

b. Six (6) floor boxes with power only

c. One (1) floor box for instructor with AV + power

d. Controller at front of room

e. Two motorized projection screens

f. Verify if instructor’s table (mobile or stationary)

g. Possible two cam locations

7. S.01 – Science Education Small (General Teaching Lab)

a. Similar AV functionality as C.01 – Inorganic Small Teaching Lab

b. Touch panel controller at front of room

c. Two (2) floor boxes for students with power only

d. One (1) floor box for instructor with AV + power

e. Verify if instructor’s table (mobile or stationary)

f. Two (2) motorized projection screens

g. Possible two cam locations (verify)

8. P.01 – Physics Large Teaching Lab

a. Six (6) floor boxes for students with power only

b. One (1) floor box for instructor with AV + power

c. Two motorized projection screens

d. Touch panel controller and equipment rack at instructor’s table

9. G.01 – GEOS Small Teaching Lab

a. One (1) projection screen

b. Two (2) floor boxes for students with power only

c. One (1) floor box for instructor with AV + power

d. Equipment rack at instructor’s table

e. Controller at instructor’s table
f. One (1) motorized projection screen  
g. Wall-mounted power and data for laptop cart

10. Offices and Conference Rooms  
a. For offices reference IRES/CMT three documents online  
   - General Guidelines  
   - Division 27 Specs  
   - Chancellor’s Office Standards (TIP)  
b. Conference rooms should have web conference support  
   - Wall-mounted display with speakers  
   - Box in wall with data/AV  
   - Floorbox at table with data/AV  
   - Box in wall/ceiling for future camera + microphone (no speakers)

11. Student Collaboration “Third Spaces”  
a. Flat-panel display with wall-mounted HHMI inputs  
b. Wireless collaboration  
c. Whiteboards  
d. Lots of power and charging stations
5.10 TELECOMMUNICATIONS

5.10.1 OVERALL REQUIREMENTS & NOTES

- Accessible ceilings with cable trays should readily allow for future cabling for additional and emerging (802.11ad – Wireless Gigabit) Wireless Access Points
- 1.25" conduit standard for network drops
- Vault 15 connects with fiber
- Provide strong Wi-Fi (802.11AC) coverage throughout new building
- Provide a single Cat6A cable to each Wireless Access Point (WAP)
- All work will be designed in accordance with the “Telecommunications Infrastructure Planning (TIP) Standards” required of all California State University facilities.
- Telecommunications service to the new building at the Siskiyou site will be brought from the existing data center located at Meriam Library
- Due to the footprint of the new building, existing infrastructure on-site might be relocated or abandoned which might include manholes, handholes, conduits and cabling

5.10.2 SYSTEM DESCRIPTION

The following summary demonstrates the intended approach to the telecommunications infrastructure system beginning with the outside plant (OSP) and continuing to the horizontal cabling within the building. The goal of telecommunications infrastructure is to meet the CSU’s commitment to provide technology infrastructure, hardware, and software to serve system-wide mission-critical needs of the CSU.

The site work involved with this project to gain new telecommunications service at the proposed Siskiyou site is as follows:

1. Manhole T-11 will be relocated due to the footprint of the proposed building. The existing manhole is AT&T’s service manhole and contains very little of the Campus fiber. The campus will suffer minimal disruptions if this fiber line is broken
2. Pullbox 13a and 13b maybe also be affected as a part of construction and may be required to be removed or relocated
3. New conduits from pullbox 13 to the Meriam Library will be required to restore service to the buildings being serviced through pullbox 13 in those fiber lines which are active
4. New conduits from the Meriam Library to the new building MPOE are required with a pullbox at the intersection of these new conduits and conduits currently connecting to Pullbox 13 to the new Siskiyou site

Once cabling has reached the MPOE of the new proposed building, vertical distribution will be made through stacked telecommunications rooms at two opposite corners of the building. The horizontal cabling distribution system will generally operate as follows:

1. The telecommunications MPOE / MDF will be located at the Southeast corner of the site, closest to the point of connection at Meriam Library’s server room
2. Telecommunications rooms will be stacked and located at the Northwest and Southeast corner of the building
   a. Telecommunications rooms will be linked via a fiber and copper backbone
   b. Telecommunications rooms will be connected via a cable tray or other acceptable horizontal cabling distribution method
3. Outgoing horizontal cabling from each telecommunications room well use the horizontal cabling conveyance system designed to reach each telecommunication work area outlet as outlined in the TIP provided by the California State University.

Horizontal cabling to individual telecommunications outlet locations for Audiovisual systems and other general guidelines stipulated by the University require the following:

1. All horizontal cabling will terminate to junction boxes with 1-1/4” conduit, minimum
2. All conduits will stub from walls directly to overhead cable tray, no j-hangers or free-cabling is allowed
3. “Daisy-chaining” of conduit backboxes is not allowed, each telecommunications backbox should have a separate 1-1/4” conduit stubbed to the nearest cable tray

For Audiovisual systems in which there is a wall-mounted display, the junction box and conduit infrastructure requirements are as follows:

1. Display backboxes shall have 1-1/4” conduit stubbed to cable tray for telecommunications cabling and a 1-1/4” conduit stubbed to the ceiling microphone junction box for AV cabling
2. Junction boxes for lecture capture cameras require 1-1/4” conduit to the display backbox
3. Floorbox locations require a 1-1/4” conduit stubbed to cable tray for telecommunications cabling in addition to a 1-1/4” conduit to the display backbox for AV cabling

For locations with projection screens and projectors, cameras and ceiling microphones should stub directly to the AV equipment rack location.
CODE ANALYSIS
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6.1 PRELIMINARY BUILDING CODE ANALYSIS

The following preliminary code analysis is based on the California Code of Regulations, Title 24, Part 2 - the 2016 California Building Code (CBC) which is adopted from the 2015 International Building Code. During Schematic Design, a comprehensive code analysis will be developed. The following analysis may vary with subsequent editions of the building code.

**Building Description:**
The building is five stories tall and 110,000 GSF total. The occupied floors are composed predominately of teaching labs, offices and research labs. The building contains mixed B and H-3 Occupancies. The main occupancy teaching and research laboratories, and offices will be classified as B Occupancies. The H-3 Occupancy is limited to a central chemical storage room with satellite small reach-in chemical storage rooms as required.

**Building Code:**
2016 California Building Code

**Building Area:**
110,000 GSF

**Occupancy:**
Mixed A-3 and B with potential H-3

**Construction Type:**
Type I-B

**Allowable Area:**
- Allowed - Unlimited
- Proposed - 110,000 GSF

**Maximum Number of Stories:**
- Allowed - 11 stories
- Proposed - 5 stories

**Maximum Building Height:**
- Allowed - 160’
- Proposed - 78’
  - (Level 1 = 0’; Level 2 = 18’; Level 3 = 33’; Level 4 = 48’; Level 5 = 63’; Roof = 78’)

**High-Rise Classification:**
Non high-rise

**Highest Occupied Floor:**
- Allowed - 75’
- Proposed - 63’ (Level 5)
Chemical Quantities and Control Areas: The Maximum Allowable Quantities (MAQ's) of hazardous materials will be in accordance with the CBC and NFPA 400 for indoor control areas. The number of control areas per floor will be determined in Schematic Design following an analysis of the chemicals used.

Fire Sprinkler System: Automatic fire sprinkler protection is being provided throughout the building to reduce the overall hazard and to increase flexibility with respect to the overall egress requirements. The fire sprinklers will be designed in accordance with CBC 903 and in accordance with NFPA 13, Standard for the Installation of Automatic Sprinkler Systems.

Occupancy Separation: Classification of the building as Type I-B construction will allow for the application of the non-separated occupancies, outlined in CBC Section 508.3. This will allow for the omission of fire-resistive rated barriers or occupant separation elements between the different occupancy areas, except the H-3 chemical storage rooms will be separated per Section 508.4.

Elevator Lobby Separation: Per CBC 713.14.1 Exception 4, elevator lobbies are not required in B-Occupancies. The elevators are not being used as a means of egress.

Convenience Stair: If and open convenience stair is desired, it is in addition to the two required exit stairs. This type of open convenience stair is permitted per CBC 1009.3 Exception 4 without considering the space to be an atrium. The floor opening shall be protected in accordance with the method detailed for protection of Vertical Openings in NFPA 13.

Fire-Resistance Rating for Building Elements: (per Table 601)
- Primary Structural Frame: 2-hrs
- Bearing Walls Exterior: 2-hrs
- Bearing Walls Interior: 2-hrs
- Non-bearing walls/partitions: 0-hr
- Floor construction: 2-hrs
- Roof Construction: 1-hr
6.2 APPLICABLE CODES AND STANDARDS

**Applicable State Codes** (latest edition)

- Title 24, Part 1 - California Building Standards Administrative Code
- Title 24, Part 2 - California Building Code (CBC)
- Title 24, Part 3 - California Electrical Code (CEC)
- Title 24, Part 4 - California Mechanical Code (CMC)
- Title 24, Part 5 - California Plumbing Code (CPC)
- Title 24, Part 6 - California Energy Code (Title 24)
- Title 24, Part 9 - California Fire Code (CFC)
- Title 24, Part 11 - California Green Building Standards Code (CALGreen)
- Title 24, Part 12 - California Referenced Standards Code
- California Code of Regulations; Title 8, Title 19

**Applicable National Codes** (latest edition)

- ADA - Americans with Disabilities Act Accessibility Guidelines
- IESI - Illuminating Engineering Society of North America
- NEMA - National Electrical Manufacturers Association
- National Fire Protection Association (NFPA) Guidelines and Standards

**Guidelines and Standards** (latest edition)

- ACGIH Industrial Ventilation - A Manual of Recommended Practice
- ANSI Z358.1 Emergency Eyewash and Shower Equipment
- ANSI/AIHA Z9.5 - Laboratory Ventilation Standard
- ASHRAE Standard 62.1 Ventilation for Acceptable Indoor Air Quality
- LEED (Leadership in Energy and Environmental Design)
- OSHA (Occupational Safety and Health Administration Standard) 29 CFR 1926 and 29 CFR 1910
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A. EXISTING SPACE USAGE

As a point of reference, the programming process included comparing the Baseline Space Program (Section 3.2) to the existing spaces in use. The following Existing Space Usage diagrams were used to compare the existing teaching and research lab spaces to the ones provided initially by the baseline and eventually proposed by the project space program (Section 3.3). For clarity, the existing floor plans are color-coded by department to correspond to the Space Program as well as the planning test-fit in Section 4.
Physical Science Building - Level 1
Physical Science Building - Level 2

- Chemistry
- GEOS
- Physics
- Science Education
- Psychology
- Interdisciplinary Science Education
- NOC/Data Center

Also used by Science Ed
Physical Science Building - Level 3
Tehama Hall - Level 1
Holt Hall - Level 2

[Diagram of Holt Hall - Level 2 with departments colored per form CPDC 2-4, then revised to reflect user comments]
Holt Hall - Level 3

- Chemistry
- GEOS
- Physics
- Interdisciplinary Science Education
- Psychology
- Vivarium
- NOC/Data Center

SCIENCE REPLACEMENT BUILDING
CALIFORNIA STATE UNIVERSITY, CHICO
Modoc - Level 2
Butte Hall - Level 4
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APPENDIX B
B. ROOM DIAGRAMS

A Room Diagram, shown in both plan format and three-dimensional view for additional clarity, has been completed for most of the spaces identified in the Space Program and can be found on the following pages. The Room Diagrams are intended to be graphic representations of potential room layouts, including equipment, laboratory benches, office furniture, etc. Also indicated on each sheet are preferred overall room dimensions, shown to the inside face of each wall. Detailed room services, such as electrical and data outlets, are intentionally not shown at this time and will be developed during future design phases. These room diagrams are the basis for understanding the capacity of the space program as well as testing the program on the proposed site. They are not intended to be the final layout.
DEPARTMENT: CHEMISTRY
SPACE ID: C.01
SPACE NAME: INORGANIC - SMALL TEACHING LABORATORY

AREA (NSF): 945
OCCUPANTS: 16

INORGANIC - SMALL TEACHING LABORATORY

DEPARTMENT: CHEMISTRY
SPACE ID: C.01
SPACE NAME: INORGANIC - SMALL TEACHING LABORATORY

AREA (NSF): 945
OCCUPANTS: 16
DEPARTMENT: CHEMISTRY
SPACE ID: C.01(3D)
SPACE NAME: INORGANIC - SMALL TEACHING LABORATORY
DEPARTMENT: CHEMISTRY
SPACE ID: C.02
SPACE NAME: INORGANIC - LARGE TEACHING LABORATORY
AREA (NSF): 1,200
OCCUPANTS: 24

SCIENCE REPLACEMENT BUILDING
CALIFORNIA STATE UNIVERSITY, CHICO

DOOR OPTION

WALL BENCH
ADJUSTABLE WALL SHELVES

ISLAND BENCH
SINK

WALL CABINET
OFOI WATER PURIFICATION UNIT

SINK

ISLAND BENCH

SINK

PROJECTOR

BOOK PACK

10' - 6"
30' - 0"

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Chico State University
Research Facilities Design

February 10, 2017

INORGANIC - LARGE TEACHING LABORATORY
ROOM DIAGRAM

AREA (NSF): 1,200
OCCUPANTS: 24

CHEMISTRY ROOM

<Diagram of room layout with detailed equipment and dimensions>
DEPARTMENT: CHEMISTRY
SPACE ID: C.02(3D)
SPACE NAME: INORGANIC - LARGE TEACHING LABORATORY
DEPARTMENT: CHEMISTRY
SPACE ID: C.03 OPTION 1(3D)
SPACE NAME: ORGANIC - SMALL TEACHING LABORATORY
DEPARTMENT: CHEMISTRY
SPACE ID: C.03 OPTION 2(3D)
SPACE NAME: ORGANIC - SMALL TEACHING LABORATORY
DEPARTMENT: CHEMISTRY
SPACE ID: C.04 OPTION 1
SPACE NAME: ORGANIC - LARGE TEACHING LABORATORY

AREA (NSF): 1,260
OCCUPANTS: 20 TO 24

10' - 6"
30' - 0"

WALL BENCH - TYP.
PIPESDROP ENCLOSURE
W/ DRYING RACK - TYP.
6' FULL VIEW
CHEMICAL
FUME HOOD - TYP.
4' CHEMICAL
FUME HOOD
BACKPACK STORAGE
LIMITED
WINDOW OPTIONS

DISPENSING & WASTE HOOD
SS/EW UNIT

ISLAND BENCH
SINK

PROJECTOR

10' WHITE BOARD

WINDOW OPTION

February 10, 2017

SCIENCE REPLACEMENT BUILDING
CALIFORNIA STATE UNIVERSITY, CHICO
DEPARTMENT: SCIENCE EDUCATION
SPACE ID: C.04 OPTION 1(3D)
SPACE NAME: ORGANIC - LARGE TEACHING LABORATORY
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<td>BIOCHEM - SMALL TEACHING LABORATORY</td>
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DEPARTMENT: CHEMISTRY
SPACE ID: C.06(3D)
SPACE NAME: SPECIAL INSTRUCTION - STUDENT SPACE
DEPARTMENT: CHEMISTRY
SPACE ID: C.07 & C.09(3D)
SPACE NAME: SPECIAL INSTRUCTION - BIOCHEM & OTHER
DEPARTMENT: CHEMISTRY
SPACE ID: C.08(3D)
SPACE NAME: SPECIAL INSTRUCTION - ORGANIC
DEPARTMENT: CHEMISTRY
SPACE ID: C.10(3D)
SPACE NAME: CENTRAL PREP STORAGE
NOTE: CONSIDER LOCATING MOST OR ALL OF
a.3.2 CHEMICAL MATERIAL STORAGE ADJACENT
TO a.3.1 MAIN CHEMICAL PREP & STORAGE

LINEAR FEET OF SHELVING = 360 LF
(5 TIERS PER TALL UNIT)
LINEAR FEET OF BENCH + HOOD = 20 LF
LINEAR FEET OF EQUIP. SPACE = 20 LF
DEPARTMENT: CHEMISTRY
SPACE ID: C.11(3D)
SPACE NAME: SATELLITE PREP STORAGE
DEPARTMENT:  GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID:  G.01 TABLE CONFIGURATION 'A'
SPACE NAME:  GEOLOGY - LOWER/UPPER DIVISION

AREA (NSF):  945
OCCUPANTS:  24

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GEOLOGY - LOWER/UPPER DIVISION
ROOM DIAGRAM
G.01 TABLE CONFIGURATION 'A'
DEPARTMENT: GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID: G.01 TABLE CONFIGURATION 'A' (3D)
SPACE NAME: GEOLOGY - LOWER/UPPER DIVISION
DEPARTMENT: GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID: G.01 TABLE CONFIGURATION 'B'
SPACE NAME: GEOLOGY - LOWER/UPPER DIVISION

