

April 5, 2004

Summary of review comments on test facility proposals to support technology development aimed at upgrading South Delta fish salvage facilities

Introduction

The South Delta Fish Facilities Forum has been focused on understanding a number of issues related to the direct and indirect fish losses due to the SWP/CVP pumping operations. This effort is intended to help managers, regulatory agencies, and stakeholders make informed decisions on fish facility alternatives given limited fiscal resources and timelines. The Forum to date has made recommendations on hydrodynamics/fisheries studies; facility feasibility studies; collection, handling, transportation, and release studies (CHTR); and Tracy Fish Facility improvements. The Forum has yet to make a recommendation on how to proceed with a new technology fish facility testing program.

While the Forum and the related technical teams have been struggling with this issue, researchers at the University of California, Davis presented an alternative testing site for consideration by the Forum. This option was asked to be considered since UC Davis felt that they could accomplish similar objectives at a much lower cost if the site was moved to their lab facility in Davis and the work was performed by University personnel in collaboration with USBR and others. There was no formal solicitation for a proposal by UC Davis or others. To date, the USBR has been proceeding on the test facility development as a directed CALFED action. They have also been integrating this effort with their CVPIA facility improvements program efforts.

The Forum Chairs (Kirk Rodgers, Diana Jacobs, and Tim Quinn) asked UC Davis to put together a proposal, if they so desired, to determine if this concept had merit. The Chairs appointed Mike Aceituno, NOAA Fisheries, to pull together a small team to evaluate this concept against the USBR's most recent "straw proposal" for a reduced size test facility at Tracy (the Tracy Demonstration Fish Facility or TDFF). Mike selected five reviewers not directly involved in either the USBR or UC Davis test facility development to evaluate these proposed efforts and to report back to the SDFP Forum.

The concept proposals reviewed were:

1. United States Bureau of Reclamation (USBR). September 2003. A Tracy Demonstration Fish Facility (TDFF) To Provide Technology Development For Upgrading South Delta Fish Salvage Facilities, California. Draft concept report submitted to the California South Delta Fish Facilities Forum.
2. Amorocho, J. University of California, Davis (UCD). February 2004. A Long Flume Fish Facility To Provide Technology Development For Upgrading South

Delta Fish Salvage Facilities In California. Proposal submitted to the California South Delta Fish Facilities Forum.

The subject proposals are attached to this review.

Also attached are the individual independent reviews by the group that Mike Aceituno set up to evaluate these proposals. The reviewers are provided just as they were submitted, except that specific reviewer names were removed to keep the comments as anonymous as possible.

Background

To minimize direct losses, both the SWP and CVP pumping plants operate fish salvage facilities to collect and transport entrained fish out of the South Delta. These facilities use “louvers” to behaviorally separate fish from the predominate flows going to the export pumps. A planned objective of the CALFED Bay-Delta Program is to eventually replace these 30 to 50 year old fish protection facilities with state-of-the-art screen systems through the CALFED Conveyance Program. Specifically, the CALFED ROD and its supporting Biological Opinions called for the development of a 500 cfs Tracy Fish Test Facility to test these technologies in a prototype system. As envisioned, new fish facilities would come on-line as water deliveries increased (10300 SDIP). In addition to the CALFED objectives, the USBR is also mandated to improve their existing fish facilities as part of their CVPIA responsibilities.

The cost of relocating and installing new fish facilities, including the supporting infrastructure, is significant -- up to \$1 billion by some estimates. The proposed test facility was being designed to address design criteria for both operational and biological features of these proposed new or improved fish facilities. While some funding has been made available through the CVPIA, Proposition 13, and 50, funding for the once planned 500 cfs Tracy Fish Test Facility is not available. Due to this dilemma, alternatives to scale back the test facility function; to reduce its size; and/or to limit the facility objectives are being explored.

General Observations on Review Comments

The reviewers who were selected to evaluate these two “proposals” had varying degrees of knowledge on the proposals or the background surrounding their development. Because the USBR and UCD proposals were prepared as concept proposals and not as a result of some formalized solicitation with defined objectives, the proposals clearly lacked consistency for a comparative analysis. The reviewers had difficulty critically evaluating or comparing several issues (budgets, research facilities, etc.) due these inconsistencies, defined management objectives, budgets, and application of the proposed work/research. Despite these differences, there were several themes that were consistent between the reviews.

In mid-March, several reviewers met to discuss their preliminary comments on both proposals. In this meeting, the reviewers agreed that most of the comments could be categorized into several general areas. The categories below reflect many of the general comments expressed by the reviewers. Please see the attached comments for specific and sometimes detailed comments by the individual reviewers.

Need to Clarify/Reaffirm Project Goals and Objectives

The SFFF Forum must clarify the fish facility objectives, budget, and timeline before a test facility proposal (such as the proposals under review here) can be properly evaluated and supported. It was very clear to the reviewers that there is not uniform agreement on the goal for the proposed project and that the priorities for overall South Delta diversion and fish facility programs have shifted. Clarification and/or reaffirmation of the management goals and objectives for fish salvage facility improvements is a pressing need that should precede the development of any new proposals related to fish facilities research. Clearly, timelines and funding restrictions have changed the character and needs of a test facility program. The technical teams will need guidance to revise the test facility strategy since they can not be expected to resolve this on their own.

If the goal is to upgrade, relocate, and potentially consolidate both the CVP and SWP fish facilities with state-of-the-art fish screens in the near term, as was originally envisioned by CALFED, an aggressive and major test program may be appropriate. If, however, the objective is simply to improve the function of the existing louver fish facilities, then a more modest effort, similar to the CVPIA Tracy Fish Facility Improvements Program (TFFIP) efforts by the USBR to date, would be appropriate. Each of these efforts would have different fish protection goals, operations issues, and engineering needs. Budgets should be proportionate to the effort and timeline necessary to meet the objectives.

The question may ultimately be related to whether or not the stakeholders and fisheries agencies are comfortable with the level of protection that can be provided by the existing louver facilities. As deliveries are increased to meet demands, agencies must balance the mitigation offered to offset the increased fish facility losses and determine if improved facilities must be part of that mix. Agencies can require prescriptive fish facility improvements as part of a project or program specific biological opinion to achieve an equivalent or higher level of protection. In the CALFED Bay-Delta Program's Programmatic EIR/S, the accompanying Biological Opinion tied fish facility improvements and replacement facilities to increases in future exports. It is unclear what fish facility measures will be included in the future biological opinions for the SDIP or OCAP.

