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The attached proposal is being submitted to you for your consideration by a NOAA Cooperative Institute. Should you recommend funding for this proposal, we request that the funding be transferred through our current **NOAA cooperative agreement, # NA17RJ1231**. The NOAA contact (described below) for this cooperative agreement should be contacted immediately if this proposal is accepted for funding.

Title of Proposal: **Implementation of Regional Integrated Ocean Observing System: Southern California Regional Coastal Ocean Observing System.**

Principal Investigator(s): **Eric J. Terrill**  
Proposal #: **2008-1362R2**  
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Task #: 2 – Joint NOAA Laboratory/JIMO Programs  
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# **Southern California Coastal Ocean Observing System (SCCOOS)**



## **Implementation of Integrated Ocean Observing Systems: Southern California Regional Coastal Ocean Observing System**

**Submitted in response to Federal Funding Opportunity:  
FY'2009 Regional Integrated Ocean Observing System**

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## **IMPACT STATEMENT**

As a result of a reduction in Year 2 funding [proposed \$3.16M and .7M awarded] to the Southern California Coastal Ocean Observing System (SCCOOS), a significant change of scope is to be implemented in FY09.

SCCOOS will implement a scope of work that continues the projects funded in the previous year. In addition, an increase in funding from Year 1 will enable SCCOOS to provide maintenance and limited operations to a network of surface current mapping high frequency (HF) radar systems in Southern California.

## **Background**

*In FY'2004, SCCOOS initiated the development of regional IOOS capacity in Southern California. The region is comprised of ~20 million people, representing 25% of the coastal population of the U.S. that live within fifty miles of the coast. The population density raises concerns about human impacts, climate change, and how the environment, in turn, will impact the economy and societal development. Dealing with this dense population requires more effective management of the coastal ocean through more accurate and comprehensive observations, and the management and delivery of those data into useful decision making tools – a mission of SCCOOS.*

## **Contextual use of SCCOOS Regional Coastal Ocean Observing System (RCOOS) funds**

Continuity of funding is critical to SCCOOS's multi-year strategy to build and operate the regional component of IOOS in a manner that addresses regional societal needs. SCCOOS objectives are to:

- Work with end users to identify their data product needs, integrate and assimilate their data, and determine best methods for communicating results to the community.
- Develop, evaluate, and optimize products designed for short-term decision-making and long-term environmental assessments.
- Provide coastal managers with science-based information for management decisions in the areas of coastal water quality, climate variability and marine ecosystems, oil spill and recovery, search and rescue, and marine safety.
- Provide coastal ocean and shoreline data and information to the general public.

SCCOOS functions as both the Regional Association (RA) and the RCOOS. SCCOOS operates through a system of awards between the implementers of the observing system, retains a Board of Governors, Executive Steering Committee, and Strategic Advisory Committee. The latter represents federal, state, and local mission-driven agencies that will benefit from a functioning regional IOOS. Attention has been given to managing IOOS expectations of the Strategic Advisory Committee, with technical activities within SCCOOS focused on gathering observations and early delivery of useful data products and decision tools. The RCOOS development was principally funded through two awards: a State of California Coastal Ocean Currents Monitoring Program (COCMP) and RCOOS funds. The implementation of National Oceanic and Atmospheric Administration (NOAA) RCOOS funding assisted in developing a federal-state partnership for California's ocean observing system infrastructure.

As part of RA/RCOOS development, user input has identified the four regional observing system priorities:

- A. Support the Southern California beach water quality management community.**
- B. Maintain area-wide ocean assessment to identify secular trends in the environment and their relationship to ecosystem variability.**
- C. Support marine operational users: search and rescue, oil spill, and marine safety and navigation.**
- D. Manage and distribute ocean information of public interest.**

Considering the above priorities balanced with reviewer feedback provided by NOAA, the SCCOOS Executive Steering Committee recommends the following observing system components to be funded with the present level of available FY09 resources:

- Conduct nearshore egg and larval surveys for in-shore California Cooperative Oceanic Fisheries Investigations (CalCOFI) stations. (Task B)
- Maintain long-line glider tracks along CalCOFI lines for Point Conception and Dana Point. (Tasks A and B)
- Maintain and operate HF radar. (Tasks A, B, C and D)
- Conduct a wide area Harmful Algal Bloom (HAB) shoreline surveillance program across Southern California. (Tasks A and B)
- Operations and maintenance of real-time, 1 km atmospheric model -mesoscale model (MM5)/Weather Research & Forecasting (WRF) output. (Tasks D and C)
- Maintain and operate nowcast/forecast regional ocean model at 1 km over the Southern California Bight. (Tasks A, D and C)

SCCOOS operations are described by the following three observing subsystems into which observing system activities can be classified:

*Subsystem 1: REGIONAL OBSERVING ACTIVITIES*

*Subsystem 2: LOCAL OBSERVING ACTIVITIES*

*Subsystem 3: DATA MANAGEMENT, SYNTHESIS, MODELING, and FORECASTING*

The original SCCOOS FY'2008 proposal identified an integrated set of observing tasks within these subsystems that addressed the identified four regional priorities. As a result of the de-scoping process, a significant number of tasks will not be supported in FY09. Table 1, *NOAA Funded Observing System Components* outlines the subsystem components and their relationship to the regional priorities. Tasks retained for FY09 are identified. Without state funding for the HF radar system, NOAA funds will provide crucial support for maintenance and operations. As a result of extremely tight budgets, SCCOOS will also leverage its RA planning grant to provide product development and base level data management support to the region. This effort is consistent with customer development and outreach. Table 2, *Partner Budgets Mapped to Observing System Component Activities*, presents the breakdown of funding for the components that will be funded with NOAA funds.