AREA (NSF): 945
OCCUPANTS: 24

10' - 6"
Moveable Tables
Electrical Floor Box
WPE
Wall Bench
Wall Cabinet
Backpack Storage
Projector
6' 2' 4'
8'
DEPARTMENT: GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID: G.01 TABLE CONFIGURATION 'B'(3D)
SPACE NAME: GEOLOGY - LOWER/UPPER DIVISION
DEPARTMENT: GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID: G.01 TABLE CONFIGURATION 'C'
SPACE NAME: GEOLOGY - LOWER/UPPER DIVISION

AREA (NSF): 945
OCCUPANTS: 16 to 24

GEOLOGY - LOWER/UPPER DIVISION
ROOM DIAGRAM

12' WHITE BOARD
ELECTRICAL FLOOR BOX, TYP.
WALL BENCH TYP.
WALL CABINET TYP.
BACKPACK STORAGE
PROJECTOR
WINDOW OPTION
LAPTOP CART

February 10, 2017
DEPARTMENT: GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID: G.01 TABLE CONFIGURATION 'C'(3D)
SPACE NAME: GEOLOGY - LOWER/UPPER DIVISION
DEPARTMENT: GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID: G.02(3D)
SPACE NAME: ENVIRONMENTAL SCIENCE UPPER DIVISION
DEPARTMENT: GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID: G.03(3D)
SPACE NAME: ENVIRONMENTAL SCIENCE LOWER DIVISION
DEPARTMENT: GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID: G.05(3D)
SPACE NAME: CLASSROOM PREP / AFTER HOURS STUDY
DEPARTMENT: GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID: G.06 + G.07 + G.08(3D)
SPACE NAME: INSTRUCTIONAL / RESEARCH A + B + C
DEPARTMENT: GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID: G.09
SPACE NAME: EQUIPMENT STORAGE

AREA (NSF): 945
OCCUPANTS: NA

GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
EQUIPMENT STORAGE

10'-6" x 30'-0"

ADJUSTABLE WALL SHELVES
STEEL RACKS
TALL CABINETS
SINK - TYP.
CART
WALL CABINET
WINDOW OPTION
EQUIP.
EQUIP.
EQUIP.
EQUIP.
EQUIP.
EQUIP.
EQUIP.
EQUIP.
DEPARTMENT: GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID: G.09(3D)
SPACE NAME: EQUIPMENT STORAGE
DEPARTMENT: GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID: G.10(3D)
SPACE NAME: PREP-DIRTY
DEPARTMENT: GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID: G.12 + G.13
SPACE NAME: FACULTY STUDENT RESEARCH - A + B

AREA (NSF): 315 ASF x 2
OCCUPANTS: 3 OCCs x 2

DOOR OPTION

G.12 FUTURE USE PROJECT LAB
G.10 ATMOSPHERIC & OPTICS PROJECT LAB

WALL BENCH
ADJUSTABLE WALL SHELVES

CYLINDER RESTRAINT

MOVEABLE TABLE

SHARED RESEARCH LAB
DEPARTMENT: GEOLOGY + ENVIRONMENTAL SCIENCES (GEOS)
SPACE ID: G.12 + G.13(3D)
SPACE NAME: FACULTY STUDENT RESEARCH - A + B
DEPARTMENT: PHYSICS
SPACE ID: P.01
SPACE NAME: GENERAL EDUCATION - LOWER DIVISION TEACHING LABORATORY

AREA (NSF): 1,260
OCCUPANTS: 36

DEPARTMENT: PHYSICS
SPACE ID: P.01
SPACE NAME: GENERAL EDUCATION - LOWER DIVISION TEACHING LABORATORY

AREA (NSF): 1,260
OCCUPANTS: 36

DEPARTMENT: PHYSICS
SPACE ID: P.01
SPACE NAME: GENERAL EDUCATION - LOWER DIVISION TEACHING LABORATORY

AREA (NSF): 1,260
OCCUPANTS: 36

DEPARTMENT: PHYSICS
SPACE ID: P.01
SPACE NAME: GENERAL EDUCATION - LOWER DIVISION TEACHING LABORATORY

AREA (NSF): 1,260
OCCUPANTS: 36

ELECTRICAL FLOOR BOX, TYP.
MOVEABLE TABLES, TYP.
SINK - TYP.
16 WHITE BOARD
PROJECTION SCREEN
WINDOW OPTION
WINDOW OPTION

February 10, 2017

PHYSICS
ROOM DIAGRAM
 Replacement Science Building
SmithGroupJJR
Chico State University
Research Facilities Design
DEPARTMENT: PHYSICS
SPACE ID: P.01(3D)
SPACE NAME: GENERAL EDUCATION - LOWER DIVISION TEACHING LABORATORY
DEPARTMENT: PHYSICS
SPACE ID: P.02 + P.08 OPTION 1(3D)
SPACE NAME: ADVANCED ELECTRONICS
DEPARTMENT: PHYSICS
SPACE ID: P.02 + P.08 OPTION 2(3D)
SPACE NAME: ADVANCED ELECTRONICS
SCIENCE REPLACEMENT BUILDING
CALIFORNIA STATE UNIVERSITY, CHICO

DEPARTMENT: PHYSICS
SPACE ID: P.03 + P.08 OPTION 1
SPACE NAME: OPTICS TEACHING LABORATORY + INSTRUMENT ROOM

AREA (NSF): 945
OCCUPANTS: 12 TO 16

OPTICS T-LAB

INSTRUMENT ROOM
(4 TOTAL IN PROJECT)

OPTICS TABLE
4'x6'

OPTICS TABLE
4'x8'

OPTICS ALCOVE

WRITE BOARD

LASER SHELF

MOVEABLE TABLES

OVERHEAD SERVICE CARRIER

TABLE

ADJUSTABLE WALL SHELVES

P.04

P.08

P.08

P.08

P.08

P.08

P.08
DEPARTMENT: PHYSICS
SPACE ID: P.03 + P.08 OPTION 1 (3D)
SPACE NAME: OPTICS TEACHING LABORATORY + INSTRUMENT ROOM
DEPARTMENT: PHYSICS
SPACE ID: P.03 + P.08 OPTION 2
SPACE NAME: OPTICS TEACHING LABORATORY + INSTRUMENT ROOM
AREA (NSF): 945
OCCUPANTS: 12 TO 16

OPTICS T-LAB

P.03

INSTRUMENT ROOM
(4 TOTAL IN PROJECT)

P.08

INSTRUMENT
ROOM

4'x6'
OPTICS
TABLE

4'x8'
OPTICS
TABLE

LASER SHELF

MOVEABLE TABLE

OVERHEAD SERVICE CARRIER

PROJECTOR

WHITE BOARD

10' - 6"

30' - 0"
DEPARTMENT: PHYSICS
SPACE ID: P.03 + P.08 OPTION 2(3D)
SPACE NAME: OPTICS TEACHING LABORATORY + INSTRUMENT ROOM
DEPARTMENT: PHYSICS
SPACE ID: P.04(3D)
SPACE NAME: COMPUTATIONAL
DEPARTMENT: PHYSICS
SPACE ID: P.05(3D)
SPACE NAME: SPECIALTY INSTRUCTION SPACE
DEPARTMENT: PHYSICS
SPACE ID: P.06
SPACE NAME: SPECIAL INSTRUCTION - SPS PROJECT

AREA (NSF): 315 ASF X 2
OCCUPANTS: 3 OCCS X 2
DEPARTMENT: PHYSICS
SPACE ID: P.06(3D)
SPACE NAME: SPECIAL INSTRUCTION - SPS PROJECT
LINEAR FEET OF SHELVING = 600 LF
(5 TIERS PER TALL UNIT)
LINEAR FEET OF BENCH = 34 LF
LINEAR FEET OF EQUIP. SPACE = 40 LF
DEPARTMENT: PHYSICS
SPACE ID: P.07(3D)
SPACE NAME: EQUIPMENT STORAGE

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Research Facilities Design
February 10, 2017
DEPARTMENT: SCIENCE EDUCATION
SPACE ID: S.01 OPTION 1 (MOVEABLE TABLES)(3D)
SPACE NAME: GENERAL TEACHING LABORATORY
DEPARTMENT: SCIENCE EDUCATION  
SPACE ID: S.02(3D)  
SPACE NAME: SPECIAL INSTRUCTION - STUDENT SPACE
DEPARTMENT: SCIENCE EDUCATION
SPACE ID: S.04
SPACE NAME: CENTRAL PREP STORAGE
AREA (NSF): 630
OCCUPANTS: N/A

TO EXTERIOR FOR OUTREACH VAN LOADING (IF PRACTICAL)

10' - 6"
30' - 0"

TO TEACHING LAB

TALL OPEN STORAGE CABINETS OR METAL RACKS

SECURE TALL STORAGE CABINETS
DEPARTMENT:  SCIENCE EDUCATION
SPACE ID:  S.04(3D)
SPACE NAME:  CENTRAL PREP STORAGE
DEPARTMENT: NEUROSCIENCE-PSYCHOLOGY
SPACE ID: PS.01
SPACE NAME: LEARNING & BEHAVIOR (PIGEON) TEACHING LABORATORY

AREA (NSF): 945
OCCUPANTS: 24 STUDENTS

TEST CHAMBERS TYP.
TEST CHAMBERS, TYP.
ELECTRICAL FLOOR BOX, TYP.
WALL BENCH TYP.
WALL CABINET TYP.
MOVEABLE TABLES TYP.
PROJECTION SCREEN
12' WHITE BOARD
EQUIP.
WINDOW OPTION
10' - 6"
30' - 0"
DEPARTMENT: NEUROSCIENCE-PSYCHOLOGY
SPACE ID: PS.01(3D)
SPACE NAME: LEARNING & BEHAVIOR (PIGEON) TEACHING LABORATORY
DEPARTMENT: NEUROSCIENCE-PSYCHOLOGY
SPACE ID: PS.02
SPACE NAME: BIOPSYCH-PSYCHOLOGY FOR STUDENTS

AREA (NSF): 630
OCCUPANTS:

ROOM DIAGRAM

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Chico State University
Research Facilities Design
February 10, 2017
DEPARTMENT: NEUROSCIENCE-PSYCHOLOGY
SPACE ID: PS.02(3D)
SPACE NAME: BIOPSYCH-PSYCHOLOGY FOR STUDENTS
DEPARTMENT: NEUROSCIENCE-PSYCHOLOGY
SPACE ID: PS.03
SPACE NAME: PSYCHOPHYSIOLOGY CONTROL & EQUIPMENT

AREA (NSF): 630

OCCUPANTS:

REPLACEMENT SCIENCE BUILDING
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CALIFORNIA STATE UNIVERSITY, CHICO

ROOM DIAGRAM
February 10, 2017

COMPUTER STATIONS
WALL BENCH TYP.
WALL CABINET TYP.
SINK TYP.
TALL STORAGE
MOVEABLE TABLES TYP.
CONTROL ROOM

EQUIP. EQUIP. EQUIP.
DEPARTMENT: NEUROSCIENCE-PSYCHOLOGY
SPACE ID: PS.03(3D)
SPACE NAME: PSYCHOPHYSIOLOGY CONTROL & EQUIPMENT
DEPARTMENT: NEUROSCIENCE-PSYCHOLOGY
SPACE ID: PS.05
SPACE NAME: PREP & STORAGE

AREA (NSF): 630
OCCUPANTS:

TO TEACHING LAB

SECURE TALL STORAGE CABINETS
TALL OPEN STORAGE CABINETS OR METAL RACKS
SINK
WALL BENCH
WALL CABINET

10' - 6"
30' - 0"
4'
DEPARTMENT:  NEUROSCIENCE-PSYCHOLOGY
SPACE ID: PS.05(3D)
SPACE NAME: PREP & STORAGE
DEPARTMENT: NEUROSCIENCE-PSYCHOLOGY
SPACE ID: PS.06(3D) OPTION 1 & 2
SPACE NAME: BEHAVIORAL ANALYSIS RESEARCH
DEPARTMENT: NEUROSCIENCE-PSYCHOLOGY
SPACE ID: PS.07
SPACE NAME: COGNITIVE/PERCEPTION RESEARCH
AREA (NSF): 630
OCCUPANTS: 2x3

(REALLOCATION FOR 2 PL's)
DEPARTMENT: NEUROSCIENCE-PSYCHOLOGY
SPACE ID: PS.07(3D)
SPACE NAME: COGNITIVE/PERCEPTION RESEARCH

AREA (NSF):
OCCUPANTS:
DEPARTMENT: NEUROSCIENCE-PSYCHOLOGY
SPACE ID: PS.08
SPACE NAME: NEUROSCIENCE RESEARCH

AREA (NSF): 630
OCCUPANTS: 2x3
(ALLOCATION FOR 2 PL's)
DEPARTMENT: NEUROSCIENCE-PSYCHOLOGY
SPACE ID: PS.08(3D)
SPACE NAME: NEUROSCIENCE RESEARCH
DEPARTMENT: NEUROSCIENCE-BIOLOGY
SPACE ID: B.05
SPACE NAME: SPECIAL INSTRUCTIONAL SPACE
DEPARTMENT: PHYSIOLOGY
SPACE ID: B.01 + B.02 + B.03 + B.04(3D)
SPACE NAME: VERT PHYSIOLOGY & NEURO PHYSIOLOGY
DEPARTMENT: INTERDISCIPLINARY
SPACE ID: 1.01
SPACE NAME: ACTIVE LEARNING (SCALE-UP)
AREA (NSF): 1,890
OCCUPANTS: 48
DEPARTMENT: INTERDISCIPLINARY
SPACE ID: 1.01(3D)
SPACE NAME: ACTIVE LEARNING (SCALE-UP)
DEPARTMENT:  INTERDISCIPLINARY
SPACE ID:  I.02(3D)
SPACE NAME:  ACTIVE LEARNING STORAGE
DEPARTMENT: INTERDISCIPLINARY
SPACE ID: I.03
SPACE NAME: TEACHING LAB

AREA (NSF): 945
OCCUPANTS: 24
DEPARTMENT: INTERDISCIPLINARY
SPACE ID: 1.04 + 1.05(3D)
SPACE NAME: TEACHING LAB - SCED & STORAGE
DEPARTMENT:  SHARED SUPPORT
SPACE ID:  SS.01, SS.02, SS.03, SS.06
SPACE NAME:  RECEIVING + CYLINDER STO + WASTE STO + RAD STO

SCIENCE REPLACEMENT BUILDING
CALIFORNIA STATE UNIVERSITY, CHICO

AREA (NSF):  315 + 105 + 105 + 105
OCCUPANTS:

Replacement Science Building
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Chico State University
Research Facilities Design

February 10, 2017

DEPARTMENT:  SHARED SUPPORT
SPACE ID:  SS.01, SS.02, SS.03, SS.06
SPACE NAME:  RECEIVING + CYLINDER STO + WASTE STO + RAD STO

AREA (NSF):  315 + 105 + 105 + 105
OCCUPANTS:
DEPARTMENT:  SHARED SUPPORT
SPACE ID:   SS.01, SS.02, SS.03, SS.06(3D)
SPACE NAME: RECEIVING + CYLINDER STO + WASTE STO + RAD STO
DEPARTMENT:  SHARED SUPPORT
SPACE ID:    SS.05(3D)
SPACE NAME:  COLLEGE SHOP
(This page intentionally left blank)
DEPARTMENT: CHEMISTRY
SPACE ID: V.01 - V.07/3D
SPACE NAME: VIVARIUM SUITE - HOLDING, PROCEDURE/ OBS, CAGE WASH, STORAGE, WORKSTATIONS

AREA (NSF): February 10, 2017
OCCUPANTS:
APPENDIX C
C. ROOM UTILIZATION TABLES

In order to maximize space allocation, the programming process included the development of utilization tables for each of the teaching labs and instructional spaces. Each Chair whose department is slated to be in the building tested their current and projected class schedule against the teaching labs proposed in the draft Space Program. This exercise resulted in adjustments to the Space Program to ensure the required courses could be accommodated by the teaching labs and instructional spaces proposed.
Figure C.2 - Geology & Environmental Science

In this "best case" scenario, not possible to schedule lecture component for 165, 230, 250, 307, or 360. Will only work with a substantial PREP ROOM and room for students to work on labs AFTER HOURS.
Figure C.3 - Physics -- Current Model

Third lab (24 students) is needed to teach the following labs.
**Physics – “Better” Model**

**Programming Process: Utilization Study**

### Figure C.4 - Physics “Better” Model

#### 36 students Studio Physics (9 modules)

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<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>T5</th>
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#### 36 students Studio Physics (10 modules)

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**Figure C.4 - Physics “Better” Model**

- 36 students Studio Physics (9 modules)
- 36 students Studio Physics (10 modules)
- 64 students Studio Physics (48 modules)
- 64 students Studio Physics (40 modules)
SCED Scenario 2: Department moves to new Physical Sciences Building

Notes:
1) all courses are shown on template except SCED 102 & SCED 142 which use the Biology stockroom in HOLT & SCED 489M which use the Gateway Science Museum
2) large (96 student) lecture room needed for SCED 101(sec 01):Intro to Earth's Environment (GE)
Figure C.6 - Neuroscience Psychology/Biology

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APPENDIX D
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D. SITE SELECTION PROCESS

At the onset of the feasibility study, the design team evaluated two potential building sites selected by the University: the Siskiyou site, which was the Baseline site submitted to the CSU Chancellor’s Office and the AHJ site, an alternate site with proximity to some of the existing campus science facilities. Both sites were analyzed consistently and massing options produced for each. Ultimately, the Building Committee selected Siskiyou as the preferred site.

