

August 1, 2005
Work Plan for Fiscal Year 2006

I. Tracy Pumping Plant CVPIA Section 3406(b)(4) Tracy Fish Test Facility Project

II. Responsible Entities

	Agency	Staff Name	Role
Lead	USBR	Ron Silva	Program Manager
Co-Lead	USFWS	Dave Harlow	Program Manager

III. Program Objectives for FY 2006

- A. Improve Fish Protection and Fish Salvage at Tracy Fish Collection Facility (TFCF). Action is in compliance with CVPIA 3406(b)(4), and CVP OCAP Biological Opinions for Winter-Run Chinook salmon, Delta smelt, and Central Valley Steelhead.”

- B. Determine Best Practical Fish Protection Technology for making Long-term Future Improvements at Tracy and Other South Delta Facilities Proposed by CALFED - Integral to CALFED’s South Delta Program and is in conformance with the ROD and Framework documents released previously and the CALFED South Delta Fish Facilities Forum recommendations.
 * Species Benefitted - Chinook salmon, Steelhead, Delta smelt, Splittail, Sacramento blackfish, Longfin smelt, Striped bass, Threadfin shad and American shad.

IV. Status of the Program

The Tracy Fish Test Facility (TFTF) as originally proposed was to be a new fish screening technology development and evaluation facility located adjacent to the existing TFCF in the South Delta. The TFTF was to develop critical information for new fish screens and salvage technology for the Delta export facilities at Tracy and at Clifton Court Forebay, and a possible screened through Delta facility on the Sacramento River. The TFTF was to allow for the testing and evaluation of new facilities for fish screening, holding, sorting, and transportation in the South Delta which is influenced by tides, heavy debris loads, and a mix of 51 species. The completed facility was to include a 250-500 cfs test channel, new state-of-the-art fish screens, new fish friendly lifts, holding and sorter facilities in one large enclosed building, fish transfer/off loading facilities to fish tanker trucks, debris and sediment management structures, and support infrastructure including laboratory, office, and maintenance buildings. The TFTF was to be designed by Reclamation with the oversight and assistance of a multi-agency coalition of fish facility experts pursuant to a “Project Management and Organization Agreement” signed by involved regulatory and water interests. The original TFTF Project was to be implemented as part of Section

3406(b)(4) of the CVPIA, and would have been integral to CALFED's South Delta and Conveyance Programs. Funding sources would have included appropriations from Reclamation, the State of California, and CALFED.

However, due primarily to large construction cost concerns, it has been recommended by the CALFED South Delta Fish Facilities Forum (SDFF) to not proceed with construction of a large scale fish test facility (TFTF) at this time. Instead, the SDFF recommended focusing on fixing up and improving the existing fish collection facilities in the south Delta as best as possible to meet original design criteria and implement other alternative actions outside of new fish screens to improve fish populations and assist in meeting agency fish population goals. Included in the recommendations was improvements to debris management (i.e. new improved cleaning equipment), phasing in replacement of a new secondary screening system, and continued facility research activities to better assess the existing facilities and how to implement and evaluate improvements. In essence, the existing facilities will be used as the "test facility" to develop and evaluate improvements in technology and fish protection. It is expected that it will take approximately five to ten years to complete facility assessments and phase in improvements to the existing facilities.

V. FY 2005 Accomplishments.

Note: Additional accomplishments have been included to facilitate reviewer's understanding of this complex and comprehensive program for developing new fish facility technology for the Delta of California.

1. February 19, 1999 - NOI in Federal Register - **COMPLETED**
2. March 17-18, 1999 - Public Scoping Meetings - **COMPLETED**
3. April 6, 1999 - CALFED's Policy Group agreed that Reclamation should proceed with the planning of a 500cfs fish screen facility for testing and evaluating new technologies.
4. June 1999 - CALFED Bay Delta Program Draft EIS included the proposed 500 cfs structure - **COMPLETED**
5. September 1999 - Agreement on Project Management and Organization for the TFTF and Clifton Court Fish Facility was signed by Reclamation, Service, Department of Water Resources, CALFED, CDFG, and National Marine Fisheries Service (NMFS). - **COMPLETED**
6. Monthly Tracy Technical Advisory Team (TTAT) meetings have been held since November 1998 which has resulted in a preferred option for the test facilities - **ONGOING**
7. Value Engineering Study - February 10, 2000 identified a number of actions to reduce costs - **COMPLETED**
8. Project Management Plan - May 15, 2000 road map to all activities and tasks for the Program, established 12 task teams - **COMPLETED**
9. Draft EA/IS released for public comments July 28, 2000 - **COMPLETED**
10. Framework and Agreements Document - provides a continuous record of all decisions agreed to by the TTAT, Central Valley Fish Facilities Review Team and Coordination Team - **COMPLETED**

