This memorandum provides a summary of the Fall 2019 Resilience & Sustainability Workshop, held in support of the Long Range Development Plan (LRDP) and Campus Master Plan. Resilience and sustainability touch on nearly all aspects of the physical environment, from buildings and landscape to infrastructure and mobility. This initiative is guided by the campus’s sustainability goals and University of California policies; it will also take into account potential strategies for resilience, in response to climate change and the need for climate adaptation.

**Workshop Purpose and Format**

The purpose of the workshops was to provide an opportunity for the campus community to provide feedback on their campus experience, and engage in active problem-solving and brainstorming for the future of the campus. The workshop format was chosen to provide opportunity for robust and in-depth discussion, complementary to past and future town hall events. Because of the breadth of topics that are related to resilience and sustainability, the Resilience & Sustainability workshop focused on smaller group discussions of key areas relevant to the physical campus environment.

The LRDP and Campus Master Plan workshops included students, faculty and staff with a diverse range of perspectives, reflecting the complexity and significance of physical planning decisions. The workshops were by invitation, based on the venues’ capacity and on staffing resources. Each workshop was facilitated by Physical & Environmental Planning staff and the master planning consultant team, and followed the same basic format:

- LRDP and Campus Master Plan Overview (see attached summary slides)
- Planning Context (see attached summary slides)
- Breakout Activity, including these key questions:
  - How can Berkeley continue its leadership in sustainability and resilience, as reflected in the physical campus environment?
  - Are there potential sustainability initiatives for the physical campus that can positively impact multiple areas of sustainability and resilience?
  - What methods and findings from ongoing campus research can be applied to the campus?
- Report Back and Next Steps

Key themes and takeaways from the ideas and solutions discussed in the workshop are documented here. They will be circulated to the campus community as well as to the LRDP and Campus Master Plan Advisory and Working Groups, for consideration as these two plans progress. The workshop themes and takeaways will be combined with LRDP/Campus Master Plan survey analysis and other sources of feedback, into Emerging Themes documents that reflect themes and priorities to be addressed in the LRDP and Campus Master Plan.

**Workshop Themes and Takeaways**

The themes and takeaways summarized below represent the discussion from the workshop, and may not include all of the challenges and opportunities documented through different modes of LRDP/Campus Master Plan engagement. The summary below may also include conflicting perspectives, reflecting the diversity of ideas generated in the workshop.
Energy

1. The location of potential land uses, especially those that are energy-intensive, will influence long-term planning for infrastructure.

2. Energy efficiency is impacted by effectiveness of building control systems, maintenance of infrastructure (e.g. leaks), and awareness of consumption.

3. Electrification of the campus’s cogeneration plant would improve energy efficiency and reduce carbon emissions, but requires significant investment.
   - Cogeneration is an efficient method of providing energy and can provide resilience in power outages, but its fuel source (natural gas) is carbon-intensive
   - The campus could move towards electrification and avoid long-term investment in non-renewable energy sources
   - The current assumption is that the campus will need to provide more chilled water in the long term for comfort cooling, in response to increasing average temperatures

4. The campus should balance sustainability and clean energy goals with economic viability.
   - Transitioning to new fuel sources can be financially challenging
   - The campus should invest in energy efficiency
   - Consider the potential for renewable energy sources on campus, such as solar panels
   - A Green Revolving Fund could help finance energy efficiency improvements
   - The campus should build awareness of the trade-offs of potential energy efficiency interventions
   - The campus’s goals for energy efficiency are linked to UCOP policies

Water Use

1. Be strategic about reducing consumption of potable water and consider how the campus could be more self-sufficient.
   - Major water users include labs, residence halls, and the cogen plant – landscape irrigation is a small fraction of total water consumption
   - There is an expectation that lab space could continue to expand, thus increasing water consumption
   - Water conservation options include water banking, behavioral change, building metering, and the cogen plant
   - Deferred maintenance impacts water use; efficiency upgrades and building metering should be addressed in building renovations to the extent possible
   - Consider grey water reuse for new buildings; however, water reuse systems should be balanced with operations and maintenance considerations
   - Consider establishing a goal of no potable water used for landscape irrigation, to reduce water consumption and embed resilience-related practices in the campus landscape
   - Comprehensive data collection could help monitor water consumption
2. The campus’s decisions about energy systems also impact water use – for example, the cogeneration plant could be a potential source of water use reduction and reuse opportunities.
   - Long-term options for the campus cogeneration plant assume that hot water would still be used to heat buildings, but would do so more efficiently
   - Although most campus buildings do not have comfort cooling now, they may need it in the long term as average temperatures continue to rise

