University California, Santa Cruz

Younger Lagoon Reserve

Annual Report 2013-2014

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Introduction

This report provides an overview of the activities that were conducted at Younger Lagoon Reserve (YLR) during the 2013-2014 fiscal year (July 1, 2013 - June 30, 2014). Younger Lagoon continued to see increases in use and activity in general. Providing an outdoor classroom and living laboratory allows for experiential learning opportunities. These opportunities have profound impacts on students both professionally and personally. This was the sixth year we had fulltime staff on site managing the Reserve. As a direct result, the level of academic and public engagement increased and the Reserve is on target for implementing its obligations required under the Coastal Long Range Development Plan (CLRDP).

Younger Lagoon represents a unique reserve within the UCSC's Natural Reserve portfolio as it has open public access to a portion of the Reserve. Along with the challenges of public access (i.e. impacts to resources, protecting research equipment, protecting endangered and threatened species, implementing regulations, etc.) having public present on-site provides opportunities for outreach and education. During the past year, we continued to implement restoration activities on the Terrace Lands portion of the reserve and, as a direct result, interacted frequently with public users. These interactions have continued to provide opportunities for reserve staff and students to discuss the short and long-term objectives and goals of the restoration work, interpret the flora and fauna of YLR, and discuss ongoing planning and development efforts of the Marine Science Campus.

CLRDP Activities

Overview

This year represented the sixth year of CLRDP related activities at Younger Lagoon Reserve. The California Coastal Commission certified the CLRDP for the "Terrace Point" property in 2008. In July of 2008, approximately 47 acres of natural areas of the "Terrace Point" property were incorporated into the University of California Natural Reserve System as part of UCSC's Younger Lagoon Reserve. The inclusion of the 47 acres into YLR, along with continued

management of the lagoon portion of YLR, was a requirement of the California Coastal Commission for the UCSC Marine Science Campus development.

The CLRDP requires that the entire Reserve be protected and that the newly incorporated Natural Reserves lands are restored over a 20-year period. Fulfilling the University's mission to support research and teaching, we continue to incorporate research and teaching into all aspects of restoration, monitoring, research and protection throughout YLR. The increased lands and access to restoration and monitoring projects are providing expanded opportunities for undergraduate experiential learning opportunities via class exercises, research opportunities, and internships.

NOID 2 (10-1) Beach Access Management Plan

This year represented the fourth full year of Beach Access Management Plan related activities at Younger Lagoon Reserve. Implementation Measure 3.6.3 of the CLRDP required that (through controlled visits) the public have access to Younger Lagoon Reserve beach and that a monitoring program be created and implemented to document the condition of native flora and fauna within Younger Lagoon and it's adjacent beach. The monitoring plan was to be implemented over a 5-year time period. At the end of the 5-year period (Winter 2015) results are to be compiled and included in a report that summarizes and assesses the effect of controlled beach access on flora and fauna. The report will be submitted to the California Coastal Commission. In March 2010, the California Coastal Commission (CCC) approved the University of California's Notice of Impending Development for Implementation Measure 3.6.3 of the CLRDP (NOID 2 (10-1)). Seymour Marine Discovery Center docent-led tours of the beach were offered twice a month throughout FY 2013-2014 and biological monitoring of the lagoon and adjacent beach was conducted quarterly in FY 2013-2014. A detailed report on activities under the Beach Access Management Plan is included as Appendix 1.

NOID 3 (10-2) Specific Resource Plan for the Enhancement and Protection of Terrace Lands at Younger Lagoon Reserve

The Resource Management Plan (RMP) within the CLRDP provides a broad outline with general recommendations and specific guidelines for resource protection, enhancement, and management of all areas outside of the mixed-use research and education zones on the MSC site (areas that will remain undeveloped). In addition to resource protection, the CLRDP requires extensive restoration, enhanced public access/education opportunities on site, and extensive monitoring and reporting requirements. The entire project is to be completed over 20 years and, as a condition of inception into the University of California Natural Reserve System, UCSC Campus has committed to providing perpetual funding for the project and continued management of YLR.

The SRP for Phase 1A and 1B of restoration (first 7 years) was approved by the CCC in September 2010. Phase 1A projects include Priority 1 weed removal, re-vegetation, baseline monitoring and selection of reference systems. Phase 1B projects include work in wetland areas, which will require further permitting from outside agencies (e.g. ACoE, USFWS, CDFG). Restoration of the Terrace lands continued throughout FY 2013-2014. Activities included weed control, planting and seed collection.

The SRP for Phase 1A and 1B of restoration (first 7 years) outlined detailed success criteria for each of the reserve's habitat types (Ruderal, Coyote Brush Grassland-Scrub, and Grassland, Coastal Bluffs, Wetlands, and Wetland Buffers). These criteria set an initial threshold of species richness and cover for specific habitat types throughout the restoration area. These criteria were further refined at the recommendation of the SAC based on results from reference site monitoring of local coastal terrace prairie grassland, seasonal wetland, and coastal scrub sites (See 2009-2010, 2010-2011 and 2011-2012 Annual Reports). FY 2013-2014 marked the third year of compliance monitoring for restored Coastal Bluffs and Grassland areas. A detailed compliance monitoring report is included in Appendix 2.

NOID 5 (12-2) Public Coastal Access Overlook and Overlook Improvements Project

In August 2012, the California Coastal Commission (CCC) approved the University of California's Notice of Impending Development NOID 5 (12-2) Public Coastal Access Overlook and Overlook Improvements Project. Construction on the Public Coastal Access Overlook and Overlook Improvements Project ("Overlooks Project") began in the winter of 2012/2013 and was completed in the spring of 2013. The project consisted of three new public coastal access overlooks, and improvements to two existing overlooks at UCSC's Marine Science Campus. Several of the overlooks, which are sited at the margins of development zones, therefore are within what is now the Younger Lagoon Reserve: Overlooks C and A are within development zones at the margin of the YLR, while the sites of overlooks D, E and F are within areas incorporated into the YLR as a condition of approval of the CLRDP. The project constructed publicly-accessible overlooks from which to view the ocean coast (Overlook F), Younger Lagoon (Overlook D), a seasonal wetland (W5) (Overlook A), and campus marine mammal pools (Overlook C) for which public access is otherwise limited due to safety hazards or for the protection of marine wildlife and habitats. The facilities will ultimately include interpretive signs and public amenities such as bicycle parking and benches to enhance public access to, and enjoyment of, these restricted and/or sensitive areas.

NOID 6 (13-1) Coastal Biology Building and Associated Greenhouses; Site Improvements Including Road, Infrastructure and Service Yards; Public Access Trails and Interpretative Panels; Wetland Connection in Specific Resource Plan Phase 1b; Sign Program; Parking Program; Lighting Plan.

In August 2013, the California Coastal Commission (CCC) approved the University of California's Notice of Impending Development NOID 6 (13-1) Coastal Biology Building and Associated Greenhouses; Site Improvements Including Road, Infrastructure and Service Yards; Public Access Trails and Interpretative Panels; Wetland Connection in Specific Resource Plan Phase 1b; Sign Program; Parking Program; Lighting Plan. This project includes development of a new seawater lab building, three new parking lots along with a parking management program, a research greenhouse complex, and associated site work including proposed storm water

treatment and infiltration features. It also consists of campus utility and circulation improvements to serve both the new lab building and future campus development under the CLRDP. The Project would develop a complex of public access and interpretive faclities, including pedestrian access trails, an interpretive program shelter, educational signage, and outdoor exhibits. This project includes mandated wetland restoration and habitat improvements as described in the Specific Resource Plan Phase 1b. This project also initiates campus wide parking, sign, and lighting programs.

The entire Notice of Impending Development (NOID) 6 (13-1) is appended to this report in Appendix 5. Details regarding fencing from NOID 6 (13-1) as it relates to YLR are provided below.

Under the CLRDP RMP MM 30, the University is required to remove and replace the existing chain link fencing that separates the lagoon from the campus and install new solid fencing and/or an additional berm along or just outside of the original YLR boundary. Under section 6.8.3 of the CLRDP (Specific Fencing/Barrier Design Guidelines), this replacement solid fencing can be up to six feet in height and is to be installed on the Younger Lagoon side of the berm, or at the break in vegetation with landscaping used to soften its appearance. The SAC have discussed this issue since their first meeting, discussed it again at their winter 2013 meeting, and has suggested that installing a solid wood fence on the Younger Lagoon side of the berm will effectively reduce the size of the reserve, increase visual disturbance to the lagoon, shade out native plantings, and is an inappropriate approach for this location, provided that visually-permeable, secure fencing, such as that proposed by the University is allowed on the McAllister Way side of the berm.

In July 2013, the University proposed that the screening provided by the berm be augmented with visually-permeable fencing on the McAllister Way side of the berm. This visually-permeable fencing would be made of open mesh-welded wire panels on rough wooden posts sited and designed to minimize visual impacts, including avoiding straight-line forms, incorporating vegetation to help it blend into the surroundings, and could be modified to allow for wildlife passage. The SAC supported this proposal and believed it struck a balance between

keeping the lagoon area secure for resource protection, research and teaching, while providing the public with relatively unobstructed views of coastal resources.

In August 2013, Commission staff found that the wire fencing on the McAllister Way side of the berm as proposed by the University was not allowable under the CLRDP, primarily for perceived negative visual impacts, and proposed that roughhewn split-rail fencing no taller than 3 feet in height, or wood post and rope (or cable) barriers no taller than 2 feet in height be used instead. The SAC believed the use of such low fencing would invite trespass and have a negative impact on sensitive resources, decreasing the value of the site for teaching and long-term research, as researchers require assurance that their equipment is relatively secure before committing to work at a reserve. While they recognized the importance of maintaining a rural and open space aesthetic to the campus, it was their hope that the Commission would recognize the importance of he lagoon area for resource protection, teaching and research and controlled public access, and to allow for taller, visually permeable fencing on the McAllister Way side of the berm. In August 2013, the SAC sent a letter to the CCC stating their support for the University's proposal and urging the Commissioners to vote in favor of the University's proposal.

At the August 2013 CCC meeting, representatives from the University, including NRS Director Gage Dayton and YLR Manager Elizabeth Howard made presentations to the Commissioners regarding the berm fence. The Commissioners ultimately voted in favor of the University's proposal.

Scientific Advisory Committee (SAC) Meetings / Recommendations

A critical component of the CLRDP was the creation of a Specific Restoration Plan (SRP) guided by a Scientific Advisory Committee (SAC). The SAC is comprised of four members: Dr. Karen Holl (SAC chair) Professor and Chair of the Department of Environmental Studies at UCSC; Tim Hyland, Environmental Scientist, State Parks, Santa Cruz District; Bryan Largay, Conservation Director, Land Trust of Santa Cruz County; and Dr. Lisa Stratton, Director of Ecosystem Management, Cheadle Center for Biodiversity and Ecological Restoration, University

of California, Santa Barbara (UCSB). SAC members met with reserve staff individually at YLR and/or over the phone or on email during FY 2013-2014. These meetings included updates on future projects under the CLRDP, and restoration and teaching activities at YLR.

Research Recommendations:

Efficacy of Exotic Control Strategies for Restoring Coastal Prairie Grasses

Restoration in Mediterranean-climate grasslands is strongly impeded by lack of native propagules and competition with exotic grasses and forbs. A multi-year study at YLR involving many undergraduate student researchers, graduate student researchers, and professor Karen Holl has tested several methods for exotic plant control combined with planting native grasses to restore prairies in former agricultural land in coastal California. Specifically, the study compared tarping (shading out recently germinated seedlings with black plastic) once, tarping twice, topsoil removal, herbicide (glyphosate), and a control treatment in factorial combinations with or without wood mulch. Into each treatment the investigators planted three native grass species (Elymus glaucus, Hordeum brachyantherum, and Stipa pulchra) and monitored plant survival and cover for three growing seasons. The results and recommendations of this study are summarized below:

- Survival of native grass species was high in all treatments, but was slightly lower in unmulched soil removal and control treatments in the first 2 yr.
- Mulching, tarping, and herbicide were all effective in reducing exotic grass cover and enhancing native grass cover for the first 2 yr, but by the third growing season cover of the plant guilds and bare ground had mostly converged, primarily because of the declining effects of the initial treatments.
- Mulching and tarping were both considerably more expensive than herbicide treatment. Topsoil removal was less effective in increasing native grass cover likely because soil removal altered the surface hydrology in this system.
- Several treatments were effective in enhancing native grass establishment, but that longer term monitoring is needed to evaluate the efficacy of restoration efforts.
- The most appropriate approach to controlling exotics to restore specific grassland sites will depend not only on the effectiveness, but also on relative costs and site constraints.

Investigating Cost Effective Methods for Coastal Prairie Restoration

Cost effective methods to restore coastal prairie are needed, and due to its mission as part of the UC NRS and its restoration obligations under the CLRDP, YLR is uniquely positioned to contribute to research on best management practices for coastal prairie restoration. At the SAC's recommendation, in FY 2011-2012 Professor Karen Holl, doctoral student Lewis Reed and undergraduate students Tianjiano (T.J.) Adams and Mickie Tang initiated a case study of planting techniques for ecological restoration in coastal prairie systems. This research continued in FY 2012-2013 with the addition of doctoral student Jessi Hammond, and in FY 2013-2014 with the addition of undergraduate student Eileen Arneson. This research aimed to test both planting design (planting the entire area or planting islands of seedlings that cover ~1/3rd of the area) to restore California coastal prairie at Younger Lagoon Natural Reserve. In addition, this research tested pre-planting mulching and post-planting mowing to control exotic weeds. In fall 2011, Adams and Tang set up 20, 10 × 10 m plots, five replicates of five treatments: (1) island planting no-mulch, (2) island planting mulch, (3) full planting no-mulch, and (4) full planting mulch. They planted three native perennial grass species (*Stipa pulchra*, Hordeum *brachyantherum*, and *Bromus carinatus*); five forb species (*Achillea millefolium, Clarkia davyi*, *Grindelia stricta, Trifolium willdenovii*, and *Symphyotrichum chilense*); and one species of rush (*Juncus patens*). Seeding was done in November 2011 and planting was conducted in January 2012. Half of each plot was mowed in the spring of 2012, 2013, and 2014. Arneson monitored survival and cover of individual planted seedlings, cover of several plant guilds, and recruitment of native forbs. The results from the third growing season (2014) are presented in Arneson (2014). The main results and recommendations are listed below.

- The entire study site was dominated by exotic species, particularly exotic grasses. As a guild, exotic grasses comprised over 70% cover. As a guild, exotic forbs comprised 25% of visual cover estimates.
- In sub-plots planted with native grasses, native grasses comprised approximately 25% of visual cover estimates.
- The mowing treatment significantly increased the percent cover of exotic grasses. The interaction of the no mowing and no mulch treatments significantly increased the percent

cover of exotic forbs. The mowing treatment had a marginally significant negative impact on the percent cover of one native grass. Mowing did not have an impact on the other two native grasses or any of the native forbs.

- The percent cover of exotic grasses was similar across all plot-level treatments.
- There was a significant treatment × mowing interaction term for exotic forb cover, which was higher in the no mulch and no mowing treatments.
- Recruitment of all of the native forb species was low or non-existent across all treatments.
- There was no apparent trend in the effect of mowing on native forb recruitment.
- The percent cover of native species in the applied nucleation plots was similar to or higher than the level in the full-planting plots.
- Surface mulch marginally increased the cover of two native forbs, though its impacts are diminishing over time.
- Annual mowing did not have an impact on native grass or forb cover, though it increased exotic grass cover.
- Based on these results, Arneson recommends continuing to experiment with applied nucleation in California grasslands. She does not recommend using a one-time application of surface mulch as a stand-alone invasive exotic control method, however, due to high costs and diminishing impacts over time, she also recommends against using annual mowing as an exotic control method, as it was ineffective in this experiment.

Mowing for Coastal Prairie Restoration and Management

Cost effective, feasible methods to restore and manage coastal prairie are needed, and due to its mission as part of the UC NRS and its restoration obligations under the CLRDP, YLR is uniquely positioned to contribute to research on best management practices for coastal prairie restoration. At the SAC's recommendation, in FY 2012-2013, doctoral student Lewis Reed initiated a literature review of mowing techniques for ecological restoration in coastal prairie systems. This research continued in FY 2013-2014. The purpose of this review is to provide insights from the scientific literature to inform effective use of mowing as a management tool at Younger Lagoon Reserve. Mowing is one of the most readily available management strategies

for a variety of land managers. This tool may be particularly important in sites such as the Younger Lagoon Reserve that are small and close to urban boundaries where other options such as grazing or fire and in some cases herbicide may be impractical. Reed's review demonstrates that mowing will have different outcomes depending factors such as the height, frequency, timing, and spatial arrangement of clipping and whether or not cut material is removed. In cases where other management tools are available, mowing may be an important part of integrated management schemes. Reed's entire report is included in Appendix 3.

Monitoring efforts in 2014-2015

During the 2014-2015 field season, Hammond and Holl will conduct restoration compliance monitoring at restoration sites 2, 4 and 6 years post planting as per CLRDP requirements.

Ongoing Management Issues

In FY 2013-2014 the SAC continued to discuss two ongoing management issues at YLR: 1) Domesticated Animals, specifically dogs, and 2) Trespass

In 1999, when the University purchased the land for the expanded MSC, a special exception was made in the campus code to allow leashed dogs on the bluff top trail that rings the YLR Terrace Lands. Since that time, the site has become popular with dog owners, many of whom do not obey the leash law. The CLRDP requires that all domesticated animals be eliminated from the campus. At the 2012 SAC meeting, YLR staff described their continued efforts to enforce the existing leash law on the campus and ongoing plans to eliminate all domesticated animals from the MSC per the CLRDP. Off leash dogs regularly chase wildlife in the reserve and disturb ongoing research and restoration projects. The SAC recommended continued education and outreach efforts with the public, LML staff and UCSC police. In FY 2011-2012, this task was made more difficult when the campus animal control officer position was eliminated. However, recent meetings with UCSC police have been promising, as newly hired officers appear interested in educating the public about and enforcing the existing leash. In FY 2014-2015, construction began on the network of public trails and overlooks planned for the MSC. These will include signage that outlines the campus pet policy as well as support for UCSC Police

Department Student Ambadassors, which YLR staff anticipate will help educate the public and reduce the number of dogs on the reserve.

YLR also staff described the problems with trespass (mostly surfers) in the reserve. The SAC recommended continued education and outreach efforts with both the public and the UCSC police.

Photo Documentation

Photo point locations were established at ten locations within YLR. These locations were chosen to ensure coverage of all major areas on the Terrace. Photos were taken on May 6, 2014. At each photo point we collected the following information:

1. Photo point number
2. Date
3. Name of photographer
4. Bearing
5. Camera and lens size
6. Coordinates
7. Other comments

Photos are included in Appendix 4

Restoration Activities

Restoration activities continued on the Terrace area of YLR and throughout the lagoon portion of the Reserve. Implementation was conducted largely by undergraduate students and community volunteers; thus, utilizing the reserve in a manner consistent with the programmatic objectives (facilitating research, education, and public service) of the University of California, Natural Reserves. Here we summarize some of the restoration activities that occurred on YLR during the past year.

Figure 1. Volunteers and undergraduate student interns plant native plants.

Priority One Weed Removal

Under the SRP, all priority-one weeds (Ice plant, Jubata grass, Monterey cypress, Cape Ivy, Panic veldgrass, Harding grass, French Broom and Monterey Pine) are to be controlled as they are detected throughout the Terrace Lands. Elimination of reproductive individuals is the goal; however, YLR is surrounded by priority-one weed seed sources and it is likely that there will always be a low level of priority-one weeds persisting on the terrace. In FY 2013-2014, reserve staff conducted weed patrols of the entire terrace, continued removing ice plant from the coastal bluffs, removed all Jubata grass re-sprouts from the terrace, removed all French Broom re-sprouts from the terrace, and removed all Cape Ivy re-sprouts from the west arm of the lagoon. In FY 2014-2015, reserve staff will continue weed control projects and patrols. Due to the long-

lived seed bank of French Broom, proximity of mature Jubata grass and Panic veldgrass on adjacent properties, and known ability of Cape Ivy fragments to re-sprout, regular patrols and maintenance of these sites will be critical. Removal of new recruit Monterey Pine and Cypress will continue as will targeted removal of current individuals.

Seed Collection and Plant Propagation

In the summer and fall of 2013, reserve staff consulted with local experts to determine appropriate seed collection sites and collected seeds for restoration growing. These seeds were collected by YLR staff and student interns and propagated by the UCSC Teaching Greenhouse in the fall and winter of 2012/2013 (Figures 6 and 7).

Figure 2. Undergraduate intern collects native seeds for habitat restoration.

Restoration Planting

In FY 2013-2014, areas along the beach cliff formerly covered with ice plant continued to be planted with native seedlings. Upland areas adjacent to the beach cliffs were planted with native seedlings.

Education

Instructional use at Younger Lagoon Reserve continued to increase this year. Courses encompassed a wide variety of disciplines. The increase in course use is a direct result of having fulltime staff on site that are able to actively engage faculty and students through outreach efforts in the classroom as well as providing on-the-ground assistance in teaching activities. The proximity of Younger Lagoon to the campus enables faculty and students to easily use the Reserve for a wide variety of instructional endeavors ranging from Restoration Ecology to Animal Tracking.

Undergraduate Students – Providing hands-on learning opportunities for future leaders

YLR's proximity to the UCSC Campus and Long Marine Laboratory make it an ideal setting for undergraduate teaching and research. In FY 2013-2014 the reserve hosted classes in Ecology, Entomology, Freshwater Ecology, Restoration Ecology, Ecology and Conservation in Practice Supercourse, Systematic Botany of Flowering Plants, Plant Ecology, Advanced Ecology and Evolutionary Biology Seminar, College 8 Service Learning Practicum, Freshwater / Wetland Ecology, and Animal Tracking (Table 1).

Internships and Senior Theses

In FY2013-2014, YLR staff sponsored over 50 undergraduate interns through the UCSC Environmental Studies Internship Office (Figure 9). The students ranged from entering freshman to graduating seniors and spent between 6 and 15 hours a week working on on-going restoration projects at the reserve. These projects included invasive species removal, re-vegetation with

native species, seed collection, and propagation. Student-interns report a deep appreciation for the opportunity to obtain hands-on experience in their field of study.

Figure 3. Undergraduate student intern at work on the reserve.

Table 1. Younger Lagoon Courses

Course Title	Institution (Department)	Instructor's Name
BIO 11C - Ecology	**Cabrillo Community College**	**Hannah Nevins**
BIOE 107 - Ecology	**University of California, Santa Cruz (Dept. of Ecology and Evolutionary Biology)**	**James Estes**

BIOE 117 - Systematic Botany of Flowering Plants	**University of California, Santa Cruz (Dept. of Ecology and Evolutionary Biology)**	**Kathleen Kay**
BIOE 122/L - Invertebrate Zoology	**University of California, Santa Cruz (Dept. of Ecology and Evolutionary Biology)**	**Baldo Marinovic**
BIOE 145 - Plant Ecology	**University of California, Santa Cruz (Dept. of Ecology and Evolutionary Biology)**	**Ingrid Parker**
BIOE 151 and ENVS 109 - Supercourse	**University of California, Santa Cruz (Dept. of Ecology and Evolutionary Biology and Environemental Studies)**	**Don Croll, Erika Zavaleta and Gage Dayton**
BIOE 155 - Freshwater Ecology	**University of California, Santa Cruz (Dept. of Ecology and Evolutionary Biology)**	**Joe Merz**
BIOE 295 - Advanced Ecology and Evolutionary Biology Seminar	**University of California, Santa Cruz (Dept. of Ecology and Evolutionary Biology)**	**Beth Shapiro**
CLEI 55 - College Eight: Service Learning Practicum	**University of California, Santa Cruz (College Eight)**	**Susan Watrus**
CLEI 55 - Sustainability Internship	**University of California, Santa Cruz (College Eight)**	**Susan Watrus**
ENVS 104A/L - Environmental Field Methods (Summer)	**University of California, Santa Cruz (Dept. of Environmental Studies)**	**Amy Wolf**
ENVS 108 - Entomology Lab	**University of California, Santa Cruz (Dept. of Environmental Studies)**	**Hamutahl Cohen**
ENVS 160 - Restoration Ecology	**University of California, Santa Cruz (Dept. of Environmental Studies)**	**Robert W Henry III**
ENVS 167 - Freshwater / Wetland Ecology	**University of California, Santa Cruz (Dept. of Environmental Studies)**	**Katie L Monsen**
ENVS 83 / 183 - Younger Lagoon Reserve Stewardship Interns	**University of California, Santa Cruz (Dept. of Environmental Studies)**	**Tim Brown**

ENVS 84 / 184 - Younger Lagoon Reserve Stewardship Interns	**University of California, Santa Cruz (Dept. of Environmental Studies)**	**Tim Brown**
OPERS Animal Tracking class	**University of California, Santa Cruz (OPERS)**	**Chris M Lay**
Provosts Sustainability Internship	**University of California, Santa Cruz (College Eight)**	**Shauna Casey**

Research

Due in part to its relatively small size and lack of facilities, YLR is unlikely to host many single-site research projects in biology or ecology. However, as one of the few remaining coastal lagoons in California, YLR is well suited to act as one of many research sites in a multi-sited project. Additionally, the close proximity to campus makes it an ideal place for faculty to conduct pilot and our small-scale studies as well as for undergraduate research opportunities. In FY 2013-2014 we approved 13 research applications.

Mercury content of Arthropods on Central California Coast

A preliminary study by researchers Peter Weiss and Kona Orlandi in 2011 showed that fog water collected in Santa Cruz contains methylmercury, a potent neurotoxin. The concentrations found, while only in the ppt range, were baffling since methylmercury is normally formed in anoxic waters and sediments. One hypothesis is that methylmercury formed in the coastal ocean is brought to the surface during upwelling and a net flux to the atmosphere occurs. Once in the atmosphere, methylmercury would be quickly taken up by cloud droplets. In 2013-2014, their research team began an investigation into the impact on terrestrial biota from mercury in fog deposition.

Undergraduate Research Highlights

Undergraduate Eileen Arneson completed a senior internship projects with the UCSC Natural Reserves in June 2014 (Figure 12). Her project, entitled ‘The effects of applied nucleation,

mulch and mowing on a California coastal prairie restoration' was a case study of planting and weed control techniques for ecological restoration in coastal prairie systems. Arneson worked closely with Reserve Manager, Elizabeth Howard, Restoration Steward Tim Brown, Graduate Student Jessi Hammond and Faculty Advisor Karen Holl to ensure that her results and recommendations would influence future restoration and management activities.

Reserve Use

The greatest educational user group for YLR in FY 2013-2014 was once again undergraduate education, breakdown of all user groups are included in Table 2. YLR was used by UC Santa Cruz, UC Davis, UC Santa Barbara, Yerba Buena High School, Delta High School, St Andrew's Episcopal School, US Geological Survey, California Department of Fish and Game, NOAA, Save Our Shores, Seymour Marine Discovery Center, Santa Cruz Bird Club, PRBO Conservation Science, California Native Plants Society, Audubon California, American Conservation Experience, and several local and regional volunteer groups (Table 3).

Table 2. Younger Lagoon Total Use

	UC Home		UC Other		CSU System		CA Comm College		Other CA College		Out of State Colleg		International Unive		Government		NGO/Non-Profit		Profit Business		K-12 School		Other		Total	
	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs
UNIVERSITY- LEVEL RESEARCH																										
Research Faculty	3	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	62
Research Scientist	4	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	120
Graduate Student Researcher	4	435	0	0	1	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	465
Undergraduate Student Researcher	6	201	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	201
College Class Undergraduate Student	4	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	90
Volunteer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10	0	0	0	0	0	0	1	10
SUBTOTAL	21	908	0	0	1	30	0	0	0	0	0	0	0	0	0	0	1	10	0	0	0	0	0	0	23	948
UNIVERSITY - LEVEL INSTRUCTION (CLASS)																										
Research Faculty	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4
Graduate Student Researcher	8	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	11
Undergraduate Student Researcher	46	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46	47
College Class Instructor	12	97	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	14	103
College Class Graduate Student	18	113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	113
College Class Undergraduate Student	521	2272	0	0	0	0	45	135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	566	2407
Professional	3	83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	83
SUBTOTAL	610	2627	0	0	0	0	46	138	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	657	2768
PUBLIC																										
College Class Instructor	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
College Class Undergraduate Student	25	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	25
K-12 Instructor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	281	0	0	5	281
K-12 Student	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	967	0	0	90	967
Professional	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	0	1	1	4	6
Other	0	0	0	0	0	0	0	0	0	0	13	13	0	0	0	0	1	3	0	0	0	0	1574	1634	1588	1650
Docent	68	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	70	70
Volunteer	75	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	35	0	0	7	11	136	166	251	287
SUBTOTAL	171	171	0	0	0	0	0	0	0	0	13	13	0	0	0	0	38	44	0	0	102	1259	1711	1801	2035	3288
TOTAL	802	3706	0	0	1	30	46	138	0	0	13	13	0	0	0	0	39	54	0	0	102	1259	1712	1804	2715	7004

*Other includes members of the public who took the SMDC'sdaily tour. Although all tours include information on YLR, we estimate that 10% of these visitors can be reasonably counted as users

Table 3. Younger Lagoon Group Affiliations

University of California Campus	**Non-governmental organizations**
University of California, Santa Cruz	American Conservation Experience
	Audubon Society
California State Universities	California Native Plant Society
San Jose State University	Monterey Bay Aquarium
	Santa Cruz Bird Club
California Community College	Save Our Shores
Cabrillo Community College	Seymour Marine Discovery Center
Universities outside California	
University of Utah	
	Volunteer Groups
K-12 system	UCSC Wilderness Orientation
Delta High School	
Lynbrook High School	
Pacific Collegiate School	
Yerba Buena High School	

Summary

FY 2013-2014 was a successful year for YLR. The reserve continued to move forward witl restoration, initiated new projects, strengthened collaborations, and developed new relation The increase in student and course use is a direct result of having superb staff on sight that actively engaged with students, faculty, and the public. In turn, we are able to achieve our mission of supporting education, research, and public education as well as meet the environmental stewardship obligations the University of California has committed to with t California Coastal Commission and the State of California in general. We look forward to continuing this exciting and important work in FY 2014-2015.

UCSC Natural Reserves Advisory Committee

Charge
The committee provides oversight of on- and off-campus natural reserves of instructional and research interest. It is responsible for developing program vision and policy for the management and use of the UCSC Campus Reserve and of the four UC Natural Reserves System holdings: Año Nuevo Island Reserve, Landels-Hill Big Creek Reserve, Younger Lagoon Reserve and Fort Ord Reserve. The committee coordinates with the systemwide NRS Advisory Committee that advises on policy for all NRS reserves.

In addition to the chair (Faculty Director), membership of the committee is comprised of faculty advisors to each reserve, one faculty representative at large, one non-senate academic appointment, one staff representative, one graduate student and two undergraduate students. The Faculty Director, in consultation with the Dean and the Administrative Director of the UCSC Natural Reserves, appoints the committee. Membership terms begin September 1 unless otherwise specified.

DURATION OF APPOINTMENTS

Faculty Director: 5 years

Faculty Advisors: 3 years

Non-Senate Academic, Staff, and Students: 1 year

Members may be reappointed at the discretion of the Faculty Director in consultation with the Administrative Director.

Hours/Quarter: Chair/NRS Representative-20, Members-10
Reports to: Division of Physical & Biological Sciences Dean

MEMBERSHIPS

Faculty Director of the Natural Reserve System	Don Croll Associate Professor, Ecology & Evolutionary Biology Long Marine Lab, Center for Ocean Health (831) 459-3610 – croll@biology.ucsc.edu
Younger Lagoon Reserve Faculty Advisor	Karen Holl Professor, Environmental Studies Environmental Studies Department (831) 459-3668 – kholl@ucsc.edu
Año Nuevo Reserve Faculty Advisor	Daniel Costa Professor, Ecology & Evolutionary Biology Long Marine Lab, Center for Ocean Health

	(831) 459-2786 – costa@biology.ucsc.edu
UCSC Campus Reserve Faculty Advisor	Greg Gilbert Professor, Environmental Studies Environmental Studies Department (831) 459-5002 – ggilbert@ucsc.edu
Fort Ord Reserve Faculty Advisor	Laurel Fox Professor, Ecology & Evolutionary Biology EE Biology/Earth & Marine Sciences (831) 459-2533 – fox@biology.ucsc.edu
Landels-Hill Big Creek Reserve Faculty Advisor	Peter Raimondi Professor, Ecology & Evolutionary Biology Long Marine Lab, Center for Ocean Health (831) 459-5674 – raimondi@biology.ucsc.edu
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2 Undergraduate Students	Mickie Tang Ecology & Evolutionary Biology Department Mtang4@ucsc.edu TBD Environmental Studies Department
4 Ex-Officio	Gage H. Dayton, Advisory Committee Convenor Administrative Director, UCSC Natural Reserves c/o Environmental Studies Department

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Younger Lagoon Reserve Scientific Advisory Committee (SAC)

Charge

As outlined in the in the CLRDP, restoration, enhancement, and management activities on the Marine Science Campus will be guided by a Scientific Advisory Committee (SAC) that is made up of independent professionals and academicians experienced in and knowledgeable about the habitats of the natural areas on the Marine Science Campus. The SAC shall guide the development of Specific Resource Plans, which shall be consistent with the performance standards set forth in the Resource Management Plan (RMP), and which may be adapted periodically based on findings from ongoing restoration work. The RMP goals and performance standards may be adjusted as directed by the SAC in coordination with the Executive Director to ensure the success of Campus restoration, enhancement, and management efforts. As such, the RMP goals and performance standards are not static requirements per se so much as initial guidelines that may be refined during the SAC process so long as such refinement is consistent with current professional restoration, enhancement, and management goals and standards, and with achieving high quality open space and natural habitat area in perpetuity consistent with this CLRDP. RMP adjustments in this respect may require a CLRDP amendment, unless the Executive Director determines that an amendment is not necessary.

The committee provides guidance for the restoration, enhancement, and management efforts at YLR, and collaborates with YLR staff on the creation and implementation of the Specific Resource Plan as outlined in CLRDP Implementation Measure 3.2.10 (below).

Implementation Measure 3.2.10 – Natural Areas Habitat Management. *Within six (6) months of CLRDP certification, the University in consultation with the Executive Director of the California Coastal Commission shall convene a scientific advisory committee (SAC) to guide the restoration, enhancement, and management of natural areas (i.e., all areas outside defined development zones, except for Younger Lagoon Reserve) on the Marine Science Campus (see Appendix A). Natural areas restoration, enhancement, and management may be completed in up to three phases corresponding to dividing the natural area into thirds (i.e., where Phase 1 accounts for at least one-third of the natural area, Phase 1 plus Phase 2 accounts for at least two thirds, and all of the three phases together account for all of the natural area). All restoration, enhancement, and management activities shall be guided by Specific Resource Plans developed by the University in accordance with the SAC and the criteria contained in the Resource Management Plan (Appendix A) and current professional standards for such plans. The SAC shall be responsible for guiding development of Specific Resource Plans and shall complete its work on the Specific Resource Plan for Phase I restoration and enhancement efforts within four (4) months of convening. The content of Specific Resource Plans shall be consistent with the performance standards set forth in Appendix A, which may be adapted periodically based on findings from ongoing restoration work. The University shall file a Notice of Impending Development for Phase I work within one (1) year of CLRDP certification. All natural areas restoration and enhancement shall be completed within 20 years of CLRDP certification, with interim benchmarks that at least one-third of the restoration and enhancement shall be completed within seven years of CLRDP certification and that at least two-thirds shall be completed within 14 years of CLRDP certification.*

The SAC was seated in January 2009. In addition to the chair, membership of the committee is comprised of three independent professionals and academicians experienced in and knowledgeable about the habitats of the natural areas on the Marine Science Campus. Brief bios of the four SAC members are below.

Dr. Karen Holl- Professor, Environmental Studies, University of California at Santa Cruz (UCSC).

Dr. Karen Holl has been on the faculty in the Environmental Studies Department at the University of California, Santa Cruz for over 15 years. She has conducted research on restoration ecology in a wide variety of ecosystems, including tropical rain forests, eastern hardwood forests, chaparral, grassland, and riparian systems in California. She has published over 50 journal articles and book chapters on restoring damaged ecosystems and is on the editorial board of the journal Restoration Ecology. She teaches the Restoration Ecology class at UCSC and supervises many of the undergraduate students who work on the UCSC Natural Reserves. She regularly advises numerous public and private agencies along the Central California Coast on land management issues. She recently was selected as an Aldo Leopold Leadership Fellow. Dr. Holl's expertise in restoration ecology, experimental design and data analysis, as well as her affiliation with UCSC and her excellent rapport with University students and staff make her an irreplaceable member of the Scientific Advisory Committee.

Dr. Holl received a Ph.D. in Biology from Virginia Polytechnic Institute and State University, and a Bachelors degree in Biology from Stanford University.

Tim Hyland - Environmental Scientist, State Parks, Santa Cruz District.

Mr. Hyland has worked in the field of wildlands restoration for over 15 years. Much of his work has focused on coastal scrub, dune, and wetland restoration at sites throughout the Central Coast, including Wilder Ranch State Park (located approximately one mile west of YLR). He has extensive experience in restoration planning and implementation, vegetation mapping, exotic species control, and native plant propagation. In addition, Mr. Hyland is highly skilled in public education and outreach. His long tenure with California State Parks and direct experience in designing and implementing large-scale restoration projects make him a valuable member of the Scientific Advisory Committee.

Mr. Hyland has a B.A. from California Polytechnic State University, San Luis Obispo.

Bryan Largay – Conservation Director, Land Trust of Santa Cruz County.

Mr. Largay has worked in the fields of hydrology, water quality, and wetlands for fourteen years with a focus on restoration and wildlife habitat. He has conducted wetland restoration, watershed hydrology, and water quality investigations and designed measures to control erosion and treat water quality problems using vegetation. Much of his work has focused on collaborative water quality protection projects with agricultural landowners and growers. He has worked to solve water resource problems with a broad array of individuals, including scientists, planners, engineers, growers, private landowners, and contractors. Prior to joining the staff of

The Land Trust of Snata Cruz County, he worked as the Tidal Wetland Project Director at Elkhorn Slough National Estuarine Research Reserve (ESSNER) and participated in the Tidal Wetland Project as a member of the Science Panel and Model Advisory Team. Mr. Largay's experience working on complex, large-scale restoration projects with agricultural neighbors in a non-profit setting make him a very important addition to the Scientific Advisory Committee.

Mr. Largay received an M.S. in Hydrologic Sciences at U.C. Davis, and a Bachelor's degree at Princeton University.

Dr. Lisa Stratton - Director of Ecosystem Management, Cheadle Center for Biodiversity and Ecological Restoration, U University of California, Santa Barbara (UCSB).

Dr. Lisa Stratton has worked in the field of science-based restoration for over 15 years. She has extensive experience in restoration planning and implementation in conjunction with campus construction projects. Much of her work at UCSB has focused on involving students and faculty in the Cheadle Center's restoration projects. Dr. Stratton's work at the UCSB has provided her with a rare understanding of some of the unique challenges and opportunities YLR staff face as they undertake the restoration project at YLR. Her combined experience in wildlands restoration and management, scientific research, and working within the University of California system make her a very important member of the Scientific Advisory Committee.

Dr. Stratton received a Ph.D. in Botany and Ecology from the University of Hawai'i, a M.S. in Conservation Biology and Sustainable Development from the University of Wisconsin-Madison, and a Bachelors degree in Comparative Literature from Stanford University

Publications

Hammond, Jessi, 2013. Compliance Monitoring Report for the Coastal Bluff Grassland at Younger Lagoon Reserve, Spring 2014. Prepared for the California Coastal Commission and Younger Lagoon Reserve Scientific Advisory Committee, 2014.

Reed, 2014. Mowing for Coastal Prairie Restoration and Management. Prepared for the California Coastal Commission and Younger Lagoon Reserve Scientific Advisory Committee, 2014.

Appendix 1. California Coastal Commission monitoring report

Appendix 2. Compliance monitoring report

Appendix 3. Student intern and graduate student reports

Appendix 4. Photo monitoring

Appendix 5. NOID 6 (13-1) Coastal Biology Building and Associated Greenhouses; Site Improvements Including Road, Infrastructure and Service Yards; Public Access Trails and Interpretative Panels; Wetland Connection in Specific Resource Plan Phase 1b; Sign Program; Parking Program; Lighting Plan.

Younger Lagoon Natural Reserve

Beach Monitoring Report

2014

Younger Lagoon Fish Surveys

Gage Dayton and Beth Howard
Younger Lagoon Natural Reserve

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Overview and Summary

In March 2010, the California Coastal Commission (CCC) approved the University of California's Notice of Impending Development Implementation for Implementation Measure 3.6.3 of the CLRDP (NOID 10-1). NOID 10-1 requires that (through controlled visits) the public have access to Younger Lagoon Reserve beach and that a monitoring program be created and implemented to document the condition of native flora and fauna within Younger Lagoon and it's beach. The monitoring plan will be implemented over a 5-year time period. At the end of the 5-year period (Winter 2015) results are to be compiled and included in a report that summarizes and discusses the potential effect of controlled beach access on flora and fauna at Younger Lagoon. The report will be submitted to the California Coastal Commission.

This document serves as a summary report for activities under NOID 10-1 that have taken place since our previous report and the end of fiscal year 2013. Previous years results are included as well. Data collected to date indicate that Younger Lagoon supports a wide variety of native flora and fauna, provides habitat for sensitive and endangered species, and supports a unique beach dune community. In general, in comparison to other local beaches surveyed native plant species richness is greatest at YLR and Natural Bridges; however, there is quite a bit of annual variation among the sites. A parameter that we quantified in 2012, and is evident from visual observation and photo documentation, is the presence of dune hummocks and downed woody material at YLR, both of which are almost entirely absent at local beaches due to human use. These features provide habitat for plant species such as the succulent plant dudleya, which grow on downed woody material and dune hummocks at YLR, as well as burrowing owls that use burrows in hummocks and seek shelter beneath downed woody material at YLR. The relatively natural state of YLR beach and dune vegetation is unique among most pocket beaches in Santa Cruz County and likely represents a glimpse into what many of the pocket beaches in the greater Monterey Bay area looked like prior to significant human disturbance. Open access to the beach would likely result in the loss of the unique ecological characteristics of the site and reduce it's effectiveness as a research area for scientific study. Controlled beach access through the Seymour Center docent led tours, provides an appropriate level of controlled access that enables people to see and learn about the lagoon habitat while limiting impacts to the system.

Introduction

Nearly 45 years ago, the University of California Natural Reserve System (UCNRS) began to assemble, for scientific study, a system of protected sites that would broadly represent California's rich ecological diversity. Today the UC Natural Reserve System is composed of 38 reserves that encompass approximately 135,000 acres of protected natural land available for university-level instruction, research, and public service. The University of California Natural Reserve System supports research and education through it's mission of contributing "*to the understanding and wise management of the Earth and its natural systems by supporting university-level teaching, research, and public service at protected natural areas throughout California*." By creating this system of outdoor classrooms and laboratories and making it available specifically for long-term study and education, the NRS supports a variety of disciplines that require fieldwork in wildland ecosystems. UC Santa Cruz administers four UC Reserves: Younger Lagoon Natural Reserve, Año Nuevo Island Reserve, Landels-Hill Big Creek Reserve, and Fort Ord Natural Reserve.

The objective of the beach monitoring program is to document the presence and distribution of flora and fauna within Younger Lagoon Natural Reserve (YLR) and to evaluate changes in distribution and density over time. Additionally, YLR staff decided to monitor nearby beaches with varying levels of use (Natural Bridges and Sand Plant Beach) in order to examine differences in the flora and fauna among the three sites. Importantly, the data collected in this study will provide a quantitative assessment of various attributes (species composition, abundance, etc.) but it is realized that the sites vary significantly from one another and there is no replication. Although data comparisons will likely be informative there are significant constraints that make meaningful statistical comparisons between the sites impossible; thus, while results will be informative they shouldn't necessarily be used to create strict prescriptions. Data from the 5-year monitoring program will be compiled and presented to the Coastal Commission at the end of the 5-year period. Reports will also be provided to Coastal Commission staff annually in order to provide progress updates and identify any necessary changes or unforeseen issues that may arise during monitoring efforts. Results of the monitoring study will be used to evaluate the trade-offs between ecological protection and public access. Variables that will be monitored include: user data, changes to habitat (as observable in photo documentation and vegetation surveys), tidewater goby presence, species composition and reproduction of beach dune vegetation, species composition of mammals and invertebrates, and abundance of birds. Details for each of the aforementioned parameters are described below.

This year's report is for Fiscal Year (FY) 2013-2014 (July 1, 2013 – June 30, 2014). Data for each monitoring objective have been added to previous year's data; thus, the results for this reporting period have been combined with all previous findings. As a result, this report provides a running summary of our findings starting from the inception of the study and running through the end of FY 2013-2014.

Younger Lagoon Access History

History of Public Access to Younger Lagoon Beach

Prior to 1972, Younger Beach was privately owned and closed to the public. The owners (Donald and Marion Younger) actively patrolled for, and removed, trespassers from their property, including the beach. In 1972, the Younger Family donated approximately 40 acres of their property to the University of California for the study and protection of the marine environment. These lands included Younger Lagoon and Beach (approximately 25 acres), and an adjoining parcel of land (approximately 15 acres) which became the site of the original Long Marine Laboratory (LML). At the time of their donation, Donald and Marion Younger intended that the lagoon, beach and surrounding slopes be protected in perpetuity by the University as a bird sanctuary.

In the years between the donation of the property and the start of LML construction (1976), the University leased the future LML site back to farmers who had been farming the property for the Younger family prior to the donation. During those years, the same no trespassing rules for the beach were enforced as they had been when the property was owned by the Younger family.

Once construction of Long Marine Lab began in 1976, the land was no longer under the watch of the farmers, and public pressure on the beach began to increase. Many Santa Cruz locals remember the next several years at Younger Beach fondly as it became a popular nude beach. The increased public access had a noticeable impact on the flora and fauna of the beach, and was not in accordance with the intention of the original donation by the Younger family. By 1978 discussions had begun between the University and the California Coastal Commission regarding the impact of uncontrolled public access to the beach. In 1981, it was decided that the impacts to Younger Beach were significant and the beach was closed to uncontrolled public access under coastal permit P-1859.

After the approval of coastal permit P-1859, the University began to actively patrol the beach for trespass and to educate the public about the closure. After YLR was incorporated into the UCNRS in 1986, users were required to fill out applications, or contact NRS staff, for specific research, education, or outreach efforts. As the LML campus grew, a protective berm and fencing were constructed around the perimeter of the lagoon, and informational ‘beach closed’ signs were posted on the cliffs above the beach. Over time, trespass decreased and the reduced public access had a noticeable positive impact on the flora and fauna of the beach.

Public access to YLR beach came to the forefront again during the CLRDP negotiation process (2000-2008). At the time negotiations began, YLR supported a rich composition of plant and animal species despite being surrounded by agricultural and urban development. Reserve staff were concerned that any increase in public access could threaten the already heavily impacted habitat. At the time of CLRDP certification (2010), all parties agreed to the Beach Access Management Plan outlined in NOID 10-1. Under the Beach Access Management Plan, the YLR beach remains closed to unsupervised public access and the reserve is implementing a management and monitoring plan that includes docent-guided tours.

Because of the importance of maintaining a natural and pristine environment (Figure 1) and protecting scientific studies and equipment, uncontrolled access to YLR is not allowed. Uncontrolled use of YLR is likely to have a negative impact on native coastal flora and fauna that inhabit the reserve, hamper research endeavors, and impact the area for future scientific and educational endeavors. Rather than an open public access policy, users are required to fill out applications, or contact NRS staff, for specific research, education, or outreach efforts. In 2010 YLR began hosting docent-guided tours that are offered by the Seymour Marine Discovery Center (SMDC).

Beach Access Tours

Beach access tours are offered two times per month (one tour on a weekday and one on a weekend). The extent of the beach access area varies depending upon the location of plants (i.e. foot traffic is seaward of the dune vegetation) and tidal conditions. Thus, the exact access area is determined by vegetation and tide level and may vary slightly from time to time. The trail provides an interpretive experience for visitors that begins with an overview of the lagoon, a walk through a restored coastal scrub habitat with viewing opportunities of the rear dune, and ends up on the beach. Tours are led by SMDC docents trained in the natural history and ecology of YLR and provide detailed information about flora, fauna, geology, and the UC Natural Reserve System. Tour curriculum focuses on the unique ecology of the YLR beach, and was first presented to SMDC docents during the regular winter docent training program in 2010. YLR Beach tours began in the spring of 2010 and are advertised via the SMDC website: http://www2.ucsc.edu/seymourcenter/calendar.html and filled via phone reservation: (831) 459-3800. The SMDC allocates tour spaces and keeps track of all user data. Tours are limited to twelve (12) persons and are best suited for adults in good physical condition and children over 10 years of age. Public members entering YLR are required to adhere to the UCNRS Reserve Use guidelines.

Figure 1. Burrowing owl on the beach at Younger Lagoon.

Study Areas

Flora, fauna, and human use were monitored at Natural Bridges State Park, Younger Lagoon Natural Reserve, and Little Wilder (Figure 2). These three sites have similar characteristics (all have beach and lagoon habitat), are within close proximity to one another, and experience varying levels of human use. Although site characteristics are similar in many ways, they are also different in many ways, and these differences likely influence species composition. Three of the primary differences among the sites are human use levels, composition of adjacent upland habitat, and the overall size of the beach and wetland areas.

Younger Lagoon Reserve

Younger Lagoon Reserve is located in Santa Cruz County, approximately 4.5 miles from the main UC Santa Cruz campus; adjacent to the UC Santa Cruz Long Marine Laboratory. One of the few relatively undisturbed wetlands remaining on the California Central Coast, Younger Lagoon Reserve encompasses a remnant Y-shaped lagoon on the open coast just north of Monterey Bay. For most of the year, the lagoon is cut off from the ocean by a sand barrier. During the winter and spring months, the sand barrier at the mouth of Younger Lagoon breaches briefly connecting the lagoon to the ocean. The lagoon system provides protected habitat for 100 resident and migratory bird species. Approximately 25 species of water and land birds breed at the reserve, while more than 60 migratory bird species overwinter or stop to rest and feed. Opossums, weasels, brush rabbits, ground squirrels, deer mice, coyote, bobcat, woodrat, raccoon,

and skunk are known to occupy the lagoon; gray and red foxes as well as mountain lion have also been sighted. Reserve habitats include salt and freshwater marsh, backdune pickleweed areas, steep bluffs with dense coastal scrub, pocket sand beach, grassland, and dense willow thickets.

Sand Plant Beach ("Little Wilder")

Sand Plant Beach is located in Santa Cruz County, approximately 1.5 miles west of YLR adjacent to Wilder Ranch State Park. Sand Plant Beach is approximately 23 acres and includes a pocket beach, dunes, cliffs and lagoon. It is open to the public for recreational use from dawn until dusk, 365 days a year. The surrounding Wilder Ranch State Park covers approximately 7,000 acres and allows human, bike and equestrian access. Much of the interior lagoon/upland habitat has been modified for agricultural production and/or ranching over the past century. Today most of the vegetation that persists inland of the lagoon is dominated by freshwater emergent vegetation and willow thickets. Major wetland restoration projects have increased native flora and fauna in the area (Friends of Santa Cruz State Parks, 2010).

Natural Bridges Lagoon

Natural Bridges Lagoon is located in Santa Cruz County, approximately 0.5 miles east of YLR on the urban edge of the city of Santa Cruz CA in Natural Bridges State Park. Natural Bridges Lagoon, beach, and State Park encompasses approximately 63 acres and includes a wide pocket beach, lagoon, cliffs, and diverse upland habitat (scrub, grass, iceplant, willow thicket, live oak, eucalyptus, and cypress). The park is world-renowned for its yearly migration of monarch butterflies and famous natural bridge. Natural Bridges State Park allows human access as well as dogs that are on leash and remain on paved roads and in parking lots (Friends of Santa Cruz State Parks, 2010). The beach is a popular destination at all times of the year; however, it is especially popular in the spring, summer, and fall months.


"Little Wilder"

Methods

User Data

User data from tours conducted by the SMDC, as well as research and education use of YLR, were recorded and maintained by SMDC and YLR Staff. User data from educational programs and fee collection are recorded and maintained by California State Parks staff for Natural Bridges State Parks. No user data was available for Sand Plant Beach.

Human Beach Use

We used remote cameras to quantify human use of Sand Plant Beach, YLR, and Natural Bridges. Cameras were placed along the eastern edge of Sand Plant Beach and Natural Bridges Beach and at the western edge of Younger Lagoon quarterly with each separate sampling events each consisting of two days. Cameras were set to automatically take photos at 15 minute intervals. Number of people were quantified for 15 minute intervals during the day (camera times varied across sampling periods due to day length and postion; however, were standardized within each sampling period). The total survey area varied between sites and among individual sampling efforts due the placement of the camera and available habitat for human users at the time of the survey (i.e. often less beach area surveyed at Sand Plant Beach compared to Younger Lagoon and Natural Bridges). In order to control for area, specific regions of photos were chosen and number of individuals within each region were counted; thus, the number of people counted per unit area was standardized. We used the largest survey area during each sampling period to standardize use within each specific region of the beach during each sampling effort. Thus, if a particular site had more or less habitat monitored, the number of individuals was standardized across sites making comparisons comparable.

Photo Documentation of Younger Lagoon Natural Reserve

Photo point locations were established at four locations within YLR (Figure 3). These locations were chosen to ensure coverage of all major areas of the beach. Photos were taken once during the reporting period. At each photo point we collected photo point number, date, name of photographer, bearing, and camera and lens size.

Tidewater Goby Surveys

Tidewater goby surveys were conducted at YLR, Natural Bridges, and Sand Plant Beach quarterly each year of the study. Surveys were conducted using a 4.5 ft x 9 ft beach seine with 1/8 inch mesh. The objectives of the surveys were to document tidewater goby presence and evidence of breeding activity (determined by the presence of multiple size/age classes). All fish were identified to species and counted. When individuals exceeded ~50 per seine haul, counts were estimated. Sampling was conducted with the goal of surveying the various habitats within each site (e.g. sand, sedge, willow, pickleweed, deep, shallow, etc.); thus, different numbers of seine hauls were conducted at each site. Species richness was compared among sites.