11. Site Infrastructure Workshop - May 2000 - building, additions, upgrades, staffing, resources - **COMPLETED**
12. Site Infrastructure Workshop Final Report - August 14, 2000 – recommendation Final Feasibility Report - August 14, 2000 - **COMPLETED**
13. 30% and 60%, and preliminary 90% Design Reports - **COMPLETED**
14. Public Workshops for the Environmental Assessment Impact Statement - August 15-16, 2000 - **COMPLETED**
15. Developed Fishery Engineering Flumes at Denver where TFTF Research and Technology Development has been ongoing since 1998 - **ONGOING**
16. Research Studies at Tracy Site for TFTF including leaky louver efficiencies , traveling screens for debris control, and fish friendly pumping tests ETC.-ongoing since 1998 - **ONGOING**
17. Research Studies for TFTF at Red Bluff Pumping Plant on fish friendly lifts and screens have been ongoing since 1995 - **COMPLETED**
18. UCD Studies - working with the UCD to cooperate on laboratory studies needed to refine facilities to be built at the TFTF - **COMPLETED**
19. CDFG Studies- are exploring new fish distribution and stocking strategies to compliment the new facilities - **ONGOING**
20. Establishment of Research Team – Tracy Fish Research Evaluation and Development, for developing the test procedures and evaluations to be conducted at the TFTF - **ONGOING**
21. Specific research activities conducted for 2005 included the following:
 - C Whole facility evaluations for delta smelt and salmon - **ONGOING**
 - C Predator tracking using sonic tags - **ONGOING**
 - C Recessed holding tank stress tests - **ONGOING**
 - C Improved debris management- **ONGOING**
 - C Facility hydraulic evaluations - **ONGOING**
 - C Distribution of delta smelt identification volume series - **COMPLETED**
 - C Water quality analysis at the TFCF – **ONGOING**
 - C Evaluation of Dual-Frequency Identification Sonar (DIDSON) for direct observation of fish movement and behavior near structures - **ONGOING**
 - C Development of TFFIP technical web site and enhanced data accessibility – **ONGOING**

Biological Benefits

The data and information generated in FY2005 is invaluable towards understanding present day operation and efficiencies of the existing TFCF for multiple species of fish. Without this information, decisions on how to improve the existing TFCF could not be made. The data generated is also valuable to both the USBR and DWR if the decision is ever made to move forward with new fish screening facilities in the south Delta.

The results so far have shown the existing TFCF to be significantly less efficient towards screening and salvaging fish as originally designed in the 1950s. Monitoring of results is incorporated into the study plan efforts and will be evaluated as improvements are

implemented and further tests conducted.

VI. Tasks, Costs, Schedules and deliverables

A. Narrative Explanation of Tasks.

1. Program Management

1.1 Program Management - Planning, budget oversight, and coordination of all activities and offices associated with this multi-year program is accomplished by the Program Manager.

1.2 Public Involvement - Reclamation staff from the Public Affairs Office are responsible for public outreach activities, press releases, and updating the website.

1.3 Tracy Office Program Implementation - Reclamation staff from the Tracy Office are responsible for assisting the planning and coordination of all activities and offices associated with this multi-year program.

2 Fisheries Engineering Research Program - Research continues on a number of subtasks at either the Denver Technical Service Center/Research Hydraulics Laboratory or at the TFCF. Study Plans are currently under development which will then be provided in August 2006 to the interagency Tracy Technical Advisory Team which oversees activities associated with improving or researching new technologies for the TFCF. The following are the proposed research activities for FY 2006. Costs for each of the following sub-tasks will be available after the Tracy Technical Advisory Team has reviewed and commented on proposed study plans and a decision can be reached on which studies will be undertaken with available funding.