## TASKS

### TABLE 1: YEAR TWO NOAA FUNDED OBSERVING SYSTEM COMPONENTS

	A. WATER QUALITY MANAGEMENT COMMUNITY	B. ENVIRONMENT & ECOSYSTEM VARIABILITY	C. OIL SPILL, SEARCH & RESCUE, MARINE SAFETY	D. PUBLIC USES
<b>REGIONAL OBSERVING ACTIVITIES</b>				
<b>BIGHT-WIDE SAMPLING</b>				
Maintain and operate auto shore stations	•	•		•
Implement underway CTD—San Pedro to Catalina	•	•		•
Provide realtime & historical trends of surfzone waveheights & currents bightwide	•	•	•	•
Conduct nearshore egg & larval surveys for in-shore CalCOFI stations		•		
Maintain existing lines of long-line glider tracks at northern & southern SCCOOS boundaries	•	•		
Maintain and operate HF Radar	•	•	•	•
<b>LOCAL OBSERVING ACTIVITIES</b>				
<b>DISCHARGE PLUME SURVEYS</b>				
Maintain and operate auto shore stations	•	•		•
Track discharge plumes using REMUS; engineer model operation and validate stratification at discharge sites	•	•		•
Deploy drifters (surface and deep drogued) to verify plume models, track plumes	•	•	•	•
<b>HARMFUL ALGAL BLOOMS</b>				
Conduct HAB surveillance shoreline sampling	•	•		•
Implement in-shore glider track	•	•		•
Implement Santa Monica Bay Mooring and HAB speciation technology (FlowCAM)	•	•		•
<b>DATA MANAGEMENT, SYNTHESIS, MODELING, and FORECASTING</b>				
<b>DATA MANAGEMENT</b>				
Manage SCCOOS data feeds, data delivery (users/feds), IOOS DMAC, <a href="http://www.sccoos.org">www.sccoos.org</a>	•	•	•	•
Develop and run training workshops	•	•	•	•
<b>DATA SYNTHESIS</b>				
Climatology Development: 1. Assemble and develop coastal climatology of ocean state variables 2. Develop climate relevant indices for ecosystem assessment 3. Trajectory synthesis to establish connectivity between regions	•	•	•	•
<b>MODELING</b>				
Develop O&M of MM5/WRF real-time operation atmospheric model at 1 km			•	•
Maintain & operate ROMS at 1 km over the southern California Bight	•		•	•
Develop & run a finer resolution ROMS at 200-m resolution, San Diego coast; deliver the output to SCCOOS			•	
Develop and run a finer resolution ROMS at 200-m resolution, SM and SP bays; deliver the output to SCCOOS			•	
Develop retrospective bight-scale hindcast, and assimilation technique		•		

Key: blue rows are currently funded; orange rows have not been funded

**TABLE 2:**  
PARTNER BUDGETS MAPPED  
TO OBSERVING SYSTEM  
COMPONENT ACTIVITIES

**TASKS**

**OBSERVING SYSTEM COMPONENTS**

REGIONAL OBSERVING ACTIVITIES		YEAR 1	YEAR 2				
BIGHT-WIDE SAMPLING							
Maintain and operate auto-shore stations	UCSD - TERRILL	\$100,000	\$100,000	•	•		•
Implement underway CTD - San Pedro to Catalina	UCSB - WASHBURN	\$50,000	\$50,000	•	•		•
Provide realtime and historical trends of surfzone waveheights and currents bightwide	UCSD - GUZA	\$150,000	\$185,000	•	•	•	•
Conduct nearshore egg and larval surveys for in-shore CALCOFI stations	UCSD - GOERICKE	\$100,000	\$100,000		•		
Maintain existing lines of long-line glider tracks at northern and southern SCCOOS boundaries	UCSD - DAVIS	N/A	\$74,530	•	•		
Maintain and operate HF Radar	Cal Poly - MOLINE	N/A	\$70,000				
	UCSB - WASHBURN	N/A	\$70,000				
	USC - JONES	N/A	\$70,000	•	•	•	•
	UCSD - TERRILL	N/A	\$70,000				
LOCAL OBSERVING ACTIVITIES							
DISCHARGE PLUME SURVEYS							
Maintain and operate auto-shore stations	USCD - JONES	\$100,000	\$100,000	•	•		•
Track discharge plumes using REMUS; engineer model operation and validate stratification at discharge sites	Cal Poly - MOLINE	\$60,000	\$60,000				
	UCSD - TERRILL	\$55,979	\$59,718	•	•		•
Deploy drifters (surface and deep drogued) to verify plume models, track plumes	UCSB - OHLMANN	\$53,501	\$55,814	•	•	•	•
	UCSD - CENTURIONI	\$51,230	\$52,078				
HARMFUL ALGAL BLOOMS							
Conduct HAB Surveillance Shoreline Sampling	Cal Poly - MOLINE	\$12,846	\$12,846				
	UCSB - BRZEZINSKI	\$41,570	\$41,569				
	USC - JONES/CARON	\$57,502	\$57,502	•	•		•
	UCLA - SHIPE	\$60,177	\$60,177				
	UCSD - MCGOWEN	\$40,000	\$40,000				
Implement in-shore glider track	USC - JONES	\$150,000	\$150,000	•	•		•
Implement Santa Monica Bay Mooring and HAB speciation technology (flowcam)	UCSB - CHANG/SPADA	\$85,073	\$85,087				
	UCLA - BURKHARDT	\$85,000	\$85,000	•	•		•
	UCSD - SEND	\$70,174	\$80,176				

# TASKS

A. WATER QUALITY MANAGEMENT COMMUNITY  
B. ENVIRONMENT & ECOSYSTEM VARIABILITY  
C. OIL SPILL, SEARCH & RESCUE, MARINE SAFETY  
D. PUBLIC USES

## OBSERVING SYSTEM COMPONENTS

DATA MANAGEMENT, SYNTHESIS, MODELING & FORECASTING		YEAR 1	YEAR 2				
DATA MANAGEMENT							
Manage SCCOOS data feeds, data delivery (users/feds), IOOS DMAC, <a href="http://www.sccoos.org">www.sccoos.org</a>	UCSD - TERRILL	\$160,000	\$159,984	•	•	•	•
Develop and run training workshops	UCSD - TERRILL	\$8,324	\$11,910	•	•		•
DATA SYNTHESIS							
Climatology Development 1. Assemble and develop coastal climatology of ocean state variables 2. Develop climate relevant indices for ecosystem assessment	UCSD- CORNUELLE	\$70,000	\$70,000		•	•	•
MODELING							
Develop O&M of MM5/WRF real-time operation atmospheric model at 1 km	UCLA - HALL	\$24,904	\$24,886			•	•
Maintain & operate ROMS at 1 km over the southern California Bight	UCLA - CHAO	\$90,000	\$90,000	•		•	•
Develop & run a finer resolution ROMS at 200 m resolution, SM and SP bays; deliver the output to SCCOOS	UCLA - MCWILLIAMS	\$50,000	\$50,000			•	
Develop & run a finer resolution ROMS at 200 m resolution, San Diego coast; deliver the output to SCCOOS	UCSD- CORNUELLE	\$25,000	\$75,000			•	
Develop retrospective bight-scale hindcast, and assimilation technique development	UCLA - MCWILLIAMS	\$59,770	\$74,787				
	JPL - CHAO	\$50,150	\$174,850		•		
OTHER ACTIVITIES							
Program management support	UCSD - TERRILL	\$93,177	\$96,333	•	•	•	•
		\$496,999	\$781,510				