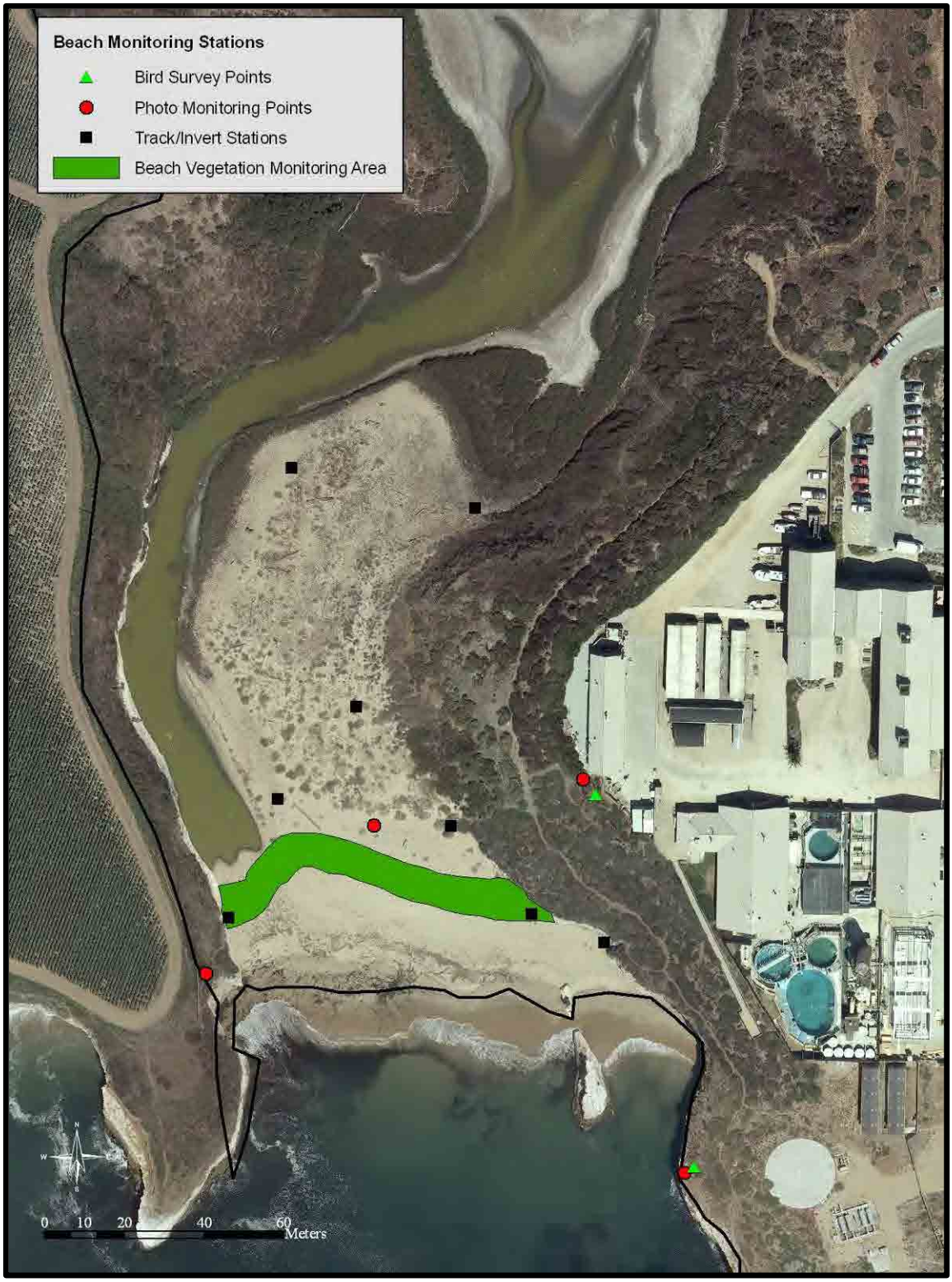

Figure 3. Locations of monitoring points, plots, and regions for YLR beach. Monitoring areas varied slightly between sampling efforts depending upon the high water mark, vegetation patterns, and water levels.

Species Composition and Coverage of Beach Dune Vegetation

Dune vegetation from the lowest (nearest to the mean high tide line) occurring terrestrial plant to 10 meters inland into the strand vegetation was surveyed quarterly throughout the study period. The exact location and extent of the area surveyed each time varied depending upon the location of the "lowest" plant detected during each sampling effort. At each location we established at 50-m east-west transect across the dune vegetation and measured the distance from the estimated mean high tide line to the "lowest" plant on the beach. Herbaceous species composition was measured by visual estimation of absolute cover for each species in ten 0.25 m^2 quadrats along the transect. Quadrats were placed every 5 m on alternating sides of the transect starting at a randomly selected point between 1 and 5 meters (a total of 10 quadrats per transect). A clear plastic card with squares representing 1, 5, and 10% of the sampling frame was used to help guide visual cover estimations. Species cover (native and exotic), bare ground, and litter were estimated at 5% intervals. Litter was specifically defined as residue from previous year's growth while any senescent material that was recognizable as growth from earlier in the current growing season was counted as cover for that species. After all cover estimates had been made, we conducted surveys within 2 m of either side of the transect (a 4 × 50 m belt). In the belt transects, individual plants were recorded as either seedlings or greater than 1 year old. Presence of flowers and seeds was also noted.

Non-avian Vertebrate Monitoring

Tracks

Vertebrate tracks were measured using raked sand plots at each site quarterly throughout the study period. Tracking stations were placed throughout the beach area in constriction zones where vegetation was absent. The objective of these surveys was simply to detect what species use the beach habitat. As such, size of plot varied from approximately depending upon the amount of available open sandy area at each location. Track stations were raked each evening and checked for tracks in the morning. Stations remained open for two days during each monitoring bout. Tracks were identified to species when possible. Species composition was summarized; however, abundance was not quantified due to the fact that most often tracks cannot be used to identify individual animals (e.g. a single individual could walk across the plot multiple times).

Small Mammals

Sherman live traps were place at each site for two nights every quarter of the study period. A total of 30 traps were placed at each site and sampled for a period of two evenings (60 trap nights per sampling bout). Traps were set at dusk and collected at dawn. Each trap was baited with rolled oats and piece of synthetic bedding material was placed in each trap to ensure animals did not get too cold. Individuals were identified to species, marked with a unique ear tag, and released at the site of capture.

Invertebrate Monitoring

Terrestrial invertebrates on beach habitat were monitored by placing 12 oz plastic containers (pit fall traps) at each tracking station (one at each corner of the plot) during tracking efforts. Traps were buried to the lip of the container and checked each morning and all individuals were collected, identified, and counted.

Avian Monitoring

We conducted ocular surveys of birds on the beach, lagoon, and cliff habitats at each site. Survey locations were selected along one edge of the beach on the cliff. At YLR and Sand Plant Beach the entire beach area, fore portion of the lagoon, and western cliff were surveyed from the eastern edge of the lagoon. At YLR the top and western face of the rock stack that is located at the beach/ocean edge was also surveyed. At Natural Bridges surveys were conducted from the eastern edge of the beach on the cliff adjacent to De Anza Mobile Home Park or from the beach to the west; fore lagoon and approximately the western ¼ of the beach area (including beach/ocean interface) was included in the survey area. Survey areas were chosen with the goal of surveying approximately the same area. Counts were recorded quarterly throughout the study. Surveys were conducted in the dawn or dusk hours within approximately 2 hours of sunrise or sunset and of one another. Data from the two days during each sampling effort were combined and individuals were identified and counted. Species richness, abundance, and diversity were calculated for each site.

Results

User Data

Younger Lagoon Reserve

There were a wide variety of public and non-profit research and educational groups that used Younger Lagoon (Table 1). The greatest user group for YLR in 2013-2014 was once again undergraduate education, a breakdown of all user groups are included in Table 2. The greatest user group was “other” which consists primarily of public tour groups to the edge of the Lagoon at the marine mammal overlook during marine mammal tours at the Seymour Center. Those users (approximately 2070 which represents 10% of the individuals that attended SMDC tours outside of the YLR beach tours) were provided an overlook of the lagoon, interpretive information via docent led tours, and opportunities to read interpretive material presented on signs about the reserve; however, did not access the beach. During the 13-14 fiscal year a total of 102 participants went on the Seymour Center docent led Younger Lagoon tours.

Table 1. Younger Lagoon user affiliations.

University of California Campus	**Non-governmental organizations**
University of California, Santa Cruz	American Conservation Experience
	Audubon Society
California State Universities	California Native Plant Society
San Jose State University	Monterey Bay Aquarium
	Santa Cruz Bird Club
California Community College	Save Our Shores
Cabrillo Community College	Seymour Marine Discovery Center
Universities outside California	
University of Utah	
	Volunteer Groups
K-12 system	UCSC Wilderness Orientation
Delta High School	
Lynbrook High School	
Pacific Collegiate School	
Yerba Buena High School	

Table 2. Younger Lagoon Total Use.

	UC Home		UC Other		CSU System		CA Comm College		Other CA College		Out of State Colleg		International Unive		Government		NGO/Non-Profit		Profit Business		K-12 School		Other		Total	
	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs	Users	UDs
UNIVERSITY- LEVEL RESEARCH																										
Research Faculty	3	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	62
Research Scientist	4	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	120
Graduate Student Researcher	4	435	0	0	1	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	465
Undergraduate Student Researcher	6	201	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	201
College Class Undergraduate Student	4	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	90
Volunteer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10	0	0	0	0	0	0	1	10
SUBTOTAL	21	908	0	0	1	30	0	0	0	0	0	0	0	0	0	0	1	10	0	0	0	0	0	0	23	948
UNIVERSITY - LEVEL INSTRUCTION (CLASS)																										
Research Faculty	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4
Graduate Student Researcher	8	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	11
Undergraduate Student Researcher	46	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46	47
College Class Instructor	12	97	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	14	103
College Class Graduate Student	18	113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	113
College Class Undergraduate Student	521	2272	0	0	0	0	45	135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	566	2407
Professional	3	83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	83
SUBTOTAL	610	2627	0	0	0	0	46	138	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	657	2768
PUBLIC																										
College Class Instructor	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
College Class Undergraduate Student	25	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	25
K-12 Instructor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	281	0	0	5	281
K-12 Student	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	967	0	0	90	967
Professional	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	0	1	1	4	6
Other	0	0	0	0	0	0	0	0	0	0	13	13	0	0	0	0	1	3	0	0	0	0	1574	1634	1588	1650
Docent	68	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	70	70
Volunteer	75	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	35	0	0	7	11	136	166	251	287
SUBTOTAL	171	171	0	0	0	0	0	0	0	0	13	13	0	0	0	0	38	44	0	0	102	1259	1711	1801	2035	3288
TOTAL	802	3706	0	0	1	30	46	138	0	0	13	13	0	0	0	0	39	54	0	0	102	1259	1712	1804	2715	7004

*Other includes members of the public who took the SMDC'sdaily tour. Although all tours include information on YLR, we estimate that 10% of these visitors can be reasonably counted as users.

Sand Plant Beach (Little Wilder)

Sand Plant Beach is located adjacent to Wilder State Park and is frequented by Wilder Stat visitors along a coastal bluff trail. Because of the size of Wilder Ranch State Park (over 7,(acres, with over 35 miles of trails) and its multiple points of access, it is unknown exactly h many people visit Sand Plant Beach each year. However, it is one of the more popular bea along this section of Wilder Ranch as there is relatively easy access along the coastal bluff

Natural Bridges Lagoon

We did not obtain user data for 2013; however, more than 925,000 people are estimated to visited Natural Bridges State Park in 2005 (Santa Cruz State Parks 2010). The proportion (those visitors that use the beach and lagoon habitat is unknown. It is likely that the number visitors remains in this range from year to year.

Human Use During Survey Efforts

Number of users at each beach during the survey efforts varied among beaches as well as between sampling dates. However, the pattern of total use (Table 3; Figures 4-5) and the n of people per photo (15 minute interval standardized for area surveyed) was consistent acrc sampling periods with overall use being highest at Natural Bridges and lowest at Younger Lagoon. Examples of photos captured during a typical monitoring session in 2010 are incl as Figure 6.

Table 3. Number of people observed in photo human use monitoring.

Site	Month	[1]Total # of people	[1]Ave # of People / 15 mir
Natural Bridges	May, 2010	1862	18.62
Sand Plant	May, 2010	233	1.32
Younger Lagoon	May, 2010	40	0.39
Natural Bridges	August, 2010	322	3.22
Sand Plant	August, 2010	19	0.19
Younger Lagoon	August, 2010	0	0
Natural Bridges	November, 2010	207	2.07
Sand Plant	November, 2010	17	0.17
Younger Lagoon	November, 2010	2	0.07
Natural Bridges	February, 2011	482	8.03
Sand Plant	February, 2011	1	0.03
Younger Lagoon	February, 2011	2	0.07
Natural Bridges	May, 2011	1756	18.30

Site	Month	[1]Total # of people	[1]Ave # of People / 15 minute
Sand Plant	May, 2011	85	0.88
Younger Lagoon	May, 2011	16	0.17
Natural Bridges	July, 2011	795	8.11
Sand Plant	July, 2011	49	0.50
Younger Lagoon	July, 2011	0	0
Natural Bridges	December, 2011	341	3.97
Sand Plant	December, 2011	24	0.12
Younger Lagoon	December, 2011	3	0.04
Natural Bridges	April, 2012	442	3.68
Sand Plant	April, 2012	15	0.08
Younger Lagoon	April, 2012	94	0.85
Natural Bridges	May, 2012	393	2.32
Sand Plant	May, 2012	14	0.10
Younger Lagoon	May, 2012	0	0
Natural Bridges	August, 2012	587	10.6
Sand Plant	August, 2012	93	3
Younger Lagoon	August, 2012	0	0
Natural Bridges	October, 2012	474	10.65
Sand Plant	October, 2012	83	2.76
Younger Lagoon	October, 2012	4	0.05
Natural Bridges	January, 2013	396	7.3
Sand Plant	January, 2013	0	0
Younger Lagoon	January, 2013	9	0.17
Natural Bridges	May, 2013	2209	23
Sand Plant	May, 2013	23	0.56
Younger Lagoon	May, 2013	0	0
Natural Bridges	July, 2013		7.95
Sand Plant	July, 2013		0.10
Younger Lagoon	July, 2013		0.01
Natural Bridges	November, 2014		5.19
Sand Plant	November, 2014		0.05
Younger Lagoon	November, 2014		0.06
Natural Bridges	February, 2014		6.77

Site	Month	[1]Total # of people	[1]Ave # of People / 15 minute
Sand Plant	February, 2014		0.03
Younger Lagoon	February, 2014		0
Natural Bridges	June, 2014		15.24
Sand Plant	June, 2014		0.12
Younger Lagoon	June, 2014		0
Natural Bridges	August, 2014		20.08
Sand Plant	August, 2014		0.61
Younger Lagoon	August, 2014		0.03

[1]Standardized by area surveyed.

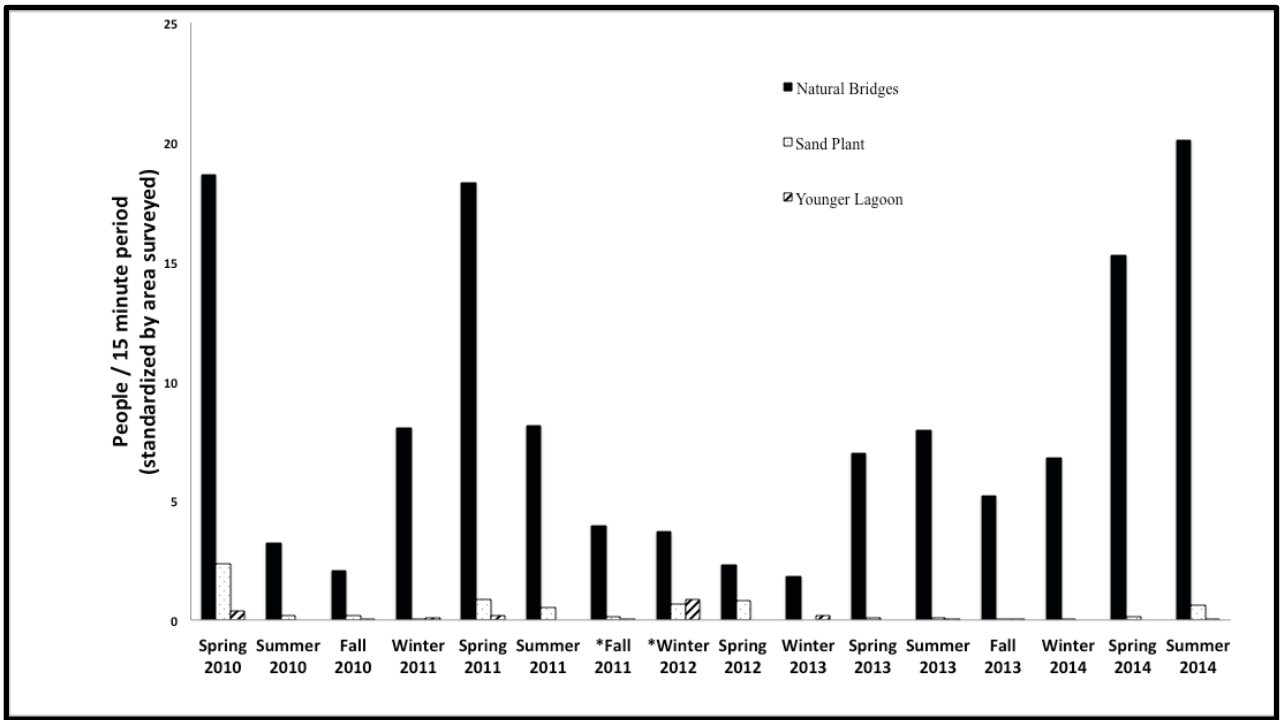

Figure 4. Average number of people per 15-minute interval at Natural Bridges, Sand Plant Beach, and Younger Lagoon Reserve.

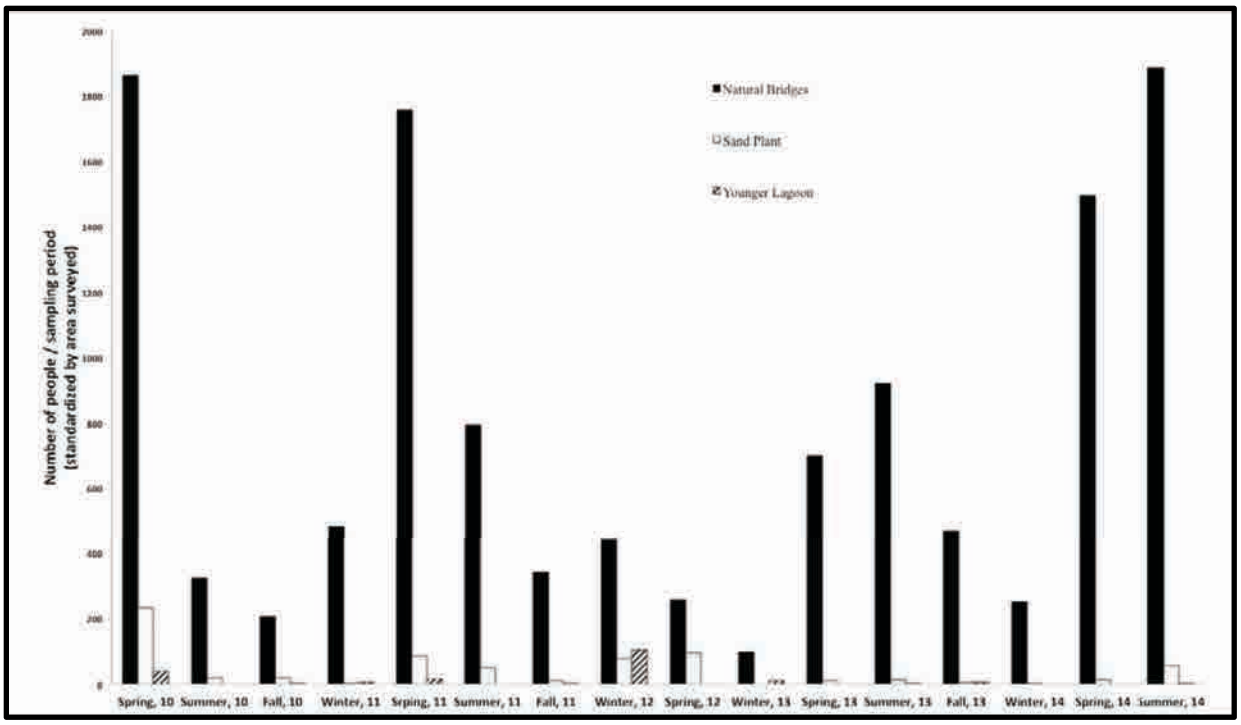

Figure 5. Total number of people counted in photographs.

Figure 6. Photos captured by remote camera during the Spring 2010 monitoring effort. Top to bottom: Sand Plant Beach, Natural Bridges, and Younger Lagoon.

Photo Documentation of YLR

Photos were taken one time during the reporting period and are included as Appendix 1.

Tidewater Goby Surveys

Tidewater goby were found at all sites during each sampling effort. Evidence of breeding (multiple size classes) was also observed at each site. Fish species richness was greatest at Natural Bridges and Younger Lagoon (Table 4).

Table 4. Vertebrate species encountered at Sand Plant Beach, Younger Lagoon, and Natural Bridges.

	Tidewater Goby	Stickleback	Sculpin	Mosquito Fish	Halibut	CRLF[1]
April 9, 2010						
Little Wilder	X	X				
Younger Lagoon	X	X				
Natural Bridges	X	X	X			
August 13, 2010						
Little Wilder	X	X				
Younger Lagoon	X	X				
Natural Bridges	X	X	X	X		
November 18, 2010						
Little Wilder	X	X				
Younger Lagoon	X					
Natural Bridges	X	X	X	X		
February 23, 2011						
Little Wilder	X	X				
Younger Lagoon	X					
Natural Bridges	X	X	X	X		
May 12, 2011						
Little Wilder	X	X				
Younger Lagoon	X	X	X		X	
Natural Bridges	X	X	X			
August 8, 2011						
Little Wilder	X	X				
Younger Lagoon	X	X				
Natural Bridges	X	X				
December 12, 2011						
Little Wilder	X	X				
Younger Lagoon	X					

Natural Bridges	X	X				
March 8, 2012						
Little Wilder	X	X				
Younger Lagoon	X					
Natural Bridges	X	X				
May 15, 2012						
Little Wilder	X	X				
Younger Lagoon	X	X				
Natural Bridges	X	X	X			
August 29, 2012						
Little Wilder	X	X				X
Younger Lagoon	X	X				X
Natural Bridges	X	X				
October 23, 2012						
Little Wilder	X	X				
Younger Lagoon	X	X				
Natural Bridges	X	X				
February 2, 2013						
Little Wilder	X	X				
Younger Lagoon	X	X				
Natural Bridges	X	X				
May 6, 2013						
Little Wilder	X	X				X
Younger Lagoon	X	X				X
Natural Bridges	X	X				
July 16, 2013						
Little Wilder	X	X				X
Younger Lagoon	X	X				
Natural Bridges	X	X		X		
November 14, 2013						
Little Wilder	X	X				
Younger Lagoon	X	X				
Natural Bridges						
February 21, 2014						
Little Wilder	X	X				
Younger Lagoon	X	X				
Natural Bridges	X					
May 2, 2014						
Little Wilder	X	X				
Younger Lagoon	X	X				

Natural Bridges	X					
No. of sites	3	3	2	2	1	2

[1]CRLF = California Red-legged Frog (*Rana draytonii*). Tadpoles have been observed at Little Wilder. Juveniles, young of year, and adults have been observed at YLR and Little Wilder.

Species Composition and Coverage of Beach Dune Vegetation

Evidence of reproduction (flowers, seeds, and seedlings) of native and non-native vegetation has been detected at all three sites. Distance from mean high tide to the lowest plant on the beach is consistently greatest at Natural Bridges and lowest at Little Wilder and Younger Lagoon (Table 5). Plant cover was generally highest at Younger Lagoon (as exhibited by proportion of bare ground) but varied across sampling efforts (Figure 7).

Table 5. Distance (m) from mean high tide to the lowest plant on the beach.

Site	Spring, 10	Summer, 10	Fall, 10	Winter, 11	Spring, 11	Summer, 11	Fall, 11	Winter, 12	Spring, 12
Younger Lagoon	56	51	20	42	55	49	26	30	28
Sand Plant Beach	33	34	56	56	40	51	29	31	38
Natural Bridges	128	130	141	146	146	138	155	160	123

Site	Summer, 12	Fall, 12	Winter, 13	Spring, 13	Summer, 13	Fall, 13	Winter, 14	Spring, 14
Younger Lagoon	47	20	30	36	37.3	32.1	26.4	36.5
Sand Plant Beach	35	38	31	41	48.1	49.9	45.6	24.2
Natural Bridges	91	75	100	72	88.9	107.3	87.4	83.2

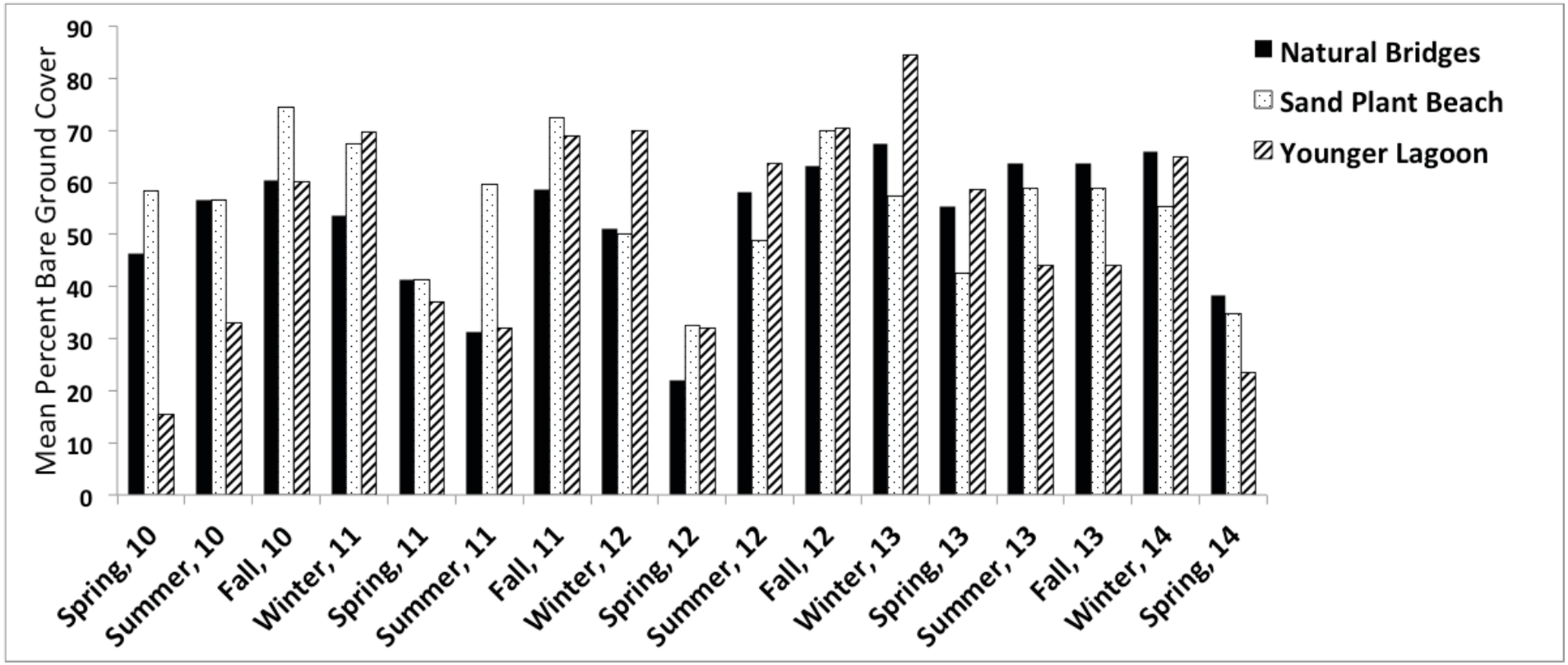

Figure 7. Mean percent bare ground encountered at each site.

Native plant species richness has consistently been greatest at Younger Lagoon; however, it has varied across sampling periods and been highest at Natural Bridges for the past year (Figure 8). Mean proportion of non-native species is greatest at Natural Bridges (53%) and least at Younger Lagoon and Sand Plant Beach (26%) (Table 6).

Table 6. Number and proportion of native and non-native species encountered during surveys at each site. Mean is calculated across all samples.

Site	Spring, 10	Summer, 10	Fall, 10	Winter, 11	Spring, 11	Summer, 12	Fall, 11	Winter, 12	Spring, 12
Natural Bridges									
Native	7 (41%)	8 (44%)	9 (60%)	8 (44%)	9 (43%)	6 (67%)	8 (62%)	9 (47%)	11 (48%)
Non-native	10 (59%)	10 (56%)	5 (40%)	10 (66%)	12 (57%)	9 (33%)	5 (38%)	10 (53%)	12 (52%)
Total	17	18	14	18	21	15	13	19	23
Younger Lagoon									
Native	11 (85%)	11 (85%)	11 (85%)	11 (73%)	12 (80%)	13 (81%)	9 (82%)	6 (50%)	6 (43%)
Non-native	2 (15%)	2 (15%)	2 (15%)	4 (27%)	3 (20%)	3 (19%)	2 (18%)	6 (50%)	8 (57%)
Total	13	13	13	15	15	16	11	12	14
Sand Plant Beach									
Native	7 (88%)	7 (63%)	7 (70%)	8 (80%)	7 (88%)	7 (88%)	9 (82%)	3 (33%)	4 (40%)
Non-native	1 (12%)	2 (37%)	3 (30%)	2 (20%)	1 (12%)	1 (12%)	2 (18%)	6 (67%)	6 (60%)
Total	8	9	10	10	8	8	11	9	10

Site	Summer, 12	Fall, 12	Winter, 13	Spring, 13	Summer, 13	Fall, 13	Winter, 14	Spring, 14	Mean
Natural Bridges									
Native	5 (35%)	10 (59%)	7 (88%)	9 (56%)	7 (37%)	6 (35%)	6 (43%)	10 (50%)	47%
Non-native	9 (65%)	7 (41%)	8 (12%)	6 (44%)	12 (63%)	11 (65%)	8 (57%)	10 (50%)	53%
Total	14	17	15	16	19	17	14	20	
Younger Lagoon									
Native	12 (67%)	7 (88%)	9 (69%)	12 (75%)	13 (72%)	14 (74%)	10 (83%)	12 (67%)	74%
Non-native	6 (33%)	1 (12%)	4 (31%)	4 (25%)	5 (28%)	5 (26%)	2 (17%)	6 (33%)	26%
Total	18	8	13	16	18	19	12	18	
Sand Plant Beach									
Native	2 (40%)	3 (50%)	4 (100%)	4 (67%)	6 (100%)	6 (100%)	5 (100%)	5 (83%)	74%
Non-native	3 (60%)	3 (50%)	0 (0%)	2 (33%)	0 (0%)	0 (0%)	0 (0%)	1 (17%)	26%
Total	5	6	4	6	6	6	5	6	

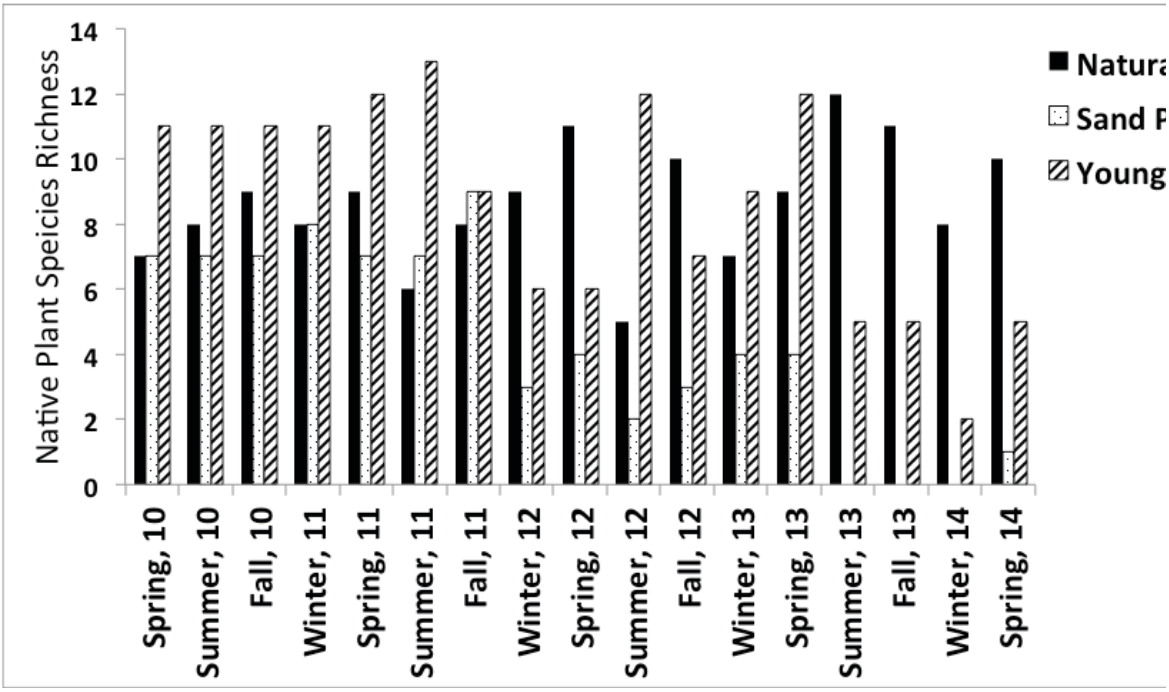

Figure 8. Number of native plant species encountered at each site.

Track Plate Monitoring

Species richness of mammals detected in raked sand plots was greatest in Natural Bridges (8). Ground squirrel were not detected at Natural Bridges and deer have not been detected i track surveys at YLR or Little Wilder (Table 7). It is likely that ground squirrel occur at N Bridges and deer have been observed at Younger Lagoon Reserve in the upland habitat and also likely using upland habitat at Little Wilder; however, they were not detected in our sur efforts. Dogs and bicycles were detected at Natural Bridges and Sand Plant Beach and veh were detected at Natural Bridges (Table 7). Frequency of detection and species richness fo species is summarized in Table 8.

Table 7. Summary of track plate sampling effort at each site.

Summary of track plate sampling effort at Little Wilder, Younger Lagoon, and Natural Bridges Spring 2014.

	Rodent[1]	Raccoon	Cottontail	Bobcat	Skunk	Squirrel	Deer	Opossum	Coyote	Bicycle	Vehicle	Dog	Hu
May 1-2, 2010													
Little Wilder	X			X	X	X			X	X			
Younger Lagoon	X	X		X	X								
Natural Bridges	X	X		X	X				X	X	X	X	
August 11-12, 2010													
Little Wilder		X		X	X							X	
Younger Lagoon	X	X	X	X		X							
Natural Bridges	X	X	X									X	
November 17-18, 2010													
Little Wilder	X		X	X					X				
Younger Lagoon	X	X											
Natural Bridges	X	X		X							X	X	
February 8 -9, 2011													
Little Wilder	X			X	X				X	X			
Younger Lagoon	X	X			X				X				
Natural Bridges		X		X					X		X		
May 3 - 4, 2011													
Little Wilder	X		X	X									
Younger Lagoon		X	X	X	X				X				
Natural Bridges		X			X				X			X	
July 22 - 23, 2011													
Little Wilder	X	X			X				X				
Younger Lagoon	X	X	X	X	X								
Natural Bridges	X	X	X		X							X	

	Rodent[1]	Raccoon	Cottontail	Bobcat	Skunk	Squirrel	Deer	Opossum	Coyote	Bicycle	Vehicle	Dog	Hu
Younger Lagoon				X					X				
Natural Bridges							X				X	X	
May 15 & 16, 2012													
Little Wilder	X		X	X									
Younger Lagoon	X	X		X					X				
Natural Bridges	X			X				X				X	
August 16 & 17, 2012													
Little Wilder	X	X	X	X	X		X		X				
Younger Lagoon	X	X		X		X	X						
Natural Bridges	X	X	X	X	X		X				X	X	
October 22 & 23, 2012													
Little Wilder	X						X		X				
Younger Lagoon		X		X					X				
Natural Bridges			X		X		X				X		
January 16 & 17, 2013													
Little Wilder	X			X					X				
Younger Lagoon	X	X		X					X				
Natural Bridges		X		X	X				X			X	
May 15 & 16, 2013													
Little Wilder	X			X	X								
Younger Lagoon	X	X		X					X				
Natural Bridges	X	X			X							X	
July 18 & 19, 2013													
Little Wilder	X	X		X					X			X	
Younger Lagoon	X	X		X					X				
Natural Bridges		X		X	X						X	X	
October 21 & 22, 2013													
Little Wilder		X		X									
Younger Lagoon		X		X					X				

	Rodent[1]	Raccoon	Cottontail	Bobcat	Skunk	Squirrel	Deer	Opossum	Coyote	Bicycle	Vehicle	Dog	Hu
Natural Bridges	X	X			X				X		X	X	
February10 &11, 2014													
Little Wilder	X	X		X									
Younger Lagoon									X				
Natural Bridges		X			X						X		
April 27 & 28, 2014													
Little Wilder		X		X					X				
Younger Lagoon		X							X				
Natural Bridges		X		X	X						X	X	
	3	3	3	3	3	2	3	1	3	2	1	2	

[1]Unidentified small rodent.

Table 8. Frequency, and native species richness, of animals and human use types at San Plant Beach, Younger Lagoon, and Natural Bridges. For example, 100% indicates a particular species was observed during each of the six sampling efforts.

Site	Rodent	Raccoon	Cottontail	Bobcat	Skunk	Squirrel	Deer	Opossum	Coyote	Bicycle	Vehicle	Dog	Human	[1]Native sp. richness
Little Wilder	(12) 75%	(8) 50%	(4) 25%	(13) 81%	(6) 38%	(1) 6%	(2) 13%%	0%	(13) 81%	(2) 13%	0%	(1) 6%	(11) 69%	7
Younger Lagoon	(10) 63%	(11) 69%	(2) 13%	(11) 69%	(4) 25%	(2) 13%	2) 13%	0%	(8) 50%	0%	0%	0%	(5) 31%	7
Natural Bridges	(7) 44%	(14) 88%	(4) 25%	(8) 50%	(11) 69%	0%	(2) 13%	(1) 6%	(4) 25%	(1) 6%	(10) 63%	(12) 75%	100%	8

[1]Bicycle, vehicle, dog, and human excluded.

Small Mammal Trapping

A total of 191 individual small mammals representing four species have been captured duri small mammal trapping efforts. Sand Plant Beach had the greatest number of individuals captured and species richness was greatest at Younger Lagoon and Little Wilder (Table 9).

Table 9. Summary of Sherman trapping effort at Sand Plant, Younger Lagoon, and Natura Bridges beaches.

Site	Pema[1]	Mica[1]	Reme[1]	Rara[1,2]	**TOTAL**
April 24 -25, 2010					
Little Wilder	8	5			**13**
Younger Lagoon	2				**2**
Natural Bridges			3		**3**
August 11-12, 2010					
Little Wilder	5	4			**9**
Younger Lagoon			1		**1**
Natural Bridges					**0**
November 15-16, 2010					
Little Wilder	5	1			**6**
Younger Lagoon				1	**1**
Natural Bridges		3	1		**4**
February 15-16, 2011					
Little Wilder	5				**5**
Younger Lagoon	6	5	0		**11**
Natural Bridges			2		**2**
April 29-30, 2011					
Little Wilder	4				**4**
Younger Lagoon	1				**1**
Natural Bridges					**0**
August 8-9, 2011					
Little Wilder	6	2			**8**
Younger Lagoon	3		3		**6**
Natural Bridges		1	5		**6**
March 30, 2012					
Little Wilder	6				**6**
Younger Lagoon	1		1		**2**
Natural Bridges		5	2		**7**

Site	Pema[1]	Mica[1]	Reme[1]	Rara[1,2]	**TOTAL**
May 15-16, 2012					
Little Wilder	4	1			**5**
Younger Lagoon	3				**3**
Natural Bridges		5			**5**
August 25-26, 2012					
Little Wilder	4				**4**
Younger Lagoon	3				**3**
Natural Bridges		4	2		**6**
November 5-6, 2013					
Little Wilder	2		1		**3**
Younger Lagoon	3				**3**
Natural Bridges		3	1		**4**
January 13-14, 2013					
Little Wilder	2		4		**6**
Younger Lagoon	2				**2**
Natural Bridges		2	1		**3**
May 1-2, 2013					
Little Wilder	1		1		**2**
Younger Lagoon	3		2		**5**
Natural Bridges		5			**5**
July 16-17, 2013					
Little Wilder	3		1		**4**
Younger Lagoon	1				**1**
Natural Bridges			1		**1**
October 22-23, 2013					
Little Wilder	5	1		1	**7**
Younger Lagoon	1				**1**
Natural Bridges		1	2		**3**
February 12-13, 2014					
Little Wilder	2	1	1		**4**
Younger Lagoon	1		1		**2**
Natural Bridges		2			**2**
April 28-29, 2014					
Little Wilder	4	1			**5**
Younger Lagoon	3		1		**4**
Natural Bridges	1				**1**

Site	Pema[1]	Mica[1]	Reme[1]	Rara[1,2]	**TOTAL**
TOTAL	**100**	**52**	**37**	**2**	**191**

[1]Pema = *Peromyscus maniculatus*; Mica = *Microtus californicus*; Rema = *Reithrodontomys megalotis*; Rara = *Rattus norvegicus.* [2]Escaped before positive ID; however, suspected to be Norway Rat.

Invertebrate Monitoring

Over all, Younger Lagoon consistently had the greatest number of individuals captured; however, patterns of species richness varied among sampling sessions (Figures 9-10). Species were identified as distinct taxa; however, at the time of the writing of this report they have not been taxonomically keyed out.

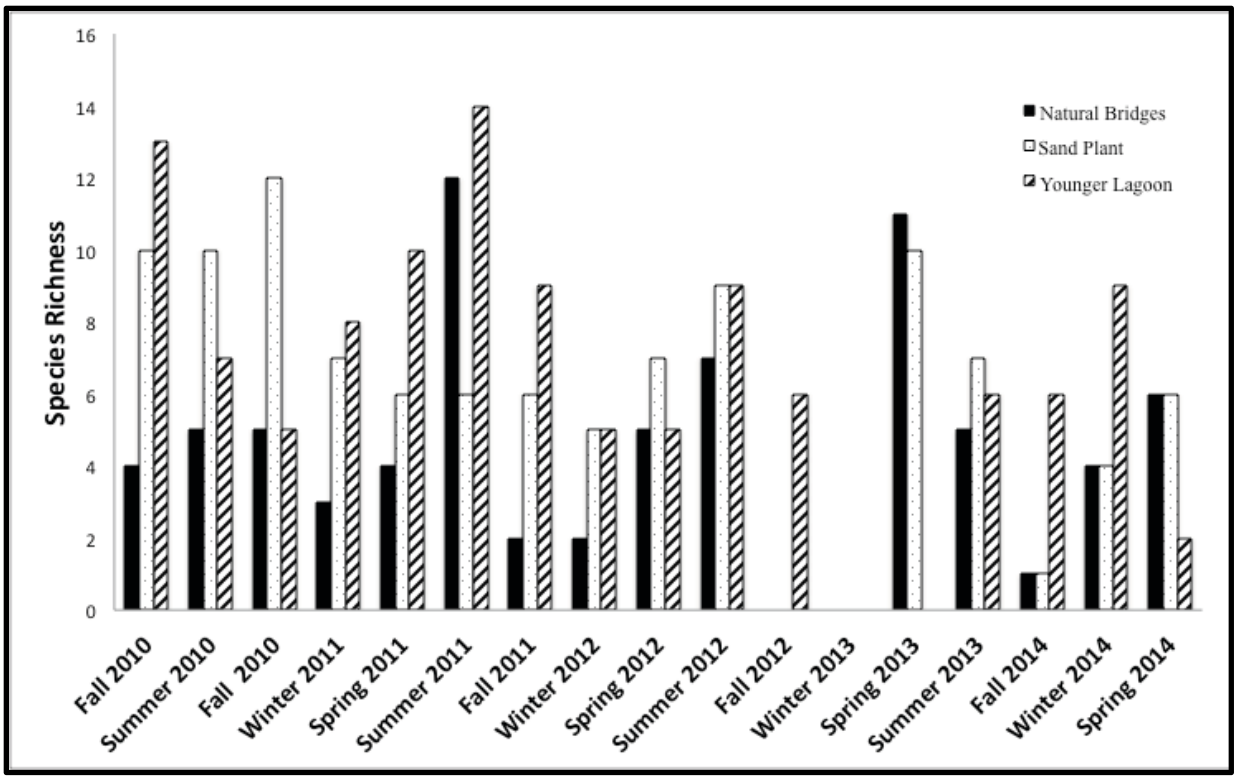

Figure 9. Species richness of invertebrates at Natural Bridges, Sand Plant Beach, and Younger Lagoon beaches.

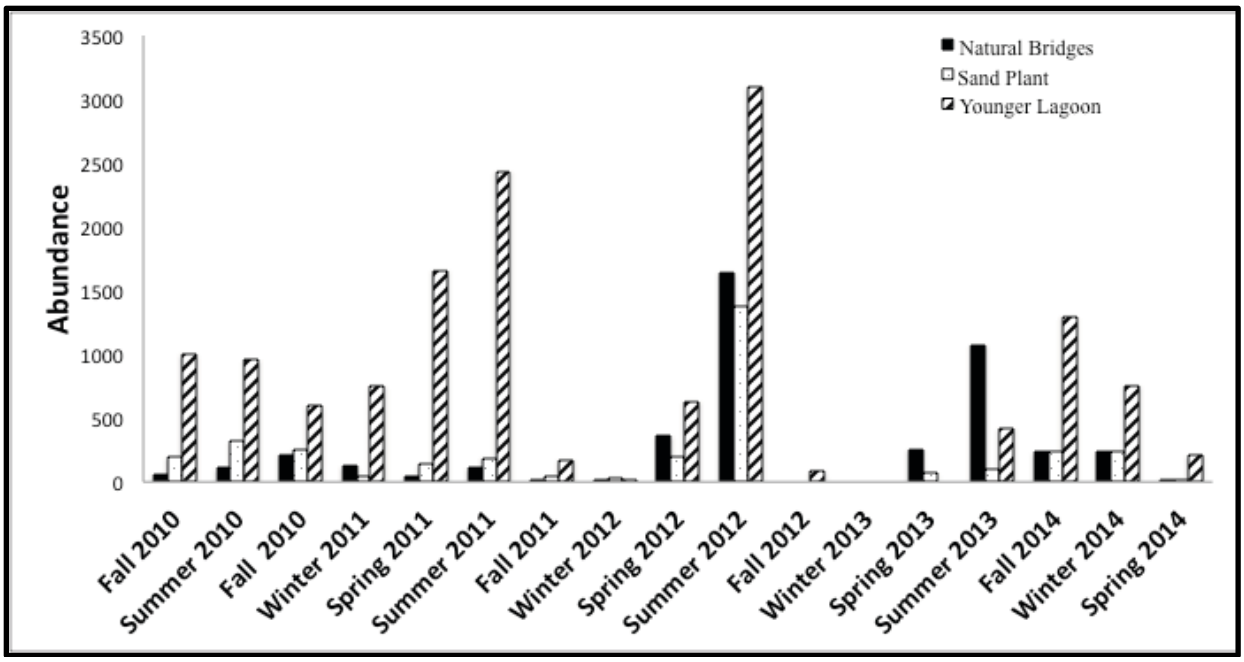

Figure 10. Total abundance of invertebrates at Natural Bridges, Sand Plant Beach, and Younger Lagoon beaches.

Avian Surveys

Avian species richness and diversity varied among sites and sampling dates (Table 10); however, richness and diversity were consistently greatest at Natural Bridges and Younger Lagoon.

Table 10. Summary of bird surveys at Sand Plant Beach, Younger Lagoon, and Natural Bridges beaches.

Site	AMCR	AMPE	BBPL	BCNH	BASW	BLOY	BLPH	BLTU	BRBL	BRPE	BUHE	CAGO	CAGU	CLSW	CORA	COOT	DO
April 24 & 26, 2010																	
Little Wilder																	
Younger Lagoon																	
Natural Bridges									2								
August 11-12, 2010																	
Little Wilder																	
Younger Lagoon						2											1
Natural Bridges	2								19								
November 15 & 16, 2010																	
Little Wilder																	
Younger Lagoon								1		27						2	
Natural Bridges									1								
February 15 & 16, 2011																	
Little Wilder																	
Younger Lagoon																	5
Natural Bridges	3								2		1		58				
May 3 & 4, 2011																	
Little Wilder	2									8							
Younger Lagoon																	
Natural Bridges	1						1						3				6
July 22 & 23, 2011																	
Little Wilder					4		1							4			
Younger Lagoon																	
Natural Bridges	9				4				6								10
March 29 & 30,																	

Site	AMCR	AMPE	BBPL	BCNH	BASW	BLOY	BLPH	BLTU	BRBL	BRPE	BUHE	CAGO	CAGO	CLSW	CORA	COOT	DO
August 25 & 26, 2012																	
Little Wilder													2		2		
Younger Lagoon		1				1	1						4				
Natural Bridges													1				
November 5& 6, 2012																	
Little Wilder																5	
Younger Lagoon									4							8	
Natural Bridges	2																
January 13&14, 2013																	
Little Wilder																	
Younger Lagoon						1					1					5	
Natural Bridges															1		
May 1 & 2, 2013																	
Little Wilder																	
Younger Lagoon									1			2					
Natural Bridges	2																
July 16-17, 2013																	
Little Wilder				1									1		1		
Younger Lagoon				1			2		7				2				
Natural Bridges							2		1				1				
October 22-23, 2013																	
Little Wilder													1		2		
Younger Lagoon			3				3						2				1
Natural Bridges	2		1							1			3				
February 13-14, 2014																	
Little Wilder												6					
Younger Lagoon																	
Natural Bridges	1																
April 27-28, 2014																	
Little Wilder	3									20							
Younger Lagoon						8				13		2					

Site	MEGU	MODO	NOHA	PECO	PIGR	PIGU	REHA	REPH	RWBB	RODO	SAND	SAPH	SNEG	SPSA	SURF	WE
April 24 & 26, 2010																
Little Wilder																2
Younger Lagoon													2			2
Natural Bridges								2					2			
August 11-12, 2010																
Little Wilder																
Younger Lagoon													4			32
Natural Bridges																3
November 15 & 16, 2010																
Little Wilder																1
Younger Lagoon				15							11			1		4
Natural Bridges	2										140		1	1		17
February 15 & 16, 2011																
Little Wilder																6
Younger Lagoon												1				
Natural Bridges				47									18			6
May 3 & 4, 2011																
Little Wilder			2			35										5
Younger Lagoon																
Natural Bridges										1						16
July 22 & 23, 2011																
Little Wilder						17							1			1
Younger Lagoon																
Natural Bridges						3				2			2			81
March 29 & 30, 2012																
Little Wilder																
Younger Lagoon				13									2			16
Natural Bridges						2					65		2			10
May 15 & 16, 2012																
Little Wilder																4
Younger Lagoon				25		5				1			2			15
Natural Bridges													2			

August 25 & 26, 2012																	
Little Wilder																	
Younger Lagoon				35				8		1			1			7	
Natural Bridges														1		5	
November 5& 6, 2012																	
Little Wilder																1	
Younger Lagoon				14			1			4			2			3	
Natural Bridges													2	1	2		
January 13&14, 2013																	
Little Wilder																	
Younger Lagoon				3	1						38	1	1				
Natural Bridges													1			11	
May 1 & 2, 2013																	
Little Wilder						8										2	
Younger Lagoon		2		9												11	
Natural Bridges																23	
July 16-17, 2013																	
Little Wilder						7											
Younger Lagoon				8		1							4				
Natural Bridges																10	
October 22-23, 2013																	
Little Wilder																	
Younger Lagoon				33									3			150	
Natural Bridges													4			110	
February 13-14, 2014																	
Little Wilder										1						103	
Younger Lagoon				8									4			7	
Natural Bridges													1			19	
April 27-28, 2014																	
Little Wilder						4										24	
Younger Lagoon						8			1							2	
Natural Bridges																18	

Discussion

Conducting biological monitoring at Natural Bridges, Younger Lagoon, and Sand Plant Beach provides insight into differences and similarities between flora and fauna, as well as the intensity of human use, across these three coastal beach/lagoon habitats. These sites are in close proximity to one another and share many ecological similarities; however, it is important to realize that these sites are different in many ways (size, proximity to the city, access, adjacent upland habitat, etc.).

Vertebrate surveys reveal, that with the exception of avian diversity and richness, the three sites continue to be relatively similar to one another. In general, Sand Plant Beach had the greatest small mammal abundance which may be a result of the extensive freshwater vegetation directly adjacent to the beach and the close proximity of upland scrub on the lagoon sides to the relatively confined beach. Track survey results were also similar across sites. The beaches are similar enough to one another that the species suite is more or less the same. One potential difference that would be of interest is whether or not the frequency of use at a finer temporal scale (e.g. per day) varies across sites.

The most profound differences between the three sites are the plant community, dune system (including downed wood), and amount of human use. In general, the proportion of native plant species richness has been greatest at YLR whereas non-native species richness was the lowest at YLR. Over the past three years, Natural Bridges has had a rise in total number of native species, this is likely due to at least in part to the relatively diverse upland habitat towards the back of the lagoon. Although, the mechanisms responsible for shaping the vegetation patterns that have been observed are unknown for certain, it is very likely that increased human use has resulted in direct impacts to vegetation and perhaps resulted in the introduction of non-native species. A parameter that we have now quantified, and is evident from visual observation and photo documentation, is the presence of dune hummocks and downed woody material at YLR both of which are almost entirely absent at Sand Plant Beach and Natural Bridges (Figure 11). It is likely that the hummocks and woody material are absent at Natural Bridges and Little Wilder due to human trampling, collection, and burning. These features provide habitat for plant species such as the succulent plant dudleya, which grow on downed woody material and dune hummocks at YLR, as well as burrowing owls that use burrows in hummocks and seek shelter beneath downed woody material at YLR. Although Younger Lagoon does experience human use, the intensity and number of users is far less than both Sand Plant Beach and Natural Bridges. Additionally, users of the YLR beach are educated about the reserve, unique natural features, and are not allowed to collect woody material or trample dune vegetation. The relatively natural state of YLR beach and dune vegetation is unique among the three sites and most pocket beaches in Santa Cruz County and likely represents a glimpse into what many of the pocket beaches in the greater Monterey Bay area looked like prior to significant human disturbance.

Figure 11. Younger Lagoon dune map. Survey data and resulting elevation model output shows topographic features on Younger Lagoon Beach.

Literature Cited

Friends of Santa Cruz State Parks. Natural Bridges. Retrieved from http://thatsmypark.org/naturalBridges.php. Accessed December 10, 2010.

Friends of Santa Cruz State Parks. Wilder Ranch. Retrieved from http://thatsmypark.org/wilderRanch.php. Accessed December 10, 2010.

Hyland, Tim. Personal communication December 22, 2010.

University of California at Santa Cruz. 2008. Final Compiled Coastal Long Range Development Plan. Prepared for California Coastal Commission, December 2008.

University of California at Santa Cruz. 2010. Notice of Impending Development 10-1, Beach Access Management Plan. Prepared for California Coastal Commission, March 2010.

Appendix 1. Younger Lagoon Photos.

YLR Beach Photopoint #1. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide

YLR Beach Photopoint #1. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide

YLR Beach Photopoint #1. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide

YLR Beach Photopoint #2. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide

YLR Beach Photopoint #2. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide

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YLR Beach Photopoint #3. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide

YLR Beach Photopoint #3. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide

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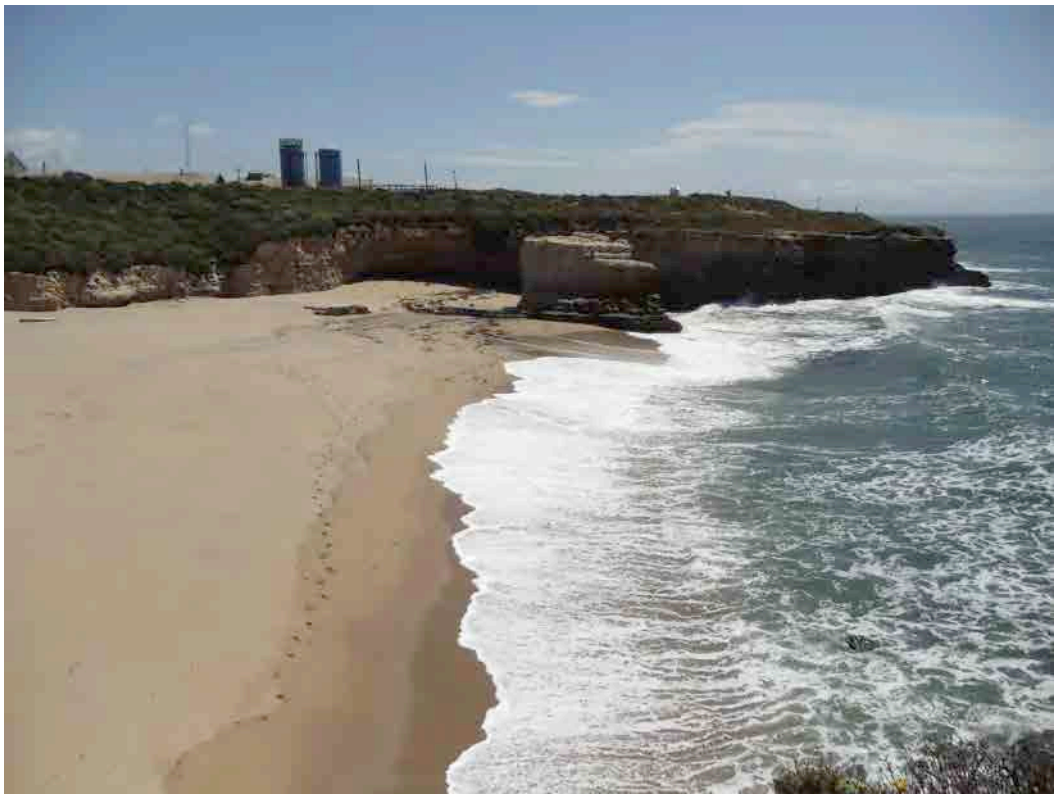
YLR Beach Photopoint #3. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide

YLR Beach Photopoint #4. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide

YLR Beach Photopoint #4. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide

YLR Beach Photopoint #4. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide



YLR Beach Photopoint #4. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide

Compliance Monitoring Report for Five Restored Habitat Patches at Younger Lagoon Reserve, Spring 2014

Introduction

In keeping with the goals of the restoration plan for the Younger Lagoon Reserve (UCNRS 2010) prepared for the California Coastal Commission, Reserve employees, interns, and volunteers have continued to move forward to restore native plant communities on the Reserve. The plantings for 2014 monitoring were planted in 2010, thus is the 4-year monitoring period for the Coastal Bluff and Coastal Prairie restoration sites respectively. Post planting monitoring occurred in 2012 and showed success exceeding target goals for cover and richness of native flora (Reed 2012), rivaling values found in reference sites (Holl & Reed 2010). Though both sites meet and exceed 4-year target goals, a decline in some parameters occurred and a discussion these observations can be found in the 'Discussion' section of this. Restoration continues to be ongoing at the Reserve providing valuable opportunities for student interns to participate and learn about restoration practices. The experimental restoration applications also allow for students to conduct research projects giving them valuable experience with research while simultaneously informing future restoration efforts. The continued monitoring of plantings will document the ongoing outcomes of these efforts.