The process of evaluating the two sites included site and climate analysis for each site, along with test-fit massing studies. It was initially assumed that a four-story building massing would be appropriate at the Siskiyou site, which is in a more urban campus context, whereas a three-story massing at the AHJ site would fit better into the more residential context. Five development strategies were studied for the Siskiyou site and three were studied for the AHJ site. These studies can be found on the following pages:

Through a process of stakeholder engagement, including building and executive committee meetings, and town halls with campus and neighborhood participation, the Siskiyou site was confirmed as the preferred site for the new Science building.

Listed below are the primary site considerations for each site.

**SISKIYOU SITE**

(+) Project baseline site (CSU, CEQA)

(+) Maximizes program fit on site

(+) Reinforces campus core

(+) Creates usable open space

(+) Reinforces campus pedestrian flow

(-) NOC diversity: south core vs. north core

(-) Vivarium proximity to related disciplines

**AJH SITE**

(+) Expands campus core

(+) Proximity to other sciences

(+) Safe bldg access for K-12 Sci Ed students

(-) Underutilizes program fit on site

(-) Site development cost: utility infrastructure

(-) Requires decanting existing programs
Figure D.2 - Site Evaluation Criteria
Figure D.3 - Baseline Site - Siskiyou
Figure D.4 - Siskiyou Site Circulation
Figure D.5 - Siskiyou Site Open Space Connection
Figure D.6 - Siskiyou Site Solar Diagram
Figure D.7 - Site Wind Analysis
Figure D.8 - Siskiyou Site Massing Options: Existing
Figure D.9 - Siskiyou Site Massing Options: Existing Forces
Figure D.10 - Summary of Site Development 1 Meeting

Siskiyou Site Development Strategies

- CANTILEVER
- TISSUE EARTHFORM
- COURTYARD
- ROTATE
Figure D.11 - Alternate Site - AJH
Figure D.12 - AJH Site Circulation
Figure D.13 - Alternate Site - AJH
Figure D.14 - AJH Site Diagram
Figure D.15 - Site Wind Analysis
Figure D.16 - AJH Site Massing Options: Existing
Figure D.17 - AJH Site Massing Options: Existing Forces
AJH Site Development Strategies

Figure D.18 - Summary of Site Development 1 Meeting
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APPENDIX E
E. MEETING NOTES

The programming and feasibility study process included several rounds of meetings with the principal stakeholder groups:

Campus Leadership
- Building Committee
- Executive Committee

User Groups
- Chemistry
- Physics
- Geological and Environmental Sciences (GEOS)
- Science Education
- Psychology
- Vivarium

Campus Departments
- Planning, Design + Construction
- IRES/IT
- Creative Media and Technology (CMT)
- Campus Utilities
- Sustainability
- Campus Stakeholders
- Shipping and Receiving
- Custodial / FMS

Included in the following pages are notes from those meetings.
SMITHGROUPJJR

Meeting Notes

www.smithgroupjjr.com

PROJECT CSU Chico Science Replacement Building Feasibility Study

MEETING DATE 11/3/2016

PROJECT NUMBER 21755.000

MEETING TIME 8:00am

PREPARED BY Jon Riddle

MEETING NUMBER 1

SUBJECT Visioning / Goals Meeting with Building Committee

LOCATION Kendall 207/209

ATTENDEES

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MEETING MINUTES

SmithGroupJJR gave a brief overview of the Feasibility Study process and Workplan, including the schedule of activities and programming confirmation process.

Five large pieces of paper were pinned to the wall with the subject headings for primary project goals and objectives (i.e. Project Goals, Vision/Strategic Plan, etc.). The group discussed each topic and their thoughts are noted here as bullet points following the five topics. This list also includes the discussion comments from the Executive Committee meeting that followed immediately after.

1. **Project Goals**
   - Timeless: Relevant for 50-100 years
   - Student-centered: Focuses on current pedagogies and multi-modal learning
   - Collaborative: Provides flexible learning spaces, especially for future teachers
   - Transparent: Encourages science on display and blurs the definition of teaching spaces
   - Hands-On: Teaches students with equipment used in the profession
   - Efficient: Accommodates many students
   - Welcoming: Supports the diverse campus population

2. **Vision / Strategic Plan**
   - Replacement: for Existing Physical Sciences Building
   - Programs: Growing community interest in the sciences
   - Research: Support graduate and undergraduate research
   - Interdisciplinary: Shared resources and cross-pollination among departments
3. **Sustainability**
- LEED: minimum LEED Silver (correction: the project RFQ section 4.4 requires LEED Gold minimum)
- Value: Find sustainable measures meaningful to campus and be transparent about them
- Second Nature: Support campus’ commitment to Second Nature action plan
- Living Laboratory: Showcase sustainability measures to incorporate in academics
- Waste stream management

4. **Pedagogies**
- Flexibility to accommodate multiple disciplines to engage in active learning
- Flexibility to adapt from one teaching style to another within same classroom/lab space
- Teaching and research drive each other
- Interactive and adaptive to new technologies
- Research
  - Need for dedicated research labs for NIH funded projects
  - Faculty take aspects of research and integrate it into teaching
  - Research on the teaching itself – science education research
- Physics
  - Collaborative model teaching
  - Need for upper division teaching and research labs
  - Need for independent faculty advanced research space to accommodate 2-3 students

5. **Project Success**
- “Thriving” - Faculty and Student satisfaction
- Integrated design and construction process; Campus involvement
- Faculty excited to move in because spaces exceed needs;
- Students excited to be in the building because it is friendly/appealing
- Captures interdisciplinary metrics: Grants, New curriculum, Student engagement, Quality of undergraduate research, Facility utilization
- Flexibility to accommodate future academic changes
- Blurs the definition of teaching spaces
- Minimizes the transition time adjusting between classes
- Develops a community of learners

End of minutes

If this report does not agree with your records or understanding of this meeting, or if there are any questions, please advise the writer immediately in writing; otherwise we will assume the comments to be correct.

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MEETING MINUTES

SmithGroupJJR team gave a brief overview of the Feasibility Study process and Workplan, including the schedule of activities and programming confirmation process, and a recap of the Building Committee meeting that happened just before.

Similar to the previous meeting, this group also discussed the project goals and objectives and their comments were added to the five topic categories - see the Meeting Notes for the Building Committee meeting on 11/3/2016.

End of minutes

If this report does not agree with your records or understanding of this meeting, or if there are any questions, please advise the writer immediately in writing; otherwise we will assume the comments to be correct.

ATTACHMENTS
Roxanne explained the scope of the project (feasibility study), the Workplan, and the project goals as determined by the Building and Executive Committees. She showed the CSU Space Program for this project that was included in the RFQ and explained programming nomenclature.

Sandra explained that, in establishing the Space Program for the project, CSU calculates the types and quantities of spaces, and their areas, by using standard formulae that determine space allocation as a factor of full-time equivalent student enrollment (FTES). Although this is a replacement building, the new spaces provided may not match the existing spaces. The CSU program was updated to reflect Fall 2015 enrollment and it includes additional space to accommodate projected 2021 enrollment.

The notes that follow are from the group discussion (all room numbers reference the Physical Sciences Building unless otherwise noted). See attached PDF’s for Roxanne’s slideshow and user comments overlaid onto the existing Physical Sciences building plans:

- No Master’s Program in Chemistry
- Central stockrooms on Levels 2 + 3, Stock rooms have a check in/out function
- Level 2 - (3) Lower Division Teaching labs -- mostly out non-major students, called Applied Sciences
- Level 3 - (8) Teaching Labs + Storage
- Class Lab turnover – most clean-up and set-up happens on Friday, some on Monday
- Like that most labs are on the same floor
- Applied = 24 students typically, reduce in quantity as they advance - 16 first semester then 12 second
- Lower Division includes: Gen Chem, Intro Chem, Quantitative, Integrated
- “Chemistry hearth” area would be ideal
- Research should integrate with teaching, currently missing from program
- Tough to transition classes during a semester, but can be changed from semester to semester
• Hard to share chem labs due to safety concerns
• 15 lab blocks at 3 hours each -- take out two for prep, leaving 13 lab blocks of utilization

Teaching Labs
• 203 – 24 students, Lower Division
• 209 – 24 students, Lower Division
• 210 – 24 students, Lower Division
• 302 - 12 students, Biochem
• 305 - 15 students, Organic
• 310 - 12 students, Organic
• 320
• 324 – Quantitative Analysis

Biochem
• Upper Div – 16 students, 2 fume hoods, 1 biosafety cabinet
Organic
• Applied Sciences (x1) – 24 students, non-major, 4 fume hoods needed, could be in Inorganic Lower Div
• Lower/Upper Div (x2) – 16 students, 6' fume hood per 2 students
Inorganic
• Upper Division – 16 students, 3-4 Fume Hoods
• Lower Division – 24 students, 2 Fume Hoods

Research Labs
• 307 – Carolyn
• 309 - Chem collaborative
• 311 - Organic
• 312 - Biochem
• 314 - Biochem
• 324a - Instrumentation
• 326 – Inorganic (don’t need wall between 324a/326)
• Currently every professor has their own research space, but per Cal Poly Model, could have 2 faculty share a research lab but glassware sharing could be a concern
• (1) 6' fume hood per research lab minimum, but Organic will need more

Lab Support
• 214 - Stockroom
• 313 - Stockroom
• 318 - Shared Instrument Room, ideally should connect to lab 324 so no need to take gloves on/off, Mass Specs, Spectrometer
• 322 - NMR x 2, 300 & 400 Mhz
• Need Refrigerator Storage

Offices
• 316 – Caroline
• 329 – Dan
• 327 – Lisa
• Student collaborative spaces should ideally be close to faculty offices
• Discipline clusters for offices would be nice but not necessary
• Randy to send quantity of staff
• Likes faculty offices by teaching labs, but department heads centralized
• Reception, office manager and office resources might be shared with other departments

CPDC Form 204 is outdated – Physical Sciences rooms that have changed:
• 209/203/210 were Geology and are now Chemistry
• 207 - now office under Geos
• 205 - faculty office under Geos
• 216 & 218 – only common Interdisciplinary rooms

End of minutes

If this report does not agree with your records or understanding of this meeting, or if there are any questions, please advise the writer immediately in writing; otherwise we will assume the comments to be correct.

ATTACHMENTS 2016-1201 CSU Chico Science Feasibility - User Workshop #1 slides.pdf
2016-1202 Physical Science Plans - User Mtg 1 notes.pdf
Meeting Notes

Roxanne explained the scope of the project (feasibility study), the Workplan, and the project goals as determined by the Building and Executive Committees. She showed the CSU Space Program for this project that was included in the RFQ and explained programming nomenclature.

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The notes that follow are from the group discussion (all room numbers reference the Physical Sciences Building unless otherwise noted). See attached PDF’s for Roxanne’s slideshow and user comments overlaid onto the existing Physical Sciences building plans:

- Fall 2011 - Fall 2015 -- Increases FTE 25%
- 45% growth in last 5 yrs. for Physics, serving engineers and others
- Serving a broad student population
- Distinction between lower + upper divisions
- (1) Office and (1) lab in Ayres
- Physics currently has 7 Teaching Labs including the one in Ayres
- Currently all research is in teaching labs. Ideally would have rooms adjacent for research
- Need distinction between intro and upper level labs
- Some labs used from 8am-10pm
- Currently lacking space for adv. Courses
Teaching Labs
- 104 – Lower Div
- 105 – Lower Div
- 106 – Lower Div
- 108 – Advanced Electronics Lab, nuclear experiments, dark room
- 121B – Dark Room – part of adv. Lab
- 121C – Adv. Lab, Upper Div – nuclear, vacuum, 3D print
- 123 – Computation physics, needs double space
- 132 - Lasers
- 134 – Optics Lab, Upper Div, research done in the TL

Lower Division
- Traditional Teaching Lab, 24 students, 2x
- Studio Physics, Scale-Up, 2x48 students with movable partition ideally
  - Tehama 116 - good example of Scale Up. Likes Starboard

Upper Division
- Optics Lab
  - Equipment driven
  - Laser Tables
  - 16 students
  - Envision 24 students
  - (4) dark-able zones
  - Alcoves for holography
- Advanced & Electronics
  - Electronic Benches with room for 16-20 with many outlets
  - Storage
  - Alternating semesters between electronics and advanced labs
  - Envision 24 students
- Research/Independent Study
- Computational Lab
  - Computing capacity currently not adequate

Research Labs
- 107 & 107A - optics, lasers, holography
- 121B - good size
- 123 – good size

Lab Support
- 103 – General storage needs to be 50% bigger incl. (2) workstations for techs
- 110 – Community room with sofas for tutoring and student work
- 106 & 108 side rooms – too small, better if double size
- 121 – Machine shop and storage, student access required
- 121A - dedicated radiation storage, currently has no shielding

Offices
- 106A, B, C – safety concerns
• 113
• 115
• 134A
• Xueli to send quantity of staff

CPDC Form 204 is outdated – Physical Sciences rooms that have changed:
• 113 & 115 – now Physics
• 121D – not off
• 233 – now Physics

End of minutes

If this report does not agree with your records or understanding of this meeting, or if there are any questions, please advise the writer immediately in writing; otherwise we will assume the comments to be correct.

ATTACHMENTS
2016-1201 CSU Chico Science Feasibility - User Workshop #1 slides.pdf
2016-1202 Physical Science Plans - User Mtg 1 notes.pdf
PROJECT CSU Chico Science Replacement Building Feasibility Study
MEETING DATE 12/1/2016
PROJECT NUMBER 21755.000
MEETING TIME 12:00pm
PREPARED BY Jon Riddle
MEETING NUMBER 5
SUBJECT Town Hall 1
LOCATION Kendall 207/209

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MEETING MINUTES

SmithGroupJJR team (RM, BK and JR) gave a short presentation to the group, describing the two site options Siskiyou and AJH, and some of the initial thoughts and goals for the planning. Large sheets of brown paper where pinned on the walls with the following six questions. The group was invited to write down their thoughts. The notes that follow are the group’s comments, as written on the brown paper.

What makes a learning space successful?
- In a student-centered learning environment, we need space for students to collaborate: think space within space
  - Quiet space to read, calculate, write (for faculty and students)
- Ways for students to put their work on display or make work visible to the whole learning community (classroom)
- Learning science needs to have materials/equipment available for students to have easy access
  - Medico key boxes, cameras?
- Classroom labs and hallways all should be learning environments: open collaborative, flexible
- Student learning center/tutor center/SI should be there, large classes (150) w/ clusters of student areas
- Good acoustics (absorb sounds before it disturbs others)
- Studio labs are great for smaller classes (30 or less)
- For medium sized classes (50-80) large carpeted rooms with flexible arrangements

What types of collaborative spaces would you like to see included in a project like this?
- Shared outreach lab/classroom space with shared resources. CG lab to accommodate 20-25 K-12 students doing hands-on science, w/in programs offered by GSM, hands-on-lab, etc., using shared equipment to reduce overhead and duplication (e.g. – laptops, microscopes, etc.). (AJH best for this type of collaboration – locale, parking, nearby resources)
- Shared project workspace and resources for design, modeling, and fabrication between centers and museums. “Maker-Space” style but less narrow in thematic/discipline
- Shared space for “collections” management, in collaboration w/ GSM, NSC depts. and museums (vertebrate, herbarium, etc.) and w/ common and shared policies, mgmt. tools and oversight
  - Don’t forget charging stations
  - Front and back doors to all offices/depts.
- Flexible lab space (not tied to a discipline)
- Student tutoring spaces
  - Hallway white board type surfaces – out of ear shot of faculty offices
- Some lockers to store teaching materials for faculties
- Natural light and nature help the creative juices flow – bring the beauty of our natural world indoors
- Collaborative research lab space – students/faculty office space in or connected to lab
  - No (health and safety)

Other building program related comments:
- Rooftop astronomy observation space
- Quality of specialized spaces: shielding, rad. storage, vibration control
• Chemical and radiation use and storage
• Shop w/ capabilities for cutting wood, metal, glass, plastics and soldering stations
• Windows into classrooms/labs for tours to inspire community high school students
• Reflect on modern technology and future science like solar energy, “green” to environment, innovative features
• Rooftop space for atmospheric and renewable energy research and teaching.
• Nobody likes lecture halls but unless we get $$ to hire much more staff we’re stuck with large classes (150+). Please include the large teaching space.
• Theft is currently a problem that causes us to lock labs and limit student access. Need security and accessibility.
• Hallway display spaces.
• Faculty offices need to be in same building as research/teaching labs.
• Adequate storage for lab equipment.
• Lecture spaces with tracks on ceilings to hang heavy items i.e. bowling balls, etc.