Need to summarize information from previous research and identify what are the remaining unknowns.

Both of the subject concept proposals lack critical components that might be found in a proposal prepared as part of a PSP or directed action proposal (i.e., a conceptual model, a thorough literature review, and a detailed research plan). This would be necessary to fully justify the construction of new experimental facilities. Further, the absence of a detailed research plan makes it impossible to know exactly what facilities are needed to address the stated goal and objectives. This problem likely stems from poorly communicated management objectives for the test facility as was pointed out earlier. While a detailed research plan is desirable earlier in the process, it is understood that the USBR and the technical teams were planning to develop these detailed plans prior to study implementation.

There has been a significant amount of research and testing to date on various fish facility components. One reviewer looked at facility related questions being investigated now or in the past and found that many issues had some level of testing completed. These tests were conducted to improve our understanding of the facilities, to propose changes to increase fish protection, or to reduce maintenance. However, it was unclear how the results of those studies were used in developing test facility components or if the earlier research was considered conclusive or sufficient. A research plan would explain what questions are being addressed and how results would be applied.

The need to establish performance measures also came up in the review process. However, in the review meeting it was recognized that performance measures may not be completely applicable at this point since the proposed test facilities would be set up to determine the appropriate performance measures. Also, performance measures should link strongly with the intended facility purpose which is not clearly understood.

Research Coordination and Oversight/Accountability

The need to infuse independent and coordinated oversight was recognized as critical to a successful test facility program. However, this oversight was not clearly identified in the concept proposals. The existing oversight by the TTAT and the IEP structure (including the CVFFRT) may not be sufficient. A revised structure may need to be evaluated.

Given the number of programs focused on South Delta fish entrainment and salvage and the magnitude of future management decisions, this oversight is critical. A detailed description of how the proposed test facility research and results will be disseminated with appropriate oversight and integrated with the other programs must be laid out. If the testing effort is geared towards the eventual South Delta fish facility replacement, there are potentially more programs that will be impacted since new facilities must address more operations issues verses just new technologies.

The reviewers did recognize the experience and track record to date by the USBR. The USBR is accountable for work completed to date, especially related to their CVPIA efforts. Also, the USBR has been working in collaboration with UCD on many efforts related to fish facility research. Some reviewers did see value of this continued collaboration.

Evaluation of Site Location and Applicability of Results

The reviewers looked at a number of advantages and disadvantages of conducting the research at the various sites. Although this will ultimately depend on the research requirements, most reviewers felt a testing flume could be constructed at either location and could function hydraulically similar at both locations. At the Tracy site, water used in the test channel is drawn from the intake channel directly behind the primary louver array. This is a once through system and should be fairly representative of the water in the adjacent channel. The USBR also suggested options to use “fish friendly” intake pumps to draw in fish (and debris) that slipped past the louvers with the water to supplement testing.

At UC Davis, the proposal is to periodically truck in water and debris to the flume from the Delta. An outdoor sump area is planned to store the water. Unlike the Tracy facility, this proposed system will recirculate the water during tests. There were few details on how water quality parameters would be controlled.

Another significant difference between the proposals is the ability to test fish in actual water quality conditions that they may be subject to in the Delta. While the Tracy site may be able to entrain some fish into their flume, both facilities will rely on a potentially heavy supply of test fish. Fish holding facilities were not described well in either proposal; however, fish holding facilities in the South Delta are available and are likely to be expanded. Likewise, there are existing fish holding facilities at UC Davis. It is assumed that these facilities would also need to be expanded to meet testing needs.

The reviewers see potentially significant advantages conducting on-site testing at Tracy for reasons of representative water quality, debris availability, and fish. Off site testing did not offer many compelling advantages. However, the reviewers did point out disadvantages of both flume systems compared to test facilities that might operate directly from the intake with tides and all (as was planned with the previously planned TFTF).

Budget detail/Lack of detail

There appears to be a significant difference between how the budgets were developed for each of the proposed facilities making the budget evaluation difficult to compare. Inconsistencies between items covered verses not covered meant that the reviewers could not tell if there was any significant difference between costs. However, the reviewers believed that if the facilities were in fact similar, then cost estimates could not be different by an order of magnitude.

Summary Recommendations

Until there is more direction from management on the test facility objectives, a defined time frame when results are needed, and some resolution on funding issues, it is difficult for anyone to make a recommendation on either of these concept proposals.

Management, including stakeholders and regulatory agencies, must determine these needs before more detailed proposals are developed. In addition, the program oversight should be reevaluated to meet the defined needs and fit into the larger context.

Once defined, a test facility proposal must include a detailed workplan showing how the test facility will be used to meet the objectives on a scientific basis. This would include a description of how this program fits with other activities that have been or are currently being conducted for the test facilities. A budget should also be included that outlines the research requirements as well as the initial facility construction and operational costs.

Collaborative efforts by the USBR and UC Davis are probably the ideal scenario as some reviewers put it. This collaboration is already occurring and should continue. However, siting a test flume off-site is probably not a great option since options to place it on-site are available.

Reviewer #1

Review comments on proposals for facilities to support technology development aimed at upgrading South Delta fish salvage facilities

Two proposals were reviewed:

3. United States Bureau of Reclamation (USBR). September 2003. A Tracy Demonstration Fish Facility (TDFF) To Provide Technology Development For Upgrading South Delta Fish Salvage Facilities, California. Draft concept report submitted to the California South Delta Fish Facilities Forum.
4. Amorocho, J. University of California, Davis (UCD). February 2004. A Long Flume Fish Facility To Provide Technology Development For Upgrading South Delta Fish Salvage Facilities In California. Proposal submitted to the California South Delta Fish Facilities Forum.

Hereafter, proposal one is referred to as the USBR proposal, and proposal two is referred to as the UCD proposal.

Review Summary

Both USBR and UCD are proposing to construct a series of structures (i.e., facilities) that collectively form a demonstration project for testing new technologies for fish diversion and recovery. The basic idea is to conduct experiments with these facilities and use the results to inform decisions about the most appropriate modifications to existing fish salvage facilities. This information could also be useful to the development of new fish salvage facilities associated with new points of diversion.

