FINAL

ENVIRONMENTAL ASSESSMENT

AND FINDING OF NO SIGNIFICANT IMPACT

Red Bluff Diversion Dam
Pilot Pumping Plant Program

Prepared by

U.S. Department of the Interior

Bureau of Reclamation
Mid-Pacific Region

Sacramento, CA

August 1993

United States Department of the Interior

Bureau of Reclamation

Mid-Pacific Region
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FINDING OF NO SIGNIFICANT IMPACT

RED BLUFF DIVERSION DAM
PILOT PUMPING PLANT PROGRAM

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Date: August 11, 1993

FONSI No. 93-05-MP

C-089554

FINDING OF NO SIGNIFICANT IMPACT
RED BLUFF DIVERSION DAM PILOT PUMPING PLANT PROGRAM

In accordance with the National Environmental Policy Act of 1969, as amended, the Mid-Pacific Regional Office of the U.S. Bureau of Reclamation (Reclamation) has determined that an environmental impact statement is not required for the Red Bluff Diversion Dam (RBDD) Pilot Pumping Plant (PPP) Program.

Reclamation is proposing to assist salmonid populations while meeting the basic project purpose of the RBDD and the Tehama Colusa Canal (TCC) by implementing the Red Bluff Diversion Dam Pilot Pumping Plant Program. The design and placement of the pilot pumping plant has been developed by Reclamation in conjunction with the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the California Department of Fish and Game.

The project consists of the installation of a pilot pumping plant immediately downstream of the RBDD which will include one helical pump (100 cubic feet per second (cfs)) and two closed Archimedes screw pumps (100 cfs, each). It is expected that the Archimedes pumps will allow fish to pass through them with minimal impact. The impact of helical pumps are uncertain, but will be evaluated as part of this program. An additional pump either helical or Archimedes (100 cfs) may be added in the future.

The pilot pumping plant is proposed to begin operating in December of 1994. The normal annual operating period will run from September 15 to May 14. This would facilitate gates of the diversion dam to be up for an additional two months of the year, when compared to historical operations and thus allow for essentially unimpeded fish passage for this period of time. The pumps themselves are expected to have minimal impact on juvenile fish (25 mm and larger) migrating downstream. Impacts will be minimized by monitoring at the evaluation facility and implementing appropriate corrective measures, as necessary, through flexibility designed into the pilot pumping plant. This would include activities such as speed control, exchangeability of the trashrack, intake bell housings, vertical screens, operational flexibility of the bypass system and other features.

This project is expected to help prevent further loss of the threatened winter-run chinook salmon and facilitate continued delivery of water in the TCC. Without implementation of this program, and the continuation of normal operations at the Red Bluff Diversion Dam, a further decline in this species may occur and recovery may be inhibited.

The following are the reasons why the impacts of the proposed action are not significant:

1. The normal operation of the Red Bluff Diversion Dam will not be adversely impacted during the construction period and efforts to minimize impact on the

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environment will be taken at every opportunity. Sheet pile will be installed to provide hydraulic isolation that will eliminate any disturbance of the river from construction.

2. Borrow material will be taken from an existing borrow area previously used by Reclamation. This site is serviced by a permanent road approximately 3/4 mile long. No threatened or endangered species occur at this site. Approximately 9,000 cubic yards of free draining material will be obtained here. No additional disturbance of the existing borrow area will occur.

3. The project will not affect public safety. All necessary precautions will be taken during the construction period. Traffic control will be utilized where necessary. Traffic on the road to access the construction site and the borrow area will be appropriately controlled by flagmen and warning signs during the construction period.

4. There will be no long-term adverse affects to fish. After construction, long-term effects of the PPP may help prevent further decline of the salmonid population while allowing the continuation of the basic project purpose of the RBDD and the TCC. The new base operation conditions required for the Central Valley Project includes maintenence of the RBDD gates in an uninterrupted raised position from September 15 to May 14. The PPP would allow flexibility to meet this requirement and still meet water delivery requirements.

5. There will not be any impact on the following Federally listed threatened, endangered or candidate species: the winter-run chinook salmon, (Oncorhyncus tshawytscha), the Valley Elderberry Longhorn Beetle (VELB), (Desmocerus californicus dimorphus), the Northwestern pond turtle, (Clemmys marmorata marmorata), the bald eagle, (Haliaeetus leucocephalus), Sacramento splittail, (Pogonichtys macrolepidotus), the green sturgeon, (Acipenser medirostris), the California red-legged frog, (Rana aurora draytonii), silky cryptantha, (Cryptantha crinita) and the adobe lily, (Fritillaria pluriflora).

6. Any vegetation, which may exist at the construction site, downstream of RBDD, will be replanted to replace that lost due to construction activity.

7. Recreation may be disrupted during the construction period. However, following completion of the pilot pumping plant, extended gates-up operation will allow for additional benefits to be realized by sport fishermen if, as expected, a subsequent inprovement in salmonid population results. The formation of Lake Red Bluff will occur after the gates of the RBDD are closed, beginning in mid-May before the Memorial Day holiday.