## **OBSERVING SYSTEM COMPONENTS**

### **Egg, Larval, Hydrographic Stations**

CalCOFI surveys make it feasible to add important time series describing the abundance of different species with a relatively small investment. These quarterly surveys of the Southern California Bight (SCB) and areas to the north include hydrographic and optical properties, primary productivity, and sampling of the eggs and larvae of many different species. Larvae and egg sampling are used as indices of species and provide a climate-relevant time record of changing biota off the coast of Southern California. The hydrographic data complements quarterly discharger sampling. Data are provided to the National Marine Fisheries Service (NMFS) and also supports the Pacific Coast Ocean Observing System (PaCOOS) objectives. Extending the historically offshore stations of CalCOFI closer to the coast brings relevance to the National Pollutant Discharge Elimination System (NPDES) permit discharge monitoring sites and to California's Marine Protected Areas planning process. SCCOOS has supported this process in the past and has received encouragement from California Department of Fish and Game to continue the effort.

Funds are requested to allow us to add an alongshore transect to the CalCOFI cruises. As part of this work, nine stations will be occupied on the 20m isobath at the ends of and interspersed with existing CalCOFI lines. At each station we will make 1.) a conductivity, temperature, depth (CTD) cast for the measurement of hydrographic variables and collection of water samples and 2.) a BONGO tow to collect plankton larger than 505 micrometer. Water samples will be analyzed for concentrations of macronutrients, conductivity, oxygen and chlorophyll *a* and taxon-specific pigments by high performance liquid chromatography (HPLC). The latter measurement will be used to estimate the contribution of different phytoplankton taxa to total phytoplankton biomass, a metric for phytoplankton community structure. Of these measurements all except pigment analysis by HPLC will be carried out at sea. Plankton collected with the BONGO net will be analyzed for bulk displacement volume and abundance of fish larvae. The costs for each year are two days of ship time on the R/V New Horizon.

Along the transects we will make nine CTD casts and net tows for zooplankton biomass, the collection of fish and invertebrate larvae, as well as make underway measurements of temperature, salinity, irradiance, and fluorescence. The hydrographic data and phytoplankton data will be deposited within three months of generation on the SCCOOS data server for public access. The Southwest Fisheries Science Center (SWFSC) will be provided the larval data and serve the data to the public using their data servers.

### **Long Line Glider Tracks**

The impact of climate variability, in phenomena like ENSO, the Pacific Decadal Oscillation, secular trends and delayed spring transitions are known to be correlated with large swings in the abundance of various marine species in the California Current Large Marine Ecosystem. Consequently, activities like fisheries and ecosystem management or Marine Protected Area monitoring that depends on estimating marine abundances or productivity must account for the impact of climate variability. Since 1949, CalCOFI has addressed this need by observing climate variability with hydrography and measurements of plankton, fish eggs, and larvae. As powerful as the ongoing CalCOFI survey is, it has limited temporal and spatial resolution that precludes



tracking the effects of fronts and eddies on marine biota and fails to describe things like the spring transitions or the onset of El Niño.

Technical advances have made it feasible to provide highly resolved long-term measurements of some water properties (temperature, velocity, nutrients, and indicators of phytoplankton and zooplankton abundance) using underwater gliders. This has been demonstrated off California with continuous sampling along CalCOFI lines 80 (Point Conception) and 90 (Dana Point) since 2006. These lines were selected in coordination with the California Current Ecosystem Long-Term Ecological Research program as representative of the climate and ecosystem of the Southern California Bight. In starting this program it was our hope that when the times series became long enough to be useful, the data would be valuable to the science and statistics advisors to the Pacific Fisheries Management Council who provide the science upon which fisheries management is based, ecosystem managers and authors of integrated ecosystem assessments (many within NOAA Fisheries and California Department of Fish and Game), analysts trying to evaluate the effectiveness of Marine Protected Areas, non-governmental organizations concerned with marine conservation, and scientists developing improved methods for predicting marine abundances and productivity on the west coast.

We propose to continue sampling on CalCOFI Lines 80 using Spray gliders supporting a CTD, Acoustic Doppler Profiler, Chlorophyll-*a* fluorometer, and an In-Situ Ultraviolet Spectrophotometer (ISUS) nutrient sensor. Typical cruises oscillate offshore and onshore along Line 80, typically extending 500 km offshore, taking about 25 days for one transit, and typically completing two round-trips before the glider is replaced by a refueled one.

Data will be available in near real-time through both <http://spray.ucsd.edu> and the SCCOOS web site. It will be made immediately available to the data assimilating ROMS model at the Jet Propulsion Laboratory (JPL)/University California, Los Angeles (UCLA) and to the SWFSC which will serve it in their data stream tailored for ecosystem managers and scientists. We will also produce data products consisting of profiles of temperature, salinity, density, velocity, chlorophyll fluorescence, acoustic backscatter, and nutrient concentration on a uniform 25 km (horizontal) by 10 m (vertical) grid for each glider transit along Line 80. The resulting sections will allow calculation of the transport of such quantities as heat, salt, nitrate, and zooplankton. These products on standard grids will provide for convenient access to glider data.

### **HF Radar**

SCCOOS operates a broad area array of HF coastal radars for measuring surface currents in order to assess and mitigate impacts of impaired water quality, track oil spills, assist with search and rescue efforts, and monitor the physical environment to better understand ecosystem change. SCCOOS proposes to maintain the network to ensure continued distribution of near real-time surface currents along the coast of Southern California (Figure 1).

Funds obtained with this program will support continued operation and maintenance of HF radar systems including supporting infrastructure, and land owner relationships/permissions. Site inspections should be conducted quarterly in order to evaluate and maintain system health, which includes local backup data storage replacement, antenna and cable inspection and data acquisition computer (laptop) maintenance. Supply items such as replacement hard drives, air

conditioners, and laptops must be maintained to ensure swift system replacement caused by failed components. HF radar infrastructure and site inspections will be maintained on a best-effort basis within the constraints of funding. Network connectivity and data distribution are not funded within this proposal. System statistics are also monitored daily through transferred diagnostics such as internal temperature, hard drive capacity and data transfer latency.