What do you hope the new building can accomplish? For science? For your campus?
• Showcase our faculty/undergrad research for multiple benefits 1) recruitment of faculty/students 2) prospective donors 3) industry partnerships 4) attract new revenue sources
• Flexible for future science innovation/research opportunities, hands-on learning
• Research lab space for faculty
• Research lab space to provide undergraduate learning opportunities in the frontiers of science preparing students for grad/post-grad research, industry, and beyond
• Inspire students to learn science, modern teaching classrooms, encourage community involvement especially K-12 in hands-on science so see its importance which would require open and flexible lab space and storage capabilities

How can the new science building reinforce ideas of the CSU Chico campus?
• Keep in mind the history of the campus and have the exterior design be compatible with the historic buildings left on campus
• Sustainable design, community – K-12 science learning spaces, instill lifelong love of the sciences, global science issues display
• Students come first – inspire students to learn science – should reflect on modern technology and future science
• Keep student learning first and in the forefront
• As the only school north of Sacramento to (except HSU) our area is grossly under serving the residents w/ opportunities for higher education. I grew up near Chico and felt my only option to pursue a science career (and education) was to leave the area. K-12 students and families can be engaged in science with this new building.

Other site and context related comments:
• Attention to parking and safety related to foot traffic and field trips.
• Bldg. could be a showcase for science in the north state – link to Gateway! Lovers or “soon to be” lovers
• Benefit (great) to have science bldg. near Gateway Science Museum – more interaction both at university level and with young people visiting campus
• Gateway S.M. has broken ground with neighbors who were initially opposed but became “friends”
• Consideration of site re: solar availability
• The vivarium for Psych pigeons only makes sense for the AJH site
• AJH site preferred due to Chem, Bio and NPSC collaborations. To keep residents happier, maybe north wing can be 1 story high with larger structure behind
• Siskiyou preferred as it's near the heart of campus, so that students can easily hang out/study in the new science building. Near Engineering/Const Mgmt/Mechtronic, student services and BMU
• AJH location – not all neighbors are happy – due to continued lighting problems.

End of minutes

If this report does not agree with your records or understanding of this meeting, or if there are any questions, please advise the writer immediately in writing; otherwise we will assume the comments to be correct.
**PROJECT**
CSU Chico Science Replacement Building Feasibility Study

**MEETING NUMBER**
21755.000

**PREPARED BY**
Jon Riddle

**MEETING DATE**
12/1/2016

**MEETING TIME**
2:30pm

**PROJECT NUMBER**
21755.000

**MEETING NUMBER**
6

**SUBJECT**
Programming Workshop 1 – Lab Techs

**LOCATION**
Kendall 109

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### MEETING MINUTES

Roxanne explained the scope of the project (feasibility study), the Workplan, and the project goals as determined by the Building and Executive Committees. She showed the CSU Space Program for this project that was included in the RFQ and explained programming nomenclature.

Sandra explained that, in establishing the Space Program for the project, CSU calculates the types and quantities of spaces, and their areas, by using standard formulae that determine space allocation as a factor of full-time equivalent student enrollment (FTES). Although this is a replacement building, the new spaces provided may not match the existing spaces. The CSU program was updated to reflect Fall 2015 enrollment and it includes additional space to accommodate projected 2021 enrollment.

The notes that follow are from the group discussion (all room numbers reference the Physical Sciences Building unless otherwise noted). See attached PDF’s for Roxanne’s slideshow and user comments overlaid onto the existing Physical Sciences building plans:

- Airgas delivers cylinders thru front door of Physical Sciences via 17-18’ flat bed truck
- Lab technicians should measure current length of shelving and benches

**Chemistry**

- 214 – Second floor stock room, has fume hood and needs prep area, has 12’H shelves
- 214A – acids storage and waste holding
• 312A – Cold room for Biochem, minimal research, liquid nitrogen currently stored inside, freezers inside the cold room currently
• 313 – Main stock room, has fume hood
  o Prep occurs in open area of room and at the 2 thin benches shown on plan
  o Needs space for carts
  o Needs waste accumulation space
• 313A – skylight / vent above – hazardous/reactive and cancer-causing materials storage
• 313B – restrictive storage - copper wire, cocaine, etc.
• 313C – solvent storage, ~1,200 bottles currently
• 315 – gas cylinder storage and CO2 fire extinguishing, CA and NG building systems, acid storage
• Chemistry needs cylinder storage room near instrument room
• EHS picks up once a month from second floor solvent and waste storage room
• Acids and bases could be stored in cabinets
• Both stock rooms have receiving windows for exchange with studs

Physics
• 103 – Main stock room, need DI water, prep carts in the evening for class the next day
• 121 – Electronics, has safety shower, shop soldering
• 121C – chemical storage, acids and bases stored under fume hoods
• 121A – Radioactive storage
• 110 – Long term storage for larger equipment, arc tables, spectrometers
• Advanced Lab uses fume hoods for painting

GEOS
• 223 – Bill’s office and storage, doesn’t use fume hoods
• For GEOS labs, everything is stored in the labs
• Research equipment stored in AJH

Campus Shop
• 102 - Campus shop – Jaydee – fixes equipment, wood and metal work, electronics, needs a fume hood, paint booth would be ideal
• Seperate campus shop in Holt including storage

End of minutes

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- Atmospheric spaces - Classes that open to the outdoors + roof top access
- GEOS = Geology & Environmental Science program
- One teaching lab on Level 1, 4 TL’s on Level 2
- Many GEOS classes/lectures (100+) taught in Ayres
- (5) labs total for GEOS would be adequate
- GEOS is only dept. in program w/ grad dept., needs Research space
- Russ, Chair of Geo couldn’t attend
- Bill to provide list of faculty, FTE’s, tenure
- Security concerns
Teaching Labs
- 119 – General Ed (GE), Lower Div, has rock storage cabinets
- 128 – Atmospheric – grant money, needs to be secure
- 208 – Computational, 12 students, too small
- 220 – Microscopy & Min Lith
- 221 – Geology, Lower Div, heavy use, no glassware
- 225 – Enviro Science, multi-use, could include Enviro Chem
- 236 – GE & Enviro Science, heavy use, needs sinks and DI water

Lower Division
- GE Geology - 24 students, potentially 3 of them, no Fume Hood, full use
- GE Enviro Science - 24 students, no Fume Hood, sinks, full use
- Multi-Use - Instrumentation, Hydrology, Limited Use
- Min / Lith - 24 hr student use

Upper Division Geology

Research Labs
- 116 – lightly used
- 204 – Geology
- 227 – Enviro Science
- 229 – Dirty
- 230 – Enviro Chem, ideally with cold room, 2 fume hoods - acids &. organics

Lab Support
- 112 – rock-cutting and soil shakers, Dean will relocate to Holt
- 116A – storage, lightly used

Offices
- 111, 114, 117, 119A, 204A
- 207 – GEOS office & storage, ideally separate rooms

CPDC Form 204 is outdated – Physical Sciences rooms that have changed:
- 112 – rock room – saws, dirty – not museum
- 205 – Science Ed Office

End of minutes

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- 2016-1202 Physical Science Plans - User Mtg 1 notes.pdf
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The notes that follow are from the group discussion (all room numbers reference the Physical Sciences Building unless otherwise noted). See attached PDF for Roxanne’s slideshow:

- Currently not using mice for Biopsychology but have in the past
- Animal quarters require adjacency w/ related teaching and research labs
- Mice were used in Neuroscience, but not currently
- Animal facility in AJH is in bad condition, not used for animals currently
- Currently offer 3 Neuroscience classes in AJH
- Chico has 57 sub-departments within Psychology – Neuroscience is the most in demand
- All 1,000 Psychology majors must take these 2 classes:
  - Biopsychology - 7 labs, 2x per week, 75 min. ea. – 24 students each, currently in Modoc
  - Learning and Behavior - 6 labs, 2x per week, 75 min. ea. – 24 students each
- Need to add 2-3 labs, currently have a junior year bottleneck

End of minutes
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The notes that follow are from the group discussion (all room numbers reference the Physical Sciences Building unless otherwise noted). See attached PDF’s for Roxanne’s slideshow and user comments overlaid onto the existing Physical Sciences building plans:

- Science Education department established 2010
- Currently teaching 10 sections in Physical Sciences building
- Rely on GEOS for instruments
- Prefers movable furniture rather than fixed
- What does "early teaching experience" look like?
- Need to consider elementary student drop-off and pick-up
- Discussion classes don’t need teaching lab environment, should accommodate 24 students, with marker boards and movable furniture
Physical Sciences
- 205 – Office
- 216 – Hands-On Lab, where elementary school students visit, should have low furniture, movable carpet squares
- 232 - Teaching Lab, 24 students (2-hour sections -- 5 hours per class)
- 236 – Teaching Lab, 24 students, shared with GEOS (4 sections - 1 group lecture + 1 day/week of lab)
- 244 – Storage
- 206 & 232 – use both TL’s when elementary kids visit, 12 CSU students with 15 kids in each TL

Tehama
- 116 - 96 students, Scale-Up (1 section - 2x week 1.15min)
- No time for set-up

Holt
- 291 - Teaching Lab, 24 students (2-hour sections -- 5 hours per class), neither teaching lab nor lecture, can accommodate small and big groups
- 291 - Storage
- 311 – Research, not bench space, collaboration in room and remotely via video, can be shared
- Need for a multi-purpose room

Need from Department
- History of the Department, how many courses, etc.
- Julie to provide list of faculty w/ tenure or tenure tract

End of minutes

If this report does not agree with your records or understanding of this meeting, or if there are any questions, please advise the writer immediately in writing; otherwise we will assume the comments to be correct.

ATTACHMENTS
2016-1201 CSU Chico Science Feasibility - User Workshop #1 slides.pdf
2016-1202 Physical Science Plans - User Mtg 1 notes.pdf
Roxanne explained the scope of the project (feasibility study), the Workplan, and the project goals as determined by the Building and Executive Committees. She showed the CSU Space Program for this project that was included in the RFQ and explained programming nomenclature.

Sandra explained that, in establishing the Space Program for the project, CSU calculates the types and quantities of spaces, and their areas, by using standard formulae that determine space allocation as a factor of full-time equivalent student enrollment (FTES). Although this is a replacement building, the new spaces provided may not match the existing spaces. The CSU program was updated to reflect Fall 2015 enrollment and it includes additional space to accommodate projected 2021 enrollment.

The notes that follow are from the group discussion (all room numbers reference the Physical Sciences Building unless otherwise noted). See attached PDF’s for Roxanne’s slideshow:

- There is a potential synergy between biology and psychology and therefore an opportunity to create a new Neuroscience center including a shared vivarium.

Animals on Campus
- Headhouse = Fish (salmon)
- Holt 327 = Rodents
- Holt 217 = Zebra Fish (research only)
- Modoc 223 = Pigeons
- AJH - Formerly Rodents
  - 108 - Teaching Lab
  - 108F - Rodent Housing
  - 108B - Cage Washer
Psychology
- 1000 students, all required to take courses that use vivarium:
  - Biopsych and Learning + Behavior
- Limitations are in teaching facilities, animal spaces, and available instructors
- Currently at Modoc
  - 221C - Research
  - 223 - Teaching Lab (Learning + Behavior), 24 students: 12 workstations w/ students in pairs
  - 223A – Prep Room, scales, sink
  - 223B – Pigeon Colony Room (accommodates 40 cages - min)
- To move, would need:
  - Teaching Lab
  - Research Space (sim to existing)
  - Vivarium Spaces, slightly larger than current, cage washer, 1 faculty office
- Formerly at AJH:
  - 108 – Teaching Lab, Biopsychology
  - 108M – Prep room and freezer
  - 108G – Cage wash
  - 108H – Rodent holding

Biology
- Only can move animals if science and teaching labs that go with them
- Currently at Holt:
  - 217 – Zebra fish, research only
  - 225 – Teaching Lab, 20 students, Vertebrate Physiology
  - 225A – Lab Support, Prep
  - 259 – Research Labs
  - 259A, B, C – Lab Support
  - 301, 301B, 301I - Research Labs
  - 301A, C, D, E, F, G – Lab Support
  - 301J, H – Faculty offices
  - 327, 327A, 327B, 327C - Animal Facility
    - A = Rat
    - B = Overflow and Morgue
    - C = Mouse
  - 329 - Teaching Lab, 20 Students, 2 students per table
  - 329 A, B, D, E - Lab Support
- Classes taught using animals:
  - Developmental Biology (1)
  - Immunology (x2)
  - Vertebrate Physiology (1)
  - Neurophysiology (1)
- To move, would need:
  - (2) teaching labs
    - Support
  - Research space sim to 259, 301
  - Faculty
- Two Instructors
- Two Researchers
  - Vivarium spaces
    - Existing scale is ok
    - Procedure Room

**Headhouse**
- Only has fish
- Used to have rodents but consolidated in Holt

End of minutes

If this report does not agree with your records or understanding of this meeting, or if there are any questions, please advise the writer immediately in writing; otherwise we will assume the comments to be correct.

**ATTACHMENTS**
- 2016-1201 CSU Chico Science Feasibility - User Workshop #1 slides.pdf
- 2016-1202 Physical Science Plans - User Mtg 1 notes.pdf
Roxanne explained the scope of the project (feasibility study), the Workplan, and the project goals as determined by the Building and Executive Committees. She showed the CSU Space Program for this project that was included in the RFQ and explained programming nomenclature.

Sandra explained that, in establishing the Space Program for the project, CSU calculates the types and quantities of spaces, and their areas, by using standard formulae that determine space allocation as a factor of full-time equivalent student enrollment (FTES). Although this is a replacement building, the new spaces provided may not match the existing spaces. The CSU program was updated to reflect Fall 2015 enrollment and it includes additional space to accommodate projected 2021 enrollment.

The notes that follow are from the group. See attached PDF’s for Roxanne’s slideshow and meeting comments overlaid onto the campus map and Butte Hall Level 4 plan:

**Data Center**
- Currently, tap power from PGE at Central Plant
- North Core + Data Center
- Current area of NOC, Data Center, Staging, and Collocation = 3,500 sf
- Existing offices – North = 2,000 sf, South = 1,700 sf

**Existing Condition = Butte 4th floor**
- 401 = Staging
  - Formerly Operator’s Room
  - New equipment received, unboxed, provisioned
  - Larger than needed but need a storage room
- 401A = Fire suppression system (FM200)
- 401C = Data Center
• Racks for campus services
• UPS (2) - serving both data center + network
• (3) AHU

401D = North Core (NOC)
• All fiber from campus terminates into it
• All copper from north campus terminates into it
• This room is fed from the north campus power grid
• Has network and electronics to support Data Center (switches) in 401C
• (1) AHU

401E = Fire suppression system (FM200)
405 = Co-location
• Other departments house servers here
• (1) AHU

Offices
• Remaining 4th Floor
• North wing = need proximity to data center
• Southeast wing = do not need proximity to data center

Diversity
• Have diversity, but limited redundancy of servers
• Fiber, Telephone, Power - separated between north/south
• In-between = emergency phones, etc.
• Fiber crosses at Physical Sciences and Plumas Bridges

If Siskiyou Site selected
• Need power from north or some other primary dedicated power source different than Merriam
• Transfer fiber (all multi-mode fiber needs to be replaced with single mode)
• Intercept all north buildings copper and fiber into a room to splice in one location (12’x12’ permanent structure over conduit. Need humidity maintenance, but limited cooling.)

If AJH Site selected
• Transfer fiber (all multi-mode fiber needs to be replaced with single mode)
• Intercept all north buildings copper and fiber into a room to splice in one location (12’x12’ permanent structure over conduit)

For either site
• New copper home runs preferred
• New or extended trenches to accommodate conduits
• New 12’ x 12’ (approx.) above grade building near Butte to intercept and splice existing copper and fiber, humidity control required by not AC
• Option to expand size to include NOC, but would need to add UPS, generator, AC, security, etc.

