

Master Plan Committee

October 23, 2023



Colorado State University

Agenda

- TDMP Update
- For MPC Input
 - Foothills Laser Center – C-ALEPH (*Grant Calhoun, VPR*)
- Updates
 - CSU Mountain Campus (*Laura Gleason, MtC & Jennifer Marley, HDS*)

TDMP Update



TDMP Update

- Transportation Demand Management Plan process has concluded
- Final Draft w/ comments (MPC and Public) incorporated into the Final Draft
- Final Draft will be sent out to MPC following the meeting
 - Memo by consultant to be included
 - 2 placeholders (Complete Streets Guide & Construction Detour Guide)
- Public announcement about the completion of the final draft – October 30th
 - Will include updates to TDMP website; Source & Collegian articles; emails to stakeholders

Foothills Laser Center C-ALEPH



Center for Advanced Lasers and Extreme Photonics

Master Plan Committee Meeting – October 23, 2023



Colorado State University

Vision:

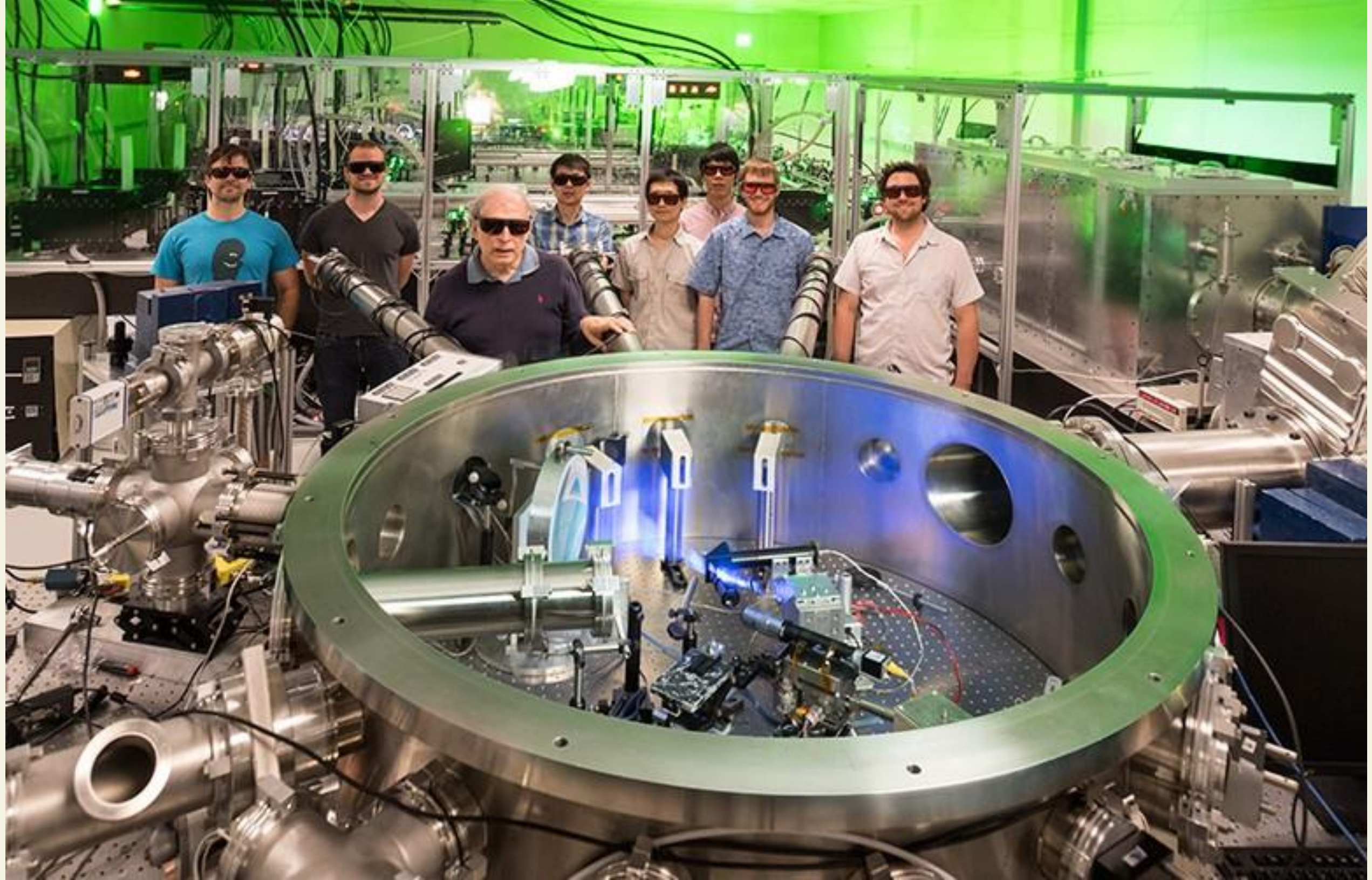
The Center for Advanced Lasers and Extreme Photonics will be the most powerful laser facility of its type, enabling world-leading research into fusion energy, medicine, and materials characterization.

Current Proposal:

Build a 43,000 gsf two-story laser center on the Foothills Campus, housing three powerful, advanced laser systems developed and maintained by researchers from CSU and Marvel Fusion, a Munich-based fusion energy company.



Project Background and Rationale



CSU laser researchers are world-class

- > \$100 M of research funding from DOE, DOD, NSF, industry, and foundations
- NSF Engineering Research Center grant (2003-14) led to key contributions to nano-scale lithography for semiconductors
- Graduates from this program are in high demand; ASML has hired 8 PhD and 1 MS graduates.
- Research experience provided to many undergraduate students



What is Laser Fusion?