This review found important deficiencies in both proposals. I would not recommend funding either proposal until these deficiencies are addressed. Both proposals lack critical components (i.e., a conceptual model, a thorough literature review, and a detailed research plan) necessary to fully justify the construction of new experimental facilities. Further, the absence of a detailed research plan makes it impossible to know exactly what facilities are needed to address the stated goal and objectives. A detailed description of the processes for cross-program coordination and oversight is also needed. More formal processes for cross-program coordination and oversight are strongly recommended, given the number of programs focused on South Delta fish entrainment and salvage, and the magnitude of future management decisions.

Information in the proposals and background information from the Tracy Technical Advisory Team suggests there is not uniform agreement on the goal for the proposed project. A review of these materials also suggests the priorities for overall South Delta diversion and fish facility programs have shifted in several ways. As a result, it may no longer be possible to achieve the original goals for fish salvage facility improvements. Clarification and/or reaffirmation of the management goals and objectives for fish

salvage facility improvements is a pressing need that should precede the development of any new proposals related to fish facilities research.

Focused workshops including outside experts could be a useful way to clarify goals and objectives, develop or refine conceptual models, evaluate information from existing research, and identify remaining gaps in knowledge. Results from these workshops could serve as the basis for a comprehensive fish facility improvements research plan.

More detailed comments follow.

1. Goals. Are the goals, objectives and hypotheses clearly stated and internally consistent?

Both the UCD and USBR proposals identify the following goal:

“Develop improved fish protection technologies for South Delta fish salvage facilities to support environmentally and economically sound water diversions.”

Each proposal lists a number of objectives to reach the stated goal. Although the objectives vary in detail and order between the two proposals, the objectives generally address the following issues:

- Debris and sediment management
- Fish and water transport (e.g., gravity flow vs. pumps or lifts)
- Evaluation of above-ground facilities
- Fish sieving or pre-sorting
- Positive barrier screen performance
- Predator and fish biomass management
- Fish residence time and bypass performance
- Fish collection, holding, and transport

The goal stated in the USBR and UCD proposals differs from the goal stated by the Tracy Technical Advisory Team (TTAT).¹ The TTAT goal is,

“Develop and implement new fish collection, holding, transport, and release technology that will significantly improve fish protection at major water diversions in the south Delta.”

The goal in the USBR and UCD proposals differs from the TTAT goal in two important ways: 1) the TTAT goal does not explicitly incorporate economic considerations, and 2) the TTAT goal is to obtain significant improvements in fish protection, while the goal stated in the USBR and UCD proposals is to develop “improved fish protection technologies.” Setting a goal to obtain significant improvements in fish protection

¹ Framework and Agreements related to Development of the TTF. August 11, 2003. Available at <http://www.usbr.gov/mp/ttf/framework.html>

suggests results of new technologies will be compared to the performance of existing technologies in a statistically rigorous way to test for significant quantitative differences. However, quantitative, statistical comparisons may not be possible in all cases given the size, location, and design of the proposed facilities compared to existing facilities.

The objectives stated in the USBR and UCD proposals are generally the same as those stated in the TTAT Framework and Agreements document. Neither proposal includes any hypothesis statements. This issue is discussed further under “Approach” below.

After the goal and objectives each proposal describes the design for a series of physical structures (i.e., facilities). Both proposals provide limited information about the proposed research to address the individual objectives or the overall goal, so it is not possible to evaluate the internal consistency of the proposals relative to the goal or objectives.

Review of the proposals and TTAT documents suggests all parties would greatly benefit from careful reconsideration and/or reaffirmation of the goals and objectives for the improvement of fish salvage facilities, given emerging differences in the stated goals and the fact that these proposals are for facilities that differ substantially from those originally contemplated. For example, is placing positive barrier screens at the intakes to all major South Delta exports still a primary goal, or is increasing louver efficiency at existing facilities an acceptable alternative? Obtaining clear and up-to-date goals and objectives should be a top priority for the South Delta Fish Facilities Forum.

2. Justification. Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

Both USBR and UCD are proposing to construct a series of structures that together form a demonstration project for testing new technologies for fish diversion and recovery (collectively referred to as fish salvage). The basic idea is to conduct experiments with these structures and use the results to arrive at informed decisions about the most appropriate modifications to existing fish salvage facilities. This information could also be useful to the development of new fish salvage facilities associated with new points of diversion.

Neither proposal justifies the projects relative to existing knowledge. This is a major deficiency. USBR, UCD, DFG, and DWR have conducted numerous studies over the last 30 years aimed at gathering information relative to each of the objectives listed in the proposals. Both proposals should thoroughly review the results of previous studies as a means to justify any new research facilities.

Neither proposal includes a conceptual model. The absence of a conceptual model based on the overall fish salvage process is a major deficiency of these proposals. A conceptual model should at least detail: 1) what is known and unknown about individual steps in the fish salvage process, 2) key assumptions in our understanding of fish salvage, 3) linkages

and interactions among steps in the process, and 4) major sources of mortality and stress points. The attached figure is an example of an initial conceptual model for the fish salvage process. This conceptual model is incomplete. For example, the conceptual model does not integrate the results from previous studies to describe what is known or unknown about specific steps in the fish salvage process. Such integration is very important and would clearly show where knowledge and information are in abundance or where they are lacking. This type of information would also tell us where uncertainties are greatest, providing an objective basis for prioritizing future research efforts.

Focused workshops including outside experts could be a useful way to clarify goals and objectives, develop or refine conceptual models, evaluate existing research, and identify remaining gaps in knowledge. One approach might be to organize individual workshops around specific steps in the overall process (e.g., debris management). Results from these workshops could serve as the basis for a comprehensive fish facility improvements research plan.

3. Approach. Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision makers?

Clearly, a tremendous amount of work has gone into the design of the proposed test facilities. The USBR and UCD proposals both imply that the proposed facilities will be able to address many if not all of the stated objectives. Although both proposals describe the facilities needed for further research, neither proposal describes a research plan for the resulting facilities. In the absence of a research plan, it is impossible to tell if the proposed facilities are the most appropriate or feasible.

