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APR 14 1999

CALFED Bay-Delta Program
1416 Ninth Street, Suite 1155
Sacramento CA 95814

Research Proposal Entitled
"Development of an Optimal Design for Reducing Predation on Delta
Smelt at a Large Fish Screen"
Principal Investigator - **Dr. M. L. Kavvas**

Dear Colleague:

It is a pleasure to present for your consideration the referenced proposal.

It is our understanding that for purposes of determining applicant category, The Regents will be classified as "State" thereby resulting awards will only include the terms identified in Attachment D of the 1999 Proposal Solicitation Package as "Terms and Conditions for State (CALFED) Funds" and "Standard Clauses-Interagency Agreements".

The University takes exception to clauses pertaining to Substitution, Rights in Data and Indemnification as detailed in Attachment D. On behalf of The Regents of the University of California, we hereby reserve the right to negotiate said clauses as detailed in the Proposal Solicitation Package should this proposal result in a subsequent award.

Please call on the principal investigator for scientific information. Administrative questions may be directed to me or to Ms. René Domino by telephone, facsimile or electronic mail at the numbers specified above. We request that correspondence pertaining to this proposal and a subsequent award be sent to the Office of Research and to the principal investigator.

Sincerely,

Original Signed by Sandra M. Dowdy
Contracts and Grants Analyst

Sandra M. Dowdy
Contracts and Grants Analyst

Enclosure

cc: M. L. Kavvas



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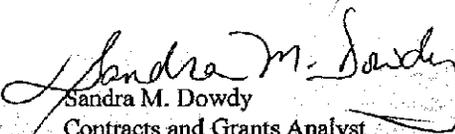
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Enclosure

cc: **M. L. Kavvas**

4.5 PSP Cover Sheet (Attach to the front of each proposal)

Proposal Title: Development of an Optimal Design for Reducing Predation on Delta Smelt at a Large Fish Screen
Applicant Name: M. Levent Kavvas
Mailing Address: UCD Civil Engr., One Shields Avenue, Davis, CA 95616
Telephone: (530) 752-2518
Fax: (530) 752-7872
Email: kavvas@ucdavis.edu

Amount of funding requested: \$ 788,225 for 1.75 years

Indicate the Topic for which you are applying (check only one box).

- | | |
|---|--|
| <input checked="" type="checkbox"/> Fish Passage/Fish Screens | <input type="checkbox"/> Introduced Species |
| <input type="checkbox"/> Habitat Restoration | <input type="checkbox"/> Fish Management/Hatche. |
| <input type="checkbox"/> Local Watershed Stewardship | <input type="checkbox"/> Environmental Education |
| <input type="checkbox"/> Water Quality | |

Does the proposal address a specified Focused Action? yes no

What county or counties is the project located in? Yolo

Indicate the geographic area of your proposal (check only one box):

- | | |
|--|---|
| <input type="checkbox"/> Sacramento River Mainstem | <input type="checkbox"/> East Side Trib: _____ |
| <input type="checkbox"/> Sacramento Trib: _____ | <input type="checkbox"/> Suisun Marsh and Bay |
| <input type="checkbox"/> San Joaquin River Mainstem | <input type="checkbox"/> North Bay/South Bay: _____ |
| <input type="checkbox"/> San Joaquin Trib: _____ | <input type="checkbox"/> Landscape (entire Bay-Delta watershed) |
| <input checked="" type="checkbox"/> Delta: <u>Entire Bay-Delta Watershed</u> | <input type="checkbox"/> Other: _____ |

Indicate the primary species which the proposal addresses (check all that apply):

- | | |
|--|--|
| <input type="checkbox"/> San Joaquin and East-side Delta tributaries fall-run chinook salmon | <input type="checkbox"/> Spring-run chinook salmon |
| <input type="checkbox"/> Winter-run chinook salmon | <input type="checkbox"/> Fall-run chinook salmon |
| <input type="checkbox"/> Late-fall run chinook salmon | <input type="checkbox"/> Longfin smelt |
| <input checked="" type="checkbox"/> Delta smelt | <input type="checkbox"/> Steelhead trout |
| <input type="checkbox"/> Splittail | <input type="checkbox"/> Striped bass |
| <input type="checkbox"/> Green sturgeon | <input type="checkbox"/> All chinook species |
| <input type="checkbox"/> Migratory birds | <input type="checkbox"/> All anadromous salmonids |
| <input type="checkbox"/> Other: _____ | |

Specify the ERP strategic objective and target (s) that the project addresses. Include page numbers from January 1999 version of ERP Volume I and II:

The ERP target is fish passage and fish screens (page 17 and 18 of the solicitation). The general objective is to improve the delta smelt survival in the Bay-Delta by reducing its predation.

Indicate the type of applicant (check only one box):

- | | |
|--|---|
| <input type="checkbox"/> State agency | <input type="checkbox"/> Federal agency |
| <input type="checkbox"/> Public/Non-profit joint venture | <input type="checkbox"/> Non-profit |
| <input type="checkbox"/> Local government/district | <input type="checkbox"/> Private party |
| <input checked="" type="checkbox"/> University | <input type="checkbox"/> Other: _____ |

Indicate the type of project (check only one box):

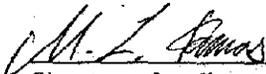
- | | |
|--|---|
| <input type="checkbox"/> Planning | <input type="checkbox"/> Implementation |
| <input type="checkbox"/> Monitoring | <input type="checkbox"/> Education |
| <input checked="" type="checkbox"/> Research | |

By signing below, the applicant declares the following:

- 1.) The truthfulness of all representations in their proposal;
- 2.) The individual signing the form is entitled to submit the application on behalf of the applicant (if the applicant is an entity or organization); and
- 3.) The person submitting the application has read and understood the conflict of interest and confidentiality discussion in the PSP (Section 2.4) and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

M. Levent Kavvas

Printed name of applicant



Signature of applicant

TITLE PAGE

**Title of project: DEVELOPMENT OF AN OPTIMAL DESIGN FOR
REDUCING PREDATION ON DELTA SMELT AT A LARGE FISH
SCREEN**

Principle Investigator: M. Levent Kavvas, Professor
Department of Civil and Environmental Engineering
University of California, Davis
One Shields Avenue
Davis, CA 95616
(530) 752-2518, FAX (530) 752-2385, mlkavvas@ucdavis.edu

Type of Organization and Tax Status: State assisted public research and
educational institution

Tax Identification Number: 94-603-6494

Participants/Collaborators in Implementation:

Joseph J. Cech, Jr., Professor
Department of Wildlife, Fish, and Conservation Biology
University of California, Davis
One Shields Avenue
Davis, CA 95616
(530) 752-3103, FAX (530) 752-4154, jjcech@ucdavis.edu