- Laser Fusion: Utilizes high intensity laser pulses to fuse nuclei, releasing energy
- Fusion
 - Carbon-free energy production
 - Previous approaches required very large infrastructure and did not achieve net positive energy
- December 2022: First-ever net positive energy from fusion reaction – using lasers
- Results replicated in August and September 2023



The Economist

Menu Weekly edition The world in brief Search

Science & technology | Private fusion

Fusion power is coming back into fashion

This time it might even work



Tokamak Energy

Mar 22nd 2023 | CULHAM

Share

Detailed description: This is a screenshot of a news article from The Economist. The article is titled 'Fusion power is coming back into fashion' and is categorized under 'Science & technology' and 'Private fusion'. The sub-headline reads 'This time it might even work'. Below the text is a photograph of a fusion reactor core, showing a bright blue plasma column in the center, surrounded by a dark, metallic structure. The image is credited to 'Tokamak Energy'. At the bottom of the article, the date 'Mar 22nd 2023' and the location 'CULHAM' are displayed, along with a 'Share' button.

The New York Times

Dec 13, 2022

Scientists Achieve Nuclear Fusion Breakthrough With Blast of 192 Lasers

The advancement by Lawrence Livermore National Laboratory researchers will be built on to further develop fusion energy research.

“It [the National Ignition Facility at LLNL] averages about 10 shots per week. A commercial facility using the laser fusion approach would need much faster lasers, able to shoot at a machine-gun pace, perhaps 10 times a second.”

Current CSU laser: 1 shot/second

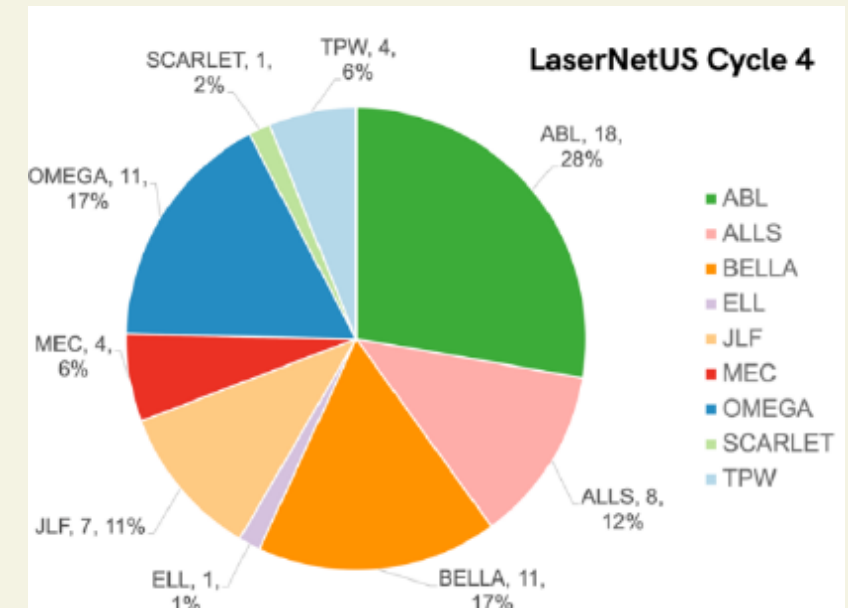
Planned CSU/Marvel Fusion lasers: 10 shots/second

Additional advanced laser applications

- Material characterization
 - Advanced lasers can produce intense ultrashort flashes of extreme UV light, x-rays, and gamma rays
 - X-rays and gamma rays can generate radiographs and tomography of material structures and large dense objects
 - Extreme UV light is used in the lithography of the most advanced computer chips
- Medical: High-energy ion beam with high flux and precision can be produced that deposit energy in a very localized region for tumor treatment (hadron therapy).
- Defense: High-energy muons can be produced with lasers; these muons can image dense objects and large structures. CSU is already funded by DARPA on this topic.

Laser fusion in U.S.

- CSU
 - Built 1-PW laser capable of high frequency pulses
 - Expertise in laser development, application of intense x-ray and particle beams, and advanced optical coatings;
- LaserNetUS
 - Dept of Energy – Fusion Energy Sciences program to provide access to high-power lasers in North America
 - Of 9 sites, CSU is by far the most sought-after



Support for Laser Fusion

- Rapid growth in laser fusion research funding at CSU
 - DARPA – Muon Project
 - DOE – Fusion Hub
 - CSU as prime; seven sub-awardees
- Public sector support
 - US Government – Inflation Reduction Act
 - EU/Germany – SPRIND
- Private sector investment – Venture Capital
 - Marvel Fusion
 - Xcimer
 - Focused Energy

Private funding for fusion (all types)



Courtesy of Dr. Mike Campbell



Benefits to CSU

Project rationale

- More powerful lasers now needed; ABL is too small
- DOE to provide funding to build a 4-PW laser if new facility is built (\$25 M)
- Marvel Fusion will build two powerful lasers if a new facility is built (\$50 M)
- Other university researchers would use these new lasers through LaserNet US (DOE will provide \$5 M/yr)
- Other companies will pay to use the new lasers; multiple industries
- The laser fusion field is at a critical stage of infrastructure development

