Elkhorn Slough Foundation Scope of Work

TASK 1: Coordination with CCAMP/RWQCB

- Evaluate current 24 site locations and plan 6 new sites in the Salinas/Tembladero area with CCAMP/RWQCB staff to ensure broad and consistent coverage of area without duplication
- Develop and submit Quality Assurance Project Plan
- Work with CCAMP/RWQCB to ensure data format is appropriate (including previously collected monitoring data)

Deliverables: **Approved Quality Assurance Project Plan**
Timeline: June 2005-August 2005
Resources: This work will be carried out at ESF/ESNERR by the new staff Water Quality Scientist (requested expense), with assistance from research coordinator Dr. Kerstin Wasson and water quality monitoring coordinator John Haskins (match), and Marc Los Huertos (requested expense).
Expenses: $13,185 (8% of total)

TASK 2: Field monitoring of watershed-scale water quality

- Monthly sampling at approximately 30 stations in Elkhorn watershed (as carried out for past 15 years, with modifications resulting from CCAMP/RWQCB coordination)
    - includes in-situ measurement of dissolved oxygen, temperature, turbidity, salinity, pH and depth using a YSI 6600 sonde
    - surface water samples are collected and iced for nutrient analysis
- We will also carry out additional targeted sampling at least once each at the five most nutrient enriched sites, sampling hourly during day and night to better characterize the eutrophic conditions (detection of potential anoxia) and to better understand the context and limitations of the monthly daytime sampling
- We supplement monthly data with high resolution water quality sampling to look at local temporal and spatial variation including D.O., pH, electrical conductivity, and temperature.

Deliverables: **Water quality data submitted each year, electronically in a form compatible with CCAMP**
Timeline: June 2005-July 2007
Resources: The monthly sampling will be carried out in the Elkhorn watershed by a staff Field Assistant (requested expense), with volunteer assistance and coordination by John Haskins (match). The targeted hourly sampling at eutrophic sites will be carried out by the Water Quality Scientist (requested expense). UC Santa Cruz will design and contribute to high resolution sampling. Necessary supplies and equipment will be provided by ESNERR (match) and UC Santa Cruz (available equipment).
Expenses: $24,556 (14% of total)

TASK 3: Laboratory nutrient analysis

- Monthly analysis of samples from 30 stations in Elkhorn watershed and analysis of samples from targeted studies of eutrophic sites
    - Samples will be collected in field (see above) filtered and analyzed at a contracted lab for ammonia, nitrate, nitrite, phosphate and chlorophyll a
    - At least twice per year, duplicate samples will be analyzed at additional laboratory

- Specialized nutrient samples collected to augment monthly samples and pollution abatement strategies (Task 5).
    - High spatial and temporal resolution samples filtered and analyzed at UC Santa Cruz for nitrate/nitrite, ammonium, phosphate, and total N and P (Task 5).

Deliverables:	**Provide electronic copy of data each year, including lab QA/QC results from additional laboratory.**
Timeline:	June 2005-July 2007
Resources:	Sample preparation (filtration) will be carried out by the Water Quality Scientist at the Moss Landing Marine Laboratories and analysis will be conducted at a contracted lab (requested expenses), with coordination by John Haskins (match). Duplicate samples and specialized nutrient sample data will be processed and analyzed at UC Santa Cruz overseen by Marc Los Huertos (requested expense, plus existing equipment (Lachat 8000 FIA).
Expenses:	$36, 874 (22% of total)

TASK 4: Data entry, processing, quality control, archiving, and dissemination

- The data and metadata will be entered, with quality assurance/control procedures as per the approved Quality Assurance Project Plan
- The data will be backed up and archived by ESNERR
- The data will continue to be made available upon written request via the ESNERR website, with links from the CCAMP and Monterey Bay National Marine Sanctuary's integrated monitoring webpage
- All UC Santa Cruz data will be subject to an approved QAPP and provided to ESF/ESNERR.