California Department of Water Resources
California Department of Fish and Game
National Marine Fisheries Services

EXECUTIVE SUMMARY

A. Project Title and Applicant Name

DEVELOPMENT OF AN OPTIMAL DESIGN FOR REDUCING PREDATION ON DELTA SMELT AT A LARGE FISH SCREEN

Dr. M. Levent Kavvas, UC Davis

Dr. Joseph J. Cech, Jr., UC Davis

B. Project Description and Primary Biological/Ecological Objectives

The objective of this project is to develop and evaluate generic sieving designs for the exclusion of the fish predators near large fish screens and, for each screen configuration, quantify predator exclusion, and the passage success, survival, and behavior of delta smelt. This project addresses a major environmental stressor identified by CALFED, alteration of flows and effects of water management activities, and associated predation mortality of priority species, such as delta smelt. The project is specifically designed to quantitatively evaluate the effectiveness of one of CALFED's primary mitigation strategies for fish protection, installation of fish screens, and to produce results which may be implied to improve fish passage and survival at fish screens, including those proposed under the CALFED alternatives. Specific questions addressed include:

How vulnerable are small Delta fishes, such as delta smelt, to predation?

Can predation rates be reduced if sorting screens are present?

How many of sorting screens are necessary to effectively reduce predation?

What is the optimal configuration of these sorting screens?

Answers to these questions will assist engineers and water managers to make decisions regarding screening of diversions and apply adaptive management techniques in water diversions operation which protect fish and enhance ecosystem quality. Answers to these questions may also help achieving the optimal design for the USBR Tracy Fish Facility.

C. Approach/Tasks/Schedule

The approach is to test delta smelt in clear water conditions, to quantitatively observe and track their movements and responses to the diversion, fish screen, sorting screens, bypass, and predators. These results will then allow us to develop an effective fish screen facility design for reducing predation. Experiments will be conducted in a large, laboratory-based flume (see Figure 1.) in which hydraulic (e.g. flow rate, approach and sweeping velocity) and biological (e.g. number of predators) conditions can be controlled and the behavior of the fishes can be closely observed and recorded.

The 21-month project is scheduled in 2 phases. Phase I (9 months) will include modifications of the flume, and design, construction and installation of fish sorting screen set along with the standard fish screen, and preparation of a Quality Assurance Project Plan (QAPP) for biological tests. Hydraulic and biological tests will be conducted, and sorting screen structure will be modified as necessary during Phase II (12 months).

D. Justification for Project and Funding by CALFED

Installation of fish screens at water diversions has been identified by CALFED as an activity that provides direct benefit to fish resources and the ecosystem. However, predation losses of bypassed fishes may substantially reduce any fish protective benefits imparted by installation of the screen. The proposed project will develop and evaluate generic sieving designs for the exclusion of fish predators near large fish screens. This project may be funded under the CALFED program for several reasons:

1. It addresses questions and will produce information applicable to mitigate problems in the Sacramento-San Joaquin Delta and river system associated with alteration of flows, effects of water management activities, and predation mortality of priority fish species, key high rank stressor identified by CALFED.
2. It specifically addresses one of the nine topics identified by CALFED as a priority problem in the Bay-Delta ecosystem, fish passage and related screen improvements, and has direct relevance to at least one other topic, fish passage assessment.
3. It will provide information directly applicable to the design and operation of proposed large-scale diversions outlined in the CALFED long-term plan alternatives.
4. It focuses on the priority specie of delta smelt that are documented to be at high risk from the stressor.

E. Budget Costs and Third Party Impacts

Total funding requested from CALFED is \$788,225 for 1 year and 9 months. This amount includes funds for equipment, supplies, and labor for flume modifications, salaries and benefits of personnel, travel, publication costs, and overhead rate of 46% - 48%. Additional support will be provided by our funding partners, including UC Davis, DWR and DFG.

F. Applicant Qualifications

Dr. M. Levent Kavvas is a professor at University of California, Davis. He has been responsible for many research projects in the areas of hydraulic and hydrologic engineering, in collaboration with different state agencies. He is currently a principal investigator on the Fish Treadmill study, an extensive study of the performance and behavior of Delta fishes exposed to 3-D flow fields near large flat plate fish screens.

Dr. Joseph J. Cech, Jr., is a professor at University of California, Davis, and a well recognized authority on physiology and behavior of fishes. He has successfully completed seven state agency contracts, many with an emphasis on Delta and riverine fishes. He is currently co-principal investigator on the Fish Treadmill study.

G. Monitoring and Data Evaluation

Project results will be reported in regularly submitted quarterly, annual and final reports. Results will also be submitted for publication in peer-reviewed scientific journals, presented at interagency workgroup meetings, and will be available for public review. Biological data collection and evaluation will be described thoroughly in a Quality Assurance Project Plan prepared by the co-principal investigator and research staff and reviewed and approved by experts from collaborating agencies

H. Local Support/Coordination with other Programs/Compatibility with CALFED Objectives

Most of the infrastructure and capital equipment required for the studies is already available at UCD Hydraulics Laboratory, UCD Aquatic Center and UCD Fish Environmental Biology Laboratory. Extensive cooperative and collaborative research and funding arrangements exist between the applicant, other UCD researchers, and state agencies (e.g. DWR, DFG). This project complements several ongoing field and laboratory based projects investigating fish responses to fish screens, fish screen effectiveness, and fish screen hydraulic performance and will provide information directly applicable to implementation of the CALFED alternatives.

PROJECT DESCRIPTION

1. Introduction

Entrainment, impingement, and predation losses of many small Delta fishes at screened and unscreened water diversions have contributed to the declines of many resident and Delta transient fishes, including the threatened delta smelt and endangered winter run chinook. Installation of fish screens has been shown to exclude fishes from diverted water (i.e., reduce entrainment losses of fishes >5mm in length, IEP Technical Report 37, 1994). However, substantial anecdotal and experimental evidence suggests that predation on small fishes that are entrained in the flow field at a fish screen, passing a fish screen, or exiting a fish bypass may be extremely high. In some instances, particularly at large diversion facilities such as the Central Valley Project or State Water Project, as well as those proposed in the CALFED alternatives, predation losses of fishes at fish screens may nullify any beneficial effects of reduced entrainment losses provided by the fish screen installation.

Understanding the unintended secondary effects of installation of fish screens is essential to the CALFED mission of ecosystem restoration, enhancing fish populations (including fish doubling goals mandated by the CVPIA), and developing an effective screen design and operational strategies for existing and future large-scale water diversions.