3. Decisions about water conservation could have long-term implications.
   - Consider building and water system life cycle costs
   - Plan for the future and for potential long-term droughts (e.g. water banking)
   - Balance development and future climate change impacts
   - Explore the potential benefits and challenges of integration with EBMUD’s purple pipe initiative

Landscape, Ecology and Stormwater Management

1. The forest is changing; as result, the landscape is evolving, towards a climate context more similar to southern California.
   - Increasing temperatures will increase the need for shade in campus open spaces
   - The current tree palette is not always adaptive to climate change; redwoods are particularly susceptible
   - Consider non-human species on campus, and how they are supported through the natural environment and campus open spaces
   - The campus needs a landscape succession plan to ensure long-term biodiversity; it should take into account how non-native vegetation could be replaced over time
   - The campus could consider using non-potable water to irrigate campus open spaces, especially during drought periods
   - Stormwater returned into the ground via baseflow ties into irrigation resources for trees, especially in riparian areas

2. Stormwater management is an important element of the campus ecology.
   - Consider adding pervious surfaces to public walkways and roads
   - Consider providing systems to capture peak storm flow, both natural and engineered
   - Herbicides can enter the creek and decrease water quality – their use should be limited to the extent possible
   - Opportunities to improve stormwater retention could be integrated with a strategy to provide more access to the creek as an open space amenity
   - Parking lots adjacent to Sather Gate and Boalt Hall currently allow untreated stormwater runoff to flow into the creek

3. Consider developing integrated fire mitigation and stormwater management strategies to reduce erosion, slow stormwater runoff, and reduce fire risk.
   - In particular, an integrated strategy is needed for the Hill Campus
• The campus’s stormwater management strategy should consider the system holistically, rather than through individual projects
• Removing eucalyptus trees could be considered as part of an overall fire mitigation strategy
• The Eucalyptus Grove could be an opportunity to redefine a major campus gateway and increase biodiversity by shifting to native species

4. **Consider justice, equity, and accessibility when making land use decisions.**
   • The campus is built on Ohlone land; consider partnering with indigenous peoples on landscape and creek restoration projects
   • Landscape and creek restoration projects could consider the expression of multiple cultures (e.g. between VLSB and Wickson Road), in addition to landscape and ecological needs
   • The campus should produce food on open land in the Campus Park and satellite sites

5. **The 2004 Landscape Master Plan includes a number of stormwater management projects which have not been implemented due to lack of funding.**
   • The campus could seek additional sources of funding for stormwater management projects, such as donor funding and research grants
   • Landscape projects require investment in ongoing maintenance, in addition to the cost of design and installation
   • Hearst North Field has poor drainage, and there could be an opportunity to improve the field’s functionality through stormwater management improvements
   • West Circle and the adjacent lawn could be a major opportunity for stormwater management and landscape improvements
   • Landscape projects could include educational signage to engage the campus community and build awareness of stormwater management

**Alternative Transportation**

1. **Consider the nexus between transportation and land use in long-term physical planning.**
   • Many modes compete for the use of the campus’s shared pathways (e.g. pedestrians, bikes, scooters, vehicles)
   • The bicycle dismount zone (where bicycles must be walked) is not always clearly identified
   • The campus and the City of Berkeley would ideally have consistent bike signage
   • Connections to the campus’s satellite locations can be inefficient
   • People perceive walking to be an inefficient mode of transportation, but the distances between campus buildings are generally not that long
   • The campus’s heritage as a natural environment should be balanced with the need for security, especially regarding nighttime lighting and late-night transportation options
   • The Classical Core style of architecture does not allow ground-floor spaces to provide ambient lighting for adjacent pathways and open spaces
2. **Explore options for reducing vehicle travel to and from campus.**
   - The campus has many existing Transportation Demand Management (TDM) and alternative transportation programs
   - TDM programs are robust for students (e.g. Class Pass) but could be improved for staff, who are more likely to drive to campus
   - Improving child care access on campus could reduce trips to campus by car for parents
   - Moving Facilities Services back to campus would reduce truck travel between its current location and the Campus Park
   - Providing additional secure bike parking, charging stations for e-bikes, and additional showers for bike commuters could encourage biking as a primary mode of travel
   - Consider options for micromobility and how these devices could be accommodated (e.g. scooters)
   - Identify potential options for reducing truck deliveries (e.g. FedEx, UPS) to campus, while maintaining service for critical deliveries

