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Fish Facility Development Plan for the CalFed Bay/Delta Solutions Process

(or "Where do we go from here")

by: Darryl Hayes, DWR and the IEP Fish Facilities Development Team

The fish facility options generally outlined in the Phase CalFed documents share many similar needs, components and objectives. A background report was prepared in May 1996 by Water Resources staff with input from Resource Agency experts that addresses these similarities and needs (report attached). Interagency staff convened on May 13 to discuss the fish facility options in the alternatives as outlined in this report. As a result of the workshop, several questions and issues were raised on the selection and advancement of the considered alternatives. The questions are listed below along with agency responses on the issues. Following this, an outline of a Workplan to address CalFed needs is presented. This workplan will address the Phase II alternatives planning for a major screening facility.

1. **Should any of the proposed diversion concepts be judged infeasible based on their being infeasible to start screen construction in about the next 5 years?**

   The diversion concepts presented all share features that need further investigation so we can predict the expected benefits. These investigations include studies on fish friendly pumps, screen criteria for Delta species, and workable upstream migrant passage facilities. Nothing of the scale envisioned in the alternatives (i.e. a complete physical fish screen barrier) has been demonstrated in the Delta environment or elsewhere, so caution and solid research should be conducted. Most of the physical feature designs and criteria could be worked out within a five year time frame ***if it is given the full five years and resources necessary to have it developed.***

   It is not envisioned that alternative technologies (i.e. sound, electricity, bubble curtains, etc.) will be all ready to go by then. These measures should be looked on as enhancements to other features and not relied upon for expected fish protection. Technologies such as the Modular Inclined Screen that stretch our understanding of the existing criteria may need a more cautious investigation and/or application despite its attractive design. Practically, in order to have a MIS fully developed, it would take at least five years when considering the level of additional testing needed for acceptance over traditional designs that have a proven track record of protection.

2. What is the relative degree of ease of screening for the various diversion proposals?

Designs concepts in the North Delta (or even further North) would be more feasible than large in-Delta Storage/ Diversion options. This assessment is based on primarily fishery and hydraulic issues.

Diversions that are centralized, accessible, automated, easily maintained, protected from flood conditions, and are located in a controlled hydraulic environment would be preferable to those that are not. Each alternative has to deal with some of these problems, but sites with multiple diversion points (Chain of Lakes concept) and poorly accessible screens (lots of submerged intakes) would be less desirable. Large (greater than a few hundred cfs) on-river screening concepts, although seemingly less complicated because they have no fish bypasses would be difficult to control, operate and maintain. This conclusion is based on previous model studies conducted for the PC.

Off-River (in canal), large scale centralized concepts appear most technically feasible. These facilities options could also be staged and evaluated in phases.

3. What are the most important fish screen considerations for each of the diversion concepts?

Many considerations are outlined in the background report. Siting a screen in a good hydraulic environment is paramount to its performance. It should be operable in all conditions expected. If hydraulic uniformity at the screen surface is wildly variable, fish protection benefits will not be achieved. Debris management and cleaning is also directly related to this consideration.

Fishery considerations are also very important. Above Delta diversions will have to deal with the early life stages of salmon (immediately post emergence) more so than in-Delta diversion concepts. Central Delta and South delta diversions will have to deal with more larval fish issues and a greater number of species protection issues. A North Delta diversion may deal with seasonal egg and larvae and salmon passage issues, but little juvenile rearing issues. A North Delta diversion may be above all but a small portion of the Delta smelt spawning and rearing habitat.

A North Delta diversion may be the best or most flexible site to handle fishery issues with operational measures instead of relying on the physical facilities only for protection. Need a sentence as to why.

4. What are the most important needs for new information concerning fish screen technology for each of the diversion concepts?

The most important new information needed relates to an understanding of juvenile Delta species interactions with a fish screen facility. Basic swimming ability research has been conducted for several species, but the relationship of swimming ability to appropriate screening criteria is lacking. The "Fish Treadmill" study program will investigate the response of Delta species to appropriate velocity fields near a long fish screen. This interagency, interdisciplinary project is being conducted at U. C. Davis. A three year program is outlined starting in summer 1996.

Technological needs can be broken down into a few areas: Operations and Maintenance facilities; Hydraulic Control features; and, Fish Handling features. These needs are outlined in the "Considerations" section of the background report. Since the needs of a major facility are common to most of the remaining CalFed alternatives, the engineering and biological technological needs are rated in the following order:

- Fish screen criteria for Delta Species
- Operations modeling in Tidal Environment
- Design of appropriate fish pumps or lifts for the bypass system
- Fish bypass entrance and exit designs
- Upstream fish migration facility designs
- Hydraulic (velocity) control features
- Sediment management (Resuspension/ Removal systems)
- Cleaning systems
- Behavioral systems for facility enhancements

5. Are there policy issues concerning fish facilities which need to be addressed during Phase I for any of the diversion concepts? Consider such things as whether screens should attempt to protect eggs and larvae and whether new screens are appropriate if the existing south Delta diversions of the SWP and CVP become part or all of the permanent Delta solution.

The continued use of the south Delta screens is a major policy issue. Any continued use of these facilities would call for improvements to bring them up to today's standards. Should the USBR, for instance, repair the old lower system or should it be a major overhaul in combination with the State's south Delta screen facility?

