APPENDIX C

U.S. FISH AND WILDLIFE SERVICE PLANNING AID MEMORANDUM

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Fish and Wildlife Enhancement
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TAKE PRIDE IN AMERICA

Memorandum

September 4, 1992

To: Regional Director, Bureau of Reclamation, Sacramento, CA
Attn: Planning Division (Carol Sakamoto)

From: Field Supervisor, Fish and Wildlife Enhancement, Sacramento CA

Subject: USBR - Red Bluff Diversion Dam Fish Passage Study; Comments on a Draft Environmental Assessment for the Pilot Pumping Plant on the Sacramento River near Red Bluff Diversion Dam.

Thank you for providing us with the draft Environmental Assessment (EA) for the Pilot Pumping Plant. We are pleased that Reclamation has incorporated many of the suggestions provided in our earlier memorandum of March 18, 1992 and has taken the initiative to involve the Fish and Wildlife Service (Service) and other resource interests in the design phases of the project.

In preparing this Planning Aid Memorandum, the Service views the primary purpose of the facility to be an evaluation of the potential for pumps to replace gravity diversion. At the same time, the Service understands that the pumping alternative represents a promising yet unproven technology from the perspectives of both engineers and biologists. While our comments below represent a best professional opinion, we anticipate refinements in operational and design features of the plant during an initial evaluation phase, which will minimize fish losses.

Following these refinements, a further goal will be to evaluate the capability of pumps and associated structures to sustain operations over a period similar to full-time gates-up operation. During this second evaluation phase, the pilot plant will provide an interim water supply until the full-scale facility is constructed, which will extend the period for unimpeded upstream and downstream passage of salmonids. Continued biological monitoring will provide information over a wider range of river conditions, and assure minimum losses.

We also foresee a third phase of operations which would follow completion of the first and second evaluation phases, and provide interim fishery and water supply benefits prior to the funding and construction of a full-scale plant, if that alternative is selected. Although we look forward to full-time operation of the pilot facility, seeking these interim benefits should not conflict with the first objective to ascertain operational features which will reduce impacts to fish exposed to pumping to a level of insignificance.

General Comments:

1. Siting of the Pilot Plant

Plant sites upstream and downstream of the dam have been considered. An upstream location would not interfere with the existing fish ladders, or with spawning gravels downstream of the dam, and would most easily be assimilated into a full-scale pilot plant. However, an upstream plant could only be tested with the dam gates raised, and would potentially limit the construction window, thus delaying completion of the pilot facility and selection of a preferred alternative. The downstream location could be operated year-round, and could be more easily linked to the existing bypass system. A downstream location would therefore hasten the evaluation process and selection of a preferred alternative for the long-term solution. This downstream location may potentially interfere somewhat with the attraction flows from the right bank fish ladder. This interference can be minimized by moving the facility downstream and giving careful attention to the contour of the sheetpiling. Judging from surface flows from the ladder, the new sheetpiling should not begin any closer than the edge of the existing sheetpiling, approximately 60 feet downstream from the ladder. The exact location of the structures will be fixed upon completion of an ongoing numerical study by Reclamation, and with agreement of the Service. The Service concurs with the downstream location for the pilot plant, but prefers an upstream site for a full-scale plant alternative.

2. Size of the Facility

The original basis of design contained two pumps, an Archimedes screw pump and a screw-impeller Hidrostal pump. Following resource agency input which included the Service, your revised plan calls for two Archimedes screw pumps and one Hidrostal, with an open bay for expansion. We support this revised plan, however, any further expansion at the downstream location beyond the four pump maximum would be discouraged, as we believe that this size is sufficient for testing purposes. Expansion of the pilot facility could interfere with spawning gravels downstream, and would conflict with the goal of a full-scale facility upstream of the dam, which would utilize the existing drum-screen and bypass complex.

3. Bypass system

An important consideration in the final design will be the bypass system. Among proposals which have been considered are: (1) A tie-in to one of the existing 60-inch pipes from the drum screens, (2) building a separate, but narrow diameter pipe to the present bypass outfall location, (3) inserting a small pipe inside one of the larger pipes, and (4) a separate pipe, but to a different bypass outfall location nearer to the bank. Construction of a separate bypass system to the same outfall location would require a coffer dam and excavation, and would be less cost-effective. A bypass nearer to the bank would be cost-effective, but unacceptable, because it is known from evaluation of the old bypass location that predators build up in this area. The idea of a small pipe inside the existing pipe was discarded because it was felt that

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the additional surfaces could result in injury to fish when the larger pipes are needed during dam diversion.