3. **Ride-hailing services like Uber and Lyft (TNCs) can cause congestion around campus.**
   - Consider relocating pick-up and drop-off zones at secondary hubs, away from congested areas like Sproul Plaza
   - While TNCs do cause congestion, they can be more convenient than other modes for getting to campus from satellite locations, and are sometimes used at night for safer travel home from campus
   - Consider a discount for shared rides, to reduce the number of single-user rides

4. **Reducing vehicular access to the Campus Park could benefit stormwater management.**
   - Vehicles impact stormwater runoff to Strawberry Creek (e.g. rubber tire residue, hydrocarbons, etc)
   - Reducing vehicle access and parking in the Campus Park could also create opportunities for additional stormwater management and flood mitigation

**Resilience**

1. **Seismic resilience should be a priority for the LRDP and Campus Master Plan initiatives.**
   - Addressing seismic resilience will require careful surge planning
   - The UCOP Seismic Safety Policy provides guidance on seismic resilience goals
   - Resilience planning should take into account potential impacts to campus operations

2. **Solar energy could be considered as a potential mode of energy generation.**
   - Solar energy infrastructure does have land use implications; it can also be a fire hazard
   - Capital investment in solar should be considered relative to other needs

3. **Wildfires have regional and local impacts; planning for fire mitigation will require coordination with multiple agencies.**
4. The City of Berkeley is also studying climate adaptation strategies, and there may be shared goals and opportunities for collaboration between the campus and the City.

5. In the case of emergencies, the priority for the campus is to resume operations as soon as possible. Resilience planning should take into account the potential timeline for recovery.
   - During emergencies and disasters, conditions can change quickly
   - Signage and wayfinding comprise another important and critical element for the development of a safe and resilient campus
   - The campus community would like to be better informed about the campus’s emergency preparedness plans and processes, with more transparent communications – the community should be empowered through education
   - Consider equity and building trust as components of emergency preparedness, especially how different groups may have specific needs that need to be accommodated
Attachment A

LRDP and Campus Master Plan Overview Presentation Slides
Berkeley has a long history of campus planning
Berkeley has a long history of campus planning
### What is an LRDP? What is a Campus Master Plan?

<table>
<thead>
<tr>
<th>Long Range Development Plan</th>
<th>Campus Master Plan</th>
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</thead>
<tbody>
<tr>
<td><strong>Differences</strong></td>
<td></td>
</tr>
<tr>
<td>• Program-level plan (land use plan) that guides the long-term physical development of the campus</td>
<td>• Aspirational ten-year plan with specific projects to address priorities, such as housing, seismic, sustainability, academic instructional space</td>
</tr>
<tr>
<td>• Required by law</td>
<td>• Not required by law</td>
</tr>
<tr>
<td>• Requires an EIR</td>
<td>• Does not require an EIR</td>
</tr>
<tr>
<td>• Can be long term</td>
<td>• Living document: can be short or long term</td>
</tr>
<tr>
<td>• Regents approval required</td>
<td>• Regents approval not required</td>
</tr>
<tr>
<td><strong>Similarities</strong></td>
<td></td>
</tr>
<tr>
<td>• Aligned with the Strategic Plan</td>
<td>• Build campus consensus around a shared vision</td>
</tr>
<tr>
<td>• Employ an integrated, systems-level approach</td>
<td>• Strategic and prioritize</td>
</tr>
</tbody>
</table>
Timeframe – How long will this take?

- **2019**
  - Long Range Development Plan
    - Data Collection
    - Discovery
    - Studies

- **2020**
  - Long Range Development Plan
    - Synthesis
    - Draft Recommendations
    - EIR analysis

- **2021**
  - Long Range Development Plan
    - Draft EIR published
    - Revision and adjustments (Final EIR)
    - Goal: Approval by the UC Regents

  - Campus Master Plan
    - Data Collection
    - Discovery
    - Studies

  - Campus Master Plan
    - Synthesis
    - Draft Recommendations

  - Campus Master Plan
    - Revision and adjustments
    - Prioritization
    - Goal: Adoption by the Chancellor and EVCP
Governance Structure

Project Management and Oversight Groups

Project Management
- Day-to-day logistical management of LRDP and CMP processes
- Prepares reports and preliminary review of content
- Project involvement at all stages, plus coordination with consultants

Stakeholder Groups
- Provide input throughout LRDP process
- Consult with Working Group on CMP assessments and component plans
- Project involvement as needed