The presence of the fish screen increases the structural complexity of the environment, providing an area where maximum foraging efficiencies and the highest densities of predators could occur. The fish are concentrated in the bypass areas and near the end of the screen making them an easy prey for piscivorous fishes. The speedy transit of fish through the screen will reduce opportunities for predators. The potential loss of juvenile fish to predation is a serious consideration in the design and operation of fish screens. Concentration and stressing of small fish near screens and accumulation of predator fish around screen structures are undesirable effects of the diversion and screening of water. Conditions that increase prey vulnerability or enhance predator opportunities must be understood in order to develop facilities that minimize fish losses. One way to minimize losses due to the predation would be to employ the sieving technique. A gradual exclusion of large fish predators is possible by placing sorting screens with different sizes of openings in a series one behind another, starting with the coarsest screen. Small fish are then exposed to the fish screen and bypassed back into the river.

2. Objective

The objective of the project is to develop and evaluate generic sieving designs for the exclusion of the predators for delta smelt near large fish screens and, for each screen configuration, quantify predator exclusion, and the passage success, survival, and behavior of delta smelt, which is one of the small-size priority Delta fish species.

3. Methods and Approach

We propose to evaluate different generic configurations (at the most 4 at the current level of funding) of these screens under various flow conditions in order to determine the one configuration that is the most efficient in reducing predation of small Delta fishes near fish screens. For each configuration, we will quantitatively evaluate the passage success, survival, and behavioral responses of delta smelt, and the effectiveness of the screen configuration for separating the large predator fish from smaller fish. These tests will be performed in a large laboratory based flume under construction at the UC Davis Hydraulics Laboratory. The apparatus is designed to provide controlled hydraulic and environmental conditions and a fish screen installation similar to those used at many large size water diversions, and similar to design being considered for the

CALFED alternatives. This approach will enable us to test selected Delta fishes in clear water conditions, to quantitatively observe and track their movements and responses to the diversion, fish screen, sorting screens, bypass, and predators.

Flume Apparatus: The flume will be located at the Hydraulics Laboratory behind the existing Sacramento River model. The flume is 59 ft long, 12 ft wide and 6 ft high. It rests on a reinforced concrete slab of 59 ft long and 40 ft wide, which has sufficient space in order to accommodate the fish collection facilities. Water will be circulated in the flume using diameter 24" steel pipes and pumps that are capable of moving 60-90 cubic feet per second of water. Discharge to the flume is controlled using a bypass valve. Water, after entering the control section, flows through a baffle consisting of expanded metal sheets filled with gravel. The purpose of the baffle is to effectively dissipate and minimize the turbulence in the water. Different water depths in the flume channel will be achieved using a control gate at the downstream end of the flume. Water is collected in the downstream water storage pool and pumped back through the pipes. A diagram of the proposed design and experimental setting is given in Figure 1.

Physical models, such as the proposed flume, allow an insight into flow discontinuities, head losses, effects of submerged screens, operational flexibility and ability to meet velocity criteria under all possible conditions. Past experience with physical model studies has been that they are often started too late to be of full benefit in the planning process. Therefore the infrastructure to support physical modeling studies needs to be in place prior to initiating detailed structure designs. That is where the proposed project falls in.

4. Proposed Scope of Work

The proposed project has two major tasks:

Task 1 – Flume and hydraulic structure constructions, flow field studies, and flume hydraulic control and operation.

Task 2 – Biological experiments and studies of delta fish with various sorting screen and fish screen configuration under various flow and environmental conditions.

Task 1 includes a) design, construction and modification of the flume and water delivery system in order to accommodate various flow conditions found in the Sacramento-San Joaquin Delta; b) design, construction and installation of the sorting and fish screens, and the associated fish collectors; c) hydraulic control and operation of the flume; d) hydraulic studies of flow velocity fields in the flume.

Task 2 includes a) collection of delta smelt, fish handling, and biological experiments under various configurations (at the most 4) for the set of fish screens for reducing fish predation in the proposed large scale flume.

Design/Experimental Protocol: Hydraulic studies will be performed for each different screen configuration and flow combination. Detailed velocity measurements will be performed to quantify the flow field in the flume. These measurements will help us gain better understanding of flow conditions near the sorting screens and a fish screen. Measurements will allow us to evaluate the angle and position of the screens in order to achieve an optimal design. Biological experiments will be performed for each different screen configuration and flow combination. Each experiment with the fish will consist of an initial pre-test, habituation period during which approach flow = 0 f/s, and a test period during which the water will flow through the diversion at the prescribed rate. Our preliminary plans call for 1 hour pre-test period and a 0.25-1 hour test period but these periods may be modified depending on results of pilot studies. For each experiment, 20-40 fish will be used (final group size for each species to be determined by pilot studies) and, in experiments with

predators, one to four striped bass (*Morone saxatilis*, >0.5 kg in weight, final number to be determined by pilot studies).

Species: While a number of small-size Delta and riverine fishes are thought to be adversely affected by agricultural diversions, priority for these experiments will be delta smelt. Because most of these fish are available in adequate numbers only during certain season, each screen configuration may not be tested with all species. Other species (e.g., steelhead) may be tested if adequate numbers of fish are available and/or field data from cooperating agencies suggest these fish are at greater risk from predation.

5. Phase and Schedule

The proposed project consists of two phases:

Phase I (duration: 9 months)

10/1/1999 Funding begins

Final design modifications for the flume and water delivery system, acquisition of equipment and materials, modification of the flume and water delivery system, testing of the flume

Design, construction, installation, and testing of the first set of fish sorting screens and standard fish screen.

Preparation and approval of a Quality Assurance Project Plan (QAPP) for biological tests

5/1/2000 Begin fish collection

Phase II (duration 12 months)

7/1/2000 Conduct biological experiments with different sets of sorting screen and fish screen configurations under various flow conditions.

Modification of sorting screen and fish screen according to the data collected in hydraulic experiment and biological experiment.

Conduct hydraulic experiments with different sorting screen and fish screen configurations.

Development of an optimal design.

Fish collection as necessary.

Final data analysis and interpretation, including comparisons of results with complementary data from other ongoing field and laboratory fish screen studies.

Report writing

6/30/2001 Submit final report.

Results of the studies will be reported in quarterly progress and financial reports, and a final report will be submitted at the end of Phase II.

6. Location of the Project

The species, stressors and habitats addressed in this project are located in all areas within the Sacramento-San Joaquin Delta and river system that are affected by existing and proposed large-scale screened water diversions and fish bypasses. The project will be executed at the Hydraulics Laboratory of the University of California in Davis, which is located near the Sacramento-San Joaquin Delta. The Delta fish will be collected and transported to the Hydraulics Laboratory for the actual design studies.