Methods

Planting

Seeds for the planting projects were primarily collected from reference sites along coastal Santa Cruz and San Mateo Counties. The seeds were typically grown D7 conetainers™ for several weeks in the UCSC greenhouses before being introduced to the site. Site preparation prior to planting typically involved some hand-pulling of large weeds (such as *Carpobrotus edulis*) and or herbicide and tarping. A heavy layer of wood chip mulch (~10-15 cm) was also applied to planting sites prior to planting to suppress subsequent weed emergence. Teams of volunteers, interns, and staff planted the native plugs primarily between December and February using dibblers. Some plantings received supplemental irrigation to help ensure establishment of the new plants. Follow up management included some hand-pulling and spot spraying of herbicide for emerging weeds.

Sampling

Vegetation sampling of Coastal Bluff and Coastal Prairie habitat patches, both planted in 2010, generally followed protocols described in Holl and Reed (2010). Along the Coastal Bluff we ran one complete and one partial transect parallel to the coast. In the Coastal Prairie habitat only partial transects were conducted due to the size and shape of the patches. This sampling yielded a total of 44 sampling frames, 18 in the Coastal Bluff habitat, and 27 in the Coastal Prairie habitat. Richness and cover values were calculated at the transect level for both habitats. For Coastal Bluff habitat, cover is presented in structural form of shrubs and herbs for comparison with 2012 data. No distinction between structural forms was made for Coastal Prairies since

these were planted with grasses, and shrubs present represent recruits and accounted for <5% of cover.

Results

Table 1 provides a summary of native cover and richness for the Coastal Bluff and Coastal Prairie habitats for the 2014 monitoring period. Cover of native shrubs in Coastal Bluff habitat was 40.3±8.6% (SE) and native herb cover was 27.5±6.2% (SE). We also observed natural recruitment of seedlings for *Achillea millefolium* (yarrow) and *Lupinus arboreus* (yellow bush lupin) in Coastal Bluff habitat. Native cover in the Coastal Prairie habitat was 39.0 ±5.2% (SE) and native species richness was 8. We observed native seedling recruitment of *A. millefolium* (yarrow), *L. arboreus* (yellow bush lupine), *Baccharis pilularis* (coyote brush), and *Grindelia stricta* (gum weed). A list of all species detected in both habitats can be found in Table 2.

Discussion

The restoration of the Coastal Bluff and Coastal Prairie habitats has been highly successful, and despite experiencing some decreases in cover and richness from 2012, measures continue to exceed 4-year target goals for native species richness and cover. Native richness decreased from year 2 monitoring in 2012 from 19.5±2.1 (SE) species to 8 species in Coastal Bluff habitat. Native richness in the Coastal Prairie habitat also decreased slightly from 12 species in 2012 to 8 species in 2014. Environmental conditions such as the lack of sufficient precipitation during the winter and spring of 2013 and 2014 may be partially responsible for this apparent decrease and resulting conditions may not have been suitable for native herbaceous species and can favor non-native species. In coastal communities herbaceous species are documented as important contributors to overall richness (Reed et al. 2011) so continuing to monitor and manage for these species is important.

Though overall native cover of the Coastal Bluff exceeds target goals of >30%, an apparent decrease of nearly 50% in native herb cover (76.3±1.5% in 2012) suggests that non-native species may be outcompeting native seedlings. Native shrub cover was similar in 2014 (40.3±8.6%) to 2012 (38.3±0.5%) however, we expect that shrub cover will expand in subsequent monitoring periods, which may help to reduce non-native cover in this area through shading and direct competition. Native cover was higher in the Coastal Prairie in 2012 (57.6±33.5%) than in 2014 (39.0 ±5.2% SE), which also may be due to the reduced precipitation. Still, native cover far exceeds target goals and evidence of native recruitment is encouraging for the continued success of this project.

Management practices on site such as hand pulling or spot-treating exotic species with herbicides has been critical to the success of restoration at Younger Lagoon Reserve. Long-term monitoring of these restoration sites will continue to inform how different practices affect restoration outcomes. For example, results indicating an increase in the cover of exotic species from one monitoring period to the next may indicate to managers the need to intervene with herbicide treatments or mechanical removal of problematic exotic species. The experimental

restoration practices ongoing at Younger Lagoon Reserve will allow future iterations of implementation to be completed using the most cost-effective and successful techniques that result in producing quality wildlife habitat for many species including small mammals, and many species of migratory and resident birds.

Works Cited

Holl, K. D., and Reed, L. K. 2010. Reference and Baseline Vegetation Sampling for Younger Lagoon Natural Reserve. Report to the Coastal Commission.

Reed, L.K., Hatch, M., Valenta, K., and Holl, K.D. 2011. Reference site characterization and restoration goals for northern coastal scrub and seasonal wetlands and Younger Lagoon Reserve. Report to the Coastal Commission.

Reed, Lewis. 2012. Compliance Monitoring Report for Coastal Bluff and Coastal Prairie Restoration Areas at Younger Lagoon Reserve, Spring 2012. Monitoring Report Prepared for California Coastal Commission.

UCSC Natural Reserves Staff and the Younger Lagoon Reserve Scientific Advisory Committee (UCNRS). 2010. Enhancement and Protection of Terrace Lands at Younger Lagoon Reserve. Plan prepared for the California Coastal Commission.

Table 1. Native cover (± standard error), and total native richness for the Coastal Bluff and Coastal Prairie monitored in spring 2014 at Younger Lagoon Reserve

	Coastal Bluff			**Coastal Prairie**	
	Shrub Cover	**Herb Cover**	**Richness**	**Native Cover**	**Richness**
Observed	40.3±8.6%	27.5±6.2%	10	39.0±5.2%	8
Target	>30% total		8	>15%	6

Table 2. Native species observed in YLR restoration sites during spring 2014. Growth forms abbreviated as follows: PF=Perennial Forb, PG=Perennial Grass, PRGM=Perennial Gramminoid, and SHRB=Shrub.

Common Name	Scientific Name	Growth Form	Coastal Bluff	Coastal Prairie
gum weed	*Grindelia stricta*	PF		x
salt marsh baccharis	*Baccharis douglasii*	PF	x	
yarrow	*Achillea millefolium*	PF	x	x
seaside daisy	*Erigeron glaucus*	PF	x	
bee plant	*Scrophularia californica*	PF	x	
blue eyed grass	*Sisyrinchium bellum*	PG	x	x
blue wild rye	*Elymus glaucus*	PG	x	x
rush	*Juncus patens*	PGRM		x
field sedge	*Carex praegracilis*	PGRM	x	x
yellow bush lupine	*Lupinus arboreus*	SHRB	x	x
lizard tail	*Eriophyllum staechadifolium*	SHRB	x	
coastal sage brush	*Artemisia californica*	SHRB	x	
coyote brush	*Baccharis pilularis*	SHRB		x

TOTAL OBSERVED RICHNESS = 13

UNIVERSITY OF CALIFORNIA, SANTA CRUZ

THE EFFECTS OF APPLIED NUCLEATION, MULCH AND MOWING ON A CALIFORNIA COASTAL PRAIRIE RESTORATION

A Senior Thesis submitted in partial satisfaction
of the requirements for the degree of

BACHELOR OF ARTS

in

ENVIRONMENTAL STUDIES/ECONOMICS

by

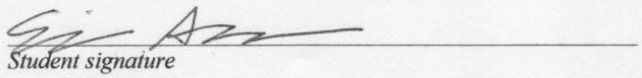
Eileen Arneson

June 2014

ADVISOR(S): Karen D. Holl, Environmental Studies & Ingrid M. Parker, EEB

ABSTRACT: The success of California grassland restoration projects is limited by cost and the ongoing presence of invasive exotic species. This study tested a lower-cost restoration technique called applied nucleation, which uses fewer plants than full-planting. This study also attempted to address the problem of persistent invasive exotic plant species through annual mowing and a one-time application of surface mulch. Three native grass species and six native forb species were planted into three planting treatments (full-planting + mulch, full-planting + no mulch, island-planting + mulch) and each treatment was crossed with a mowing treatment. Here I report on the third year of monitoring of the percent cover of the major plant guilds. I found that the percent cover of native species in the applied nucleation plots was similar to or higher than the level in the full-planting plots. I also found that surface mulch marginally increased the cover of two native forbs, though its impacts are diminishing over time. Annual mowing did not have an impact on native grass or forb cover, though it increased exotic grass cover. Based on these results, I recommend continuing to experiment with applied nucleation in California grasslands. I do not recommend using a one-time application of surface mulch as a stand-alone invasive exotic control method, however, due to high costs and diminishing impacts over time. I also recommend against using annual mowing as an exotic control method, as it was ineffective.

KEYWORDS: Restoration, grasslands, mulch, mowing, native plants



Student signature

6/8/14

Date

THE EFFECTS OF APPLIED NUCLEATION, MULCH AND MOWING ON A CALIFORNIA COASTAL PRAIRIE RESTORATION

ABSTRACT

The success of California grassland restoration projects is limited by cost and the ongoing presence of invasive exotic species. This study tested a lower-cost restoration technique called applied nucleation, which uses fewer plants than full-planting. This study also attempted to address the problem of persistent invasive exotic plant species through annual mowing and a one-time application of surface mulch. Three native grass species and six native forb species were planted into three planting treatments (full-planting + mulch, full-planting + no mulch, island-planting + mulch) and each treatment was crossed with a mowing treatment. Here I report on the third year of monitoring of the percent cover of the major plant guilds. I found that the percent cover of native species in the applied nucleation plots was similar to or higher than the level in the full-planting plots. I also found that surface mulch marginally increased the cover of two native forbs, though its impacts are diminishing over time. Annual mowing did not have an impact on native grass or forb cover, though it increased exotic grass cover. Based on these results, I recommend continuing to experiment with applied nucleation in California grasslands. I do not recommend using a one-time application of surface mulch as a stand-alone invasive exotic control method, however, due to high costs and diminishing impacts over time. I also recommend against using annual mowing as an exotic control method, as it was ineffective.

INTRODUCTION

A majority of California grasslands are dominated by invasive exotic plant species. The term invasive exotic refers to species that are outside of their natural range and are spreading (D'Antonio et al. 2007). The impacts of invasive exotic species in California grasslands are numerous and include impacts to human health, livestock, and ecological structure and functional processes (DiTomaso et al. 2007). In the past three decades, numerous projects have been undertaken to restore native species assemblages in California grasslands (Stromberg et al. 2007). DiTomaso et al. (2007) provide a framework for successful California grassland restoration that includes three phases: 1) invasive exotic control 2) achievement of landuse objectives 3) ongoing management to prevent reinvasion.

The first step in California grassland restoration projects is invasive exotic control (DiTomaso et al. 2007). While it has been shown that native perennial grasses can be superior competitors to exotic annuals after three years of growth (Stromberg et al. 2007), several studies have shown that established stands of exotic annual grasses preclude native perennial grass establishment (Dyer & Rice 1997, Hamilton et al. 1999, Nyamai et al. 2011). A number of methods exist for removing undesirable species including herbicide application, mowing, and hand-pulling (DiTomaso et al. 2007).

Unfortunately, invasive species usually cannot be eradicated in a one-time effort (DiTomaso et al. 2007). Exotic annuals are known to have a long-lived seed bank relative to native perennials, and can reemerge throughout the restoration process (D'Antonio et al. 2007). Additionally, the life history characteristics of exotic invaders make them excellent colonizers, making re-invasion a serious concern in restoration sites located near stands of invasive exotic species (DiVittorio et al. 2007). One method used to address the problem of an exotic seedbank is the application of surface mulch immediately prior to planting. Mulch has been shown to

provide a physical barrier against the germination of seeds in the soil (Reynolds et al. 2001, Jodaugienė 2006, Chalker-Scott 2007). It also reduces evaporation of water in the soil and moderates soil temperature, creating a favorable environment for planted species (Chalker-Scott 2007, Nyamai et al. 2011).

Once invasive exotic species have been removed, the next step in the restoration process is to achieve landuse objectives (DiTomaso et al. 2007). The landuse objective common to all California grassland restoration projects is restoring native species assemblages (DiTomaso et al. 2007). A number of studies have demonstrated that native perennial bunchgrasses are dispersal-limited, precluding natural re-colonization (Hamilton et al. 1999, Seabloom 2011). So, restoring native species assemblages in California grasslands requires re-vegetation. Common re-vegetation techniques include: direct seeding, planting seedlings, dividing, and haying (DiTomaso et al. 2007). Direct seeding is an attractive option because it is often cheaper and less labor-intensive than other planting methods (Reed, 2013). However, in California grassland restoration sites, planting seeds often leads to low rates of native plant establishment compared to other planting methods. Reed (2013) measured establishment of native plant species at the Younger Lagoon Reserve, a California coastal prairie restoration site. He found extremely low (1-2%) germination of three native forb species planted as seeds, while seedlings had much higher (25-100%) survival (Reed, 2013). Studies by Dyer and Rice (1996) and Seabloom (2011) also found extremely low (<1% in both studies) survival of seeded native perennial bunchgrasses across a series of California grasslands. The difference in establishment rates can be explained by the life history characteristics and competitive interactions of invasive exotic plants. Invasive exotic plants tend to germinate earlier in the year than natives, and act as competitors for light and moisture at the seedling stage (Dyer & Rice 1997, DiVittorio et al. 2007, Reed 2013). Planting native species as seedlings can help shift the competitive dominance in their favor.

Yet, raising plants to the seedling stage can be costly. One possible solution to the high cost of planting seedlings is applied nucleation. Under this method, clusters of planted individuals called islands expand outward over time through recruitment (Corbin and Holl 2012). An applied nucleation experiment in a Minnesota prairie showed that seeding 25% of a restoration plot resulted in similar levels of native forb cover to fully-seeded plots, and at only one-third of the cost (Grygiel et al. 2009). A series of studies in tropical forests have also demonstrated the economic viability of applied nucleation (Zahawi et al. 2013). Additionally, applied nucleation has been shown to successfully address the problem of propagule limitation in tropical forest restoration (Corbin & Holl 2012, Zahawi et al. 2013). A system is propagule-limited when it unable to recover naturally due to a lack of incoming native seeds. This barrier to recovery is characteristic of many California grasslands (Hamilton et al. 1999, D'Antonio et al. 2001, DiVittorio et al. 2007). While applied nucleation has yet to be experimentally tested in California grassland restoration, it may be a viable alternative to full-planting.

The final step in California grassland restoration projects is continued management, which ensures that re-vegetation efforts are successful in the long term (DiTomaso et al. 2007). In systems with mixed native/exotic species assemblages, it can be useful to target the differences in life history characteristics between exotic annuals and native perennials. When properly timed, mowing can theoretically prevent seed set from exotic annuals without damaging native perennials (Stromberg et al. 2007). Yet Maron & Jefferies (2001), Lulow (2008), and Hayes & Holl (2011) all found that mowing shifted dominant species assemblages from tall-statured exotic grasses to short-statured native and exotic forbs. Hayes and Holl (2011) suggest that mowing has differential impacts based upon species stature rather than life history. Based on

this information, mowing is probably not a desirable continued management strategy in all California grassland restoration projects.

My study was designed to determine the best methods for restoring a native California coastal prairie, a distinct sub-category of California grassland. The experiment was originally designed to address the following questions within the context of California coastal prairies:

1) Does the application of surface mulch favor the survival and growth of native species?
2) Does annual mowing favor the survival and growth of native species?
3) Does planting seedlings result in higher survival and growth than drill seeding does?
4) Is applied nucleation an appropriate alternative to full planting?

This experiment is now in its third year of growth. In the first year of growth, Adams (2012) found that applied nucleation and mulching treatments led to slightly higher or equivalent survival and cover of native species when compared to full planting and no mulch treatments. In the second year of growth, Tang (2013) found that the mulch treatment had a strong positive effect on native plant cover and recruitment. Additionally, Tang (2013) found that while mowing reduced exotic grass cover, it also reduced the survival of native grasses. Due to low native survival and cover, the seeded and island-planting + no mulch plots originally included in the experimental design were removed.

Based on the results of Adams (2012) and Tang (2013) and reviewing the existing literature on California grassland restoration, I hypothesized that:

1) Native grass cover and native forb cover would be higher in mulched than non-mulched plots.
2) Exotic forb and exotic grass cover would be lower in mulched than non-mulched plots.
3) Native forb recruitment would be higher in mulched than non-mulched plots. Because the mulch was shown in Tang (2013) to reduce exotic cover, there should be fewer exotic seeds in mulched plots. Native forbs should therefore face reduced competition from exotics in the early stages of growth.
4) Mowing would shift community assemblage from tall-statured exotic grasses to short-statured exotic forbs, consistent with the studies by Maron & Jefferies (2001), Lulow (2008), and Hayes & Holl (2011)
5) Mowing would increase the recruitment of native forbs. Mowing reduces the plant canopy, which may otherwise limit the availability of sun and moisture to forbs at the seedling stage.

METHODS

Study Site

This study was conducted on the terrace lands at the Younger Lagoon Reserve (YLR) (lat 36°57'03”N, lon 122°03'57W) in Santa Cruz, CA. The YLR property is adjacent to the Pacific Ocean and experiences a Mediterranean climate. The terrace lands were intensively farmed for about 70 years, then left fallow for another 20 years (Hunt 2009). Following the removal of agricultural disturbance, the study site became dominated by invasive exotic species. In particular, it was dominated by two exotic annual grasses, *Festuca perennis* and *Bromus diandrus*, and two exotic annual forbs, *Raphanus sativus* and *Helminthotheca echiodes.* No

record exists concerning the terrace lands' historical species assemblage, but it was likely characterized by a mixture of coastal prairie, coastal scrub, and freshwater wetland communities. Today, YLR is part of the University of California's extensive Natural Reserve System (NRS) and is used as a living laboratory for students, faculty, and staff. My study is part of a larger project to restore 19 hectares to native perennial grassland and coastal scrub. The larger project will continue for 20 years and then be preserved in perpetuity (Hunt 2009). Specific details regarding the larger project and restoration goals can be found in the UC Santa Cruz Marine Science Campus Long Range Development Plan (2008).

It is worth noting that the study site was planted in 2011, which was a drought year, and that each successive year of growth has also occurred under drought conditions (Table 2). This year has been particularly dry (232.1 mm, compared to a 12-year average of 434.7 mm) (Table 2). California grassland species composition in any given year is influenced by available moisture (Reaver Morghein et al. 2007). Moisture is also crucial for recruitment and for the first several years of plant growth (Wilson et al. 2004).

Experimental Design

Note: Experimental design details drawn from (Tang, 2013).

Site Preparation

In October 2011, various students and NRS staff fenced the entire study site in order to exclude humans and small herbivores. We also applied the broad spectrum herbicide glyphosate to the entire area in order to eliminate all vegetation from the site. Following herbicide application, we applied wood chip mulch to the plots assigned a mulch treatment. In January 2012, we applied a second round of glyphosate, several days before planting.

Treatments

The study site is split into 15 10x10 m plots. Each plot was assigned a plot-level treatment (full-planting + mulch, island-planting + mulch, full-planting + no mulch). There were 5 replicates of each plot-level treatment. Each plot-level treatment was combined with two treatments at the sub-plot level: plant stature (grasses/forbs and rushes) and mowing (mowed/not mowed). The north half of each plot was planted with grasses and the south half was planted with forbs and rushes (Fig. 1**)**. The east half of each plot was mowed and the west half was left un-mowed (Fig. 1**)**. So, each of the treatments is crossed with the others.

We used three species of native perennial bunchgrasses (*Stipa pulchra, Hordeum brachyantherum,* and *Bromus carinatus)*, two species of native annual forbs (*Clarkia davyi* and *Trifolium willdenovi)*, three species of native perennial forbs (*Achillea millefolium, Symphyotrichum chilense* and *Grindelia stricta)*, and one species of native rush (*Juncus patens)* (Fig. 1). We planted them in January 2012, when they were three months old. Note that *Trifolium willdenovi* did not survive the first growing season due to herbivory (Adams 2012). The seedlings were arranged in one of two planting methods: full/island. In full-planting plots, we planted 484 seedlings, organized into 22 rows of 22 plants **(**Fig. 1**)**. In plots assigned the island-planting treatment, we only planted 144 seedlings, organized into four 2.25 x 2.25 meter islands **(**Fig. 1**).** In each island-planting plot, two of the islands were composed of grasses and the other two were composed of forbs and rushes (Fig. 1). Each island was composed of six rows, each with six seedlings (Fig. 1).

In late May 2012, the east half of each plot was mowed. The treatment was repeated in late May 2013.

Data Collection

Percent cover and Recruitment

I measured percent cover and recruitment in April and May 2014. I took a total of 20 samples per plot. I split each plot into four equal sub-plots and took 5 samples from each sub-plot. Each sub-plot had a different treatment: 1) grasses/mowed 2) grasses/not-mowed 3) forbs and rushes/mowed or 4) forbs and rushes/not-mowed. I created a one meter buffer area one meter from the edge of the plot to reduce bias from the edge effect in my results (Fig. 2). Then I overlaid an imaginary grid, created by 2 perpendicular meter-tape transects, over each 4 x 4 m sub-plot (Fig. 3). Grid cells were each the size of a quadrat (0.25 m x 1 m), laid perpendicular to the direction of planting (Fig 3). Each grid cell was assigned a number, and I used a random number generator to determine which grid cells to place quadrats in (Fig 3). Note that within each island-planted plot, the planting direction of the island was oriented in one of two different ways (Fig. 1). For this reason, I re-oriented the grid in two of the four sub-plots in each island-planted plot to ensure that sampling was consistent and unbiased (Fig. 2).

I visually estimated percent cover within each sample. I estimated percent cover of native forbs, grasses, and rushes on a per species basis and the percent cover of exotic grasses and exotic forbs as guilds. I also estimated percent cover of mulch, bare ground, gopher disturbance, and thatch (standing dead matter). I estimated cover to the nearest 1% for individual native species with <10% cover. If a native species occupied ≥10% of the sample, then I estimated cover in 5% intervals (e.g., 15-20% *Stipa pulchra*). All other categories were estimated in 5% intervals with no lower bound. If two plant species overlapped, then I estimated the percent cover of each. Percent cover estimates within a sample could therefore sum to more than 100%.

I measured seedling recruitment in the same grid cells I used to measure percent cover. Due to difficulty in distinguishing between grass seedlings, I focused my estimates on the five native forb and rush species: *Achillea millefolium, Clarkia davyi, Grindelia stricta*, *Juncus patens* and *Symphyotrichum chilense.* I counted each recruit individually if there were fewer than 20. Otherwise, I estimated recruits to the nearest 10.

Statistical Analysis

I attempted numerous data transformations in order to make the percent cover data normally distributed, but was unsuccessful. I determined that even though my data was not normally distributed, the variances were satisfactorily homoskedastic to use two-way ANOVAs to test for statistical significance. Please note that p-values should be interpreted with caution, however. The model included plot-level treatment (island-planting + mulch, full-planting + mulch, full-planting + no mulch), mowing (mowed, not-mowed) and a treatment × mowing interaction. The dependent variables I considered were: percent cover of the four most abundant individual native species, exotic grasses as a guild, and exotic forbs as a guild. I used post-hoc Tukey tests in order to determine which treatment means were significantly different when plot-level treatment was significant in the model. I was unable to run statistical analysis on the recruitment data I collected due to low recruitment.

RESULTS

The entire study site was dominated by exotic species, particularly exotic grasses. As a guild, exotic grasses comprised over 70% cover. *Bromus diandrus* was the most prevalent exotic grass species. *Bromus hordeaceus* and *Avena barbata* were also common. As a guild, exotic forbs comprised 25% of visual cover estimates. The most prevalent exotic forb species was *Medicago polymorpha,* although *Raphanus sativus* and *Geranium dissectum* were also common.

In sub-plots planted with native grasses, native grasses comprised approximately 25% of visual cover estimates. It is worth noting that the two best performing planted species were both native grasses: *Hordeum brachyantherum* (13%) and *Bromus carinatus* (9%). The third native grass, *Stipa pulchra* had extremely low percent cover (2%). In sub-plots planted with native forbs, native forbs comprised just 11% of visual cover estimates. The best performing native forb was *Achillea millefolium* (7%). Three other native forb species had extremely low percent cover: *Grindelia stricta* (2%), *Symphyotrichum chilense* (1%), and *Juncus patens* (<1%). Due to low cover, I omitted these three species from my statistical analysis. No seedlings of the annual forb *Clarkia davyi* were observed during vegetation surveys this season.

The mowing treatment significantly increased the percent cover of exotic grasses (Table 1, Fig. 4). The interaction of the no mowing and no mulch treatments significantly increased the percent cover of exotic forbs (Table 1, Fig. 5). The mowing treatment had a marginally significant negative impact on the percent cover of one native grass: *B. carinatus* (Table 1, Fig. 6). Mowing did not have an impact on the other two native grasses: *S. pulchra* and *H. brachyantherum* or any of the native forbs: *A. millefolium, G. stricta, S. chilense* and *J. patens* (Table 1).

The percent cover of exotic grasses was similar across all plot-level treatments. There was a significant treatment × mowing interaction term for exotic forb cover, which was higher in the no mulch and no mowing treatments (Table 1, Fig. 5). Two native grasses, *B. carinatus* and *S. pulchra,* had marginally higher cover in island-planted plots than in full-planted plots (Table 1, Fig. 7). The percent cover of the other native species were similar in fully-planted and island-planted plots (Table 1). One native grass, *H. brachyantherum*, had lower cover in mulched plots, but the result was only marginally significant (Table 1, Fig. 7). Two native forbs, *S. chilense* and *G. stricta,* showed a trend towards higher cover in surface mulched plots but their cover was low overall.

Recruitment of three of the native forb species: *Achillea millefolium, Grindelia stricta, Symphyotrichum chilense,* was low across all treatments (Table 3). No recruits of the two other species: *Clarkia davyi* and *Juncus patens,* were found at all (Table 3). For this reason, my recruitment data could not be interpreted with statistical analysis. For the three measured species, recruitment was highest in the mulched plots. This result must be interpreted with caution, however, as 97% of *G. stricta* recruits were found in a single sample. There was no apparent trend in the effect of mowing on native forb recruitment.

DISCUSSION

Despite the fact that the entirety of this experiment has taken place during drought conditions (Table 2), the overall percent cover of native grasses was relatively high (25%). A similar level of native grass cover was found by Holl et al. (unpublished manuscript) during the third year of growth in an experiment planted at YLR during a high rainfall year. While seemingly low, this level of native grass cover is comparable to that found at multiple local

reference sites (Holl & Reed, 2010). It also exceeds the 6-year goal for the percent cover of native grasses that is part of YLR's larger restoration plan (20%) (Holl & Reed, 2010). This suggests that the restoration effort was successful, at least in terms of native grass cover.

The percent cover of native forbs was much lower than that of native grasses (11%). This may be due to the differential ability of native grasses and native forbs to tolerate drought stress. Some coastal prairie bunchgrasses are adapted to utilize the moisture in coastal fog for growth, allowing them to persist in the arid California summers (Corbin et al. 2005). This ability may have allowed the native grasses to better tolerate the lack of rainfall than the native forbs. Drought stress seems a likely explanation for the failure of *J. patens,* in particular, since it is a wetland plant. The lack of rainfall can probably also explain the failure of the native annual forb *Clarkia davyi* to recruit in this growing season, as well as the low levels of recruitment for the other native forb species. This is consistent with the findings of Wilson et al. (2004), that seedling establishment and survival in semiarid prairie systems are dependent on annual rainfall.

Like many California grassland restoration sites, my study site was dominated by invasive exotic grasses. Ongoing exotic control is necessary for restoration success (DiTomaso et al. 2007). Exotic species are able to regenerate from the soil seed bank and from seed rain from nearby stands (D'Antonio et al. 2007, DiVittorio et al. 2007). The mowing treatment, which has been repeated once per year, was meant to work as an ongoing exotic control method. Yet the mowing treatment actually ended up increasing the percent cover of exotic grasses. It is unclear why this would be the case, considering that previous studies have shown that mowing tends to shift competitive dominance from tall-statured exotic annual grasses to a mixture of short-statured native and exotic perennial forbs (Maron & Jefferies 2001) or to short-statured exotic annual forbs (Hayes & Holl 2011). This was even the case with a single annual mowing event, like that used in this experiment (Maron & Jefferies 2001). It is likely that the results of the mowing experiment were also influenced by drought conditions (Table 2). Wilson et al. (2004) emphasize that the rainfall in the year of initiation of a grassland restoration project may have a stronger effect than the specific restoration treatment used.

The mulch treatment had some positive effects on restoration efforts, but the effects have been diminishing over time. Almost all of the mulch has decomposed since its application three years ago (personal observation). While data gathered from the same experiment in the previous two growing seasons showed a strong positive effect of the mulch treatment on native species survival and cover and a negative effect on exotic grass cover, I found that only two planted species were positively impacted by the mulch treatment and that it had no impact on exotic grass cover in this growing season. (Adams 2012, Tang 2013). The diminishing impact of the mulch treatment over time is consistent with the findings of Holl et al. (unpublished manuscript), which were also drawn from an experiment at YLR. Holl et al (unpublished manuscript) found that the impacts of surface mulch on native grass establishment and exotic grass cover significantly diminished by the third year after its application. This supports the claim by DiTomaso et al. (2007) that invasive exotic species often cannot be eradicated in a one-time effort, but rather, require on-going management.

The applied nucleation treatment was very successful. Most of the native species had similar levels of cover in island-planting and full-planting treatments, and two native grasses actually had *higher* percent cover in the island-planting treatment. Yet, the island-planted plots were planted with 70% fewer individuals. In both the Minnesota prairie and the tropical forest applied nucleation experiments, native cover was similar in applied nucleation and fully-planted plots (Grygiel et al. 2009, Zahawi et al. 2013). It is not clear why the cover of planted species

might be *higher* in island-planted plots, especially because many of the samples in the island-planting plots were drawn from outside the planted area (Fig. 2). It is possible that native grasses in the full-planting treatment faced greater competition from neighbors than those in the island-planting treatment. Competition could reduce native grass survival or restrict individual growth. The latter seems like a plausible explanation for my results, since Tang (2013) found that two native forbs had higher individual cover in island-planted than fully-planted plots. It is not possible to know for certain whether the percent cover of these grasses was higher due to larger individual growth, however, since I did not include individual cover in the scope of my study.

Suggestions for Future California Coastal Prairie Restorations

For future California coastal prairie restoration projects, I would recommend using the native grasses *H. brachyantherum* and *B. carinatus* and the forb *A. millefolium*. I do not recommend using *J. patens* except in instances where irrigation will be used for the first several years of growth or when planting in a specific wetland area. I also recommend against using the forb *Trifolium willdenovii.* While this plant was not considered in the scope of my study, it was originally included in this experiment. It did not survive the first growing season due to herbivory.

I recommend against using annual mowing events as an ongoing exotic management strategy in California coastal prairie systems. This technique did not prove to be an effective exotic management technique in my experiment. Nor did it have a positive impact on the majority of planted species. The findings of previous studies concerning the efficacy of mowing have been mixed (Maron & Jeffries 2001, Lulow 2008, Hayes & Holl 2011). Resources would be better allocated to other exotic control techniques.

I also recommend against using a single application of surface mulch as a stand-alone exotic control method. The effects of surface mulch on both native establishment and exotic control diminish over time. Native bunchgrasses have been demonstrated to require at least three years to establish (Stromberg et al. 2007). Nearly all of the mulch used in this experiment has decomposed, allowing exotic grasses to reinvade the site. Combining a one-time application of surface mulch with an ongoing exotic control method may be useful in allowing native bunchgrasses to establish. The combination of surface mulch and hand-pulling has been an effective exotic control method at other project sites at YLR (personal observation). Hand-pulling is not suitable for projects that are very large, resource-limited, or difficult to access, however.

I strongly recommend continuing experimentation with applied nucleation in California coastal prairie systems. This is an emerging technique which, if successful, may help alleviate cost-limitations in coastal prairie restorations. In the Minnesota prairie restoration project, Grygiel et al (2009) found that seeding 25% of a study plot resulted in similar levels of native forb cover to plots that were 100% seeded, and at only one-third of the cost. My study showed that two native grasses actually had *higher* percent cover in island-planted plots. Since cost is a major limitation in restoration projects, applied nucleation could have a major positive impact.

Finally, I recommend using restoration techniques to address the interannual variability in California rainfall. Moisture is important in plant establishment and recruitment. Irrigation should be considered if planting in a particularly dry year. Additionally, managers should consider replanting a given site in subsequent years. This was shown in Wilson et al (2004) to improve rates of seedling establishment when interannual rainfall was a limiting factor.

REFERENCES

Chalker-Scott, L. (2007). Viewpoint impact of mulches on landscape plants and the environment: A review 1, *25*, 239–249.

Corbin, J. D., & Holl, K. D. (2012). Applied nucleation as a forest restoration strategy. *Forest Ecology and Management*, *265*, 37–46.

Corbin, J. D., Thomsen, M. A., Dawson, T. E., & D'Antonio, C. M. (2005). Summer water use by California coastal prairie grasses: fog, drought, and community composition. *Oecologia*, 511-521.

D'Antonio, C. D., Levine, J., & Thomsen, M. (2001). Ecosystem resistance to invasion and the role of propagule supply: A California perspective. *Journal of Mediterranean Ecology*, 233–245.

D'Antonio, C. M., Malmstrom, C., Reynolds, S. A., & Gerlach, J. (2007). Ecology of invasive non-native species in california grasslands. In M. R. Stromberg, J. D. Corbin, & C. M. D'Antonio, *California Grasslands: Ecology and Management* (pp. 67–86). Berkeley and Los Angeles: University of California Press.

DiTomaso, J. M., Enloe, S. F., & Pitcairn, M. J. (2007). Exotic plant management in California annual grasslands. In M. R. Stromberg, J. D. Corbin, & C. D. D'Antonio, *California Grasslands: Ecology and Management* (pp. 281–296). Berkeley and Los Angeles: University of California Press.

Dukes, J. S., & Shaw, R. M. (2007). Responses to changing atmosphere and climate. In M. R. Stromberg, J.D. Corbin & C. D. D'Antonio, *California Grasslands: Ecology and Management* (pp. 218-229). Berkeley and Los Angeles: University of California Press.

DiVittorio, C. T., Corbin, J. D., & D'Antonio, C. M. (2007). Spatial and temporal patterns of seed dispersal: an important determinant of grassland invasion. *Ecological Applications: A Publication of the Ecological Society of America*, *17*(2), 311–6.

Galatowitsch, S. M. (2012). *Ecological Restoration* (1st ed.). Sunderland, MA: Sinauer Associates.

Grygiel, C.E., Norland, J.E., & Biondini, M.E. (2009). Precision prairie reconstruction (PPR): A technique for increasing natie forb species richness in an established grass matrix. *Ecological Restoration 27(4),* 458-466.

Hamilton, J. G., Holzapfel, C., & Mahall, B. E. (1999). Coexistence and interference between a native perennial grass and non-native annual grasses in California. *Oecologia*, *121*(4), 518–526.

Hayes, G. F., & Holl, K. D. (2003). Site-specific responses of native and exotic species to disturbances in a mesic grassland community. *Applied Vegetation Science*, *6*(2), 235–244.

Hayes, G. F., & Holl, K. D. (2011). Manipulating disturbance regimes and seeding to restore mesic Mediterranean grasslands. *Applied Vegetation Science*, *14*(3), 304–315.

Holl, K.D., Hayes, G.F., Ericson, C., Howard, E.A., Reed, L.K., Tang, M., & Vasey, M.C. (unpublished manuscript). Repeated failure of restoration seeding over many years in several coastal prairie sites.

Holl, K.D., Howard, E.A., Brown, T.M., Chan, R.G., de Silva, T.S., Mann, E.T., Russel, J.A., & Spangler W.H. (unpublished manuscript). Efficacy of exotic control strategies for restoration coastal prairie grasses.

Holl, K.D., & Reed, L.K. (2010). Reference and baseline vegetation sampling for Younger Lagoon Natural Reserve – Spring 2010.

Hunt, L. (2009). Narrative History of Younger Lagoon Reserve, 1–25.

Jackson, R. D., & Bartolome, J. W. (2007). Grazing ecology in California grasslands. In M. R. Stromberg & J. D. and C. M. D. Corbin , *California Grasslands: Ecology and Management* (pp. 197–206). Berkeley and Los Angeles: University of California Press.

Jantz, P. A., Preuser, B. F. L., Fujikawa, J. K., Kuhn, J. A., Bersbach, C. J., Gelbard, J. L., & Davis, F. W. (2007). Regulatory Protection and Conservation. In M. R. Stromberg & J. D. and C. M. D. Corbin, *California Grasslands: Ecology and Management* (pp. 297–318). Berkeley and Los Angeles.

Lulow, M. E. (2008). Restoration of California Native Grasses and Clovers: The Roles of Clipping, Broadleaf Herbicide, and Native Grass Density. *Restoration Ecology*, *16*(4), 584–593.

Maron, J. L. and R. L. J. (2001). Restoring enriched grasslands: effects of mowing on species richness , productivity, and nitrogen retention, *11*(4), 1088–1100.

Nyamai, P. a., Prather, T. S., & Wallace, J. M. (2011). Evaluating restoration methods across a range of plant communities dominated by invasive annual grasses to native perennial grasses. *Invasive Plant Science and Management*, *4*(3), 306–316.

Reed, L. K. (2013). A field seeding trial for native coastal prairie species at Younger Lagoon Reserve.

Reynolds, S. A., Corbin, J. D., Antonio, C. M. D., Madroño, S., & October-december, N. (2001). The effects of litter and temperature on the germination of native and exotic grasses in a coastal california grassland. *Madroño*, *48*(4), 230–235.

Seabloom, E. W. (2011). Spatial and temporal variability in propagule limitation of California native grasses. *Oikos*, *120*(2), 291–301.

Seabloom, E. W., Harpole, W. S., Reichman, O. J., & Tilman, D. (2003). Invasion, competitive dominance, and resource use by exotic and native California grassland species. *Proceedings of the National Academy of Sciences of the United States of America*, *100*(23), 13384–9.

Stromberg, M. R., D'Antonio, C. M., & Corbin, J. D. (2007). Epilogue: Future Directions. In M. R. Stromberg & J. D. and C. M. D. Corbin, *California Grasslands: Ecology and Management* (pp. 319–322). Berkeley and Los Angeles: University of California Press.

Stromberg, M. R., D'Antonio, C. M., Young, T. P., Wirka, J., & Kephard, P. R. (2007). No Title. In M. R. Stromberg, J. D. Corbin, & C. M. D'Antonio, *California Grasslands: Ecology and Management* (pp. 254–280). Berkeley and Los Angeles: University of California Press.

Tang, M. (2013). Effects of mulch, planting design, and mowing on native plant restoration in a California coastal prairie Mickie Tang, 1–22..

UC Santa Cruz Marine Science Campus Long Range Development Plan. (2008). Retrieved from: http://ppc.ucsc.edu/cp/projects/11407

Wilson, S. D., J. D. Bakker, J. M. Christian, X. D. Li, L. G. Ambrose, and J. Waddington (2004). Semiarid old-field restoration: Is neighbor control needed? Ecological Applications **14:**476-484.

Zahawi, R. a., Holl, K. D., Cole, R. J., & Reid, J. L. (2013). Testing applied nucleation as a strategy to facilitate tropical forest recovery. *Journal of Applied Ecology*, *50*(1), 88–96.

Table 1: Results of a two-way ANOVA analyzing the impacts of mulch and mowing on the percent cover of exotic grasses, exotic forbs, native grasses, and native forbs

	Planting Treatment		Mowing		Planting Treatment x Mowing	
Variable	*F*	*p*	*F*	*p*	*F*	*P*
Exotic guilds percent cover:						
Exotic Grasses	0.1	0.9209	41.2	**<0.0001**	0.1	0.9488
Exotic Forbs	17.9	**<0.0001**	5.8	**0.0170**	5.8	**0.0339**
Native species percent cover:						
Bromus carinatus	2.8	0.0624	3.6	0.0611	0.3	0.7157
Hordeum brachyantherum	1.5	0.2182	0.0	0.9089	1.5	0.2374
Stipa pulchra	2.7	0.0719	0.0	0.9080	1.8	0.1656
Achillea millefolium	0.4	0.6732	0.6	0.4288	1.5	0.2226

Table 2: Annual and average rainfall values at Younger Lagoon Reserve

Date	Rainfall (mm)
July 2010 – June 2011	720.20
July 2011 – June 2012	367.50
July 2012 – June 2013	288.60
July 2013 – June 2014	232.1
12 Year Average (July 1990 – June 2013)	434.74

Table 3: Native forb recruitment by treatment

	Mowing Treatment	Planting Treatment		
Native Forb Species		Full + Mulch	Full + No Mulch	Island + Mulch
Achillea millefolium	Mowed	32	51	35
	Not Mowed	46	24	40
Symphyotrichum chilense	Mowed	3	0	8
	Not Mowed	0	0	4
Grindelia stricta	Mowed	0	0	0
	Not Mowed	108	0	2
Juncus patens	Mowed	0	0	0
	Not Mowed	0	0	0
Clarkia davyi	Mowed	0	0	0
	Not Mowed	0	0	0

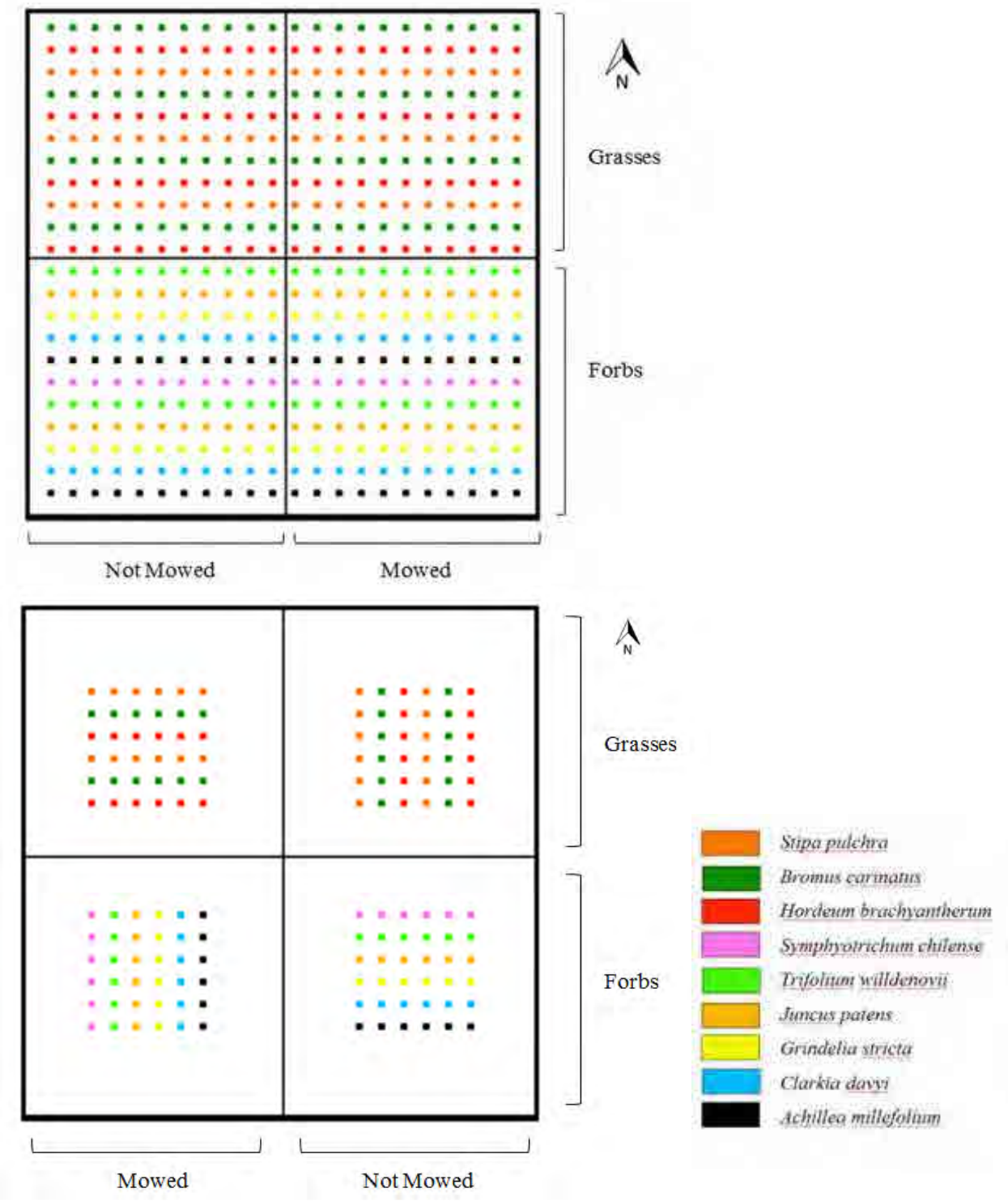


Figure 1: Planting style for full-planting plots (top) and island-planting plots (bottom).

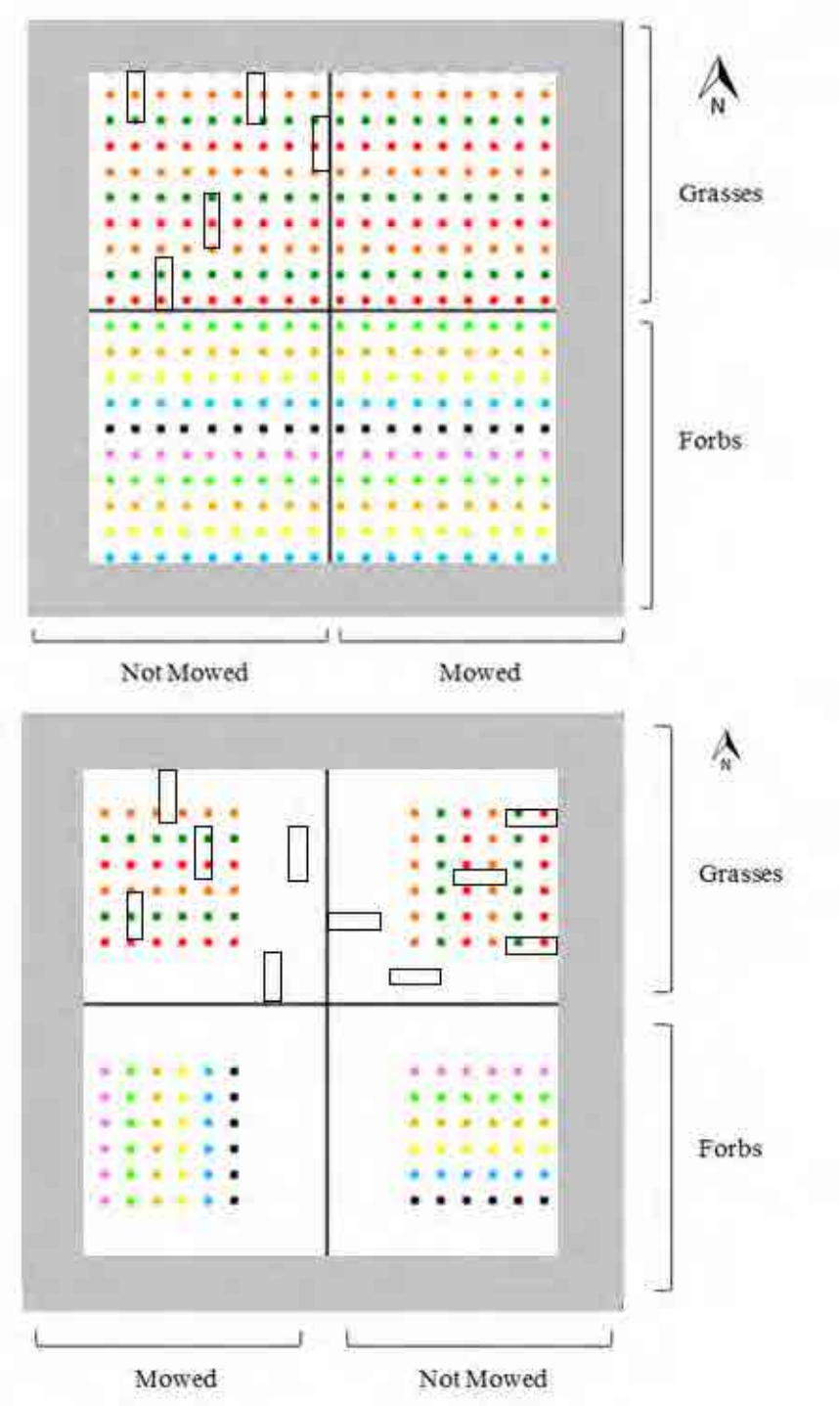


Figure 2: Sampling design in full-planted plots (top) and island-planted plots (bottom). Gray areas represent 1 m buffer. Rectangles represent randomly placed sampling quadrats. Note that quadrat layout is always perpendicular to planting direction. Also note that sampling is repeated in all four sub-plots (though quadrat placement is only shown in some).

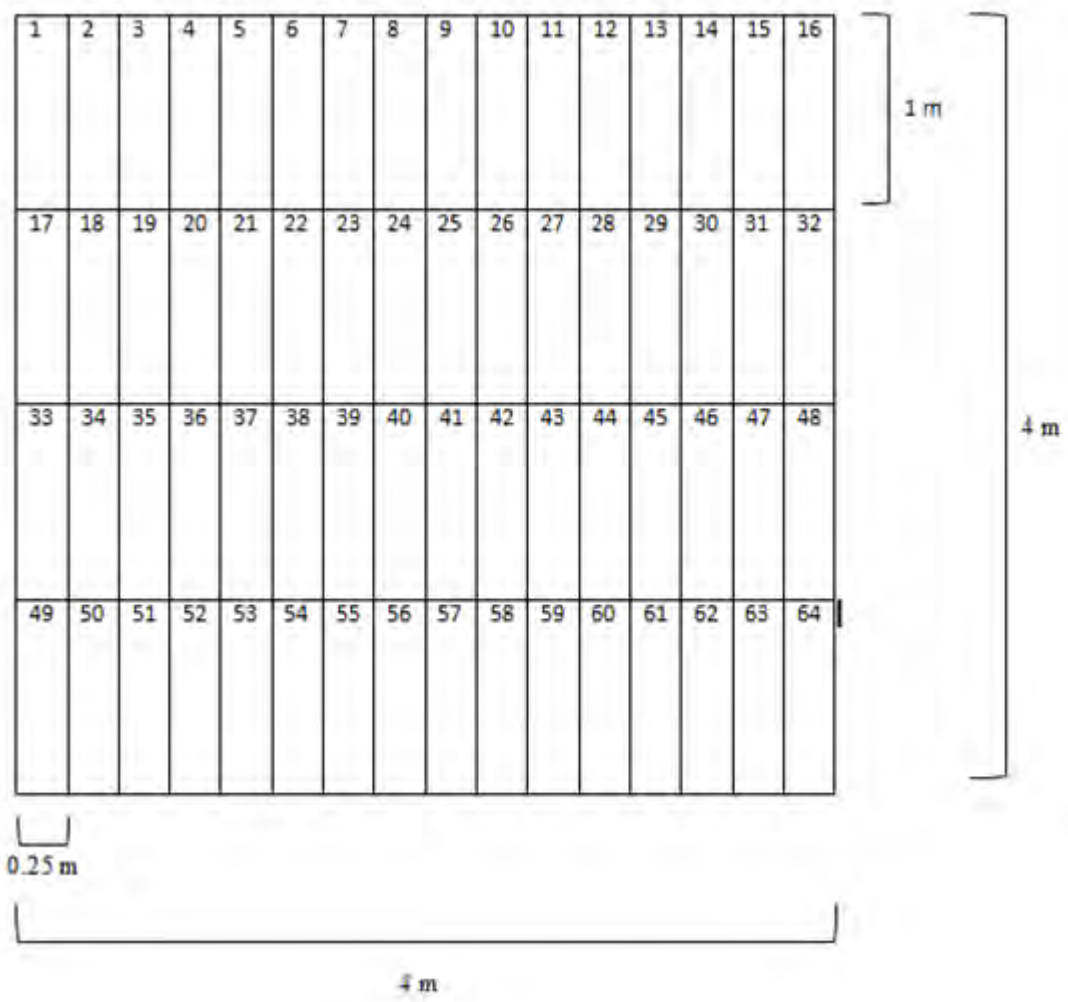


Figure 3: Sampling grid used in each sub-plot. Cell 1 is in the northeast corner of most sub-plots. The sampling grid is rotated 90 degrees in the northeast and southwest sub-plots in island-planted plots, however, so that cell one is in the southeast corner of each sub-plot.