8. The project will not adversely affect water quality. Construction specifications will include a water quality management plan to minimize any impacts.

9. There will be no adverse impact from noise to the area surrounding the construction site.

10. The RBDD Pilot Pumping Plant will be located in an area completely altered by the construction of the Tehama Colusa Canal. A survey of the general area has been performed for cultural resources and none exist at the proposed site. In the unlikely occurrence that cultural resources are encountered after the project has begun, the procedures in 36 CFR 800.11 would be followed. The contractor would cease work at that location and notify Reclamation. Reclamation's Regional Archeologist would assess the nature and value of the site and would recommend to the State Historic Preservation Officer (SHPO) a course of action. Appropriate mitigation, as determined through negotiations with SHPO, would be completed for any significant sites.

11. There is no long term adverse impact to social and economic conditions that may result with the installation of the PPP at RBDD.

12. A need was identified to generate greater sweeping flows past the Red Bluff Diversion Dam Pilot Pumping Plant. Changes in the design of the PPP have been incorporated in order to generate these flows past the PPP intake. The changes include repositioning the intake (a 9 degree rotation which moves the upstream end of the intake about 5 feet and the downstream end about 30 feet further into the river).

The implementation of additional measures to achieve increased flows will be initiated following construction of the PPP. Initially, five possible courses of action were suggested to facilitate greater sweeping flows at the intake of the PPP. These options include:

1) gate manipulations at RBDD;
2) dredging of the site above and below RBDD, and;
3) use of groins or other channel control structures in the river;
4) constricting the channel cross section above the dam; and
5) a combination of the above.

Continued hydraulic model studies combined with comments from the first and second revised Draft Environmental Assessment (EA) review have led Reclamation to select a version of number 5) above as the channel modification option recommended for implementation. This option incorporates gate manipulation at RBDD with limited upstream dredging, has comparable flow manipulation benefits to the other channel modification options considered, and can be achieved at minimum cost, with no in-river construction. Only if this option fails to provide the necessary sweeping flows would other options be considered. A detailed explanation of the selected option as well as the other alternatives considered is provided in Appendix E of the EA. All options, other than the selected gate manipulation combined with upstream dredging, will be subject to separate environmental documentation at a later date, depending on their scope and nature.

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FINAL

ENVIRONMENTAL ASSESSMENT

Red Bluff Diversion Dam
Pilot Pumping Plant Program

Prepared by

U.S. Department of the Interior

Bureau of Reclamation
Mid-Pacific Region

Sacramento, CA

August 1993

Summary

This Environmental Assessment (EA) has been prepared to assess the environmental effects of the construction and operation of a Pilot Pumping Plant (PPP) Program proposed by the Bureau of Reclamation (Reclamation) at the Red Bluff Diversion Dam (RBDD). The purpose of the program is to provide information for evaluation and refinement of the performance characteristics of the two types of pumps. As an added benefit, the continued delivery of water in the Tehama Colusa Canal (TCC) will be ensured while reducing the impact to anadromous fish associated with the historical operation of the RBDD.

Following construction of the Red Bluff Diversion Dam in 1964, and the subsequent closure of the gates in August of 1966, there has been a marked decrease in the anadromous salmonid population of the upper Sacramento River. Of specific concern has been the pronounced decline in the numbers of the winter-run chinook salmon (winter-run) Oncorhynchus tshawytscha which has been federally listed as a threatened species. These population declines have necessitated the implementation of a variety of measures to arrest a further decline of, and to assist recovery of salmonid populations.

One of the proposed measures to assist salmonid populations is the Red Bluff Diversion Dam Pilot Pumping Plant Program. The design and placement of the pilot pumping plant has been developed by the Bureau of Reclamation in conjunction with the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the California Department of Fish and Game. The pilot pumping plant, along with the no action alternative, are the two alternatives considered in this EA.

The project consists of the installation of a pilot pumping plant immediately downstream of the RBDD which will include one helical pump (100 cubic feet per second (cfs)) and two closed Archimedes screw pumps (100 cfs, each). It is expected that the Archimedes pumps will allow fish to pass through them with minimal impact. The impact of helical pumps is uncertain, but will be evaluated as part of this program. An additional pump, either helical or Archimedes, (100 cfs) may be added in the future.