ECOLOGICAL/BIOLOGICAL BENEFITS

This project develops fish sorting screens that could be used on diversions throughout the Sacramento-San Joaquin Delta and tributaries in order to reduce fish predation in river diversions. It evaluates the effects of fish predation near fish screens on several priority fish species that are at the greatest risk of decline: delta smelt (primary species, 1st tier).

Installation of fish screens at water diversions has been identified by CALFED as an activity that provides direct benefit to fish resources and the ecosystem. However, predation losses of entrained, impinged, and bypassed fishes may substantially reduce any fish protective benefits imparted by installation of the screen. The proposed project will develop and evaluate generic sieving designs for the exclusion of fish predators near fish screens. The results of this project will help in developing better fish screens, screens that exclude or divert predators. Such screens can help reduce predation losses near diversion facilities. The passage success of several priority Delta fish species will be quantitatively evaluated, and the efficacy of several water diversion designs and operational strategies will be put to test. The results will have application and provide benefit to several habitat types, including tidal perennial aquatic habitat, instream aquatic habitat, and shaded riverine habitat, and all fishes which reside in or pass through these habitats. This project will specifically evaluate passage success, and entrainment, impingement and predation losses of delta smelt, one of the priority fish species, thought to be a high risk from water diversion related stressors. Results may be applicable to predict diversion and screen impacts on other ecologically and/or morphologically similar species not tested (e.g., steelhead, longfin smelt, striped bass).

Understanding of the unintended secondary effects of installation of fish screens is essential to the CALFED mission of ecosystem restoration, enhancing fish populations (including fish doubling goals mandated by the CVPIA), providing information and tools for effective adaptive management by agencies and water users, and implementing the CALFED alternatives.

Installation of fish screens at existing large water diversions (e.g., Tracy pump plant of CVP) and at possible future diversions proposed as components of the CALFED long term plan alternatives has been identified by CALFED as an activity which provides a direct benefit to fish resources and the ecosystem. However, substantial evidence suggests that large numbers of screened and bypassed fishes may be instead lost to predation. The direct benefit attributed to screen installation may be minimal.

The proposed project will quantitatively evaluate the passage success and vulnerability to predation of priority Delta fishes, and test the effectiveness of several screen configurations designed to exclude and divert predatory fishes and thus reduce predation losses of small size priority species. It addresses specific ERPP objectives as outlined below:

1. Continued research on fish screening and related facilities design and operations, and on fish behavior relative to screening (ERPP v.1, Water diversion as stressor, p. 424-429);
2. Reduction of adverse effects of CVP and SWP diversions during the period when larvae, juvenile, or adult life stages of Delta smelt appear in the Delta (ERPP v.1, Vision for Delta smelt, p. 191);
3. Removal of predators associated with diversions and fish protection facilities (ERPP v.1, Vision for splittail, p. 207);

In addition, through its focus on Delta smelt (project results should be applicable to all runs), this project also addresses objectives of the Anadromous Fish Restoration Program and other sections of the CVPIA. Our results will provide CALFED and other environmental managers and water users with information essential to make decisions regarding screening and operation of large water diversions that, by protecting fishes, enhance ecosystem functioning and quality.

This experimental approach and use of a laboratory-based system for a biological evaluation of the fish protection qualities of fish screens is preferable to field studies and will provide greater direct benefit than field studies for several reasons.

- 1) The flume under construction at UC Davis Hydraulics Laboratory is generic in design. It is not site specific and it allows for testing of different screen configurations. Rate of flow, approach and sweeping velocities are easily controllable and therefore different combinations can be tested. The flume can also be widened from current 12 feet up to the 32 feet width. There is also a space for longitudinal extension of the flume. The flume with this modular design, lends itself to a wide array of studies. Various scaled models can be put into the flume and tested as well as some 1:1 studies of diversion and fish screening sites.
- 2) Observations of fishes near fish screens installed at water diversions in the Delta or rivers are logistically and technically difficult (e.g., turbid water conditions limit visibility for human or video observations).
- 3) The presence, numbers, species, and sizes of fishes near any particular diversion are not predictable and cannot be replicated, therefore development of a scientifically and statistically valid study to assess screen effectiveness is difficult. Artificial introduction of test fish (including mark, release and recapture studies) near the diversion and screen is problematic because the effects of exposure to the diversion and predators cannot be easily separated from the stressful effects of handling and release, and these stressed fish may respond differently to the diversion than unhandled fish.
- 4) Hydraulic (e.g. flow rates, approach and sweeping velocities), environmental (e.g., temperature, light levels) and biological conditions (e.g., number and type of predator) are inherently uncontrolled in the field and cannot be replicated or tested quantitatively.

The results from this project will assist CALFED and other environmental and resource managers to make decisions regarding the design and operation of screened water diversions in ways which truly protect fish, and enhance ecosystem quality, and contribute to fish doubling goals mandated by the CVPIA. Since this design study is generic in nature and performed at a large laboratory flume, the optimal configuration to be developed for the set of fish screens for minimizing fish predation can then be applied at any particular diversion location.

Recently, USBR has proposed to build a new diversion structure to replace its current Tracy Fish Collection Facility due to its low louver efficiency and fish salvage. As stated in its feasibility report of the new facility, major field modification of its diversion structure will not be easy regardless of planning due to the size of the facility, and many proposed changes can be pretested in laboratory models thereby limiting field modifications to fewer and the most promising ideas. Developed sorting screens will have direct application to the Tracy Fish Collection Facility. Such screens can also be used as a debris management tool.

Furthermore, this apparatus, once developed, will also be useful for studies on the effects of other environmental and biological conditions (e.g., temperature, turbidity, salinity, fish size, other species). This flume apparatus is not site specific but it is rather a generic apparatus where various fish screening alternatives can be tested and evaluated. The flume will be useful for solving fish screen failure problems that have occurred recently in various small agriculture diversions along Sacramento River.

While the proposed project is new, it continues the applied research interest and collaborative activities of our laboratory on the effects of flows, fish screens, and environmental conditions on the performance, behavior, and physiology of Delta fishes. Much of the required laboratory, fish holding, and hydraulic facilities and infrastructure are in place and available (see *Implementability*).

facilities). This project capitalizes on a number of existing and new cooperative and collaborative arrangements between our hydraulic engineering research group, applied environmental biology research group, state and federal resource agencies (e.g., DWR, DFG, USFWS, NMFS). It also complements several ongoing and proposed projects, including the Fish Treadmill project (DWR contract # B-80898), a detailed investigation of the behavior and performance of Delta fishes exposed to large flat-plate fish screens.