The USBR proposal indicates that the interagency Tracy Facility Research and Evaluation Document Team (TFRED) “has met numerous times the past three years to focus on planning and review of Tracy research activities.” Draft documents focusing on earlier, larger test facility designs have been prepared, but a final research plan focusing on the newly proposed facilities does not exist. The Tracy Fish Facility Improvement Program’s 2004 study plan does include a proposal focused on development of a research plan for the proposed facilities.²

A detailed research plan should be developed before proposals to build new test facilities are considered for funding. A thorough research plan would include a conceptual model and would review previous work. The research plan would also list and prioritize the science questions that must be answered or hypotheses that must be tested to achieve the

² Liston, C. Development of Initial Three-Year Study Plans for an Above-ground Tracy Demonstration Fish Facility (TDFF). Pages 83-86 in Liston, C. and R. Silva. Current Applied Research Study Plans – Fiscal year 2004. Tracy Fish Facility Improvement Program. U.S. Department of Interior, Bureau of Reclamation, Denver Technical Service Center and the Mid-Pacific Region.

stated objectives. Information from the research plan can then be used to determine what new facilities, if any, are needed to complete the research. Following this approach will help to maximize the utility of research results in future management decisions.

4. Feasibility. Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

Both the UCD and USBR proposals provide descriptions of the general research approach with details and specifics focusing mainly on facilities design and specifications. However, neither proposal explicitly documents how the facilities will be used to address the stated objectives.

The facilities proposed by UCD and USBR are unable to address two important issues: 1) the effects of tidal variation on facility hydraulics, and 2) contemporaneous comparison between a gravity bypass system and a pump bypass system. The inability to make such a comparison was a major concern of the FWS in its evaluation of alternative Tracy Fish Test Facilities.³ The USBR proposal does state, “The TDFP could be constructed and evaluated in several phases.” The proposal identifies a “Gravity flow with active/passive separator just downstream from the bypass” as a “Phase-2” item. No timetable for the phases is given, and it is unknown if the gravity flow system would replace the Phase 1 pump system excluding the possibility of side-by-side comparisons.

Building a test facility at the existing Central Valley Project South Delta export facilities (CVP) seems to offer several advantages. A test facility at the CVP would obviate questions about differences in water quality, would facilitate debris experiments, and might allow the possibility of some paired tests between the existing salvage facilities and the proposed test facilities. However, it is not clear why the USBR proposal contains three different pump options for supplying water to the head of the flume structure. No documentation is provided to suggest these pumps are for anything more than providing a reliable and regulated water supply to the flume. Evaluating the reliability and economy of these pumps should be the main criteria for deciding on the most appropriate equipment.

It is not clear why such a large positive barrier fish screen is included in both proposals. Quite a bit of research is available on the screening technologies proposed. Further, this research has carefully examined approach and sweeping velocity tolerances for many of the fish species of concern.⁴ Is the intent to test the performance of a positive barrier screen at higher amounts of diversion under “real-world” conditions? If this were the case, then it would be very important to first clarify the ultimate management goal for such screens relative to upgrading existing structures and development of new salvage

³ Attachment 1: USFWS Memorandum to TTAT Chairman. Dated August 11, 2003. Available at <http://www.usbr.gov/mp/tftf/attch1.html>

⁴ See for example, Cech, J.J., P.S. Young, C. Swanson, M.L. Kavvas, Z.Q. Chen, and H. Bandeh. 2001. Fish treadmill-developed fish screen criteria for native Sacramento-San Joaquin watershed fishes. Final report submitted for CALFED project 99-NO2. Sacramento, California.

facilities. If the goal is to upgrade all facilities with positive barrier screens, then it might make more sense to test the “real-world” ability of this technology at the Skinner Fish Facilities.

Two issues not addressed in the USBR and UCD proposals are: 1) scalability of the fish lift pumps, and 2) overwhelming salvage processes by increasing salvage efficiencies. Detailed specifications are lacking, but it is assumed that the lift pump used to move fish into the bypass structure is substantially smaller than the pump required in a full production facility. Does the performance of these pumps differ significantly as the size is scaled up to that required in a full production facility or under situations of high fish biomass?

Developing technologies to increase the number of fish successfully salvaged is the main outcome of the fish facilities research programs. Increased screening efficiencies, reducing pre-screen predation, minimizing bypass exposure time, and modifying many other factors will all result in more fish, a lot more fish moving through the entire salvage process. One potential outcome is that cumulative improvements in fish salvage processes will overwhelm the capacity of the system and system operators. This is particularly true given the continuing substantial responsibilities to provide near-real time data on the number, size, and species of fishes entering the salvage facilities. Critically evaluating the implications of facility improvements and the consequences on existing processes and infrastructure could go a long way towards clarifying management goals and better decisions down the road.

5. Coordination, integration, and oversight. If part of a larger suite of studies, how does the project proponent propose to address program coordination and integration? What oversight processes are proposed?

USBR and UCD proposals both acknowledge the importance of coordinating and integrating the proposed work with other relevant projects. In addition to the proposed facilities, other projects providing information directly related to South Delta water project fish entrainment and fish salvage processes include: 1) collection, handling, transport, and release studies (DFG), 2) South Delta improvements program (DWR), 3) South Delta near- and far-field studies (USBR, USGS, and DWR), and 4) the Tracy Fish Facility Improvement Program (USBR).

The establishment of more formalized coordination and integration processes is strongly recommended, given the substantial multi-agency efforts underway or proposed, and the magnitude of future decisions. This might include establishment of an interagency coordination team populated by the leads for each of the relevant projects. This team would have the responsibility to ensure maximal ongoing coordination among the projects and would serve as the main forum for the development and internal review of project work plans. This team would also work at the interface between technical staff engaged in the research and agency management. The coordination team would have program-reporting responsibilities to the South Delta Fish Facilities Forum, the TTAT, and the Interagency Ecological Program. One or more technical work-groups would also

exist, as needed, to address specific technical issues (e.g., development of explicit definitions and conceptual models for “zone of influence” and “zone of entrainment”) and to provide in-house peer review of technical products.