It is very important to address what fish species and life stage are to be protected by the diversion facility. The earlier this is addressed, the more specific the study plans can be. The practical limitation of existing fish screen technology provides limited protection to eggs and larval fishes. Operation and Maintenance issues and cost/ benefits are prohibitive when attempting to exclude eggs and larvae at a large facility. Sizing of storage and diversion facilities to allow for curtailed operations during periods of maximum egg and larvae abundance should be incorporated into the plan.

A major policy issue would also relate to diversion constraints. Should the facility be overdesigned in capacity, or should it be physically constrained to limit diversions. As an example, anything which gives the CVP and SWP the capacity to divert all of the Sacramento River in a critically dry year series remains a major policy issue.

Proposed Workplan for Phase II and III

During Phase II enough fish facility planning needs to be done to support a conclusion as to which facility should be selected as part of the preferred program. During Phase III sufficient work should be done to initiate fish facility construction when the plan calls for that construction. Since lead times during Phase III may not be sufficient to do all of the necessary fish facility planning, some tasks needed to provide information during Phase III will need to be started during Phase II.

Planning will involve a combination of data gathering and technical studies to answer important questions outlined earlier. Many of these efforts are already underway and either address the generic feasibility questions, or will lead to more specific evaluations as needed in Phase III.

Below is a recommended process for facilities development which would fit any of the options considered.

Fish Facilities Project Development

I. Conduct Delta Operations Modeling (to define baseline hydraulic conditions)

II. Conceptualize Design Alternatives and Preliminary Costs

III. Develop Biological/ Engineering Study Plan to address Facility Impacts

IV. Identify Biological / Engineering Needs

V. Collect Site Data (Hydraulic, Fish, Water Quality, debris loading)

VI. Perform 2-D Numerical Hydraulic Modeling of Facility

VII. Conduct Physical Modeling Studies

VIII. Conduct Final Design and Cost Estimates

IX. Construct Phased Facility Interim Evaluation

Existing or Proposed Fish Facility Research Projects in support of Proposed Delta actions

Considerable information is available for preliminary designs. Collection of additional data will allow for more refined designs and would increase the comfort level of fish protection and water management options. The existing or proposed programs tabulated in Table 1 deserve involvement and support by CalFed in implementing the proposed solutions in a timely manner. Since many of the alternatives share these common needs and objectives, the programs listed here have wider application than their original intent. These programs could be modified for more specific CalFed objectives.

Project Status	PROJECT / PROGRAM	RELEVANT CALFED OBJECTIVE	FUNDING NEEDED	STUDY LENGTH	PROJECT SPONSOR
Started Summer '96	Fish Treadmill	Screen Criteria for Delta Species	YES	3 Years	DWR/ IEP
Started Spring '95	Red Bluff Research Pumping Plant	Fish Pumping and Bypass Issues, Evaluation Facility Issues	NO	4 Years	USBR
Started Spring '94	Glenn-Colusa Irrigation District Fish Screen - Interim Screen Studies	Long Flat Plate Screen, Bypass Spacing Issues, Hydraulic Control Issues, Predation	YES	2 Years	GCID/ ??
	Glenn-Colusa Irrigation District Fish Screen - Proposed Replacement	Hydraulic Issues, Modeling, Fish Bypass (Pumps, Entrances, Exits), Sedimentation, Operational Issues	NO	4 Years	CVPIA/ USBR
Started 1993	Tracy Fish Facility Improvements	Louver Replacement Facility?, Improved South Delta Facilities, Holding/Salvage Improvements, Debris Management	NO	3 Years	USBR

Field Tests '96 - '97 Add'l tests proposed	Modular Inclined Screen Testing	Promising New Design, Operational Flexibility, Hydraulic Issues, Cost Savings	NO (Existing) YES (Proposed)	4 Years for New Testing	EPRI/ DWR
Postponed Indefinitely	ACOE Stone Locks Fish Ladder	Delta Adult Migration Passage (Salmon or Other Species)	N/A	N/A	ACOE
Proposed	Physical Hydraulic Model Testing	Identify Hydraulic Concerns/ Design	YES	2 Years	DWR/ USBR
Proposed	Fisheries Abundance/ Distribution (Review and Update Data)	Baseline Fisheries Data and Identified species Protection	YES	4 Years	IEP/ DFG

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Factors Influencing the Choice of Screen Facility Types and Site Configurations

NOTE: Items are *NOT* listed in order of importance

- ✔ Range of flow diverted
- ✔ Percent of river flow diverted
- ✔ Sediment loads (bed load and suspended)
- ✔ Debris
- ✔ Biofouling
- ✔ Flooding
- ✔ Season of operation
- ✔ Operational flexibility
- ✔ Fish swimming abilities / Criteria
- ✔ Variations in river hydraulics
- ✔ Site characteristics
- ✔ Maintenance
- ✔ Accessibility
- ✔ Navigation restrictions
- ✔ Short and long term riverain habitat degradation
- ✔ Construction considerations
- ✔ Predation potential
- ✔ Fisheries protection
- ✔ Cost (Capitol Costs, O&M, Replacement)