Deliverables:	**Long-term water quality monitoring database for the Elkhorn watershed, with 15+ years readily available to managers, students, and researchers** **Long-term water quality monitoring data submitted in a form compatible with CCAMP**
Timeline:	Sept 2005-July 2007
Resources:	This work will be carried out at ESF/ESNERR by the Water Quality Scientist (requested expense), with assistance from John Haskins (match) and ESNERR computer services (match). UC Santa Cruz data will be managed by Marc Los Huertos (requested expense).
Expenses:	$24,190 (14% of total)

TASK 5: Statistical analysis of data – overall trends and correlations with management

- We will develop spatio-temporal models based on dynamic linear models to determine temporal trends and spatial correlations using long-term water quality data. These models allow for a time-varying description of the behavior of the process generating the observations, including trends, spatial correlation, and the strength of the association with covariates such as land management or tide–gate regime patterns. Recent examples of these models appear in Huerta, Sansó and Stroud (2004) "A Spatio-Temporal Model for Mexico City Ozone Levels" Applied Statistics, vol. 53:231-248 and Stroud, Müller and Sansó,

(2001) "Dynamic Models for Spatio-Temporal Data", Journal of the Royal Statistical Association, Series B, vol. 63:673-689.

- Collect existing water quality data that are either long-term or have been repeated over the years in the study area.
- Collect data on time-varying processes drivers (including precipitation, land use, tide, and tide-gate regimes). This task will includes updating the existing GIS database to include water quality, soil characteristics and relevant management practices (15+ years of data) for three areas (Azevedo Ponds, Moro Cojo, and Tembladero Slough) with the assistance of UC Santa Cruz (Marc Los Huertos) and MCRCD (Bryan Largay).
- Identify and evaluate appropriate dynamic linear model(s) to determine water quality trends/changes and their relationship to land use.
- Develop and test alternative water quality sampling designs to the relative strengths of current monitoring programs to detect water quality changes.

- We will evaluate water quality monitoring of constructed wetlands and sediment pond and determine the level of uncertainty of their purported effectiveness.
  - Collate existing and appropriate water quality data on sediment ponds and constructed wetlands for the central coast of California.
  - Initiate specialized sampling (e.g. temporal: diel, daily, weekly; spatial changes at varying depths and samples collected in a spatial grid) and analyze for nutrients (Task 3) to determine how variance is captured in alternative sampling regimes.
  - Develop an end-user statistical model to determine the uncertainty with various sampling designs and costs. Resource agencies and researchers can use the model to design monitoring programs with explicit uncertainties can be evaluate appropriately.

Deliverables:	**-GIS maps and graphical and tabular results of statistical analyses of water quality trends and management correlates**
Timeline:	July 2005-Dec 2006
Resources:	The GIS database will be developed at ESF/ESNERR by the Water Quality Scientist (requested expense) and Eric Van Dyke (match). The statistical analysis will overseen by Bruno Sanso, Assistant Professor, UC Santa Cruz (requested expense plus match) in consultation with Marc Los Huertos (request expense) and to hire a graduate student in Applied Math and Statistics (requested funds) and the work will be included as part of the graduate student's Ph.D. dissertation and published peer reviewed scientific journal.
Expenses:	$51,762 (30% of total)

TASK 6: Dissemination of results to scientific and management audiences

- We will summarize the resulting information on long-term water quality trends in the Elkhorn watershed, on geographic differences between sites and regions, and on correlates of the patterns with agricultural management practices in formats appropriate for audiences ranging from water quality scientists to laypeople to regional regulators and policy-makers.
- Develop and distribute a flow chart and calculation tool (e.g. spreadsheet model) to help resource agencies (RCD, NRCS, RWQCB) and researchers (USDA-ARS, universities, etc.) to develop monitoring programs that can adequately describe pollution abatement effectiveness and the relative uncertainties.
- We will develop and describe statistical models in published in a peer-reviewed scientific journal.

- Outreach and education forums to be present water quality data for resource agencies (RCD, NRCS, UCCE) and growers, land owners, and other users and interested parties.