2.1 Evaluations of a pumped fish bypass and above ground holding tank

In 1998 a research project on fish friendly pumps and above ground holding tanks was funded under the Tracy Research Program. As part of the project, Tracy Fish Facility holding tank no.1 was taken out of normal service. In place of using the in-ground holding tank, a 16-inch Hidrostal pump was installed on the holding tank influent line and bypass flow pumped to an above ground holding tank. The above ground holding tank was designed for collecting fish during short-term fish pump evaluation tests. Three years of fish passage tests on the Hidrostal pump have shown this type of pump can be used with low injury and mortality to delta fish species. During the same period, laboratory testing and development of improved designs for fish holding tanks was conducted in Reclamation's Water Resources Research Laboratory. This proposal builds on prior work by constructing and evaluating a demonstration facility of a state of the art pumped bypass fish salvage and holding facility.

2.2 Evaluation of holding tank influences on chinook salmon and delta smelt.

Fish are collected and held for up to 24 hr in large, circular, concrete tanks (about 20-ft diameter, 15-ft high) in moderate velocity (0.6-3.1 ft/s) with ambient debris. Fish holding time is dependent on fish density and time of

year. Typically, fish are held for 8 hr in the spring when Delta smelt are present, 12 hours in the winter when Chinook salmon smolts are present, and 24 hours the remainder except when either fish density or debris load is high (based on guidelines in Bates et al. 1960). Fish are further concentrated into a 500 gallon lift bucket one, two, or three times per day and moved to a transport truck. The influence of holding conditions on fish condition and survival is not well understood and believed significant.

The objective of this study is to complete holding/swirl experiments using Chinook salmon and Delta smelt. Experiments with Sacramento blackfish suggest some external damage occurs during high velocity/high debris conditions but immediate mortality is low. We will evaluate holding influences on diverted fish at the Tracy Fish Facility and document areas that could be improved.

2.3 Fish Holding Associated Stress in Sacramento River Chinook Salmon at South Delta Fish Salvage operations.

During the past twenty years, several fish species in the Sacramento-San Joaquin Delta have declined in abundance, including Sacramento River winter-run chinook salmon (*Oncorhynchus tshawytscha*), delta smelt (*Hypomesus transpacificus*), and striped bass (*Morone saxatilis*). Water diversions are suspected of being one of the causes of declines in fish populations throughout California (Brown and Moyle 1993, Bennett and Moyle 1996, Danley et al. 2002). These federally and state-listed threatened and endangered fish species, and those of concern because of an economically viable sport fishery are frequently recovered during salvage operations. Reclamation's Tracy Pumping Plant (TPP) along with its sister facility, the State's Harvey Banks Pumping Plant, divert approximately 24% of the Delta's average annual inflow (Mitchell 1996). The magnitude of the water volume that passes through these pumps can create flows that attract fish. This results in an increased concentration of fish in the vicinity of the pumping facilities (Arthur et al. 1996, Bennett and Moyle 1996, Brown et al. 1996). Operations of the south Delta State and Federal fish salvage facilities in California require daily collection and holding of fish, and the transport of these fish back to the Sacramento-San Joaquin River Delta, away from the facilities. These functions are of major importance for efficient return and survival of salvaged fishes; however collecting, holding, and transport methods associated with entrainment of the fishes inadvertently may cause harm that the fish salvage facilities are attempting to minimize.

The Bureau of Reclamation's Tracy Fish Collection Facility (TFCF) consists of a system of louvers, bypasses, and holding tanks to reduce the associated fish loss of its pumping operation. This fish diversion is intended to redirect fishes from entrainment and then release them back to the