Benefits to CSU

- World-leading laser center
 - Among most powerful lasers in the world
 - Unique technology to advance laser fusion
 - High-power lasers also benefit advanced materials and medical research
- Involvement of faculty and students from COE, CNS, and other colleges
- Substantial private company engagement expected; Northern CO becomes a national laser hub for research, development, and commercialization
 - Interest from Xcimer, Focused Energy; Advanced Energy and other photonics groups
- The project will bring CSU national and international recognition as a technology leader in an area that impacts clean energy, medicine, defense and discovery science





Project Plan

Center for Advanced Lasers and Extreme Photonics

Colorado State University

hord | coplan | macht



Original Design

- 43,000 gsf two-story building
- First floor:
 - Thick concrete slab to minimize vibration
 - Infrastructure for one laser (the beam from one can be split)
- Second floor:
 - Preparation laboratories
 - Offices
 - Teaching spaces

Current Design: Three ultra-high-power lasers will be able to be fired in synchrony to briefly produce a peak power of 14 Peta-Watts (about 14,000X the power produced by all power plants in the US)

Site Options

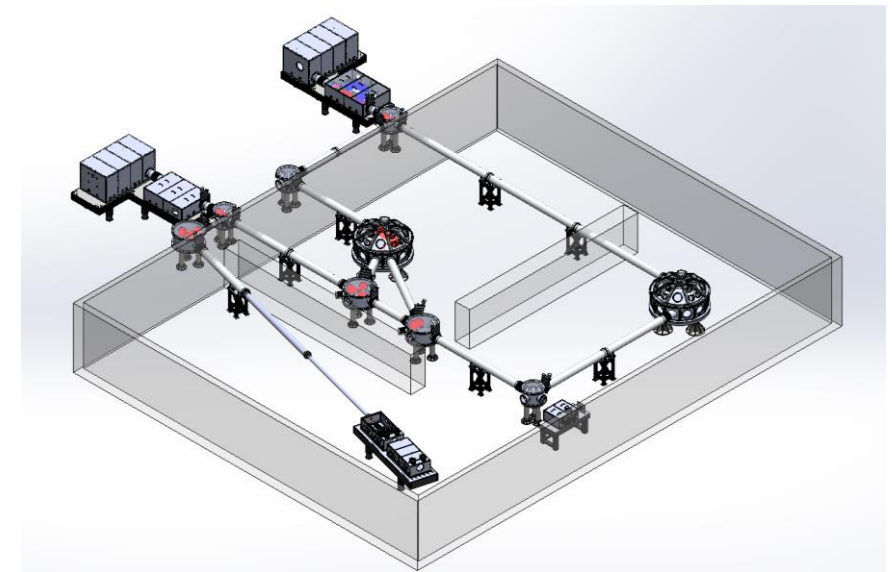
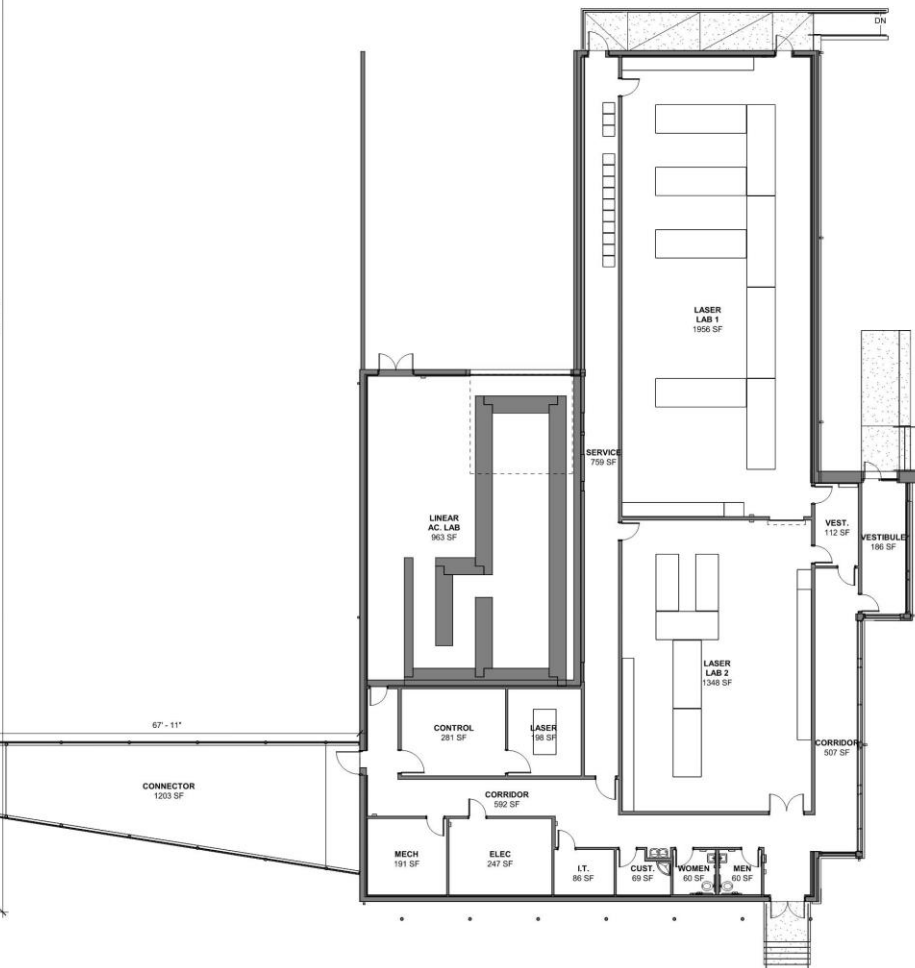
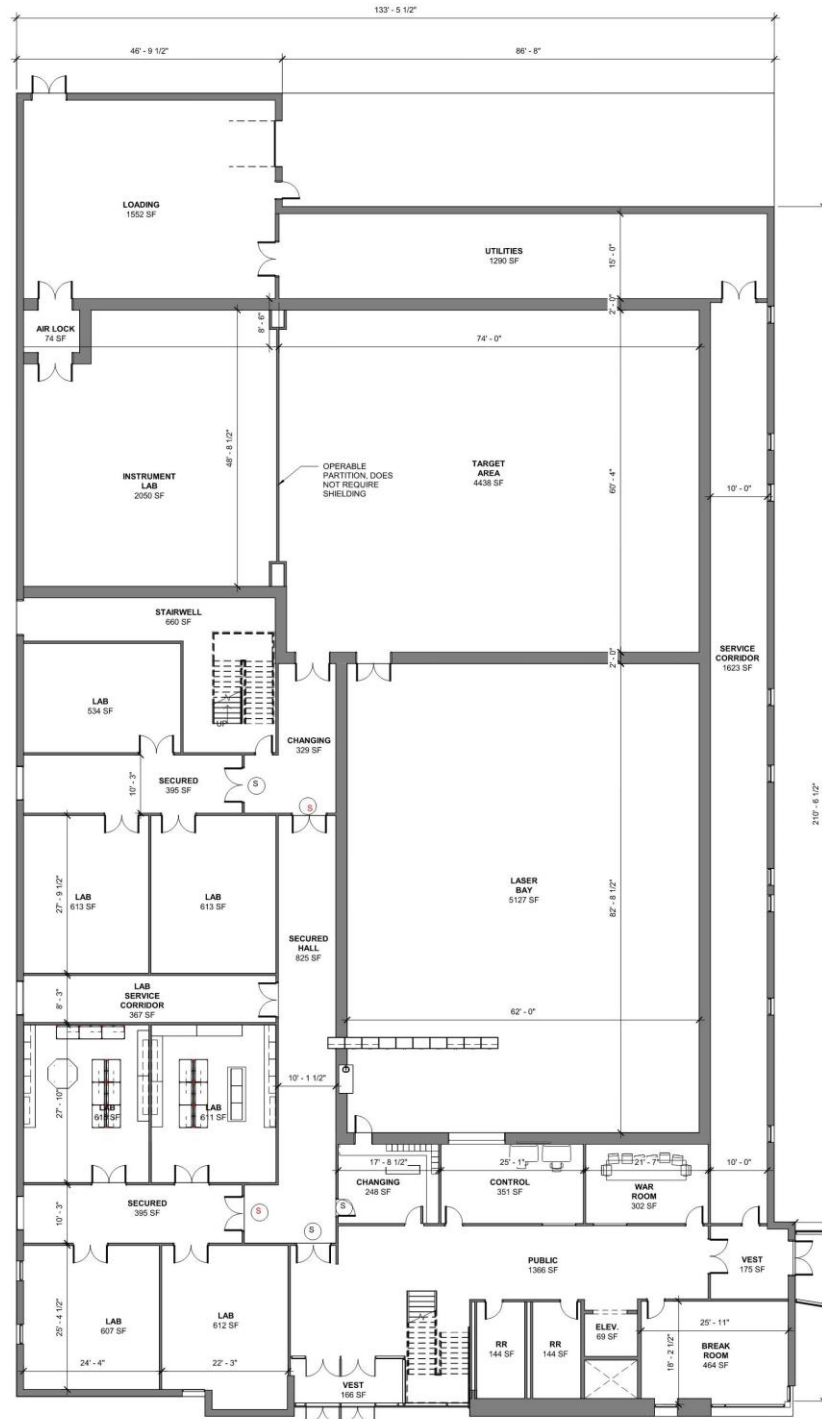
- North Foothills Campus
- Site 1: directly adjacent (south) of current Advanced Beam Laboratory (ABL)
- Site 2: east of ABL (preferable)