A decision was made by Reclamation to provide all water users with the same amount of water as previously allocated. However, the Biological Opinion issued by the National Marine Fisheries Service now requires that the gates be opened an additional two months each year. Historic "gates-up" operations have been from November 1 through April 30. The new period has been stipulated as September 15 through May 14, and will be in effect beginning in 1994. These dates were based on the premise that the PPP would be completed and operating, beginning in October of 1993. Although completion of the PPP has been delayed to December, 1994, Reclamation is still required to meet these dates, which are the new base operation conditions for the Central Valley Project. When operational, the PPP will help insure that an adequate water supply will be made available to irrigation districts, wildlife refuges, and other water users. However, during construction, there will be times when the gates must be operated to accommodate construction activities. This could occur intermittently during mid-March through April, 1994 when gates on the

right river bank may be closed to accomodate cofferdam construction, and again in late August, 1994 when the cofferdam is removed. Additional closing of the gates on the right bank may occur for up to four hours about once per month to aid divers checking cofferdam stability. Lake Red Bluff will not be reinstated prior to April 30, 1994. Reclamation is currently re-initiating consultation with the National Marine Fisheries Service to reach agreement on how these operational changes during construction should be carried out, so that the water delivery commitments along the TCC may be met, and fishery needs accommodated, until the PPP is fully operational.

Pursuant to the following schedule, the gates of Red Bluff Diversion Dam must remain in the raised position to provide unimpeded upstream and downstream passage for winter-run chinook salmon:

a. The gates of Red Bluff Diversion Dam must remain in the raised position through at least April 30, 1993.

b. The gates of Red Bluff Diversion Dam must be raised on November 1, 1993 and remain in the raised position through at least April 30, 1994.

c. On September 15 of each year commencing in 1994, the gates of Red Bluff Diversion Dam must be raised and remain in the raised position from September 15 through at least May 14.

NMFS will review proposals for intermittent gate closures of up to 10 days, one time per year, on a case-by-case basis. Reclamation recently reinitiated consultation with NMFS for activities related to construction of the pilot pumping plant but the request was not to change the essence of the above schedule.

The PPP would allow flexibility in meeting existing requirements without severly restricting water deliveries during this period. Thus, the normal annual gates-up operating period will run from September 15 to May 14. This would allow the gates of the diversion dam to be up for an additional two months of the year, thus allowing for essentially unimpeded fish passage during this period of time. The pumps themselves are expected to have minimal impact on juvenile fish (25 mm and larger) migrating downstream. Impacts will be minimized by monitoring at the evaluation facility and implementing appropriate corrective measures, as necessary, through flexibility designed into the pilot pumping plant, such as pump speed control, exchangeability of the trashracks, intake bell housings, vertical screens, and operational flexibility of the bypass system and other features.

Additional features of the RBDD PPP Alternative

A need has been identified to generate greater sweeping flows past the Red Bluff Diversion Dam Pilot Pumping Plant. Changes in the design of the PPP will be incorporated in order to generate these flows past the PPP intake. The changes include repositioning the intake (a 9 degree rotation which moves

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the upstream end of the intake about 5 feet and the downstream end about 30 feet further into the river).

Additionally, during the construction phase for the PPP, the fish screens for the temporary pumps will be removed prior to cofferdam construction, beginning in mid-March or early April 1994, and will remain out through late summer. It is anticipated that pumping will occur during the gates-up portion of this time period, as necessary, to meet water delivery needs. Screens will be replaced prior to pumping for the TCC canal when the gates are raised on September 15, 1994.

The implementation of additional measures to achieve increased flows will be initiated following construction of the PPP. Five possible courses of action have been suggested to facilitate greater sweeping flows at the intake of the PPP. A primary option consisting of gate manipulation (selective gate operation) and limited upstream dredging has been identified as the alternative that will be implemented initially. Only if this option fails to provide the necessary sweeping flows would other options be considered. A detailed explanation of all alternatives is provided in Appendix E of the Environmental Assessment.

All channel modifications other than selective gate operations combined with upstream dredging will be subject to separate environmental documentation at a later date depending on their scope and nature, as developed and determined to be necessary, to generate adequate sweeping flow past the PPP.

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GLOSSARY

cfs - Cubic Feet Per Second

DFG - California Department of Fish and Game

DWR - California Department of Water Resources

EA - Environmental Assessment

FWS - U.S. Fish and Wildlife Service

NMFS - National Marine Fisheries Service

RBDD - Red Bluff Diversion Dam

PPP - Pilot Pumping Plant

Fines - Silt and clay particles of less than .062 mm in diameter.

Groins - Any structure built into the water to protect against erosion or to establish normal channel widths; also to direct the axis of flow to promote scour.

Thalweg - Line connecting the lowest or deepest point along a streambed (flow line).

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INTRODUCTION

After construction of the Red Bluff Diversion Dam (RBDD) in 1964 and with the subsequent closure of the dam gates in August of 1966, there has been a marked decrease in anadromous salmonid populations of the upper Sacramento River. Of specific concern has been the pronounced decline in numbers of the winter-run chinook salmon which has been Federally listed as a threatened species. These population declines have necessitated the implementation of a variety of measures to arrest a decline of the salmonid population. One of the measures proposed to assist salmonid populations while still facilitating the delivery of water into the TCC, is the Pilot Pumping Plant (PPP) program.