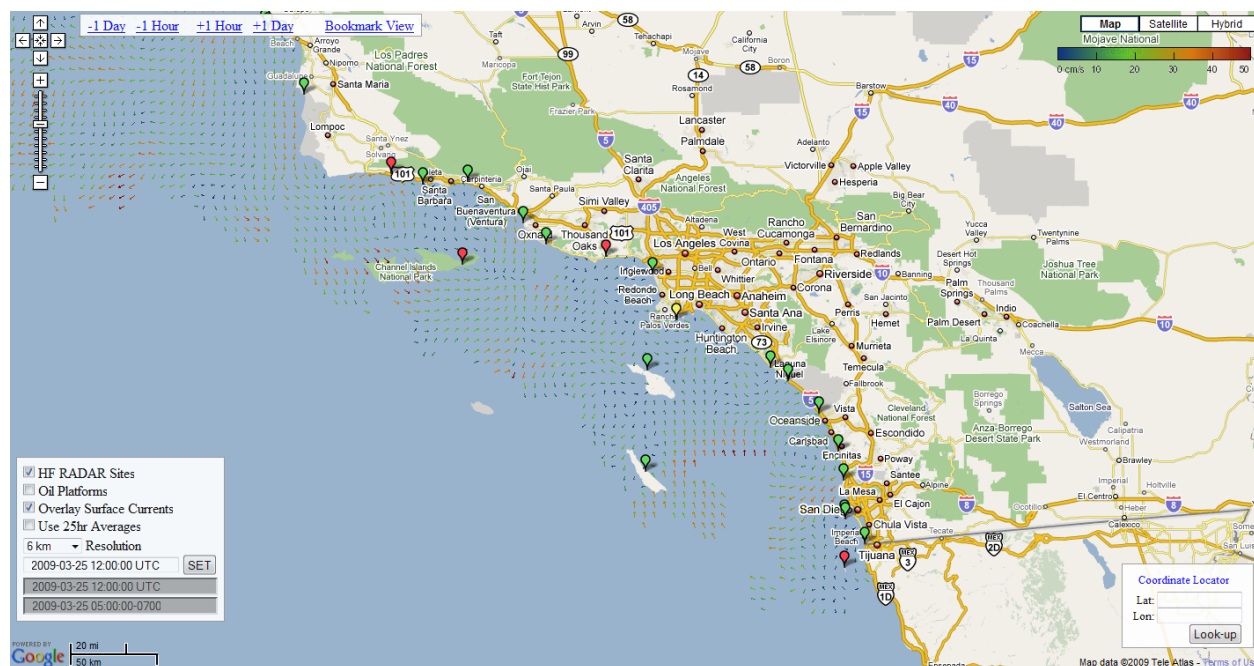


Figure 1. A map of the SCCOOS operated HF radar network. The array has sites operating at 25 MHz, 13 MHz, and 4.5 MHz, providing surface current maps at resolutions of 1 km and 6 km. Data are to be made available hourly to national networks and local end-users, and used in trajectory-based products.

The continued evaluation and calibration of each system is required. Transmit and receive antennas are sensitive to environmental change and surrounding infrastructure. System calibrations/beam patterns should be conducted at least semi-annually in order to evaluate antenna performance and data validation. Calibrations consist of echoing the signal at a constant radius from the receive antenna and are optimally performed from a boat at a distance of approximately 1.5 km. System calibrations are also limited by the constraints of funding and will be conducted when feasible at the recommended interval. Time series data are collected and processed to evaluate antenna response, and calibrations are then applied to onsite data processing. Continual data review and system analysis are required for optimal performance and validation of radial current vectors measured from individual systems.

Real-time products of velocity fields are already in place and distributed in near real-time to the public through [www.sccoos.org](http://www.sccoos.org) and [www.cencoos.org](http://www.cencoos.org), and through the national data server effort at NDBC. Real-time data products from the system will continue to be used for a number of different efforts, including but not limited to: assessment of ecosystem trends, long term trends, oil spill response, regional ocean modeling, search and rescue, storm water discharges and outfall tracking, and vessel traffic aids.