Space Quality
• Raised flooring at Data Center. Raised flooring not required at NOC.
• 10-12’ ceiling height
• Secured via card and camera
• Need 12’ vent racks, cold aisles
End of minutes

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ATTACHMENTS

2016-1201 CSU Chico Science Feasibility - User Workshop #1 slides.pdf
2016-1202 IRES-IT Campus & Data Center plan mark-ups.pdf
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The notes that follow are from the group discussion (all room numbers reference the Physical Sciences Building unless otherwise noted). See attached PDF’s for Roxanne’s slideshow and user comments overlaid onto the existing Physical Sciences building plans:

- Core facility not needed due to the types of equipment and research, could reserve a central space for major instruments, share with Engineering?

Current instrumentation that could be shared
- Microscopes
- Mass Spectrometers
- Tissue Culture Hoods
- Biosafety Cabinets
- Liquid Nitrogen
- Thermocyclers
- Fume Hoods
-80 freezers
-20 freezers
Incubators
Cell Sorter

**Looking ahead**
- Future ICPMS for Geology (needs alcove + clean room)
- Renewal of interest in getting large pieces of equipment via grants
- Maker Space - 3d printers, computers, fume hoods, exhaust
- Hunt Library at NCSU – collaborative spaces, interactive computing, multimedia creation, large-scale visualization tools
- Computer labs that are Interdisciplinary and shared
- Campus shop could be consolidated in a Holt, just needs a satellite 100 SF in the new building

End of minutes

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**ATTACHMENTS**
2016-1201 CSU Chico Science Feasibility - User Workshop #1 slides.pdf
2016-1202 Physical Science Plans - User Mtg 1 notes.pdf
MEETING MINUTES

SmithGroupJJR began with a status update of the Workplan and a recap of the first round of User Meetings / Programming Workshops. The following notes are from the group discussion that followed.

- Sandra pointed out that research lacking in chemistry and physics program
- Science Ed is missing from program, should we move both Physical Sciences and Holt Science Ed spaces to new bldg., or just the Physical Sciences piece?
- Dave H. recommends working with Julie’s Science Ed group when designing the teaching spaces
- Sandra recommends the group takes a deeper dive into potential Neuroscience department
- Sean mentions that the smallest component of vivarium is Biology’s rodents and Psychology’s pigeons plus minimal support spaces, teaching and research labs = 8,000 SF but doesn’t incl. Psychology’s future rodents from AJH. Current program allotment is too small really be a central all-in campus vivarium
- Sandra describes challenges w/ data center (relocating the NOC, need for diversity, etc.)
• President Hutchinson is developing a new strategic plan that will inform a new master plan that should advise where the data center should go
• Core facilities aka “Major Instruments” – redefine as shared or major equipment space
  o Sean suggests creating a space on the ground floor; space to grow into and recruit for
  o Kevin suggests surveying the facility to find out what “major instruments” are needed/desired
• A list of class utilization for each space by time is needed – Steve R. to work w/ registrar’s office
• Potential for combining/sharing computational spaces
• Dave H. mentions that Natural Science generally and Psychology specifically have grown faster on campus than other depts.
• Sandra points out that research and collaborative spaces not in program, so we need to be creative about naming and sharing. For example, research = “student project areas”, collaboration = “scholarly activity”
• Randy points out that some labs are taught until 10pm
• Xueli points out that Physics serves Engineering students – grown 45% in last 5 yrs.
  o “Research” space includes students independent study which is a class activity
• We need a list of all faculty and staff:
  o % full time
  o Tenure track or not
• Sandra mentions we will explore a couple of ways to look at offices – traditional and open/active
  o Dave H. mentions there may be contractual obligations to provide private offices
• Dave H. mentions they plan to hire one more Natural Science faculty to get to 5, which is the minimum size for a dept. Not sure if it makes sense to centralize or distribute

End of minutes

If this report does not agree with your records or understanding of this meeting, or if there are any questions, please advise the writer immediately in writing; otherwise we will assume the comments to be correct.
PROJECT CSU Chico Science Replacement Building Feasibility Study

MEETING DATE 12/13/2016

PROJECT NUMBER 21755.000

MEETING TIME 10:30am

PREPARED BY Jon Riddle

MEETING NUMBER 14

SUBJECT Campus Utility Systems

LOCATION Kendall 109

ATTENDEES

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MEETING MINUTES

Jon Riddle gave an overview of the project scope of work and a review of the topo drawings for each site including known and assumed project boundaries and building setbacks for each.

The following are notes from the discussion:

General Notes

- The Campus turns off the central plant during school breaks (first week of June – 2nd wk. August, Friday – Sunday weekends, and other holiday weeks), so the new building will need a standalone chiller for the data center and vivarium.
- Water all over campus is around 50-70 psi.
- Backflow preventers are needed after each CAL water service connection but not at each building
- Irrigation water comes from a well on campus, just north of the creek and is also used for cooling tower make up water.
- There is currently no water reuse on campus (they have maintenance concerns—but did not elaborate).
- Wastewater is discharged to the city sewer which is treated and discharged to the Sacramento River
- BMS system for campus is Schneider Electric “Structureware” controls system
  - Migrated to Structureware a year ago
- Physical Sciences building is all once – through air including the offices
- Geos and Chemistry should be on sep air system due to smells
• Mechanical controls are run on separate network in buildings, but on the IRES/campus network on the site
• Access controls and fire alarm wiring will be provided via IRES fiber

AJH Site
• Facility services will be accessed from Arcadian Ave
• The neighbors in the neighborhood are very sensitive to disruption from the campus so it will be important to them that noise, visual presence, traffic, etc. be carefully managed
• All utilities appear to be available within a reasonable distance:
  o Steam MH in Arcadian, ~75psi, piping for 150psi, line runs under Modoc, would need to extend north to serve a new building
  o Sewer
  o Domestic Water — Neil requests that we not add new hydrants on separate meters
  o PG&E gas
• There is a need to consider the size of the sewer line at Siskiyou
• In discussion about whether to move utilities out of the street and onto campus property, Sandra warned that doing so may limit campus options in the future
• Sewer easement exists along North property line
• Service and delivery would be better from Arcadian Ave because the state does not own the curb cut at Esplanade. Alternatively, could potentially create (N) curb cut and service route via Gateway Museum parking lot
• 12 KV electric line and 12” chilled water line are east of Modoc
• Gateway museum gets gas from esplanade
• There is natural gas piping in existing building
• Could eliminate PG&E gas meters since campus gets deregulated rate
• AJH served by campus steam
• Gas high pressure main from Esplanade
• Cal Water service from Esplanade
• Currently Gateway Museum is served by AJH – interest in providing separate IT services to Gateway

Siskiyou
• Need to relocate existing 12kv line
• All utilities from the CUP are brought across the creek on the pedestrian bridge and down the pedestrian corridor east of the existing Siskiyou building
• Steam lines at the east side are disconnected but we can connect at that same manhole
• Capture cost for relocation of IT, $200K estimate is to move T-11, probably doesn’t incl. T-114 manhole relocation
• Two IT vaults just east of existing building which contain large amounts of fiber:
  o T-11 vault is maxed out
  o T-11A will have additional work-outs, 6’ x12’ vault

End of minutes

If this report does not agree with your records or understanding of this meeting, or if there are any questions, please advise the writer immediately in writing; otherwise we will assume the comments to be correct.
MEETING MINUTES
Jon started the meeting by giving an overview of the project (see attached PowerPoint). The following are notes from the discussion:

A discussion of the Institute for Sustainability’s Living Lab Program. There are opportunities to do much more than monitoring electrical meters, especially considering the departments that will be housed in this building.

Former CSU Chico President Zingg was an original signatory of Second Nature, a group dedicated to making the principles of sustainability fundamental to every aspect of higher education. Current President Hutchinson wants to continue this legacy at CSU Chico.
- Building should be transparent and it should educate students about how building systems work
- Project should include climate tracking and monitoring

The goals for the project should be aspirational:
- Value over bells and whistles
- Integrate sustainable solutions for the building into the curriculum in a meaningful way
- Building should be climate neutral
- Project should be transparent and educational
- Explore viability of standalone hoods
- Actively search for best management practices/options
- Incorporate passive strategies first, then active strategies to minimize energy use
- The building should be seasonal building
  - Design for expanded comfort w/ demand ventilation
  - Current temperature set point is 68 – 78, explore how this might change with seasons
• What teaching choices can be made to reduce energy?
• Maximize water reuse
• People should want to go to the new building
• Plug load study recommended
• Building should be resilient
• Project should minimize commute emissions; encourage bicycling

Promote wellness
• Maximize natural daylight and views
• Avoid red list materials
• Building should not generate any hazardous materials
• Provide source controls rather than correcting after the fact – net zero waste

Incentivize behavior change
• Sub metering to the room level
• Connect utility meters to on-line dashboard
• Fume hood sashes with controls – incorporate training and tracking to improve habits
• Engage the faculty by laying out scenarios that reduce energy use
• A building that comes with a manual, think about how signage can inform and change attitudes
• People in the building should be operators, not occupants

Minimize impact to Big Chico Creek
• Community uses the creek and watershed for science teaching/learning
• Headwaters reserve is upstream, farm downstream
• Use the project to tell the story of the watershed
• Habitat restoration, reduce erosion and runoff
• Provide permeable site surfaces
• 4000 acre ecological reserve (watershed)
• Chico has a compelling water story to tell

Sustainability targets
• Net Zero everything if possible
• Cal Green (compliance) and beyond
• Set energy target (EUI) goals by department, with stretch goals
• Incorporate Labs 21 best practices
• Compare costs vs. results of ECM’s (energy conservation measures)

General notes
• Use water siphons for vacuum…. Look for alternatives to central vacuum systems
• Occupancy sensors for hoods? Or some similar controls
• Used best practices for everything (labs 21)
• Used of passive technologies (Passive Certification)
• Is this a seasonable building (natural ventilation) – different temperatures (68 deg. winter – 78 deg. summer) – expanded comfort range
• Teaching alternatives to be more sustainable – computer based vs lab base (chemistry). What are the minimum requirements based on Cal-Green
• CU/CSU Energy Goals (~20% better than T24)
• Heating using electricity may not be a viable option due to cost and technology
• Solar PV to reduce demand charges. Maximize solar PV installation
• Maximize self-generation for building (visibility is important)
• Bike parking (counting emissions from commute as part of climate goal)
• Security is an issue (5,000 bike parking spaces on campus, but not many are secured)
• Air station for bikers at current Siskiyou location
• Interested in water reuse for building; reduce erosion, more permeable, etc.
• Minimize the use of water inside the building – how can that be connected to the Chico Water Story?
• Potentially consider water re-use, minimize water usage first. “water ready”
• Ventilation (screens, building pressurizations, demand control ventilation, etc.)
• Smart grids energy storage?
• Prioritize value over cost/price

End of minutes

If this report does not agree with your records or understanding of this meeting, or if there are any questions, please advise the writer immediately in writing; otherwise we will assume the comments to be correct.

ATTACHMENTS 2016-1213 CSU Chico Science Feasibility - Eco Charrette.pdf
Roxanne reviewed the workplan and gave a recap of the user programming meetings and the first town hall. Next, Bill presented the site development options that SGJJR has developed for both the Siskiyou and AJH sites – see attached PDF of the slide show. Lastly, Sandra reviewed the preliminary cost model. The following are notes from the discussion:

- Jim requests SG study a 5-story bldg. at Siskiyou – top floor could be shell
- Jim asks that the team look at construct staging
- Sandra suggests a goal that Siskiyou building connects the campus quad to Warner – Cantilever opt. does this
- Julie requests the footprint area for each option
- Mike points out that crossing Warner is a challenge, likes Cantilever and Courtyard options for Siskiyou
- Sandra doesn’t like how Courtyard option has hard edge at creek – does like how the Rotate option meets the creek
- Dave points out that the geometry of the Rotate option has some precedence in Chico
- Sandra mentions there will be a meeting with the neighbors in January to discuss the AJH site development options
- Dave points out S-Curve option for AJH could step down to minimize scale relative to the neighboring houses
- Sandra points out that service will be a challenge at AJH
- The AJH site is good in terms of its proximity to the Gateway Science Museum and the relative ease of drop off for the visiting K-12 students
• Jim points out master plan doesn’t include the AJH site, Sandra also notes that CEQA review is ongoing for the Siskiyou site, but not the AJH site
• Dave points out that it will be important to design space for community engagement
• All agree the AJH site is too large for this project – it should be broken into smaller parcels

End of minutes

If this report does not agree with your records or understanding of this meeting, or if there are any questions, please advise the writer immediately in writing; otherwise we will assume the comments to be correct.

ATTACHMENTS 2016-1214 CSU Chico Science Feasibility - Site Meeting #1.pdf
Roxanne gave an update of the Workplan and a recap of the programming process so far. She explained that the space program has been updated since the previous Programming Workshop to reflect comments and to better align with current space usage (see attached). Roxanne and Jon presented a matrix and colored floor plans (see attached) that reflected the actual current usage in the Physical Science Building as compared to the CSU baseline program. Sean presented draft Room Diagrams (see attached) that reflect the information received so far. The following are comments from the discussion:

- Fall 2011 - Fall 2015 -- Increases FTE 25%
- Serving a broad student population
- Distinction between lower + upper divisions
- 108 - Advanced electronics lab
- 121A - dedicated radiation storage

Teaching Lab
- Lower Division
  - Traditional Teaching Lab
    - 24 Students
  - Studio Physics
    - Scale-Up
    - Tehama 116 - good example of Scale Up. Starboard
    - Two x 48 students
- Upper Division
  - Optics Lab
    - Equipment driven
    - Laser Tables
Meeting

www.smithgroupjjr.com

• 16 students
• Envision 24 students
• (4) darkable zones
  ○ Advanced & Electronics
    • Electronic Benches with room for 16-20 with many outlets
    • Storage
    • Alternating semesters between electronics and advanced labs
    • Envision 24 students
  ○ Independent Study
  ○ Computational Lab
    • Computing capacity -- flag for David Hassenzahl/Sandra

Research
• 123, 121B - good size research space for faculty

Jon’s notes:
• 104, 105, 106, 108 – LD Classrooms (4)
• Eric Wassinger, Chem 160 Studs – requests a scale up classroom
• 8 – 10pm lecture
• 8 – 5pm Teach labs
• Physics: doesn’t like face forward skating for studio, pref. the 2 next to each other w/ sliding glass doors btwn
• Would like every wall to be a teaching wall
• Put white boards on racks of the cabs
• P.03 – adv electronics – keep to 3 mods plus (2) ½ mod. Instrument rms. (P.08)
• P.01 GE Classroom – 3 mods works fine
• P.04 also works as 3 mods and (2) P.08 instrum. rm.
• P.06 comput. could be 3 mods too > 24 studs
• P.07 equip. stok needs 54"w door and a half x 2 ea. rm
• Need another space for SPS – student collab. “Club Room” SPS = society of phys. studs.
• P.09 – Fac Stud proj – should be 2 mod space, could have shared tutoring center w/ disc but desire a sep sps room – possible?
• P.08 inst (2) adv elec optics
• Send room diagrams

End of minutes

If this report does not agree with your records or understanding of this meeting, or if there are any questions, please advise the writer immediately in writing; otherwise we will assume the comments to be correct.