Working Group
- Develop LRDP principles, program and framework
- Participate in stakeholder meetings
- Oversee CMP assessments, guide development of 10-year plan and component plans, and phasing scenarios

Advisory Group
- Overall strategic direction for LRDP, EIR and CMP
- Decides LRDP principles
- ID’s CMP priorities
- Reviews LRDP and CMP project progress

Approvals
- UC Regents
  - Adopt and certify LRDP and EIR
  - No role with CMP

- Chancellor, EVCP
  - Approve final LRDP and final CMP
  - Project involvement for final UC Berkeley approvals

Capital Planning Committee
- Updates and approvals as needed
- Project involvement at key milestones
Sasaki Associates is our lead consultant, along with Page as our LRDP strategy consultant. The Sasaki team complements and supports on-campus expertise and governance. They will:

• Analyze existing conditions of the physical campus environment
• Synthesize key areas of need from the Strategic Plan
• Hold listening sessions with a wide range of campus stakeholders
• Develop design guidelines
• Identify potential projects and priorities for the Campus Master Plan

Additional sub-consultants that will be part of our planning effort:

• Biddison Hier – Strategic Planning Advisor
• PGA Design – Landscape Heritage
• Forell / Elsesser – Structural Engineering and Seismic
• Fehr & Peers – Mobility Planning and Parking
• ARUP – Energy, Utilities, and Sustainability
• Sherwood Design Engineers – Civil and Storm Water Management
• Page & Turnbull – Historic Architectural Resources
• TBD Consultants – Cost Estimation
Campus and Community Engagement

Objectives

• Provide information and updates on the planning process
• Promote inclusive dialogue, open discussion, and consensus building
• Encourage early and ongoing participation

lrdp.berkeley.edu
masterplan.berkeley.edu
Today’s Workshop

Purpose

• Engage the campus community in active problem-solving
• Learn about the planning process

Format

• Planning Context: Key issues to be addressed
• Breakout Activity: Brainstorm together on a specific issue
• Report Back: Share key takeaways from each table
• Next Steps and Wrap-up: What happens next
Attachment B

Planning Context Presentation Slides
How are sustainability and resilience defined?

- **Sustainability** is the ability to meet the needs of the present while living within the carrying capacity of supporting ecosystems and without compromising the ability of future generations to meet their own needs. *(UC Berkeley Chancellor’s Advisory Committee on Sustainability)*

- **Resilience** is the capacity of individuals, communities, institutions, businesses, and systems... to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience. *(Rockefeller Foundation’s 100 Resilient Cities)*
What does the Strategic Plan say about sustainability and resilience?

Academic Priorities:
• Support interdisciplinary collaboration to address complex issues related to sustainability and resilience

Implications for Physical Planning:
• Require adequate space for multi-disciplinary research clusters and venues for sharing work more broadly
• Campus environment would ideally be a proving ground and model of sustainable and resilient development and systems

Leverage “...the breadth of Berkeley’s expertise across nearly all dimensions of environment and its many intersections with society.”
University of California Sustainable Practices Policy establishes goals for:

- Green building
- Clean energy
- Transportation
- Climate protection
- Sustainable operations
- Waste reduction and recycling
- Environmentally preferable purchasing
- Sustainable foodservice
- Sustainable water systems
What are the climate trends that will impact the campus?

**Warmer Weather**
- Number of hot days quadruples by 2090

**Indirect Disruption**
- Increased flooding, higher temperatures, and fires lead to disruption in utility supply chains (roads, energy and water supply)

**Less Rainfall**
- 26” / year Average annual precipitation
- Climate projected to become drier with longer periods of drought

**Extreme Storms**
- Extreme storms are anticipated to become larger and “peakier”

**Fire Hazards**
- Located in one of the most fire-prone natural landscapes
- Hill Campus is located within a “Local Responsibility Area Very High Fire Hazard Severity Zone”
How can we address these trends?

Energy  Water Use  Stormwater Management  Ecology and Landscape
Energy
How Energy Utilities are Connected
Sustainability and Resilience of Energy Infrastructure

**Sustainability:** how do we prevent it from getting worse?

**Resilience:** how do we adapt to the trend?
Where is the campus now?

- **Baseline**
- **Business as usual**
- **Best**
- **Carbon free, full resiliency**
Where is the campus headed?