Third party impacts Results from this study could have impact on the operational guidelines for fish screens and water diversions by suggesting techniques and approaches to minimize predation and better protect endangered Delta and riverine fishes. Application of the results of this proposed project could have impacts on sport, commercial and native Californian fisheries by improving protection of fishes at small water diversions throughout the Delta and the river system and thus enhancing fish populations

MONITORING AND DATA EVALUATION

Flow velocities: Experiments will be conducted at the approach flow velocity, 0.2 f/s (6 cm/s, the present criteria for delta smelt) and a control flow condition, 0 f/s, with different sweeping velocities.

Environmental Conditions: Experiments will be conducted during the late winter, spring, and fall at ambient temperatures, 12-20°C (estimated seasonal range).

Hydraulic Measurements: Three dimensional water velocity flow field measurements will be performed prior to the beginning of the biological experiments. During the biological experiments single point flow measurements will be used as a quality control feature. Water velocity will be measured using the SonTek Acoustic Doppler Velocimeter. This instrument is capable of measuring turbulent velocities at a rate of up to 25 samples per second. It measures velocity in three directions and allows for qualitative assessment of turbulence structures in the flow field near the fish screens.

Biological Measurements: Fish behavior and responses to the diversion will be monitored during each experiment visually by researchers as well as recorded by four 60 frame/s video cameras mounted in stationary locations above the fish screens and bypasses. Recordings from each camera will be analyzed manually and using a computer-assisted motion analysis. For each video record, information on flow velocities and directions, fish size, and linear scaling will be incorporated into the computer program and/or data record for calibration purposes. Measurements will include fish orientation, location within the apparatus (e.g., distance from screen surface), swimming velocity, distance and direction traveled, passage through or impingement on a screen, time to bypass, % of fish bypassed, and predation events. Fish orientation, and distance, direction and velocity traveled over the ground will be combined with velocity-vector maps of the flume to calculate true swimming velocities and distance traveled through the water by individual fish. Survival will be monitored during all experiments and for a minimum of 24 h post-test in fresh water.

Project results will be reported in regularly submitted quarterly, annual and final reports. Results will also be submitted for publication in peer-reviewed scientific journals in the appropriate fields, presented at interagency workgroup meetings, and will be available for public review. Data collection, acceptability, quality control, and evaluation will be described thoroughly in a Quality Assurance Project Plan prepared by the principal investigator, collaborating scientists, and research staff (including research collaborators from state and federal agencies) and reviewed and approved by one or more experts from these collaborating agencies who are not directly involved in the

project. The optimal design of sorting screens can be evaluated in the field such as in the Tracy Fish Collection Facility.

IMPLEMENTABILITY

The proposed project is highly implementable. It utilizes existing facilities and resources at the University of California, Davis (UCD), as well as ongoing and productive collaborative arrangements with various state and federal agencies. It builds upon the expertise of scientists at University of California, Davis in areas of hydraulics and fish biology (including Delta fishes), and fish screen technology and operation (see *Applicant Qualifications*). There are no laws, regulations, land use conditions, hazardous materials concerns, etc. which would delay or preclude implementation of this project.

Facilities: The project will be executed at the UCD Hydraulics Laboratory where the flume will be constructed and all the experiments will take place. Experimental fishes will be maintained at the UCD Hydraulics Laboratory and Aquatic Center. UCD Fish Environmental Biology Laboratory will be utilized for analysis of fish behavioral and physiological data and samples. Videotape records from each experiment will be analyzed at the UCD Fish Environmental Biology Laboratory. Hydraulics Laboratory facilities include: a water circulation system capable of moving 90 cfs water flow, a concrete flume platform of 59 ft x 40 ft with a water storage pool of 4500 cubic feet, a dedicated 265 ft deep well which provides non-chlorinated, air-equilibrated water, a temperature controlled fish holding facility, analytical equipment including 3-D velocimeter with downward and side looking probes, computers, and staff experienced in construction and hydraulic testing. Aquatic Center facilities include: a dedicated well which provides non-chlorinated, air-equilibrated water; a large scale, temperature-controlled fish holding facility (e.g., 23 tanks are available for this project); and an experienced staff for fish care and technical support. The Fish Environmental Biology Laboratory facilities include: computer-assisted motion analysis system, some video equipment, and computers with necessary database access and software.

Permits: Required permits for water use and discharge, and animal collection and care are on file or being processed.

COSTS TO IMPLEMENT PROPOSED PROJECT

Total funding requested from CALFED is \$788,225 for 1 year and 9 month (see Table 1). Budget costs for Task 1 include salaries and benefits of 2 quarter-time Hydraulics Laboratory shop mechanics and 4 half-time hydraulics engineers who will modify the flume and water supply system and install necessary sorting and fish screens. The budget cost for installations and modifications include sorting and fish screens, necessary plumbing and pumps for water supply system, additional fish holding tanks and associated plumbing, electrical installation, observation structure and a car-port type structure to cover the apparatus. Construction and installation of this type of apparatus at a facility without the water handling and fish holding infrastructure available at the UCD Hydraulics Laboratory would be more expensive. Budget costs for Task 2 include salaries and benefits of 2 quarter-time post-doctoral researchers in fish biology for 4 months and fish collection cost in Phase I. The budget costs for Task 2 also include salaries and benefits of 2 quarter-time post-doctoral researchers in fish biology and 2 quarter-time student research assistants for 12 months, and 3 full-time Post-graduate researchers for 9 months in Phase II. Budget costs for Phase II are mainly salaries and benefits for research and support staff, supplies and overhead. Budget costs for project management is the summer compensation for M.L. Kavvas (2.0 months).

Table 1. Total Budget (CALFED funds only)

Task	Direct Labor Hours	Direct Salary and Benefits	Services Contracts	Material and Acquisition Costs	Miscellaneous and other Direct Cost	Overhead and Indirect Costs	Total Cost
Task 1 (Hydraulics)	9675	228,140		125,000	43,828	117,179	514,146
Task 2 (Fish Biology)	7131	137,080		4,400	17,000	71,593	230,073
Project Management	346	26,066			4,000	13,940	44,006

Grand Total Cost = \$788,225

Table 2. Quarterly Budget of Phase I

Task	Oct-Dec 99	Jan-Mar 00	Apr-Jun 00
Task 1 (Hydraulics)	174,806	54,806	54,806
Task 2 (Fish Biology)	-	3,982	11,947
Project Management	4,030	4,030	4,030

Phase I Total = \$312,437

Table 3. Quarterly Budget of Phase II

Task	Jul-Sep 00	Oct-Dec 00	Jan-Mar 01	Apr-Jun 01
Task 1 (Hydraulics)	57,432	57,432	57,432	57,432
Task 2 (Fish Biology)	56,836	52,436	52,436	52,436
Project Management	7,979	7,979	7,979	7,979

Phase II Total = \$475,788

COLLABORATIVE ARRANGEMENTS AND COST-SHARING:

UCD Fish Environmental Biology Group: Assist in design of screen configurations, experimental design, implementation, analysis, and interpretation of biological experiments.