Sacramento-San Joaquin River Delta relatively “unharmful” downstream of the influence of the pumps. The TFCF was originally designed to divert downstream migrating smolt chinook salmon from the exported flow and was not intended to divert and salvage the myriad of fish species that are entrained by the pumping practices today. To date, more than 50 species have been observed at the TFCF with more than 5 million fish collected annually (Johnson Wang, TFCF, Tracy, California, personal communication). These high species and fish totals, along with the documented declining abundance of several fish species, are prompting TFCF improvements, including more efficient operational methods. Evaluations and improvements of both the State and Federal fish salvage facilities have been ongoing for a number of years, though emphasis has been more on the facilities themselves rather than the operations for handling, transporting, and release of fishes (Liston et al 2000). Efforts by California Fish and Game have demonstrated problems with survival of salvaged fish after transport to the release site and Reclamation researchers have contributed to the understanding of survivorship and injury of fishes associated with the holding tanks at TFCF (Raquel 1989, Cathy Karp, USBR, Denver, Colorado). These studies, and ongoing technological advances in concepts related to fish holding (USBR Hydraulics Lab Denver, Colorado), indicate an important need for accelerating and expanding studies at the two salvage facilities. Research and monitoring plans have been instituted to investigate the consequences that these water diversions are inflicting on Sacramento-San Joaquin River Delta fish fauna and ways to minimize their negative impacts (CHTR Program, Raines et al. 2000). Fish losses due to entrainment are reduced with improved salvage operations, and the success of these operations is dependent on the survival of screened fishes. Measuring the acute physiological stress and potential direct and indirect mortality experienced by fishes during the different components of the salvage process is vital to understanding negative impacts the process may have on fish. The response to stressors causes an extension of a fish’s physiological condition beyond the normal state to a point that, if extreme or prolonged, may compromise its chances for survival (Barton et al. 2002). Exposure of fishes to environmental stressors, such as capture and handling, can be a great concern to fisheries biologists, in that extreme or prolonged stressors may plague fish performance (i.e. growth, metabolism, reproduction, immune system, predator evasion) and overall health (Barton et al. 2002), adversely affecting population size and sustainability. Abated performance due to sublethal stresses may increase the susceptibility of these fishes to predators (indirect mortality; Olla et al. 1992, Strange and Cech 1992, Mesa 1994, Mesa et al. 1994). For example, predation by striped bass has been identified as a major source of mortality for chinook salmon entrained at the State’s Harvey Banks Pumping Plant (Moyle 2002).

One of the most broadly used approaches to evaluating physiological responses of fish to environmental stressors is measuring blood plasma constituents such as cortisol, lactate, glucose, osmolality, chloride, sodium, potassium, and pH (Pickering 1981, Barton and Iwama 1991, Iwama et al. 1995). However, because some of these reflect a normal response to less extreme or prolonged stressors, from which a fish can quickly recover, an assessment of fish well being and performance should not be restricted to an examination of internal chemo-physiological changes, alone. A more complete assessment would include an examination of chemo-physiological changes and compromised performance over a functional spectrum, covering proximate (e.g., blood plasma constituents), performance (e.g., burst swimming speed), and ecological measurements (e.g., predator avoidance). If the biochemical changes are not linked to the organismal level responses, then the validity of applying such measures to the population or ecosystem levels become more remote. Therefore, a combination of physiological changes in plasma constituents and the ability to perform under controlled challenge tests should assess, more accurately, stress-related effects of the fish salvage process. Furthermore, the probability of developing a widely usable, low-cost indicator of salvage-activities-induced physiological impairments or mortality on salvaged fishes is increased. Finally, information will be used to identify and compare the impacts of components of the salvage operation that are causing the most “harm” and help to design alternative salvage methods or equipment.

2.4 Studies on tracking fish movements inside fish salvage facilities using telemetry.

Studies to develop potential methods for accurately assessing fish predator and prey movements and positioning inside salvage facilities will continue. Both radio tagging and sonic tagging will be examined for eventual expanded use in the TFTF. New techniques using small “pinger” tags for juvenile salmon and striped bass will be given special effort. (Fish are fitted with a small sonic emitting device and the signal is picked up with sonic receivers; now being used in the Pacific Northwest to track salmon around dams). Ability to use these techniques in the TFTF would be extremely valuable in determining if fish are “residing” or “hanging out” in the system, where, and under what hydraulic conditions.

2.5 Design and evaluation of improved louver cleaning technology for the TFCF.

This study will investigate using medium to high-pressure spray to clean debris off the primary and secondary louvers at the Tracy Fish Facility. The goal of the study is to determine the best combination of spray nozzle shape, size and spray pressure required to fragment and dislodge aquatic debris impinged on the louvers. Rather than trying to remove the small fragmented debris (mainly *Egeria*), the material will be allowed to flush through the

louvers carried by the flow. The first phase of the study will be conducted in the Hydraulics Laboratory using a prototype size section of louver and elodea as the primary debris.