At this time, the Service prefers utilizing one of the existing pipes. We emphasize that these larger pipes are intended to carry about 120 cubic feet per second (cfs) each in order to match the velocity of the river at the outfall and effectively disperse fish. When the dam gates are raised, and no diversion return flow is available, the test facility will provide for a 10 percent return flow of up to 36 cfs with all pumps running concurrently (i.e., total capacity of 358 cfs from the five 25 cfs existing pumps, two 100 cfs Archimedes pumps, and one 33 cfs Hidrostal pump), and as little as 3 cfs if only the Hidrostal is operated. With these low return flows, the fish will remain in the darkened pipe for a much longer time than for what the bypass is designed, and may be returned to the river disoriented or in poor condition. In addition, the lower flows would not efficiently disperse fish into the river and may result in attraction of predators to the bypass outfall.

To address these concerns, one potential solution is to flush the bypass pipe on a regular basis with a higher flow. This flow could be provided by intermittantly routing some of the screened water back to the bypass pipe to supplement the return flow through one of the 60 cfs bypasses from the existing drumscreens. Another option is to dedicate some of the 125 cfs from the five existing 25 cfs pumps which are proposed for water supply during gates-up operation, to continuously augment the bypass flow. It may also be possible to modify the bypass outfall to create a structural or high velocity barrier to predators without major in-river construction. We view these operational or structural changes as part of the initial evaluation process to assure minimum impacts to fish during long-term operations.

Operating criteria for the bypass system (flushing intervals, volumes) must be tested during initial evaluations and determined to be effective in minimizing fish impacts before long term gates-up operations would proceed. If adequate return flows are provided, a tie-in from the evaluation facility to the existing bypass should result in minimal impacts to fish.

4. Trashrack

The trashrack should be designed to exclude large objects which could obstruct the screen and/or bypasses, and to maintain sweeping flows across the intakes. To achieve this function, we recommend a vertical, canted grid design, initially with 1-inch spacing to prevent adult salmon attracted to the lower end of the facility from being gilled on the rack. The design should include the capability to exchange the grid if necessary. Although it would be desirable to have a design which would also exclude fish, we do not consider this the primary function of the trashrack, and do not expect that fry <40 mm will be able to avoid the intake. Furthermore, we expect that at least one of the pump designs to have a negligible effect on fish mortality.

5. Screens

It is our understanding that the evaluation facility will have wedge-wire type screens. In our March 26, 1992 comments on the basis of design, we expressed some concern about potential difficulties with fouling and transport of debris with this configuration. With proper attention to the cleaning system, design of the trashrack, a safety system, and dimensions of the tie-in from the dewatering facility to the bypass, we no longer believe this will be a significant problem. The pipes from the evaluation facility to the bypass should be large enough to pass all objects not excluded by the trashrack.

Present plans illustrate an automatic sweeper to remove debris from the vertical screens. The California Fish and Game Code (Sections 1600, 5900, and 6100) requires continuous cleaning for screens designed for 0.33 feet per second, the maximum allowable through-screen velocity. Therefore, we recommend that a safety system be designed to shut off the pump to any screen in the event that the through-screen velocity exceeds 0.33 feet per second, which may be caused by excessive debris loading or sweeper malfunction. This could be accomplished by measuring the water height on both sides of the screen and activating an automatic shutoff feature when a prescribed head differential is exceeded. This would reduce the risks of either fish injury due to impingement on the screen, screen damage, or flooding out the facility.

In our previous comments of March 26, 1992, we also expressed concerns about entrainment effects of the higher-speed Hidrostal pump on fish swimming abilities. It will be necessary to operate this pump unscreened in order to document disorientation phenomena. Because of the lower performance of this pump in previous studies, Hidrostal testing should be limited from April 1 through June 30, when winter-run juveniles are not present. If this design proves ineffective, the pump should be idled or replaced with the Archimedes design, rather than have it fitted with a screen on the intake. An intake screen on the Hidrostal pump would probably interfere with the sweeping flows to adjacent screw pumps.