**Baseline**

**Business As Usual**
- Reduce potables water use by 36%
- Water-efficient heating and cooling systems
- LEED Silver and EBOM Certification

**Meet UCB Requirements**
- Carbon Neutral by 2025
- 100% Clean Energy by 2025
- Procure Renewables onsite and offsite

**Better**
- Procure biogas
- Electrify Carbon offsets
- Energy efficient upgrades and retrofits
- EUI reduction of 2% per year
- Projects exceed CBC by 20%

**Best**
- Energy efficient design and operations
- Carbon Free, Full Resiliency
Water Use
UC Berkeley’s Water Use Goals

**BASELINE/GOOD**

- **MEET UC REDUCTION GOAL**
  - Reduce potables water use by 36% per weighted user by 2025
  - Water-efficiency (fix leaks, smart irrigation, fixture retrofits) and education

**BEST**

- **ZERO WATER WASTE**
  - 100% of non-potable water uses served with non-potable supply

**BETTER**

- **WATER RE-USE**
  - Generate non-potable water on campus to reduce potable water use
  - Serve all future non-potable demands with non-potable water supply

- **provide future-ready infrastructure (e.g. new buildings dual-plumbed)**

The UCB Campus Sustainability Plan lists strategies to increase the use of non-potable water on campus, reduce potable water usage, and identify new funding sources for water projects. However, there are not specific quantitative targets identified.

Consider export of non-potable water to LBNL and City of Berkeley to offset on-campus water use.

**Source:** UC Berkeley Office of Sustainability
Stormwater Management
UC Berkeley’s Stormwater Management Goals

**Baseline/Good**
- MEET UCB REQUIREMENTS
  - Treat stormwater prior to discharge to creek
- BETTER
  - All new projects install stormwater management BMPs
- ON CAMPUS RESTORATION
  - Integrate stormwater management into water reuse, landscape and resiliency strategies
  - Pursue restoration projects for Strawberry Creek
  - Creek daylighting and restoration, stormwater retention, reduced erosion
- BEST
  - WATERSHED RESTORATION
  - Pursue watershed-wide restoration opportunities
  - Ecological restoration of upper watershed and full extent of Creek
  - Coordinated efforts with City of Berkeley and LBNL
• Northwest area of campus is generally more permeable

• Southwest and Northeast areas of campus are generally more paved
Where do Flooding Risks Exist?

- West Circle Culvert <2 to 3-year event
- Culvert at Oxford Street into City of Berkeley system <25-yr Event
- City of Berkeley and LBNL drainage into North Fork (offsite drainage)
- Big Inch (60-72” bypass culvert)
- Little Inch (30” Culvert)
- Earthen dam controls flow into Big Inch and downstream flooding

Sources: UCB Campus Infrastructure Master Plan (2015)
Strawberry Creek Management Plan (1987 and 2006 updates)
Ecology and Landscape
Tree Species Diversity

Dominant Species
- California Live Oak, *Quercus Agrifolia* (22%)
- Tasmanian Blue Gum, *Eucalyptus Globulus* (13%)
- California Redwood, *Sequoia Sempervirens* (11%)
- Others

Diversity Hotspots
Ecological Resilience: Tree Canopy Diversity

- Campus tree diversity “10-20-30” rule of thumb to promote tree canopy biodiversity and resilience: no more than 10% of one species; 20% of one genera, or 30% of one family
- Strong diversity today with 190 species on campus

Three species exceed 10%

One genera exceeds 20%

No families exceed 30%
What are the key issues for the LRDP and Campus Master Plan?

• Position the campus as a living lab
• Prioritize sustainable mobility strategies
• Advance carbon neutrality goals, including plans for the renewal of the Central Heating Plant and zero-waste
• Continue to minimize water use, promote water reuse, and advance stormwater management best practices
• Restore and embrace natural systems as campus amenities
• Promote campus ecological diversity
• Advance adaptation and resilience—fire hazards, rising temperatures, flood mitigation, etc.
• Optimize the use of existing resources; balance new construction with renovation
Breakout Activity and Reporting Back

**Visioning Exercise (10:35 – 11:00 am)**
- Break out into groups by theme: energy, water use, stormwater management, and landscape and ecology
- What are the top three ways you could be more sustainable?
- How can Berkeley continue its leadership in sustainability and resilience, as reflected in the physical campus environment?

**Mapping Exercise (11:00 – 11:35 am)**
- Regroup into teams that include multiple themes
- Are there potential sustainability initiatives for the physical campus that can positively impact multiple areas of resilience and sustainability?
  - What methods and findings from ongoing research can be applied to the campus?

**Report Back (11:35 – 11:55 am)**

**Next Steps and Wrap Up (11:55 am – 12:00 pm)**