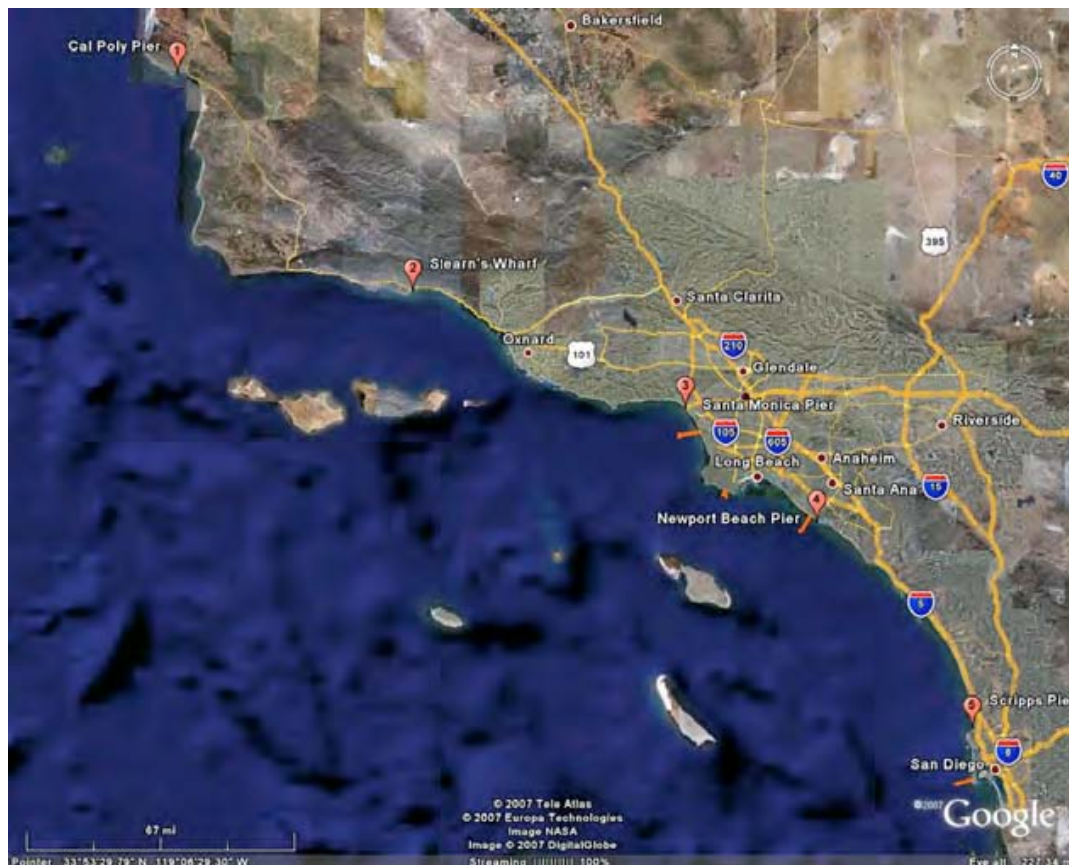


Figure 2. Locations of the primary HAB sampling sites along the Southern California coast. The sites are indicated by the red balloons numbered 1-5. They correspond to:  
 1) San Luis Obispo  
 2) Stearns Wharf, Santa Barbara  
 3) Santa Monica Pier  
 4) Newport Beach Pier, and  
 5) Scripps Pier, La Jolla.

### HAB Shoreline Surveillance

The SCCOOS harmful algal bloom group is monitoring the occurrence of harmful phytoplankton species at sub-regions near five pier sites from San Luis Obispo to La Jolla (Figure 2). Pier sites were chosen as they are areas of highest public usage of the ocean. At minimum, samples are obtained on a weekly basis at each of the sites. Net tows are taken and the abundance of potentially toxic species enumerated and reported that same day. Water samples for more quantitative cell counts are also taken and related variables are measured. The related variables include temperature, salinity, chlorophyll concentration, primary inorganic nutrients, and particulate domoic acid concentration.

Sampling by the group began the week of 30 June 2008 and has continued since then. In addition to the pier sampling, SCCOOS now has a web page for collecting and displaying the data for the Southern California Bight in near real time: [www.sccoos.org/data/chlorophyll](http://www.sccoos.org/data/chlorophyll).

As part of the monitoring effort, the group has already detected the presence and toxicity of two HAB species, *Pseudo-nitzschia* and *Alexandrium catenella* during the spring of 2009, but not yet in high concentrations at the pier stations. Domoic acid toxicity has been associated with the *Pseudo-nitzschia* bloom and low levels of paralytic shellfish poisoning (PSP) were associated with *Alexandrium*.

Members of the SCCOOS HAB team are working closely with the state-wide initiative, the California Harmful Algal Bloom Monitoring and Alert Program (HABMAP). HABMAP also includes members from the Central and Northern California Ocean Observing System (CeNCOOS). The SCCOOS HAB team plans to collaborate with the Southern California Coastal



Water Research Project (SCCWRP) organized Bight program that has been deferred until February-June 2010, assuming that state funding for that effort is restored in the coming fiscal year.

Continued funding of this effort will fulfill the goals outlined in the initial proposal:

1. Continued monitoring of HAB species abundances and domoic acid toxicity.
2. Building a time series of observations that will help to evaluate under what oceanographic and environmental conditions harmful blooms occur.
3. Collaboration with SCCWRP's Bight program to evaluate nutrient fluxes and HAB responses in the Southern California Bight
4. Integration with modelling efforts with a long term goal of prediction of HAB event probabilities.

### **Ocean Modeling and Forecasting**

***Forecasts and now-casts of ocean conditions on a range of space and time scales are made using the Regional Ocean Modeling System (ROMS).*** The model is run in both an assimilating mode to incorporate observations and to make forecasts, and in an open mode or partially assimilating mode to test the model and make improvements. The models make estimates of connectivity on bight-wide scales as a guide to understanding dispersal of materials near sea surface and below the sea surface. The model ingests HF radar derived surface currents, ocean glider data where available, sea surface temperatures from buoys (NDBC and VOS), and satellite-derived sea-surface temperature (SST) maps. The ocean model is driven by the MM5/WRF atmospheric model. A model reanalysis will be conducted over a selected multi-year time window using non-telemetering data inputs (eg. CTD from vessels, non-real-time moorings) to assist in the development of dynamical indices that have ecosystem relevance.

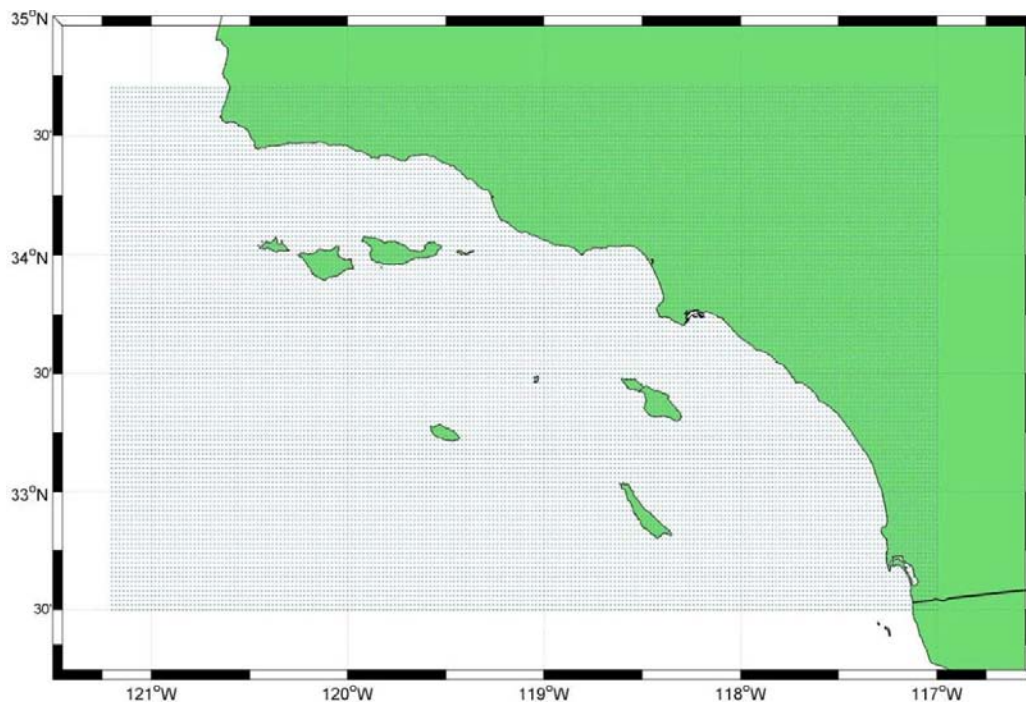


Figure 3. The 1 km grid used by the real-time nowcast/forecast Regional Ocean Modeling System (ROMS). Nowcasts and 48-hour forecasts are created every 6 hours with approximate 12 hour latency.