ATTACHMENTS
PGM 2016-1214 CSUC 21755 Space Program_CSU Standard.pdf
2016-1214 CSUC User Workshop #2 - RFD Room Diagrams.pdf
2016-1214 Physical Science Plans - corrected per User Mtg 1 comments.pdf
2016-1213 CH SiskiyouII CPDC 2-4Rev082616 - Compare Baseline & Existing.pdf
MEETING MINUTES

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Science Education department founded 7 years ago

- Room 232, Gen Storage 244 south of Elevator
- Share 236 with GEOS (4 sections of 24 - one group lecture + 1/day week of lab)
- Teach 10 sections
- Rely on Environmental Sciences + Geology for instruments / questions

- Physical Sciences
  - (1) Teaching Lab - 24 students (2-hour sections -- 5 hours per class)
  - Storage
  - (1) Teaching Lab - Share with GEOS

- Tehama
  - 116 - 96 students (1 section - 2x week 1.15min)
  - No time for set-up

- Holt
  - (1) Teaching Lab - 24 students (2-hour sections -- 5 hours per class) - Room 291
Meeting Notes

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- Storage
- Research - Room 311 (Not bench space)
- Need for a multi-purpose room

- Basement of Mariam (Library) - technology + resources
- Want to bring elementary students to class -- friendly for kids
- What does "early teaching experience" look like? Typically bring 30 elementary students. Total = 24 + 30.
- Need to consider elementary student drop-off

Need from Department
- History of the Department
- Staff

Jon’s notes:
- Lisa – Chem BD – part of Chemistry dept but ED., Julia
- Holt 291 TL, also 3 MODs, (1) storage wall, mov. Tasks
- Science ed ok w/ scale up C.R. being interdisc
- Science ed also would like the (2) studio rooms to be adj and able to open to each other
  - 2 rooms @ 48 = (1) @ 96
- Movable walls don’t work well acoustically
  - Can’t afford sky fold/skywall probably
- Every table has (2) monitors – (2) groups @ 4 ea
- Prefer rounded tables for better group conversation
- Gen chem – lecture – 60 studs – 98 stud currently in arts and humanities
- Can scale up room accom 48 phys or 60 sci ed
- Sci ed could work w/ movable tables but not ideal
- In lieu of screens, could have white boards, room could have wall hangers for personalized white boards
- Sci ed doesn’t need 98 capacity (physics does)
- Storage in the classrooms is key bc don’t currently have dedicated room, like the 2 mod ded stor
- If movable tables in TLs – how to accom the stor below table currently? If acco via movable stor containers used, prep time/schedule req’d
- Stream table: 30”w x 8’L on wheels, need space for it
- TL’s – prefer teaching walls all around not just at front
- Likes sinks on both walls
- TL could have stor on one wall, other opp wall could be ___ bds, temp cart stor, etc.
- Julie says it doesn’t work to share TL w/ physics bc sci ed too dirty
  - Geos TL could work w/ movable tables
  - (2) 3 MODs TL’s and (1) 2 MODs stor would work
  - Faculty –stud project space needs to have privacy
  - Prefers meeting area to back room to accom 8-10 people
  - Research space – actually is a conf rm
  - Like privacy – visual and audio w/ video and white boards
  - Could be smaller than 2 mods, fewer work stations

End of minutes
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- 2 classes every Psychology major must take:
  1. Learning and behavior
  2. Biopsych
- Neurosciences:
  1. Animal housing
  2. Research
  3. Exam
  4. Tissue/prep
- 108 – TL and res
- 108M – Behav and Frz
- 1084 – Rats
- 108J – Off
- 108I – Stor and elec panel
- 108 P + N – Labe – (2) hoods – animal and chems
- 108G – Cage wash
- 108L – Frt, ref, stor – on gen
- 108F – Mice
- B, C, D, E, O – Biopsych
• 108K - Mech
• 108 P + N – Res
• 108Q – Waste
• 108T – Tech off
• 108I – Stor and ___

• Neurosciences incl: these sub groups:
  1. Cognitive and perception – 219/221 Modoc
  2. Behavior and learning
  3. Biopsychology
  4. Neurosciences

• What animal facility incl min:
  1. Housing animal – mice and rats – incl bedding and feed
  2. Behavior test rm – water mice, video capture
  3. Procedure for ea. species
  4. Cage wash – shared
  5. Prep rm – sink, weighing, frc.

• Penel Res:
  • (1) TL showered w/ Mike, Biological Psychology – 7 specs @ 24 studs
  • (1) large ewc, fridge, 2 F.H.’s
  • (2) chem hoods, microscopes, cryostats
  • Equipment rooms
  • (6) small rooms sup biopsych T.L.’s: psychophysiology for students: desk with 3 people. Self contained, interview rooms

• Lind to send faculty
  • 200 mice – 4 per cage – shoe box
  • 300 rats – 4 per cage

• 12 operant conditioning ______ in 223 – 24 studs

• Has wiremold on wall w/ switches for eqpt
• Needs teaching wall – M. BDS and projection
• Penelope to send eqpt room reqmts to Linda
• Bman and Martin – 219 – Sub rms, cognition
• Patrick – also pigeon res.
• Learning 219F and 221A and behavior analy
• Mike – Psych researcher
  • Can secure donor $
  • MRI possible? – currently pays to use Stanford’s MRI eqpt

• Could the 6 interview rms incl a smaller control room with 1-way glass to a bigger participant room?
• Electronics in control room
• 6-8 in participant room
• Pigeons: accom 64 pigeons, 1 per cage, racks w/ 8 cages each
• Schedule Webex 1/19

End of minutes
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Need 215 Stations

- C.01 – Inorganic. Small – 3 mods. U.D. 3 hoods – integrated
- Could reach a small GE lab in
- Try (2) + (@) – save 1 mod
- (2) C.03 – org. small – 3 mods – 16 studs
- (1) C.04 – org large – 4 mods – 22 studs
  - Prefer C.03 version w/ F.H.’s away from windows/not blocking
  - Saved (1) mod by
- (1) C.05 – Biochemistry – small – 16 studs – add – 20 – 60 FRL, could be in adj. stor. and instrum.
- (0) C.06 – Biochemistry – large
- Organic – needs (1) locker per stud. and biochemistry
  - Large org – 4 studs per F. H. + 2 F.H.
- C.07 – Central prep – off to accommodate 3 tech stations
- C.08 – Sat. prep
  - Add sink to island
• Solvent storage rm.
  • (1) C.09 – Instrumentation. Room 3 mods – add 2nd door
  • (2) C.10 – NMR – ½ mods.
  • C.11 – Res lab – 2 mods ea. min. – 6 mods total, target is 8 total
    o Org prefers 8’ F.H.
  • Lisa – Res space – 2 offices w/ interview space incl. video and audio, don’t need observation but need confidential storage and privacy. Could share interview space (1 or 2 offices)
  • Org res – (2) 6’ F.H.s per mod.
    o Assigned 3 studs per res. Module
    o In lieu of cold room provide deli cases
    o Need space for refrigerators

End of minutes

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Data Center
Currently, tap power from PGE at Central Plant
North Core + Data Center

Existing Condition = Butte
- 401D = North Core (NOC)
  - All fiber from campus terminates into it
  - All copper from north campus terminates into it
  - This room is fed from the north campus power grid
  - Has network and electronics to support Data Center (switches) in 401C
  - (1) AHU
- 401E = Fire suppression system (FM200)
- 401C = Data Center
  - Racks for campus services
  - UPS (2) - serving both data center + network
  - (3) AHU
- 401 = Staging
  - Formerly Operator’s Room
  - New equipment received, unboxed, provisioned
o Larger than needed but need a storage room
- 401A = Fire suppression system (FM200)
- 405 = Co-location
  o Other departments house servers
  o (1) AHU
- Offices
  o Remaining 4th Floor
  o North wing = need proximity to data center
  o Southeast wing = do not need proximity to data center

Diversity
- Currently have diversity, but limited redundancy of servers
- Fiber, Telephone, Power - separated between north/south
- In-between = emergency phones, etc.
- Fiber crosses at Physical Sciences and Plumas Bridges

Siskiyou
- Provide redundant power required
- Transfer fiber (all multi-mode fiber needs to be replaced with single mode)
- Intercept all north buildings copper and fiber into a room to splice in one location (12'x12' permanent structure over conduit. Need humidity maintenance, but limited cooling.)

AJH
- Transfer fiber (all multi-mode fiber needs to be replaced with single mode)
- Intercept all north buildings copper and fiber into a room to splice in one location (12'x12' permanent structure over conduit)

Space Quality
- Raised flooring at Data Center. Raised flooring not required at NOC.
- 10-12' ceiling height

End of minutes

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Lower Division
- **GE Geology lab**
  - 24 student labs
  - Potentially 3 of them
  - No Fume Hood
  - Full use
- **GE Environmental Science**
  - No Fume Hood
  - Sinks
  - 24 students
  - Full use
- **Multi-Use**
  - Instrumentation
  - Hydrology
  - Limited Use
• Min / Lith  
  ○ 24 hr student use  
• Upper Division Geology  
• Only program with grad research  

• Atmospheric spaces - Classes that open to the outdoors + roof top access  
• Computational - where are those spaces  
• Dean Dave wants Room 112 - rock-cutting to be in Holt.

Jon's notes:  
• G.01 – GE large – don’t need break out, do need adj stor  
• G.01 – GE small  
• G.02 – multi-use large  
• G.02 – M-N small  
• G.03 – 1 –up div Geology – movable  
• 1 –up div Minerology, g.04 – env chem  
• Move to chem group or interdisc  
• Need adj stud break out (1/2 mod) and prep (1/2 mod)  
• G.05 – equip stor – 1 mods  
• G.07 – Rock prep – 2 mods – thin section  
• G.08 & G.09 – research – 3 mods  
• G.10 – env chem res – 2 mods  
  1. Should integrate w/ chem and use their labs if possible  
• Geology ___ one need for prep rooms then chem and phys bc they have central stor  
• Geology is used to smaller 945 sf TL’s now movable tables preferred  
• Need to add up div env sci TL  
• Currently have 5 TL’s – enviro chem taught in one of the 5  
• Research – 6 categories  
  1. Dirty applied ecology  
  2. Env chem  
  3. Atmosph/optical  
  4. Microscopy  
  5. Multi-use/comp  
  6. Furnace room 100sf 1/3 mod  
• Would like a place to store field eqpt near vehicular entr  
• Every grad stud should have space/work stn  
• They have 24 grad studs, TA’s are grad studs that teach  

End of minutes  

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Meeting Notes

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PROJECT CSU Chico Science Replacement Building Feasibility Study

MEETING DATE 12/15/2016

PROJECT NUMBER 21755.000

MEETING TIME 11:00am

PREPARED BY Jon Riddle

MEETING NUMBER 23

SUBJECT Programming Workshop 2 – Vivarium

LOCATION Kendall 109

ATTENDEES

<table>
<thead>
<tr>
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Animals on Campus

- Headhouse Fish
- Holdt 327 = Rodents
- Holdt 217 = Zebra Fish (research only)
- Modoc = Pigeons
- AJH - Formerly Rodents
  - 108 - Teaching Lab
  - 108F - Rodent Housing
  - 108B - Cage Washer
  - 108H - Rat Colony

Psychology

- 1000 students
- Biopsych and Learning + Behavior are mandatory -- some students take in senior year
- Limitations are in teaching facilities, animal spaces, and available instructors
- Currently at Modoc
  - 223 - Teaching Lab (Learning + Behavior)
  - 223A - Scales, sink
223B - Colony Room (accommodates 40 cages - min)
221C - Research

To move, would need:
- Teaching Lab
- Research Space (sim to existing)
- Vivarium Spaces
  - Slightly larger than current
  - Cage Washer
- Faculty
  - 1 Faculty Office

Biology
- Only can move animals if science and teaching labs that go with them
- Either you move Biology or you don't
- Currently at Holdt
  - 329 Teaching Lab (20 Students)
  - 329 D, E - Lab Support
  - 225 - Vertebrate Physiology (20 Students)
  - 225A - Vertebrate Phys Prep
  - 259, 259A, B, C - Research Space
  - 301 Suite - Research Space
  - 327, 327A, 327B, 327C - Animal Facility
    - C = Mouse
    - B = Overflow = Morgue
    - A = Rat
- Classes taught using animals:
  - Developmental Biology (1)
  - Immunology (x2)
  - Vertebrate Physiology (1)
  - Neurophysiology (1)
- To move, would need
  - (2) teaching labs
    - Support
  - Research space sim to 259, 301
  - Faculty
    - Two Instructors
    - Two Researchers
  - Vivarium spaces
    - Existing scale is ok
    - Procedure Room

Headhouse
- Only has fish
- Used to have rodents but consolidated in Holdt

AJH
- Use to house rodents
Jon’s notes:

- Re-label colored plans: vivarium/assoc spaces vivarium cluster – institute for neuroscience
- Teaching labs could both be 3 mods ea.
- TLI – vert physiology – animals in - dissections, could accom neurophysiology but need add’l sup rooms
  - Cell culture rooms – 3 rms @ 1/3 ea., 2 cell cult – 1 prep, 225A Holt: could be smaller
- Shared TL for biology accom both vert. physiology and neurophysiology
- 1,063 SF TL currently, BSL2, need 6’ biosafety cab, sinks
- Bio res lab – 2 mods needs small inner rm for lab eqpt
- Need to be able to roll out animal racks and hose off floor or holding areas. Need space for temp racks
- Other disciplines potentially assoc w/ neuroscience
  - AI – computer science
  - Philosophy of the mind (Philosophy dept)
  - Teach/res lab for piegeons – ideally a table w/ greater than STO depth for tables, 200 v DC power req’d
  - Windows are inconvenient for pigeon TL/res lab

End of minutes

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Shared Instrumentation
- Mass Spectrometers
- Tissue Culture Hoods
- BSC
- Fume Hoods
- -80 freezers
- Cell Sorter
- ICPMS - in Geology (needs alcove + clean room)
- Renewal of interest in getting large pieces of equipment via grants
- Maker space - 3d printers, basic computers, fume hood, exhaust
- Hunt Library

Jon's Notes:
- EHS, UPD, FM
- Marvin, EHS, John, PD
- Siskiyou – closer to E parking
• Crime prevention and public safety thru active design, security card access, crime prevention thru ___ design
• Exter lighting, secure windows
• Prickly landscaping
• High transient population near park/ajh
• Creek boundaries
• Deliveries on campus via pickup or elec vehicle direct to stock rm
• EHS picks up waste, 90-day tsds stok waste, contractor picks up from there
  o At day 70 of 90 day cycle, EHS contacts phys sci, requests lists of wastes then sched pick up
• Vivarium – animal waste goes autoclave then to landfill
• John would prefer to see bldg. @ Siskiyou and so would Marvin
  o John concerned about children of daycare ctr w/ proximity to potential hazmat issues
• Broad scope c-license for chemicals
• Marvin concerned about rad stor
• Most rad stok in Holt
• Open campus – use proxy cards & CCTV
• Chemical inventory tracked by dept – no maq’s bc never been managed
  o Will have scanning/tracking mech for chemicals
• Jim - secured bike parking – fenced and card access
  o Dr. Aynes
  o Sandra recommends this becomes a master plan issue
  o Biggest crime on campus is bike theft
• Active shooter concern
• John likes how 3D rotate gets close to ivy, remove trees well-lit
• Sandra mentions PGE util might move below ___/ivy
• Marvin – don’t need loading dock if receiving at lvl 1 and sep from front door
• Gateway service from esplanade
• Modoc from Arcadia

End of minutes

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Roxanne gave a recap of User Programming Workshop #2.

Dean Hassenzahl requested that the faculty consider how emerging teaching pedagogies might require new and different teaching spaces and/or technologies. He pointed out that so far the process has been to understand how they teach today in their current Physical Science Building spaces, but more thought needs to be put into how they will teach into the future so that the new building will accommodate future teaching styles.

End of minutes

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**PROJECT**
CSU Chico Science Replacement Building Feasibility Study

**MEETING DATE**
1/11/2017

**PROJECT NUMBER**
21755.000

**MEETING TIME**
3:00pm

**PREPARED BY**
Jon Riddle

**MEETING NUMBER**
26

**SUBJECT**
Programming Workshop 2a – Vivarium, Biology All-In

**LOCATION**
WebEx

**ATTENDEES**

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**MEETING MINUTES**

All-In Vivarium, spaces for Biology:
- 5 total Cellular/Molecular Biology faculty today
- Refer to as Cellular / Molecular Biology rather than Biology Neuroscience
- Approx. 5% of Biology faculty are associated with animal facility
- 42:1 Student: Faculty ratio in Cellular / Molecular Biology currently
- Ideal ratio would be 20:1, so double the amount of Faculty to accommodate growth for *department*
- Biology group to discuss internally and confirm the amount of growth to plan for

Types of Animals (Vertebrate only)
- Rats – plan for 100 Biology, need to also accommodate Psychology
- Mice – plan for 200 Biology, need to also accommodate Psychology
- Fish, two distinct set-ups:
  - Fresh/Brackish Water (Zebra, Japanese Rice Fish, Guppies), 260 SF, for 2 faculty.
  - Fresh to Salt Water (Salmon), 314 SF currently, very compact, should be bigger
- Pigeons
- Frogs
- Invertebrate excluded (earthworms and cockroaches)

Capacity
- Currently 2 racks Zebra fish, would like to plan for 6 racks
- Currently Salmon in Headhouse, fish in tanks and trays, Steve to provide plans (recently installed equipment), duplicate current capacity, no growth anticipated
- Currently 40 cages Pigeons, no growth factor yet applied – question for Psychology
- 100 frogs per semester currently used, ordered for use, housed for 5 weeks, 20 at a time, but not bred, live for 5 days
7 Biology Courses Taught that need proximity to Vivarium:
- Immunology
- Developmental Biology
- Cell Biology
- Advanced Physiology & Cell Biology
- Vertebrate Physiology
- Neurophysiology
- Principles of Physiology and Development

Accommodated in 4 different Teaching Labs
- 945 SF each adequate

Research
- 3 Shared Research Labs would suffice
- 1 Module per faculty needed, 315 SF each

End of minutes

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ATTACHMENTS  PGM 2017-0105 CSUC 21755 Space Program_Add 3.pdf
**MEETING MINUTES**

SGJJR team gave a brief update of the Workplan and the progress made so far for the Feasibility Study. Next SGJJR gave a recap of the Project Goals, the Town Hall Meeting (Dec 3), the Site Development Meeting (Dec. 14) and the User Programming Workshop #2 (Dec 14-15). Included in SGJJR’s presentation was an overview of the 5 massing options studied for the Siskiyou site and the 3 massing options studied for the AJH site. Also presented were a range of 6 scenarios for the Space Program, ranging from the CSU Baseline to an All-In Program that captured all of the spaces requested so far. Roxanne (RM) explained that the goal of the meeting was to close as many doors (i.e. make as many decisions) as the Building Committee was comfortable doing, so that the remaining feasibility study efforts could proceed effectively.