Deliverables: **- Technical Report written for lay audience and available on-line- The report will describe the implications of the proposed exploratory data analysis including; the most appropriate model to determine relationships to land use and water quality trends/changes, comparisons of water quality sampling designs with current monitoring programs, and any suggestions on how to improve current monitoring efforts given the results.**
-The end-user statistical model (flow chart and calculation tool) to determine the uncertainty with various sampling designs and costs, along with a written description of how to use the model and any important considerations/constraints of model's use.
-Peer-reviewed scientific publication,
-summary powerpoint presentations tailored to the needs of local agencies

Timeline: Jan 2006-June 2007

Resources: This work will be carried out at ESF/ESNERR by the Water Quality Scientist (requested expense), with guidance from John Haskins and Kerstin Wasson (match) and ESNERR computer services (match). Outreach presentations will be made by Marc Los Huertos (requested expense) and ESF Water Quality Scientist.

Expenses: $19,634 (12% of total)

PROJECT BUDGET FORM

NON-POINT SOURCE FUNDS GRANTS FOR NORTH MONTEREY COUNTY (PGE-SEP)

APPLICANT AGENCY NAME: Elkhorn Slough Foundation

CONTACT PERSON'S NAME: Dr. Kerstin Wasson **PROJECT START DATE:** 1-Jul-05 **ENDING DATE:** 30-Jun-07

BUDGET CATEGORY	FUNDS REQUEST (A)	TOTAL MATCH (B)	TOTAL BUDGET (A + B)	Education & Outreach	On-site Imple-mentation	Monitoring to Evaluate Practices	Monitoring Watershed Trends	FUNDS REQUESTED
PERSONNEL								
Water Quality Scientist (To Be Hired)								
Wage 24 months @ $ 2,500.00 per month	60,000	20,000	80,000	10,000		5,000	45,000	60,000
Benefits 24 months @ $ 500.00 per month	12,000	4,000	16,000	2,000		1,000	9,000	12,000
Field Assistant (Sue Shaw)								
Wage 250 hrs. @ $ 20.00 per hour	5,000	5,000	10,000				5,000	5,000
Benefits 250 hrs. @ $ 4.00 per hour	1,000	1,000	2,000				1,000	1,000
Research Coordinator (Dr. Kerstin Wasson)								
Wage 1 months @ $ 4,000.00 per month		4,000	4,000					
Benefits 1 months @ $ 800.00 per month		800	800					
Water Monitoring Coordinator (John Haskins)								
Wage 2 months @ $ 3,333.00 per month		6,666	6,666					
Benefits 2 months @ $ 667.00 per month		1,334	1,334					
	78,000	**34,800**	**112,800**	**12,000**	-	**6,000**	**60,000**	**78,000**
OPERATING	-	-	-	-	-	-	-	-
TRAVEL	-	-	-	-	-	-	-	-
SUPPLIES & EQUIPMENT								
Field and laboratory supplies		2,000	2,000					
Computer equipment and supplies		3,000	3,000					
	-	**5,000**	**5,000**	-	-	-	-	-
CONSULTANTS & PROFESSIONAL SERVICES								
Laboratory Nutrient Analysis	15,000	10,000	25,000			3,000	12,000	15,000
	15,000	**10,000**	**25,000**	-	-	**3,000**	**12,000**	**15,000**
SUBCONTRACT TO UCSC (Dr. Marc Los Huertos, PI)								
Total includes overhead; see separate spreadsheet	63,250	16,456	80,125	772		21,914	40,564	63,250
	63,250	**16,456**	**79,706**	**772**	-	**21,914**	**40,564**	**63,250**
Subtotal Direct Costs	156,250	66,256	222,506	12,772	-	30,914	112,564	156,250
Overhead: @ 15% of Direct Costs (Excluding subcontract)	13,950	N/A	13,950	1,800	-	1,350	10,800	13,950
TOTAL BUDGET	**170,200**	**66,256**	**236,456**	**14,572**	-	**32,264**	**123,364**	**170,200**
	MATCH =	38.93%	(MINIMUM MATCH REQUIRED = 25%)					