2.6 Fish sorting and debris handling research.

The US Bureau of Reclamation (USBR) has an active fish salvage evaluation program that is investigating ways to improve operations and salvage efficiency of the existing facility (TFCF) and to assist with the design of various elements for proposed on-site Tracy Fish Test Facilities. A model will be used to test the effectiveness of fish sorting and holding designs to meet modern fish protection requirements prior to constructing improvements or replacement of fish salvage facilities for the state and federal water diversions in the South Delta.

Holding and fish sorting systems are critical to the process of returning healthy fish to the Delta. Currently, the in-ground circular collection system is believed inadequate because fish are confined in multispecies assemblages with varying debris type and load for 8 to 24 hours. It is believed that fish may be more vulnerable to stress and predation because of these holding conditions.

A 1:3 scale physical model of a proposed on-site fish sorting and holding facility has been constructed in the USBR's Water Resources Research Laboratory in Denver. Several concepts for fish sorting and holding will be tested to determine which methods or designs provide the best performance. In addition, the model will provide continuous hydraulic design data, operation data, and will examine methods for debris control using a fisheries-engineering approach.

2.7 TFCF Collection Efficiency for Delta Smelt, Splittail, and Chinook Salmon
TFCF facility overall salvage efficiency for Delta smelt and splittail is poorly known. Little information exists on primary louver efficiency. We have previously conducted efficiency experiments with Chinook salmon and striped bass and plan to refine those estimates. In addition, we will research methods to improve facility efficiency by manipulating operations.

The primary objectives of this study are two: 1) determine the Tracy Fish Collection Facility's efficiency for salvaging Delta smelt, splittail, and Chinook salmon and 2) increase the sample size for testing the hypothesis, "average channel velocity has a significant influence on secondary louver efficiency for Delta smelt."

2.8 Feasibility Studies for Various New Concepts to Phasing In of a New Secondary Screening System at the TFCF.

This study will investigate rehabilitating the secondary fish collection system at the Tracy Fish Collection Facility. The secondary system provides further dewatering of flow from the four bypasses located on the

primary louver. A dual-louver system within the secondary flow channel guides fish into below ground holding tanks. The fifty-plus year old facility no longer provides fish salvage efficiencies near its original design goals. Changing hydraulic, debris and biological conditions in the delta have negatively impacted the facility. This study will develop an engineering feasibility report defining viable options for improving the secondary dewatering, fish holding and fish loading facility. Options will be considered ranging from component modifications to total facility replacement. Feasibility level drawings and costs will be presented for the options studied.

2.9 Determining Appropriate Loading and Hauling Densities for Fish Species of the Sacramento-San Joaquin Delta.

The primary objective of this study is to determine the maximum holding (transporting) densities for fish species of the Sacramento-San Joaquin Delta region, focusing on Delta smelt (*hypomesus transpacificus*), Sacramento splittail (*Pogonichthys macrolepidotus*) and Threadfin shad (*Dorosoma petenense*). The purpose of this study is to develop a table that the Tracy Fish Collection Facility (TFCF) diversion workers will use to determine the maximum densities of fish that could be transported at various temperatures in a 2,000 gallon fish haul truck. This work is to be an update of The Bates Tables, developed in 1957 for determining the maximum hauling densities of Chinook Salmon (*Oncorhynchus tshawytscha*), Striped Bass (*Morone saxatilis*) and white catfish (*Ameiurus catus*). Dependent upon fish size (mm FL), variation of species salvaged and water temperature (deg. C) the tables will use estimated salvage numbers generated from the 10-minute-count procedures to evaluate the appropriate times that holding tanks should be emptied and fish hauled out of the TFCF. Through this study we will determine if Bates' historic classification of all non-salmonids as "fish" is appropriate in determining hauling densities of the ESA listed Delta smelt and Threadfin and American shad, the highest contributors of biomass salvaged at the TFCF. We will also seek to determine if the current suggested holding densities for salmonids at the TFCF (winter-run C.S., fall-run C.S., spring-run C.S. and steelhead) are appropriate for the current truck hauling system.