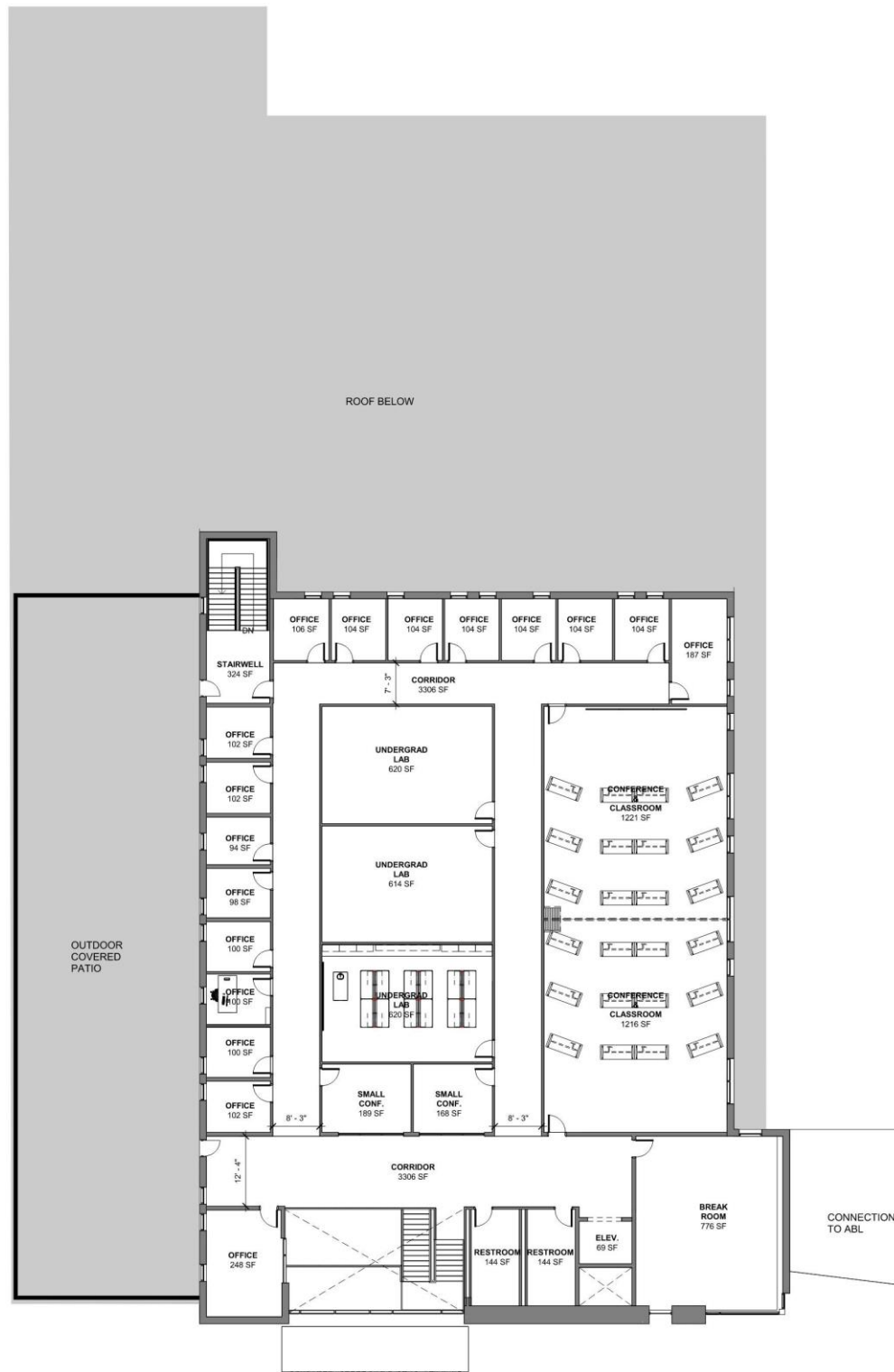


Aerial image of the new Center for Advanced Lasers and Extreme Photonics & ABL Center