We have been informed by Richard Kristoff, Bureau of Reclamation, Willows that removable intake screens will be fitted to the five existing 25 cfs pumps. A brief mention of the placement and operation of these screens should be included in the EA.

6. Evaluation Facility

The height between drop pools must be designed in accordance with criteria developed by the National Marine Fisheries Service (NMFS) to avoid potential fish injury or stress; we do not anticipate any major modifications from the present design, which illustrates a maximum drop of about 7 feet.

7. Evaluation Criteria

The first evaluation phase should involve intermittant, short-term operation of both pump types. Refinements to the above design features should be made in this initial phase to minimize juvenile salmon impacts. The second phase should involve longer term, continuous operation of the pumps, to determine

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pump durability, evaluate fouling problems, sedimentation and operations at different river flows. Biological monitoring will continue during the second phase. If during the first phase, one pump type demonstrates significant adverse impacts on fish survival or behavior which cannot be rectified, it should not be included in the second phase.

Fish passage through the existing bypass during gravity diversion will need to be evaluated with short-term operations, and compared with fish passage during pump diversion with the dam gates raised. Impacts in terms of quantified fish mortality, injury, condition, disorientation, predator activity near the sump, intakes and bypass outfall, or other measurable criteria shall be considered acceptable for long-term pilot plant operations if determined to be equal to or less than that observed for fish exposed to the drumscreens and bypass during gravity diversion. If adverse impacts are observed, efforts will be made to modify structures or operations to lessen these effects. In this way, long-term operations can be assured to have the least possible impact on fish.

7. Temperature Benefits

Elimination of Lake Red Bluff is expected to result in as much as 1.0 degree Fahrenheit cooler water in the river within the lake reach and downstream of Red Bluff Diversion Dam, and may provide some additional temperature protection for salmon spawning in and below the lake reach.

Specific comments:

1. p. 1, ¶ 4. The NMFS Biological Opinion has defined gates-up operation from November 1 to April 30 as part of a reasonable and prudent alternative within the control of Reclamation. The benefit accrued by the pilot project is 2 additional months of gates-up operation, rather than 8 as implied.

2. p. 1, ¶ 4; p. 11, ¶ 2. The largest helical pump currently available has a maximum capacity of 33 cfs, not 100 cfs. The Service agrees that the larger Hidrostal unit would be desirable as it would match the capacity of the 3-flight Archimedes screw pump with the maximum variable speed setting of 28 revolutions per minute. Please contact the manufacturer and determine if a larger Hidrostal unit can be supplied by the anticipated completion date of October 1993.

3.p. 1, ¶ 4. "...(25 mm and smaller)..." should read "...(25 mm and larger)...."

4. p. 1, ¶ 4. The reference to the pumps being expected to have minimal impacts should be qualified by the understanding that impacts will be minimized by monitoring at the evaluation facility and implementing appropriate corrective measures as necessary. The summary should mention the flexibility designed into the pilot plant, such as pump speed control, exchangability of the trashrack, intake bell housings, vertical screens, operational flexibility of the bypass system and other features.

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5. p. 1, ¶ 6. The main purpose of the pilot pumping plant is to assist in defining the preferred alternative. An ancillary benefit is augmentation of water supply. The pilot facility does provide some significant protection beyond that which would be mandated by NMFS under the authority of the Endangered Species Act, but we view this project as an essential step in achieving full protection, such as by replacing the dam with a full-scale pumping facility. The summary should reflect this purpose.

6. p. 6, ¶ 3. The pilot project was initiated by Richard Kristoff of the Bureau of Reclamation, not the Service, and the Archimedes screw application is credited to Carl McCullough, also of Reclamation, after seeing these pumps in Europe.

7. p. 12, ¶ 2. The phrase "...September through May," should read as on p. 13, ¶ 4 "mid-September through mid-May", or provide the specific dates.

8. p. 12, ¶ 3. The 149 day period of gates-up operation for the no-action alternative is incorrect as NMFS requires November 1 to April 30, or 180 days.

9. p. 12, ¶ 2. The phrasing "d. evaluation opportunity-..." implies non-essential status to pump type selection. The first three items, a-c, are being evaluated with respect to pump type. Please rephrase.

10. p. 12, ¶ 4. The reference to the gates-down operation providing adequate water supply to users in "the town of Red Bluff" is unclear, as the water would be available independent of gate position. Do you mean water available for lake recreational use? Please clarify.