2.10 Publish Tracy Volume Series No. 23 and 32.

Publish Tracy Volume Series No. 28, entitled "Evaluation of Mitten Crab Exclusion Technology During 2000 at the TFCF" and Tracy Volume Series No. 32 entitled "A Key to Early Life Stages and Early Life Histories of Cyprinids in the Sacramento-San Joaquin Delta, California: with Emphasis on Splittail, (*Pogonichthys macrolepidotus*), Spawning in the Suisun Bay and Delta".

3. Complete Section 10 Permits.

USBR staff from the Denver Technical Service Center are responsible for the preparation of all documentation necessary for compliance with the

- Endangered Species Act.
- 4. Land Development
- 4.1 Abandoned Intake Channel (AIC) - USBR staff are responsible for all the negotiations and documentation for all land development activities, including the filling in of the AIC located adjacent to the TFCF.

Should funds become limited and not allow total program accomplishment in FY05 as provided in this Work Plan, certain minimum levels of funding will be necessary to prevent either abandonment of the Program or seriously delaying the Program, thus resulting in delays to improving the TFCF pursuant to the CVP OCAP Biological Opinions and CALFED SDFP Forum recommendations.

Priority tasks that need to be funded as a minimum in FY06 include:

1. Program Management
2. Fisheries Engineering Research Program
3. Complete Section 10 Permits.

B. Schedule and Deliverables

#	Task	Dates		Deliverable
		Start	Complete	
1	Program Management	10/01/05	09/30/06	Program Coordination, Program Planning, Budget Oversight, TTAT Chairperson
1.1	Public Involvement	10/01/05	09/30/06	Public Involvement, Public Outreach, Press Releases
1.2	Tracy Office Program Implementation	10/01/05	09/30/06	Review study plans, continue aquaculture facility operation and development, support for land development
2	Research Program	10/01/05	09/30/06	Complete study plans, implement studies, monitor development
3	Environmental Documentation	10/01/05	11/01/05	Complete Section 10 Permits
4	Land Development	10/01/05	10/01/06	Complete sampling of AIC, collect design data, and obtain permits from regulatory agencies

C. Summary of Program Costs and Funding Sources

#	Task	Total Cost	CALFED	W&R
1	Program Management	\$200,000		\$200,000
1.2	Public Involvement	\$50,000		\$50,000
1.3	Tracy Office Program Implementation	\$50,000		\$50,000
2	Research Program	\$2,008,000		\$2,008,000
3	Environmental Documentation	\$25,000		\$25,000
4	Land Development	\$50,000		\$50,000
	Total Program Budget	\$2,383,000		\$2,383,000

D. CVPIA Program Budget

#	Task	FTE	Direct Salary and Benefits Costs	Contracts Costs	Miscellaneous Costs	Administrative Costs (Incl. O/H & Indirect)	Total Costs
1	Program Management	1.0	\$103,000		\$5,000	\$92,000	\$200,000
1.1	Public Involvement	0.2	\$25,000		\$2,000	\$23,000	\$50,000
1.2	Tracy Office Program Implementation	0.2	\$25,000		\$2,000	\$23,000	\$50,000
2	Research Program	14.0	\$1,008,000	\$200,000	\$50,000	\$750,000	\$2,008,000
3	Environmental Documentation	0.1	\$13,000			\$12,000	\$25,000
4	Land Development	0.2	\$25,000		\$2,000	\$23,000	\$50,000
	Total by Category	15.7	\$1,199,000	\$200,000	\$61,000	\$923,000	\$2,383,000

Table E. DRAFT CVPIA 5-Year Budget Plan FY 2007 – 2011
(\$ Thousands)

Program Description and Section		FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	Total (\$)
	W&RR	2,383	2,383	2,383	1,883	1,883	10,965
	RF	0	1,500	16,200	5,500	2,856	26,056
CVPIA Section 3406(b)(4)	State	0	0	0	0	0	0
	CALFED	0	0	0	0	0	0
Total:		2,383	3,883	18,583	7,383	4,739	37,021

WRR – Water and Related Resources Appropriations

RF – Restoration Fund (Section 3407)

State – State of California cost share funding

FY 2007 – 2011 WRR Appropriations are displayed as amounts that might be reasonable appropriated each year. These figures could significantly change in the Congressional Appropriations process. The annual RF budgets were estimates taking into account the three-year rolling average. All of these estimates will be adjusted annually as RF collections are realized.