Reclamation is currently involved in a long range fish passage study at the Red Bluff Diversion Dam. The objectives of this study are to improve passage for both downstream and upstream migrating chinook salmon and steelhead trout, to maintain water supply capability and to prevent adverse impacts in other areas. The pilot pumping plant supports this effort. (Please refer to Figure 1).

This EA has been integrated with environmental review and consultation requirements of the Fish and Wildlife Coordination Act, the Endangered Species Act, the National Historical Preservation Act and Federal policies on farmland, wetlands and floodplains. Preparation of the EA has been coordinated with affected Federal, State and local resource agencies including the U.S. Fish and Wildlife Service (FWS), the National Marine Fisheries Service (NMFS), the California Department of Fish and Game (DFG), California Department of Water Resources (DWR), and the California State Regional Water Quality Control Board (State Board).

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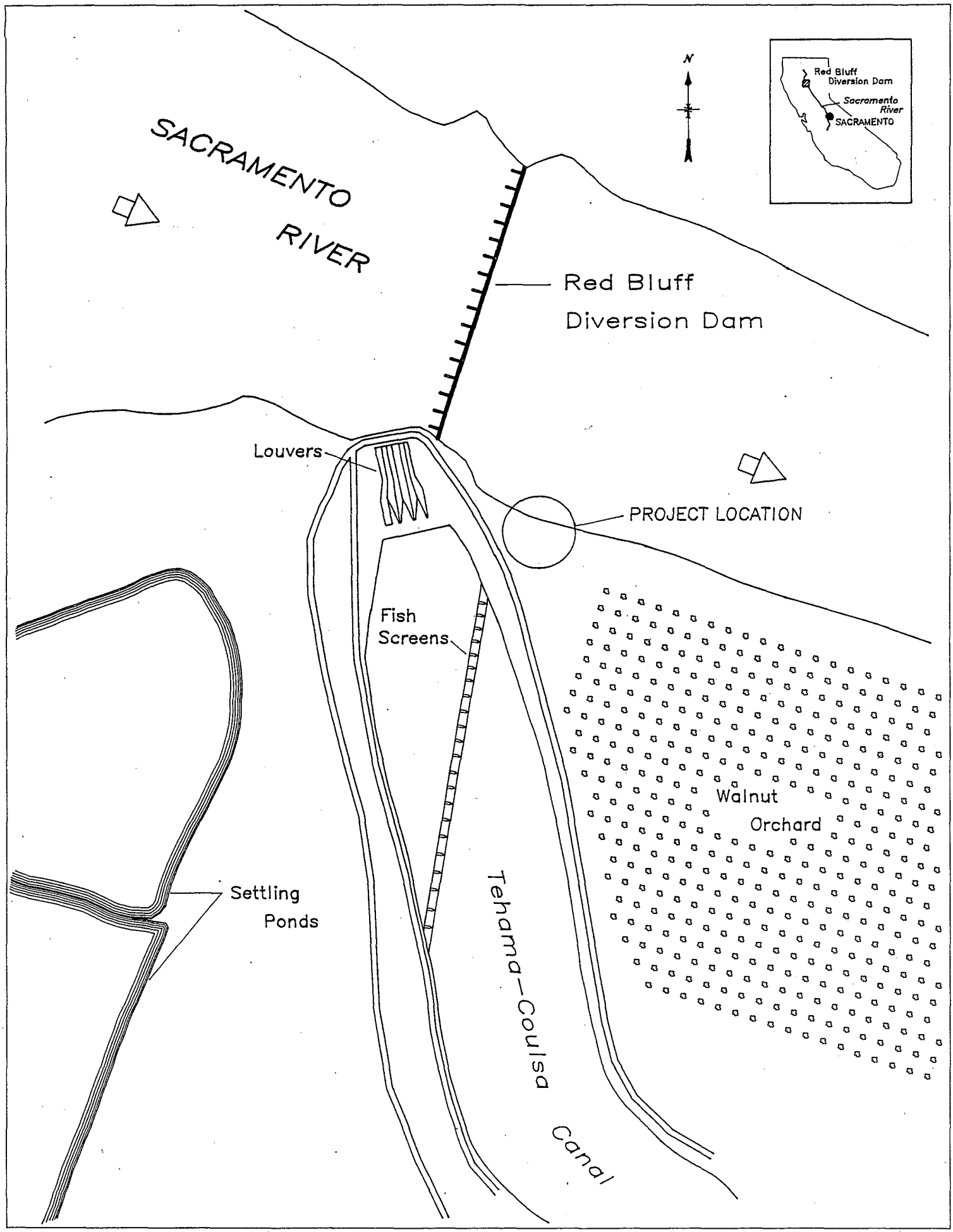

Figure 1

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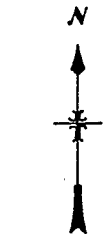