11. p. 13, ¶ 2. Please mention that the five conventional pumps will have screened intakes.

12. p. 13, ¶ 4. "(125 cfs)" should read "(125 cfs total capacity)."

13. p. 13, ¶ 4. "425 cfs would occur" should read "425 cfs would potentially be available." The value is 358 cfs if the Hidrostal is 33 cfs instead of 100 cfs.

14. p. 13, ¶ 5. The paragraph does not seem to accurately describe the most recent designs. The proposed location, as discussed earlier, will be specified on the basis of consultation with the Service and results of a numerical study in progress by Perry Johnson of Reclamation. The present plans do not convey fish via a single collector basin. Rather, there are three distinct separation and evaluation facilities for the pilot plant. The last sentence implies that the fish would enter the canal and somehow be diverted back to the river. The water first enters a separation facility where the fish are concentrated by a vertical screen and moved in the bypass flow to the evaluation facility. Most of the water (without fish), is conveyed to the canal. The bypasses flow through evaluation facilities where there is an inclined screen fish separator which moves fish into the holding tanks. When the bypass flow is not being sampled, the fish are conveyed not by the Tehama-Colusa Canal inlet works, but by separate 18-inch bypass pipes which will join one of the 60-inch main bypass pipes about 300 feet downstream

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of the dam. Please update the description of the location and provide more detail on the main features of the plant.

15. p. 16, Table 2. The table does not appear to accurately summarize the literature cited. Please make the following changes for salmon life history attributes:

-Adult migration for fall-run peaks is in September while spring-run should read "peaks May-July" instead of "May, June, July".

-Spawning of late fall-run is January 1-April 15, of winter-run is April 16-August 15, and of spring-run is August 16-October 15.

-Winter-run egg incubation is April 15-October 15.

16. p. 20, Table 6. The five existing pumps should not be included in calculation of benefits of the pilot pumping plant, unless they are incorporated into the evaluation purpose of the project. Evaluation of entrainment by these pumps may be useful in determining effects of similar pumps elsewhere in the Central Valley, even though they are not considered potential candidates for use in a full-scale pumping plant. These pumps may be considered part of the project if used to augment return flow, as mentioned above. The purpose of these pumps should be clearly stated.

17. p. 21, Table 7. The "90% increase" in survival of winter-run has not been substantiated. We suggest the "90%" be deleted.

18. p. 22, ¶ 3. Please specify dates of gates-down operation.

19. p. 22, ¶ 3. The last sentence should be deleted. Attempting to increase the flow down these ladders would exceed their design specifications, and would not necessarily result in significantly greater attraction.

20. p. 23, ¶ 3. Change phrasing "Other listed species that occur..." to read "Other listed species that may occur...."

21. p. 24, ¶ 3. Change "Western pond turtle" to read "Northwestern pond turtle."

22. p. 24, ¶ 5. Change "...water oriented recreation..." to read "...lake oriented recreation...."

23. p. 25, ¶ 1. Change "...approximately eight months..." to read "...an additional 2 months...."

24. p. 25, ¶ 2. Change "...passage of the winter-run..." to read "...passage of most of the winter-run...."

25. p. 25, ¶ 2. Delete last sentence.

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26. p. 26, ¶ 1. The last sentence refers to possible changes in lake water levels resulting from gates being closed to allow "...existing pumps to remain operational..." which would result in "changes in water quality downstream of RBDD." Please clarify the nature and severity of this impact.

27. p. 26, ¶ 2. Delete second sentence.

28. p. 26, ¶ 3. Change "...National Park Service..." to read "...U.S. Forest Service...."

In summary, the Service supports the Pilot Pumping Plant as a project which offers the potential for substantial benefits to fish passage in the near and long term. Because it represents an untested technology, the facility must be fully evaluated and verified to have no significant adverse impact to fisheries before it can be committed to continuous operation. We look forward to full coordination with Reclamation in the evaluation activities.

Thank you again for inviting our input to the planning process. Our response has been coordinated with the Northern Central Valley Fishery Resource Office in Red Bluff. If you have any questions, please contact Steve Schoenberg or Tom Richardson in Sacramento at (916) 978-4613 or Jim Smith in Red Bluff at (916) 527-3043.

Sincerely,

Wayne S. White
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