UCD Fish Pathology Laboratory (School of Veterinary Medicine): Fish disease diagnosis and treatment.

California Department of Water Resources (DWR): Consultation and assistance in design, construction and testing of the fish screen configurations.

California Department of Fish and Game (DFG): Consultation in the design of fish screen configurations, and assistance in fish collection and experiments.

National Marine Fisheries Services (NMFS): Consultation in the design of fish screen configurations and fish behavior experiments.

Cost-sharing: Collaborating agencies are expected to provide us with the part-time services of their personnel for different tasks (see Table 4). California Department of Water Resources (participation pending) will provide us with a hydraulic engineer and biologist to consult and assist with the

design, construction and testing of fish screen configurations, and to assist with the preparation of the QAPP. UC Davis is requesting from California Department of Fish and Game (participation pending) to provide equipment and in-kind services to assist in fish collection, design of fish screen configurations and preparation of QAPP.

Potential for Incremental Funding: Because the proposed project requires a moderately large capital outlay for modification of the flume before experiments can be initiated, and involves relatively long-duration and complex biological tests on live fishes which may only be available seasonally, the potential for incremental funding is limited. Biological experiments, particularly those designed to test several variables (e.g., fish species, day vs. night), require replication in order to produce scientifically and statistically valid results and are time consuming. Further, a commitment for the entire 24 months will facilitate attracting and keeping top-quality post-graduate researchers and maintaining a smoothly running program. Funding of this project will provide the State with a generic apparatus for various environmental studies. This is possible due to the modular design and expandability of the flume.

Table 4. Total funding for the project including counterparts from funding partners

	Phase I	Phase II	Total
University of California, Davis	20,600 ^a	36,050 ^a	56,650
Department of Water Resources	28,000 ^b	28,000 ^b	56,000
Department of Fish and Game	10,000 ^b	50,000 ^c	60,000
CALFED	312,437	475,788	788,225
Total:	371,037	589,838	960,875

Legend:

^a salary for M.L. Kavvas (15%) and J.J. Cech (5%)

^b estimated salaries of DWR and DFG personnel

^c salaries and equipment for fish collection

APPLICANT QUALIFICATIONS

A. Organization of the Project

For over thirty years, the University of California Hydraulics Laboratory in Davis has been conducting hydraulic investigations through simulations and scaled models. The present and future research interests of the Hydraulics Laboratory are focused towards meeting the needs for the solution of the ecological, environmental and hydraulic engineering problems existing in the overall Delta region. Currently, Laboratory is conducting a Fish Treadmill study in order to determine how Delta fish species of various sizes and swimming abilities behave if subjected to a flat plate fish screen, and what are the suitable approach and sweeping velocities and screen exposure duration for various fish species.

The project will be under the direction and supervision of the principal investigator, Dr. M. Levent Kavvas, Professor in the Department of Civil and Environmental Engineering, University of California, Davis. Day to day project management, data analysis and interpretation, and report writing will be provided by the research engineer Dr. Z.Q. Chen. Three post-graduate research engineers will assist with design, construction, operation, and data collection and analysis. One part-time shop technician will assist in the construction of the related structures, as well as with the daily routine maintenance.

Biological studies will be under the direction and supervision of the co-principal investigator, Dr. J. J. Cech, Jr., Professor in the Department of Wildlife, Fish, and Conservation Biology, University of California, Davis. Day to day project management, implementation, data analysis, interpretation, and report writing will be provided by two post-graduate researchers, Drs. C. Swanson and P. S. Young. Part-time post-graduate researchers will assist with fish collection and care, and data collection and analysis. Collaborating engineers and biologists from DWR, DFG and NMFS will work with the principal investigators and managing hydraulic engineers and biologists.

B. Collaborating Scientists

Dr. M. Levent Kavvas is a professor at UC Davis, Civil and Environmental Engineering Department since 1985. He has been responsible for many related research projects in collaboration with different state agencies. He is an author of more than 87 journal and proceedings publications in the areas of hydraulic and hydrologic engineering. He has been a member of the Editorial boards of several engineering journals, and is currently the Editor of ASCE Journal of Hydrologic Engineering. He is currently a principal investigator on the Fish Treadmill study (DWR contract # B-80898), an extensive study of the performance and behavior of Delta fishes exposed to 3-D flow fields near large flat plate fish screens.

Dr. Z.Q. Chen is a Research Engineer with the UCD Hydraulics Laboratory. He has worked on various hydraulic modeling studies, and currently is a lead engineer for the Fish Treadmill Project. He was also involved in the hydraulic modeling study of the Fish Treadmill 1:2.5 scale model. Dr. Chen specializes in physical hydraulic models, hydraulic engineering, and hydrological modeling.

Dr. Joseph J. Cech, Jr. has been a professor at UCD since 1975 and was Chair of the Department of Wildlife, Fish, and Conservation Biology from 1992-1997. He has published more than 80 peer-reviewed articles and books in the fields of physiology and physiological ecology of fishes, and has won numerous awards, honors, and grants. He has successfully completed seven contracts with state agencies for studies of the physiological ecology of fishes in the Sacramento-San Joaquin Delta and rivers. He is currently co-principal investigator, with M. L. Kavvas, Department of Civil and

Environmental Engineering, UCD, on the Fish Treadmill Project (DWR contract # B-80898), a comprehensive study of the performance and behavior of Delta fishes exposed to 3-D flow fields and large flat-plate fish screens.

Dr. Christina Swanson has been a post-doctoral researcher in Dr. Cech's laboratory. She has spent the past five years studying the environmental tolerances, swimming performance, and behavior of Delta fishes, with an emphasis on the biology of delta smelt. She was the managing researcher on three successfully completed state contracts and is currently one of the managing biologists on the Fish Treadmill Project.

Dr. Paciencia S. Young received her doctoral training and is currently a post-doctoral researcher in Dr. Cech's laboratory. She is an expert in the areas of stress and exercise physiology of fishes and has spent the past four years studying the environmental tolerances, swimming performance, and behavior of Delta fishes, with an emphasis on the biology of splittail and delta smelt. She was the managing researcher on two successfully completed state contracts and is currently one of the managing biologists on the Fish Treadmill Project.

Mr. Ted Frink, a biologist with the Environmental Services Office, California Department of Water Resources, will consult and assist with us on design of different fish screen configurations, data analysis and interpretation of results.

Mr. Shawn Mayr, a civil engineer with the Environmental Services Office, California Department of Water Resources will assist and consult with us on design, construction and testing of the different fish screen configurations.

Mr. Robert Fujimura, a biologist with California Department of Fish and Game, will assist and consult with us on experimental design, data analysis and implementation of the experiments.