**Siskiyou Site**
- Dean Hassenzahl (DH) points out the new Science center for campus can’t exist around Siskiyou
- President Hutchinson (GH) would like to not lose spot in Chancellor’s queue for funding; DH agrees this is of utmost importance
- GH also points out that the money that has been approved by the Chancellor’s office will go further at the Siskiyou site since it is more compact and therefore less expensive to develop
- **Siskiyou site is confirmed**

**AJH Site**
- Trinity, Holt, AJH could become Science core and have space remaining at the AJH site to build an additional future science building (~40 years)
- Sandra points out that cost model indicates building the same building at AJH will cost more
- Gayle mentions that decanting the child care center would be challenging
Program
- Sandra explains the Science Ed component needs further refinement
- Dean says CSU space allocation formulas don't reflect how we teach today
- Sandra points out that Natural Sciences FTES growth has significantly exceeded the projections
- Need to balance Research, which CSU doesn't provide for but is necessary for RTP (faculty retention and promotion), with the Teaching Labs
- Chemistry also wants to have an active learning / interdisciplinary classroom. Randy says this can't be shared due to the need to swap out materials used for teaching
- Data Center is out; Science Ed is in - pending confirmation with Chancellor's office negotiation on Thursday 1/19/2017
- Gayle recommends not calling program scenario "Right-Size" but instead "Minimum"
- Around 50% faculty tenure-track; Chancellor's goal is 75% - this suggests more private offices potentially
- The 133K "Add Growth & Flexibility" version is the preferred scenario
- Neuroscience department including vivarium and Psychology + Biology teaching labs, research and private offices should be in the program

Massing
- Consensus that 153K GSF is too big for Siskiyou site
- Sandra suggests 125K GSF +/- is the appropriate upper limit for GSF at Siskiyou

Outstanding
- Dean wants to understand quantity of faculty offices per Department
- GEOS - can't share their spaces, coupled with lower enrollment means lower than 70% efficiency. They don't serve other depts. like Chemistry and Physics
- Need to look at utilization of Interdisciplinary lecture and active learning classrooms
- Need more detail about the Vivarium +
- Sandra suggests the Right-Size Vivarium, but leaving the non-neuroscience vivarium and teaching labs in Holt; also moving the salmon from the Headhouse to Holt
- Steve suggests taking all of Science Ed, from Holt and Physical Sciences, to new building. Roxanne explains the 4,000 ASF in the program accommodates it all
- Conversation about open office vs. traditional private offices
- Need to validate amount of private offices in Growth
- Warm Shell vs Full Build-Out with respect to construction cost - Gayle interested in maximum build-out with some shell space

Cost
- Gayle requests shell scenario
- Gayle asks for Chancellor's office to help pay for the escalation increase and increase in FTES; the school Chico to pay for some increase too
- Sandra mentions the state bonds will sell in Feb, meeting with Chancellor's office this Thursday
- Environmental assessment starts this Friday with Chico's consultant - will ask them to evaluate for a 135K max potential build-out
- Roxanne mentions that options/doors need to be closed by 2/14 final meeting

End of minutes
If this report does not agree with your records or understanding of this meeting, or if there are any questions, please advise the writer immediately in writing; otherwise we will assume the comments to be correct.

ATTACHMENTS 2017-0117 Critical Decisions Meeting.pdf
MEETING MINUTES

Adjacencies
- If Chemistry needs to occur on two floors, are there potential synergies with other depts?
  - Ideally Chemistry would be on one floor, but Steve points out this makes future growth and contraction is difficult
- If Chemistry needs to occur on two floors, what would be a logical split in terms of spaces?
  - Option 1 Lower level, non-major labs:
    - Inorg large 111
    - Inorg large 111
    - Satellite prep/storage
  - Option 2 Lower level:
    - Inorg large 111
    - Inorg large 111
    - Inorg large 112
    - Inorg large 107
    - Satellite prep/storage
  - It would be ideal if the labs above are butted up next to each other with glass sliders between to provide connectivity (similar to studio labs)
  - Sean to explore a version of Chemistry dept that has a variation with studio teaching labs
- Would be ideal if Special Instruction spaces were directly adjacent to the related Teaching Lab so students could flow from one to the other
- Is there a preference what floor Chemistry is on?
  - Having multiple departments on one floor can foster collaboration
- What is the relationship of research labs to other spaces?
- What is the relationship of offices to other spaces?
○ Feel strongly permanent faculty should have private office (private research grant conversation, emotional student conversation)
○ Don’t like the way the Arts building does offices - staff complain. Student traffic can be disruptive, concern about merging the dept offices
○ Receptionist currently does multiple things, not just reception, and each dept has their own
  • Sandra suggests an automated directory in lieu of receptionists
  • Randy points out that Chemistry serves 1,500 students, many students come and go, important to maintain personal relationship
○ Should offices be dispersed?
  • Like offices clustered near student collab, connecting stair and on the same floor with the labs, equally distributed
  • Don’t like offices on different floor
  • Would like Special Instruction adjacent to the faculty office - more collab potential
○ Sandra explains there are ways to address these concerns without private office, Advantages include:
  • Save space overall
  • Lockable cabinets
  • Executive committee discussion
○ Randy points out that moving to open office is a huge culture shift
  • Need time to understand
  • Where do the books go?
    • Steve points out that intro Chemistry is highly used and could be on ground floor rather than Science Ed, in that case, ideally the remaining Chemistry would go on Level 2 for proximity

Room Data/Utilities
• Design team to share Sean’s matrix, Randy’s group to confirm/edit the highlighted cells, Design team to match room names to room diagrams, Design team to provide instructions… solid dots = need
• Blane says they use steam in many of their teaching labs. Sean mentions he hasn’t installed a steam system in 15 years. Sandra points out this is expensive infrastructure
• Should N2 be distributed or via cylinders
• Chemistry has a lot of refrigerators that would ideally be on standby/generator, organic compounds that could become dangerous if power lost. We are not proposing UPS system for the building - Standby will have a temporary power loss.
• Local owner-furnished UPS for the NMR
• Communications will be discussed more with the AV group
• NMR and Instrument rooms may require different temperature setpoints
• Room finishes will be filled in by design team
• Departments to identify any rooms that need temp control 365/24 days/hours

General Notes
• Where does research equipment storage happen (incl. fridges and freezers)? Room diagrams show pink rectangles - equipment storage allotment
• Reducing from 2,800 to 1,800 sf of central storage/prep - concerned there may not be enough storage
• Sean mentions that we keep the support to lab ratio in alignment with other teaching lab facilities
• Roxanne explains that research space is now labeled “special instructional” and included in the Teaching Lab category
• Roxanne explains that Shared Support is for conference rooms, lactation rooms, etc - can’t be used for department program
• Randy asks about the cylinder storage, loading dock, etc ocurs - Roxanne explains they are in Shared Support. Where will they occur in the plans?
• Roxanne requests the utilization spreadsheet has course numbers in lieu of X's
• Randy mentions that the College is putting together a list of requests, including club/study rooms for each department

End of minutes

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ATTACHMENTS
Meeting Notes

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PROJECT CSU Chico Science Replacement Building Feasibility Study

MEETING DATE 1/24/2017

PROJECT NUMBER 21755.000
MEETING TIME 1:15pm

PREPARED BY Jon Riddle
MEETING NUMBER 29

SUBJECT Programming Workshop 3 – Geology and Environmental Sciences
LOCATION Kendall 109

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MEETING MINUTES

Utilization Worksheets

- PPT shows (5) teaching labs, since program includes only (3) teaching labs, drop the (2) TL's on the left (Lower Div) which will be easier to teach in another building on campus since less equipment
- GEOS is the only dept that teaches lectures in the building, 96 and 192 students
- Per Dave, lecture rooms should be in multiples of 24 students since they feed into the labs better
- Russell suggests providing teaching labs in lieu of the (2) 84 student Lecture rooms, provide instead (3) 24-seat Teaching Labs (2 for GEOS Lower Div and 1 for Sci Ed) - to be Interdisciplinary

Adjacencies

- Need loading dock access, proximity to service elevators
- Need storage for field equipment near loading dock
- No concerns about being adjacent to any other dept, would be nice to be in same building
- No value to be adjacent to other depts
- Ideally on one floor - having classrooms on different floors from stockroom would be a challenge
- Lower Div TL's could be self-contained with 1/2 module storage/prep
- GEOS has a lot of commonality with Sci Ed, their classes currently taught in GEOS TL's
- Could be beneficial to use some Chem labs, GEOS is collaborative - works with all other science depts
- Instrumentation ideally on first floor, mass spec, electronic imaging, microscopy
- Some dirty prep spaces should be near loading dock

Offices...
• Some prefer offices to be close to the TL’s, Russel prefers his office to be removed
• Critical for ASC to be adjacent to Dept Chair
• Dept Chair doesn't need to be near Faculty offices
• Faculty offices should be adjacent to Research
• Faculty offices should ideally be removed from TL's for noise separation
• Univ of Utah science building works well per Russel, really considers how students walk through the building
• GEOS club is a tutoring room - ideally close to Teaching Labs
• Reception is typically by the ASC plus a full-time student position
• Concern with sharing department reception is how to direct student flow, but open to alternate approaches

Room Data/Utilities
• RFD to update the room names on the Room Data matrix, then share with GEOS for review and comment
• GEOS doesn’t use natural gas in their labs
• Dirty rock prep might need a floor drain

Additional Spaces
• Larger reach-in refrigerators for big environmental samples (e.g. stormwater samples)

End of minutes

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MEETING MINUTES

Roxanne gives an overview of the project and progress made so far.

How does the campus work?

- Would like to treat the lab spaces similar to other teaching/classroom spaces (i.e. not a lower level of technology)
- Sandra likes ZGF building in San Diego - offices have loveseat with monitor on the wall - allows for collaboration around a screen
- Historically 3 types of smart classroom, based on size, dictated screen size
- Recent years heading towards more scale-up / active learning
  - 4 displays
  - Touch displays
  - Movable furniture
- More recently
  - Allowing faculty to move, not tethered to podium (Tehama 116, 120 students)
  - Will use Extron device with iPad controller
- Even Chemistry, which has fume hoods, looking to incorporate more technology and flexibility in TL’s
- Increased need for power and data at the floors
  - Sandra asks if that’s needed - could have rapid recharge lockable stations
  - Explains that power is needed for the monitors at the tables
- Standards documentation is out of date
  - Sandra explains we would like to work with them to develop the new standards
- Skeptical about the low-profile wiremold that gets installed below carpet
- Brent and Mike designers, Cale is more involved with pathways and details
- They update div 27 after each project on campus to capture the latest technology used
- Brent asks what we are looking for from campus standards:
  - Looking for general style guidelines for
• Scale-up rooms, narrative not make/model
• Teaching labs
• Conference rooms, audio/video conferencing capability
• Classrooms with conferencing capability?
  ○ Sandra explains that course capture can get quite expensive
    • Brent suggests putting in the infrastructure for course capture (one camera per room), pipe needed but not necessarily the wiring, so it can be easily added later
    • Mike mentions they are doing it via software not hardware which saves money
• Roxanne mentions that we have a couple scale-up classrooms, but 25 +/- teaching labs, so easier to do the scale-up rooms correctly
• CMT to set performance levels for the room types, Salter to describe room requirements in detail
• Cale mentions that Salter did AV for the Arts & Humanities, but they didn't communicate with CMT
• JR to send room diagrams to Salter and CMT - space list with quantities and typical room diagrams
• David to organize the call with Salter and CMT
• Sandra mentions we probably won't have money for screens everywhere, so some combination of marker boards (e.g. glass partition) and screens
• Sandra mentions one goal of the project is transparency and "science on display"
• See TIP guidelines for office requirements, quantity of data outlets - ideally identify double occupant offices

End of minutes

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MEETING MINUTES
Sam - lead at Central Shipping and Receiving - 95% of everything that comes on campus they receive
- Central Receiving - 940 W First St
- Vans and electric carts for deliveries of small to large items
- FMS movers handle really large items, e.g. crates that weight 600 lbs
- Campus allows Airgas to make direct deliveries
- Sean explains we anticipate double doors at loading/receiving
- Central Receiving receives animals and delivers them, directly to the lab in the case of animals
- Central delivers direct to labs
- Airgas currently enters the Physical Sciences building
- Moving and Airgas may need a staging area, but Central does not
- Dept of Enviro Health and Safety picks up all hazardous storage
- Never enough storage
- Rad storage for Physics - picked up and processed by EHS, then hands off to Central for pick-up by vendors
- Mail is delivered by mail services dept that Dale oversees to each Dept - the depts then deliver internally to their faculty. Currently no mail rooms in buildings on campus
- Don't need a loading dock, but need parking for delivery vehicles, more than one at a time:
  - Custodians
  - Mail delivery
  - Shipping delivery
  - Maintenance
- Campus frowns on big trucks on campus, so we won't plan for an 18-wheeler to back-up to the building, but some space for a truck to pull-over and unload
- Should plan for a van turn-out for deliveries and for GEOS to pick-up students and field equipment
- There's a barrier arm where the service road meets Waller/Ivy
- Don't need charging stations for electric vehicles
- AS - Associated Students does recycling
End of minutes

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ATTACHMENTS
Meeting Notes

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PROJECT CSU Chico Science Replacement Building Feasibility Study
MEETING DATE 1/25/2017

PROJECT NUMBER 21755.000 MEETING TIME 8:00am

PREPARED BY Jon Riddle MEETING NUMBER 32

SUBJECT Programming Workshop 3 – Science Education LOCATION Kendall 109

ATTENDEES

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MEETING MINUTES

Utilization Worksheets
- Julie provides a new/updated utilization worksheet with additional Teaching Labs requested
- Science Ed teaching currently in 3 Teaching Labs:
  - 232 Phys Sci Bldg
  - 236 Phys Sci Bldg (shared with GEOS)
  - 291 Holt (has storage in room 266A Holt)
- Sandra suggests two options for including Science Ed:
  - Options 1 - move all Science Ed spaces to new building
  - Option 2 - move the Science Ed spaces except keep the spaces that currently use the Biology stock room in Holt (291 Holt Teaching Lab, 266A Holt Storage - courses 102 and 142)
- Increase Science Ed teaching labs from 3-mods each to 4-mods. Labs are typically taught to 24 university students but need to accommodate occasional 36 middle school students
- Science Ed teaches multiple disciplines - GEOS, Chemistry, Physics, etc.
- Science Ed labs are 3 days/wk (most labs are 2 days/wk)
- Referring to Julie’s latest utilization worksheet, three teaching labs could be consolidated to two if the course 101 can be taught in a GEOS teaching lab
- Hands-On Lab
  - Not officially part of Science Ed. Science Ed has been staffing it, but will change to Integrated Science (water tables) or Biology department
  - Needs to look like a Junior High school science module
  - 30 students, 4th or 5th graders, 12 adults (42 people total)
  - Typically classes taught 8-1pm, 3 days a week
  - Math & Science outreach, workshops on weekends
Ideally on the ground floor
Needs access to drop-off zone, students arrive via bus or parent drivers
Storage area required for "traveling kits", including stream table, that other schools borrow (part of outreach program)
Video camera course capture would be useful so researchers can observe university and middle school student interaction
Send Utilization Worksheet for Hands-On Lab to Ann

Special Instruction
Interview room needs privacy, looks fine as shown in 2-mods room diagram
Work stations area - keep workstations against wall, but remove workstations in the middle for flexibility
Science Ed to update the utilization worksheet two ways - one with Biology included and one without

Adjacencies
Julie mentions that the spaces that use the GEOS stockroom should be close to it
If courses 102 and 142 are included, then a Biology stockroom will be required
Hand-On Lab should be on ground floor

Room Data Utilities
Chico Junior has great movable furniture in the labs, casework along the perimeter, water, technology above splash zone of sinks, multi-functional, 36-students
SGJJR to send Room Data matrix, two versions to Julie (GEOS) and Ann (Biology) to review/confirm

Interdisciplinary
Additional third Scale-Up studio lab requested in lieu of lecture rooms

End of minutes

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Meeting Notes

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PROJECT CSU Chico Science Replacement Building
Feasibility Study

MEETING DATE 1/25/2017

MEETING NUMBER 21755.000

MEETING TIME 9:30am

MEETING NUMBER 33

PREPARED BY Jon Riddle

SUBJECT Programming Workshop 3 – Biology & Vivarium

LOCATION Kendall 109

ATTENDEES

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MEETING MINUTES

Program Confirmation
- Campus has confirmed that the Vivarium will be Neuroscience only

Utilization Worksheet
- Utilization is low, not 70% for all three teaching labs
- Jonathan explains that the three requested Neuroscience teaching labs need to be separate unique spaces
  - Learning & Behavior - specifically for pigeons
  - Psychobiology - no dissection, has cell culture
  - Vert Physio & Neuro Physiology - has dissection/blood on lab tables
- Dean Hassenzahl advises to combine Psychobiology with Vert Physio & Neuro Physiology into a single teaching lab (reduces total Psych + Bio TL's from 3 to 2 teaching labs) due to low utilization
- Vert Physio and Neuro Physiology each has a separate prep room currently - media prep, autoclave, storage of sterile material
  - Needs 1 mod of Research (reduce from 2 mods to 1) - hood, incubator, open lab with microscopes
  - Needs Animal Prep Room, 1 mod (add)
  - Convert small 1/3 module Prep Room to Storage

Room Diagrams
- Vivarium: Two holding rooms with Mice and Rats and Procedure Room in between meets the Biology needs (plus cage wash, feed and bedding, etc.)