First floor



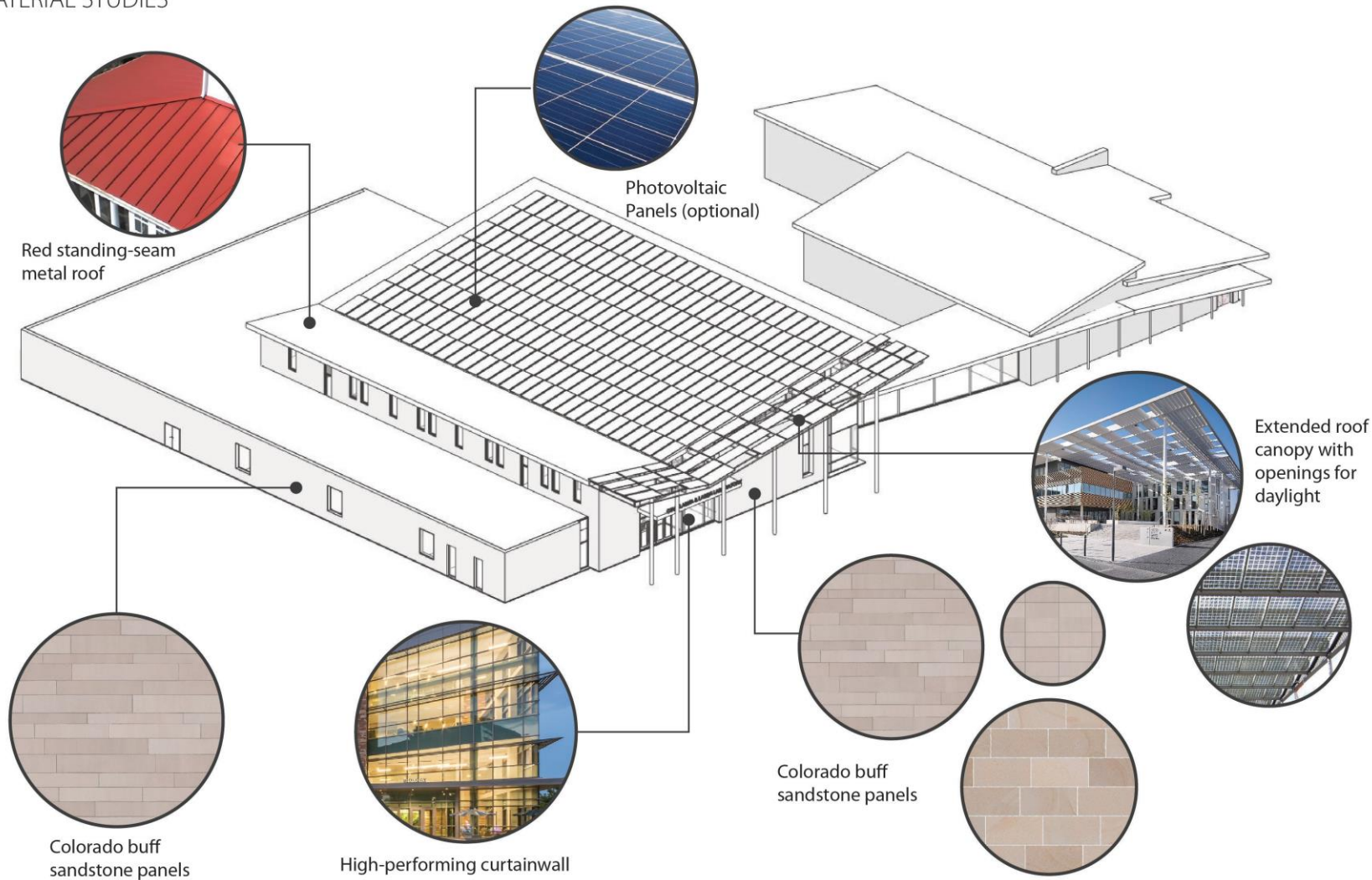
Second floor





Section Perspective thru the new laboratories & Laser Lab (first floor) and offices, undergraduate lab and Multi-Purpose room (second floor)

MATERIAL STUDIES





Aerial of existing site

LANDSCAPE DESIGN

The main access road into the site is Laporte Avenue. There is an existing unpaved access drive east of the site that provides an excellent entry point into the site. The concept design for this project proposes paving this road to allow for a new, welcoming, entry to the Center for Advanced Lasers and Extreme Photonics.

The entry plaza will include a paver walk from the limited guest parking spaces to the front entry plaza. Landscaping will include native plantings and low-water use vegetation to enhance the current xeriscaping.

Delivery Access will be on the west end of the building shared by the ERC. Large delivery vehicles can access the site and easily loop around the south as needed to exit. The ABL and the new facility will share a utility yard and nitrogen tank located between the two buildings. The yard will be fenced with a secure gate for maintenance access only.



Project Schedule

Timeline of Events

- Preliminary design developed mid-2022; estimated cost \$63-\$68 M
 - Facility to include CSU-developed, DOE-funded laser only
 - Project did not move forward
- Early 2023: Negotiations with Marvel Fusion
 - MF to build two lasers and place in Center; CSU to own lasers
 - MF to provide 50% of laser time to other users
 - MF to lease office and laboratory space for 20 people
 - MF to provide \$1M in student support and other programmatic efforts
- June 2023: CSU and Marvel Fusion sign Term Sheet
 - Facility to be designed in conjunction with Marvel Fusion and informed by other laser centers
 - Construction completion estimated 42 months after project approvals

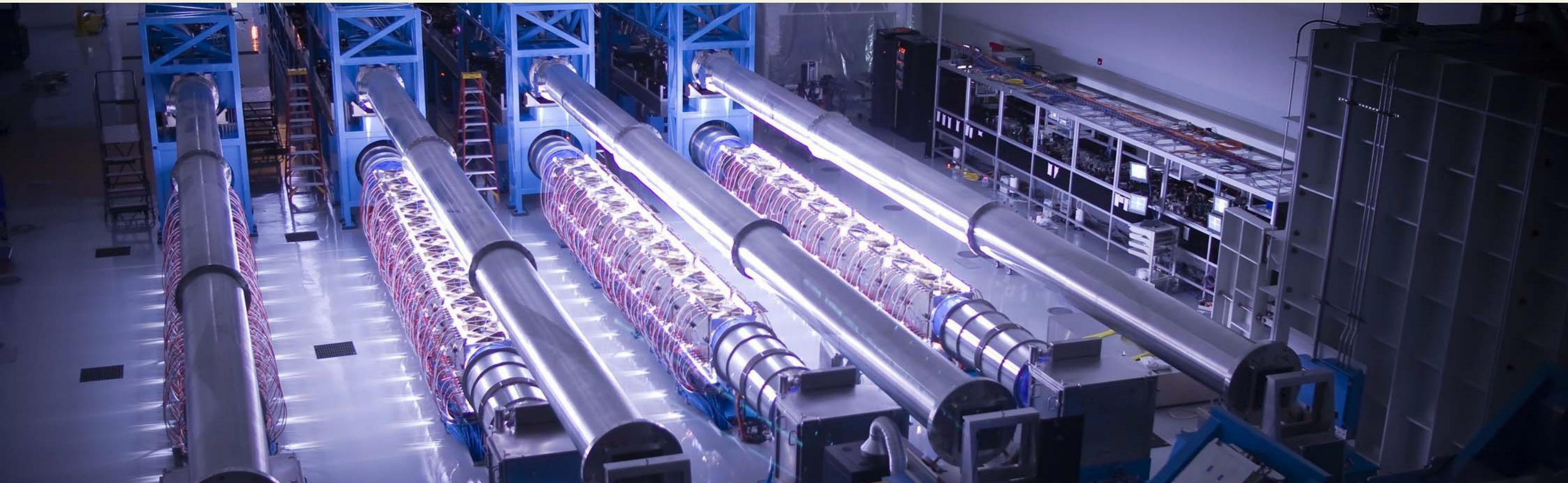
Timeline of Events – Continued

- June 2023: CSU and Tetrad sign MOU for project development
- August 2023: Public Announcement of CSU-Marvel Fusion project
- September 2023: Tetrad issues RFP for architect for program plan development
- October 2023: Selection of SWBR, a Rochester, NY-based firm
- TBD: Plan of Finance Approval by Board of Governors
- TBD: Development Agreement between CSU and Tetrad
- TBD: Research and Facility Partnership Agreement between CSU and Marvel Fusion