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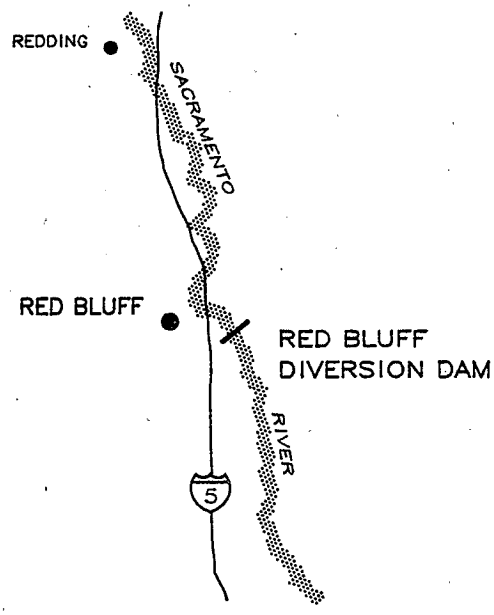
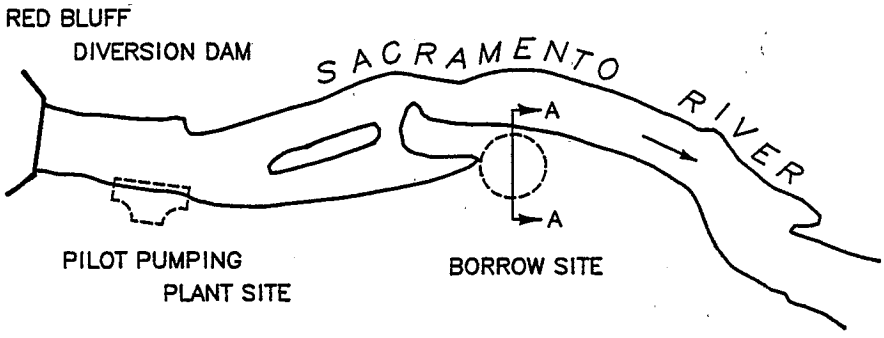
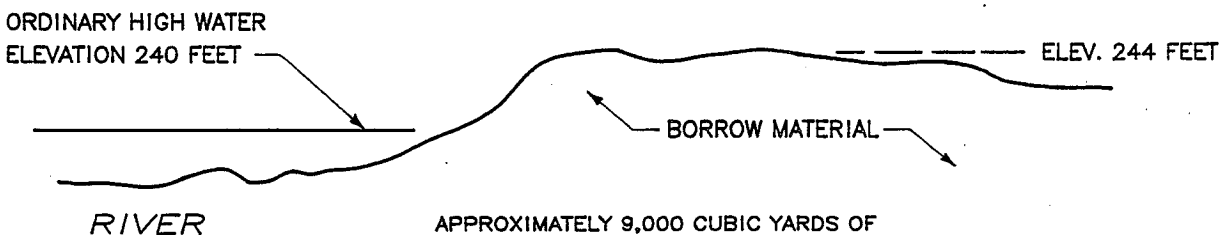