The USBR proposal states, “...the interagency Tracy Technical Advisory Committee will continue to provide project oversight.” This is not the best arrangement, because many of the people serving in an oversight capacity are also principle investigators on fish facility projects or agency staff representing a specific interest. A more rigorous and independent oversight arrangement is appropriate given the magnitude of the proposed facilities and related projects. The South Delta Fish Facilities Forum (SDFFF) should provide management, agency, and stakeholder oversight. The coordination team mentioned above would report to the SDFFF on an ongoing basis to ensure the programs remain consistent with management needs. In addition, the SDFFF should establish an independent technical review panel for fish facilities programs. This panel would work much the same way as the Environmental Water Account independent technical review panel by conducting annual reviews of program activities. The independent panel would also review proposed work plans. The SDFFF would use results of the panel review in its ongoing management of fish facility programs.

**6. Performance measures. If applicable, are performance measures identified?
Does the proposal describe how project performance will be assessed?**

The development of specific performance measures should be a purpose of the UCD and USBR proposals or any other fish facilities research. In this context, fish facilities research would aim to develop performance measures that could be used to evaluate the performance of future modifications to the CVP and SWP fish salvage facilities.

Generally, performance measures provide a quantified description of successful performance and include a temporal component. A performance measure will also indicate the type of research or monitoring information needed to assess future performance. Ultimately, each step in the fish salvage process could have one or more performance measures. For example, research on debris management could serve to identify physical solutions to reduce debris interference. This same research could also identify appropriate performance measures associated with those physical solutions.

Hypothetical performance measures for debris management might be:

- Operate physical structures that on a sustained basis reduce the debris and sediment load reaching the primary screens and louvers by 35% compared to existing conditions.
- Develop physical structures to reduce pre-screen debris and sediment loads in all seasons, which result in no significant increase in pre-screen fish mortality or fish injury when quantitatively compared to estimated values from the existing fish salvage facilities.

- Develop physical structures to reduce pre-screen debris and sediment loads that decrease ongoing operation and maintenance costs by 20% compared to existing debris and sediment management programs at the fish salvage facilities.

UCD and USBR propose to move fish from the flume to the bypass structure using a “fish lift pump.” Ancillary documentation (see footnote 3 for reference) suggests representatives of the TTAT questioned whether these pumps would increase the mortality of salvaged fish compared to a gravity flow system. Given this concern, it is important for the TTAT to develop quantified performance measures for assessing the success or failure of the fish lift pumps before conducting any experiments. Otherwise, the researchers will have no objective threshold to evaluate lift pump performance, increasing the risk that the scientific studies will not fully address management information needs.

7. Products. Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretative (or interpretable) outcomes likely from the project?

USBR and UCD propose to provide new facilities as the main product. It is understood that these facilities would be used to conduct research aimed at improving fish salvage processes; however, the research products are not described. Management information needs would be best served if peer-reviewed journal publications were the main written products of any focused fish facilities research effort. While this process requires more work and time, the products are much more robust and are more likely to achieve broad acceptance by all interested parties.

8. Capabilities. What is the track record of authors in terms of past work? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have the infrastructure available and other aspects of support necessary to accomplish the project?

I am not qualified to evaluate the capabilities of the proposal authors.

9. Budgets.

Budgets for the two proposals differ substantially for unknown reasons. Budget details are generally lacking for the USBR proposal, but the stated overall cost (\$10 million) is about four times that of the budget proposed by UCD. More detailed budgets for each proposal should be evaluated before making any final funding decisions.

Budgets for the associated research are less clear than the facility construction budgets. The USBR proposal states, “Evaluation costs are within the expected range of 2-3 million dollars annually.” It is not possible to evaluate the appropriateness of this budget estimate in the absence of a research plan. It would also be important to know if this \$2-3 million fully incorporates the approximately \$2-million budget for ongoing USBR fish

facilities research at the Denver Technical Service Center. The UCD proposed budget is stated to cover only construction costs. However, the UCD budget does include \$350,000 for personnel salary and benefits. It is unknown if these personnel are necessary to oversee construction, or if these funds are to cover some research conducted by UCD personnel.

Reviewer #2:

Summary

According to background information provided, the USBR proposal was developed within the confines of a \$10 million budget and a given foot print. The UCD proposal mimics the USBR proposal, presumably in an effort to show they can do the same work for less money instead of independently designing a research facility and studies that would answer the fish salvage questions being asked. Neither proposal included sufficient details to fully understand the proposed scopes of work. Neither proposal included a budget other than a bottom-line cost. Without detailed budgets and study plans, neither proposal can be considered complete or worthy of funding.

More importantly, it is not clear if either proposed facility will be able to sufficiently answer questions that need answering. Additionally, since some questions are being addressed presently (CHTR, trashracks/debris handling) questions remaining to be answered must be identified. Also, are there sufficient existing research facilities that may be used to answer the questions, and to what degree can existing production facilities be used?

When considering on-site versus off-site research facilities, I believe quality research could be conducted at either location. The Tracy and UCD sites both weaknesses, but none is a show stopper.

An alternate approach to designing/building a research facility could look like the following: The fish forum delegates experienced researchers to develop study plans to answer specific fish salvage questions and include facility design concepts to facilitate research on the subjects. Those developing the study plans meet with design engineers to develop designs for a research facility that will accommodate as many of those studies as possible. The facility and studies could then be put out to bid asking for itemized costs for facility construction, facility O&M, and detailed budgets for each study plan.

Comparing/Contrasting the two proposals without regard for the Framework & Agreements related to Development of the TFTF

The UCD proposed flume design is nearly identical to the USBR proposed design with the exception of location. Relatively minor differences are discussed below. Since final design for a facility at either location would depend on input from TTAT, CVFFRT, and/or others it is reasonable to believe that identical facilities of similar size and design as what is proposed could be built at either location. With that assumption, a comparison of the two proposals should focus on whether one location is inherently better than the other, on costs of building and operating the facilities, and on abilities of staff to carry out required studies.

Neither proposal included a detailed budget. It is difficult to believe both cost estimates include the same elements given one is four times the cost of the other. Detailed budgets

are required to fully judge the proposals in terms of cost. Without detailed study plans it is not possible to judge if these proposed costs include adequate, or excessive, testing, data analysis, and reporting.

Long term operating costs are not addressed in either proposal. Potential differences in operating costs will include the need to truck Delta surface water to the UCD facility and possible disposal fees. Labor costs at a UCD facility could be significantly lower since student labor could be used at very low cost, and faculty and/or staff may be able to donate time.