These forecasts are initialized with the 06Z NAM forecast from NOAA and last for 48 hours. Their resolution is 4 km, covering a region from 116.2 W and 122.1W and from 32.0 N to 35.1 N. Continued comparison of the WRF winds, with available point measurements in the Southern California Bight, is in progress. Through comparison with field experiments, it is determined that stratus cloud distributions in the WRF model lack realism, causing errors in solar fluxes at the ocean surface. This is a critical issue because it can cause SST errors when the atmospheric output is imposed on a regional oceanic prediction system. To address this issue, a test of the sensitivity of stratus simulation to boundary forcing data products, vertical resolution, cloud parameterization formulation, and cloud parameterization tuning parameters will occur, and necessary adjustments will be made. An improved version of the daily WRF forecasts will be implemented in the coming year.

The existing JPL web portal will be maintained and refined to receive SCCOOS data and distribute the assimilative ROMS model products: <http://ouocean.jpl.nasa.gov/SCB>. The ROMS real-time operations will produce nowcast and forecast fields as well as model-derived products. Participation will also occur in retrospective analysis or real-time field experiments during the period of interest using the ROMS modeling and data assimilation system.

## YEAR 2 MILESTONES

Regional Observing Activities	Qtr1	Qtr2	Qtr3	Qtr4
<b>BIGHT-WIDE SAMPLING</b>				
<b>Conduct nearshore egg and larval surveys for in-shore CalCOFI stations</b>				
Extend the quarterly CalCOFI cruises by one day each to add an alongshore transect	X	X	X	X
At nine CalCOFI stations make 1.) a CTD cast for measurement of hydrographic variables and collection of water samples 2.) a BONGO tow to collect plankton	X	X	X	X
Analyze water samples for concentrations of macronutrients, conductivity, oxygen, and chlorophyll- <i>a</i> and taxon-specific pigments by HPLC	X	X	X	X
Analyze plankton collected for bulk displacement volume and abundance of fish larvae	X	X	X	X
Deposit hydrographic and phytoplankton data on SCCOOS data server; provide larval data to NOAA's SWFSC for public access	X	X	X	X
<b>Maintain long-line glider tracks along CalCOFI lines</b>				
Continue sampling on CalCOFI Lines 80 using Spray gliders supporting a CTD, Acoustic Doppler Profiler, Chlorophyll- <i>a</i> fluorometer, and an ISUS nutrient sensor	X	X	X	X
Data posted online at <a href="http://spray.ucsd.edu">http://spray.ucsd.edu</a> and <a href="http://www.sccoos.org">www.sccoos.org</a> , and made available to the data assimilating ROMS at JPL/UCLA and to the SWFSC	X	X	X	X
<b>HF radar</b>				
Continue maintenance and any necessary replacement of HF radar supporting infrastructure to include: enclosures, air conditioning, cabling, data acquisition systems, local data storage, communications, and solar power as feasible within constraints of budget	X	X	X	X
Continue monthly hardware, software, and administration maintenance for data acquisition, processing, storage, distribution, and web hosting of radial and total current vectors	X	X	X	X
Maintain and strengthen land owner relationships and permit renewals for HF radar site locations	X	X	X	X
Conduct quarterly or as needed conference calls between SCCOOS technicians	X	X	X	X
Conduct antenna calibrations of maintained HF radar systems as feasible within constraints of budget	X		X	
<b>HARMFUL ALGAL BLOOMS</b>				
Weekly collection at San Luis Obispo; Stearns Wharf, Santa Barbara; Santa Monica Pier; Newport Beach Pier; Scripps Pier, La Jolla	X	X	X	X
Monthly transect of HAB indicators and relevant environmental conditions in Santa Monica Bay	X	X	X	X
<b>San Luis Obispo (CalPoly task)</b>				
Weekly sampling, identification, and enumeration of HABs	X	X	X	X
Subsamples sent weekly to USC for toxin analysis	X	X	X	X
Subsamples sent weekly to UCSB for nutrient analysis	X	X	X	X
Contribute to regional database; analysis of regional HAB events			X	X
Data posted on web site weekly	X	X	X	X

<b>Santa Barbara (UCSB task)</b>				
Weekly HAB surveillance	X	X	X	X
Weekly measures of water quality (domoic acid, nutrients, phytoplankton biomass)	X	X	X	X
Weekly collection of primary inorganic seawater nutrient samples	X	X	X	X
Weekly CTD variables collected at Stearns Wharf Pier; when a HAB event is detected, expand sampling to include Goleta Pier and Elwood Pier	X	X	X	X
Contribute to regional database; analysis of regional HAB events	X	X	X	X
Updates to web site	X	X	X	X
<b>Los Angeles (UCLA task)</b>				
Weekly chlorophyll <i>a</i> concentration analysis	X	X	X	X
Weekly vertical profiles of CTD data	X	X	X	X
HAB taxa and domoic acid concentrations sent weekly to D. Caron, USC	X	X	X	X
Samples for nutrient concentrations sent weekly to M. Brzezinski, UCSB	X	X	X	X
<b>Los Angeles (USC task)</b>				
Weekly HAB, domoic acid and chlorophyll concentration analyses	X	X	X	X
Weekly temperature, salinity and chlorophyll from pier sensors	X	X	X	X
<b>La Jolla (UCSD task)</b>				
Taxonomy for HAB species, weekly sampling	X	X	X	X
Weekly sampling and measurements for domoic acid concentrations, primary inorganic nutrients, chlorophyll <i>a</i> concentration, and temperature and salinity	X	X	X	X
All data forwarded to web site, weekly	X	X	X	X
<b>MODELING</b>				
Continue daily WRF forecasts; compare WRF winds with available point measurements in the Southern California Bight	X	X	X	X
Test the sensitivity of stratus simulation to boundary forcing data products, vertical resolution, cloud parameterization formulation, and cloud parameterization tuning parameters	X	X	X	X
Implement an improved version of the daily WRF forecasts			X	X
Maintain the meteorological forecasts; provide the relevant output of the regional reanalysis to SCCOOS				X
<b>Maintain and operate ROMS at 1km over the Southern California Bight</b>				
Operational ROMS modeling; transferred daily to SCCOOS database	X	X	X	X
ROMS reanalysis; 1st regional ROMS reanalysis for a period of interests				X