Mr. Rick Wantuck with National Marine Fisheries Services, will consult with us on the design of fish screen configurations and fish behavior experiments.

C. Conflict of Interest

There are no existing or potential conflicts of interests for any of the personnel involved in this project.

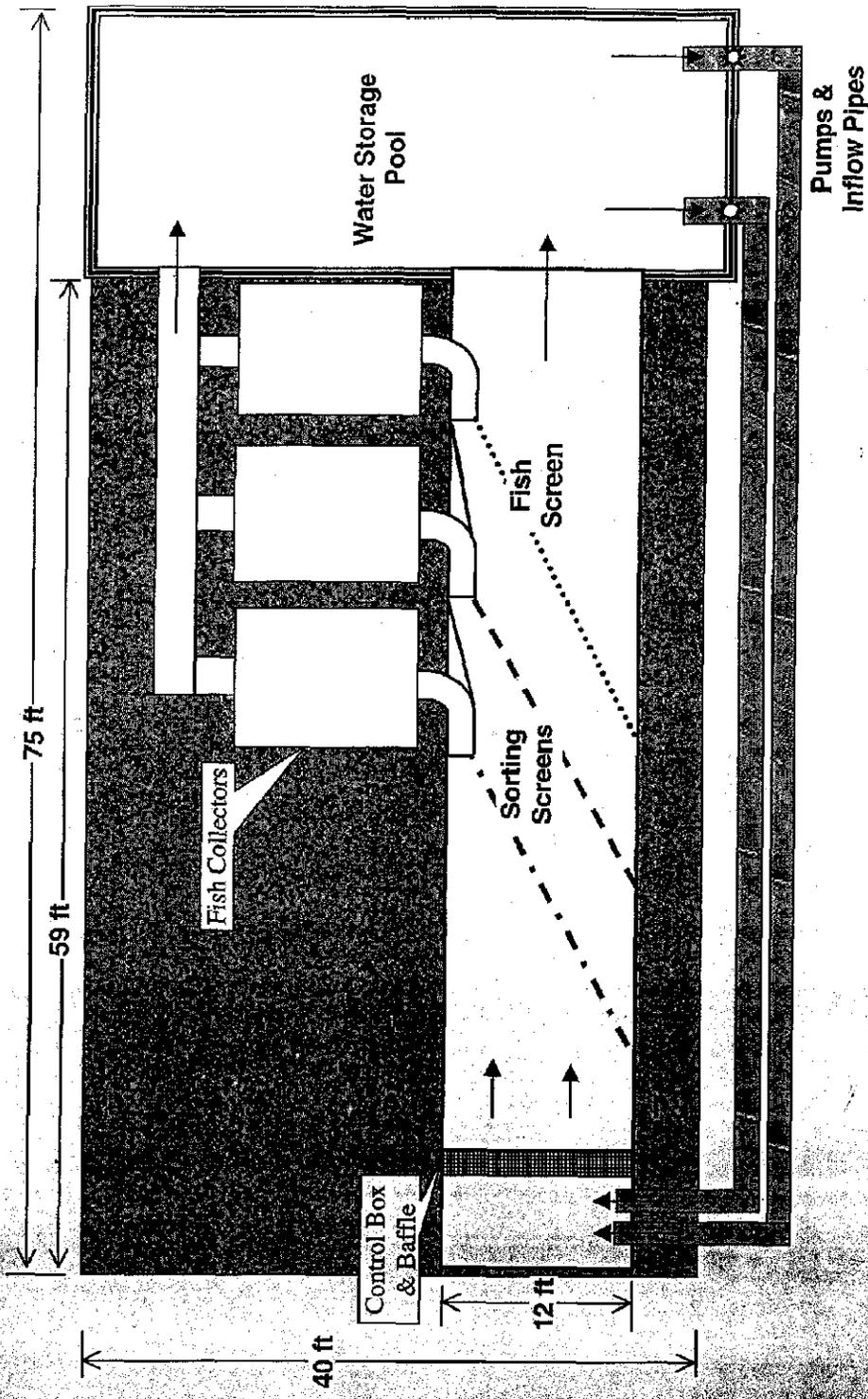


Figure 1. Diagram of the proposed design for predation study

U.S. Department of the Interior

Certifications Regarding Debarment, Suspension and
Other Responsibility Matters, Drug-Free Workplace
Requirements and Lobbying

Persons signing this form should refer to the regulations referenced below for complete instructions:

Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions - The prospective primary participant further agrees by submitting this proposal that it will include the clause titled, "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions. See below for language to be used; use this form for certification and sign; or use Department of the Interior Form 1954 (DI-1954). (See Appendix A of Subpart D of 43 CFR Part 12.)

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions - (See Appendix B of Subpart D of 43 CFR Part 12.)

Certification Regarding Drug-Free Workplace Requirements - Alternate I. (Grantees Other Than Individuals) and Alternate II. (Grantees Who are Individuals) - (See Appendix C of Subpart D of 43 CFR Part 12)

Signature on this form provides for compliance with certification requirements under 43 CFR Parts 12 and 18. The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of the Interior determines to award the covered transaction, grant, cooperative agreement or loan.

PART A: Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions

CHECK IF THIS CERTIFICATION IS FOR A PRIMARY COVERED TRANSACTION AND IS APPLICABLE.

- (1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
 - (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
 - (b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - (c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
 - (d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- (2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

PART B: Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions

CHECK IF THIS CERTIFICATION IS FOR A LOWER TIER COVERED TRANSACTION AND IS APPLICABLE.

- (1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
- (2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

PART C: Certification Regarding Drug-Free Workplace Requirements

CHECK IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS NOT AN INDIVIDUAL

Alternate I. (Grantees Other Than Individuals)

A. The grantee certifies that it will or continue to provide a drug-free workplace by:

- (a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;
- (b) Establishing an ongoing drug-free awareness program to inform employees about--
 - (1) The dangers of drug abuse in the workplace;
 - (2) The grantee's policy of maintaining a drug-free workplace;
 - (3) Any available drug counseling, rehabilitation, and employee assistance programs; and
 - (4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;
- (c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);
- (d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will --
 - (1) Abide by the terms of the statement; and
 - (2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;
- (e) Notifying the agency in writing, within ten calendar days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification numbers(s) of each affected grant;
- (f) Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph (d)(2), with respect to any employee who is so convicted --
 - (1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or
 - (2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;
- (g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a) (b), (c), (d), (e) and (f).

B. The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance (Street address, city, county, state, zip code)

Check if there are workplaces on file that are not identified here.