“Project Benefits” as listed in the two proposals

Both proposals list project benefits. Below I rate each bulleted “benefit” as an advantage (or not) for one proposal versus the other.

USBR’s TDFF

- TDFF can be constructed and tested with reduced funding. *This is ambiguous and needs explaining.*
- Simplified construction expedites schedule – facility will be online in 2005. *Construction timeline is similar to LFFF proposal. Advantage: none*
- Modular design can minimize required shakedown time – as a result significant study findings will be generated within a few months of startup. *It is unclear if there is any difference between the TDFF and the LFFF proposals in this regard. Advantage: none*
- Operational changes can be made quickly which should expedite testing sequences. *Similar to LFFF. Advantage: none*
- Placement of the TDFF behind the TFCF minimizes listed species influences on operations. *Operating the TDFF will require either a Section 7 or Section 10 permit from NOAA Fisheries. A source of Delta water for the LFFF was not specified in the UCD proposal. Locating a suitable, screened point of diversion and water rights could be a minor problem. Advantage: unknown*
- TDFF will not impact existing Tracy Pumping Plant operations. *Similar for LFFF. Advantage: none*
- Siting on USBR property minimizes environmental impacts. *Similar for LFFF. Advantage: none*
- TDFF will be tested in south Delta conditions (water quality, debris, sediment, biological organisms) which results in heightened confidence of findings over results from off site lab studies. *It is unclear if the LFFF can adequately replicate*

water conditions seen at Tracy. Biologists I spoke with seem to think water quality changes will be negligible or mitigated. Advantage: minimal to very high TDFF

- Siting the TDFF at the TFCF allows use of existing Tracy fish sources and holding capabilities, and experienced fisheries-engineering staff, which reduces cost and setup time, and assures continuity of fish salvage related studies ongoing since the late 1980s. *Capable staff are available for either facility. Reductions in cost and setup time need to be fully explained. Advantage: unknown*

UCD's LFFF

- LFFF can be constructed and tested with a much smaller cost than that of TDFF. *Detailed budgets of both proposals need to be reviewed to determine why cost differences are so great. If cost estimates given are for similar capital improvements and research, Advantage: very high LFFF*
- Available infrastructure in UCDJ AHL expedites the construction of the flume and the associated facility – the complete LFFF will be constructed in 13 months. *The USBR proposal states construction should take 9 months, March 15 – December 20. Advantage: none*
- LFFF at the UCDJ AHL would employ the university's experienced fisheries researchers, engineering faculty and staff in order to further reduce the cost and duration of planned investigations. *Like UCD's fish treadmill, high quality data could be produced by the university's researchers, staff and faculty; however, student researchers are dependent on consistent funding. Gaps in funding could result in the loss of trained student and staff researchers thus slowing reactivation time. On the other hand, having this proposed research facility at a major university could stimulate interest in the field infusing new blood into environmental programs, and could serve as a research and demonstration site in the future for the university. Advantage: minimal LFFF*
- In experiments LFFF can utilize south Delta's natural water that is of the same condition as of the South Delta fish collection facilities (water quality, debris, sediment, biological organisms). *Delta water may be trucked to the UCD site. How long would any one batch of Delta water maintain chemical and physical qualities of "fresh" Delta water? How would "old" water and debris be disposed and at what cost? What is the long term operating cost of trucking water? How would trucking test fish from the Delta affect fish behavior? (Delta smelt tested in UCD's treadmill studies seem to be less hardy than those used in pump tests at Tracy and BCID.)*

Biologists I've spoken with, including Stacy Li (NOAA Fisheries), Tina Swanson (Bay Institute/UCD treadmill studies), Brad Bridges (DWR Skinner facility), in

general believe Delta surface water could be used without significant change in water quality. Sedimentation would occur but sediment could be resuspended before use in the facility. Turbidity is primarily sediment, not biological thus algae blooms most likely will not occur, especially if the reservoir of Delta surface water is covered. Advantage: unknown

- LFFF can also utilize clear well water conditions that would enable the researchers to observe the fish behaviors visually. *Several native Delta species suffer high mortality rates when raised in the well water available at the Tracy site (3-4 ppt plus high concentrations of metals), so if testing with clear water is desired Tracy water would need to be filtered (pers. comm. Brad Bridges, DWR). Advantage: moderate LFFF*
- LFFF at the UCDJ AHL allows easy access to all researchers and staff of the State and Federal agencies; UCDJ AHL is just 15 miles from Sacramento. *True, the LFFF would be more easily accessible to bureaucrats. Advantage: minimal LFFF*
- Due to the modular design of LFFF operational changes can be performed expediently in order to minimize the duration of a sequence of tests. *Not different from the TDF. Advantage: none*
- Placement of the LFFF away from the TFCF eliminates the influences of listed species on TFCF operations. *The LFFF would require water be drawn from the delta using a screened source. Being located away from the Delta is not an advantage. The TDF will require a permit, but LFFF will most likely also require permits for obtaining Delta surface water. Advantage: unknown*
- LFFF will not impact existing Tracy Pumping Plant operations since it is completely removed from the Tracy Pumping Plant. *The TDF would also have no impact on the Tracy Pumping Plant operations. Advantage: none*
- Siting on UCD property minimized environmental impacts. *There are no anticipated, significant environmental impacts for the TDF. Advantage: none*

Minor differences in design between the two proposals

Details of the two proposed designs vary in only minor ways, as far as I could tell given only conceptual design-stage drawings. First, UCD's LFFF does **not** include a louver system and associated bypass with holding tank. This could easily be added for minimal cost to the design. Second, the UCD proposal offers either a pump-then-sort option, or a gravity sort option. In discussions with Dr. Kavvas at UCD, it would be possible to redesign the system to include both gravity and pump options in a single facility, presumably at a slightly higher cost. Additionally, the flume could be lengthened considerably at UCD with relatively little additional cost. Lengthening the flume at the Tracy site would require purchasing additional land thus increasing costs significantly.