End of minutes
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ATTACHMENTS
PROJECT CSU Chico Science Replacement Building Feasibility Study

MEETING DATE 1/25/2017

PROJECT NUMBER 21755.000

MEETING TIME 11:00am

PREPARED BY Jon Riddle

MEETING NUMBER 34

SUBJECT Programming Workshop 3 – Psychology & Vivarium

LOCATION Kendall 109

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MEETING MINUTES

Program Confirmation
- Psychophysiology uses the (6) small 1/3-mod interview rooms, undergraduates - should be considered Special Instruction (teaching lab)
  - Ideally entered via a teaching lab
- Neurosciences research (2 mods) is for rodents, tissue processing, one single room is fine, fume hoods
- Psychophysiology research (2 mods) includes control room with 1-way glass
- Acceptable to transport animals in public corridors with covered cages, but Neuroscience teaching labs should be close by the Vivarium
- Sandra points out that Vivarium accommodates some growth, but having just two

Utilization Worksheets
- Biopsych can share teaching lab with Vert Physiology & Neuro Physiology if adequate prep is provided adjacent
  - For Vert Physiology & Neuro Physiology: sterile media prep, (2) small tissue culture rooms, small storage
  - For Biopsychology: Prep for sheep brains, lots of racks, sinks, benches

Room Diagrams
- Sean and Mike sketched room layouts for Psychophysiology

Vivarium
- Penelope’s group will have a breeding program for rodents
- Cage Wash will need a floor drain for washing cage racks
- Sean’s Vivarium layout seems appropriately scaled and laid out

Adjacencies
- Teaching Lab with Pigeons adjacent to Vivarium, door between desired
- Relationship between Vivarium and Pigeon Lab is stronger than between Pigeon Lab and Prep

End of minutes

If this report does not agree with your records or understanding of this meeting, or if there are any questions, please advise the writer immediately in writing; otherwise we will assume the comments to be correct.

ATTACHMENTS
PROJECT CSU Chico Science Replacement Building Feasibility Study

MEETING DATE 1/25/2017

PROJECT NUMBER 21755.000

MEETING TIME 1:30pm

PREPARED BY Jon Riddle

MEETING NUMBER 35

SUBJECT Programming Workshop 3 – IRES/IT

LOCATION Kendall 109

ATTENDEES

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MEETING MINUTES

- Sandra explains that she met with Chancellor's office recently and they seem amenable to swapping the NOC/Data Center for the Science Ed department, so current assumption is that the NOC/Data Center is out of the program
- There’s interest at the city to provide a Distributed Antenna System (DAS), which allows user to offer services like wifi or AT&T to provide services
- College of Natural Sciences is least supported from an IT/Technology point of view. Provost paid for 1/2 a full-time person to support the new Arts & Humanities building. Should consider doing this for the new Science building also since it's anticipated technology will be embedded in many of the labs and classrooms
- Sandra requests that wireless access points (WAP’s) be installed above drop ceilings as much as possible

End of minutes

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ATTACHMENTS
MEETING MINUTES

- The custodial group is called Facilities Management Services (FMS). Located with Central Shipping and Receiving
- Student Services building achieved the Green Housekeeping Innovation for LEED
- Currently visiting elementary students are dropped off on Ivy in front of the parking garage
- Utility closet for custodial service
- Student Services Center good example
- Need custodial closet on each floor
  - Need floor sink
  - Cabinetry, shelves
  - Power outlets for charging
  - Ventilating fan
  - Basic lighting
  - ~91 SF custodial closet is appropriate on typical floors for a floor area of about 30,000 sf
    - Accommodates, mops, carts, etc.
  - ~105-120 SF for is a good size for central custodial closet with storage on one floor only
    - Larger equipment
    - Auto scrubber (not ride on) used in Arts + Humanities for terrazzo / hard surface floors
    - Trash carts
- Room for equipment in custodial closet
  - Vacuums, Floor buffers, etc.
  - Ride-on vacuum if required for large expanses of carpet (not likely for this project)
- Physical Sciences has requested its own dumpster, other buildings don't have it, Durban and Sandra think we can resolve it without dumpster
- Recycling is collected via totes by AS (Associated Students)
- Trash is collected by FMS via carts and timed with trash pick-ups
- Vivarium not cleaned by custodial staff, cleaned by department
- Lab benchtops are only cleaned by FMS between semesters
• Pigeons and bats are pests on campus
• Flush inset aluminum grille walk-off mats indoors are preferred to outdoors or surface-type
• FMS washes lowest level of building windows but contracts out for upper levels
  o JLG should be adequate for up to 4-story building as long as access is provided
• Student Service Center has windows that pivot and make for ease of washing
• FMS has large trucks for delivery, somewhere to park and drop-off
• Need to plan for FMS tradesmen and provide parking for their full-size pickup trucks
• Between 6pm - 2:30am trash is picked up via small electric vehicles
• The vehicle turn from Warner to the Service Drive is tight/difficult for trucks – will likely need to be improved as part of the project
• No anticipated need for a service yard

End of minutes

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MEETING MINUTES

Dean Hassenzahl and Sandra gave a quick recap of the process
- What goes in the building, how big, and cost
- How we incorporate Student-Faculty special project areas (Research) which are not funded by CSU formula

Roxanne gave a recap of the Site Selection and Program Validation process
- Sandra explained that CEQA, Chico City General Plan establish the building setbacks from Big Chico Creek (75’ or 100’ conservatively)
- Concern about the Vivarium at Siskiyou site

Sandra explains the Growth & Flexibility component
- Chancellor's office has been asked to provide additional money
- Concern about bulky / barrier building rather than being a transparent / transition building when the building size increases above 135K GSF
- Building Committee determined that the new building should be 135K GSF or less
- Question asked if additional funding were available, would the AJH site be reconsidered - Sandra explains that the CEQA analysis is already underway for Siskiyou, so it would re-start the process to change sites
• Sandra explains that they hope to negotiate with Chancellor's office, the Campus, to find additional $7-9M to get to the 110-112K Minimum program
• To get the $24-28M necessary for the Growth component, donor money would be required

Vivarium
• Explained that a Consolidated Vivarium was explored, but leadership agreed that Growth & Flexibility was preferred
• Vivarium will be specifically Neuroscience related, does not include all of Biology animal needs
• Steve asks what percentage the Neuroscience/Vivarium and its components are of the building - current program has this component as 17% of building, the CSU baseline had it at 22%
• Steve does not see the motivation to locate the Vivarium in this new building from a faculty perspective - suggests cutting this program out in favor of reducing the square footage to get on target with ASF and to add Interdisciplinary large scale teaching spaces, and growth spaces
• Sandra asks the Executive Committee, that if the Vivarium/Neuroscience component is not desired, then request the Building Committee remove Neuro from the program - however, this means the building will be smaller

Interdisciplinary
• Shared teaching spaces
• Originally considered (2) 84-seat lecture rooms, but recognize that this is not how science is being taught today and into the future... additional 48-seat Active Learning space plus 24-seat Flex Teaching lab provided instead
• Sandra points out that currently Interdisciplinary is ~2,000 ASF above the CSU program, so priorities need to be established
• Dean Hassenzahl mentions that the campus does not have as many large scale classrooms as it should. Currently these science classes are being taught in the Arts & Humanities
• Dean H advocates making these spaces as generic as possible - not assigned to any department, to accommodate changes
• Russell explains the Dept Chairs have received mixed messages about how to allocate space in Interdisciplinary
• Roxanne and Suzanne recommend that, now that the Dept programs are resolved, the College should discuss again the desired Interdisciplinary spaces.
• Roxanne requests the College provide the final Interdisciplinary spaces by noon next Tuesday 1/31
• SGJJR to provide the Dept teaching labs summary slides

Office Areas
• Non-tenure track lecturers more than 0.8 full-time get a private office, less than 0.8 shares an office
• Tenure-track faculty get an office
• Steve requests that 0.8 full-time office rule applied to temp lecturers too
• 62 or 66 offices is goal for college (non-Neuroscience) - Steve to send the faculty lists
• Sandra explains that we’re responsible to deliver offices per the CSU standards
• Sandra asks if the College would consider moving towards an open office environment
• SGJJR to compare office counts requested by College vs provided by CSU formula

CSU formulas and funding
• Randy and Kevin feel like other new science buildings in the CSU system are getting larger square footages per FTES than Chico
• Sandra points out that all CSU schools use the same forms, but sometimes the Campus adds additional funds
• Sean points out that sometimes donors add additional funds
• Randy points out that the CSU formulas result in a much smaller new department - questions if the formulas are correctly applied
• Peggy asks if the Campus/College has explored taking a loan to add funds to the project

Next Steps
• Town Hall and Site Development Mtg #2 next week 1/30/17
• Schematic Design complete
• November Board of Trustees meeting to approve CEQA, Design Review, Schematic Design, Schedule, Cost

End of minutes

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Ken gives a presentation that describes some of the audiovisual technologies being used today in classroom environments, see attached PowerPoint file. The following are notes from the discussion:

**Overall Requirements**
1. Ceiling height in labs and classrooms is a concern for sight lines
2. Any room with dual displays will require matrix switching and touch panel controller
3. All projection screens are to be motorized with low-voltage control capability
4. Department chairs should review the room diagrams along with our list of media requirements for each room type and confirm, especially for the studio labs
5. Interest in right-sizing the classrooms for active learning 25-40 sq ft / student
   a. What size is necessary when equipment is involved?
   b. University expressed that because of special equipment requirements, active learning classrooms may need to be sized larger than 25 sq ft per student that could be considered typical
6. CSU Chico already using some Scale-Up classrooms
   a. Using some lecture capture in select spaces
7. Chico has standardized around Extron for AV equipment (control and switching). They have used Extron equipment as a basis to do custom active learning spaces
8. The University has used prefabricated solutions from Steelcase (media:scape) for collaborative learning. They noted that the Steelcase system electronics commonly fail
9. “Third Spaces” (social spaces) can be in niche locations like hallways or awkward spaces leftover in corridors, and should encourage student collaboration. Low-tech solutions like whiteboards are often the best tools for these space types. Selecting the right furniture along with high-performing Wi-Fi can be all that is needed to create engaging social learning spaces
10. The University is currently using Ad Astra as its course scheduling platform
a. There’s interest in adding more scheduling functionality including integration with campus AV.
b. Salter to verify if Extron’s TCP/IP-based Global Viewer (enterprise-level AV asset management software) can synchronize with Ad Astra for room scheduling.
c. Discussion of various touch panel schedulers including Extron and iPad placed outside of rooms next to entrance doors.

11. Provide strong Wi-Fi (802.11AC) coverage throughout new building.
12. Provide a single Cat6A cable to each Wireless Access Point (WAP).
14. Mic and lecture capture infrastructure (conduit and junction boxes) should be provided for all classrooms. However, only a select-few may have the equipment on opening day.
15. Place network drops at locations with “laptop carts”.
16. Provide ADA assistive listening systems in all classrooms and other rooms with amplified sound.
17. 1.25” conduit standard for network drops.
18. Conference rooms should have junction box above display to display backbox, wallmount junction box.
19. Projections screens to be 16:9 aspect ratio.
20. No free-air cabling, place conduits back to the nearest cable tray.
21. Ask Jon / Cale about drawings from vaults to new building.
22. Vault 15 connects with fiber, review plans provided by Cale.

**Room-by-Room Requirements**

**C.02 – Inorganic Large Teaching Labs (24 Seats)**
- Two large (approximately 9’ wide) adjacent or opposite screens at teaching wall (media surfaces) for both redundant and compare-and-contrast viewing (requires a minimum 2 output video matrix switcher).
- Projection screen configuration should allow for use of large whiteboard while at least one screen is down.
- Provide conduit stub w/ pull-string to lab benches for possible future cabling (e.g. fiber optic to the desktop).
- Fixed instructor station with integral AV equipment rack and the following:
  1. Desktop PC + HDMI for laptop (Cable Cubby)
  2. Touch panel controller inset at angled counter top
  3. Outlet receptacles for connection of AV equipment and computers to campus network.
- AV consolidation point above ceiling, can add future cabling to instructor station.
- Ceiling-mounted loudspeakers.
- Lecture capture desired with following:
  1. Ceiling-mounted beam-forming microphone
  2. Lavalier microphone for instructor
  3. Pan/tilt/zoom video camera
  4. Lecture capture device in equipment rack.

**C.01 – Inorganic Small Teaching Lab**
- Provide similar AV capability as C.02 Large Teaching Lab.
- As room is smaller only one display may be needed. Provide two displays if compare-and-contrast capability is determined necessary.

**P.06 Computational Physics**
- Provide similar AV capability as C.02 - Large Teaching Lab.
- Reconfigurable chairs and benches.
- Consider switching to laptops at student lab benches.
- Floorboxes located at each end of labs for power and data (total of 4)
- Floor box with AV capabilities at Instructor’s station
- Possibly two screens, (1) for student sharing (1) for instructor
- Provide ability to show any student’s screen at the projection screens via screen-sharing or wireless collaboration hub (e.g. Extron ShareLink)
- Additional floorbox dedicated to instructor workstation (AV only at instructor location)

P.02 Studio Teaching
- May be divisible
- Dedicated AV equipment rack, serviceable from outside of the classroom to minimize class disruptions
- Four motorized projection screen (approximately 10’ wide), each capable of displaying its own independent image source (four-output video matrix)
- Four wireless collaboration hubs to allow students to display four separate images to four projection screens
- Wireless data only
- Ten (10) floorboxes for power only
- Touch panel controller on south wall
- Lecture capture with two beam-forming microphones to cover the larger area
- AV input plate with data at front of room (below touch panel) for hardwire (HDMI) connections

S.01 Interview Room
- Treat as small conference room with wall-mounted flat-panel display (no projection screen) and floorbox connections
- Web conferencing / capture infrastructure camera
- Small AV switcher in pedestal leg of table
- Hard-wire data at workstations from wall

S.01 – Science Education Large
- Similar AV functionality as C.02 – Inorganic Large Teaching Lab
- Six (6) floor boxes with power only
- One (1) floor box for instructor with AV + power
- Controller at front of room
- Two motorized projection screens
- Verify if instructor’s table is stationary or moves
- Possible two cam locations

S.01 – Science Education Small (General Teaching Lab)
- Similar AV functionality as C.01 – Inorganic Small Teaching Lab
- Touch panel controller at front of room
- Two (2) floor boxes for students with power only
- One (1) floor box for instructor with AV + power
- Verify if instructor’s table is stationary or moves
- Two (2) motorized projection screens
- Possible two cam locations

P.01 – Physics Large Teaching Lab
- Six (6) floor boxes for students with power only
- One (1) floor box for instructor with AV + power
• Two motorized projection screens
• Touch panel controller and equipment rack at instructor’s table

G.01 – GEOS Small Teaching Lab
• One (1) projection screen
• Two (2) floor boxes for students with power only
• One (1) floor box for instructor with AV + power
• Equipment rack at instructor’s table
• Controller at instructor’s table
• Pne (1) motorized projection screen
• Wall-mounted power and data for laptop cart

Offices and Conference Rooms
• For offices reference IRES/CMT three documents online
  1. General Guidelines
  2. Div 27 Specs
  3. Chancellor’s Office Standards (TIP)
• Conference rooms should have web conference support
  1. Wall-mounted display with speakers
  2. Box in wall with data/AV
  3. Floorbox at table with data/AV
  4. Box in wall/ceiling for future camera + microphone (no speakers)

• Student Collaboration “Third Spaces”
  1. Flat-panel display with wall-mounted HHMI inputs
  2. Wireless collaboration
  3. Whiteboards
  4. Lots of power and charging stations

End of minutes

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ATTACHMENTS 2017-0208 CSU Chico Science Bldg Visioning.pptx
CSUC Room Diagrams for AV-IT discussion.pdf