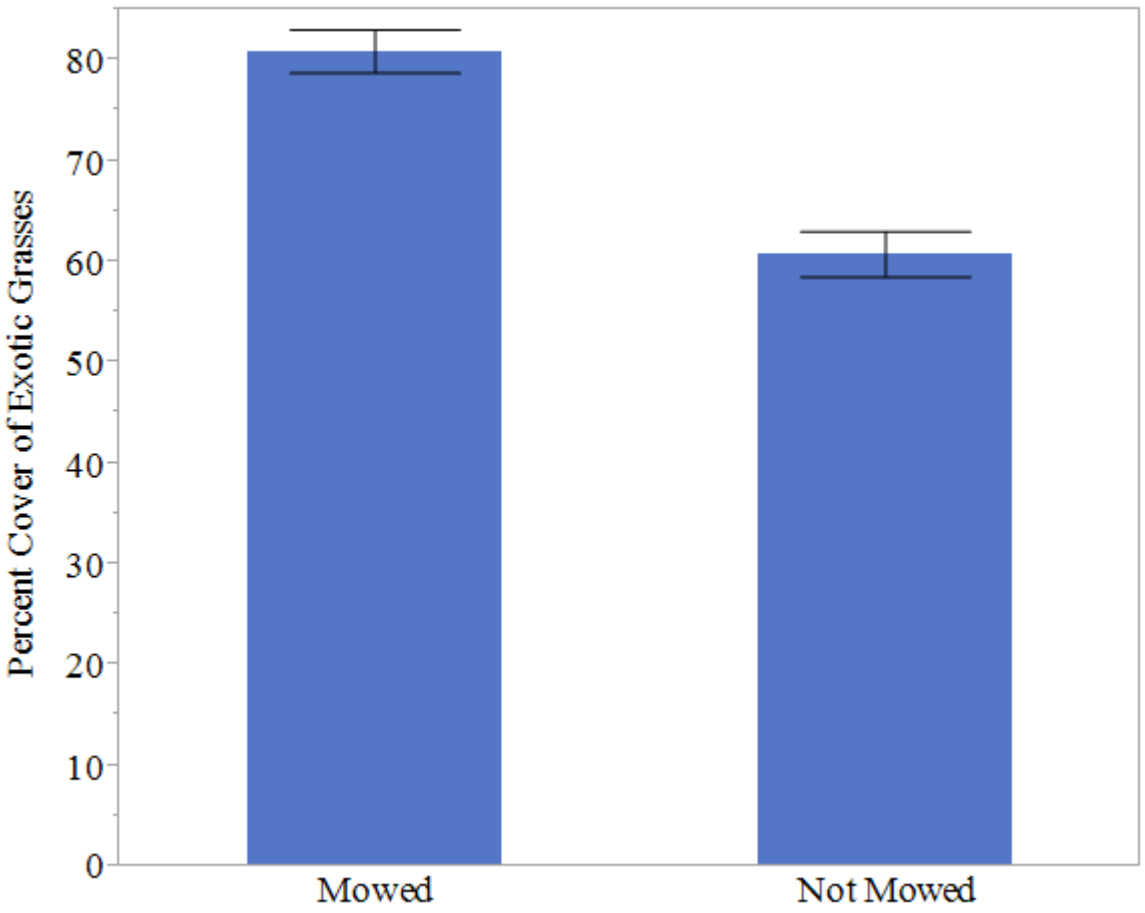


Figure 4: The effect of mowing on the percent cover of exotic grasses. Error bars represent one SE.

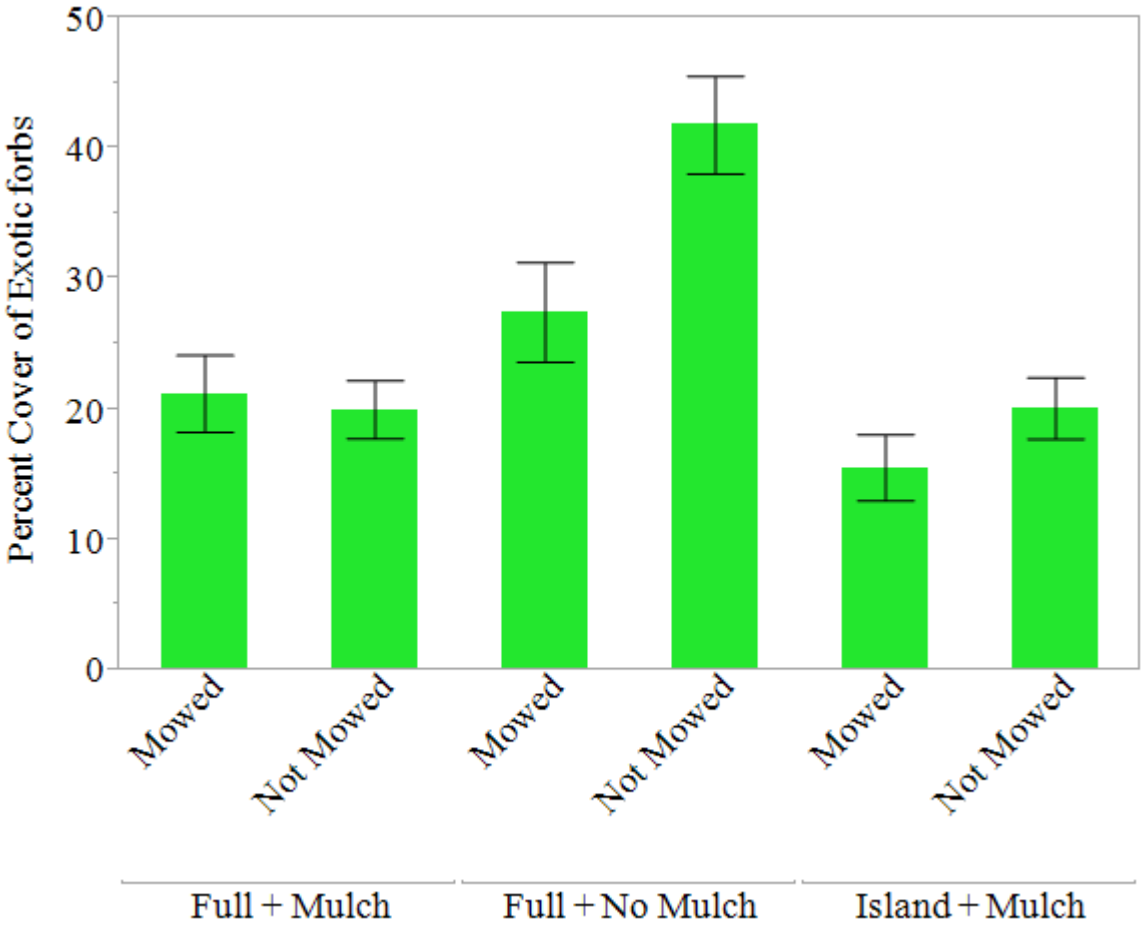


Figure 5: The effect of planting style and mulch on the percent cover of exotic forbs. Error bars represent one SE.

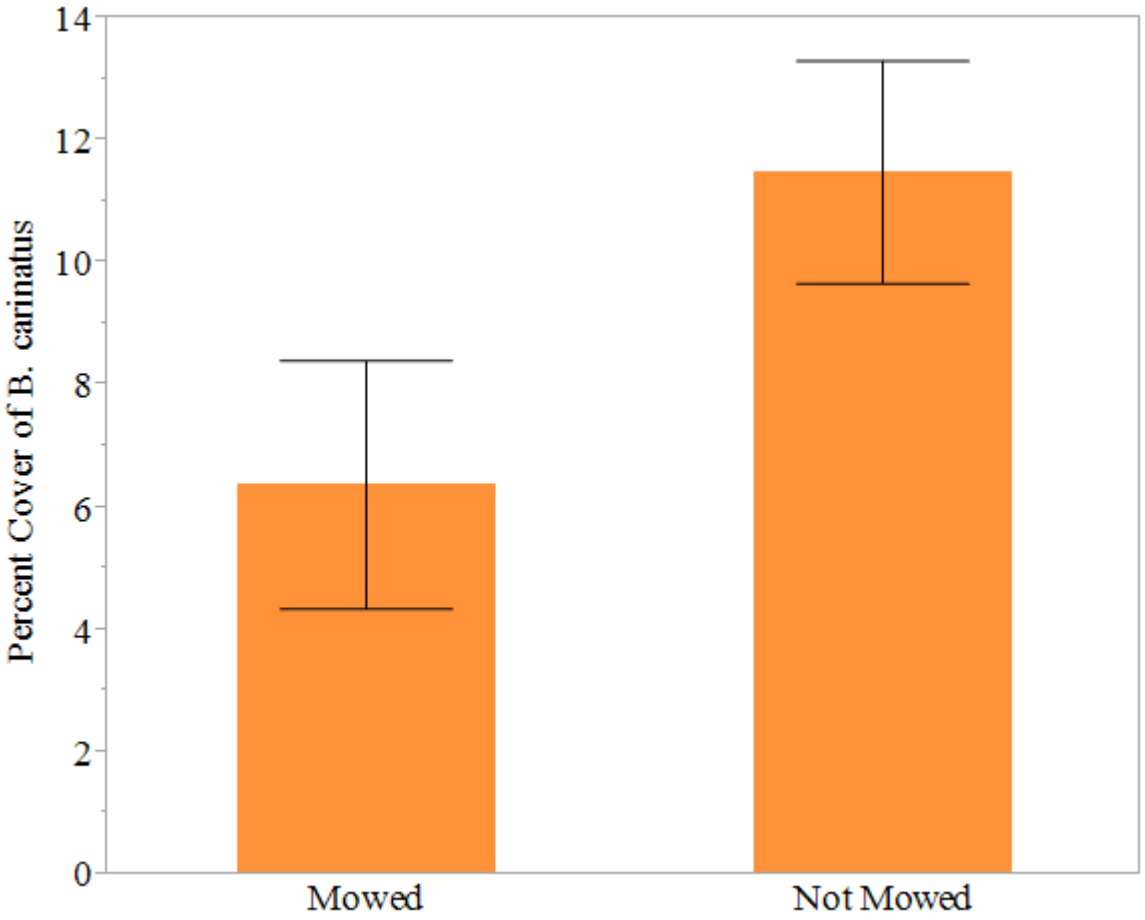


Figure 6: The effect of mowing on the percent cover of *Bromus carinatus*. Error bars represent one SE.

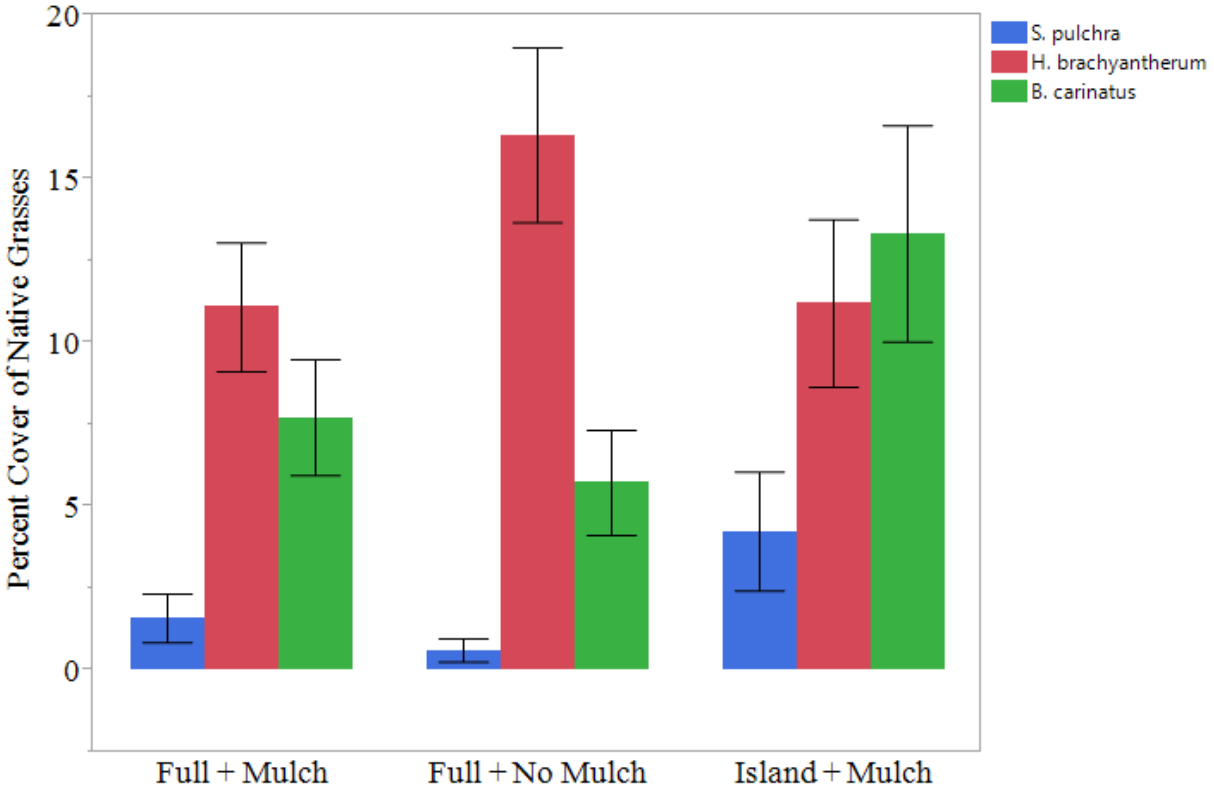


Figure 7: The effect of planting style and mulch on the percent cover of native grasses. Error bars represent one SE.

YLR Beach Photopoint #1. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide

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YLR Beach Photopoint #4. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide

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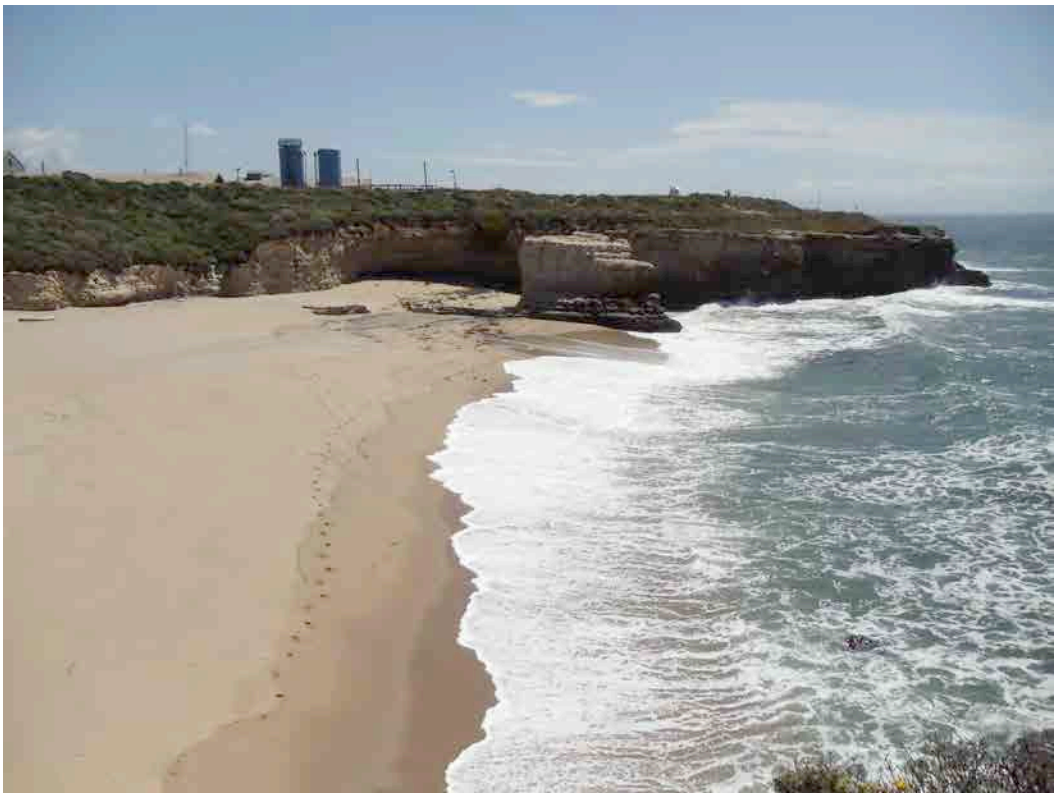

YLR Beach Photopoint #4. May 6, 2014. Photographer: Jordan Isken. Camera: Sony Cyber-Shot DSC-W370/B 14.1 Megapixels, lens fully extended wide

NOTICE
COASTAL LONG RANGE DEVELOPMENT PLAN (CLRDP) AMENDMENT #1
&
NOTICE OF IMPENDING DEVELOPMENT 6 (13-1)

A Notice of Impending Development (NOID) provides notice to the public and the California Coastal Commission of UC Santa Cruz' intention to undertake a development project at its Marine Science Campus. In order for a project to be implemented, it must be contemplated by and within the parameters of the Marine Science Campus Coastal Long Range Development Plan (CLRDP). The CLRDP is available at UCSC's McHenry Library, the Santa Cruz Public Library and at: http://lrdp.ucsc.edu

The California Coastal Commission will review the project that is the subject of this NOID and determine if it is consistent with the CLRDP. The California Coastal Commission will provide advanced public notice of the date of the hearing.

CLRDP Amendment #1 consists of 11 actions proposed either to comply with CLRDP requirements (e.g. a CLRDP requirement that the CLRDP be amended to reflect Younger Lagoon boundary changes); to conform the CLRDP with planning refinements since CLRDP approval (e.g. refinement in the proposed trail routes); to provide internal consistency after minor language changes in the CLRDP made late in the approval process; and to amend existing CLRDP implementation measures to facilitate implementation of certain CLRDP goals.

Project Summary for NOID 6 (13-1) This project includes development of a new seawater lab building, three new parking lots along with a parking management program, a research greenhouse complex, and associated site work including proposed storm water treatment and infiltration features. It also consists of campus utility and circulation improvements to serve both the new lab building and future campus development under the CLRDP. The Project would develop a complex of public access and interpretive facilities, including pedestrian access trails, an interpretive program shelter, educational signage, and outdoor exhibits. This project includes mandated wetland restoration and habitat improvements as described in the Specific Resource Plan Phase 1b. This project also initiates campus wide parking, sign, and lighting programs.

Supporting Information, which includes more details about this project is available at: http://ppc.ucsc.edu/cp/planning/docs **A hard copy is available for review at UC Santa Cruz Office of Physical Planning and Construction, 1156 High Street, Barn G, Santa Cruz, CA 95064**

University Approval Date **January 19, 2012**
see CLRDP 8.1.4 (5)

NOID Posting Date **June 21, 2013**
see CLRDP 8.2.4

Environmental Compliance (CEQA/NEPA) Date **January 19, 2012**
see CLRDP 8.1.4 (5)

X CEQA Environmental Impact Report
CEQA document

NA NEPA _____
NEPA document

UC Santa Cruz Project Manager

Name Dean Fitch
Phone 831-459-2170
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Coastal Commission Contact

Name Susan Craig
Phone 831-427-4863
Email scraig@coastal.ca.gov

Notice of Impending Development 6 (13-1)

Supporting Information

see CLRDP 8.2.5

Table of Contents

1. Project Report

1a. NOID 6 (13-1) – Project Description

The project consists of the following elements:

1. Coastal Biology Building and associated greenhouses
2. Site Improvements including Road, Infrastructure, Service Yards
3. Public Access Trails and Interpretive Panels
4. Wetland Connection in Specific Resource Plan Phase 1b
5. Sign Program (ref: Design Guidelines Section 6.7)
6. Parking Program (ref: Policy 5.5)
7. Lighting Plan (ref: Policy 4.3, IM 4.3.8)

This project includes development of a new seawater lab building, three new parking lots along with a parking management program, a research greenhouse complex, and associated site work including proposed storm water treatment and infiltration features. It also consists of campus utility and circulation improvements to serve both the new lab building and future campus development under the CLRDP. Along McAllister Way from the NOAA building to the Ocean Health parking area, the project removes informal parking, replaces the existing chain-link fence and restores the area to native vegetation. The Project would develop a complex of public access and interpretive facilities, including pedestrian access trails, an interpretive program shelter, educational signage, and outdoor exhibits. This project includes mandated wetland restoration and habitat improvements as described in the Specific Resource Plan Phase 1b. This project also initiates campus wide parking, sign, and lighting programs. The project is described as five separate proposals in the Marine Science Campus Projects Environmental Impact Report (January 18, 2012) but is consolidated into NIOD 6 (13-1).

Coastal Biology Building: The main component of NOID 6 (13-1) is the proposed Coastal Biology Building facility (CBB) which would consist of a new research and teaching lab building and associated greenhouses. These facilities would provide space for research, instruction, offices and related support operations for the Ecology and Evolutionary Biology (EEB) Department of UC Santa Cruz' Physical and Biological Sciences Division. The CBB would allow the EEB department to move as a unit to a single facility at the Marine Science Campus (MSC), a move that would bring the Coastal Science faculty together with their Marine Science colleagues. This department consolidation has been identified in both external reviews and internal planning as essential for the department to further its objectives in coastal and marine science. The proposed CBB facility at the MSC would serve as a center for marine-dependent, coastal-dependent, and coastal-related biological sciences research and study for the EEB Department, and would provide greatly enhanced opportunities for both graduate and undergraduate students to participate in coastal and marine research and study.

Site Improvements: The project would provide the backbone of an improved utility system for future development of the MSC. Wastewater system improvements would reduce the MSC's reliance on an existing sewer lift station**.** Water distribution system improvements would ensure adequate fire suppression capacity to meet fire flow demand for existing and envisioned facilities. Storm water management systems, including detention basins and a complex of infiltration features, would enhance campus storm water management in a manner consistent with CLRDP storm water management objectives. The proposed project also includes circulation infrastructure improvements that are required by the CLRDP, including conversion of a portion of the existing entry road to a pedestrian path in support of the restoration of the wetlands on the Upper Terrace; parking, sidewalk, and bicycle access improvements to improve public access to and around the MSC; and a revised alignment of the entry road. The project would include construction of a consolidated Utility Yard and a Storage Yard facility that would serve both the CBB Project and also future project development envisioned under the CLRDP. The project would also include development of a centralized electrical distribution system for the MSC, to enable a more sustainable electrical power management and distribution within the campus.

Public Access Trails: The project would build upon and enhance the public outreach and educational activities already being carried out at the Seymour Marine Discovery Center and throughout the MSC. The proposed improvements to public access and interpretation will include a multi-use central trail, site perimeter paths connecting the public access overlooks, and interpretive amenities. Improvements of the site are designed to inspire and engender stewardship of the natural resources of the MSC, the Monterey Bay National Marine Sanctuary, and all California coastal marine resources. The interpretive features will engage visitors directly in scientific explorations, strengthen their connection to the natural environment, and provide a deeper understanding of scientific investigation. Access to the vast array of coastal amenities will benefit a broad range of age, socio-economic, and cultural groups.

Wetland Connection: The proposed project would consolidate, expand, and enhance Upper Terrace wetlands as mandated by the CLRDP. Under the proposed SRP Phase 1B, the hydrology of wetlands W1 and W2 would be integrated. Reconnecting W1 and W2 would increase water flow to W2 and remove the drainage function of W1 (currently a man-made ditch that accelerates water flow from the Upper Terrace into Younger Lagoon). The goal of hydrological restoration also would be to provide a functioning wetland upland/transitional habitat and maintain existing potential California red-legged frog habitat at the northern end of W2. SRP Phase 1B also would contribute to the establishment of appropriate native grass and herbaceous wetland species that would enhance habitat connectivity between these wetlands and Younger Lagoon; reduce the potential for erosion; and improve storm water quality in this area.

Signage Program: Sign types proposed are based on a hierarchy and rhythm of experiences on the campus. Distinct sign types, each coordinated with a graphic design theme, offer the visitor a common understanding and thus expectation throughout the MSC. The signage program for the Marine Science Campus consists of three types of signage: Wayfinding/Directional/Informative, Regulatory, and Interpretive.

Parking Program: The parking program at the Marine Science Campus includes 10 dedicated public coastal access and 40 dual use visitor/public coastal access parking spaces in the Lower Terrace area, 5 dedicated coastal visitor parking spaces in the Middle Terrace and 15 dedicated coastal visitor parking spaces at the campus entrance. It also identifies 197 spaces for use by Marine Science Campus employees and their visitors, as well as UC service vehicles. Parking management for all 267 spaces on the campus will be accommodated through a combination of pay station or metered spaces and permit-controlled spaces, with enforcement provided by UCSC Parking Enforcement. Parking enforcement operates 8AM -5PM weekdays only and not on holidays. Parking is free during holidays and weekends, free after 5PM and before 8AM weekdays, and free in campus entry Coastal Access lot at all times. All parking spaces are designated by signage consistent and coordinated with regulatory and enforcement requirements. Parking signage is intended to be as minimal as practical to maintain clarity.

Lighting Plan: Site lighting for the MSC would include pole-mounted fixtures in the parking lots and bollard-mounted fixtures along major pedestrian circulation paths. These fixtures would have cut-off shields to prevent horizontal and vertical light pollution. A campus identification sign at the main entrance also would be illuminated. Light fixtures would have a simple design and natural color scheme to align with the rural character of the site.

PROJECT ELEMENTS

Coastal Biology Building and associated greenhouses

The proposed CBB lab building is a mostly two-story building with three wings that shelter a courtyard. The longest wing extends east-west along the north side of the project site (parallel with and near the northern edge of a proposed parking lot), and is approximately 300 feet long. This wing would accommodate labs along its northern side and offices along its southern side, with additional lab support spaces on the ground floor. A second 152-foot-long wing parallel with McAllister Way and perpendicular to the northern wing would form the west side of the building. This wing also would be primarily two stories and would accommodate a seawater lab and house the core seawater facility, the seawater tanks (in a section of the wing that would be

partially open to the air), mechanical and utility rooms, restrooms, small conference rooms, administrative offices, and the building lobby. A shorter one-story southern wing would house a large seminar room and other common areas.

Consistent with CLRDP requirements, maximum height for the building would be 36 feet (calculated from the average natural grade of the building footprint); exhaust systems may extend an additional 5 feet in height. Building forms would be similar to existing buildings on the MSC, such as the Ocean Health Building and the Seymour Marine Discovery Center, with gabled and shed roof styles, wood cladding, and muted colors that blend with the landscape. The CBB lab building exterior would be partially clad in vertical board and batten wood or wood-like siding, extending up over a board-formed concrete foundation, with shingle roofing. An exposed concrete wall, poured in place or split face, may be extended eastward from the east end of the southern wing, to help shelter the interior courtyard from wind. The roofs will include ventilation equipment, light monitors, and equipment screens, in accordance with CLRDP requirements. A portion of the roof of the central wing will be vegetated, to assist in storm water management.

A 20,000-gallon seawater storage tank, which would be about 12 feet in diameter and 30 feet high, would be constructed outside the CBB lab building.

An associated greenhouse complex, located on the opposite side of McAllister Way from the CBB lab building, would provide plant research facilities for faculty and students and also would provide space to grow plants for the large-scale YLR terrace lands restoration project ongoing at the MSC. The greenhouse complex would include five 600-sf greenhouses, a double greenhouse (1,200 sf), and one 3,300-sf greenhouse research facility, all within a fenced, graded yard. All of the buildings would be one story (12 feet) in height. The greenhouse complex would be accessed via a paved service road from McAllister Way.

Improvements would include creating a vegetated berm along the YLR perimeter that abuts the west and south edges of the development. Soil from utility trenches and other project-related excavations would be used as needed to increase the height and length of the screening berm. The berm would be planted with woody shrubs and other appropriate native plant species, and the existing chain link fence along the YLR margin west of McAllister Way would be replaced with new fencing designed to allow the passage of light, air, and wildlife, but prevent unauthorized entry.

The overall conceptual site layout for the Middle Terrace, as set forth in the MSC Area Plan (Walker-Macy et al. 2008) envisions a central, pedestrian-oriented axis, the Middle Terrace Walk, flanked by a compact arrangement of two-story structures with predominantly east-west orientation. The proposed CBB lab building, to be located near the south end of the Middle Terrace, would be the first of these facilities to be developed under the CLRDP.

CBB Project includes two new parking lots (115 spaces total), one south of the lab building and one north of the greenhouse complex. Parking stalls would have permeable surfaces (pervious asphalt, gravel pavers, or similar materials), while the more heavily-trafficked parking lots' aisles would have standard impervious asphalt paving. If financially feasible, photovoltaic panels would be installed over the parking lot south of CBB. These would create a shelter approximately 8 feet high above the parking stalls. The footings for the framework that would support the photovoltaic panels would be installed along the center line of the lot. Runoff from the panels would drain to the pervious surface of the lot and then to the vegetated swale in the lot, or directly to the vegetated swale.

Bicycle parking would be provided at each of the building's entrances, with a substantial area of covered bicycle parking along the south side of the south wing of the building. The CBB facility would include bicycle commuter amenities for building employees and users. Two bicycle showers and six bicycle-commuter lockers would be provided in the CBB facility and, with access to a third shower in the nearby CDFG facility, would support bicycle commuting by CBB employees. The project would include sheltered secure covered bicycle storage for about 27 bicycles, with space reserved to provide a total of up to 108 bicycle storage spaces, as warranted by demand (up to one space for each employee of the facility).

Site Improvements including Road, Infrastructure, Service Yards

A proposed new entry road would follow a new route across the Middle Terrace south of the existing entry road and rejoin McAllister Way south of the CDFG building. The existing entry road would be abandoned from the Delaware Avenue entrance. This new, asphalt-concrete-paved road would be routed to the south of the abandoned existing road alignment. In conjunction with excavation in the McAllister roadway for utility installation, McAllister Way would be slightly reconfigured between CDFG on the north and the vicinity of the Seymour Center on the south.

At the same time, the configuration and design of the Delaware/Shaffer intersection would be modified to improve its safety and functioning for vehicles, pedestrians, and bicyclists. Improvements would include relocation the City's large above-ground water meter and backflow assembly to a less visible location; installation of new entryway fencing and a new automated gate; and roadway design to realign the entry drive with the end of Delaware Avenue, provide adequate bus turnaround room in the intersection, accommodate the entry to a new proposed parking lot and integrate the pedestrian trail crossing and access to a new pedestrian trail along the abandoned Delaware Avenue Extension. A new sign at the main entrance would be lighted with a shielded, downward-directed light designed to comply with CLRDP specifications.

The new Delaware Avenue Extension would be 22 feet wide with unpaved shoulders and without curbs. The roadway would include a sidewalk from the campus entry to McAllister Way, where it would connect to a proposed new sidewalk along McAllister Way near the CDFG facility. A linear bioretention pond would be built along the side of the road for storm water treatment and infiltration.

Various utility improvements (water, sea water, sewer, natural gas, electrical, telecommunications, and storm water) are included in the project. Most of these utilities are included in underground trenches and vaults in the roadway or new pedestrian corridor.

Project includes development of a new centralized Utility Yard, at the north end of the Middle Terrace immediately north of the new campus main entry road. This facility would provide secure space for stand-by generators. Standby generators for the CBB lab building and greenhouse facilities would be the first generators to be sited in the yard. A modular building for temporary storage of regulated waste also would be sited in the Utility Yard. The regulated materials storage unit would safely store hazardous waste generated by campus research activities and by maintenance of boats, buildings, and landscape maintenance between regular off-site shipments. The footprint of the unit would be about 10 feet by 15 feet.

The proposed Utility Yard would be a graded, graveled area of about 11,400 sf. Within the Utility Yard, each generator and storage tank would be sited on an individual concrete pad. The entire facility would be screened by a solid wooden fence up to 8 feet in height with a locked gate for security. It would be screened from the new campus entry road and from the abandoned entry road/new pedestrian path by tall shrubs such as willow and alder (if the area is wet) or other appropriate species, planted along the fence line.

Project would also include development of a staging area and Storage Yard of about 58,000 sf on the east side of the campus' Upper Terrace adjacent to Shaffer Road. At present this is a level area of coyote brush and previously disturbed grassland with a mix of native and non-native species. Development of this area is for a shared campus warehouse and laydown area. This area would be used initially for construction staging and then developed as an open-air Storage Yard as part of the proposed project (the warehouse would be developed at a later time).

At present, the road shoulders in two areas along McAllister Way are being used for informal parking: 1) the area on the west side of the road between the existing greenhouses and the Ocean Health Building parking lot in the Lower Terrace area; and 2) on the east side of the road adjacent to the NOAA facility. Both areas are unsurfaced and are not striped. The areas presently accommodate about 50 cars parked diagonally or perpendicular to the roadway. The CLRDP (Section 9.2) determined that the use of these areas along McAllister Way for parking is not consistent with its function as a buffer for the original Younger Lagoon

Reserve, to the west, and for wetland W5, to the east. Under the proposed project, the use of these areas for informal parking would be abandoned, and the areas would be restored to their natural state with native plantings. This would entail scraping of the surface, scarification, import of suitable topsoil, and hand and mechanical replanting with native shrubs and grasses.

The proposed project would include development of a 15-space parking lot designated for public coastal access parking, immediately north of the new main entry road at the campus main entrance. This lot would provide trailhead parking for pedestrians using the public access trails. The parking lot would include ADA-accessible parking spots. The lot would be surfaced in pervious material, would include bioretention basins, and would be surrounded by vegetated swales.

Public Access Trails and Interpretive Panels

The "backbone" of the project is the development of an integrated 1.2 mile pedestrian and bicycle trail system that would link MSC facilities, public coastal access overlooks, and a new public access parking lot near the main trailhead at the MSC main entrance. Trails will form a loop from the campus entrance to the coastal bluff, along the bluff, and back through the campus terraces. Trails will provide views and educational interpretation of coastal features, grasslands, wetlands, and the campus' habitat restoration and sustainable storm water system projects. The trails would connect the existing and proposed overlooks.

A major new bicycle and pedestrian trail, the Central Campus Trail and Bike Path, would start at the campus entrance and curve southwest along the east side of the Middle Terrace Development Zone. At the south end of the NOAA facility, the trail would merge with a new pedestrian path parallel to the east side of McAllister Way, and then terminate at McAllister Way at the north end of the Seymour Discovery Center parking lot.

The Central Campus Trail would serve as the primary bicycle access to the campus as well as a pedestrian path. This trail would be 12 feet wide and would be surfaced with permeable or semi-permeable material designed to preserve preconstruction infiltration patterns, such as permeable concrete.

A wayfinding exhibit and visitor information will be provided at the campus main entry along with an orientation and wayfinding signboard. Interpretive panels would be placed along the trails interpreting the wetland habitat, native plant restoration activities and storm water treatment improvements on the MSC.

All the trails would be furnished with benches, trash cans, recycling bins, bike racks, and similar amenities at appropriate locations. Minor barriers to restrict pedestrian movement to the trails (e.g., rope and pole) may be installed. The trails would be surfaced in permeable or semi-permeable materials such as engineered wood fiber, gravel pavers or grass pavers, pervious cement, or aggregate paving.

Wetland Connection in Specific Resource Plan (SRP) Phase 1b

SRP Phase 1B consists of activities proposed to implement the elements of habitat restoration under the Phase 1 Specific Resource Plan (SRP), developed in compliance with the previously approved CLRDP Resource Management Plan (RMP). Phase 1B of the SRP consists of elements that entail work in wetlands or that could directly or indirectly affect wetlands or wetland habitat. Significant elements of this project include: minor earth moving and/or minor manipulation of the outflow of wetland 1 (W1) to restore the historical connectivity of this agricultural drainage with the adjacent wetland 2 (W2); hand work within wetlands W3, W5, and W6 to remove non-native plants and restore the balance of native vegetation; work in the outflow channel from wetland W1 toward Younger Lagoon to reduce erosion and improve water quality; and habitat improvements to enhance the wildlife movement corridors that extend across the Upper Terrace. The project also would install 10 to 15 piezometers around the Upper Terrace to monitor wetland hydrology and the effects of the wetland W1/W2 reconnection. The locations of the project elements described below are shown on the attached Figures. Note that the CLRDP (Table A.12) requires that RMP Management Measures 9 and 10, which address the reconnection of wetlands W1 and W2 and vegetation restoration in wetlands W1, W2, and W6 (proposed below), be implemented in conjunction with completion of any drainage improvements for the first project north of the Delaware Avenue Extension. This requirement therefore would be triggered by the proposed development of the Upper Terrace Storage Yard described above.

All restoration would be carried out under the direct supervision of YLR staff and restoration biologists and would follow SRP Phase 1 specifications (UC Santa Cruz Staff and the Younger Lagoon Reserve Scientific Advisory Committee (SAC), June 1, 2010). With the exception of mechanical excavation and earth-moving for wetland reconnection, most project elements would be carried out by small groups of student interns or volunteers under the supervision of YLR staff.

If rainfall is insufficient, new plantings would be hand watered or temporarily irrigated for the first year after planting, to ensure that they are adequately established. Weeding for removal of non-native plants, replanting, and additional planting would be continued as needed to meet the restoration success criteria set forth in SRP Phase 1A.

SRP Phase 1B would implement some elements of the CLRDP RMP over a period of about five years. The actions described below are under consideration as means to achieving the goals of reconnecting wetlands W1 and W2, restoring the channel that connects these wetlands to Younger Lagoon, and improving wildlife corridors and habitat on the Upper Terrace. The actions to be implemented will be selected from those described below through consultation among the SAC that was formed to plan the implementation of the RMP. Some actions, such as the wetland reconnection efforts, may be carried out experimentally and adjusted depending on initial outcomes; other actions, such as efforts to restore and enhance the channel to Younger Lagoon, may require multiple iterations to achieve the project goals. Further, since the proposed actions would entail work in federal jurisdictional wetlands, they will require a Clean Water Section 404 permit from the Army Corps of Engineers and, as such, are subject to modification to meet USACE requirements and any mitigation measures that might be imposed by other federal agencies, such as U.S. Fish and Wildlife Service.

The CLRDP Resource Management Plan requires that campus habitat restoration activities include the reconnection of Upper Terrace wetlands W1 and W2. Wetland W1, on the western margin of the Upper Terrace, is a former agricultural ditch, probably constructed to drain the adjacent agricultural field. It is separated from wetland W2 (located immediately to the east) by a slightly elevated area that may partially represent spoils left from the ditch construction.

Two options for carrying out the wetland reconnection are being considered. The project may implement either or both options, over time, as needed to achieve the project objectives. The first option under consideration is removal of the elevated area between wetlands W1 and W2. The area from which soil would be removed would be about 20 feet wide by 640 feet long. Mechanical grading, using a bulldozer, backhoe, or small grader, would be used to remove the soil and create a smooth rise in elevation from the edge of wetland W1 eastward to the low upland around Wetland W2. Under high-flow conditions, water would overflow from wetland W1 into wetland W2. This result would be enhanced by the use of ditch plugs (described below), if the accumulation of vegetative matter in wetland W1 substantially reduced the ditch's flow capacity. This option would entail disturbance of about 1 acre of wetland and adjacent upland habitat, with about 0.5 acres of cut in the upland (the berm) and 0.14 acres of fill in wetland W1. In total, about 1,000 cubic yards (cy) of soil would be excavated and moved on site. This option would reduce the duration of seasonal inundation in wetland W1, but would provide connectivity between the two wetlands.

Alternatively, or in addition to this action, the berm between wetland W1 and wetland W2 could be breached with targeted small mechanical excavations. The extent of each breach would vary depending on immediate topography, but a typical breach would be around 20 feet wide (the width of the berm) by about 33 feet long. Breaching would establish points from wetland W1 from which water would overflow under high-flow conditions. This effect would be enhanced if breaching of the wetland W1 berm were combined with the topographic alterations described below, or with the use of ditch plugs, described below. As noted above, the project may be iterative, based on initial results; the methods used and extent of ground disturbance in the wetland areas also will be subject to the terms of the Clean Water Act Section 404 permit that would be required for the project. For purposes of the analyses below, the maximum extent of possible ground disturbance is assumed.

Another method for reconnecting wetlands W1 and W2, possibly to be used in conjunction with the other actions described above would be to create "ditch plugs" across the width of the wetland W1 ditch (Figure 2-7a). These could be constructed from the earth excavated during berm removal or breaching—or, alternatively, vegetative material such as jubata grass (Cortaderia jubata) or coyote brush slash from the site, or imported straw bales, could be used. Depths of fill could vary, ranging from a low dam across the ditch to complete fill of short segments. It is estimated that up to eight ditch plugs, each of about 60 cy, would be created. About 0.3 acres would be disturbed, including 0.2 acres of cut in uplands (the berm) and 0.05 acres (480 cy) of fill placed in wetland W1 under this action.

The wetland W1 channel joins Wetland 2 near the northern edge of the Delaware Avenue Extension. The slightly elevated Delaware Avenue Extension roadway serves as a dike that directs most of the water into a joined wetland channel, which runs westward along the north side of the road through a dense willow patch, and then onward to Younger Lagoon. Prior to the construction of the Delaware Avenue Extension, runoff from wetlands W1 and W2 likely flowed in a less defined channel. The diking effect of the road has resulted in a concentrated flow, and channel erosion has resulted. A farm road once extended northward from the north edge of the Delaware Avenue Extension near the point at which Delaware turns southward and becomes McAllister Way. North of the Delaware Avenue Extension at this point, the water channel from the wetlands runs between a pair of concrete headwalls at the location where the channel once ran under the farm road via two culverts, since removed. (Note that this channel is sometimes wet and includes some wetland indicators, but has been determined not to be a jurisdictional wetland in this area).

Under the proposed action, a flashboard—a movable weir—would be installed at the culvert headwall, which would be modified to provide support for the flashboard. The flashboard structure would be designed in such a way that the crest could be adjusted to create a pooled area in the outflow channel from wetland W1 upstream of the headwalls, which would create deeper water and longer lasting emergent wetland habitats, provide temporary storage and a gradual release of storm water runoff, and potentially result in improved amphibian and wetland habitat.

Two options for sizing and management of the flashboard weir are under consideration. Under the first ("Smaller Pool Option"), the crest of the flashboard could be adjusted to create a small pooled area with a water depth of 1 to 1.5 feet during base flow conditions and 1.5 to 2.0 feet under storm flow conditions. The flashboard would be designed with a freeboard of 1.0 foot for the design storm, to reduce the risk of inundation of the Delaware Ave Extension/ McAllister Way. Under the "Larger Pool Option", the flashboard would be designed to be adjustable to create a pooled area with maximum water depth of 2.0 to 2.5 feet during base flow conditions, and 2.5 to 3.0 feet under storm flow conditions. Under this option, storm flow would inundate the edge of the existing road. As noted above, the project may be iterative, based on initial results; the methods used and extent of ground disturbance in the wetland areas also will be subject to the terms of the Clean Water Act Section 404 permit that would be required for the project. For purposes of the analyses below, the maximum extent of possible ground disturbance is assumed.

The proposed action, with its maximum extent would disturb about 0.2 acres and would result in 0.1 acres of fill in wetland W1. Creating the pond would require about 200 cubic yards (cy) of soil, either imported or excavated from the elevated areas adjacent to wetland W1. The flashboard control structure would require 3 cy of concrete and would require installation of two 20-foot-long steel pipes, 4 feet in diameter.

In conjunction with work to reconnect wetlands W1 and W2, the project would include installation of 10 to 20 piezometers at locations scattered throughout the Upper Terrace. The objective of this work would be to monitor the hydrology of wetlands throughout the terrace as well as the hydrologic effects of wetland reconnection efforts. Each piezometer would consist of a length of 2-inch-diameter PVC pipe, consisting of a filter tip joined to a riser pipe, which is inserted into a drilled bore hole and left in place with an above ground standpipe, for future monitoring. Readings of water level are obtained with a water level indicator. These would be semi-permanent installations. Holes would be drilled with a gas powered auger or a hand-operated drill, hand-carried to each site.

The channel connecting wetlands W1 and W2 to Younger Lagoon is incised and has a steep grade—in some places greater than 5 percent. Active erosion is occurring in the channel, which, if uncontrolled, could migrate upstream and, over time, cut channels in wetland W2. Channel incision in this area poses risks of increased sedimentation to Younger Lagoon and also of accelerating drainage of wetlands W1 and W2, which could lower the water table in this area and diminish the wetland functions over time.

Incision in this area currently is controlled to some degree by the presence of willow roots and woody debris. Under the proposed action, additional grade-control points would be established by packing additional willow and/or other appropriate native brush in the channel. Some of this material would root and establish new plants, which would provide low-impact erosion control. The channel currently extends through Wetland 6 en route to Younger Lagoon; some of the proposed brush packing would occur within this wetland. The proposed action would disturb 0.03 acres and would include placement of 0.01 acres of vegetation within wetland W6. Work would be carried out by hand. Up to 20 cy of vegetation would be placed at 10 locations. The action would likely need to be repeated annually for five years.

Restoration activities, under SRP Phase 1B, would include planting of native grasses and wetland species and removal of non-native plants within wetland habitats. All activities would follow standard native vegetation restoration practices outlined in the previously approved SRP Phase 1A and would be consistent with the requirements of the RMP previously approved as a component of the CLRDP. Virtually all of this work would be carried out by hand, with small crews working intermittently. Only locally derived native plants would be used for the restoration. If rainfall is inadequate, plantings would be irrigated by hand as needed for their establishment.

Sign Program (ref: Design Guidelines Section 6.7)
The sign program for the Marine Sciences Campus consists of three types of signage:

- Wayfinding/Directional/Informational
- Regulatory
- Interpretive

Wayfinding signs would be installed or replaced throughout the campus to facilitate public access to current and proposed buildings, interpretive features and amenities. Wayfinding signs may include locational identifiers or directional indicators to direct visitors to major buildings and programs including the Seymour Marine Discovery Center, parking lots, trails and overlooks, and other visitor amenities. A main wayfinding exhibit orienting visitors to the campus would be established at the main entrance to the campus, which may include maps and more detailed wayfinding and/or programming information. Other informational signs in this category may include those for posting hours or policies, safety warnings, restricted areas, etc. Wayfinding signage would have its own graphic theme of font, font color, and background.

Regulatory signs on the Marine Science Campus include those conveying information about speed limits, fire lanes, hazardous materials, parking regulations, etc. Regulatory signs governed by jurisdictional codes or enforcement policies would comply with current enforcement standards. Other regulatory signs would be consistent with the design standards of wayfinding signs.

Interpretive signs on the MSC campus are proposed to cover a wide range of topics – from information about individual species to how the seawater system works to support marine research activities. Interpretive panels may vary greatly in the details of both content and layout, but would maintain a consistent "look and feel" through a graphic theme to include a common font, a subject line prominently displayed within a color banner at the top of the panel, the facility and program logos included along the bottom edge, and a colorful mix of photos, illustrations, and/or text arranged uniquely for each panel in between.

Please see Section 4, Appendix B6 Sign Program, for more detail and illustrations on the proposed Sign Program.

Parking Program (ref: Policy 5.5)

Consistent with CLRDP IM 5.3.6, thirty (30) dedicated coastal access and forty (40) dual-use parking spaces are designated for direct and easy access to coastal amenities including the trails, overlook interpretive areas and the Seymour Marine Discovery Center. The spaces would be identified with clear visible signage directing visitors to the lots. The proposed coastal access parking locations are the least confusing to the visitor—At the campus entrance area, a 15-space lot is dedicated to free (no fee) public coastal access parking whenever the campus is open. At the Seymour Marine Discovery Center mixed use lot the coastal access and Seymour Center spaces would be grouped logically together making the signage easy to follow and reducing the number of signs needed. At the Middle Terrace parking lot, five (5) Coastal Access spaces would be grouped together near the entrance to the parking lot, easy to see upon arrival. The coastal access and dual-use dedicated parking spaces in mixed lots would be clearly distinguished with distinct color parking space striping and a number for each space. Payment would be accommodated by pay stations and/or meters in the lots, installed as part of the project. For the dual-use spaces, permits could be obtained with entry to the Seymour Marine Discovery Center. The parking lots would be clearly identified with the hours permits are required and the instructions at the pay station or meters would reiterate to visitors the permit hours, including the times when parking is free.

As required by the CLRDP, coastal access parking fees would be kept modest, and consistent with fees for coastal public access parking in other parts of the City and County of Santa Cruz, for example the SC Municipal Wharf, the Cowell beach area, the Santa Cruz Harbor, Natural Bridges State Beach, and Wilder Ranch State Park. Initially the fees would be $1.50/hour, which is at the low end of fees charged for short term parking in comparable areas. Modest fees for parking would not negatively impact public access at this site for several reasons: One 15-space parking lot would be dedicated to public access visitors at the main entrance to the MSC near the "trailhead" to the public access trail system on the campus—this lot would not have any fees for parking at any time; All parking would be free to visitors every weekday between 5PM and 8AM and on all weekends and holidays during campus open hours--these free parking hours include the highest parking demand times for public visitors; Other locations with similar visitor parking fees do not exhibit underutilization, which would be expected if the parking fees were set too high; Further, at this location there would always be a free parking alternative convenient to the public amenities on the campus—in the main parking lots after hours, weekends and holidays, in the free lot, or on public streets immediately adjacent to the walking and biking trails on the Marine Science Campus.

Following is a list of the existing and proposed parking lots on the Marine Science Campus with the uses proposed under this NOID (Lot #202 was the subject of NOID 09-1 approved by the Coastal Commission on 11/2/09):

Lot 201, north of the Seymour Marine Discovery Center (MDC):
- 10 dedicated Public Coastal Access spaces (pay station controlled);
- 40 Dual Use Public Coastal Access spaces (pay station or MDC permit controlled);
- 30 LML/COH staff and visitor spaces (permit controlled); and
- 2 Disabled spaces (Disabled placard controlled).

Lot 202, west of the Seymour Center:
- 17 UC Vehicle reserved spaces (permit controlled); and
- 1 Disabled space (Disabled placard controlled).

Lot 203, northeast of Center for Ocean Health Building:
- 36 staff and visitor spaces (permit controlled); and
- 1 Disabled space (Disabled placard controlled)

Lot 204, north of NOAA Fisheries Laboratory:

- 69 staff and visitor spaces (permit controlled)
- 5 dedicated Public Coastal Access spaces (pay station or meter controlled);and
- 4 Disabled space (Disabled placard controlled)

Lot 205, south of Department of Fish & Wildlife:
- 35 staff and visitor spaces (permit controlled); and
- 3 Disabled space (Disabled placard controlled)

Lot 207, Marine Science Campus entry:
- 14 dedicated Public Coastal Access spaces (free) and
- 1 Disabled space (Disabled placard controlled)

Please see Section 4, Appendix B7 Parking Program, for a graphic illustration of existing and proposed parking lots, locations of Coastal Access parking, and illustrations of the parking regulation signage.

Lighting Plan (ref: Policy 4.3, IM 4.3.8)
Site lighting would include pole-mounted fixtures in the parking lots and bollard-mounted fixtures along major pedestrian circulation paths. These fixtures would have cut-off shields to prevent horizontal and vertical light pollution. The greenhouses would include shielding of interior lighting, to ensure that no direct light is shed into the Younger Lagoon area and that indirect light is minimized.

The project would install lighting for the McAllister Way pedestrian path, bus stops, the Utility Yard (including security lighting on the regulated waste storage building), and the Upper Terrace Storage Yard. A campus identification sign at the main entrance also would be illuminated.

The proposed new main road alignment from the campus entrance to the Seymour Marine Discovery Center parking lot would be lighted by low bollard type lighting along the sidewalk from the entry to McAllister Way and along the McAllister sidewalk. This lighting would be augmented by taller cut-off shielded lighting only at entrances to parking lots, building entries and at pedestrian crossings. MSC entry parking lot would not be used at night and would not be lighted.

Other proposed pedestrian and bicycle trails, including the multi-use Central Campus Trail, would not include lighting except as needed for safety, such as at vehicle road and parking lot driveway crossings, and intersections of pedestrian paths with the multi-use trail route. Future transit stops would be equipped with electrical service to provide lighting in future when the stops become functional.

See Section 4, Appendix B8 Lighting Plan, for illustrations of lighting locations and fixture types.

1b. CLRDP Consistency Determination

As stated in Policy 1.1 (Development Consistency), "Development shall be deemed consistent with the CLRDP if it is consistent with the provisions of Chapters 5, 6, 7, 8, 9, and Appendices A and B."

The project is described as five separate proposals in the Marine Science Campus Projects Environmental Impact Report[1] due to various project approvals and funding mechanisms but are

[1] Coastal Biology Building (CBB); MSC Parking Phase 1 (described in CBB project description thus applicable policies and implementation measures identified with CBB); MSC Environmental Health & Safety (EH&S) Facility; Nature Education Facilities Project (NEF); Specific Resource Plan (SRP) Phase 1B. The

consolidated into NIOD 6 (13-1). The approval for the implementation of the MSC Parking Program followed a separate process.

The attached table (Appendix A) includes the list of Policies, Implementation Measures and Figures found in Chapter 5. Those that apply directly to this NOID are identified and followed with a comment regarding the project's consistency. In addition, sections of Chapters 6, 7, 8, 9, and Appendices A and B that also apply to this NOID are referenced with comments.

1c. Environmental Compliance Documentation

See Section 3

1d. Technical Reports

See section 5

1e. Consultation Documentation with other Agencies

N/A

1f. Implementing Mechanisms

N/A

1g. Correspondence Received

N/A

1h. Project Manager

Name	Dean Fitch
Phone	831-459-2170
Email	ppc@ucsc.edu

Alternate:

Name	Steve Davenport
Phone	831-459-4771
Email	sldaven@ucsc.edu

2. University Approval Documentation

ITEM FOR ACTION

FOR VICE CHANCELLOR, BUSINESS AND ADMINSTRATIVE SERVICES APPROVAL

NOID 4 (12-1) Marine Science Campus Parking Program

Associate Vice Chancellor for Physical Planning and Construction recommends that, upon review and consideration of the potential for environmental consequences of the proposed Marine Science Campus Parking Program (the Project) as described in the Project Report of Notice of Impending Development 4 (12-1), and in accordance with University Delegation of Authority, the Vice Chancellor of Business and Administrative Services of the Santa Cruz campus:

1. Determine the Marine Science Campus Parking Program Project to be Exempt under the California Environmental Quality Act (CEQA), as described in the Project Report (see Section 1c); the Environmental Compliance Documentation; and

2. Approve the Marine Science Campus Parking Program Project

The Project would not result in any significant environmental impacts. The University has determined that the Project is Exempt from the provisions of CEQA as shown in the Project's Environmental Impact Classification form (see Section 1e Environmental Compliance Documentation).

APPROVED

Christine L. Valentine
Vice Chancellor Valentine, Business and Administrative Services

3/29/12
Date

3. Environmental Compliance Documentation

Notice of Determination

To: ☒ Office of Planning and Research
PO Box 3044, 1400 Tenth Street, Room 222
Sacramento, CA 95812-3044
☐ County Clerk County of _____

From: University of California
Physical and Environmental Planning
1111 Franklin Street, 6th Floor
Oakland, California 94607-5200

Subject:

Filing of Notice of Determination
in Compliance with Section 21108 or 21152 of the Public Resource Code

State Clearinghouse Number: 2010062090
Project Title: Marine Science Campus Projects
Project Location (include county): University of California, Santa Cruz (UCSC), Marine Science Campus (MSC), City of Santa Cruz (Santa Cruz County). The 98-acre UCSC MSC is located on the western edge of the City of Santa Cruz, about 3 miles south of the UCSC Main Campus. Vehicle entry to the MSC is at the intersection of Delaware Avenue and Schaffer Road. The northern edge of the UCSC MSC is located about ¼-mile south of Highway 1. MSC is bounded to the east by Schaffer Road, Antonelli Pond, and De Anza Santa Cruz residential community, to the south by the Pacific Ocean coastline, and to the west by agricultural lands in the County of Santa Cruz. The MSC site includes Assessor's Parcel Numbers: 3-32-03, 3-32-08, 3-32-09, 3-32-10, and 3-32-12.

Project Description: The Marine Science Campus Projects includes the following projects that will be implemented at the MSC during the same general timeframe: Coastal Biology Building Project (CBB) Project, MSC Environmental Health & Safety Facility (EH&S) Project, MSC Parking Phase 1 Project: Parking Lots C and D, Nature Education Facilities (NEF) Project, and Specific Resources Plan Phase 1B (SRP Phase 1B). The MSC Projects also include 11 minor amendments to the UCSC Coastal Long Range Development Plan (CLRDP) collectively known as "CLRDP Amendment #1" and modification to CLRDP EIR General Mitigation Measure 4.3-1.

The proposed CBB Project consists of development of a seawater-equipped laboratory and research facility and greenhouse complex (approximately 47,500 gsf [33,000 asf]), and associated surface and stormwater infiltration facilities, improvements to the MSC utility and circulation infrastructure, and development of a small utility yard and a storage yard equipped with emergency generators that would support the CBB facilities and provide space for additional generators as needed to support future development at the MSC under the CLRDP. Utility and circulation infrastructure improvements would implement some of the requirements of the CLRDP and include replacement of a portion of the existing wastewater lines, extension of seawater distribution lines, a new campus roadway, and a dedicated bicycle pedestrian pathway.

The proposed EH&S Facility would consist of a regulated waste storage container that would be sited in the utility yard and that would serve existing and planned laboratories at the MSC.

The proposed MSC Parking Phase 1 Project would develop two parking lots with 115 parking spaces adjacent to the CBB facilities.

The NEF Project would develop or improve a network of pedestrian trails and associated interpretive exhibits and signage around the MSC and also would provide a public access parking lot near the campus entrance.
The SRP 1B Project would implement provisions of the CLRDP Resource Management Plan, including hydrologic reconnection of wetlands on the northern part of the campus, erosion control improvements, and restoration of native vegetation in wetland areas.

Project construction is anticipated to begin in October 2013 and would require about 21 months to complete. Some of all of the projects likely would be under construction simultaneously during at least part of this period.