The USBR's proposed TDFF is a flow-through system pumping and discharging water directly from/to the DMC downstream of the TFCF louvers. This allows consistent water quality for each test, but limits control over water quality which changes seasonally. Three alternatives each differing only in primary pump options are offered, one of which employs fish-friendly pumps. Because listed species certainly exist in this part of the canal and will most likely be entrained in the system, only the fish-friendly pumps alternative is considered feasible by NOAA Fisheries. All pumping within the test facility for lifting test fish would also require fish-friendly pumps.

The UCD LFFF is a recirculating system. Recirculation pumps need not be fish-friendly since water is screened. When Delta surface water is desired, it must be obtained from a screened source to prevent entrainment of listed species. Storing the water on site could change water quality parameters to a point where fish behavior would be affected. It is unknown if using stored Delta surface water and captive fish would significantly affect the outcome of tests.

Are the designs appropriate and adequate? Reviewer #1's question list

Goals

Details of how the facilities are to be used are not included in either proposal. Studies must be developed and the facilities must be designed to meet those specific needs. Physical operating ranges are included but study plans are absent. I am very uncomfortable assuming productive research could come from either proposal without having specific study plans reviewed by TTAT and/or CVFFRT, and designing the facility to meet those needs.

Justification

Not all goals listed in the Framework & Agreements Related to Development of the TTF document can be met with the proposed facility designs. The Framework document calls for a 500 cfs facility that is designed to develop generic information for solving fish screening/handling/and transportation problems in the Delta while meeting modern fish screening criteria. (see below)

The new facility should also be able to compare above-ground fish holding tanks with "fish friendly" lifts to generate bypass flows, and below-ground holding tanks with gravity fed bypass flows. Both proposals say they can accomplish this but I can not see how from the included drawings.

Approach

Below is a list of evaluation themes listed in Framework & Agreements Related to Development of the TTF, Section II, Part A. If all themes were included in a single proposal the general base of knowledge would benefit greatly. For each theme not included in a proposal, the worth of that proposal is lessened. Additional themes could also be pursued in a research facility if the list is open for modification. Proposals

including evaluation themes are marked with an “X.” Numbered items refer to notes listed below the table.

Evaluation Theme	USBR TDFP	UCD LFFF
Handle debris	X	X
Fish-friendly pumps	X	X
Fish transportation and release	1	1
Fish separating systems Leaky louver/screen sorting	X	2
Fish crowders	1	1
Holding – above ground vs. below ground tanks	X 3	X 4
Bottom v. side sorters	5	
Rectangular vs. oval holding tanks		
Multiple methods for fish transfer to transport trucks	1	1
Bypass configuration (vertical slot vs. circular pipe)		
Bypass conveyance (open flume vs. circular pipe)		

1. Statements in the proposal claim this element can be studied, but no details are provided.
2. A leaky louver array and associated bypass and holding tank is not present in any drawings for the UCD LFFF proposal, although the proposal claims to be able to study a leaky louver/positive barrier screen concept.
3. The USBR proposal mentions comparing above ground and below ground holding tanks, but drawings show only a pump-then-sort option proposal.
4. The UCD proposal mentions comparing above ground and below ground holding tanks, but drawings show construction options of either a gravity fed bypass system, or a pump-then-sort option. Dr. Kavvas said additional land is available to build both systems at the UCD site.
5. Bypass entrances to both proposed facilities include a horizontal sorter. The USBR proposal also shows a leaky louver system, which could be considered a vertical sorter.

With a larger facility, additional goals could be met. Internal bypasses could be studied in greater detail as well as influence of unscreened diversions, and extended exposure times. The louver design included in the USBR proposal is very short which will most certainly affect screening efficiency results. Scalability is also a concern in handling debris and salvaged fish.

Feasibility

The approach is not fully documented. In fact, details are non-existent. Perhaps there are too many individual tests to be performed in these proposed facilities to develop study

plans at this stage of design? On the other hand, the need for the studies should dictate design of the facilities.

The scale of the proposed projects may be too small to meet research objectives. The Framework document calls for a 500 cfs facility – both of these proposals call for 250 cfs facilities. Exposure times at higher sweeping flows are not sufficient to adequately assess exposure time effects.

Coordination, integration, and oversight

Study designs must include input from the fish forum, IEP, TTAT and/or the CVFFRT. Debris handling studies are already being conducted at UCD; any additional debris handling studies should take advantage of lessons learned in those studies. The TTAT and CVFFRT should provide some degree of oversight to ensure results will meet the needs of regulatory agencies.

Performance measures

Proposals do not address project performance, i.e. there are no criteria for assessing whether the project is successful or not.

Products

No specific products are identified in either proposal. It is assumed that reports on tests will be developed and disseminated to agencies and the public. Papers in professional journals should also be developed and presented at regional, national, and international conferences.

Capabilities

Both the USBR and UCD have qualified researchers to answer fish screening and fish sorting questions associated with this proposed project. UCD produced valuable information from their fish treadmill work. USBR has a long history of fish handling research and reporting; however, there is some question as to whether research conducted by the USBR would be accepted as unbiased given the fact that results from these studies may affect long term operations of the south Delta facilities. Sufficient infrastructure exists for both proposals.

Budgets

It is difficult to believe the two cost estimates are for construction of the similar facilities and scopes of work. Detailed budgets are required to determine if the two proposals are truly comparing comparable projects. Additional submittals will be required for final design. Estimates of long term O&M of each facility are also needed.

Reviewer #3:

COMMENTS REGARDING USBR'S TTF-LITE AND UCD'S LFFF PROPOSALS (3/25/04)