AREA MAP





APPROXIMATELY 9,000 CUBIC YARDS OF BORROW MATERIAL TO BE USED AS BACKFILL FOR PILOT PUMPING PLANT

SECTION A – A

PROPOSED BORROW SITE

RED BLUFF PILOT PUMPING PLANT

SACRAMENTO RIVER

U.S. Bureau of Reclamation

Willows, California

Figure 2

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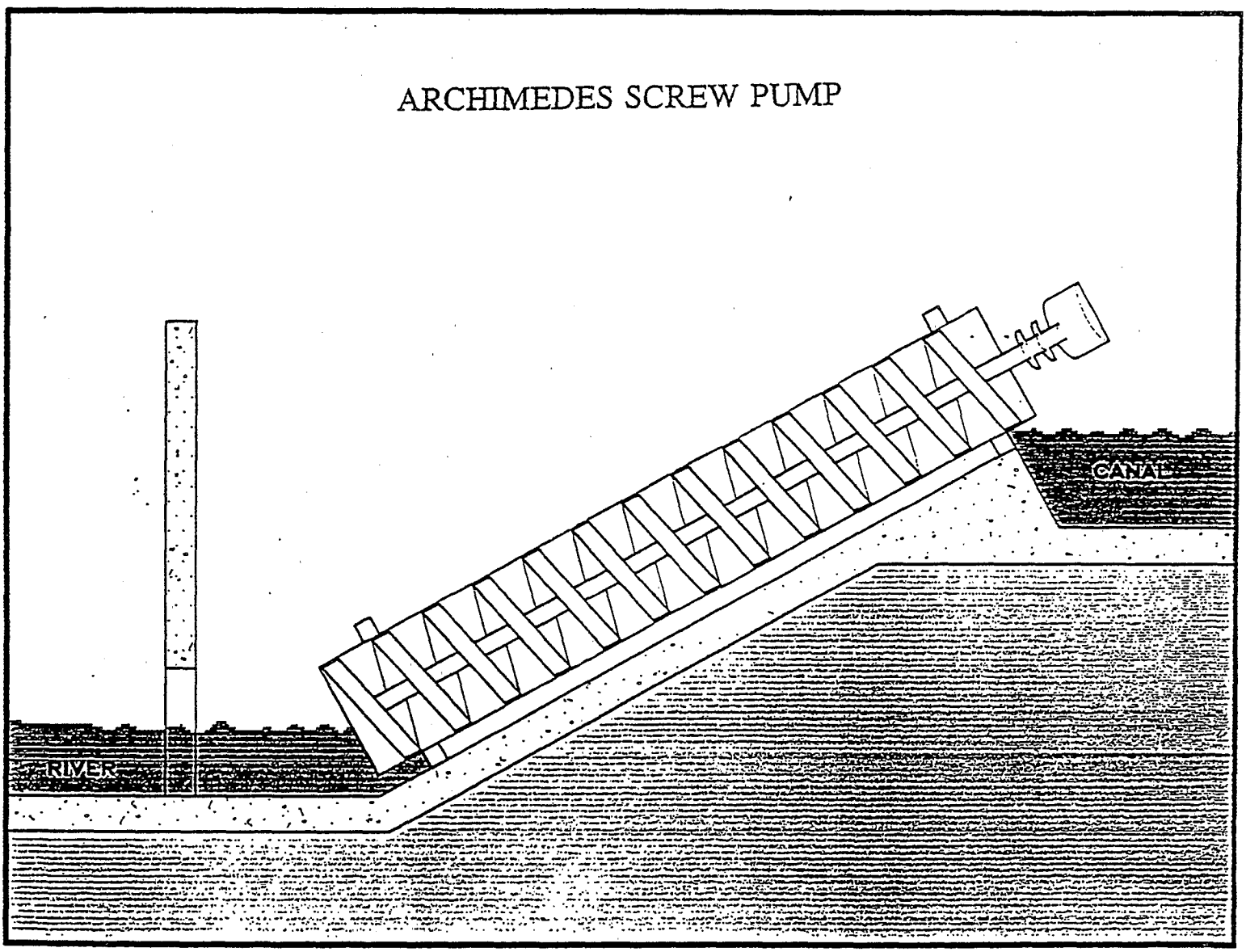
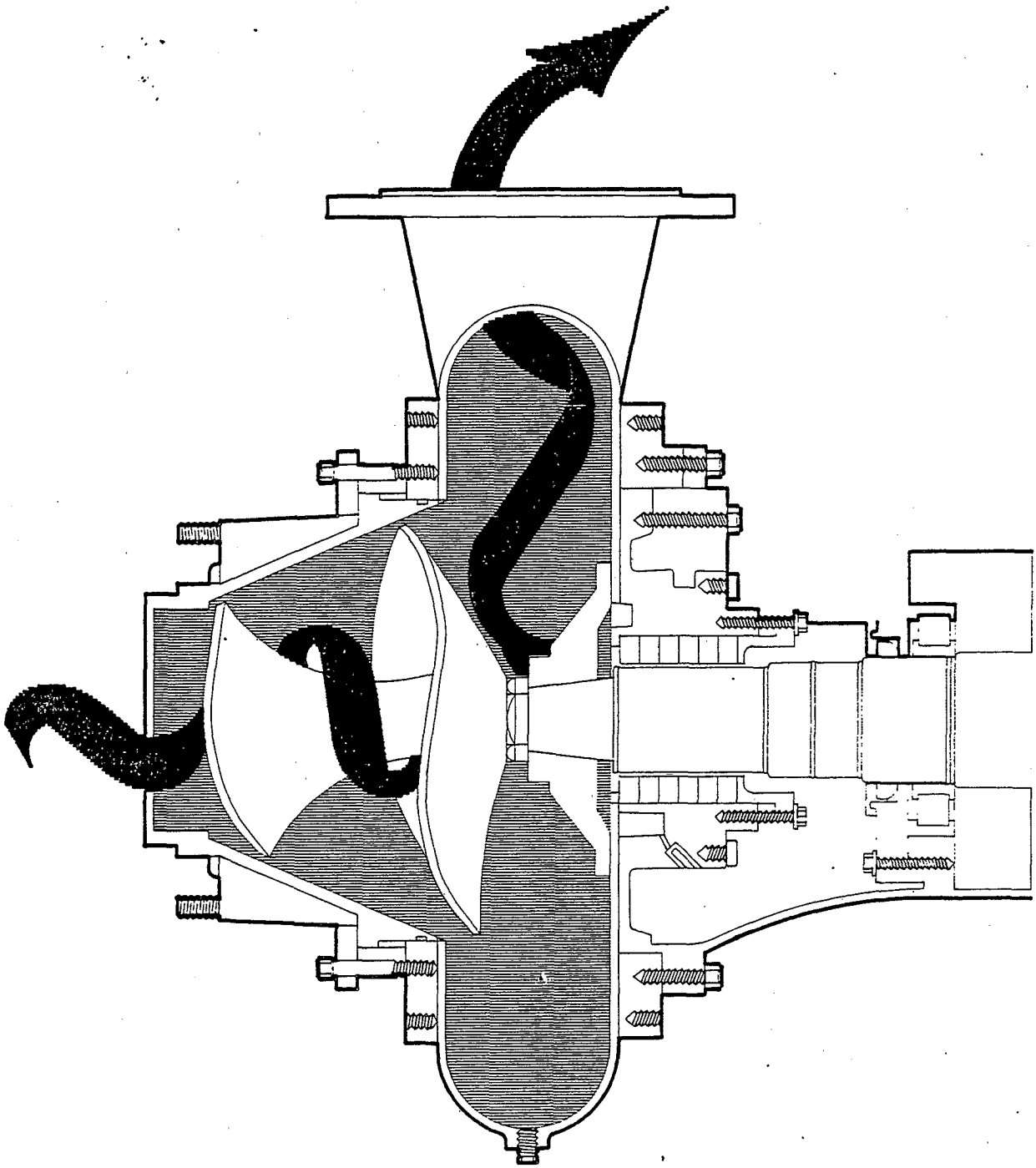