G:\PD\NOD & NOE\2012\01 January\UCSC Marine Science Campus Projects EIR NOD 2012.01.13b MG'K edits.docx
Dated Received for filing at OPR:

Authority cited: Sections 21082 and 21087, Public Resources Code.
Reference: Sections 21000-21174, Public Resources Code

Revised 2004

This is to advise that the University of California (☒ Lead Agency ☐ Responsible Agency) has approved the above-described project on January 18, 2012, and has made the following determinations regarding the above-described project:

1. The project ☒will have a significant effect on the environment.
2. ☒ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures ☒ were made a condition of the approval of the project.
4. A mitigation reporting or monitoring plan ☒ was adopted for this project.
5. A statement of Overriding Considerations ☒ was adopted for this project.
6. Findings ☒ were made pursuant to the provisions of CEQA.

This is to certify that the final EIR with comments and responses and record of project approval is available to the general public at: Physical Planning and Construction, Barn G, 1156 High St, University of California, Santa Cruz, 96064, Telephone: (831) 459-3732.

Signature: Charlotte Strem

Title: Acting Director, Physical and Environmental Planning
Date: January 19, 2012

Dated Received for filing at OPR:

Authority cited: Sections 21082 and 21087, Public Resources Code.
Reference: Sections 21000-21174, Public Resources Code.

Revised 2004

RECEIVED
JAN 24 2012
STATE CLEARING HOUSE

CK# 01415847

State of California—The Resources Agency
DEPARTMENT OF FISH AND GAME
2012 ENVIRONMENTAL FILING FEE CASH RECEIPT

RECEIPT# 424106
STATE CLEARING HOUSE # (If applicable) 2010062090

SEE INSTRUCTIONS ON REVERSE. TYPE OR PRINT CLEARLY

LEAD AGENCY UC Physical & Env. DATE 1/23/12
COUNTY/STATE AGENCY OF FILING Alameda DOCUMENT NUMBER
PROJECT TITLE Marine Science Campus Project
PROJECT APPLICANT NAME Charlotte Strem PHONE NUMBER (510) 643 0113
PROJECT APPLICANT ADDRESS 111 Franklin St. 10th Floor CITY Oakland STATE CA ZIP CODE 94607-5200
PROJECT APPLICANT (Check appropriate box):
☐ Local Public Agency ☐ School District ☐ Other Special District ☑ State Agency ☐ Private Entity

CHECK APPLICABLE FEES:

☒ Environmental Impact Report (EIR)	$2,919.00	$ 2,919
☐ Mitigated/Negative Declaration (ND)(MND)	$2,101.50	$
☐ Application Fee Water Diversion *(State Water Resources Control Board Only)*	$850.00	$
☐ Projects Subject to Certified Regulatory Programs (CRP)	$992.50	$
☐ County Administrative Fee	$50.00	$
☐ Project that is exempt from fees		
☐ Notice of Exemption		
☐ DFG No Effect Determination (Form Attached)		
☐ Other		$

PAYMENT METHOD:
☐ Cash ☐ Credit ☒ Check ☐ Other TOTAL RECEIVED $ 2,919

SIGNATURE X TITLE Clerk

WHITE - PROJECT APPLICANT YELLOW - DFG/ASB PINK - LEAD AGENCY GOLDEN ROD - COUNTY CLERK DFG 753.5a (Rev. 11/11)

** TOTAL PAGE.05 **
TOTAL P.005

UNIVERSITY OF CALIFORNIA **ENVIRONMENTAL IMPACT CLASSIFICATION**

(revised)

Campus or Field Station Santa Cruz **Project Account:** _____

Project Title UCSC Marine Science Campus Parking Management Program

For purposes of compliance with the California Environmental Quality Act of 1970 (CEQA), and Amended University of California Procedures for Implementation of CEQA, this project has been reviewed and initially classified as indicated below. Please check (X) as appropriate. Include project description and appropriate local map.

X I. EXEMPT FROM THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

When it can be seen with certainty that there is no possibility the action will result in physical changes to the environment or the action is specifically exempted by statute, the project is classified as exempt from CEQA.

___ II. CATEGORICALLY EXEMPT

This project falls under the indicated Class of Exemption and there is no significant effect on the environment.

___ Class 1: Existing Facilities
___ Class 2: Replacement or Reconstruction
___ Class 3: New Construction of Small Structures
___ Class 4: Minor Alterations to Land
___ Class 5: Alterations in Land Use Limitations
___ Class 6: Information Collection
___ Class 7: Regulatory Protection of Natural Resources
___ Class 8: Regulatory Protection of the Environment
___ Class 9: Inspection
___ Class 10: Loans
___ Class 11: Accessory Structures
___ Class 12: Surplus Government Property Sales
___ Class 13: Acquisition for Conservation
___ Class 14: Minor Additions to Schools
___ Class 15: Minor Land Divisions
___ Class 16: Transfer of Ownership of Land to Create Parks
___ Class 17: Open Space Contracts
___ Class 18: Designation of Wilderness Areas
___ Class 19: Annexation of Existing Facilities and Lots
___ Class 20: Changes in Organization of Local Agencies
___ Class 21: Regulatory Enforcement Actions
___ Class 22: Educational Programs
___ Class 23: Normal Operation
___ Class 24: Regulations of Working Conditions
___ Class 25: Transfer of Ownership of Land to Preserve Open Space
___ Class 26: Acquisition Housing for Housing Assistance
___ Class 27: Leasing New Facilities
___ Class 28: Small Hydroelectric Projects
___ Class 29: Cogeneration Projects
___ Class 30: Minor Actions to Prevent Hazardous Substance Release
___ Class 31: Historic Resource Restoration/Rehabilitation
___ Class 32: In-fill Development Projects

___ III. INITIAL STUDY

This project is not Exempt from CEQA or Categorically Exempt; an Initial Study is to be prepared to determine if the project may have a significant effect on the environment that has not been substantially and adequately analyzed in a certified program EIR.

Checklist___ Narrative___

___ IV. ENVIRONMENTAL IMPACT REPORT (EIR)

It is known that the project will have a significant effect on the environment and has not been adequately and substantially analyzed in a certified program EIR.

PROJECT DESCRIPTION: UCSC's Transportation and Parking Services (TAPS) proposes to implement a parking management program at it's Marine Science Campus in compliance with requirements of the Marine Science Campus Coastal Long Range Development Plan (CLRDP). The program will involve restriping and signage of some parking, and changes in the parking fee/ permit structure and procedures. These changes are designed to ensure adequate coastal access for the public, and also to encourage the use of alternative transportation modes. The project would not entail development of new parking or elimination of any existing parking spaces. This project would not result in physical changes in the environment and therefore is exempt from CEQA.

V. Does this project conform to the approved CLRDP? X YES ___ NOT APPLICABLE

VI Sally Morgan 9/01/10
Prepared by Date

Local Approved by: Thomas Vani 9.9.10
Date

VI OFFICE OF THE PRESIDENT

_____ Concur with Classification
_____ Do not Concur

COMMENTS:

Signed Date

Form Date 6/94 UCSC/EAG

4. Plans, Specifications, etc.

(this section used if project documentation is large format or extensive)

SEE ATTACHED SHEETS

Appendix B1 Coastal Biology Building and associated greenhouses
Appendix B2 Site Improvements including Road, Infrastructure, Service Yards
Appendix B3 Public Access Trails and Interpretive Panels
Appendix B4 Wetland Connection in Specific Resource Plan Phase 1b
Appendix B5 *not used*
Appendix B6 Sign Program (ref: Design Guidelines Section 6.7)
Appendix B7 Parking Program (ref: Policy 5.5)
Appendix B8 Lighting Plan (ref: Policy 4.3, IM 4.3.8)

5. Technical Reports

SEE ATTACHED SHEETS

Appendix C1 2011 Wetland Report
Appendix C2 2012 Grading and Drainage Plan

Note: This table refers to proposed CLRDP Amendment #1, which is being submitted to the Coastal Commission as a separate action.

	A	C
1	**Measure**	**NOID 6 Consistency**
2	**5.1 Application of the Long Range Land Use Development Plan**	
3	**Policy 1.1 Development Consistency**	The University finds the project contemplated under NOID 6 (13-1) to be consistent with the CLRDP
4	IM 1.1.1: Figures of Chapter 5	As described below, the project is consistent with Figures 5.1 - 5.4, which show the "kinds, locations, maximum size and intensity" of allowed development. The project is also consistent with Chapters 5, 6, 7, 8, 9, and Appendices A and B and the type and locational restrictions of Section 5.2.
5	IM 1.1.2 Lease Agreements	
6	IM 1.1.3 Federal In-holding and CLRDP	
7	**Policy 1.2 University Commitments**	The proposed project includes the University commitments that are triggered by the proposed development or otherwise required at the time of this NOID, and that have not yet been implemented, including trail, drainage, circulation and parking improvements.
8	**5.2 Land Use**	
9	Figure 5.1 Building Program	The proposed project would construct a total of about 47,500 gsf of Marine Research and Education Facilities building space. This is within the 254,400 gsf of building space in this category in the CLRDP Building Program. The project would construct about 150 sf of building space (the regulated waste storage facility). This is within the 37,400 sf of Equipment Storage and Maintenance Facilities building space in this category in the CLRDP Building Program.
10	Figure 5.2 Land Use Diagram	The proposed development is consistent with the applicable land use designations. The CLRDP land-use designation for the proposed CBB building, parking lots, utility yard, and Greenhouse Complex; the new campus roadway; most of the new roadway and underground utility corridors, and portions of some of the trails; and the staging areas, is Research and Education Mixed Use. The overlooks and most of the trail improvements would be in land designated as Resource Protection Buffer. The SRP Phase 1B Project would consist of wetland enhancement and restoration within land designated as Resource Protection. Short segments of the new campus roadway and the main bicycle/pedestrian trail, and most of the De Anza Trail would be constructed in land designated as Open Space.

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	A	C
1	**Measure**	**NOID 6 Consistency**
11	Figure 5.3 Locational Restrictions for Building Program	The proposed development conforms with the restrictions described in Figure 5.3. Equipment storage and maintenance facilities are allowed only in the Middle Terrace Development Zone and are not allowed in Subareas 4, 5 6, 7, 9, or 10. The proposed regulated waste facility would be constructed in the Utility Yard in Subarea 2, which is consistent with these restrictions. There are no locational restrictions for the Marine Research and Education facilities (the CBB building and Greenhouse Complex), public access and recreation facilities, and parking facilities that are included in the proposed project.
12	**Policy 2.1 Stable Urban/Rural Boundary**	
13	IM 2.1.1 Oversizing of Utility Lines Prohibited	The new utility lines would not exceed the capacity required to serve the CLRDP building program. The projected utility demand and proposed utility improvements are described in the EIR Section 3.16.
14	IM 2.1.2 Utility Prohibition Zone	In conformance with this measure, the proposed sewer and/or water lines are outside the utility prohibition zone (EIR Figure 2-3b).
15	**Policy 2.2 Strengthening the Urban/Rural Boundary through the Protection of Adjacent Agricultural Resources**	
16	IM 2.2.1 Setback of Development and Uses from Adjacent Agricultural Uses	Consistent with this measure, the project includes only ancillary unoccupied research support space (greenhouses) within 200 feet from the western property line. All other development would be outside the 200-foot and 300-foot setbacks.
17	**Policy 2.3 Designing for the Urban Edge**	
18	IM 2.3.1 Cluster Development	The proposed development is consistent with this measure. The CBB lab building would be adjacent to the existing NOAA building; new greenhouses and support space would be clustered with existing CDFG structures. Structures at edge of the development area (greenhouse complex and Subarea 2 Utility Yard) would be small and have a low profile.
19	IM 2.3.2 Impervious Coverage	The proposed development is consistent with this requirement. With the proposed development, approximately 19 percent of the Middle Terrace Development Zone would be impervious. The remaining 81 percent would be pervious.The development would not increase impervious surface in the Lower Terrace development zone.

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	A	C
1	**Measure**	**NOID 6 Consistency**
20	IM 2.3.3 Windbreak/Screening Trees	Windscreen consisting of tall, native shrubs is included in landscaping on the west side of CBB, consistent with CLRDP Figure 6.6. As part of CLRDP Amendment #1, as recommended by the Scientific Advisory Committee (SAC), the Campus is proposing to revise this measure to change "windbreak/screening trees" to "windbreak/ screening plantings." The SAC has determined that the trees indicated as windbreaks are not native to the site and tend to be invasive and therefore should not be planted on the campus.
21	IM 2.3.4 Buildout Planning	The proposed project is consistent with MSC Area Plan, which identifies sites for future buildings and utilities, and therefore does not interfere with the ability of future development to conform with the CLRDP or other University commitments.
22	IM 2.3.5 Interim Weed Abatement Measures for Undeveloped Land Within Development Zones	
23	**Policy 2.4 Short-term and Caretaker Accommodations**	
24	IM 2.4.1 Short-Term Accommodation Use Restriction	
25	IM 2.4.2 Caretaker Accommodations	
26	IM 2.4.3 Use Conversion	
27	**Policy 2.5 Ensuring Appropriate Land Uses on the Marine Science Campus**	The proposed CBB facility would serve as a center for marine-dependent, coastal-dependent, and coastal-related biological sciences research and study for the UCSC Ecology and Evolutionary Biology Department, and would provide greatly enhanced opportunities for both graduate and undergraduate students to participate in coastal and marine research and study.
28	**5.3 Natural Resource Protection**	
29	**Policy 3.1 Protection of the Marine Environment**	
30	IM 3.1.1 Seawater System	The proposed project includes expansion of the seawater distribution system to serve the proposed development but would not expand the intake flow rate or construct new ocean intake pipelines.

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	A	C
1	**Measure**	**NOID 6 Consistency**
31	IM 3.1.2 Discharge of Drainage/Stormwater	The proposed drainage systems are consistent with Drainage Concept Plan and the Winzler and Kelly, *Marine Science Campus Grading and Drainage Master Plan,* April 2012 (Section 5 of this NOID). See MSC Project EIR Section 3.9 for details.
32	Policy 3.2 Protection and Restoration of Habitat Areas	
33	IM 3.2.1 Restoration of Wetlands on the Marine Science Campus	The proposed SRP Phase 1B would implement this measure. Implementation of this project will include work in jurisdictional wetlands and is expected to require a Clean Water Act permit from the U.S. Army Corps of Engineers. Consultation with USFWS will be conducted in the context of that permitting process. UCSC also has provided both USFWS and CDFG with descriptions of the projects and assessment of anticipated biological resources impacts and mitigation measures, for their review and comment.
34	IM 3.2.2 Management of Terrace Wetlands	The project includes stormwater management features to protect water flow and quality that are consistent with the Drainage Concept Plan (see MSC Project EIR Section 3.9 and Winzler and Kelly, *Marine Science Campus Grading and Drainage Master Plan* , April 2012 (Section 5 of this NOID). The project also includes interpretive signage to control access by humans and domestic animals. The SRP Phase 1B project will implement elements of the Resource Management Plan to enhance native vegetation and habitat.
35	IM 3.2.3 Protection and Enhancement of Wildlife Movement	Enhancement of wildlife corridors will be carried out by the UC Natural Reserve as part of the Phase 1 Specific Resource Plan. Fencing and landscaping are included in the Staging and Storage Yard that would be constructed in the Upper Terrace Development Program. If improvements to Shaffer Road up to the entrance to the proposed Upper Terrace Storage Yard are required for adequate functioning and maintenance of the road, the Campus would coordinate with the City and with CDFG regarding the extension of the wildlife corridor across Shaffer Road, as required under RMP MM 29. The Campus has provided CDFG and USFWS with project information and proposed mitigation measures.
36	IM 3.2.4 Management of Special Status Species Habitat.	The proposed SRP Phase 1B includes restoration and enhancement of wetland habitats, consistent with the provision of the RMP.

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	A	C
1	**Measure**	**NOID 6 Consistency**
37	IM 3.2.5 Protect Habitat Areas from Human Intrusion	The project would develop trails and install interpretive signs. SRP 1B would enhance wetlands by integrating wetlands W1 and W2 and removing non-native plants and restoring the balance of native vegetation.
38	IM 3.2.6 Natural Area Management	The proposed SRP Phase 1B would restore and enhance open space and natural habitat areas.
39	IM 3.2.7 Management of Water Quality and Drainage Features	
40	IM 3.2.8 Maintenance and Monitoring of Terrace Habitats	The proposed SRP Phase 1B Project included in this NOID provides a maintenance and monitoring program that is consistent with the Resource Management Plan.
41	IM 3.2.9 Wetland Buffers	An evaluation of ESHAs under current site conditions was completed by the Huffman-Broadway Group in February 2011. Proposed CLRDP Amendment #1 includes revisions to the boundaries of wetland 2, 3 and 5 and their associated Resource Protection Buffers to take into account the results of this evaluation. The project would construct trails within the revised wetland buffers, as allowed within areas designated Resource Protection Buffer. The siting of the propsoed development is consistent with these revised buffers. (See MSC Projects EIR, Section 3.4, and Huffman-Broadway Group, *Technical Letter Report, Reverification of CCC Wetlands and Corps Jurisdictional Boundaries,UCSC Marine Science Campus,* January 2011, in Section 5 of this NOID.**)**
42	IM 3.2.10 Natural Areas Habitat Management	The SRP Phase 1B included in this NOID would implement part of Phase 1 of the restoration, enhancement and management of natural areas as described in the measure.
43	IM 3.2.11 CRLF Protection	CRLF surveys are conducted annually on the campus.The MSC Projects EIR (Section 3.4) identifies mitigation measures to protect CRLF. These mitigations were adopted by the University in conjunction with project approval in January 2012.

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	A	C
1	**Measure**	**NOID 6 Consistency**
44	IM 3.2.12 USFWS Consultation Required	The Campus anticipates that consultation with USFWS regarding special status wildlife species that may be affected by the proposed projects will be conducted by the US Army Corps of Engineers in the context of Clean Water Act permitting. In addition, the campus has provided USFWS and CDFG with project descriptions, the project biological resources technical report, and the EIR assessment of biological resources impacts and mitigation measures. This measure will be included in the mitigation monitoring program for each of the proposed projects.
45	IM 3.2.13 Rodenticides	
46	IM 3.2.14 Non-Invasive Native Plant Species Required	As recommended by the SAC, as part of proposed CLRDP Amendment #1, the Campus is proposing to revise this implementation measures to require that propagules to similar habitats along the coast of western Santa Cruz county and southern San Mateo County (first and lower reaches of the second marine terraces). All proposed landscape and restoration plantings would be consistent with this measure, as amended. This measure will be included in the project mitigation monitoring programs.
47	**Policy 3.3 Use and Protection of Coastal water and Wetlands**	
48	IM 3.3.1 Pre-development Evaluation of Wetland Conditions.	An evaluation of wetlands under current site conditions was completed by the Huffman-Broadway Group in February 2011. Proposed CLRDP Amendment #1 would revise the Resource Protection and Resource Protection buffers to reflect the expanded boundaries of the wetlands based on the new evaluation. The expanded buffers are consistent with the buffer widths established by the CLRDP (that is, 100' from the edge of all wetlands, and 150' from portions of Wetland 5). (See MSC Projects EIR, Section 3.4, and Huffman-Broadway Group, *Technical Letter Report, Reverification of CCC Wetlands and Corps Jurisdictional Boundaries,UCSC Marine Science Campus* , January 2011, in Section 5 of this NOID.)
49	IM 3.3.2 Update CLRDP With Respect to Wetlands	Proposed CLRDP Amendment #1 would update CLRDP Figure 5.6 to reflect the expansion of wetlands and wetland buffers based on the updated wetland evaluation that was completed in compliance with IM 3.3.1, above.
50	**Policy 3.4 Protection of Environmentally Sensitive Areas (ESHAS)**	

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	A	C
1	**Measure**	**NOID 6 Consistency**
51	IM 3.4.1 Additional Measures to Protect Habitat Areas	The siting and design of the CBB building, greenhouses, roads, lighting, , utility and storage yard, and trails comply with the CLRDP development restrictions and each project element includes measures that would be monitored through the MMP to protect biological resources.
52	IM 3.4.2 Noise Intrusion into Terrace ESHA	All noise sources that would be constructed as part of the proposed project, including the generator yard, greenhouses, and CBB, would be within designated development areas and are at least 100 feet from the designated Resource Protection Areas. The project would construct paths and overlook improvements in Resource Protection Buffers, but these would not be sources of significant noise.
53	IM 3.4.3 Noise Intrusion into YLR	Noise levels at the YLR boundary were modeled as part of the MSC Projects EIR (EIR Section 3.11). Operation of the proposed development would not result in noise levels exceeding 60 dBA CNEL. The proposed CLRDP Amendment #1 would clarify that "YLR" in this IM refers to the original YLR and not to the YLR as expanded to include all lands outside the development areas on the MSC terrace lands, which were included in the expanded YLR as part of the CLRDP approval process.
54	IM 3.4.4 Pre-development Evaluation of ESHA Conditions.	An evaluation of ESHAs under current site conditions was completed by the Huffman-Broadway Group in February 2011. Proposed CLRDP Amendment #1 would revise the Resource Protection and Resource Protection buffers to reflect the expanded boundaries of the ESHA based on the new evaluation. (See MSC Projects EIR, Section 3.4, and Huffman-Broadway Group, *Technical Letter Report, Reverification of CCC Wetlands and Corps Jurisdictional Boundaries,UCSC Marine Science Campus* , January 2011, in Section 5 of this NOID.)
55	IM 3.4.5 Update CLRDP with Respect to ESHA	Proposed CLRDP Amendment #1 would update the CLRDP to reflect the results of the ESHA evaluation that was completed in compliance with IM 3.4.4, above.
56	**Policy 3.5 Special Protection for Younger Lagoon Reserve**	

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	A	C
1	**Measure**	**NOID 6 Consistency**
57	IM 3.5.1 Protection and Enhancement of YLR Habitats	The proposed project includes installation of YLR fencing and berms, and interpretive signage to educate humans regarding the need to prohibit domestic animals on the site. SRP Phase 1B includes control of invasive plants and enhancement of native vegetation.
58	IM 3.5.2 Protection of Special Status Species in YLR	All the Projects include measures to protect special status animal species during project construction and operations (MSC Projects EIR Section 3.4).
59	IM 3.5.3 Protection of YLR Resources	The proposed development includes features to ensure that quality of storm water discharges is protected and natural vegetation and buffers are included in each project. The proposed project also includes some stormwater repairs as required by the CLRDP.
60	IM 3.5.4 Development of Monitoring & Maintenance Program	
61	IM 3.5.5 Siting of Windbreak/Screening Trees	Windbreak/screening shrubs would be planted in conjunction with construction of the CBB, Greenhouse Complex, and Utility Yard. As part of CLRDP Amendment #1, as recommended by the Scientific Advisory Committee, the Campus proposes a revision of this measure to change “windbreak/screening trees” to “windbreak/ screening vegetation.” The SAC has determined that the trees used as windbreaks are not native to the site and tend to be invasive and therefore should not be planted on the campus.
62	IM 3.5.6 YLR Manager Consultation	The YLR Manager has been consulted throughout the project planning and design process. The Administrative Director of the UCSC Natural Reserves and the Field Manager of the Younger Lagoon Natural Reserve have reviewed the scope of this Project , NOID 6 (13-1). _____ _____ Gage Dayton, Date Administrative Director, UCSC Natural Reserves

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	A	C
1	**Measure**	**NOID 6 Consistency**
63	IM 3.5.7 Movement Not Visible from YLR	Movement associated with development would not be visible from within the original YLR (MSC Projects EIR Section 3.4). As noted above, proposed CLRDP Amendment #1 would clarify the distinction between the original YLR (to which this IM refers) and the YLR terrace lands, where activity and development, although buffered and screened as prescribed by the CLRDP, would nonetheless be visible due to the proximity of the YLR terrace lands to development areas.
64	IM 3.5.8 Protective Measures for YLR in Middle Terrace	The proposed project design includes an earthen berm and plantings of high shrubs in Development Subarea #7 to screen the greenhouses from the YLR and extend the berm south to connect to the existing berm.
65	**Policy 3.6 Public Access to and within YLR**	
66	IM 3.6.1 Provision of Controlled Access within YLR	
67	IM 3.6.2 Visual Access to YLR	
68	IM 3.6.3 Public Beach Access within YLR	
69	IM 3.7.1 Bluff Setbacks	The proposed development is in compliance with the setbacks. Only public access trails, habitat restoration/enhancement, berms and fencing, and storm water drainage improvements are proposed within the setback.
70	**Policy 3.7 Bluff Setbacks**	
71	IM 3.7.2 Coastal Bluff and Blufftop Area Protection and Enhancement Measures	
72	IM 3.7.3 Protecting Existing Development from Coastal Erosion	
73	**Policy 3.8 Protection of Adjacent Agricultural Reources**	
74	IM 3.8.1 Cooperation	
75	IM 3.8.2 Agreement to Indemnify and Hold Harmless	This measure would be implemented before project construction and is included in the adopted mitigation monitoring plans for the proposed development.
76	**Policy 3.9 Conservation of Cultural Resources**	

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	A	C
1	**Measure**	**NOID 6 Consistency**
77	IM 3.9.1 Construction Monitoring—Archaeological/Paleontological Resources	This requirement is part of the Campus' standard construction contract template and would be included in the construction contract documents. This measure is also included in the adopted mitigation monitoring plans for the proposed development.
78	**Policy 3.10 Hazardous Materials Management**	
79	IM 3.10.1 Hazardous Materials Management	The Campus has hazardous materials safety procedures in place to address these requirements that are applicable to all construction and operations and are monitored through licensing requirements and oversight by Campus EH&S. This measure would be included in the MMP for each project.
80	IM 3.10.2 Protective Measures for Laydown Yard	
81	**Policy 3.11 Energy Efficiency in New Construction**	
82	IM 3.11.1 Energy Efficiency in New Construction	The primary axis of the CBB is oriented east-west to allow for the greatest exposure of each building's façade to natural light, minimize solar heat gain, and reduce the need for artificial lighting. Operable windows would be provided in office spaces, and pervious pavement used in parking lots and pedestrian and bicycle paths. Exterior lighting will be provided only as needed for safety. Indoor lighting will be controlled by occupancy sensors.
83	IM 3.11.2 Energy Efficency in Use	
84	**Policy 3.12 Air Quality and Energy Conservation through Land Use and Transportation Controls**	
85	IM 3.12.1 Air Quality and Energy Conservation through On-Campus Short-Term Accommodations	
86	IM 3.12.2 Air Quality and Energy Conservation through Controlling Travel Mode Split	See IMs 5.2.1 and 5.2.2, 5.4.1, 5.5.1, 5.5.3, 5.4.1, 5.6.1 through 5.6.6, 5.8.1 through 5.8.3
87	IM 3.12.3 Air Quality and Energy Conservation through Parking Control	See IM 5.5.1
88	IM 3.12.4 Air Quality and Energy Conservation through Alternative Transportation	See IMs 5.4.1, 5.5.1, 5.6.1 through 5.6.6
89	IM 3.12.5 Air Quality and Energy Conservation throughTransportation Demand Management	See Ims 5.8.1 through 5.8.3

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	A	C
1	**Measure**	**NOID 6 Consistency**
90	Policy 3.13 Natural Resource Protection Analysis Required	Consistency of the proposed development with the natural resource protection provisions of the CLRDP is analyzed in the MSC EIR (Sections 3.1, *Aesthestics,* 3.4, *Biological Resources* , and 3.9, *Hydrology and Water Quality*). The Campus will prepare a water quality monitoring program for the project as specified in the Drainage Concept Plan. Results of the monitoring will be included in the annual water quality report prepared by the Campus to comply with CLRDP reporting requirements. Monitoring of water levels in the root zones in wetlands W4 and W5 would also be implemented as required by MSC Projects Mitigation HYD-2 (MSC Projects EIR p. 3.9 24).
91	**Policy 3.14 Permanent Protection**	
92	IM 3.14.1 Natural Areas Protection	All of the natural areas outside of the four designated development zones were incorporated into the YLR in 2009, in compliance with this requirement. Proposed CLRDP Amendment #1 would amend the CLRDP to indicate that all areas outside of development zones, including new areas excluded from development as a result of the updated wetland delineation (reported in Section 3.4 of the MSC Projects EIR), are now part of the YLR.
93	**5.4. Scenic and Visual Qualities**	
94	Figure 5.4 Development Subareas	The proposed development is consistent with the development restrictions of CLRDP Figure 5.4 (see EIR Table 3.10-1).
95	**Policy 4.1 Protection of Scenic Views**	
96	IM 4.1.1 Location of Development	Siting of the CBB, greenhouses, support space, and generator yard are consistent with the CLRDP land-use plan, which takes into account public views. Clustering of the proposed development is discussed under IM 2.3.1, above. As analyzed in MSC Projects EIR, Section 3.1, *Aesthetics* , the proposed development would not have significant impacts on public views.
97	**Policy 4.2 Protection of Scenic Quality**	

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	A	C
1	**Measure**	**NOID 6 Consistency**
98	IM 4.2.1 Design Standards and Illustrative Campus Buildout Site Plan	Siting of the proposed development is consistent with the CLRDP land-use plan. UCSC has provided design consultants with the applicable design guidelines and checks for project consistency at all stages of project design. Description of the proposed building materials and their consistency with the CLRDP design guidelines are provided in the MSC Projects EIR Section 3.1, *Aesthetics* . Preliminary parameters for selected projects in Chapter 7 are not applicable to the proposed development.
99	IM 4.2.2 Alteration of Natural Landforms	The proposed development is sited on level land; the alteration of natural landforms would be limited to the construction of drainage swales and detention ponds, which would be consistent with the guidelines in the Drainage Concept Plan.
100	IM 4.2.3 Building and Other Structure Height	Consistent with this implementation measure, the proposed CBB would be two stories and would have a sloping roof, except for a small area that would be flat to accommodate a vegetated roof. The roof line would be 36 feet above natural grade. Two exhaust stacks would extend 5 feet above the top of the roof line. The proposed greenhouse complex buildings and the regulated waste storage facility in Subarea 2 Utility Yard, which are near the perimeters of development zones, would be one story.
101	IM 4.2.4 Laboratory Buildings	The CBB would be 36 feet tall; exhaust stacks may extend an additional 5 feet upward.
102	IM 4.2.5 Maximum building GSF	Consistent with this IM, the CBB would be 40,000 gsf; the greenhouse complex would include five greenhouses at 500 sf each, one 1,200-sf greenhouse, and a 3,900-sf research facility.
103	IM 4.2.6 Maximum Additional Square Footage in Lower Terrace	
104	IM 4.2.7 Construction Materials	The CBB would be clad in vertical board and batten wood or wood-like siding and shingle roofing, and may have an exposed concrete surface at the base.

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	A	C
1	**Measure**	**NOID 6 Consistency**
105	IM 4.2.8 Building Setbacks	The CBB would be set back 15 feet from McAllister Way. The greenhouses would be more than 100 feet from McAllister Way. The regulated waste storage facility would be approx-imately 40 feet from the new campus road.
106	IM 4.2.9 Building Length Limitations	The CBB section facing McAllister Way would be 137 feet long; the section facing the new parking area to the south would be 110 feet long.
107	IM 4.2.10 Placement of Utility Lines Underground	All proposed utility lines would be underground.
108	IM 4.2.11 Windbreak/Screening Trees	Tall shrubs would be planted as windbreaks along the east side of the CBB site as specified in Section 6.5 and as shown on Figure 6.6 of the CLRDP. As noted above, proposed CLRDP Amendment #1 would revise the CLRDP requirement for screening trees to instead specify tall shrubs, as recommended by the SAC.
109	IM 4.2.12 Development in Northernmost Portion of Middle Terrace	As shown in the visual simulations in the MSC Projects EIR Section 3.1, *Aesthetics* , the proposed development in Subarea #2 is limited to a generator yard, which has a low profile and would not significantly impact public views as seen from public trail segment PT13.
110	IM 4.2.13 Development Along Edge of Lower Terrace	The only development along the edge of the Lower Terrace included in this NOID are public access trail improvements.
111	IM 4.2.14 Building Development West of McAllister Way in lower terrace	
112	IM 4.2.15 Building Development West of McAllister Way in Middle Terrace	The greenhouses and greenhouse support space proposed for Subarea #6, and drainage improvements and fencing/landscaping in Subarea #7 are consistent with this measure.
113	IM 4.2.16 Building Development Outside of Subareas Prohibited	The proposed CBB, greenhouses and greenhouse support space would be within Subareas #4 and #6. Development outside the subareas and inside of the development zones would include streets, parking areas, and pathways, which would be consistent with this measure.
114	**Policy 4.3 Visual Intrusion and Lighting**	

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	A	C
1	**Measure**	**NOID 6 Consistency**
115	IM 4.3.1 Visual Intrusion into YLR	Potential visibility of human activity and light in YLR is analyzed in the MSC PRojects EIR in Section 3.4, *Biological Resources* . The EIR identifies CBB Mitigation BIO-11, which would ensure that light from the new greenhouses does not spill over into Younger Lagoon. Proposed CLRDP Amendment #1 would clarify that the reference to YLR in this and other measures is intended to refer to the original YLR, and not necessarily to the YLR terrace lands that were added to the YLR during the final CLRDP approval process. It would not be possible to develop the terrace lands in such a way that no light and activity are visible in the YLR terrace lands, which are immediately adjacent to approved development boundaries.
116	IM 4.3.2 Visual Intrusion into Terrace ESHA and Other Areas Outside of Development Zones	Potential visibility of human activity and light in Younger Lagoon and the Terrace ESHA are analyzed in the MSC Projects EIR in Section 3.4, *Biological Resources* . The EIR identifies CBB Mitigation BIO-11, which requires that the greenhouses include screening to ensure that light does not spill over into Younger Lagoon. The CBB laboratory building, parking lots and roadways include design elements and lighting intended to minimize light spill and the visibility of activity, including shielded lighting, non-reflective surfaces, and screening with vegetation and earthen berms where feasible and appropriate.
117	IM 4.3.3 All Lighting	Lighting for the proposed projects is analyzed in the MSC Projects EIR Section 3.1, *Aesthetics* . Consistent with this implementation measure, lighting would be provided only as necessary for safety and navigation. This measure would be included in the MMP for the CBB and MSCI projects.
118	IM 4.3.4 Building Lighting	Consistent with this implementation measure, exterior building lighting would be located only at building entries and courtyards. Potential visibility of human activity and light in YLR is analyzed in the MSC Projects EIR Section 3.4, *Biological Resources* . The EIR identifies CBB Mitigation BIO-11, which would ensure that light from the new greenhouses does not spill over into Younger Lagoon. The CBB laboratory building is sited at a sufficient distance that light, even from second story windows, would not spill into the younger lagoon area.

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	A	C
1	**Measure**	**NOID 6 Consistency**
119	IM 4.3.5 Street and Trail Lighting	Street lighting would be limited to low bollard-type lighting along the McAllister Road sidewalk, taller cut-off shielded lighting at entrances to parking lots, building entries, and pedestrian crossings. Parking Lot A would not be used at night and would not be lighted. Trails would not include lighting except as needed for safety, such as at vehicle road and parking lot driveway crossings and intersections of pedestrian paths with the multi-use trail route.
120	IM 4.3.6 Parking lot and Maintenance yard Lighting	Parking Lot A would not be lighted. Lighting in parking lots B and C would be full cut-off lighting and would pole mounted.
121	IM 4.3.7 Sign lighting	The project includes sign lighting at the campus entrance and at the CBB Building.
122	IM 4.3.8 Lighting Plan Required	A detailed lighting plan for the proposed development is included in Appendix B of this NOID. MSC Projects EIR Figure 2-5 illustrates the proposed locations of signage and lighting, consistent with this measure.
123	**5.5 Circulation and Parking**	
124	Figure 5.5 Circulation and Parking Diagram	Existing parking is being dedicated to coastal access visitors(PP)
125	***Auto Circulation***	
126	**Policy 5.1 Adequate Vehicular Access.**	The proposed project would develop a new main entry road and a central bicycle/ pedestrian route into the campus to improve campus access for pedestrians and bicycles as well as motor vehicle circulation. These are sited to avoid sensitive natural areas, and would include features to treat and infiltrate storm water.
127	IM 5.1.1 New Circulation System	As required by this IM, the project would abandon Delaware Avenue Extension and construct a new campus street to replace the abandoned road, and would improve the Shaffer/Delaware Ave. intersection. Proposed CLRDP Amendment #1 would revise CLRDP Figure 5.5 to reflect updated campus planning for improved roadway alignment and function. The alignment of the new campus entry roadway and associated minor roadways would differ from the alignments shown on CLRDP Figure 5.5, but would accomplish the goal of removing the main entry road from the wetland buffer and would be consistent with other CLRDP requirements with respect to avoidance of protected areas.
128	IM 5.1.2 Improve Shaffer Road/Delaware Ave intersection	The project includes improvements to the Shaffer Road/Delaware Avenue intersection, including relocation of above ground utilities; signage; lighting; and integration with existing and new pedestrian and bicycle routes.

Note: This table refers to proposed CLRDP Amendment #1, which is being submitted to the Coastal Commission as a separate action.

	A	C
1	**Measure**	**NOID 6 Consistency**
129	IM 5.1.3 Shaffer Road Improvements	According to the terms of the 2008 Comprehensive Settlement Agreement: 1) Campus will pay 100% of the cost of improvements to the MSC entrance at the intersection of Shaffer Road and Delaware Avenue, as well as improvements to Shaffer Road on University property up to the new driveway to Upper Terrace development zone when development occurs in that zone; and 2) As identified in the CLRDP, UCSC will collaborate with the City of Santa Cruz on the construction of an emergency grade crossing over the tracks at such time as the City elects to pursue this project.
130	IM 5.1.4 Access for Wildlife Across Shaffer Road (Upper Wildlife Corridor)	The driveway entrance to the MSCI Project Upper Terrace Storage Yard would be located in the center of the development area (MSC Projects EIR Figure 2-3a), and avoids the wildlife corridor and buffer areas. The Campus has initiated consultation with CDFG and USFWS about the proposed Projects, including potential wildlife passage features across Shaffer road north and south of the entrance to the Storage Yard and will construct such features as considered advisable by these agencies.
131	IM 5.1.5 Access for Wildlife across Shaffer Road (Lower Wildlife Corridor)	If upgrades of Shaffer Road are required to provide long term access to the storage yard on the Upper Terrace, the Campus would develop of safe passage features at the eastern end of designated campus wildlife corridors, to facilitate wildlife movement (particularly for CRLF) across Shaffer Road. These featureswould be designed in consultation with wildlife biologists, USFWS, and CDFG.
132	IM 5.1.6 Use of Former Access Road	As required by this implementation measure, the project includes abandonment of Delaware Avenue Extension and its restoration as a public trail and habitat buffer area. The Campus has provided USFWS and CDFG with project description, the project biological resources technical report, and a summary of biological resources impact assessment and proposed mitigation measures for the project. It is anticipated that this work and other project elements will be subject to a Clean Water Act Section 404 permitting by the US Army Corps of Engineers, and that formal consultation with USFWS on CRLF impacts and mitigation measures will be conducted by the Army Corps in this context.
133	IM 5.1.7 Emergency Access	Se IM 5.1.3
134	***Travel Mode Split***	

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	A	C
1	**Measure**	**NOID 6 Consistency**
135	**Policy 5.2 Travel Mode Split**	
136	IM 5.2.1 Encourage Alterantives to the Single-Occupant Vehicle	Section 3.15 of the MSC Projects EIR details TDM measures that currently are implemented by TAPS for all UCSC facilities toward the achievement of this goal, and also identifies mitigation measures to encourage alternatives to the use of single-occupant vehicles at the campus. A dedicated parking space is available for a UCSC vanpool vehicle.
137	IM 5.2.2 Alternatives to the Single-Occupant Vehicle	Secure bicycle storage and showers for bicycle commuters would be provided at the CBB. The CBB and greenhouses would be served by new pedestrian and bicycle trails. A dedicated parking space is available for a UCSC vanpool vehicle.
138	***Parking***	
139	**Policy 5.3 Parking for Campus Use and Public Coastal Access**	
140	IM 5.3.1 All Campus Users Off-Hour Parking	Permit parking enforcement would be limited to the hours of 8 – 5, Monday through Friday, excluding holidays.
141	IM 5.3.2 Public Coastal Access Parking	The proposed development includes a parking lots with five designated coastal access visitor parking spaces and the NEF Project includes a 15-space coastal access visitor lot. These parking spaces will be reserved for and available to visitors as specified in the IM. Signs would designate the 10 Coastal Access Parking spaces accordingly.
142	IM 5.3.3 Campus Entrance Public Coastal Parking	The project would construct a 15-space public coastal access parking lot adjacent to the campus entrance (MSC Projects EIR Figure 2.3a)
143	IM 5.3.4 Middle Terrace Public Coastal Access Parking	Five spaces in Parking Lot D would be designated for public coastal access.
144	IM 5.3.5 Lower Terrace Dual Use Parking	The proposed parking program designates 40 spaces as dual use.
145	IM 5.3.6 Lower Terrace Public Coastal Access Parking	The proposed parking program designates 10 public coastal access parking spaces in the Lower Terrace development zone.

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	A	C
1	**Measure**	**NOID 6 Consistency**
146	IM 5.3.7 Parking Demand Satisfied on Campus	As discussed in Sections 3.10 and 3.15 of the MSC Projects EIR, it is anticipated that, with implementation of the MSCI Project, which would remove some campus parking, and designation of 70 parking spaces for visitors only (as required by CLRDP IMs 5.3.3, 5.3.4, 5.3.5, and 5.3.6), parking demand by MSC affiliates could exceed campus parking supply, even though the project would construct three additional parking lots. Proposed CLRDP Amendment #1 would revise IM 5.3.7 to allow some campus parking off-campus, while also preserving the intent of the IM, which is to ensure that sufficient street parking is preserved near the campus for public parking for coastal access. This would be accomplished though monitoring of parking and implementation of additional TDM measures to reduce parking demand as needed. The proposed measures are detailed in MSC Projects EIR Section 3.15.
147	IM 5.3.8 Free and/or Low Cost Public Coastal Access Parking	Permit cost from the pay station for the 10 Coastal Access spaces and 40 dual use spaces will be nominal.
148	***Parking Supply***	
149	**Policy 5.4 Parking Supply**	
150	IM 5.4.1 Development of New Parking	The proposed project would bring the total number of parking spaces on the campus to 267. The project would construct the five dedicated public coastal access parking spaces in the Middle Terrace development zone and the MSC public coastal access parking lot.
151	IM 5.4.2 Lease Agreements	
152	IM 5.4.3 Distribution & Intensity of Parking	The proposed dvelopment would add 115 parking spaces to the Middle Terrace development zone, in two lots, one adjacent to the proposed CBB laboratory building and one adjacent to the proposed greenhouses. It also would remove about 48 spaces along McAllister Way in the area between the Lower and Middle Terrace development zones. The development would also add one small coastal access parking lot on the Upper Terrace.
153	***Parking Management***	
154	**Policy 5.5 Parking Management**	
155	IM 5.5.1 Permits Required	All parking in the Lower Terrace Development Zone will require permits 8-5, M-F, excepting holidays.

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	A	C
1	**Measure**	**NOID 6 Consistency**
156	IM 5.5.2 Public Coastal Access Parking	The project would provide 15 public coastal access spaces at the campus entrance, which is close to the head of several trails. The parking design includes the features specified in the IM.
157	IM 5.5.3 Carpools & Vanpools	A dedicated parking space is available for a UCSC vanpool vehicle.
158	IM 5.5.4 Parking Management Strategy for Special and/or Temporary Events	
159	IM 5.5.5 Entrance Kiosk	
160	IM 5.5.6 Parking Limitation Seaward of Whale Skeleton	Parking in Lot #202 will be limited to University vehicles and will have one disabled space.
161	IM 5.5.7 Parking Enforcement	Parking will be enforced by the UCSC Police Department's Parking Enforcement division.
162	***Pedestrian and Bicycle Facilities***	
163	**Policy 5.6 Promotion of Bicycle Use and Walking**	
164	IM 5.6.1 Sheltered and Secure Bike Parking	The proposed development includes sheltered secure covered bicycle storage for about 27 bicycles, with space reserved to provide a total of up to 96 bicycle storage spaces, as warranted by demand (up to one space for each employee of the new facilities).
165	IM 5.6.2 Bike Parking Outside Buildings	Secure bicycle racks for about 40 bicycles also would be provided at various locations around the facility and additional bicycle racks would be added as warranted by demand during the occupancy of the facility.
166	IM 5.6.3 Personal Lockers and Showers	Two bicycle showers would be provided in the CBB and CBB occupants would also have access to a third shower in the nearby CDFG facility.
167	IM 5.6.4 Coordinated Marketing with City of Santa Cruz	
168	IM 5.6.5 Crosswalk Design	The pedestrian crossings included in the proposed project have been designed to meet the specifications of the IM and would include low bollard lighting as needed for safety.
169	IM 5.6.6 Siting Buildings for Ease of Access	The proposed CBB would be located adjacent to McAllister Way and the sidewalk along that roadway. The new bicycle trail would pass by the eastern edge of the building site.

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	A	C
1	**Measure**	**NOID 6 Consistency**
170	Transit	
171	Promotion of Transit use	
172	IM 5.7.1 Extension of SCMTD Transit Services	
173	IM 5.7.2 Expansion of Shuttle Services	MSC Projects Mitigation TRA-1C, which is included in the adopted Mitigation Monitoring and Reporting Program for the CBB Project, requires that the Campus expand shuttle service if warranted by demand, based on monitoring of parking demand associated with the CBB Project.
174	IM 5.7.3 Physical Infrastructure for Transit	The project would provide for a future transit stop on McAllister Way, in the vicinity of the CBB facility, to serve anticipated future transit needs. The proposed improvements to the Delaware/Shaffer intersection include the provision of adequate bus turnaround room in the intersection.
175	***Transportation Demand Management (TDM) Coordination***	
176	**Policy 5.8 TDM Coordination**	
177	IM 5.8.1 Carpool & Vanpool Services	See IM 5.5.3
178	IM 5.8.2 TDM Coordination	MSC Projects Mitigation TRA-1A, which is included in the adopted Mitigation Monitoring and Reporting Program for the CBB Project, specifies measures that TAPS would take to ensure that MSC-affiliates are informed of campus TDM programs, including programs promoting ridesharing, transit and other alternative transportation modes.
179	IM 5.8.3 Transportation Information	See IM 5.8.2
180	***Traffic Impacts on City Streets***	
181	**Policy 5.9 Impacts Offset**	The Campus would pay its fair share of necessary transportation upgrades as specified in the 2008 Comprehensive Settlement Agreement and described in the MSC Projects EIR, p. 3.15-34.
182	***Circulation and Parking Plan***	

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	A	C
1	**Measure**	**NOID 6 Consistency**
183	**Policy 5.10 Circulation and Parking Plan Required**	Parking and circulation elements of the proposed projects are described in Section 2.0 and analyzed in Section 3.15 of the MSC Projects EIR. As discussed above, proposed CLRDP Amendment #1 would revise parking IM 5.3.7 to allow some campus parking to be accommodated off campus, providing that it can be demonstrated that campus-related parking demand would not impede public parking in these areas for coastal access.
184	**5.6 Public Access and Recreation**	Parking program complies with coastal access parking
185	Figure 5.6 Coastal Access and Recreation Diagram	
186	**Policy 6.1 Free Public Access for Visitors**	
187	IM 6.1.1 Free Public Access for Visitors	
188	IM 6.1.2 Public Access Parking	The proposed project would construct 15 public coastal access parking spaces at the campus entrance. Five of the spaces in Parking Lot D also would be designated for visitor parking.
189	IM 6.1.3 Public Access Trails	The project would construct public pedestrian and bicycle trails throughout the campus. The proposed alignment differs from Figure 5.6, to minimize intrusion into the Resource Protection buffers, based on consultation with the manager of the YLR. Proposed CLRDP Amendment #1 includes revision of Figure 5.6 to reflect the trail system as now proposed and of the grouping of trail development set forth in Figure 9.1. These revisions would result in a public trail system that would provide the same level of public coastal access on approximately the same schedule as originally proposed.
190	IM 6.1.4 Public Access Overlooks	Construction of Overlooks B and F is triggered by construction of the CBB. The Campus will construct these as a separate project that was approved by the University in February 2011. The MSC Projects include construction of Overlook G and a shelter at Overlook A. The design of these improvements would be consistent with the design guidelines in Chapter 7 of the CLRDP. Overlook G is not required by the CLRDP but would be similar to Overlook A, and would provide another visual access point for wetlands 4 and 5.
191	IM 6.1.5 Docent-Led Tours and Education Programs for the Public	
192	IM 6.1.6 Educational Programs for Pre-College Students	

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	A	C
1	**Measure**	**NOID 6 Consistency**
193	IM 6.1.7 Interpretive Information	The proposed project includes interpretive displays and signs.
194	**Policy 6.2 Management of Public Areas**	
195	IM 6.2.1 Public Use Hours for the Marine Science Campus	
196	IM 6.2.2 Public Trail Continuity	As shown on MSC Projects EIR Figure 2.3a, the proposed trails generally follow the alignments shown in Figure 5.6 of the CLRDP, with adjustments to minimize intrusion into the resource protection buffers. Proposed CLRDP Amendment #1 would revise Figure 5.6 to show the new alignment.
197	IM 6.2.3 Access to Resource Protection Areas	
198	IM 6.2.4 Access to Resource Protection Buffer Areas	
199	IM 6.2.5 Access to Coastal Bluffs	Theproposed trails would provide access to the coastal blufftop (MSC Projects EIR Figure 2.3a). Overlook F, on the coastal bluff, will be constructed as part of a separate, previously approved project.
200	IM 6.2.6 Access to Laboratories and Research Areas	
201	IM 6.2.7 Caretaker Residence and Lab Security	
202	IM 6.2.8 Bicycles on MSC	
203	IM 6.2.9 Domestic Pets	
204	IM 6.2.10 Public Access Signage	The project would provide signs at the trail heads and intersections, Overlook G, and at public access parking areas at the campus entrance and in Parking Lot D. The proposed parking program includes signage that indicates the location of coastal and visitor access parking and is consistent with UCSC parking signs
205	IM 6.2.11 Off-Campus Trail Continuity	The proposed trails would be interconnected, as shown on MSC Projects EIR Figure 2-3a. There currently are no existing trails in adjoining areas off site, but should such trails be developed in the future, connections with campus trails would be permitted.
206	IM 6.2.12 Maintenance of Existing Public Access	

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	A	C
1	**Measure**	**NOID 6 Consistency**
207	IM 6.2.13 Public Access to YLR Beach	
208	**Policy 6.3 Public Access and Recreation Plan Required**	Consistency of the project with public access and recreation parameters of the CLRDP is analyzed in the MSC Projects EIR Section 3.14, *Recreation* . The project would be consistent with these parameters.
209	**5.7 Hydrology and Water Quality**	
210	Figure 5.7 Utilities Diagram	
211	**Policy 7.1 Management of Storm Water and Other Runoff**	
212	IM 7.1.1 Management of Stormwater and Other Runoff	As discussed in MSC Projects EIR Section 3.9, *Hydrology and Water Quality* , the storm water management systems for the proposed development are consistent with the requirements of the Drainage Concept Plan and include LID features where practicable.
213	IM 7.1.2 Water Quality Standards	As discussed in MSC Projects EIR Section 3.9, *Hydrology and Water Quality* , the storm water management systems for the proposed CBB, MSCI and NEF Projects meet the water treatment requirements specified in Winzler and Kelly, *Marine Science Campus Grading and Drainage Master Plan* , April 2012 (Section 5 of this NOID).
214	IM 7.1.3 Pre- and Post-Development Flows	As discussed in MSC Projects EIR Section 3.9, *Hydrology and Water Quality* , the storm water management systems for the proposed CBB, MSCI and NEF Projects meet the flow requirements specified in the Drainage Concept Plan 9. Also see Winzler and Kelly, *Marine Science Campus Grading and Drainage Master Plan* , April 2012 (Section 5 of this NOID).
215	IM 7.1.4 Pre-Development Drainage Patterns Defined	As discussed in MSC Projects EIR Section 3.9, *Hydrology and Water Quality* , the design criteria for the drainage system are based existing conditions, which have not changed since certification of the CLRDP.
216	IM 7.1.5 Pre-Development Drainage Peak Flow Rates Defined	As discussed in MSC Projects EIR Section 3.9, *Hydrology and Water Quality* , the design criteria for the drainage system are based on existing conditions, which have not changed since certification of the CLRDP.

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	A	C
1	**Measure**	**NOID 6 Consistency**
217	IM 7.1.6 Groundwater Recharge	As discussed in MSC Projects Section 3.9, *Hydrology and Water Quality*, the storm water management systems for the proposed CBB, MSCI and NEF Projects includes the use of infiltration, including in vegetated storm water basins and swales, to the maximum extent practicable.
218	IM 7.1.7 Seawater system	
219	IM 7.1.8 Irrigation and Use of Chemicals for Landscaping	
220	IM 7.1.9 Wastewater	The CBB Project includes connections to the City of Santa Cruz sanitary sewer system for all wastewater generated by development of the CBB and greenhouses.
221	IM 7.1.10 Elements of the Stormwater Treatment Train	As discussed in MSC Projects EIR Section 3.9, *Hydrology and Water Quality*, the storm water management systems for the proposed CBB, MSCI and NEF Projects uses the treatment BMPs identified in the Drainage Concept Plan and combines them in a treatment train where possible.
222	IM 7.1.11 Runoff Containment for Laydown Yard and Food Service Areas	
223	IM 7.1.12 Location of Treatment Train Components	The proposed project includes one vegetated storm water basinin the Middle Terrace Development Zone and two in the Upper Terrace, which are located in Open Space, consistent with this implementation measure.
224	IM 7.1.13 Permeable Hardscape	The surface of the parking stalls in parking lots C and D would be permeable (pervious asphalt, gravel pavers, or similar materials). The new minor trails would be surfaced in permeable materials that are compatible with ADA access, such as engineered wood fiber, gravel or grass pavers or permeable asphalt. The new major trail would be surfaced with permeable materials.
225	IM 7.1.14 -- Ocean Discharge	
226	IM 7.1.15 Drainage System Interpretive Signs	Interpretive signs would be provided at the locations shown on EIR Figure 2-5, under the NEF and MSCI projects.
227	IM 7.1.16 Design of Vegetated Stormwater Basins	The proposed drainage system for the CBB Project is described in detail in MSC Projects Section 3.9, *Hydrology and Water Quality*. The design of the proposed vegetated storm water basins is consistent with this implementation measure. Also see Winzler and Kelly, *Marine Science Campus Grading and Drainage Master Plan*, April 2012 (Section 5 of this NOID).

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	A	C
1	**Measure**	**NOID 6 Consistency**
228	IM 7.1.17 Designation of Treatment Train	The design proposed drainage system for the CBB project, which is described in detail in MSC Projects EIR Section 3.9, *Hydrology and Water Quality* , is consistent with the CLRDP water quality requirements. Water quality monitoring points would be identified during detailed design of the storm water system. This implementation measure would be included in the MMP for the CBB and MSCI projects. Also see Winzler and Kelly, *Marine Science Campus Grading and Drainage Master Plan* , April 2012 (Section 5 of this NOID).
229	**Policy 7.2 Long-Term Maintenance and Monitoring**	
230	IM 7.2.1 Drainage System Monitoring & Maintenance	After construction, the project drainage systems would be included in the water quality monitoring plan that is described in detail in the Drainage Concept Plan.
231	IM 7.2.2 Stormwater System Natural Features Maintenance	
232	IM 7.2.3 Drainage System Sampling	After construction, the project drainage systems would be included in the water quality monitoring plan that is described in detail in the Drainage Concept Plan.
233	IM 7.2.4 Long-Term Maintenance of Stormwater System	After construction, the project drainage systems would be maintained as specified in the Drainage Concept Plan.
234	**Policy 7.3 Drainage Discharge Points**	
235	IM 7.3.1 Discharge to YLR	The proposed Subarea 7 berm drainage system, which discharges to Younger Lagoon, has been designed to accommodate the 100-year storm even. This implementation measure would be included in the MMP for the CBB and MSCI projects.
236	IM 7.3.2 Discharge Siting and Design	This implementation measure would be included in the MMP for the CBB and MSCI projects and will be implemented during detailed design of the storm water system.

