LONG RANGE DEVELOPMENT PLAN 2005-2020
UNIVERSITY OF CALIFORNIA, SANTA CRUZ

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Draft

INFRASTRUCTURE AND TECHNOLOGY WHITE PAPER

1. The 1988 Long Range Development Plan

a . Energy

- Expand energy management systems –control heating/cooling based on use/temperatures
- Exclude air-conditioning (for comfort) in new buildings
- New buildings to utilize solar energy features where feasible

b. Water

- Install new water pressure system if development over elevation 900
- Implement water conservation measures – install low flush and low flow fixtures in new buildings; retrofit 80% of existing units; reduce per acre irrigation by 12.5% from baseline usage
- Negotiate cost share of new water sources with the City once the City has developed and approved the new sources
- Share costs with City for off-campus water pump upgrades
- Pay fair share costs (through user fees) for upgrade to off-campus sections of sewer lines

c. Storm Drainage

- Implement campus drainage plan
- Implement water recharge to springs and seeps
- Monitor ground water quality

d. Waste/Hazardous Materials

- Implement a recycling and waste reduction program –
- with a goal of 20% diversion
- Strengthen waste materials reduction programs
- Implement household waste program

2. Existing Conditions

Overall the campus has moved forward within the framework of the 1988 LRDP, although there are some elements that have not been addressed and some components of the campus infrastructure will require upgrade as the campus grows. The campus operates under very tight fiscal controls and this impacts the funding available for operational staff and maintenance.

a. Energy

A cogeneration plant, that predates the 1988 LRDP and at the time had the capability to provide 80% of the campuses peak load, continues to operate to provide electricity (sufficient for 33% of current campus peak electrical requirements) and heating water to the campus core. Since 1988, no additional internal energy sources have been added to the campus infrastructure. However, instrumentation (central and within/at buildings) has been installed to monitor and understand consumption. UCSC continues its "no air-conditioning for comfort" policy and new non-laboratory areas of buildings have been designed without air-conditioning. The campus consumption is among the lowest in the UC system. Energy conservation projects have been funded with limited building budget, campus and loan funds. The central cooling and heating water system has been expanded to accommodate growth in the campus core.

The majority of energy requirements are met by off campus power sources provided by PG&E. Electrical energy reliability has been problematic, which has forced the addition of generators to many campus buildings. However, the generators cannot be used on a consistent basis for power generation due to emissions limitations.

b. Water

Since 1988, a range of water conservation programs have been implemented which have effectively maintained campus water consumption at near 1988 levels. In calendar year 2002 UCSC's water usage was approximately 3.5% greater than it's usage in 1986-87, a period over which enrollment grew by 52 %. That is, despite student enrollment increases and the addition of a number of new buildings, UCSC's water conservation efforts resulted in average daily use that is almost the same as it was 16 years ago. Installation of computerized irrigation and timed drip systems have kept water used for irrigation at 12.5% or below the 1984/85 baseline.

Under 1962 and 1965 agreements, the City is to provide, at all times, up to 2 million gallons of water in a 24-hour period. Current UC water usage averages 520,000 gallons per day (gpd), or approximately ¼ of its contractual right.

The City has not reached consensus on new water sources. As a result, although the campus has an agreement for additional water supply, there may be a shortfall of as much as 50% in drought years. There are two capped wells on campus of unknown capacity that could be used for non-potable water uses. However, effect on the overall aquifer would need to be considered if these wells were targeted for reactivation.

c. Storm Water Drainage

Storm water effectively exits the ground surface of the campus—principally through canyons that run north-south through campus and lead to sinkholes in the cavernous limestone topography that underlies the campus. The condition and extent of these underground systems is not completely understood and is, therefore, an unknown factor in campus growth. A master plan is currently under development, which is intended to address these issues as well as providing a plan to reduce stormwater erosion and sedimentation.

d. Waste/Hazardous Materials

Recycling efforts have far exceeded the 20% goal outlined in the 1988 LRDP. Twenty seven percent of the non- construction waste stream (66% residential housing related and 34% state administrative facilities related) is currently diverted. In fact, when construction and demolition related waste streams are included the campus exceeds the 50% waste diversion goal prescribed by the State of California.

It is projected that there is currently 35 years of local landfill capacity in the City Dimeo Lane facility. This projection would include some allowance for growth of UCSC since it is within the waste collection region for the landfill. UCSC will need to continue its recycling and waste diversion efforts as it grows.

e. Network and Telecommunications

This is a new consideration for the LRDP. There is currently enough space in the existing corridor for the necessary cabling if the old, unused systems are removed and/or replaced. A comprehensive UPS/emergency generator for the Data Center is in the design phase. Inter-building infrastructure is being upgraded to support dual entrances to increase reliability. Current in-building wiring is inadequate to meet anticipated bandwidth/density needs in 70% of our buildings.

Wireless deployment is in its early stages on campus, but will likely have an impact over the life of the new LRDP.

3. Key Physical Issues

There are key infrastructure issues that will impact the direction and amount of future growth of the UCSC campus. The degree to which each of these issues is understood varies. Some studies are underway and others are required.

a. Electric/Gas System Capacity

Energy supply and distribution represents a key consideration in campus growth. Electricity supply in particular has been unreliable, though some improvement has been achieved through PG&E upgrades. Off campus PGE supply for both the electric and gas systems may be at, or approaching, capacity. The reliability issue impacts the quality of research and efficient operation of the campus. A number of areas related to the energy systems need to be thoroughly examined to inform decisions on growth. Planning underway will inform the campus in these areas as planning moves forward.