**Implementation of Regional Integrated Ocean Observing Systems: Southern California Regional Coastal Ocean Observing System**

	Davis	Goericke	McGowan	Terrill	UC	REVISD FY
	Long-Line Glider Tracks	Bight-Wide Sampling	Harmful Algal Blooms	HF Radar	Campuses & Subawards	2009 TOTAL
Salaries & Fringe Benefits		\$ 35,229	\$ 23,229	\$ 40,588		\$ 99,046
Travel		\$ 1,875	\$ 972	\$ 748		\$ 3,595
Equipment		\$ -	\$ -	\$ -		\$ -
Supply and Materials	\$ 64,250	\$ 7,874	\$ 5,172	\$ 10,080		\$ 87,376
Contractual:						
Subawards	\$ -	\$ -	\$ -	\$ -	\$ 210,348	\$ 210,348
Multi-Campus Awards	\$ -	\$ -	\$ -	\$ -	\$ 286,632	\$ 286,632
						\$ -
Other: Ship Time	\$ -	\$ 36,223	\$ -	\$ -		\$ 36,223
Other: Lab Support	\$ -	\$ 5,006	\$ 5,110	\$ 8,929		\$ 19,045
Other Subtotal (Ship time and Lab Support)	\$ -	\$ 41,229	\$ 5,110	\$ 8,929		\$ 742,265
Direct Costs	\$ 64,250	\$ 86,207	\$ 34,483	\$ 60,345	\$ 496,980	\$ 742,265
Indirect Costs (16%)	\$ 10,280	\$ 13,793	\$ 5,517	\$ 9,655	\$ -	\$ 39,245
TOTAL COSTS	\$ 74,530	\$ 100,000	\$ 40,000	\$ 70,000	\$ 496,980	\$ 781,510



**IMPLEMENTATION OF REGIONAL INTEGRATED OCEAN OBSERVING  
SYSTEMS: SOUTHERN CALIFORNIA REGIONAL COASTAL OCEAN  
OBSERVING SYSTEM**

**REVISED BUDGET JUSTIFICATION (FY 2009)**

***Salaries/Benefits:*** SIO salary recharge rates are used for calculating salaries. The rates include components for employee benefits, provisions for applicable merit increases and range adjustments in accordance with University policy. Fringe benefits are not shown separately, but are included in the salary cost category. Only actual direct hours are charged to the project.

***Travel:*** Funds are requested for cruise and field experiments to collect samples, to maintain HF radar sites, and to attend organizational and regional meetings.

***Equipment:*** No equipment or fabrication costs are included in FY 2009.

***Supplies:*** Various project specific supplies and expendable materials are included to perform the work proposed. These include, but are not limited to, maintenance and repairs, laboratory/field/cruise supplies, chemicals, computer materials and peripherals, networking services, small boat services, and communication costs.

***Contractual:*** Multi-campus awards and subawards are grouped together on the revised 424A.

***Other:*** UNOLS ship costs are included in the budget. Other costs for the proposed program include Laboratory Support Services that are calculated at 22% of the MPL/JIMO direct salary cost. This direct charge was approved in February 1991.

***Indirect Costs:*** Indirect costs are calculated with a base overhead rate of 16% of total direct costs less tuition remission and equipment. The date of the most recent indirect cost agreement was 5/28/04. The cognizant agency for the University is the Department of Health and Human Services. The contact is Helen Fung located at 50 United Nations Plaza, Suite 347, San Francisco, CA 94102-4918.

## COLLEGES AND UNIVERSITIES RATE AGREEMENT

EIN #: 1956006144A1

DATE: May 28, 2004

INSTITUTION:  
University of California (UCSD)  
San Diego Campus

FILING REF.: The preceding  
Agreement was dated  
June 23, 1999

CA

The rates approved in this agreement are for use on grants, contracts and other agreements with the Federal Government, subject to the conditions in Section III.

## SECTION I: FACILITIES AND ADMINISTRATIVE COST RATES\*

RATE TYPES: FIXED FINAL PROV. (PROVISIONAL) PRED. (PREDETERMINED)

TYPE	EFFECTIVE PERIOD		RATE(%)	LOCATIONS	APPLICABLE TO
	FROM	TO			
PRED.	07/01/02	06/30/04	52.0	On-Campus (1)	Organized Research
PRED.	07/01/04	06/30/05	53.5	On-Campus (1)	Organized Research
PRED.	07/01/05	06/30/06	54.0	On-Campus (1)	Organized Research
PRED.	07/01/06	06/30/08	54.5	On-Campus (1)	Organized Research
PRED.	07/01/02	06/30/08	26.0	Off-Camp. (1)	Organized Research
PRED.	07/01/02	06/30/08	53.0	On-Campus (1)	Instruction
PRED.	07/01/02	06/30/08	26.0	Off-Camp. (1)	Instruction
PRED.	07/01/02	06/30/04	40.0	On-Campus (1)	Other Sponsored Act.
PRED.	07/01/02	06/30/04	24.5	Off-Camp. (1)	Other Sponsored Act.
PRED.	07/01/04	06/30/08	45.0	On-Campus (1)	Other Sponsored Act.
PRED.	07/01/04	06/30/08	26.0	Off-Camp. (1)	Other Sponsored Act.
PRED.	07/01/02	06/30/04	52.8	On-Campus (2)	Organized Research
PRED.	07/01/02	06/30/04	26.8	Off-Camp. (2)	Organized Research
PRED.	07/01/02	06/30/04	57.0	On-Campus (2)	Instruction
PRED.	07/01/02	06/30/04	30.0	Off-Camp. (2)	Instruction
PRED.	07/01/02	06/30/04	40.0	On-Campus (2)	Other Sponsored Act.
PRED.	07/01/02	06/30/04	24.5	Off-Camp. (2)	Other Sponsored Act.
PRED.	07/01/02	06/30/04	13.0	(A) (1)	Organized Research
PRED.	07/01/04	06/30/08	16.0	(A) (1)	Organized Research
PRED.	07/01/02	06/30/04	26.5	(B) (1)	Organized Research
PRED.	07/01/04	06/30/08	28.0	(B) (1)	Organized Research
PRED.	07/01/04	06/30/08	19.0	(C) (1)	Organized Research
PROV.	07/01/08	UNTIL AMENDED	Use same rates and conditions as those cited for fiscal year ending June 30, 2008.		