Figure 3



HELICAL PUMP

Figure 4

PURPOSE AND NEED

The RBDD Pilot Pumping Plant program was initially proposed by Reclamation and is concurrently being developed with the Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS) and the California Department of Fish and Game (DFG) in order to minimize the impacts on winter-run chinook salmon until a permanent, long range solution to correct fishery problems has been implemented. It would serve to provide for evaluation and refinement of the performance characteristics of the two types of pumps. (Please refer to Figures 2 and 3). Additional secondary benefits to other salmonids will also be realized as a result of this project. (Please refer to Tables 1 - 6).

Ongoing consultation under section 7 of the Endangered Species Act (ESA) addressing Central Valley Project (CVP) operations includes consideration of operations at RBDD. A Biological Opinion provided for long-term operation of the CVP included extended opening of gates at RBDD as a routine annual mode of operation. The construction of the pilot pumping plant would allow Reclamation to meet these ESA requirements while still allowing the basic project purpose to proceed. Reclamation did not anticipate the delay in the construction of the PPP with its completion in December, 1994. Reclamation is currently re-initiating consultation with the National Marine Fisheries Service to reach agreement on operational changes that may be needed during construction to meet water delivery commitments along the TCC until the PPP is fully operational.

Pursuant to the following schedule, the gates of Red Bluff Diversion Dam must remain in the raised position to provide unimpeded upstream and downstream passage for winter-run chinook salmon:

a. The gates of Red Bluff Diversion Dam must remain in the raised position through at least April 30, 1993.

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c. On September 15 of each year commencing in 1994, the gates of Red Bluff Diversion Dam must be raised and remain in the raised position from September 15 through at least May 14.

NMFS will review proposals for intermittent gate closures of up to 10 days, one time per year, on a case-by-case basis. Reclamation recently reinitiated consultation with NMFS for activities related to construction of the pilot pumping plant but the request was not to change the essence of the above schedule.

The currently proposed program is the culmination of meetings and discussions that have been held with interested parties of Federal, State and local resource agencies as well as interested citizens and private organizations. The significant issues considered and deemed necessary for the program were the biological and operational criteria indicated previously. These are the

unimpeded passage of fish during the extended gates-up operation, and reduced mortality of those that would be pumped through the proposed pumps.

TABLE 1

List of Common and Scientific Names of Fishes That Could Potentially be Encountered at the Proposed Prototype Pumping Facility at Red Bluff Diversion Dam, California

Common Name	Scientific Name
Lampreys	Petromyzontidae
Pacific lamprey	Lampetra tridentata
Sturgeons	Acipenseridae
Green sturgeon	Acipenser medirostris
White sturgeon	Acipenser transmontanus
Herrings	Clupeidae
American shad	Alosa sapidissima
Threadfin shad	Dorosoma petenense
Trout and Salmon	Salmonidae
Chinook salmon	Oncorhynchus tshawytscha
Steelhead/Rainbow trout	Oncorhynchus mykiss
(perhaps rarely: Coho, Pink, and Chum salmon; Brown trout)	
Minnows	Cyprinidae
Carp	Cyprinus carpio
Sacramento squawfish	Ptychocheilus grandis
Roach	Hesperoleucus synmetricus
Hitch	Lavinia exilicauda
Sacramento blackfish	Orthodon microlepidotus
Hardhead	Mylopharodon concephalus
Golden shiner	Notemigonus crysoleucas
Suckers	Catostomidae
Sacramento sucker	Catastomus occidentalis
Catfishes	Ictularidae
White catfish	Ictalurus catus
Channel catfish	Ictalurus punctatus
Bullheads	Ictalurus sp.
Livebearers	Poeciliidae
Mosquitofish	Gambusia affinis
Sticklebacks	Gasterosteidae
Threespine stickleback	Gasterosteus aculeatus

Above information from several sources: Moyle, 1976; Dick Painter, California Dept. of Fish and Game, Personal Communication; Robins et al., 1980 (Common and Scientific Names); Numerous USFWS Documents of RBDD.