PROJECT BUDGET FORM

NON-POINT SOURCE FUNDS GRANTS FOR NORTH MONTEREY COUNTY (PGE-SEP)

APPLICANT AGENCY NAME: The Regents of the University of Califonia

APPLICATION DUE DATE: 1-Dec-04

CONTACT PERSON'S NAME: Dr. Marc Los Huertos **PROJECT START DATE:** 1-Jul-05 **ENDING DATE:** 30-Jun-07

BUDGET CATEGORY	FUNDS REQUEST (A)	TOTAL MATCH (B)	TOTAL BUDGET (A + B)	Education & Outreach	On-site Imple-mentation	Monitoring to Evaluate Practices	Monitoring Watershed Trends	FUNDS REQUESTED
PERSONNEL								
Assistant Researcher--Marc Los Huertos								
Salary 1 months @ $ 5,366.66 per month	5,367		5,367	429		3,059	1,878	5,367
Benefits 1 months @ $ 1,771.00 per month	1,771		1,771	142		1,009	620	1,771
Assistant Professor--Bruno Sanso								
Salary 0.5 months @ $ 8,600.00 per month	4,300	2,150	6,450			860	3,440	4,300
Benefits 0.5 months @ $ 2,580.00 per month	1,290	645	1,935			258	1,032	1,290
Laboratory Technician								
Salary 1.5 months @ $ 3,000.00 per month	4,500		4,500			2,250	2,250	4,500
Benefits 1.5 months @ $ 900.00 per month	1,350		1,350			675	675	1,350
Graduate Student								
Salary 9 months @ $ 1,500.22 per month	13,502		13,502			2,700	10,802	13,502
Benefits 9 months @ $ 156.56 per month	1,409		1,409			282	1,127	1,409
Undergraduate Student Assistant								
Salary 96 hrs. @ $ 10.00 per hour	960		960			768	192	960
Benefits 96 hrs. @ $ 0.25 per hour	24		24			19	5	24
	34,473	**2,795**	**37,268**	**571**	**-**	**11,881**	**22,021**	**34,473**
OPERATING								
Dissolved Nutrients Analysis	1,200		1,200			960	240	1,200
Total N and P Analysis	1,650		1,650			1,320	330	1,650
	2,850	**-**	**2,850**	**-**	**-**	**2,280**	**570**	**2,850**
TRAVEL								
Administration, Outreach, Education	200		200	100		50	50	200
WQ sampling	645		645			500	145	645
	845	**-**	**845**	**100**	**-**	**550**	**195**	**845**
SUPPLIES & EQUIPMENT								
Field Equipment	755		755			604	151	755
Lab Glassware	695		695			417	278	695
Reagents	550		550			358	193	550
			-					-
	2,000	**-**	**2,000**	**-**	**-**	**1,379**	**622**	**2,000**
GRADUATE STUDENT TUITION AND FEES								

Non-Resident Fees	9,960		9,960			1,992	7,968	9,960
Registration Fees	4,872		4,872			974	3,898	4,872
			-					-
	14,832	**-**	**14,832**	**-**	**-**	**2,966**	**11,866**	**14,832**
OVERHEAD MATCH								
Foregone Overhead Match (34.9% of Total Direct Costs)		13,661	13,661					-
	-	**13,661**	**13,661**	**-**	**-**	**-**	**-**	**-**
Subtotal Direct Costs	55,000	16,456	71,456	671	-	19,056	35,273	55,000
Overhead: @ 15% of Direct Costs (Maximum = 15%)	8,250	N/A	8,250	101	-	2,858	5,291	8,250
TOTAL BUDGET	**63,250**	**16,456**	**79,706**	**772**	**-**	**21,914**	**40,564**	**63,250**
	MATCH =	26.02%	(MINIMUM MATCH REQUIRED = 25%)					