- (1) Facilities & Admin Rates (2) Facilities & Admin Rates-DOD Contracts Only  
(A) Nimitz Marine Facility & Marine Physical Laboratories  
(B) Gen Clinical Res Ctr (On-Campus) (C) Gen Clinical Res Ctr (Off-Campus)

## \*BASE:

Modified total direct costs, consisting of all salaries and wages, fringe benefits, materials, supplies, services, travel and subgrants and subcontracts up to the first \$25,000 of each subgrant or subcontract (regardless of the period covered by the subgrant or subcontract). Modified total direct costs shall exclude equipment, capital expenditures, charges for patient care, tuition remission, rental costs of off-site facilities, scholarships, and fellowships as well as the portion of each subgrant and subcontract in excess of \$25,000.

INSTITUTION:  
University of California (UCSD)  
San Diego Campus

AGREEMENT DATE: May 28, 2004

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SECTION II: SPECIAL REMARKS

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TREATMENT OF FRINGE BENEFITS:

This organization charges the actual cost of each fringe benefit direct to Federal projects. However, it uses a fringe benefit rate which is applied to salaries and wages in budgeting fringe benefit costs under project proposals. The fringe benefits listed below are treated as direct costs.

TREATMENT OF PAID ABSENCES

Vacation, holiday, sick leave pay and other paid absences are included in salaries and wages and are claimed on grants, contracts and other agreements as part of the normal cost for salaries and wages. Separate claims for the costs of these paid absences are not made. A separate charge is made to Federal projects for vacation benefit leave accruals.

DEFINITION OF EQUIPMENT

Effective July 1, 1999, equipment is defined as tangible nonexpendable personal property having a useful life of more than one year and an acquisition cost of \$1,500 or more per unit.

DEFINITION OF ON-CAMPUS, OFF-CAMPUS AND SPECIAL RATES

DEFINITION OF OFF-CAMPUS RATE

The off-campus rate is applicable to those projects conducted at facilities not owned or leased by the University. However, if the project is conducted in leased space and lease costs are directly charged to the project, then the off-campus rate must be used.

PROJECTS CONDUCTED ENTIRELY ON-CAMPUS OR ENTIRELY OFF-CAMPUS:

Projects conducted entirely on-campus or entirely off-campus will be applied the on-campus or off-campus rate respectively.

PROJECTS CONDUCTED PARTIALLY OFF-CAMPUS AND PARTIALLY ON-CAMPUS:

If the project involves work at both on-campus and off-campus sites, either the on-campus or off-campus rate generally should be applied, consistent with where the majority of the work is to be performed. Salary cost is generally accepted as a measure of work performed in terms of the total project.

USE OF BOTH ON-CAMPUS AND OFF-CAMPUS RATES

The use of both on-campus and off-campus rates for a given project may be justified if both of the respective rates can clearly be identified with a significant portion of salaries and wages of the project. For purposes of this provision, significant is defined as approximately 25% or more of the total costs and a project's total salary and wage costs exceed \$250,000.

OTHER SPECIAL RATES

These rates apply only to the facility or program to which they are identified. If any additional special rates become necessary the establishment of such rates should be coordinated through the cognizant negotiation agency.

The following fringe benefits are treated as direct costs:

OASDI, MEDICARE, RETIREMENT PLAN, HEALTH/DENTAL/OPTICAL/LIFE INSURANCE, WORKERS COMPENSATION, UNEMPLOYMENT INSURANCE, NON-INDUSTRIAL DISABILITY INSURANCE, ANNUITANT HEALTH/DENTAL INSURANCE, INCENTIVE AWARD PROGRAM, EMPLOYEE SUPPORT PROGRAM, SEVERANCE PAY AND TUITION/FEE REMISSION OF CERTAIN STUDENT EMPLOYEES.

INSTITUTION:  
University of California (UCSD)  
San Diego Campus

AGREEMENT DATE: May 28, 2004

SECTION III: GENERAL

A. LIMITATIONS:

The rates in this Agreement are subject to any statutory or administrative limitations and apply to a given grant, contract or other agreement only to the extent that funds are available. Acceptance of the rates is subject to the following conditions:  
(1) Only costs incurred by the organization were included in its facilities and administrative cost pools as finally accepted; such costs are legal obligations of the organization and are allowable under the governing cost principles; (2) The same costs that have been treated as facilities and administrative costs are not claimed as direct costs; (3) Similar types of costs have been accorded consistent accounting treatment; and (4) The information provided by the organization which was used to establish the rates is not later found to be materially incomplete or inaccurate by the Federal Government. In such situations the rate(s) would be subject to renegotiation at the discretion of the Federal Government.

B. ACCOUNTING CHANGES:

This Agreement is based on the accounting system purported by the organization to be in effect during the Agreement period. Changes to the method of accounting for costs which affect the amount of reimbursement resulting from the use of this Agreement require prior approval of the authorized representative of the cognizant agency. Such changes include, but are not limited to, changes in the charging of a particular type of cost from facilities and administrative to direct. Failure to obtain approval may result in cost disallowances.

C. FIXED RATES:

If a fixed rate is in this Agreement, it is based on an estimate of the costs for the period covered by the rate. When the actual costs for this period are determined, an adjustment will be made to a rate of a future year(s) to compensate for the difference between the costs used to establish the fixed rate and actual costs.

D. USE BY OTHER FEDERAL AGENCIES:

The rates in this Agreement were approved in accordance with the authority in Office of Management and Budget Circular A-21 Circular, and should be applied to grants, contracts and other agreements covered by this Circular, subject to any limitations in A above. The organization may provide copies of the Agreement to other Federal Agencies to give them early notification of the Agreement.

BY THE INSTITUTION:

University of California (UCSD)

San Diego Campus

(INSTITUTION)

(SIGNATURE)

Joseph P. Mullinix

(NAME)

Senior Vice President-Business & Finance

(TITLE)

(DATE)

ON BEHALF OF THE FEDERAL GOVERNMENT:

DEPARTMENT OF HEALTH AND HUMAN SERVICES

(AGENCY)

(SIGNATURE)

David S. Low

(NAME)

DIRECTOR, DIVISION OF COST ALLOCATION

(TITLE)

May 28, 2004

(DATE) 0236

HHS REPRESENTATIVE: Robert S. Klein

Telephone: (415) 437-7820