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	A	C
1	**Measure**	**NOID 6 Consistency**
237	**Policy 7.4 Drainage Plan Required**	As described in MSC Projects EIR Section 3.9, *Hydrology and Water Quality* , the proposed storm water drainage systems for the MSC Projects would be consistent with the storm water rand other runoff parameters of the CLRDP.
238	**5.8 Utilities**	
239	**Policy 8.1 Provision of Public Works Facilities**	
240	IM 8.1.1 Sizing of Utilities	As discussed in MSC Projects EIR Section 3.16, *Utilities and Service Systems* , the new utility lines would not exceed the capacity required to serve the CLRDP building program.
241	IM 8.1.2 Seawater System	The proposed project would expand and improve the functioning of the seawater distribution system but would not expand or modify the intake or discharge infrastructure.
242	**Policy 8.2 Protection of Biological Productivitiy and Quality of Coastal Waters When Providing Public Works Facilities**	
243	IM 8.2.1 Installation of New Utility Lines and Related Facilities	The project would not construct any new incidental public underground utility lines or public facilities below wetlands or riparian corridors.
244	IM 8.2.2 Seawater System	
245	IM 8.2.3 Evaluation of Western Utility Corridor	
246	**Policy 8.3 Water Conservation Required**	The CBB design includes high-efficiency plumbing fixtures (dual-flush (1.6/1.1gpf) toilets, 0.125-gpf urinals, 0.5-gpm restroom faucets, and 1.5-gpm showerheads). A new landscape irrigation controller would automatically adjust the irrigation schedule to compensate for daily fluctuations in the weather and associated irrigation requirements.
247	**Policy 8.4 Impacts to City Water and Sewer Systems Offset**	The Campus would pay its fair share of the cost of water and sewer system upgrades according to the terms of existing agreements with the City.

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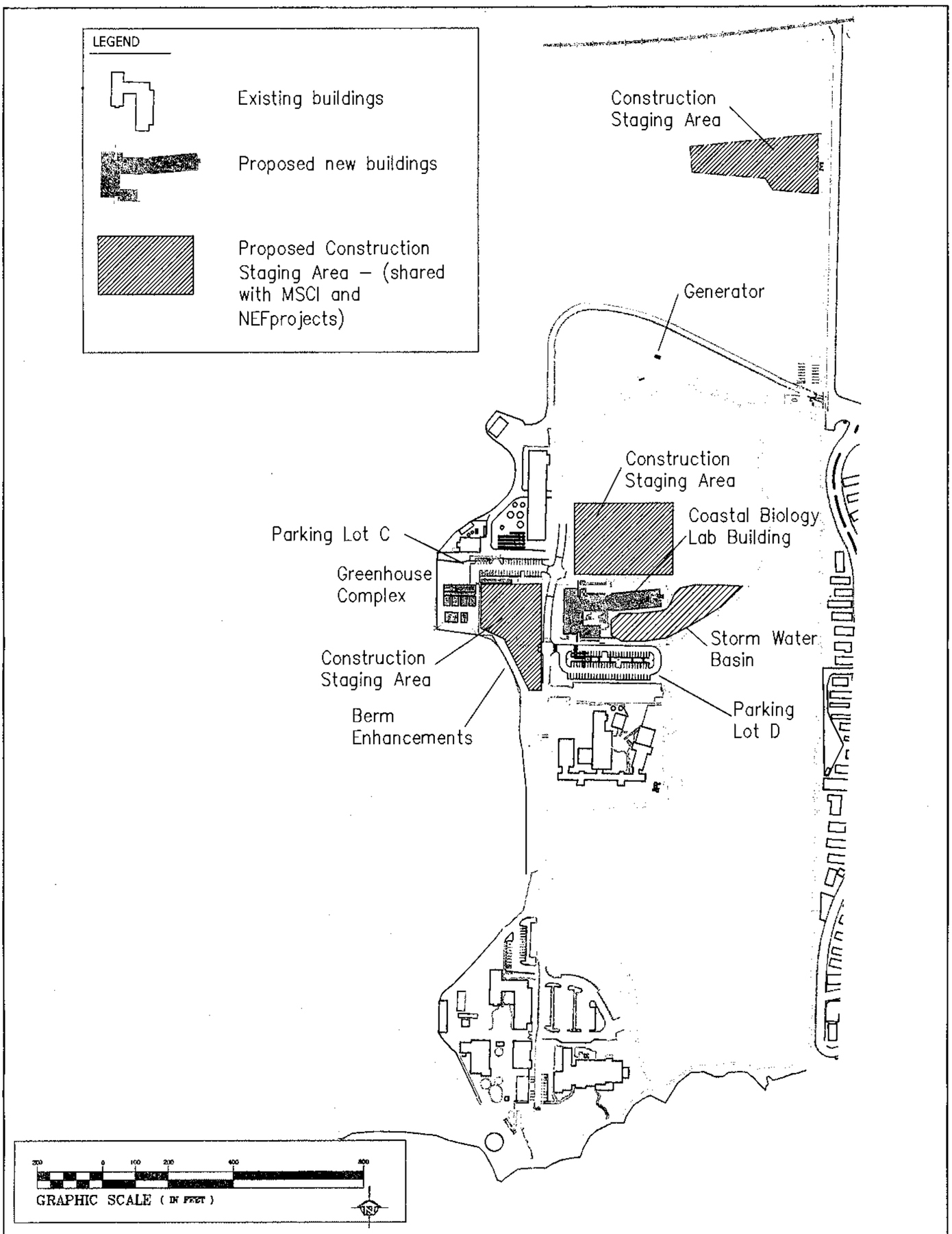
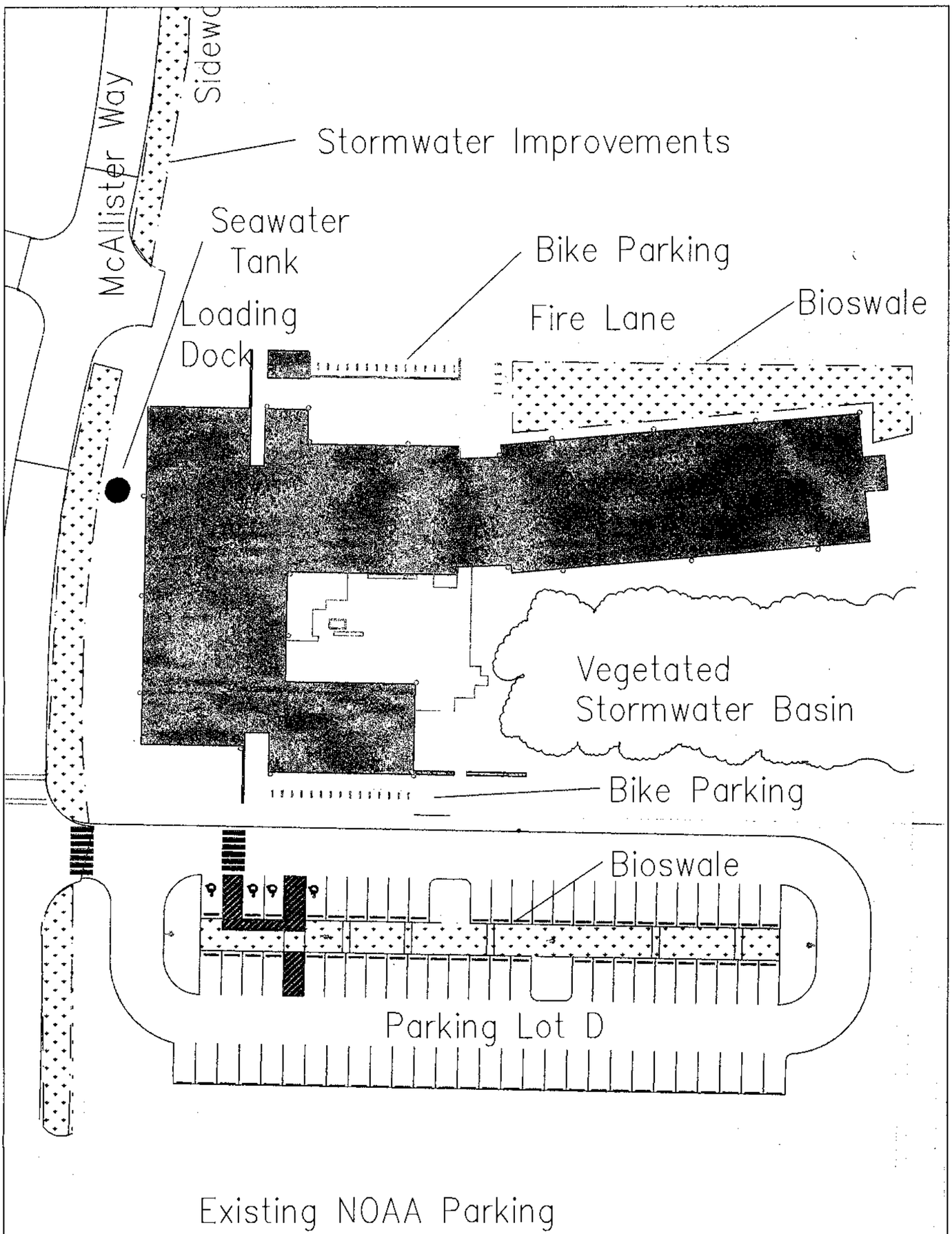
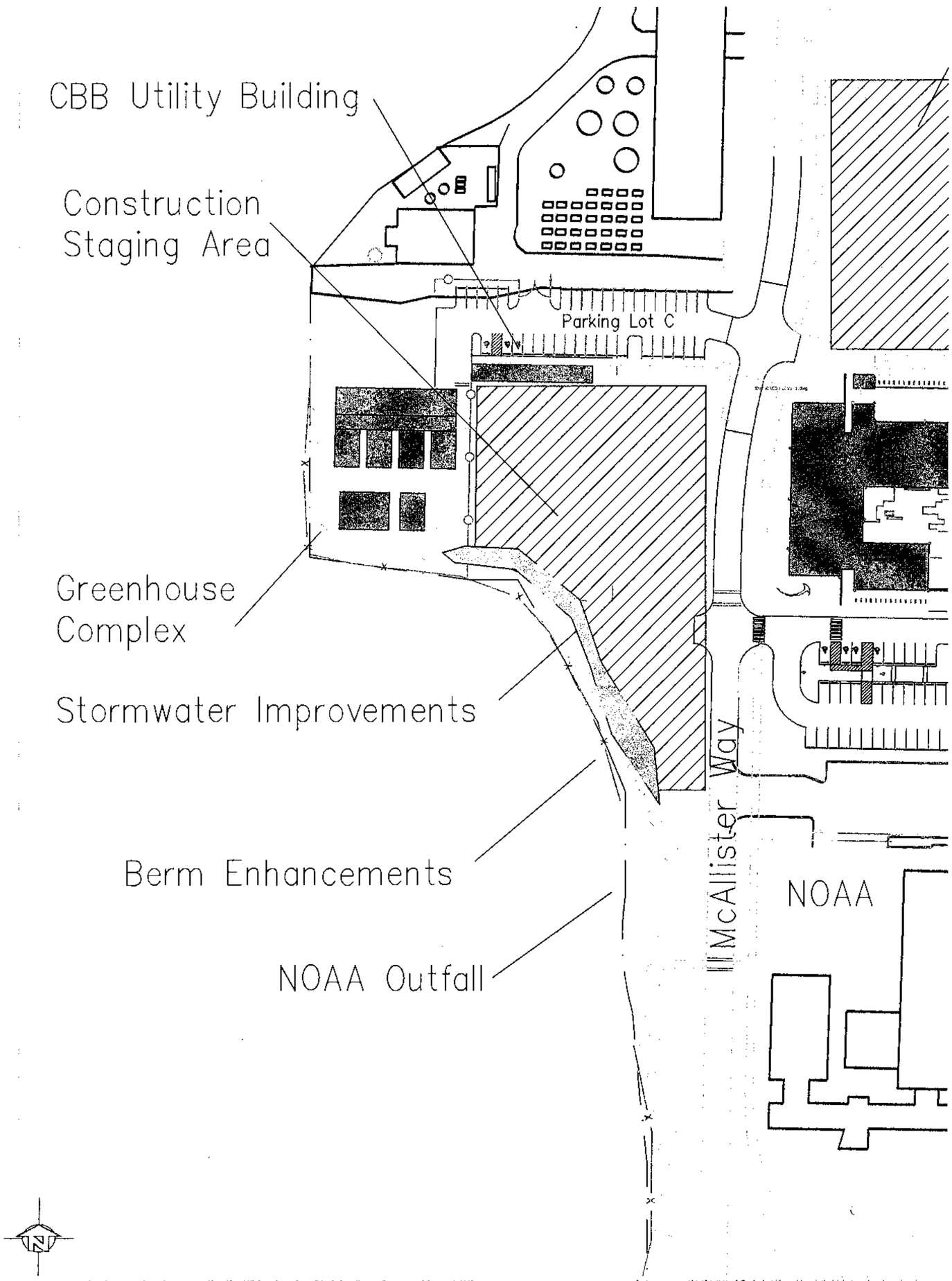
	A	C
1	**Measure**	**NOID 6 Consistency**
248	**Policy 8.5 Utility Plan Required**	As described in MSC Projects EIR Section 3.16, *Utilities and Service Systems* , the project is consistent with the utility parameters of the CLRDP.
249	**CHAPTER 6 Design Guidelines**	
250	**6.1 Building Design**	This NOID and the public notification process are submitted in conformance with the requirements of the CLRDP. See Project Description 1a. above.
251	**6.2 Campus Street Design**	This NOID and the public notification process are submitted in conformance with the requirements of the CLRDP. See Project Description 1a. above.
252	**6.3 Parking Design**	This NOID and the public notification process are submitted in conformance with the requirements of the CLRDP. See Project Description 1a. above.
253	**6.5 Landscape Design**	This NOID and the public notification process are submitted in conformance with the requirements of the CLRDP. See Project Description 1a. above.
254	**6.6 Lighting Design**	This NOID and the public notification process are submitted in conformance with the requirements of the CLRDP. See Project Description 1a. above.
255	**6.7 Signage Design**	This NOID and the public notification process are submitted in conformance with the requirements of the CLRDP. See Project Description 1a. above.
256	**6.8 Fence/Barrier Design**	This NOID is submitted in conformance with the fence design and location of the guidelines. An amendment (Action 10), as recommended by the Scientific Advisory Committee to protect resources, is included in this NOID.
257	**Chapter 7 Illustrative Campus Buildout Site Plan and Preliminary Design**	This NOID is submitted in conformance with the concepts of the Illustrative campus buildout representations of the CLRDP. The development proposed in this NOID is changed from early project planning efforts identified in Chapter 7 but consistent with the buildout concept.
258	**CHAPTER 8 Development Procedures**	This NOID and the public notification process are submitted in conformance with the requirements of the CLRDP.
259	**CHAPTER 9 Capital Improvement Program**	The proposed project includes the University commitments that are triggered by the proposed development or otherwise required at the time of this NOID, and that have not yet been implemented, including trail, drainage, circulation and parking improvements.
260	**APPENDIX A Resource Management Plan**	This NOID implements a portion of the RMP as described in the Specific Resource Plan developed by the Scientific Advisory Committee (SAC)..
261	**APPENDIX B Drainage Concept Plan**	Consistency of the proposed development with the Drainage Concept Plan is described in the MSC Projects EIR Section 3.9, *Hydrology and Water Quality* .



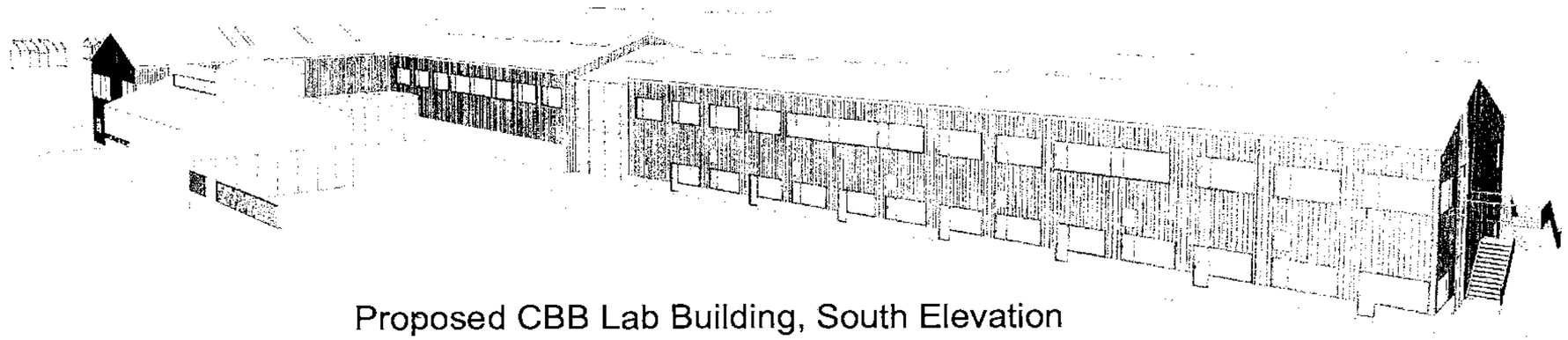
UC Santa Cruz Marine Science Campus Coastal Biology Building and Infrastructure Improvements Final Environmental Impact Report Nov. 2011	Proposed CBB Project Elements	Figure 2-2a



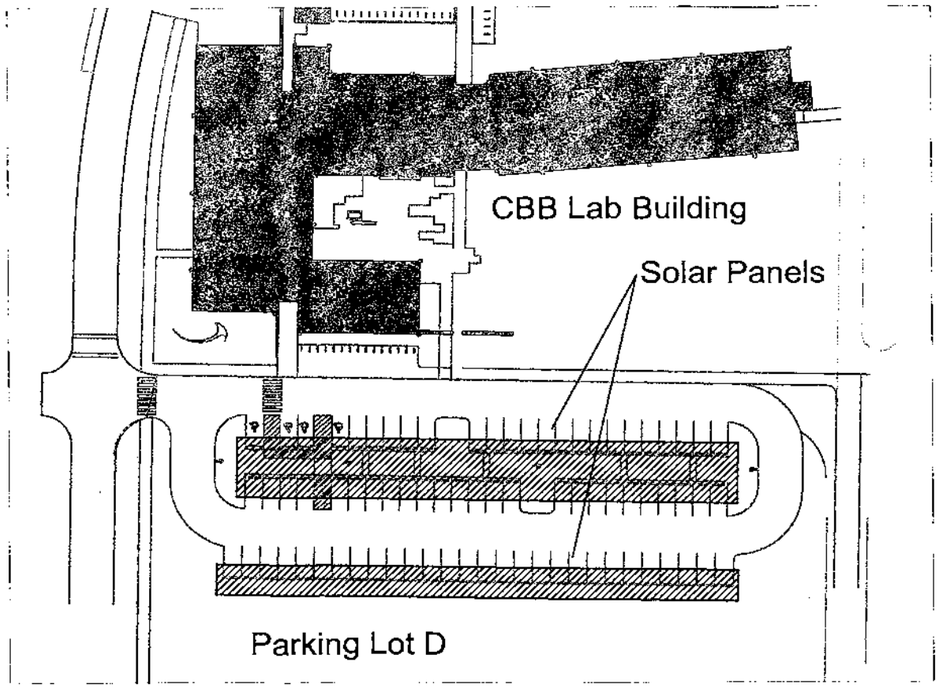
UC Santa Cruz Marine Science Campus Coastal Biology Building and Infrastructure Improvements Final Environmental Impact Report Nov. 2011	Proposed CBB Project Elements CBB Lab Building	Figure 2-2b

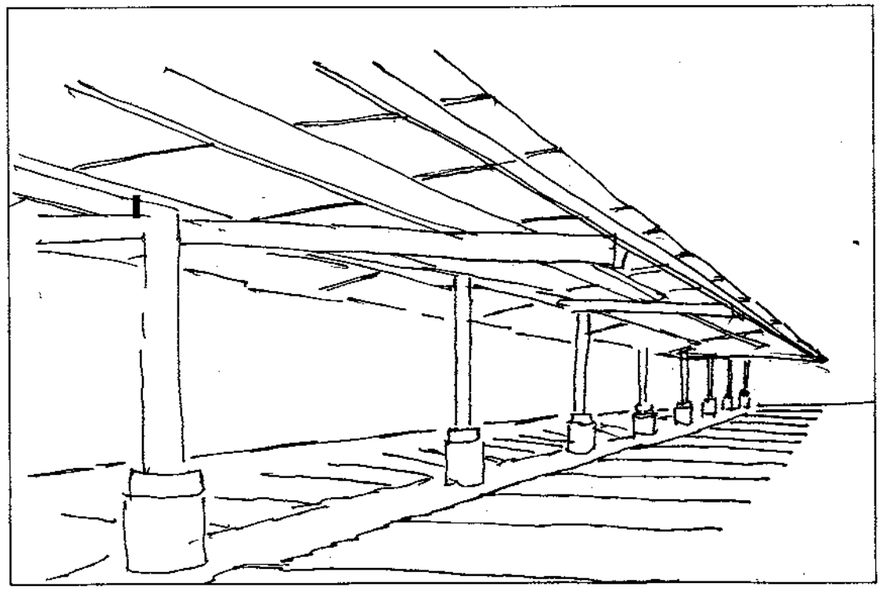


UC Santa Cruz Marine Science Campus Coastal Biology Building and Infrastructure Improvements Final Environmental Impact Report November 2011	Proposed CBB Project Elements Greenhouse Complex	Figure 2-2c



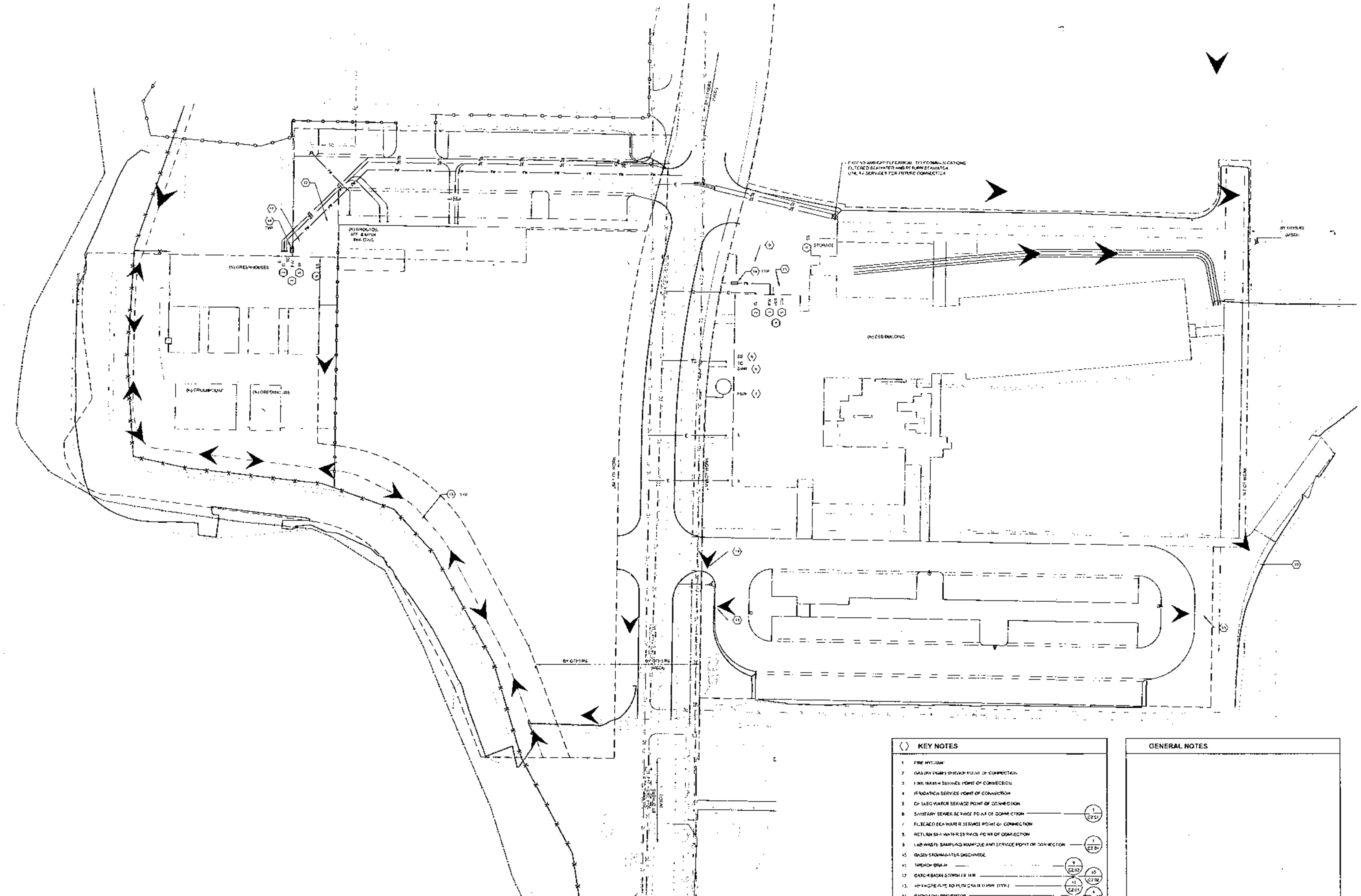
Proposed CBB Lab Building, South Elevation





Proposed Parking Solar Panels -
Plan View & Schematic Elevation

UC Santa Cruz Marine Science Campus Coastal Biology Building and Infrastructure Improvements Final Environmental Impact Report November 2011	Proposed CBB Lab Building and Parking Solar Panels	Figure 2-2d



1 / C1.04 UTILITY PLAN
SCALE: 1"=20'

0 10' 20' 40'

N

( ) KEY NOTES

1. FIRE HYDRANT
2. GAS (BY PG&E) SERVICE POINT OF CONNECTION
3. FIRE WATER SERVICE POINT OF CONNECTION
4. IRRIGATION SERVICE POINT OF CONNECTION
5. CHILLED WATER SERVICE POINT OF CONNECTION
6. SANITARY SEWER SERVICE POINT OF CONNECTION — 1/C2.01
7. FILTERED SEA WATER SERVICE POINT OF CONNECTION
8. RETURN SEA WATER SERVICE POINT OF CONNECTION
9. LAB WASTE SAMPLING MANHOLE AND SERVICE POINT OF CONNECTION — 7/C2.01
10. BASIN STORMWATER DISCHARGE
11. TRENCH DRAIN — 9/C2.02
12. CATCH BASIN STORM FILTER — 10/C2.02
13. HDPE PIPE TO PERFORATED PIPE (TYP.) — 11/C2.01
14. BACKFLOW PREVENTOR — 4/C2.01
15. WATER METER ASSEMBLY — 6/C2.01

GENERAL NOTES

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COASTAL BIOLOGY BUILDING
UCSC Marine Sciences Campus

Printing:	Date	Revisions:	Date
100% SCHEMATIC DESIGN	12.17.2010		
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Sheet Title
UTILITY PLAN

EHDD Job No.: 09001
Drawn By: KS
Scale: NONE

Sheet No.:
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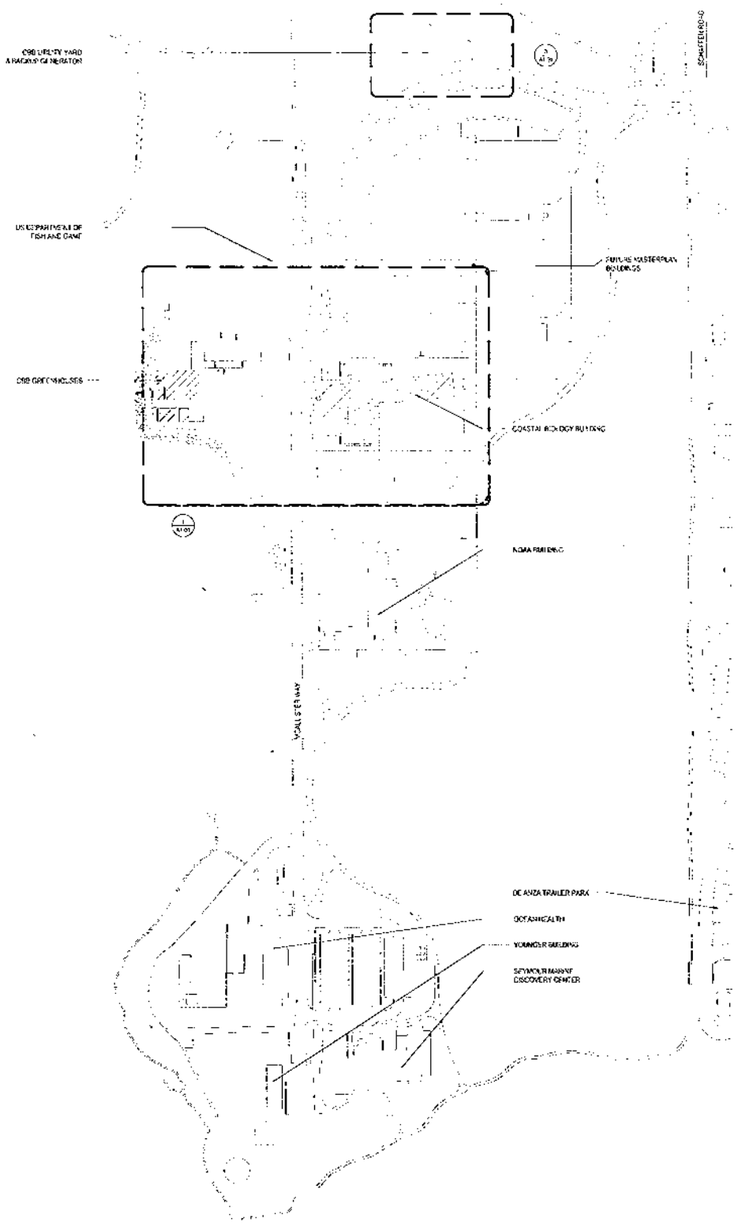
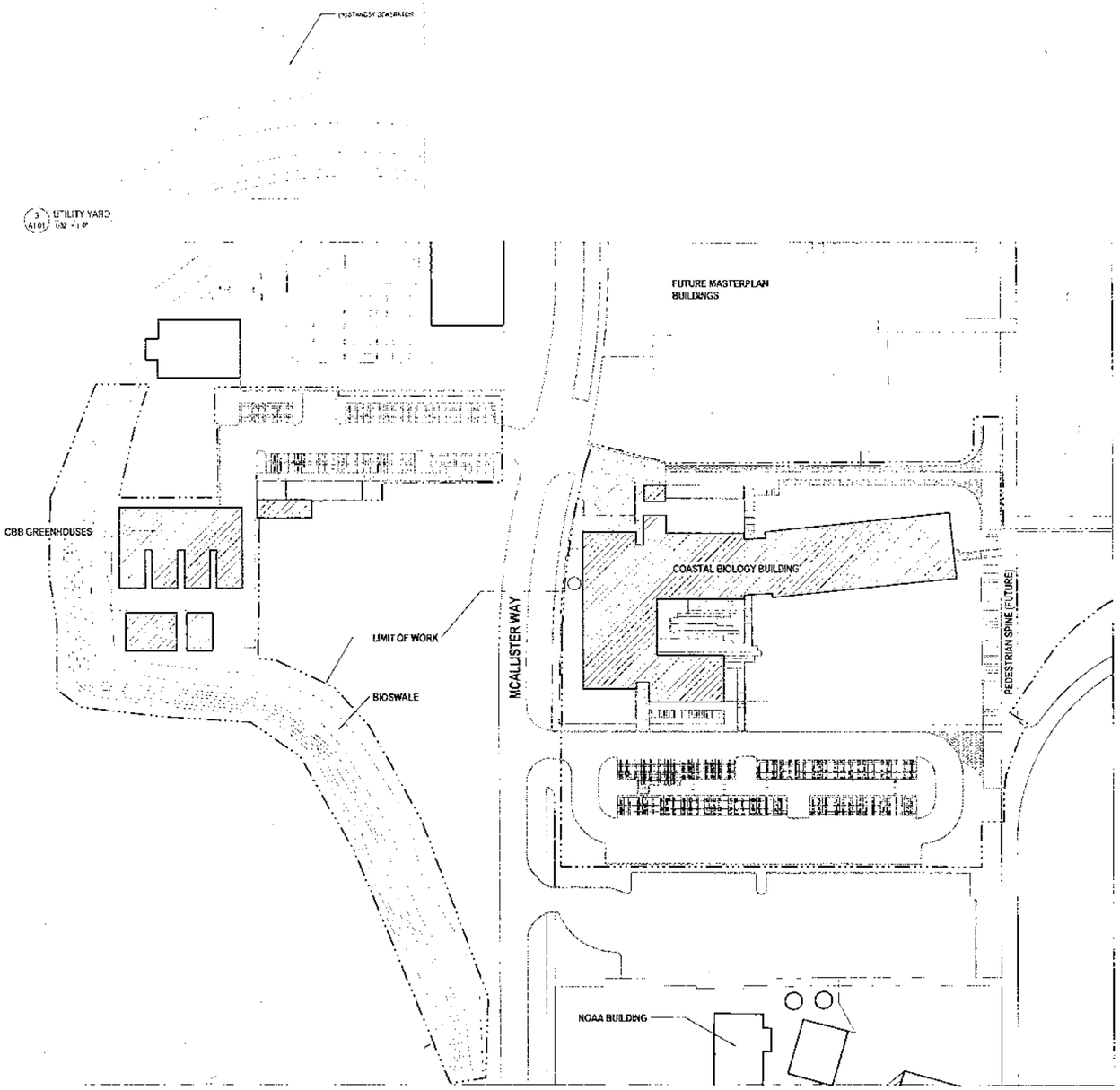


2 MARINE SCIENCES CAMPUS PLAN



1 SITE PLAN

SITE PLAN KEY NOTES

Architects
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Environetics Heisley Dodge & Dawes
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(415) 765-9163 fax (415) 285-3866
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Phase	Date	Revisions	Date
50% SCHEMATIC DESIGN	10/15/2010		
100% SCHEMATIC DESIGN	12/23/2010		
100% SCHEMATIC DESIGN	Rev 2/25/2011		

Sheet Title: SITE PLAN

1106 Job No 1210.1 Sheet No
Drawn By Author
Scale As indicated

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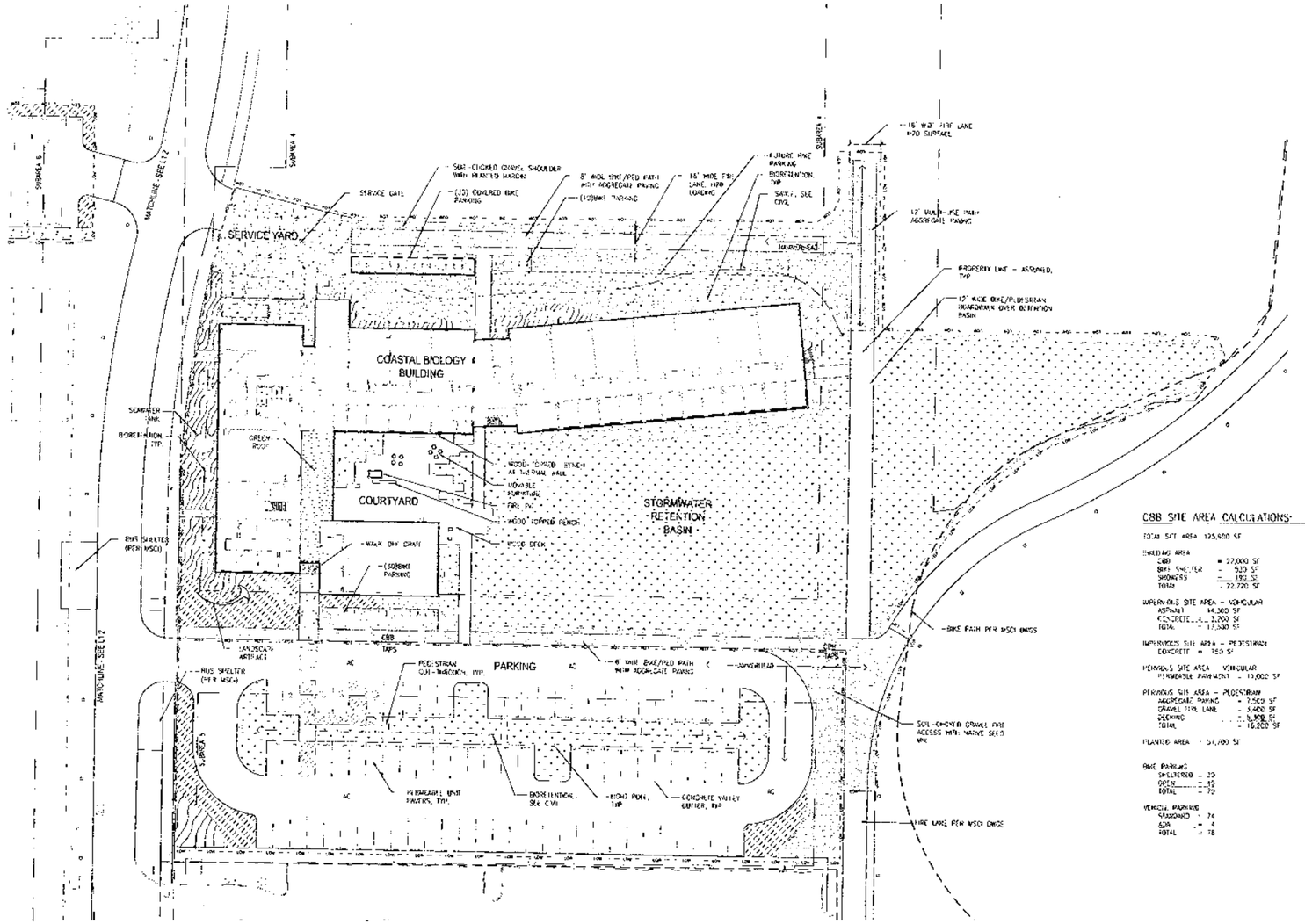

LEGEND

- SLT AREA BOUNDARY
- PROPERTY LINE - EXISTING
- PROPERTY LINE - ASSUMED
- PROJECT LIMIT OF WORK
- CONCRETE PAVING
- ASPHALT PAVING
- AGGREGATE PAVING
- GRAVEL PAVING - FIRE LANE SHOULDER
- PERVEABLE PAVING - PARKING STALLS
- LOW SHRUB PLANTING
- HIGH SHRUB PLANTING
- GRASSLAND PLANTING
- STORMWATER PLANTING
- GREEN ROOF
- BIKE PARKING
- LANDSCAPE ARTIFACT
- DECK
- SWALE FLOW LINE

CBB SITE AREA CALCULATIONS:

TOTAL SITE AREA 125,650 SF

BUILDING AREA
- CBB = 22,000 SF
- BUS SHELTER = 529 SF
- SHOWERS = 192 SF
- TOTAL = 22,720 SF

IMPERVIOUS SITE AREA - VEHICULAR
- ASPHALT 14,300 SF
- CONCRETE = 3,200 SF
- TOTAL = 17,500 SF

IMPERVIOUS SITE AREA - PEDESTRIAN
- CONCRETE = 750 SF

PERVIOUS SITE AREA - VEHICULAR
- PERMEABLE PAVEMENT = 13,000 SF

PERVIOUS SITE AREA - PEDESTRIAN
- AGGREGATE PAVING = 7,560 SF
- GRAVEL FIRE LANE = 3,400 SF
- DECKING = 3,990 SF
- TOTAL = 16,200 SF

PLANTED AREA = 57,780 SF

BIKE PARKING
- SHELTERED = 10
- OPEN = 40
- TOTAL = 50

VEHICLE PARKING
- STANDARD = 74
- ADA = 4
- TOTAL = 78

PLANT SCHEDULE - REPRESENTATIVE SPECIES

SYMBOL	COMMUNITY	BOTANICAL NAME	COMMON NAME
	LOW SHRUB	ARTEMISIA CALIFORNICA	CALIFORNIA SAGEBRUSH
		ARCTOSTAPHYLOS SPP.	MANZANITA
		BACCHARIS PILULARIS 'PROSTRATA' FORM	PROSTRATE COYOTE BRUSH
		ENCELIA CALIFORNICA	CALIFORNIA BRITTLEBUSH
		ERIOGONUM LATIFOLIUM	COAST BUCKWHEAT
		ERIOPHYLLUM STAECHADIFOLIUM	LIZZIE'S LACE
	HIGH SHRUB	BACCHARIS PILULARIS	COYOTE BRUSH
		RHAMNUS CALIFORNICA	COFFEEBERRY
		ARTEMISIA CALIFORNICA	CALIFORNIA SAGEBRUSH
		NATIVE GRASS MIX	
	GRASSLAND	SANICULA CRASSICAULIS	CALIFORNIA BLACKBERRY
		HORDEUM BRACHYANTHERUM	MEADOW BARLEY
		LEYMUS TRITICOIDES	CREEPING WILDRYE
	STORMWATER	HORDEUM BRACHYANTHERUM	MEADOW BARLEY
		ELEOCHARIS MACROSTACHYA	PALE SPIKE RUSH
		JUNCUS PATENS	COMMON RUSH
		JUNCUS PHAEOCEPHALUS	BROWN-HEADED RUSH
		SCIRPUS CERNUUS	LOW CLUB RUSH
		ADDITIONAL NATIVE GRASSES ACCORDING TO MOISTURE REGIME	
	GREEN ROOF	ACHILLEA MILLEFOLIUM	YARROW
		ERIOGONUM LATIFOLIUM	COAST BUCKWHEAT
		ARMERIA MARITIMA	SEA PINK
		ERIGERON GLAUCUS	SEASIDE DAISY
		FRAGARIA CHILOENSIS	COAST STRAWBERRY

PLANTING NOTES

1. ALL PLANT MATERIALS TO BE NATIVE OR ADAPTED TO THE SITE
2. GREEN ROOF PLANTING TO RECEIVE PERMANENT IRRIGATION
3. GREEN ROOF SOIL TO BE LIGHT WEIGHT TOPSOIL, MIN. 6" DEPTH
4. SITE SOIL SHALL BE RESTORED TO PRE-CONSTRUCTION COMPACTION AND ORGANIC MATTER CONTENT

0 5 10 20 40

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UCSC Marine Sciences Campus

Sheet Title: SITE PLAN

Printing:	Date:	Revisions:	Date:
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100% SCHEMATIC REVISION	REV 02 25.2013		

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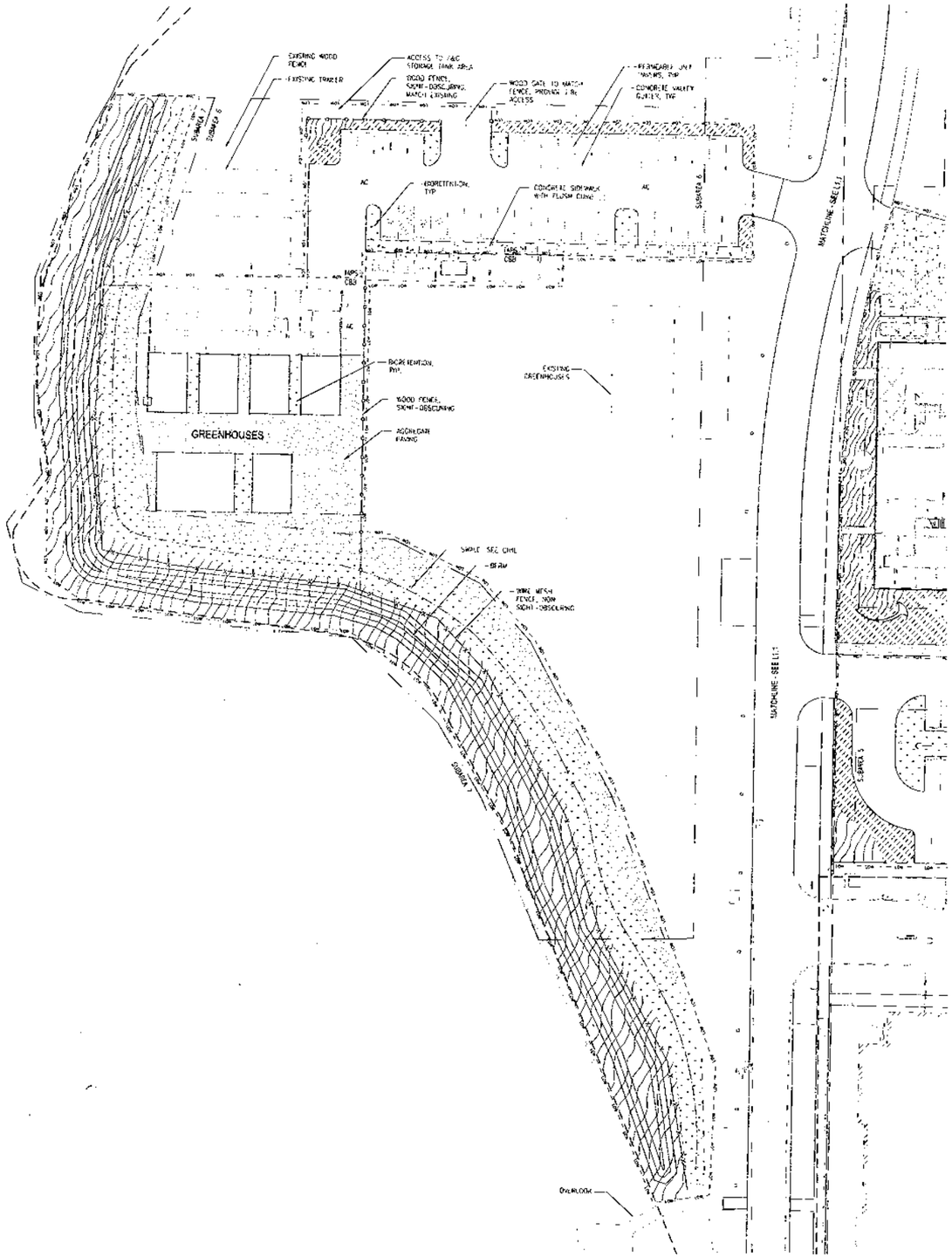

LEGEND

- SITE AREA BOUNDARY
- PROPERTY LINE - EXISTING
- PROPERTY LINE - ASSUMED
- PROJECT LIMIT OF WORK
- CONCRETE PAVING
- AC ASPHALT PAVING
- AGGREGATE PAVING
- GRAVEL PAVING - FIRE LANE SHOULDER
- PERMEABLE PAVING - PARKING SEMIS
- LOW SHRUB PLANTING
- HIGH SHRUB PLANTING
- GRASSLAND PLANTING
- STORMWATER PLANTING
- GREEN ROOF
- BIKE PARKING
- LANDSCAPE ANTIRACK
- DECK
- SWALE FLOW LINE

GREENHOUSE SITE AREA CALCULATIONS:

TOTAL SITE AREA: 71,200 SF

BUILDING AREA = 8,980 SF

IMPERVIOUS SITE AREA
- CONCRETE 1,200 SF
- ASPHALT + 5,700 SF
- TOTAL = 7,900 SF

PERVIOUS PAVED SITE AREA
- AGGREGATE PAVING 3,900 SF
- PERMEABLE PAVEMENT + 5,400 SF
- TOTAL = 9,300 SF

PLANTING AREA = 45,100 SF

VEHICLE PARKING
- STANDARD = 35
- ADA = 3
- TOTAL 38

PLANT SCHEDULE - REPRESENTATIVE SPECIES

SYMBOL	COMMUNITY	BOTANICAL NAME	COMMON NAME
	LOW SHRUB	ARTEMISIA CALIFORNICA	CALIFORNIA SAGEBRUSH
		ACHILLEA MILLEFOLIUM	YARROW
		BACCHARIS PILULARIS 'PROSTRATE FORM'	PROSTRATE COYOTE BRUSH
		ERIOPHYLLUM CONFERTIFLORUM	CALIFORNIA GOLDENYARROW
		ENCELIA CALIFORNICA	COAST SUNFLOWER
		ERIOPHYLLUM STAECHADIFOLIUM	LIZARDTAIL
	HIGH SHRUB	BACCHARIS PILULARIS	COYOTE BRUSH
		RHAMNUS CALIFORNICA	COFFEEBERRY
		ARTEMISIA CALIFORNICA	CALIFORNIA SAGEBRUSH
		MAYAS GRASS MIX	
	GRASSLAND	DANTHONIA CALIFORNICA	CALIFORNIA OATGRASS
		HORDEUM BRACHYANTHERUM	MEADOW BARLEY
		LETHUS TRIFLORUS	CREEPING WILDRYE
	STORMWATER	HORDEUM BRACHYANTHERUM	MEADOW BARLEY
		ELEOCHARIS MACROSTACHYA	PALE SPIKE RUSH
		JUNCUS PATENS	COMMON RUSH
		JUNCUS PHAEOCEPHALUS	BROWN HEADED RUSH
		SCIRPUS CERNUUS	LOW CLUB RUSH
		ADDITIONAL MAYAS GRASSES ACCORDING TO MOISTURE REGIME	
	GREEN ROOF	ACHILLEA MILLEFOLIUM	YARROW
		ERIOGONUM LATIFOLIUM	COAST BUCKWHEAT
		ARMERIA MARITIMA	SEA PINK
		ERIGERON GLAUCUS	SEASIDE DAISY
		FRAGARIA CHILOENSIS	COAST STRAWBERRY

PLANTING NOTES

1. ALL PLANT MATERIALS TO BE NATIVE OR ADAPTED TO THE SITE
2. GREEN ROOF PLANTING TO RECEIVE PERMANENT IRRIGATION
3. GREEN ROOF SOIL TO BE LIGHT WEIGHT POMICEL, MIN. 6" DEPTH
4. SITE SOIL SHALL BE RESTORED TO PRE-CONSTRUCTION COMPACTION AND ORGANIC MATTER CONTENT

0 5 15 20 40

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Sheet Title: SITE PLAN

Printing:	Date:	Revisions:	Date:
100% SCHEMATIC DESIGN	12.17.2010		
100% SCHEMATIC DESIGN (R1)	02.23.2011		

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Scale: 1" = 20'-0"

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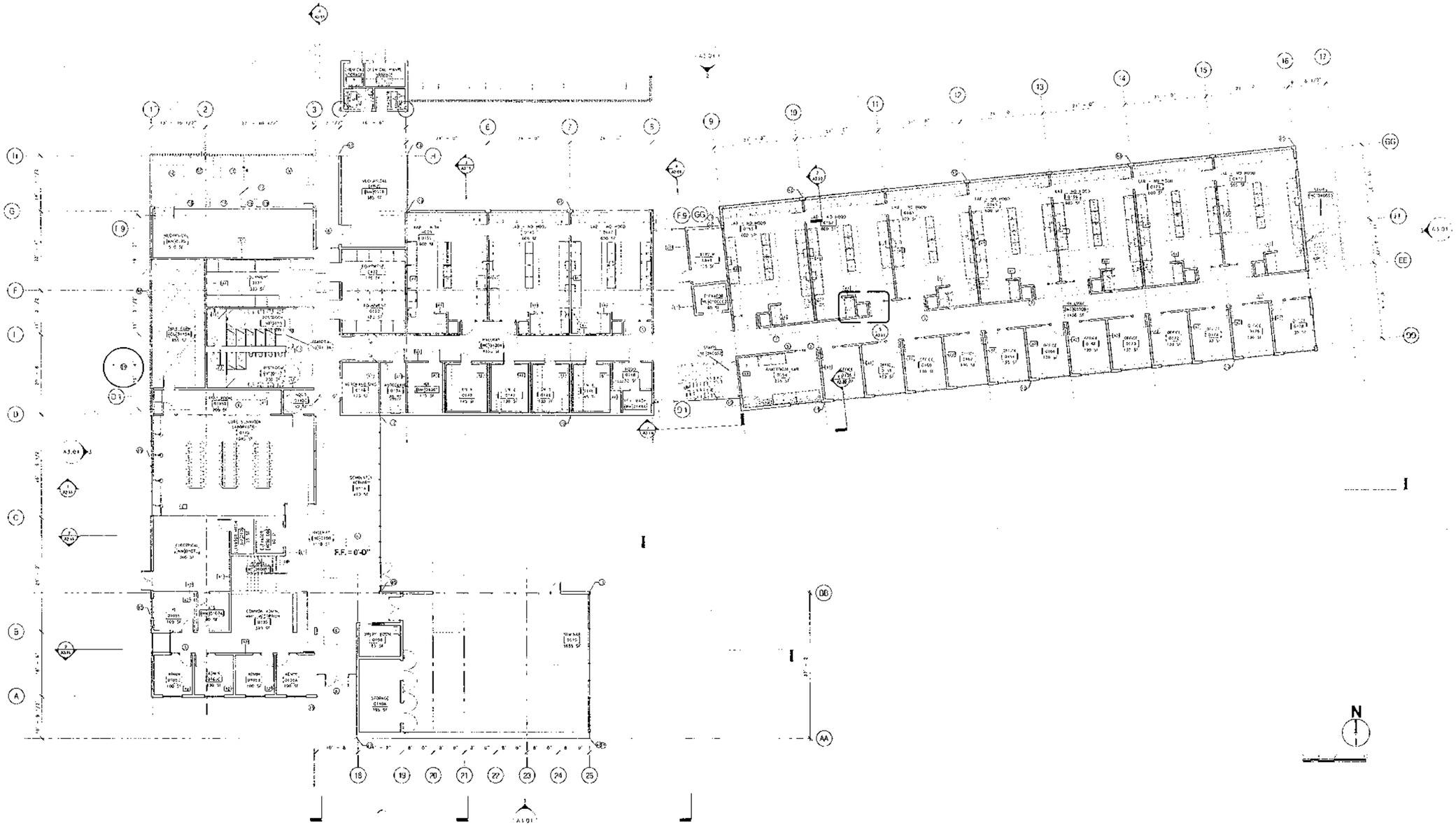

FLOOR / ROOF PLAN KEY NOTES

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Consultants:

COASTAL BIOLOGY BUILDING
UCSC Marine Science Campus

Phase	Rules	Revision	Date
50% SCHEMATIC DESIGN	10/15/2010		
100% SCHEMATIC DESIGN	12/17/2010		
100% SCHEMATIC DESIGN REV	2/25/2011		

ENDD Job No. 07023 Sheet No.
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Sheet Title
LEVEL 1 FLOOR PLAN