PART D: Certification Regarding Drug-Free Workplace Requirements

CHECK IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS AN INDIVIDUAL

Alternate II. (Grantees Who Are Individuals)

- (a) The grantee certifies that, as a condition of the grant, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in conducting any activity with the grant;
- (b) If convicted of a criminal drug offense resulting from a violation occurring during the conduct of any grant activity, he or she will report the conviction, in writing, within 10 calendar days of the conviction to the grant officer or other designee, unless the Federal agency designates a central point for the receipt of such notices. When notice is made to such a central point, it shall include the identification number(s) of each affected grant.

PART E: Certification Regarding Lobbying
Certification for Contracts, Grants, Loans, and Cooperative Agreements

CHECK IF CERTIFICATION IS FOR THE AWARD OF ANY OF THE FOLLOWING AND THE AMOUNT EXCEEDS \$100,000: A FEDERAL GRANT OR COOPERATIVE AGREEMENT; SUBCONTRACT, OR SUBGRANT UNDER THE GRANT OR COOPERATIVE AGREEMENT.

CHECK IF CERTIFICATION IS FOR THE AWARD OF A FEDERAL LOAN EXCEEDING THE AMOUNT OF \$150,000, OR A SUBGRANT OR SUBCONTRACT EXCEEDING \$100,000, UNDER THE LOAN.

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

As the authorized certifying official, I hereby certify that the above specified certifications are true.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL

TYPED NAME AND TITLE

DATE

BUDGET INFORMATION - Non-Construction Programs

SECTION A - BUDGET SUMMARY						
Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1.		\$	\$	\$ 312,437	\$	\$ 312,437
2.				475,788		475,788
3.						
4.						
5. Totals		\$	\$	\$ 788,225	\$	\$ 788,225
SECTION B - BUDGET CATEGORIES						
6. Object Class Categories	GRANT PROGRAM FUNCTION OR ACTIVITY				Total (5)	
	(1)	(2)	(3)	(4)		
a. Personnel	\$ 89,868	\$ 239,470	\$	\$	\$ 329,338	
b. Fringe Benefits	15,490	46,458			61,948	
c. Travel	3,000	4,000			7,000	
d. Equipment	120,000	9,400			129,400	
e. Supplies	16,000	19,000			35,000	
f. Contractual						
g. Construction						
h. Other	10,414	12,414			22,828	
i. Total Direct Charges (sum of 6a-6h)	254,772	330,742			585,514	
j. Indirect Charges	57,665	145,046			202,711	
k. TOTALS (sum of 6i and 6j)	\$ 312,437	\$ 475,788	\$	\$	\$ 788,225	
7. Program Income	\$	\$	\$	\$	\$	

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SECTION C - NON-FEDERAL RESOURCES					
(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS	
8.	\$	\$	\$	\$	
9.					
10.					
11.					
12. TOTAL (sum of lines 8 - 11)	\$	\$	\$	\$	
SECTION D - FORECASTED CASH NEEDS					
	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	\$ 312,437	\$ 178,836	\$ 62,818	\$ 70,783	\$
14. NonFederal					
15. TOTAL (sum of lines 13 and 14)	312,437	178,836	62,818	70,783	
SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT					
(a) Grant Program	FUTURE FUNDING PERIODS (Years)				
	(b) First	(c) Second	(d) Third	(e) Fourth	
16.	\$	\$	\$	\$	
17.					
18.					
19.					
20. TOTAL (sum of lines 16-19)	\$	\$	\$	\$	
SECTION F - OTHER BUDGET INFORMATION					
21. Direct Charges: yr 1 - 312,437; yr 2 - 475,788		22. Indirect Charges: yr 1 - 46% and yr 2 - 46.5% of MTDC			
23. Remarks					

1-013243

ASSURANCES - NON-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired, as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.
10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).
12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE
APPLICANT ORGANIZATION	DATE SUBMITTED

Standard Form 424B (Rev. 7-97) Back

**APPLICATION FOR
FEDERAL ASSISTANCE**

OMB Approval No. 0346-0043

1. TYPE OF SUBMISSION: Application <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Non-Construction		2. DATE SUBMITTED 4-16-99		Applicant Identifier	
Preapplication <input type="checkbox"/> Construction <input type="checkbox"/> Non-Construction		3. DATE RECEIVED BY STATE		State Application Identifier	
		4. DATE RECEIVED BY FEDERAL AGENCY		Federal Identifier	
5. APPLICANT INFORMATION					
Legal Name: The Regents of the University of California			Organizational Unit: College of Engr: Civil & Env. Engr.		
Address (give city, county, State, and zip code): University of California, Davis Sponsored Projects Office 410 Mrak Hall, Yolo Cty, Davis, CA 95616-8671			Name and telephone number of person to be contacted on matters involving this application (give area code) M. Levent Kavvas, (530) 752-2518		
6. EMPLOYER IDENTIFICATION NUMBER (EIN): 94 - 6036494			7. TYPE OF APPLICANT: (enter appropriate letter in box) <input checked="" type="checkbox"/> I		
8. TYPE OF APPLICATION: <input checked="" type="checkbox"/> New <input type="checkbox"/> Continuation <input type="checkbox"/> Revision If Revision, enter appropriate letter(s) in box(es) <input type="checkbox"/> <input type="checkbox"/> A. Increase Award B. Decrease Award C. Increase Duration D. Decrease Duration Other(specify):			A. State H. Independent School Dist. B. County I. State Controlled Institution of Higher Learning C. Municipal J. Private University D. Township K. Indian Tribe E. Interstate L. Individual F. Intermunicipal M. Profit Organization G. Special District N. Other (Specify) _____		
			9. NAME OF FEDERAL AGENCY: CALFED Bay-Delta Program		
10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: TITLE: N/A			11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT: Development of an Optimal Design for Reducing Predation on Delta Smelt at a Large Fish Screen		
12. AREAS AFFECTED BY PROJECT (Cities, Counties, States, etc.): United States					
13. PROPOSED PROJECT		14. CONGRESSIONAL DISTRICTS OF:			
Start Date 10/01/99	Ending Date 06/30/01	a. Applicant III		b. Project III	
15. ESTIMATED FUNDING:		16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?			
a. Federal	\$ 312,437	a. YES. THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON: DATE _____			
b. Applicant	\$	b. No. <input checked="" type="checkbox"/> PROGRAM IS NOT COVERED BY E. O. 12372 <input type="checkbox"/> OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW			
c. State	\$	17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT? <input type="checkbox"/> Yes If "Yes," attach an explanation. <input checked="" type="checkbox"/> No			
d. Local	\$				
e. Other	\$				
f. Program Income	\$				
g. TOTAL	\$ 312,437				
18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT, THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.					
i. Type Name of Authorized Representative		b. Title		c. Telephone Number	
f. Signature of Authorized Representative				e. Date Signed	

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