- 1) The proposals are too conceptual to carefully judge their technical merits, which is a limitation of the process we are in, not the project proponents.
- 2) Clearly, both proponent groups are highly competent and could design and implement good studies (in collaboration with others), and develop a facility to use for the experiments.
- 3) To a very large extent, meaningful cost comparisons are problematic at this stage.
- 4) The reasons given for doing the work in Davis rather than in the southern Delta seem, largely, unconvincing, and, in some cases, strained. The work should not be done off-site, if it is feasible to do it on-site. If it is done off site there will be inevitable (and in this case, avoidable) technical and applicability problems. The "accessability" issue raised in UCD's proposal is particularly unconvincing. The TFCF is not that far away.
- 5) Ease-of-contracting should be a factor in deciding who should do the work and where. Timeliness in moving money is a big factor in determining project success these days.
- 6) The USBR folks have done a great and improving job of reporting the results of their Tracy work in a form relevant to management decision making. Can UCD match their efforts?
- 7) USBR has a team assembled who has been preparing in collaboration with others to do this work (in some form) for years. They are highly experienced in doing delta and FF work, and have developed strong ties with others. "Switching horses" will have many foreseeable and unforeseen costs, and could result in large stranded costs.
- 8) Are Reviewer #2's concerns about fish-friendly pumps at Tracy "taking" listed species significant?. Are not the fish already "taken"?
- 9) The appearance of bias if USBR folks lead the work should not be a problem, especially if the work is not openly and in a collaborative manner, which they have a history of.
- 10) This work could be done in Tracy with UCD as strong collaborators (along with the rest of the local fish facility experts).
- 11) As collaborators with the UCD Hydraulic Lab researchers and engineers, we respect their expertise and ability to design, fabricate, operate, and evaluate complex hydraulic and biological test facilities. The UCD proposal proponents presented some good arguments for choosing the location and team. Expertise, fabrication facilities, logistics, local labor, water quality, and

permitting advantages make good arguments for considering their location.

- 12) We believe the most relevant information can be obtained by placing demonstration facilities in the Delta and exposing test facilities to the actual conditions facing current or proposed South Delta facilities. UCD and Denver Hydraulic labs both can perform controlled laboratory based models and simulations physically removed from the actual site of interest. However, since South Delta conditions are complex and changing in water conditions, fish species entrained, and debris loads, site trials may be more insightful on the operation of proposed facilities in the Delta.
- 13) Many years of technical, collaborative work have been invested on the physical designs and the research objectives of the USBR TFDF. Having another proponents take over this CALFED directed action program (TFTF) at this late phase, transfer certain component designs, and/or adopt research objectives developed by the TFRED may harm future collaborative research program development efforts.
- 14) Some of listed advantages of the UCD sites may also be limitations; low cost student student assistance will not provide dedicated or stable expertise; behavior or performance in clear well water may not similar to those in turbid or tidally varying Delta water; and UCD is also distant from personnel experienced with existing salvage facilities operations and actual facility components or fish communities of interest. The layout of the LFFF is almost the entire length of grounds of the Laboratory and is next to one side of the boundary line, which limits the area available for future modification of the flume or for adequate access to the flume structure.

Reviewer #4:

After spending part of the weekend reviewing the reports (sorry -- the past two weeks has been very busy), I've concluded that my expertise really cannot add much or anything to the mix of other competent reviewers. I don't think it would be productive for me to attend Thursday's meeting -- just not my area of expertise.

HOWEVER,

I have a few comments to reinforce specifics of comments sent out by Reviewers #1 and #2:

The lack of a detailed budget needs to be addressed in revised proposals.

Reviewer #2's table comparing "evaluation themes" for both proposals is a good place to start the review of specific scientific goals, after addressing the even more important issue of study purpose.

Study purpose: interesting differences between USBR and UCD statements. I believe strongly (opinion coming!) that economics need to be a part, as well as improving performance in the context of overall survival of target fish species through their entire life cycle. This means IMHO that the purpose statement needs to recognize how screens on the large diversions in the southern Delta fit into the other factors affecting (or potentially affecting) escapement or whatever "survivability" measure we use for different species. So I disagree with both current statements. This needs (along with the other good comments the group will develop) to come back to the SDFFF for discussion, which I think is the plan.

Performance measures! Where are they? Reviewer #1 and #2 both pointed this out. I strongly agree -- but they should be linked to purpose which itself needs to be revisited.

Reviewer #1's comments in the second full paragraph on page 4 of his memo: I strongly disagree and strongly agree. "Outside experts could be a useful way to clarify goals and objectives" could mean to some that we could lose the focus on how screens fit into the mix of tools that will also be used to improve survival at other life cycle stages (at least for salmon -- I don't feel qualified to make any observations about screens and Delta smelt). But the rest of the sentence is exactly what needs to be done.

I really liked the second paragraph on page 7 of Reviewer #1's memo regarding oversight and independent technical review.

A word or two about Reviewer #1's figure: Very good idea. But ... it should put screens in the bigger context of all factors that affect survival. I'd see this figure as a "zoom in" from a larger figure.

I puzzled a bit about Reviewer #2's observations about Delta water quality and implications to the UCD proposal (page 3, paragraph 3 of his memo), but decided it probably made sense. I was thinking "drinking water quality" while reading this section -- no relation to the study!

As I said, I don't have much to contribute other than general observations. I think Reviewer #1 and #2 have done excellent work in critiquing the proposals.

Thanks for the invite. I'll do something else Thursday and let the real experts do the work. Sorry I was late in reading all the material.

Regards

Reviewer #5

General Comments

These are my general comments. The other reviewers have provided sufficient detailed reviews, in my opinion. Also, given that these proposals are not true proposals, but rather pre-proposals, this general level of review should suffice at this time:

- 1) Both proposals need more detailed cost estimates to clearly show why one is significantly more expensive than the other. Since both proposals show more or less the same structural facilities and layouts, cost details are essential to review these proposals. These are not really proposals, but rather pre-proposals.
- 2) Both proposals need research plans and breakdowns of personnel costs to perform the research. Without research plans and detailed personnel cost breakdowns, comparisons of the two proposals are not really possible.
- 3) The proposals need to elaborate on the significant or negligible benefits of having a facility on-site in the Delta or off-site at UCD. Both sites would need to simulate tides, and therefore the issues are probably water quality, debris, turbidity, vigor of test fish, and aquaculture facilities. My gut feeling is that on-site tests in the Delta for some research elements will be clearly more beneficial.
- 4) Reclamation has a large team and history of fishery research facility testing and documentation. The UCD team is smaller and more limited in experience. UCD's use of student labor may not be an advantage. I think Reclamation will have an advantage here.
- 5) IF UCD is chosen, I think they must collaborate extensively with Reclamation.
- 6) This comment is not really part of the review, but rather a general question: Is it appropriate to give this project to anyone besides Reclamation at this stage given that they, at least tentatively, received the Calfed Prop 13 funds to do this and they have received several million in past years to develop study plans and designs for small, intermediate, and full sized test facilities? They must believe they are the logical choice to do this project, with subcontracting work/collaboration going to UCD.