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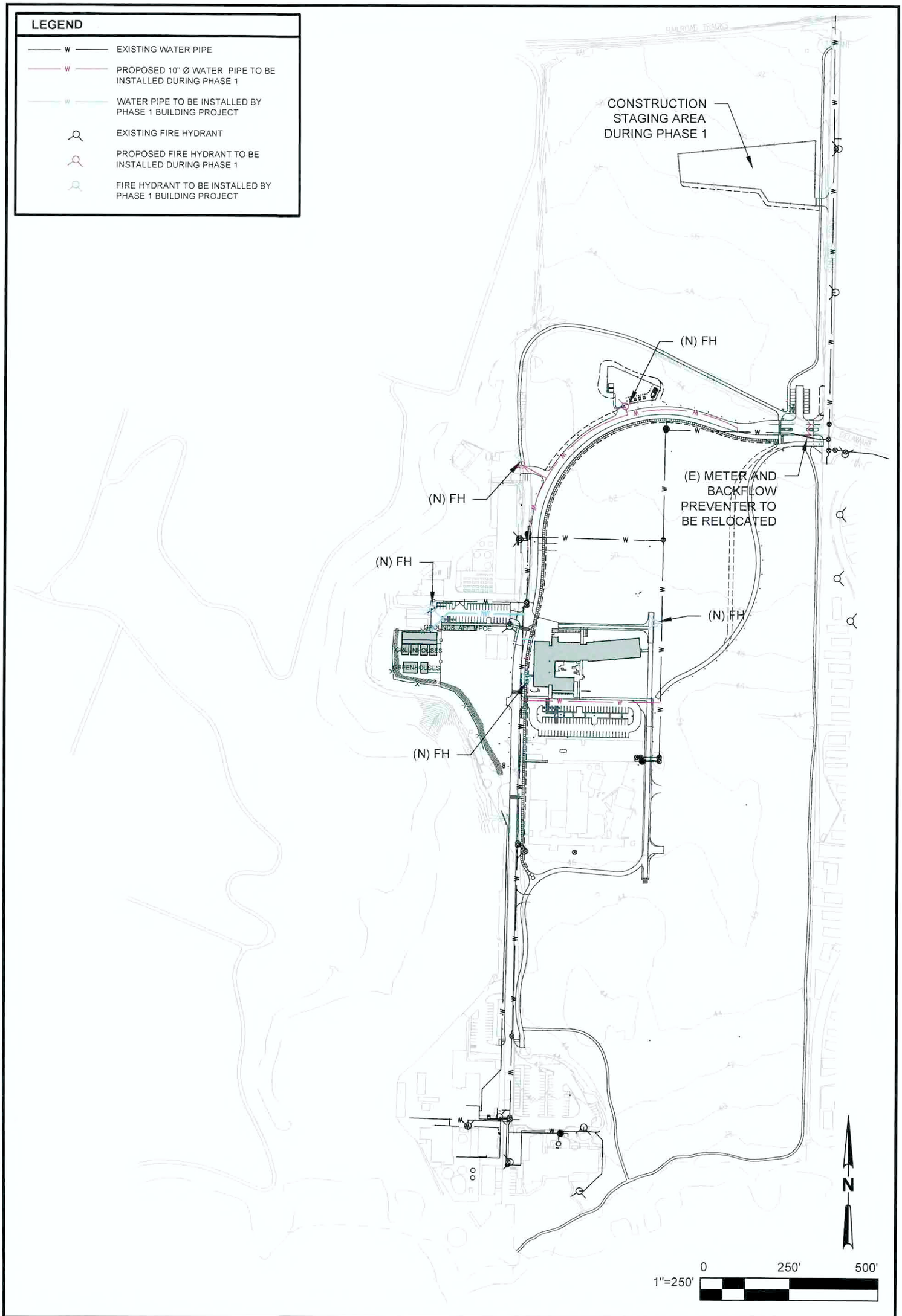

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Santa Cruz, California

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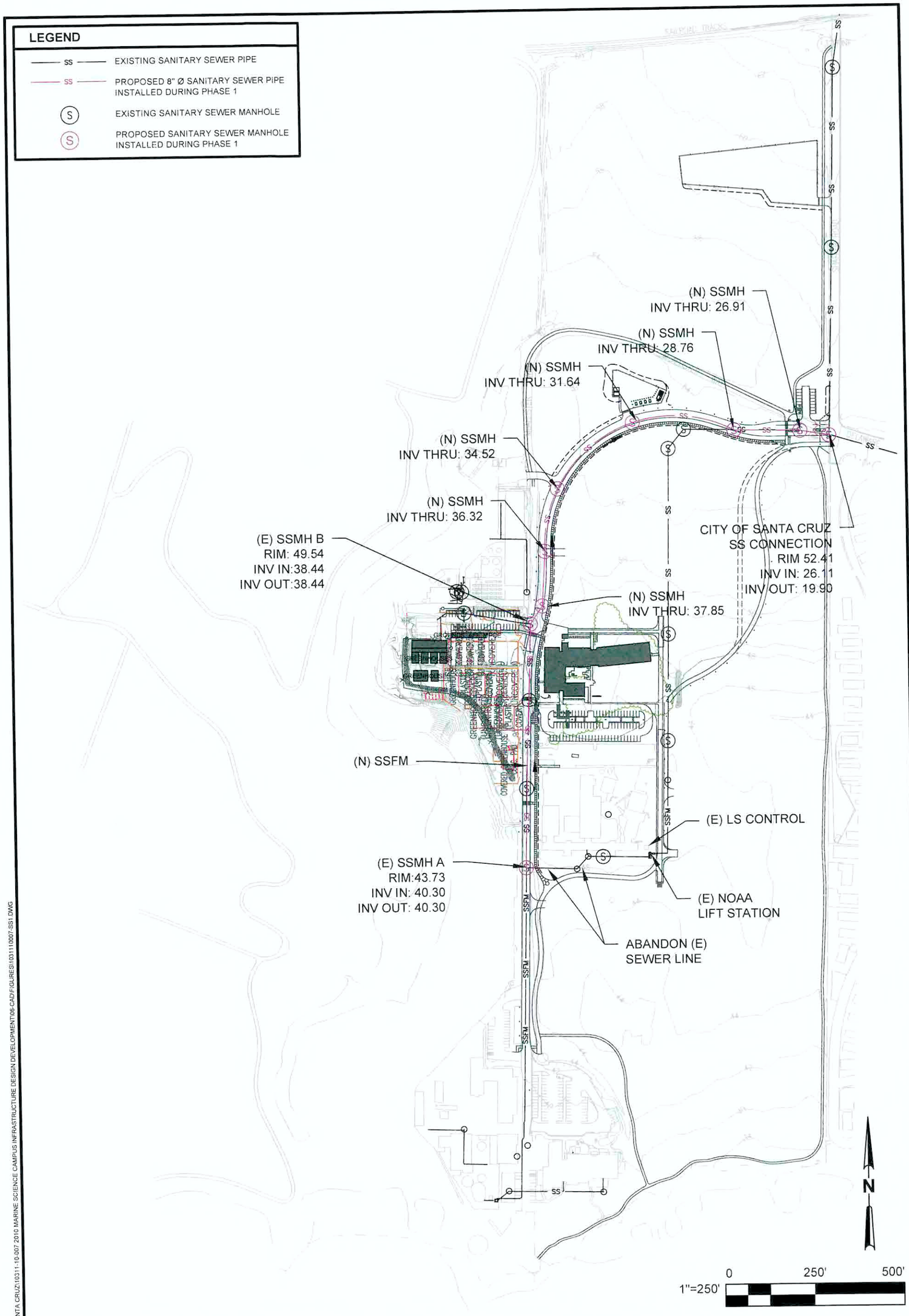
MARINE SCIENCE CAMPUS INFRASTRUCTURE SCHEMATIC DESIGN UCSC PROJECT NUMBER 4933

PHASE 1: WATER PLAN

PROJ NO: 10311-10-007
DRWN JW | CHKD TS
DATE DECEMBER, 2010
FIGURE NO.
W1

2011-03-21 3:02 PM TPHAM
\\CORP\WKPROJECTS\SFO\10311 UC SANTA CRUZ\10311-10-007 2010 MARINE SCIENCE CAMPUS INFRASTRUCTURE DESIGN DEVELOPMENT\06-CAD\FIGURES\10311110007-W1.DWG



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MARINE SCIENCE CAMPUS
INFRASTRUCTURE SCHEMATIC DESIGN
UCSC PROJECT NUMBER 4933

PHASE 1:
SANITARY SEWER PLAN

PROJ NO: 10311-10-007
DRWN: JW CHKD: TS
DATE: DECEMBER, 2010
FIGURE NO.
SS1

2011-03-21 3:02 P.M. TPHAM
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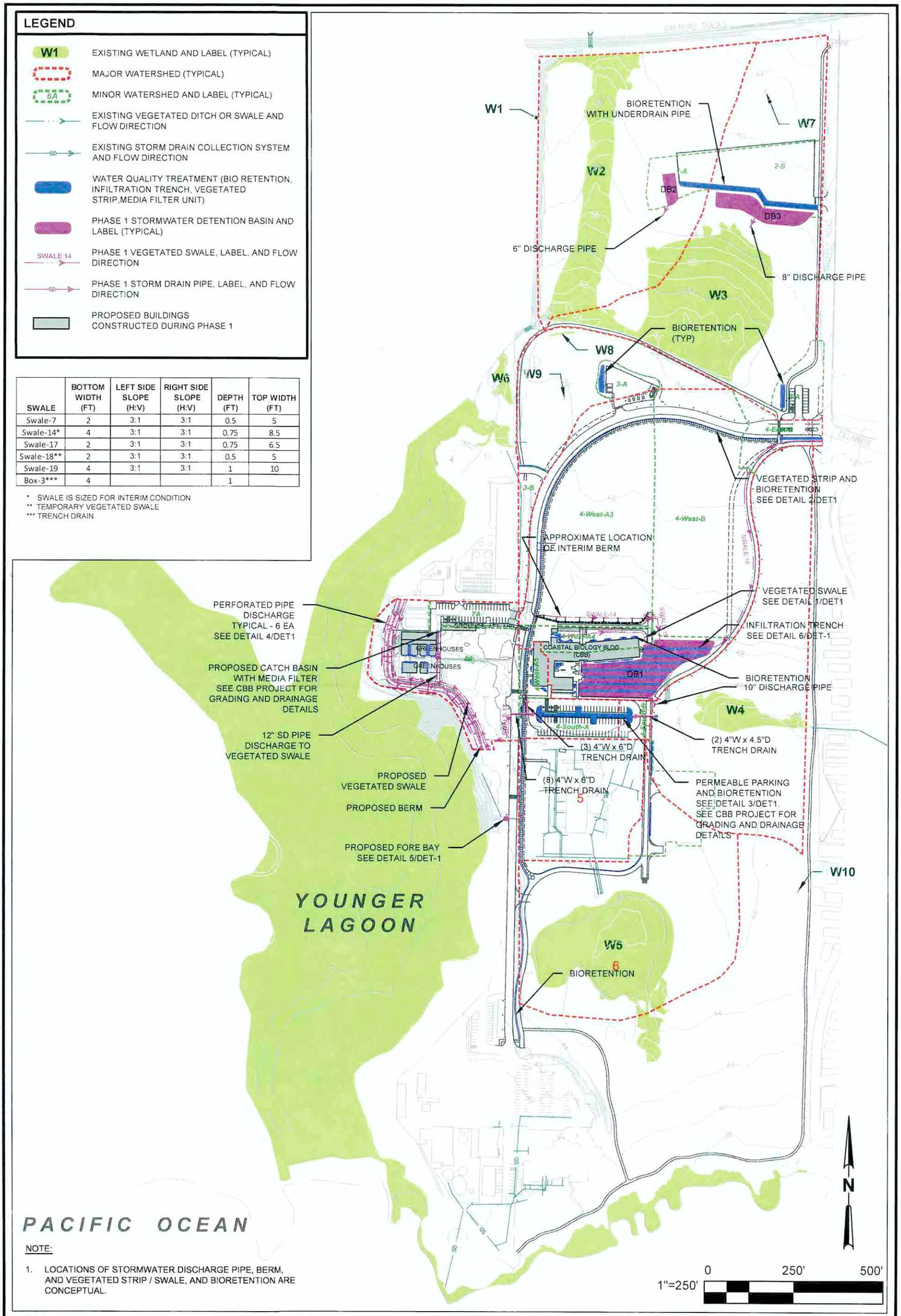

SWALE	BOTTOM WIDTH (FT)	LEFT SIDE SLOPE (H:V)	RIGHT SIDE SLOPE (H:V)	DEPTH (FT)	TOP WIDTH (FT)
Swale-7	2	3:1	3:1	0.5	5
Swale-14*	4	3:1	3:1	0.75	8.5
Swale-17	2	3:1	3:1	0.75	6.5
Swale-18**	2	3:1	3:1	0.5	5
Swale-19	4	3:1	3:1	1	10
Box-3***	4			1	

* SWALE IS SIZED FOR INTERIM CONDITION
** TEMPORARY VEGETATED SWALE
*** TRENCH DRAIN

NOTE:

1. LOCATIONS OF STORMWATER DISCHARGE PIPE, BERM, AND VEGETATED STRIP / SWALE, AND BIORETENTION ARE CONCEPTUAL.

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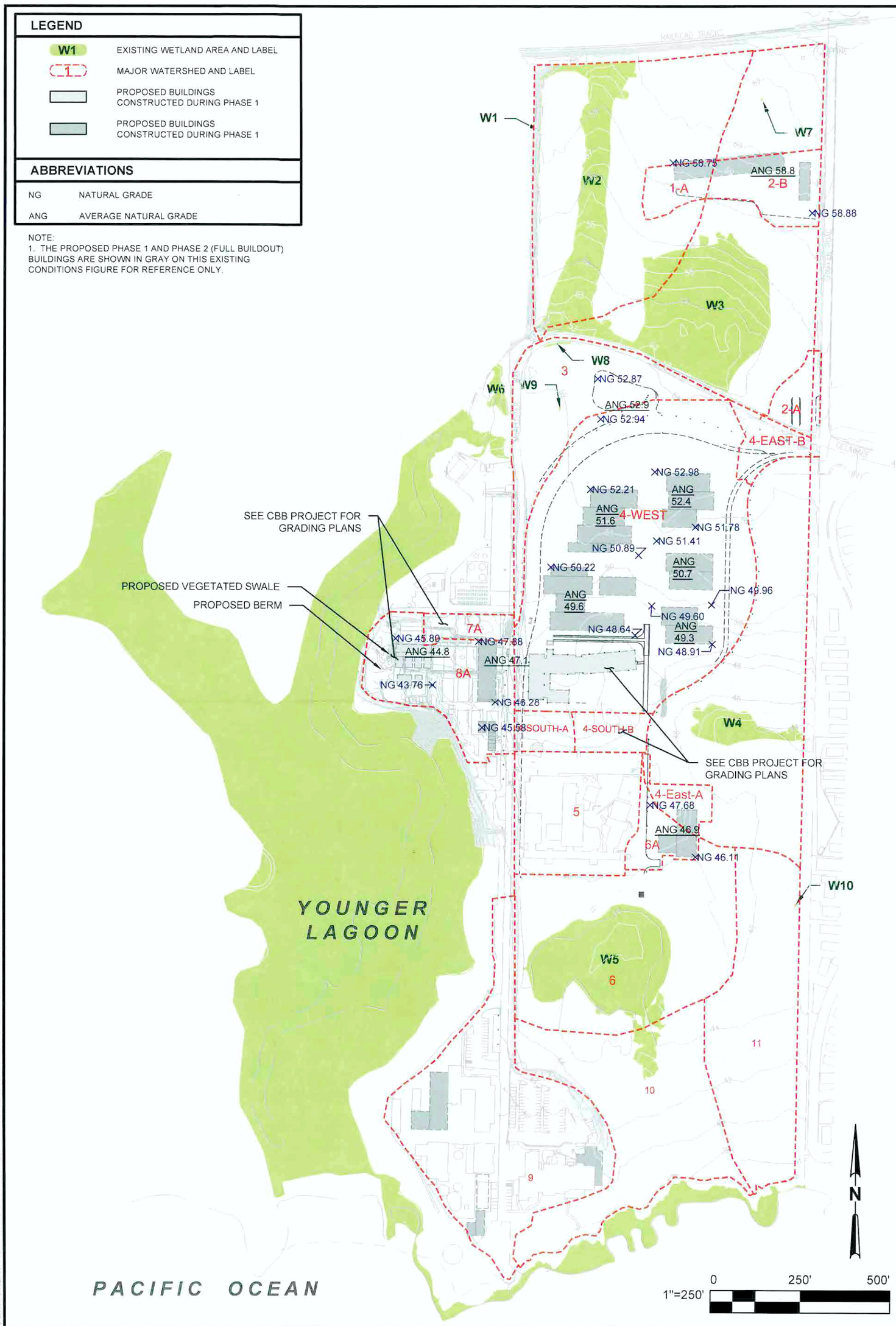
MARINE SCIENCE CAMPUS INFRASTRUCTURE SCHEMATIC DESIGN
UCSC PROJECT NUMBER 4933

PHASE 1: VEGETATED SWALE PLAN

PROJ NO. 10311-10-007
DRWN TP | CHKD TS
DATE: DECEMBER, 2010
FIGURE NO.
SD1



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MARINE SCIENCE CAMPUS INFRASTRUCTURE SCHEMATIC DESIGN UCSC PROJECT NUMBER 4933

AVERAGE NATURAL GRADE

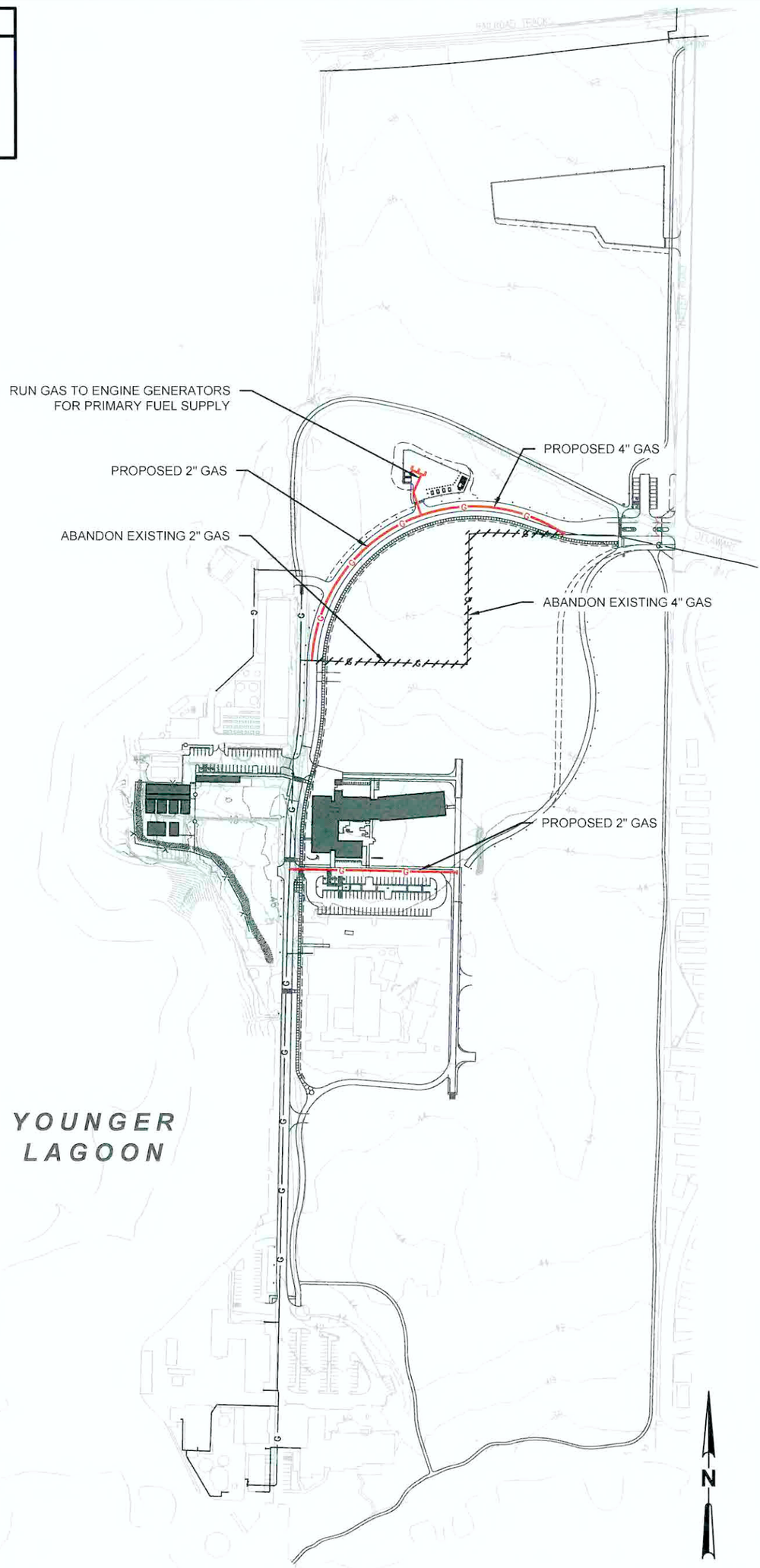
PROJ NO: 10311-10-007
DRWN: TP CHKD: TS
DATE: DECEMBER, 2010
FIGURE NO: **GR1**

LEGEND

- EXISTING NATURAL GAS PIPE
- PROPOSED NATURAL GAS PIPE INSTALLED DURING PHASE 1
- EXISTING NATURAL GAS PIPE TO BE ABANDONED / DEMOLISHED

NOTES:

SERVICE LATERALS TO BUILDINGS HAVE NOT BEEN SHOWN.



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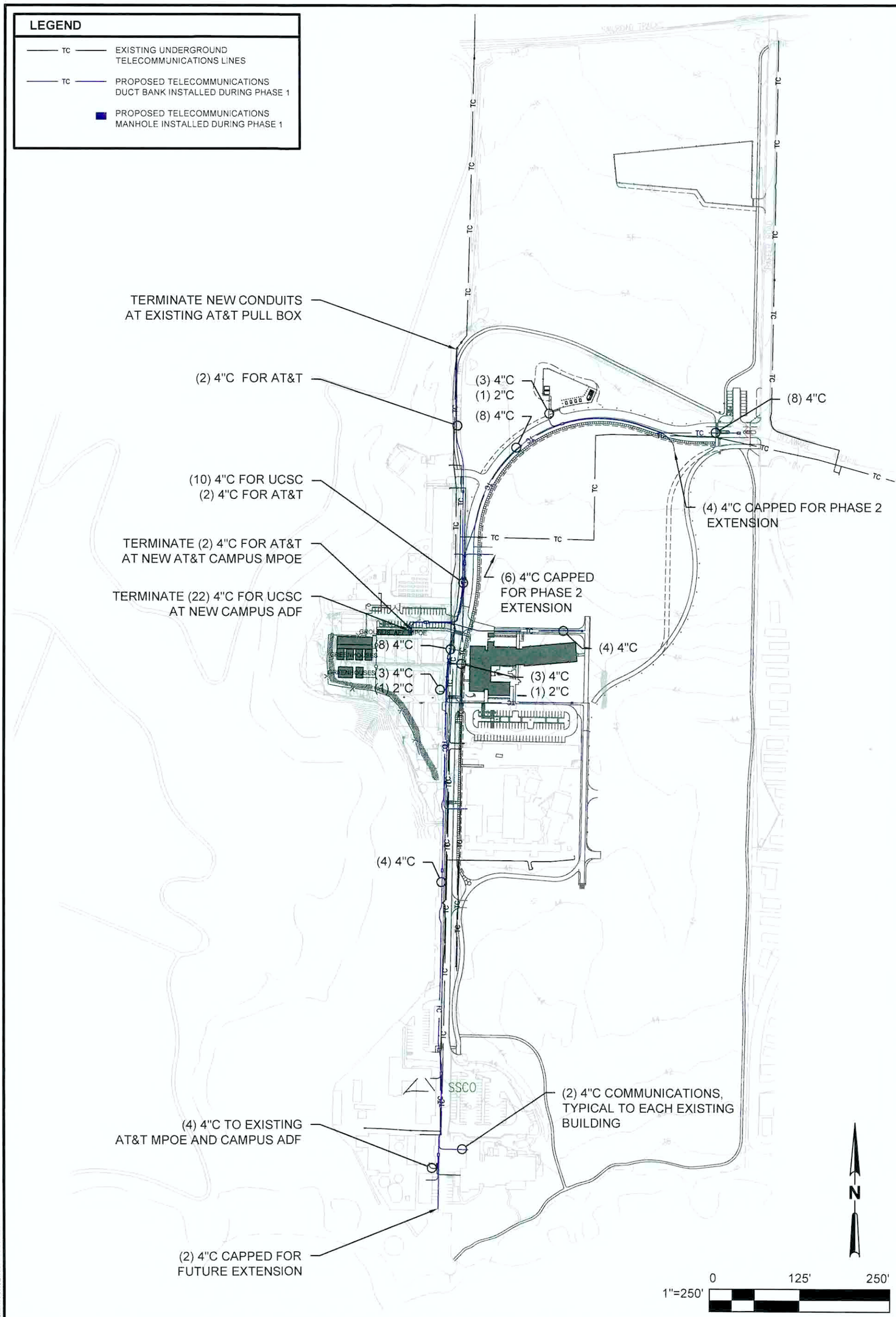
PHASE 1: NATURAL GAS

PROJ NO	10311-10-007
DRWN TP	CHKD TS
DATE	DECEMBER, 2010
FIGURE NO	ME1



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MARINE SCIENCE CAMPUS INFRASTRUCTURE SCHEMATIC DESIGN UCSC PROJECT NUMBER 4933

PHASE 1: TELECOMMUNICATIONS PLAN

PROJ NO: 10311-10-007
DRWN: CW | CHKD: CW
DATE: DECEMBER, 2010
FIGURE NO.
TC1

2011-03-21 3:16 PM TPHAM
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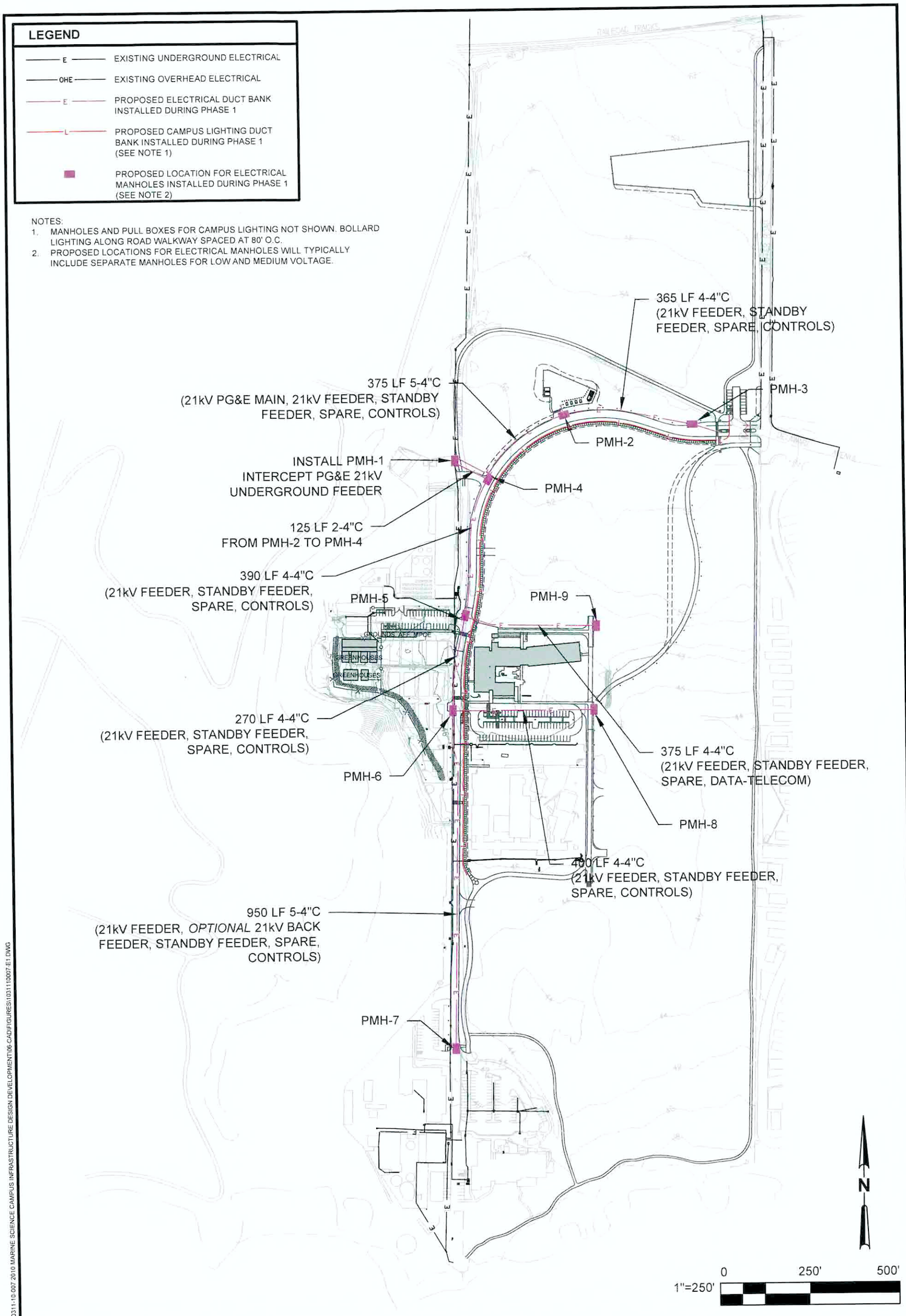

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Santa Cruz, California

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MARINE SCIENCE CAMPUS INFRASTRUCTURE SCHEMATIC DESIGN UCSC PROJECT NUMBER 4933

PHASE 1: ELECTRICAL PLAN

PROJ NO: 10311-10-007
DRWN: AML CHKD: SD
DATE: DECEMBER, 2010
FIGURE NO:
E1

2011-03-21 3:48 PM PSCHEETZ
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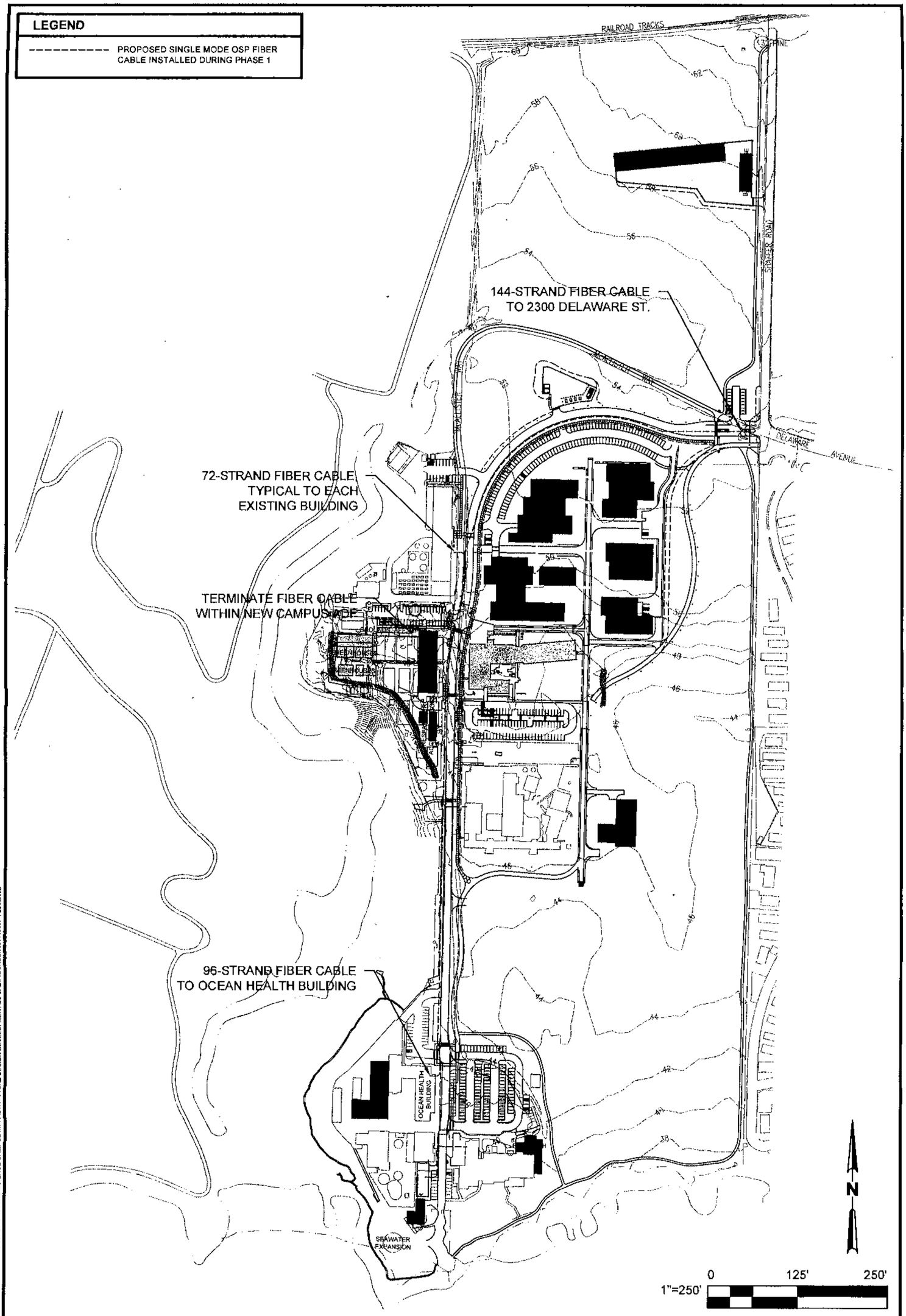

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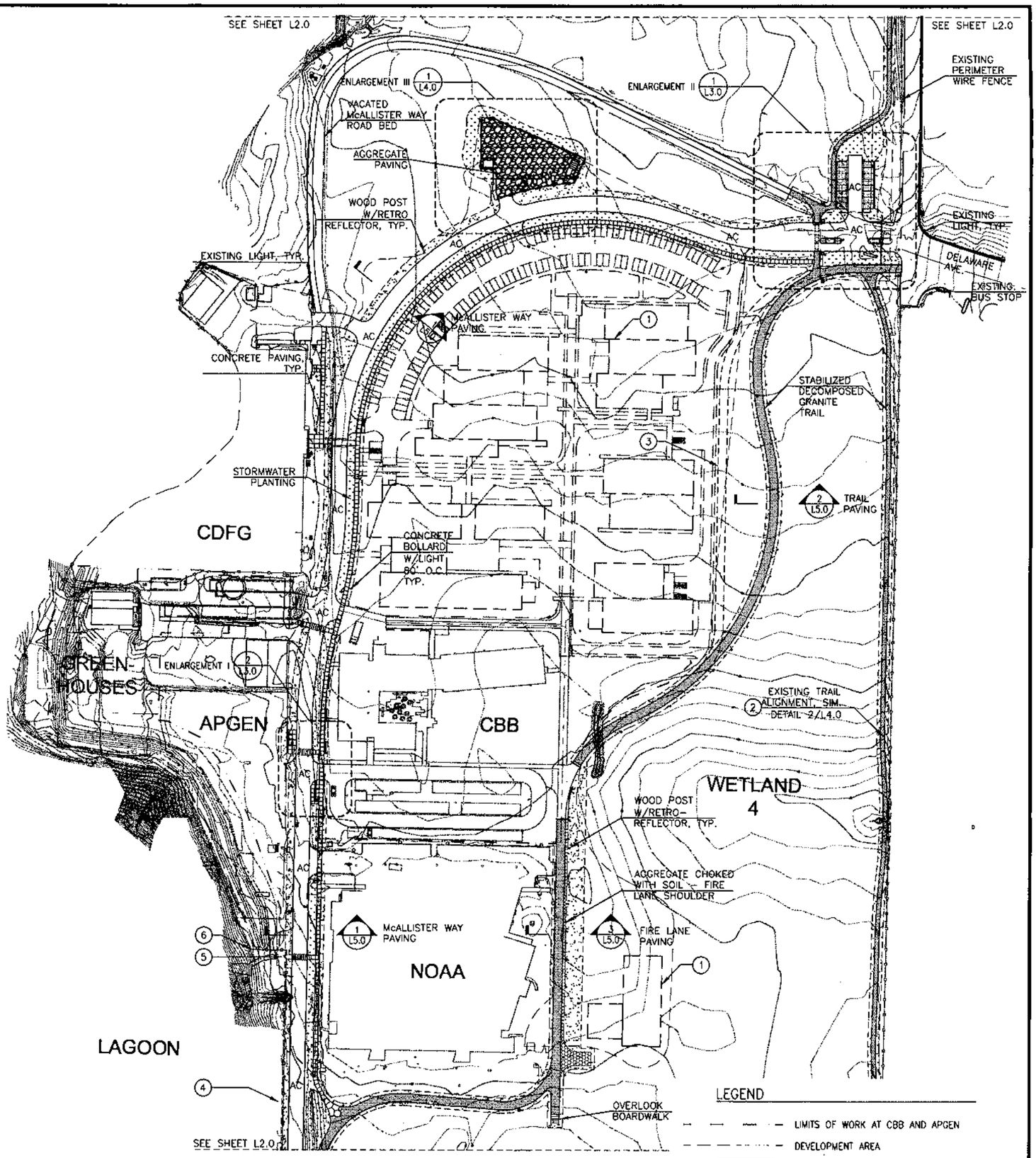
MARINE SCIENCE CAMPUS INFRASTRUCTURE SCHEMATIC DESIGN UCSC PROJECT NUMBER 4933

PHASE 1: TELECOMMUNICATIONS FIBER CABLING PLAN

PROJ NO. 10311-10-007
DRWN: CW | CHKD: CW
DATE: DECEMBER, 2010
FIGURE NO.
TC4



KEY NOTES

1. FUTURE PLAN DEVELOPMENT. ACTUAL PLAN MAY VARY
2. EXISTING TRAIL TO BE REGRADED TO 6-FOOT WIDTH AND RESURFACED WITH STABILIZED DECOMPSED GRANITE.
3. ALTERNATE TRAIL ALIGNMENT AT SUBAREA 8, UCSC TO CONFIRM.
4. REMOVE EXISTING CHAIN-LINK FENCE AND INSTALL NEW FENCE.
5. INSTALL 4-FOOT WIDE GATE AT FUTURE OVERLOOK LOCATION. INSTALL 90% OPAQUE SHADE CLOTH ON GATE.
6. END NEW FENCE. CBB PROJECT CONTINUES FENCE INSTALLATION TO GREENHOUSES.

LEGEND

- LIMITS OF WORK AT CBB AND APGEN
- DEVELOPMENT AREA
- CONCRETE PAVING
- AC — ASPHALT PAVING - H20 RATED
- STABILIZED DECOMPOSED GRANITE PAVING
- AGGREGATE PAVING
- AGGREGATE CHOKED WITH SOIL - FIRE LANE SHOULDER
- PERMEABLE UNIT PAVERS
- STORMWATER PLANTING AREA
- NATIVE SEED MIX
- x — WIRE FENCE - MATCH EXISTING NON SIGHT-OBSCURING HELD 6" OFF FINISH GRADE
- WOOD FENCE SIGHT-OBSCURING HELD 6" OFF FINISH GRADE
- WOOD POST WITH RETROREFLECTOR

N

SCALE
0' 75' 150' 225'
1" = 75'

2011.02.21 10:01 AM GRAMPTON
F:\WORK\1103\DRAWR\PLOTS\L0.DWG

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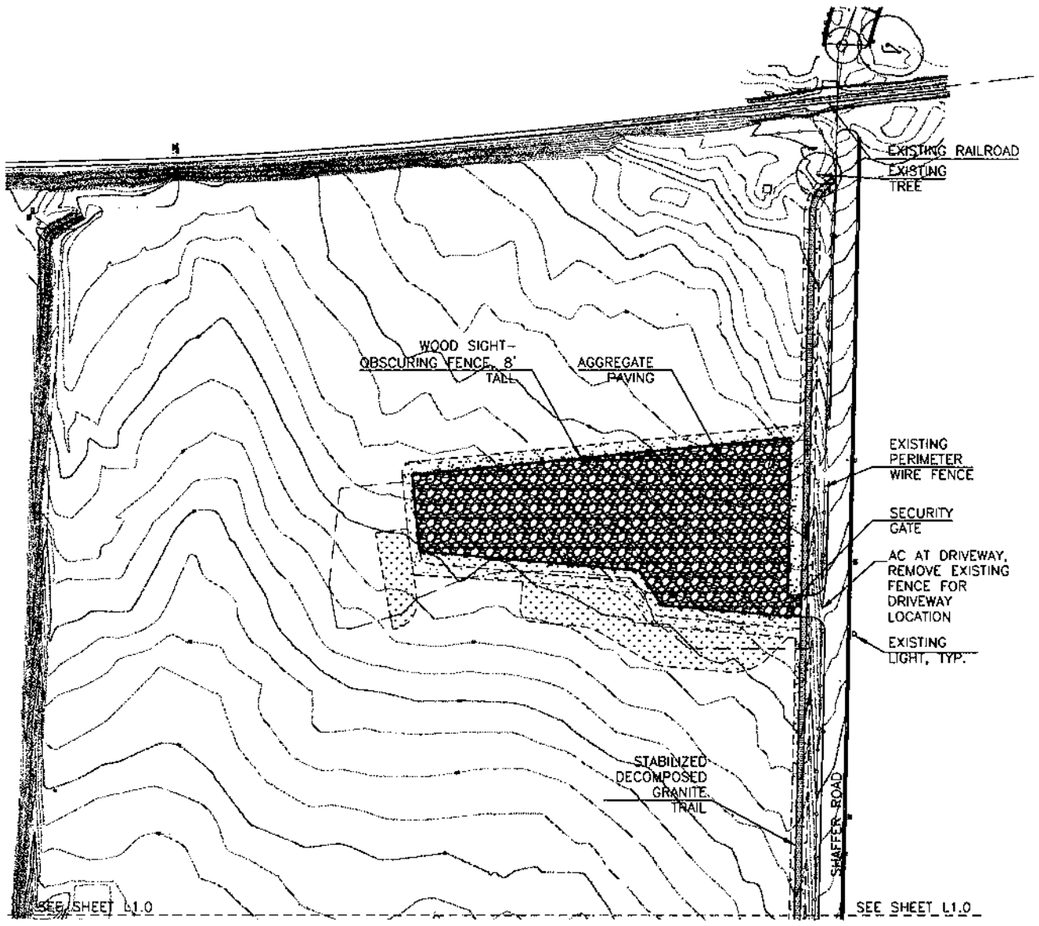
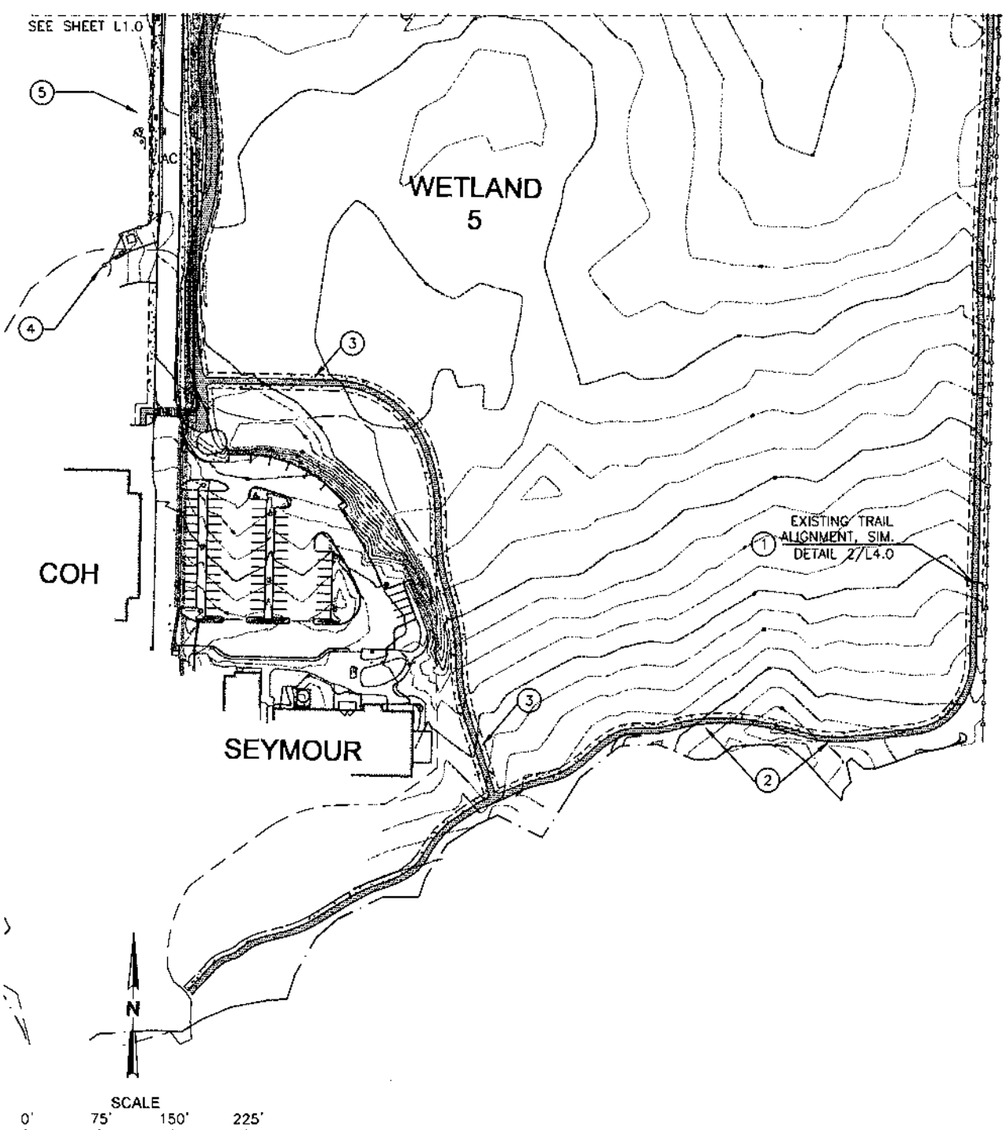
MARINE SCIENCE CAMPUS
INFRASTRUCTURE SCHEMATIC DESIGN
UCSC PROJECT NUMBER 4933

LANDSCAPE SITE PLAN

PROJ NO 10311-10-007
DRWN: MC CHKD. TC
DATE: MARCH, 2011
FIGURE NO:
L1.0





LEGEND

- LIMITS OF WORK AT CBB AND APGEN
- DEVELOPMENT AREA
- CONCRETE PAVING
- AC — ASPHALT PAVING – H20 RATED
- STABILIZED DECOMPOSED GRANITE PAVING
- AGGREGATE PAVING
- AGGREGATE CHOKED WITH SOIL – FIRE LANE SHOULDER
- PERMEABLE UNIT PAVERS
- STORMWATER PLANTING AREA
- NATIVE SEED MIX
- x — WIRE FENCE – MATCH EXISTING NON SIGHT-OBSCURING HELD 6" OFF FINISH GRADE
- WOOD FENCE SIGHT-OBSCURING HELD 6" OFF FINISH GRADE
- WOOD POST WITH RETROREFLECTOR

KEY NOTES

1. EXISTING TRAIL TO BE REGRADED TO 6-FOOT WIDTH AND RESURFACED WITH STABILIZED DECOMPSED GRANITE.
2. APPROXIMATELY 300-FEET OF EXISTING TRAIL TO BE ELEVATED (ROCK TURNPIKE) WITH WITH OPEN GRADED DRAIN ROCK TO ALLOW WATER MOVEMENT BELOW THE TRAIL PROFILE IN ORDER TO PREVENT LOCATIZED FLOODING OF THE TRAIL.
3. TRAIL ALIGNMENT PREDICATED ON FUTURE PARKING LOT AND BERM REALIGNMENT.
4. BEGIN NEW FENCE AT THE END OF EXISTING FENCE AT DRIVEWAY. INSTALL NEW FENCE 8-FEET FROM EDGE OF PAVING.
5. REMOVE EXISTING CHAIN-LINK FENCE AND INSTALL NEW FENCE.

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111 SW Oak, Suite 200 Portland, OR 97204
Phone 503.228.4122 Fax 503.228.1978

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PHYSICAL PLANNING AND CONSTRUCTION
Santa Cruz Campus — Santa Cruz, California

BAR IS ONE INCH ON ORIGINAL DRAWING
0 — 1"

MARINE SCIENCE CAMPUS
INFRASTRUCTURE SCHEMATIC DESIGN
UCSC PROJECT NUMBER 4933

LANDSCAPE SITE PLAN

PROJ NO: 10311-10-007
DRWN: MC | CHKD: TC
DATE: MARCH, 2011
FIGURE NO.
L2.0

2011-03-21 10:09 AM GRAMPTON
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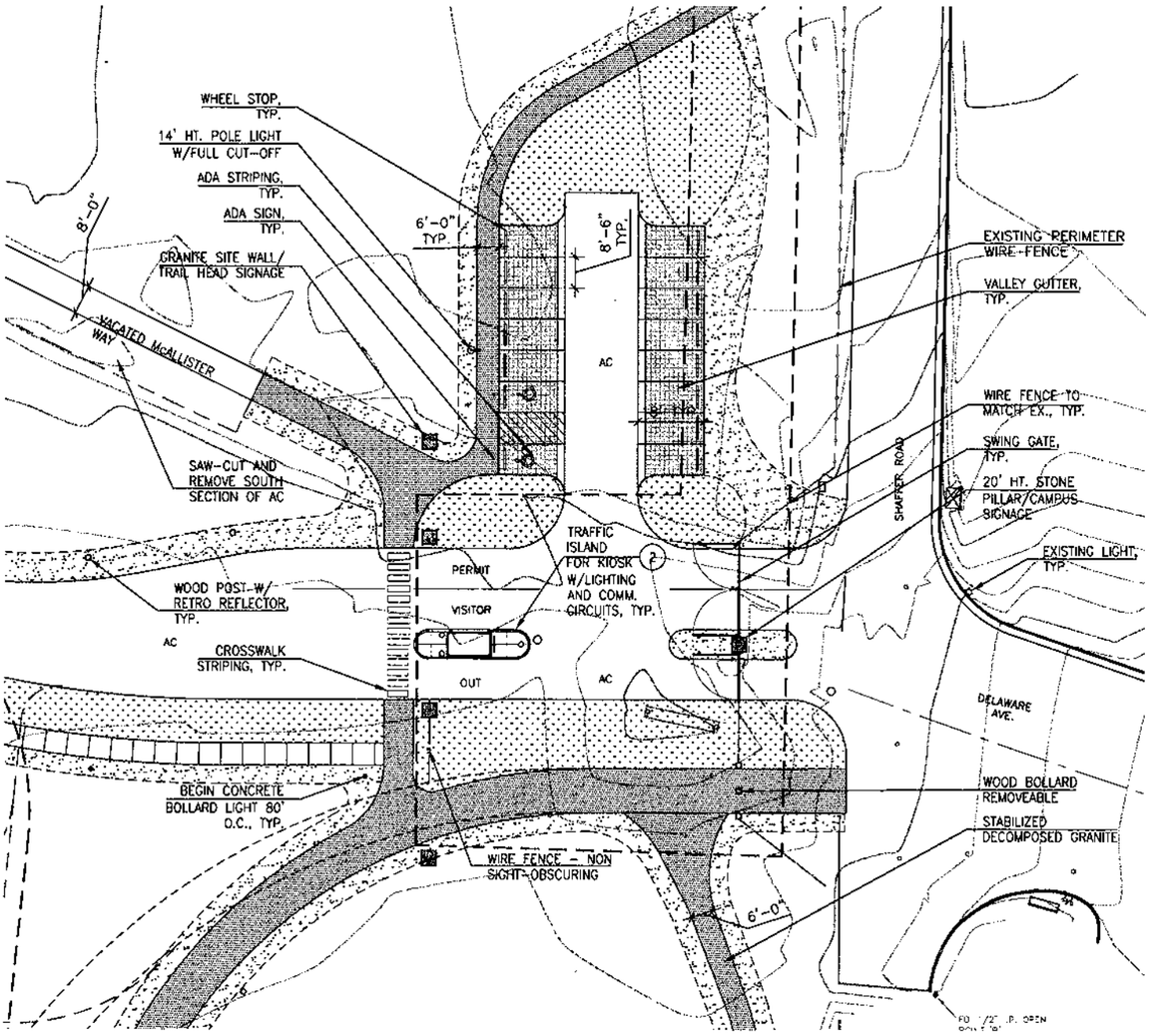
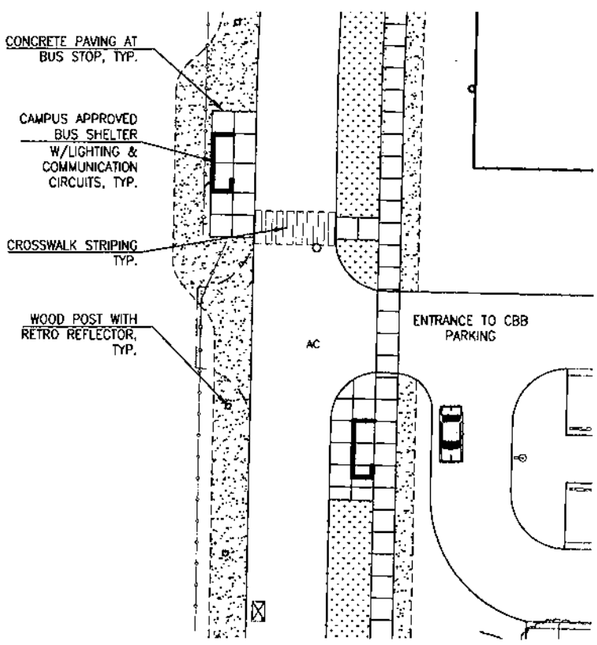


1 ENLARGEMENT II – MARINE CAMPUS ENTRY & PUBLIC PARKING – SUBAREA 16
SCALE: 1" = 20' – 0"
PLAN



2 ENLARGEMENT I – BUS STOPS AT CBB PARKING LOT
SCALE: 1" = 20' – 0"
PLAN

N

SCALE
0' 20' 40' 60'
1" = 20'

LEGEND

- LIMITS OF WORK FOR CBB, APGEN & GREENHOUSE
- DEVELOPMENT AREA
- CONCRETE PAVING
- AC — ASPHALT PAVING – H20 RATED
- STABILIZED DECOMPOSED GRANITE PAVING
- AGGREGATE PAVING
- AGGREGATE CHOKED WITH SOIL – FIRE LANE SHOULDER
- PERMEABLE PAVING
- STORMWATER PLANTING AREA
- NATIVE SEED MIX
- WIRE FENCE – MATCH EXISTING NON SIGHT-OBSCURING HELD 6" OFF FINISH GRADE
- WOOD FENCE SIGHT-OBSCURING HELD 6" OFF FINISH GRADE
- WOOD POST WITH RETRO REFLECTOR

2011-03-21, 10:12 AM, CRAMPTON
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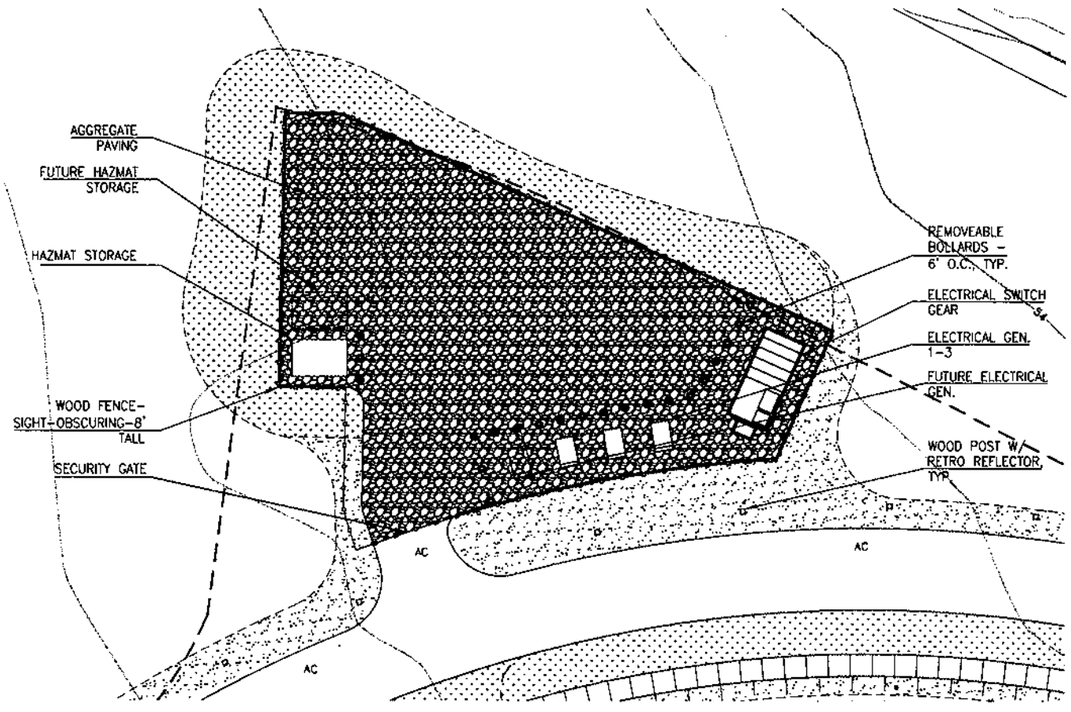
Santa Cruz Campus — Santa Cruz, California

BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"