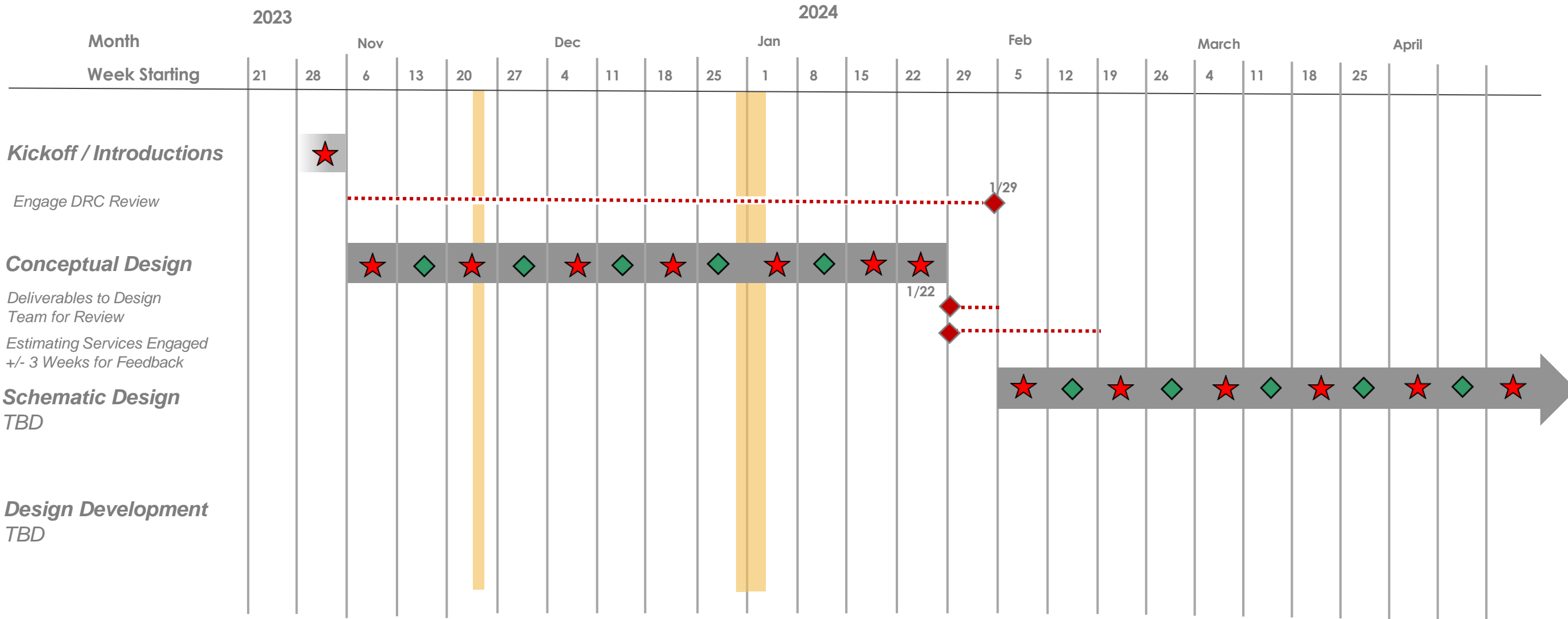
SWBR

Colorado State University Center for Advanced Lasers and Extreme Photonics

October 11, 2023



Project Schedule – 12 Week Outlook



- ★ Owner Meeting
- ◆ Weekly Project Meeting
- ◆ Milestone
- Holiday

Thank you



Colorado State University

CSU Mountain Campus



CSU Mountain Campus

October 2023

Lauren Gleason, Director of Conference & Event Services and Mountain Campus

Jenifer Marley, Project Manager, Housing & Dining Services Facilities





Vision

Serve as the region's premiere high elevation educational facility and provide a platform for cutting edge research and scholarly endeavors.

2017: CSU Housing and Dining Services partnered with CSU Facilities Management and Warner College of Natural Resources to update the vision for the Mountain Campus. The vision outlines goals for enhancing management, programming, and facilities at the Mountain Campus while maintaining its unique character and important aspects of the student experience there.

2023: Presidential Task Force worked on/is working on a report and used the vision: to advance CSU Land Grant mission of education, research, service, and extension as a base

Mission

We provide a unique and outstanding living and learning experience and natural resource base for a diverse blend of instruction, research, conferences and programs with an academic or educational focus.

Values

Honoring the Past, Embracing the Future, Adaptability & Flexibility, Collaboration & Community for All, Fiscal & Environmental Stewardship



Programming in 2023

- **Classes/Academics – 27 classes and 53% of bed nights**
 - Warner College of Natural Resources
 - College of Natural Sciences
 - College of Liberal arts
- **Research – requests are steadily increasing, 1% of bed nights, numerous day trips**
- **Retreats/Events – 55 internal and 36 external in 2023; 24% of bed nights**
- **Eco Experience – 31 school trips and 22% of bed nights**
- **Ropes Course**

Recent Changes

- **Administrative Structure**
 - Previous: On-Site Director, Assistant Director, and Coordinator
 - New: Director on Main Campus, On-Site Associate Director and 2 Assistant Directors

2023 Presidential Task Force

- Charged May 2023
- Met weekly through September
- Presented Recommendations two weeks ago
- Meetings are continuing to work on follow-up items