- What is the real availability and costs associated with off-campus (PG&E) electricity and gas sources? Can better reliability or more supply be assured? What is the range and most likely costs associated with new supplies and distribution systems?
- What is the state of the current energy infrastructure—particularly that for which maintenance has been deferred?
- What alternative energy generation technologies are available?
- Are there targeted areas where emissions can be reduced?
- What is the expected additional service demands as the campus grows? What campus programs can help limit these additional demands?
- What are the opportunities to reduce energy use and make energy use more efficient?

b. Water

While there is a contractual agreement between UCSC and the City in which additional supply is to be made available, it should be recognized that the City is likely to have problems meeting this obligation—particularly in drought conditions. Any Campus growth is contingent upon finalizing a water supply strategy that continues to include conservation and new source development in partnership with the City.

c. Sinkholes and Storm Water Drainage

While storm water is currently effectively controlled, the reliance on complex geologic conditions—coupled with an expected increase in runoff as new hard surfaces are constructed—makes this an issue to be addressed by the campus. A better understanding of the conditions of the underlying limestone complex would not only bring clarity to the issue of storm water runoff capacity, but would also allow for reductions in construction issues as the campus is further developed. Specific issues will be better understood upon completion of the storm water master plan currently under development.

d. Network and Information Technology

As enrollment increases, IT facilities will need to increase and cabling will need to be upgraded. The Data Center may need to expand or move off-campus to meet growing need for space associated with hosting servers. Future technology needs and trends may make current bandwidth obsolete and require in-building wiring upgrades. Current in-building wiring is inadequate to meet anticipated bandwidth/density needs in 70% of buildings.

e. Infrastructure Improvement and Maintenance Funding:

With significant campus growth, increased regulatory and sustainability goals, there will be a need for greater investment in the infrastructure supporting the campus.

f. Support Space:

Support space for units will increase and planning will need to include space or alternative locations for Physical Plant operations, Environmental Services Facilities, Fire Department, Business Administration Services, Student Affairs, IT, and other academic support needs.

g. Sustainability

Sustainability and best management practices will become increasingly important as the campus expands both because of the need to increase the campus population using limited resources, new sustainability policies across the UC system, and from Student referendums at UCSC. Planning efforts, both by student groups and UCOP, are currently underway and these goals will need to be considered in the LRDP.

h. Topography of North Campus

Campus growth to the north the mountainous topography of the site will require extensive expansion of existing infrastructure.

i. Environmental Constraints

There may be environmental constraints (i.e. protected species, emissions, etc.) that will have implications to the siting and costs for infrastructure improvements and/or expansion.

j. Studies

Results of additional studies underway will need to be considered to allow for more informed decision-making. These include:

- Utility Master Plan – Study of energy related systems including generation options; natural gas and electricity supply and options, etc.
- Stormwater Drainage Plan
- Water supply and conservation opportunities including City/University partnerships, non-potable use of on-site wells, etc.

k. Summary

Improvements to the existing infrastructure will be required as the campus grows. Proactive and active management of energy and water systems to achieve a sustainable future will continue to be promoted. A defined funding strategy will be required to support the development of new technologies and efficient infrastructure.

4. Possible Approaches

Issue Specific:

The most significant infrastructure issues relate to providing adequate and reliable services for water, utilities and network and information technology and can have a number of mitigation strategies.

a. Water

- Increasing water conservation programs including retrofit of current structures
- Limited pumping program from wells and geophysical testing to determine aquifer parameters (sell as way to help city with limited capacity)
- Including fire resistant design in new construction to assure that water requirements for single building do not put the campus at undue risk
- Establishing water targets or goals in conjunction with the community/City
- Develop packaged treatment plant for on-site location. Use recycled water for irrigation, cooling towers and other non-potable uses

b. Utilities

- Initiate off campus service planning studies with PGE
- Solar or other sustainable/low emission energy sources
- Supply standby generation power at new buildings

- Continue to implement energy efficient design for all new projects. In line with UC Policy on sustainability reduce energy demand of new buildings beyond current UCSC standards
- Offset PG&E electric unreliability by increasing co-generation capacity using low emission technology
- Investigate energy conservation retrofit opportunities

c. Network and Information Technology

- Change IT cabling and other systems concurrent with any new northern roads and with upgrades of other utilities in multi-use corridors in the central campus
- Provide dual entrances to campus building for backbone network
- Upgrade in-building wiring in conjunction with building renovation projects
- Use wireless systems (particularly for buildings in north campus and outdoor areas) to the extent possible

d. UCSC as a Sustainable Community

As the planning process moves forward, addressing campus growth within a sustainability framework will allow for appropriate investment in conservation and efficient infrastructure[1].

A sustainability approach could provide:

- Greater growth than would otherwise be feasible
- The potential to create a campus which is seen as both visionary and a prime example of how sustainability can be incorporated into a university setting
- Increased opportunity for student and faculty recruitment & research
- An avenue for community outreach and involvement through education on sustainable practices
- Increased reliability in utility service
- An educational campaign focused on new students that could both increase participation in sustainable practices and feeling of being part of special community
- Reduced life-cycle costs of infrastructures systems

[1] At a campus wide level sustainability can also be used to address wider issues – economic, social and environmental. There is likely to be a case for putting sustainability at the forefront of the campus goals and to use it to promote good environmental stewardship; to raise the profile of the University in its relations with the community, and to increase its ability to attract students and high quality faculty and staff. A sustainability framework can also be used to address the needs of all stakeholders and can provide a method of quantifying goals to be reached. In other words, sustainability should be able to demonstrate a positive business case.