MARINE SCIENCE CAMPUS INFRASTRUCTURE SCHEMATIC DESIGN
UCSC PROJECT NUMBER 4933

LANDSCAPE PLAN ENLARGEMENTS

PROJ NO. 10311-10-007
DRWN MC | CHKD TC
DATE MARCH, 2011
FIGURE NO
L3.0



1 ENLARGEMENT III – STORAGE YARD AND GENERATORS – SUBAREA 2

PLAN

LEGEND

- LIMITS OF WORK FOR CBB, APGEN & GREENHOUSE
- DEVELOPMENT AREA
- CONCRETE PAVING
- AC — ASPHALT PAVING – H20 RATED
- STABILIZED DECOMPOSED GRANITE PAVING
- AGGREGATE PAVING
- AGGREGATE CHOKED WITH SOIL – FIRE LANE SHOULDER
- PERMEABLE PAVING
- STORMWATER PLANTING AREA
- NATIVE SEED MIX
- WIRE FENCE – MATCH EXISTING NON SIGHT-OBSCURING HELD 6" OFF FINISH GRADE
- WOOD FENCE SIGHT-OBSCURING HELD 6" OFF FINISH GRADE
- WOOD POST WITH RETRO REFLECTOR

N

SCALE

0' 20' 40' 60'

1" = 20'

2011-03-21 2:24 PM CRAMPTON
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PHYSICAL PLANNING AND CONSTRUCTION

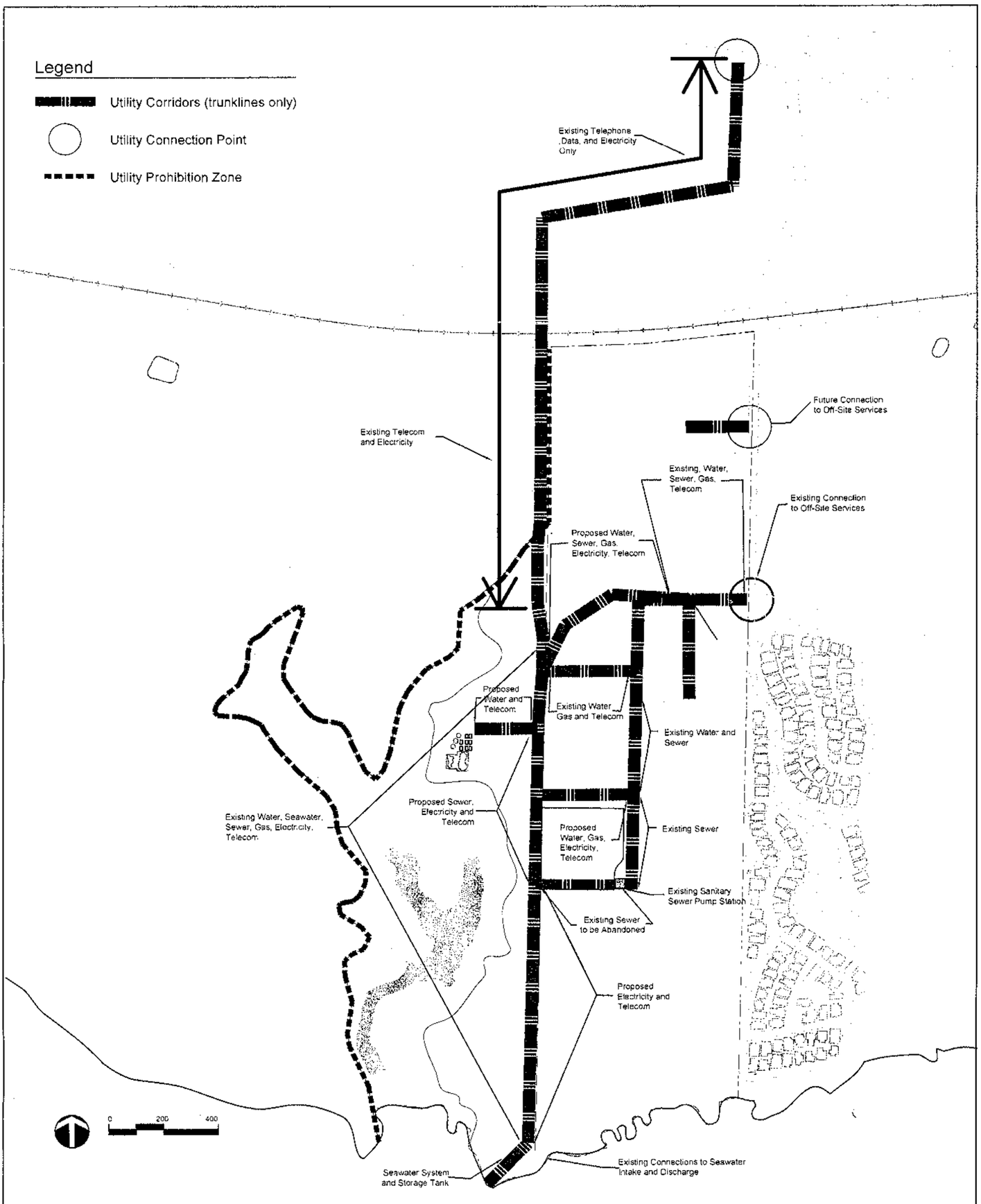
Santa Cruz Campus — Santa Cruz, California

BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"

MARINE SCIENCE CAMPUS
INFRASTRUCTURE SCHEMATIC DESIGN
UCSC PROJECT NUMBER 4933

LANDSCAPE PLAN ENLARGEMENTS

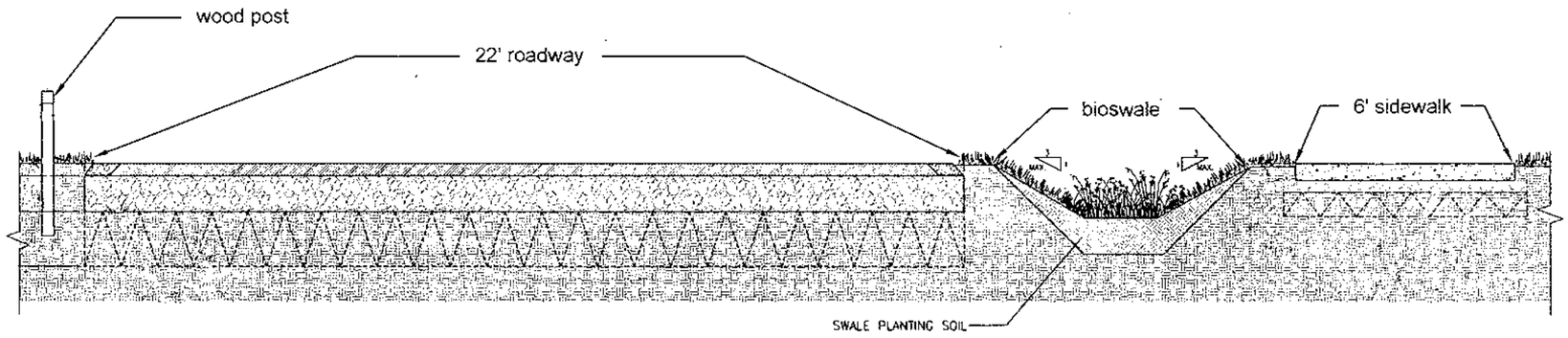
PROJ NO 10311-10-007
DRWN MC CHKD TC
DATE MARCH, 2011
FIGURE NO:
L4.0



UC Santa Cruz Marine Science Campus
Coastal Biology Building and
Infrastructure Improvement
Final Environmental Impact Report Nov. 2011

Proposed Utility Corridors

Figure
2-3b



UC Santa Cruz Marine Science Campus Coastal Biology Building and Infrastructure Improvements Final Environmental Impact Report Nov. 2011	Typical Cross-section of New Roadway	Figure 2-4

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landscape architecture urban design planning
[illegible]

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Santa Cruz Campus
Santa Cruz, California

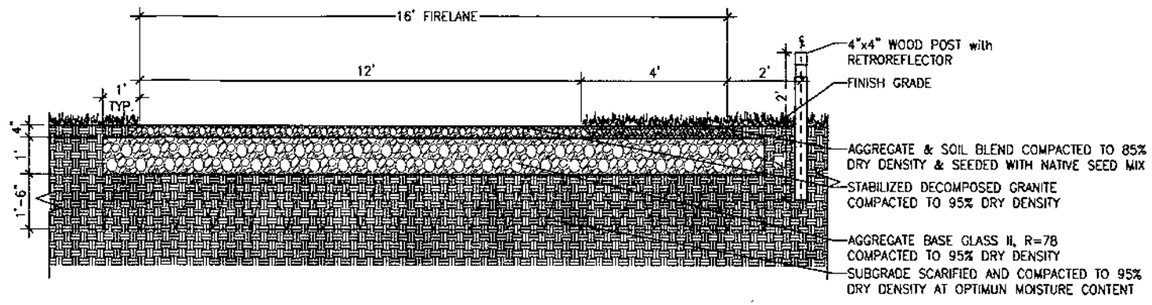
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"

MARINE SCIENCE CAMPUS
INFRASTRUCTURE SCHEMATIC DESIGN
UCSC PROJECT NUMBER 4933

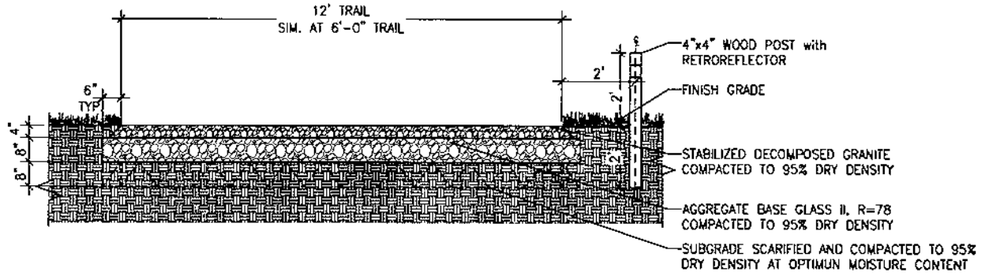
LANDSCAPE SECTIONS

PROJ NO: 10311-10-007
DRWN: MC | CHKD: TC
DATE: MARCH, 2011
FIGURE NO

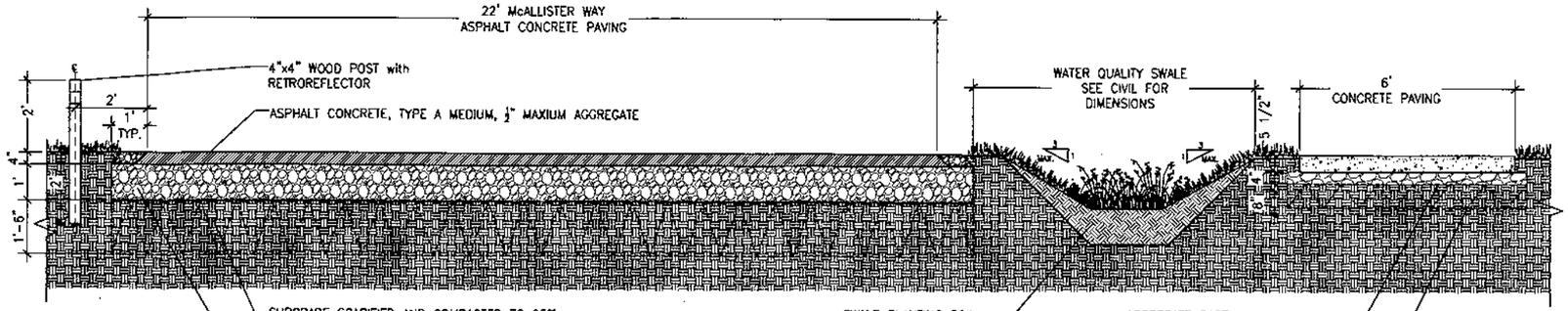
L5.0



3 FIRELANE PAVING
NTS
SECTION

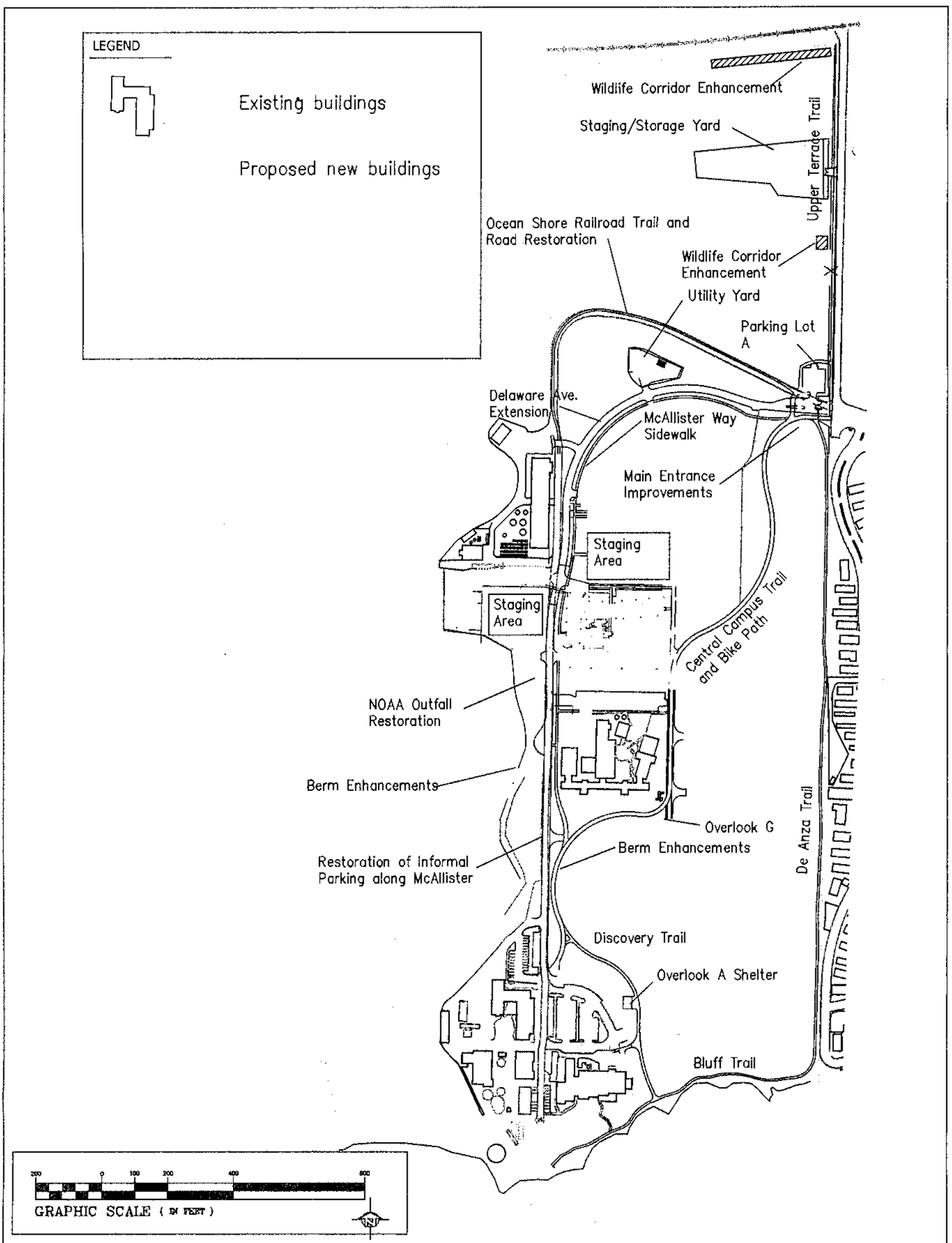


2 TRAIL PAVING
NTS
SECTION

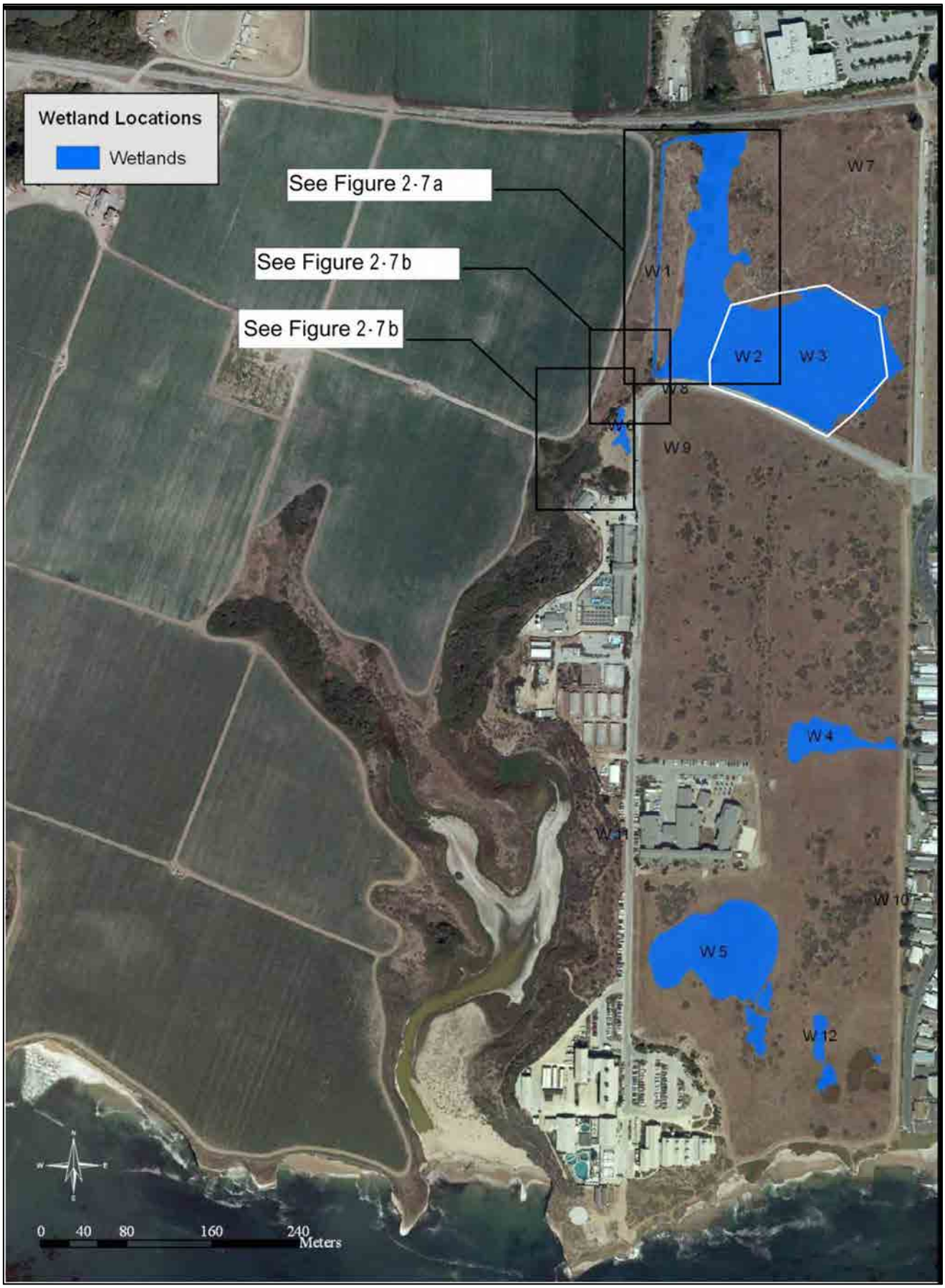


1 McALLISTER WAY PAVING
1/2" = 1'-0"
SECTION

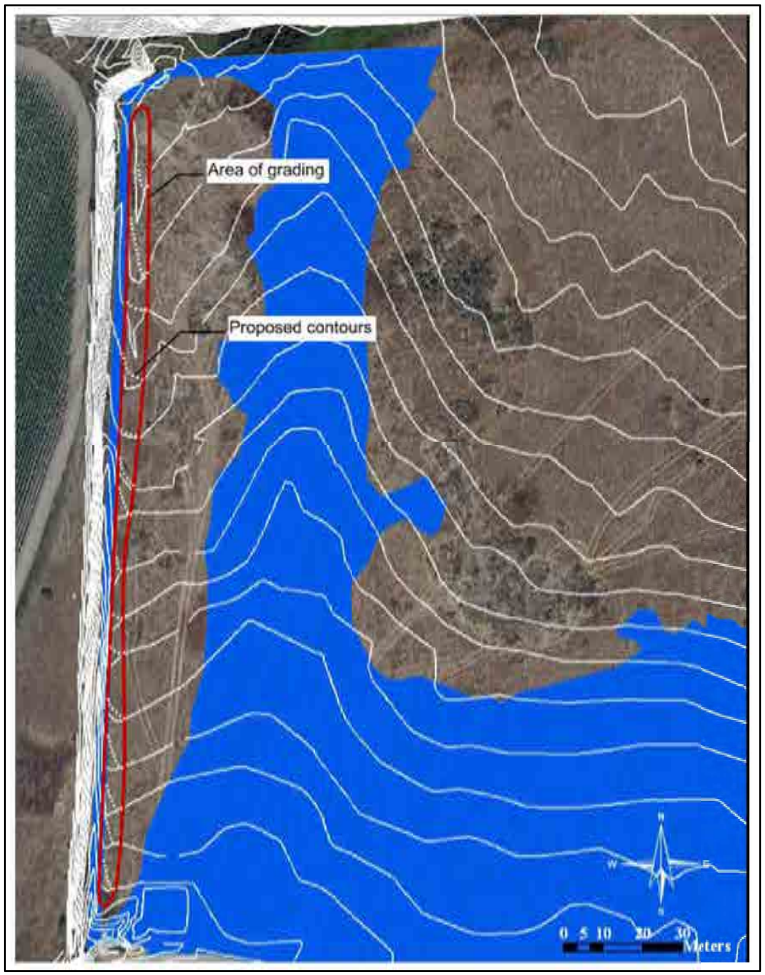
NOTE:
CONFIRM ALL DEPTH & WIDTH OF PAVING SECTIONS WITH GEOTECHNICAL ENGINEER AND FIRE MARSHALL.



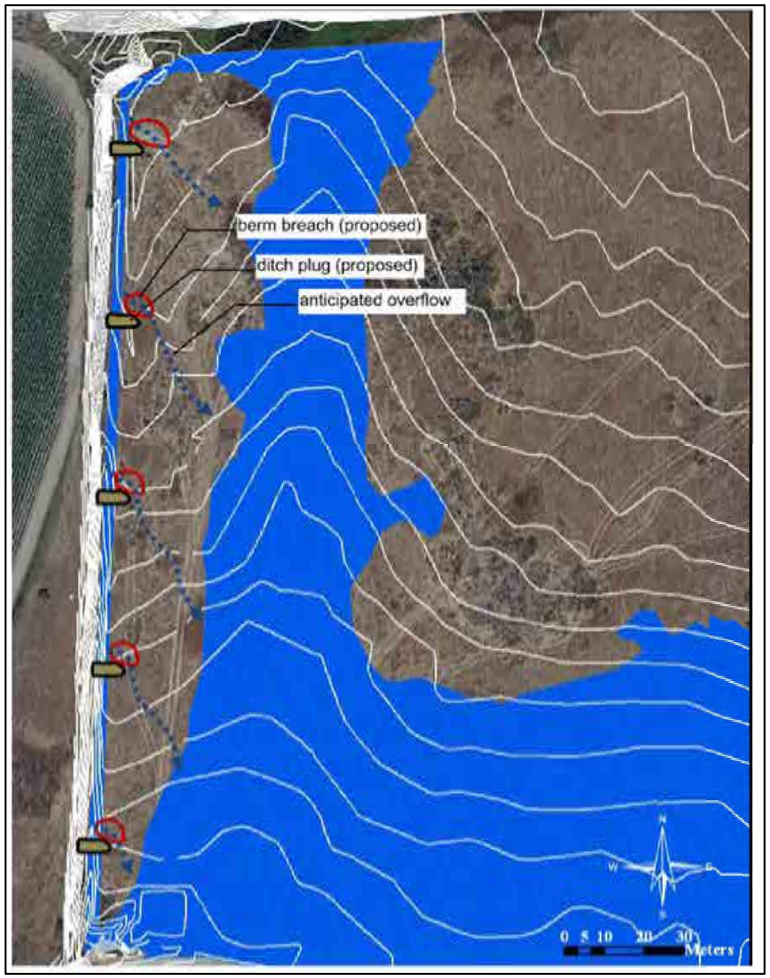
UC Santa Cruz Marine Science Campus Coastal Biology Building and Infrastructure Improvements Final Environmental Impact Report Nov. 2011	Proposed MSCI and NEF Project Elements (See Figure 2-3b for utility corridors)	Figure 2-3a



UC Santa Cruz Marine Science Campus Coastal Biology Building and Infrastructure Improvements Final Environmental Impact Report Nov. 2011	Marine Science Campus Wetlands	Figure 2-6



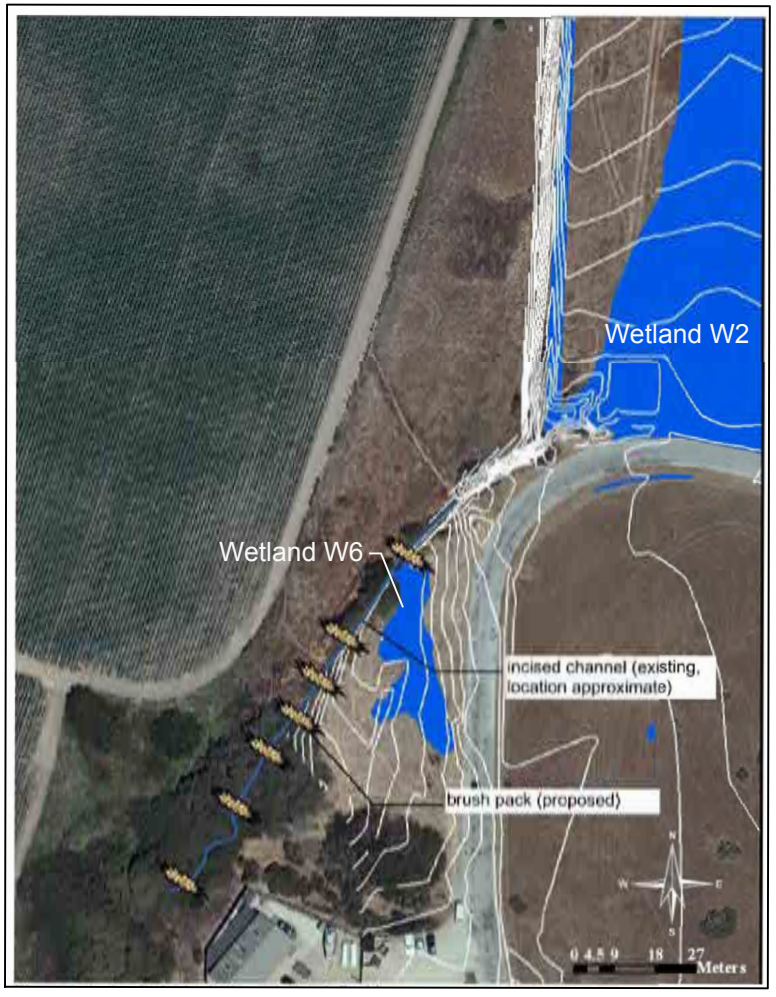
Option 1: Berm Removal



Option 2: Breach Berm

UC Santa Cruz Marine Science Campus Coastal Biology Building and Infrastructure Improvements Final Environmental Impact Report November 2011	Specific Resource Plan Phase 1B Options for Wetland W1 and W2 Reconnection	Figure 2-7a

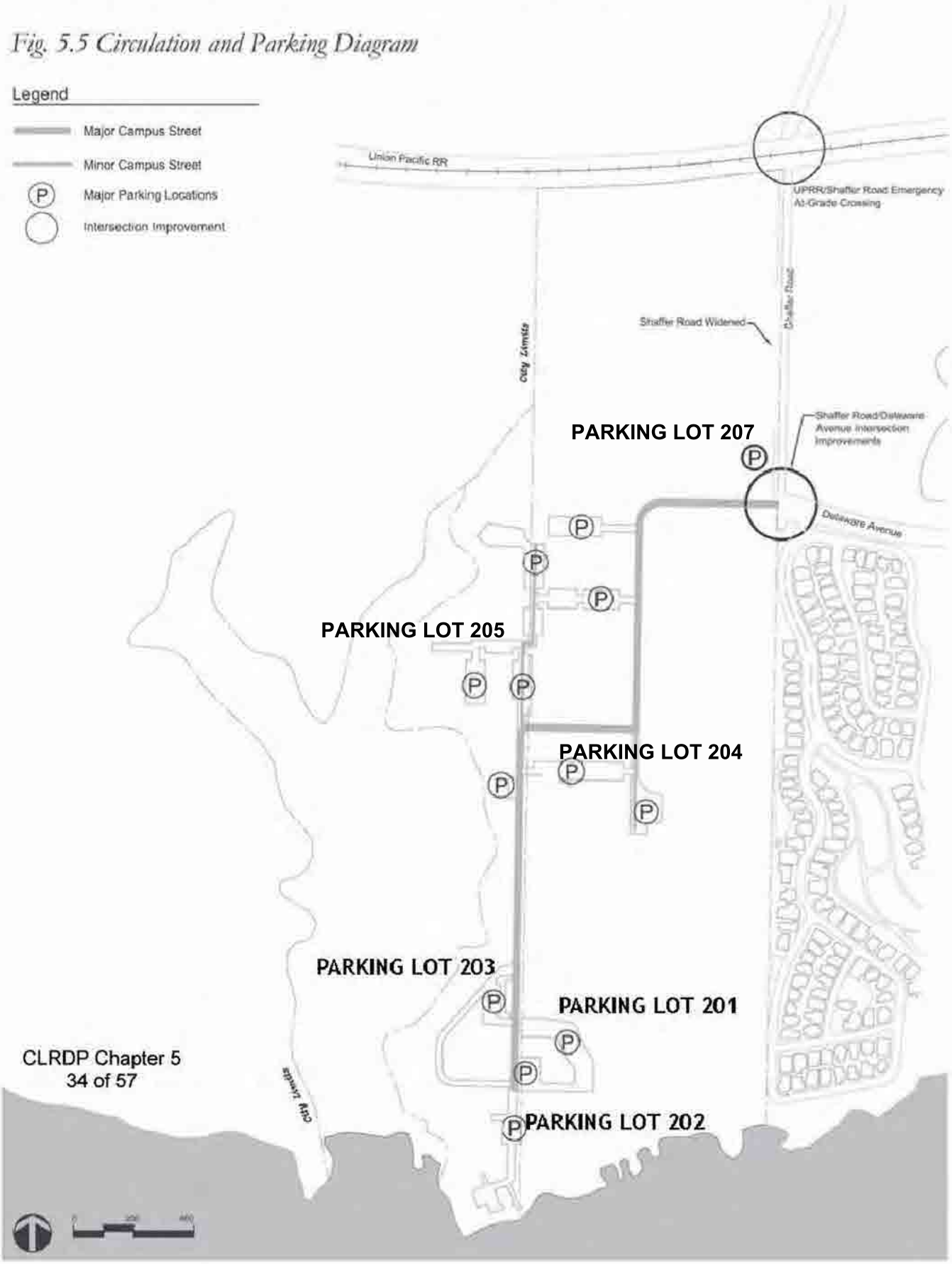
Flashboard Dam (large pond option)



Incised Channel Brush Packing

UC Santa Cruz Marine Science Campus Coastal Biology Building and Infrastructure Improvements Final Environmental Impact Report November 2011	Specific Resource Plan Phase 1B Flashboard Dam and Brush Packing	Figure 2-7b

Fig. 5.5 Circulation and Parking Diagram



Middle Terrace Parking Lots

LOT 207

TOTAL SPACES: 15

FREE PARKING 13
DISABLED 2

LOT 205

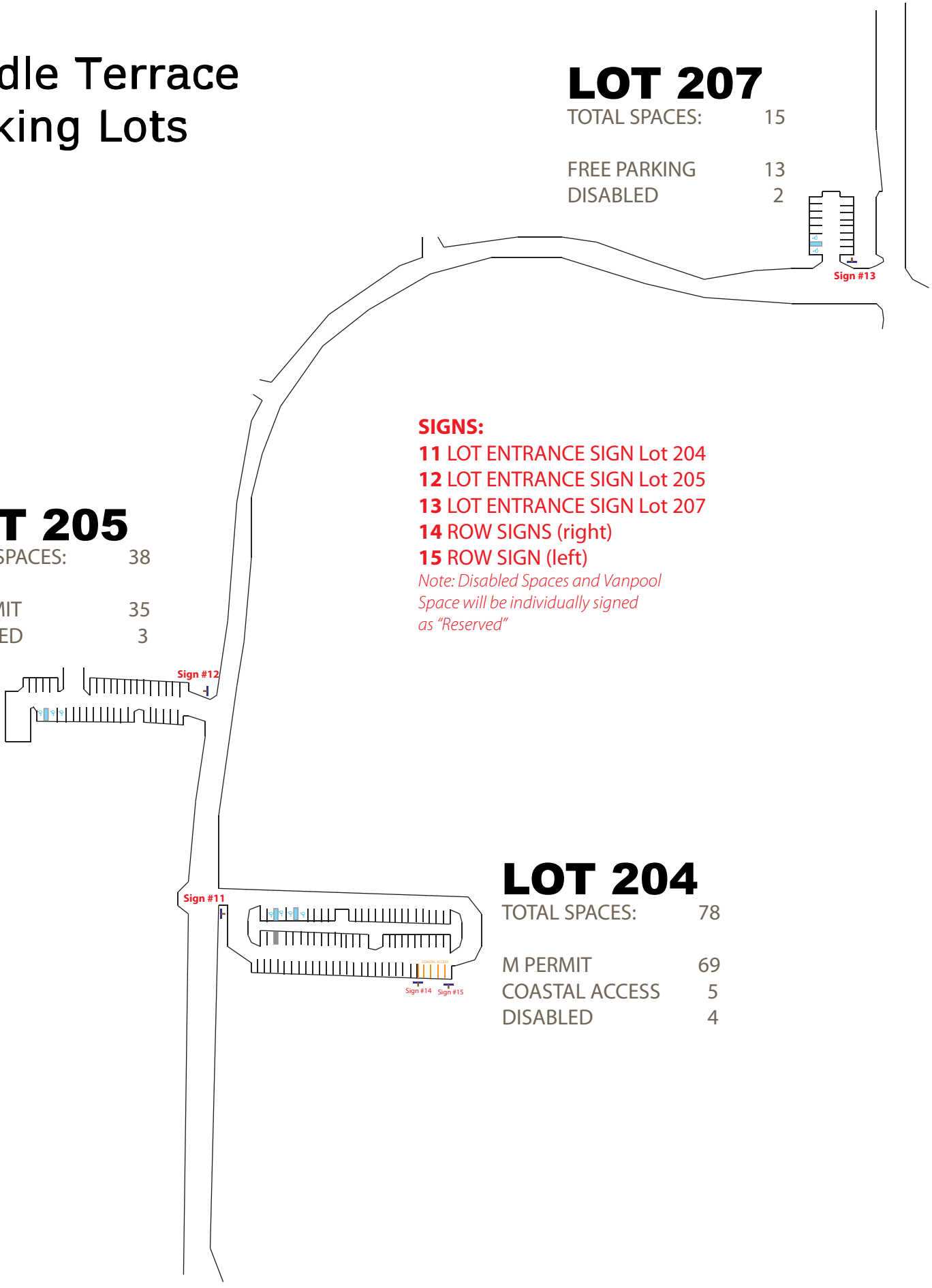
TOTAL SPACES: 38

M PERMIT 35
DISABLED 3

SIGNS:

11 LOT ENTRANCE SIGN Lot 204
12 LOT ENTRANCE SIGN Lot 205
13 LOT ENTRANCE SIGN Lot 207
14 ROW SIGNS (right)
15 ROW SIGN (left)

Note: Disabled Spaces and Vanpool Space will be individually signed as "Reserved"

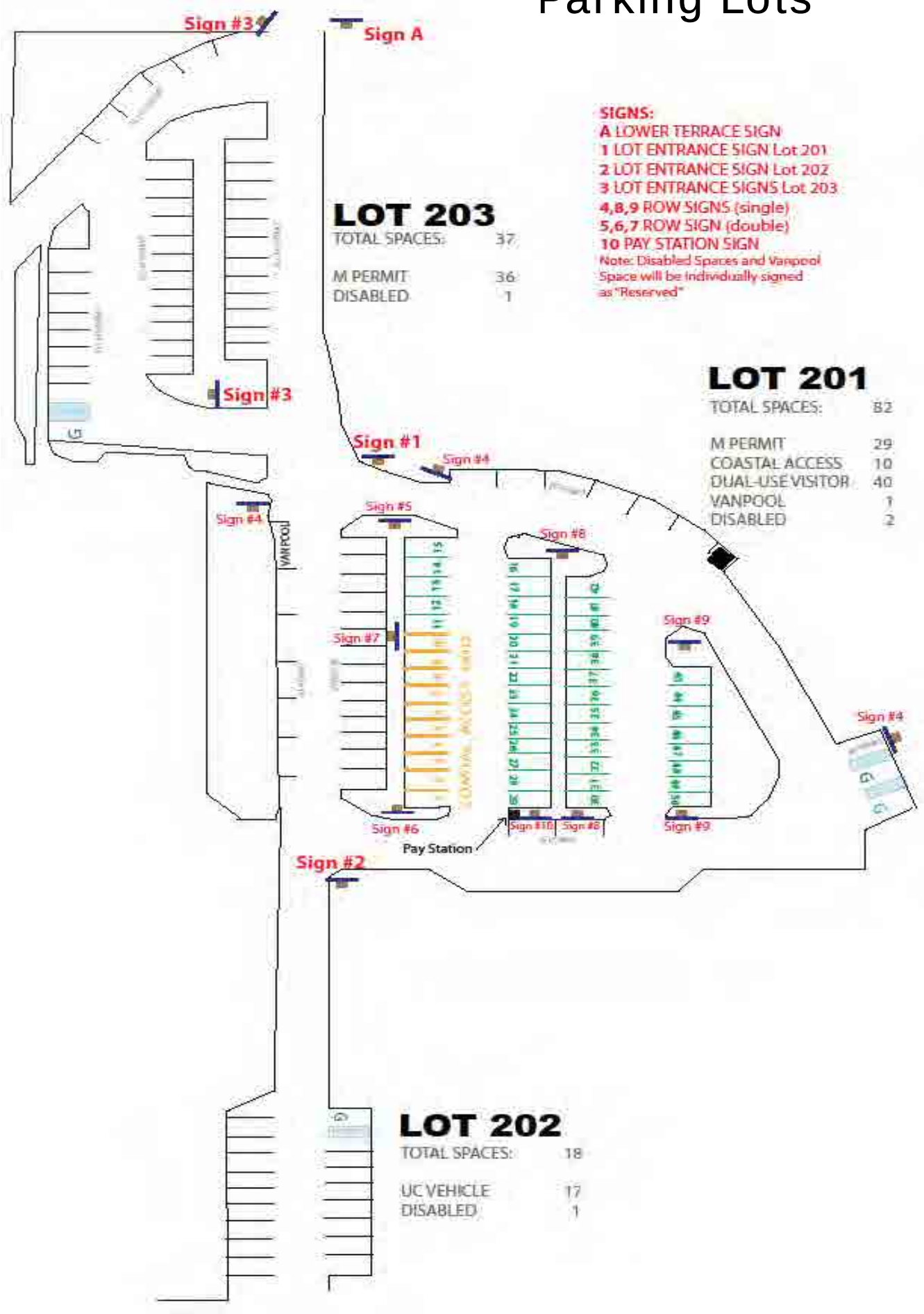


LOT 204

TOTAL SPACES: 78

M PERMIT 69
COASTAL ACCESS 5
DISABLED 4

Lower Terrace Parking Lots



24” W
24” H

24” W
24” H

ENTRANCE SIGN ARRAY 1

24” W
24” H

P Lot 202

Permit Types Allowed:

UNIVERSITY VEHICLES

Park only in marked spaces.
Enforced Monday-Friday 8:00 am - 5:00 pm.

24” W
24” H

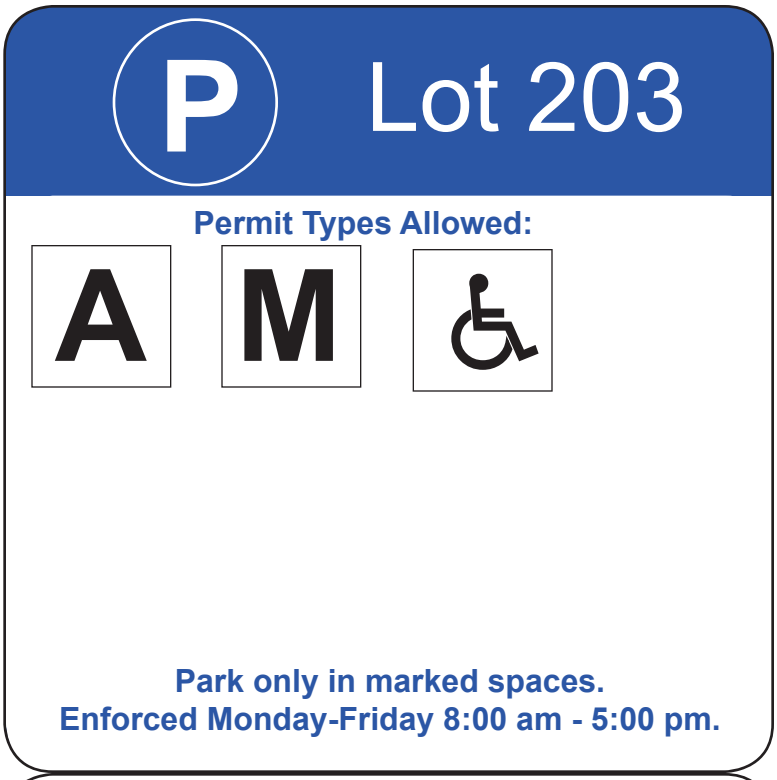
UNAUTHORIZED VEHICLES PARKED IN DESIGNATED ACCESSIBLE SPACES NOT DISPLAYING DISTINGUISHING PLACARDS OR SPECIAL LICENSE PLATES ISSUED FOR PERSONS WITH DISABILITIES WILL BE TOWED AWAY AT THE OWNER’S EXPENSE

TOWED VEHICLES MAY BE CLAIMED AT
(Insert Address)

OR BY TELEPHONING
(Insert Telephone Number)

ENTRANCE SIGN ARRAY 2

24” W
24” H



24” W
24” H

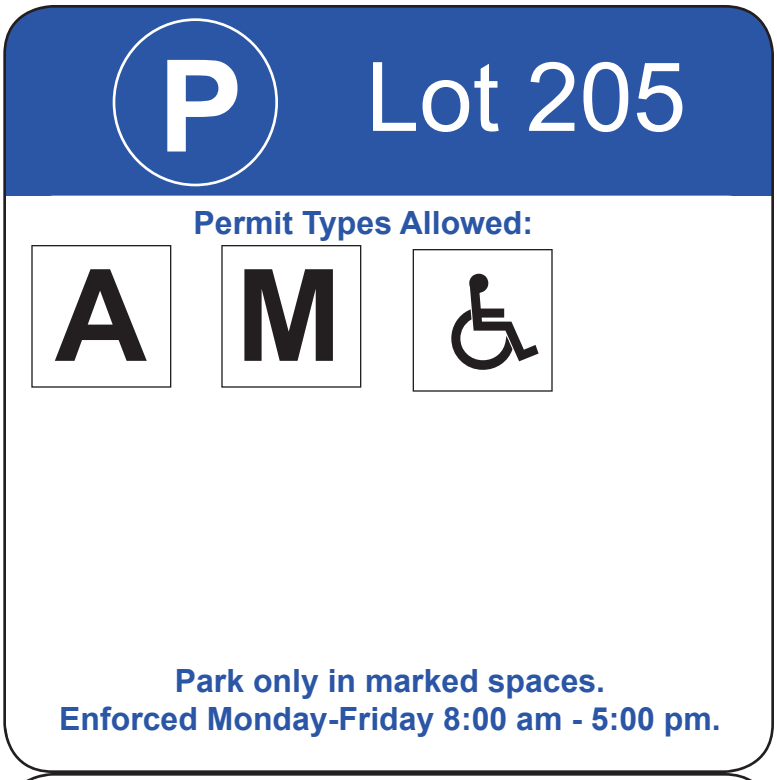
ENTRANCE SIGN ARRAY 3

24” W
24” H

24” W
24” H

ENTRANCE SIGN ARRAY 11

24” W
24” H



24” W
24” H

ENTRANCE SIGN ARRAY 12

24” W
24” H

24” W
24” H

ENTRANCE SIGN ARRAY 13

LOWER TERRACE ENTRANCE SIGN A

24” W
24” H

4” W
6” H
Pay Station
Decal

ROW (END) SIGN 4

12” W
12” H

ROW (END) SIGN 5

24” W
12” H

ROW (END) SIGN 6

24” W
12” H

ROW (END) SIGN 7

24” W
12” H

ROW (END) SIGN 8

12” W
12” H

ROW (END) SIGN 9

12” W
12” H

SIGN AT PAY STATION 10

12” W
12” H

ROW (RIGHT) SIGN 14

12” W
12” H

ROW (LEFT) SIGN 15

12” W
12” H

APPENDIX B6: UCSC Marine Science Campus Signage Program

The signage program for the Marine Sciences Campus would consist of three basic types of signs:

- Wayfinding/Directional/Informational
- Regulatory
- Interpretive

Wayfinding signs would be installed or replaced throughout the campus to facilitate public access to current and proposed buildings, interpretive features and amenities. Wayfinding signs may include locational identifiers or directional indicators to direct visitors to major buildings and programs including the Seymour Marine Discovery Center, parking lots, trails and overlooks, and other visitor amenities. A main wayfinding exhibit orienting visitors to the campus would be established at the main entrance to the campus, which may include maps and more detailed wayfinding and/or programming information. Other informational signs in this category may include those for posting hours or policies, safety warnings, restricted areas, etc. Wayfinding signage would have its own graphic theme of font, font color, and background.

Sign material would consist of:

Regal Bronze Alumalite planks or wood planks
Rough-cut redwood posts
Univers 67 Condensed Bold White type
Variations of above as necessary to accommodate information signs with dense text

The Wayfinding/Directional/Informational signage category includes:

- Campus directional signs
- Campus street signs
- Pedestrian wayfinding signposts
- Miscellaneous information

Campus Directional Sign

This sign is the primary communication medium for conveying directional information on the campus. These signs indicate the directions to each major building complex and activity center. Technical specifications: Regal Bronze Alumalite planks with annodized aluminum H channel with rough-cut 6x6 redwood posts; 4" Univers 67 Condensed Bold type.

Campus Street Sign

This sign uses the signature wayfinding color of the campus, helping differentiate McAllister Way on the Marine Science Campus (UC property) from Delaware Avenue (Santa Cruz City property).

Technical specifications: Regal Bronze Alumalite planks on 4" square steel posts painted to match. Reflective White Univers 67 Condensed Bold type with white border.

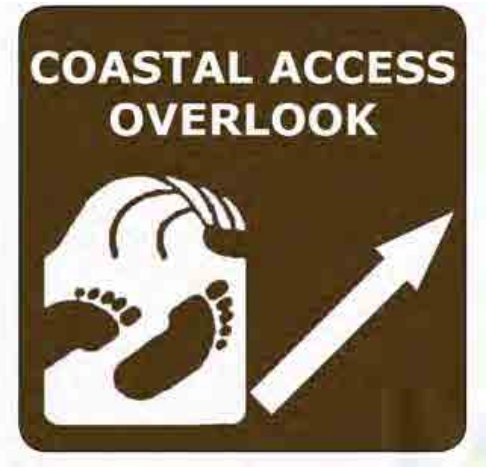
Wayfinding Signposts

This sign uses the signature wayfinding color of the campus. The signs indicate major destinations within the campus public trail and sidewalk system. Distances are provided for each destination in both miles (decimal) and meters.

Technical specifications: 4" redwood posts (painted to approximate Regal Bronze color of signs), approximately 4'6" high. White plastic signs with brown letters back-etched.

Coastal Access Signage

Using the same wayfinding color scheme, the MSC campus would use the signature "wave/footprint" signs directing visitors to coastal overlook points where appropriate. These signs would be posted on existing structures (e.g., fences, railings) or on separate wooden signposts, as needed.



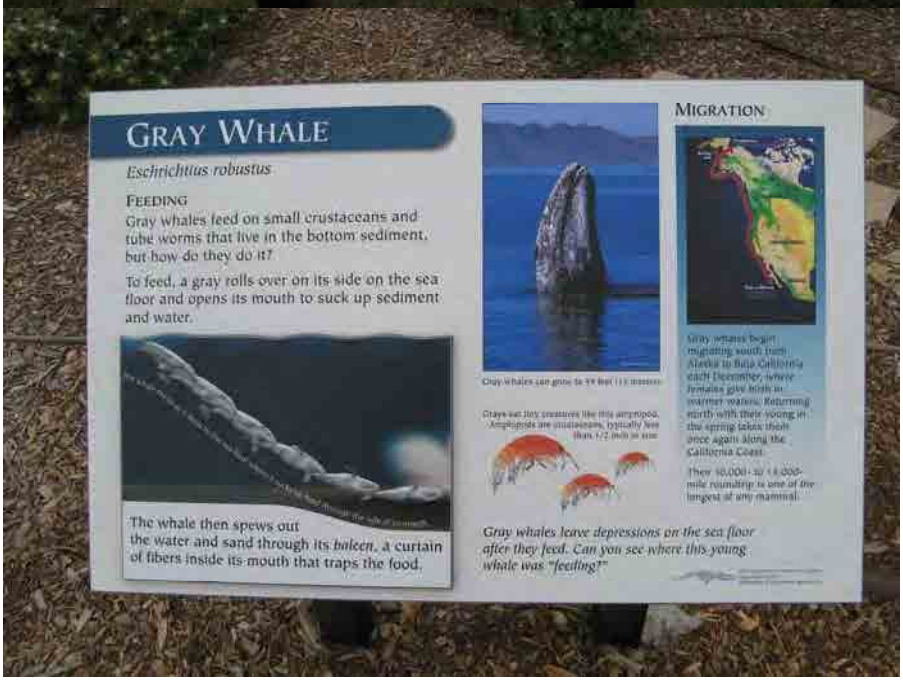
Miscellaneous Informational Signage
Informational signs in this category may include those for posting hours or policies, safety warnings, restricted areas, etc. The photos below of two existing miscellaneous signs on the MSC illustrate the variety of information intended in this sign category. These and other existing signs on the campus that do not conform to the proposed new design standard will be replaced.

Existing signs to be replaced

Regulatory Signage
Regulatory signs on the Marine Science Campus include those conveying information about speed limits, fire lanes, hazardous materials, parking regulations, etc. Regulatory signs governed by jurisdictional codes or enforcement policies would comply with current enforcement standards, for example parking-related signs will be consistent with parking signs used at the UCSC main campus to be consistent with enforcement standards. Other regulatory signs would be consistent with the design standards of Wayfinding signs. Below are illustrations of some code governed regulatory signs. Please see the section on the MSC Parking Program for examples of the parking regulation signs proposed.

Interpretive Signage

Interpretive signs on the MSC campus are proposed to cover a wide range of topics – from information about individual species to how the seawater system works to support marine research activities to restoration activities to broad ecological and geographical concepts. Interpretive panels may vary greatly in the details of both content and layout, but would maintain a consistent "look and feel" through a graphic theme to include a common font, a subject line prominently displayed within a color banner at the top of the panel, the facility and program logos included along the bottom edge, and a colorful mix of photos, illustrations, and/or text arranged uniquely for each panel in between.



UCSC Marine Science Campus Lighting Program

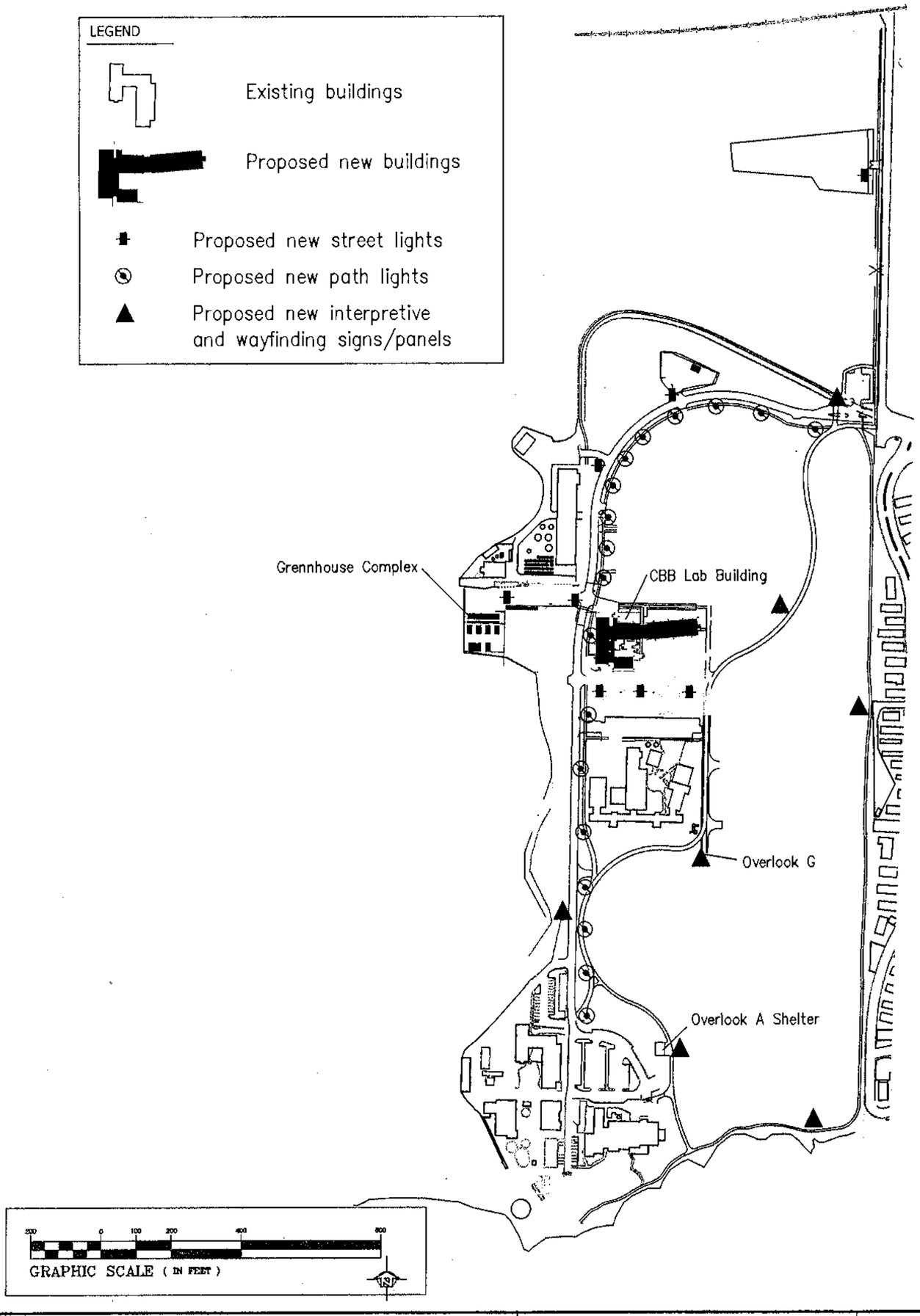
The lighting program for the Marine Sciences Campus consists of site lighting (wayfinding/interpretive/safety) and security lighting (facility/safety)

The lighting will be designed to:

- Provide the lowest levels necessary to achieve safety and efficient wayfinding
- Avoid unnecessary light detrimental to plant and animal biology
- Avoid light spilling into natural areas
- Minimize artificial light interference with view of the coastal night sky
- Cut-off light fixtures shall be used to avoid light spilling
- Lighting shall be mounted as low as feasible to minimize visibility of light source
- Path light shall be low bollard type
- Fixtures shall align with the character of the campus (natural colors and materials)

Sample path light:

Sample parking lot/security light:



UC Santa Cruz Marine Science Campus Coastal Biology Building and Infrastructure Improvements Final Environmental Impact Report Nov. 2011	Proposed Lighting and Interpretive Signs	Figure 2-5