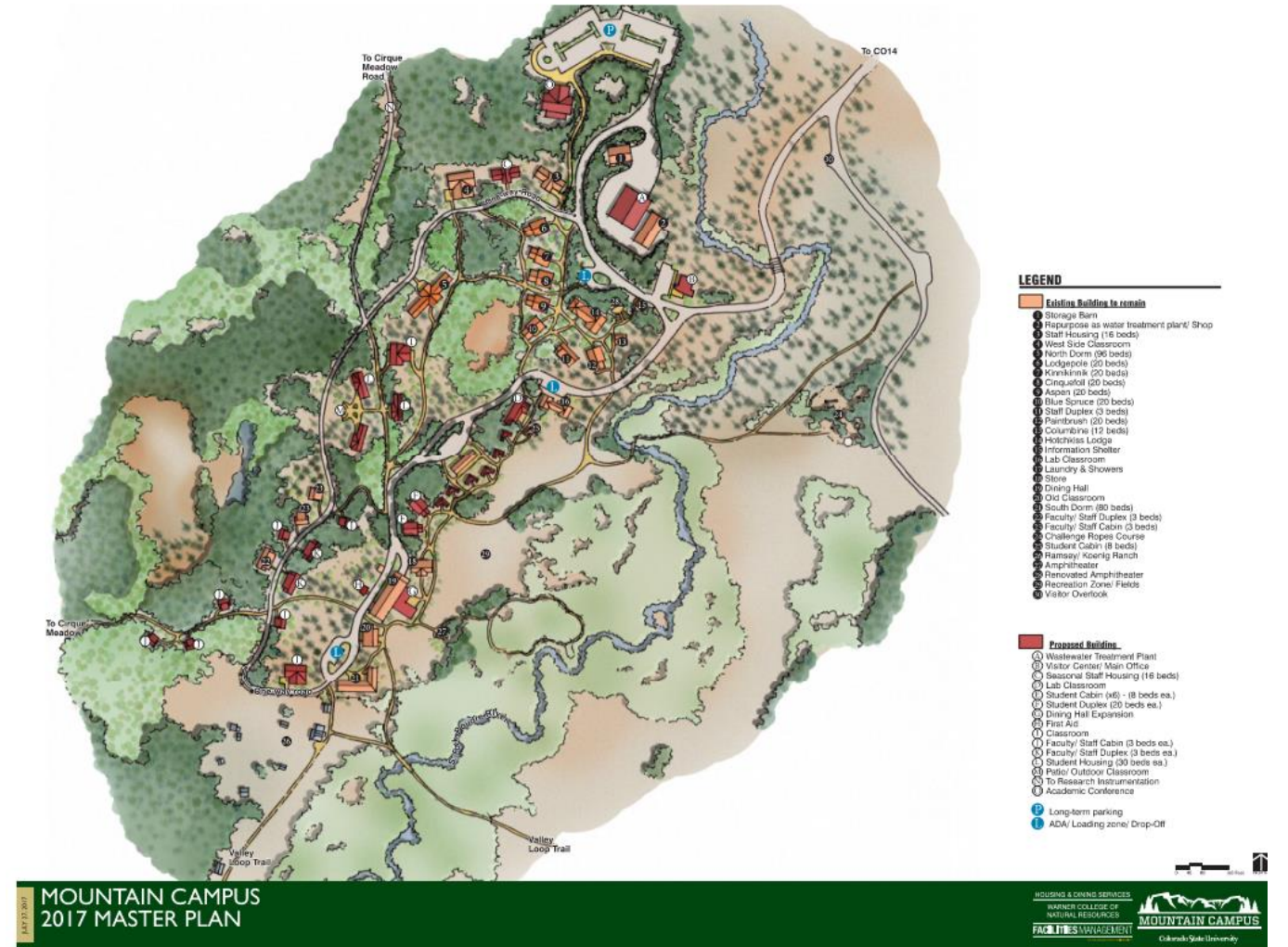
Existing Campus Building Inventory - ~75 facilities

- Central Campus Resources – Dining/Office/Store
- Group Resources – Classroom/Conference Space
- Guest Housing
- Staff/Faculty Housing
 - Cabins 1-5 no longer exist
- Campus Operations Facilities
- Outdoor Amenities
- Historic Ramsey/Koenig Ranch

2017 Master Plan

2019-2023

- Capital Projects
 - Harbison Research & Education Building
 - WWTP
- Studies
 - 2019 & 2020 Facility Condition Assessment
 - 2022 Building Code Assessment



Known Facilities Needs:

Capital Planning Projects

- Master Plan
- Electrical Study
- Campus Utilities (Water, Sewer)
- Telecommunications (Internet, WiFi, Satellite, Phones)
- Parking, Roads, Bridges & Trails
- Security; Signage

Building Repair & Maintenance

- Roofs, siding, windows, doors, lighting, decks & stairs, hot water heaters, etc.

Capital Projects

- Student Cabins (priority - wood burning stove replacement)
- Faculty Cabin and Far Side Cabin Replacements
- Main Vehicular Bridge
- Dining Hall and Kitchen

Health/Life Safety and Building Code Deficiencies

- Fire systems, code-required signage, structural, MEP, accessibility

Challenges

- Health/life safety concerns
- Every project, study, idea opens a can of worms
- Balance rustic nature with updated facilities
- Remote location; industry interest

Next Steps

- **Campus Planning Projects**
 - Comprehensive Planning - need a wholistic approach to develop a prioritized plan for a path forward
 - Include: Electrical, Telecommunications, Domestic Water and Sanitary Sewer
- **Student Cabin Heat Replacement**
 - Electrical study will inform direction
- **Faculty Cabins**
 - Cabin 1-3 demolished
 - Cabin 4 burned; Cabin 5 demolished
 - Failed Procurements
 - Need to repackage as larger project with additional funding



Questions?
Comments?