Common and Scientific Names of Fishes (Continued)

Common Name	Scientific Name
Sea basses	Percichthyidae
Striped bass	Morone saxitilis
Sunfish and Black Basses	Centrarchidae
Green sunfish	Lepomis cyanellus
Redear	Lepomis microlophus
Bluegill	Lepomis macrochirus
Largemouth bass	Micropterus salmiodes
Smallmouth bass	Micropterus dolomieui
Surfperches	Embiotocidae
Tule perch	Hysterocarpus traski
Sculpins	Cottidae
	Cottus sp.

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Table 2
Generalized Approximate Timing Patterns Of Various Life History Activities Of The Four "Runs" of Chinook Salmon In The Sacramento River, California

Life History Activity	Fall Run	Late Fall Run	Winter Run	Spring Run
Adult Migrations	July 1 - Mid-Dec (Peak = Sept)	Late Oct - Apr 10 (Peak = late Dec)	Dec 15 - July 5 (Peak = Mar-Apr)	Mar 20 - Oct 5 (Peaks in May - July)
Spawning	Oct 1 - Late Dec (Peak = all of Nov)	Jan 1 - Apr 15 (Peak = Late Feb)	Apr 16 - Aug 15 (Peak = Late May - Early June)	Aug 16 - Oct 15
Egg Incubation	Oct 1 - End of Mar	Jan 1 - End of June	Apr 15 - Oct 15	Aug 10 - Dec 31
Rearing and Downstream Migration	Late Dec - End of June (Peak for Smolts = May; Peaks for Fry, or 35-45 mm Fish, Occur With Freshets in Jan-Feb)	Apr 10 - Dec 15 (Peak=Early July)	July 10 - Mar 15	Nov 1 - May 5

Data Summarized From Vogel and Marine 1991.

TABLE 3

Biweekly Counts of Adult Fish Migrating Upstream Through
Fish Passageways at Red Bluff Diversion Dam
During May 5, 1991, Through November 30, 1991

Time Period (1991)	Chinook Salmon	Steelhead Trout	American Shad	Sacramento Squawfish
May 5 - May 18	104	5	0	684
May 19 - June 1	156	0	0	891
June 2 - June 15	283	1	4	427
June 16 - June 29	309	1	1	166
June 30 - July 13	732	0	5	90
July 14 - July 27	1,891	5	5	230
July 28 - Aug 10	980	3	0	17
Aug 11 - Aug 24	3,709	9	0	22
Aug 25 - Sept 7	4,754	45	0	17
Sept 8 - Sept 21	7,624	149	0	35
Sept 22 - Oct 5	9,087	463	0	43
Oct 6 - Oct 19	7,164	882	5	391
Oct 20 - Nov 2	4,314	883	0	78
Nov 3 - Nov 16	2,055	699	0	182
Nov 17 - Nov 30	2,237	247	0	4
Totals	45,399	3,392	20	3,277

Data Taken From USFWS Fish Counts Conducted by the Northern Central Valley Fishery Resource Office. Daily Counts Taken from 6 a.m. to 8 p.m.

Data Sheets Provided at Bureau of Reclamation Offices at Red Bluff by Joe Van Aelst.

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TABLE 4

Total Counts of Numbers of Adult Fish Migrating Upstream Through Fish Passageways at Red Bluff Diversion Dam During December 1, 1983, Through April 30, 1984, and December 1, 1984, Through April 30, 1985

Species	Dec 1, 1983 to Apr 30, 1984	Dec 1, 1984 to Apr 30, 1985
Chinook Salmon	6,681	8,116
Steelhead Trout	268	599
American Shad	0	0
Sacramento Squawfish	16,173	6,767

Data Provided by Jerry BigEagle, USFWS, Northern Central Valley Fishery Resource Office, Red Bluff, California. Daily Counts Taken from 6 a.m. to 8 p.m.

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TABLE 5

Monthly Average and Range of Estimated Numbers of Downstream Migrating Juvenile Chinook Salmon Approaching Red Bluff Diversion Dam (Data from July 1982 Through June 1986)

Month	Average	Range
July	825,700	188,924 - 2,540,591
August	129,080	7,994 - 163,922
September	140,785	67,842 - 295,264
October	202,500	37,657 - 396,317
November	1,030,240	364,003 - 2,537,494
December	6,446,520	374,271 - 15,046,336
January	14,361,360	1,135,293 - 27,381,824
February	21,672,920	1,226,132 - 67,840,478
March	3,562,780	363,416 - 8,105,593
April	4,590,740	1,014,640 - 6,223,675
May	11,709,740	1,973,206 - 22,365,055
June	6,846,295	448,926 - 14,125,511

Data Summarized From: United States Fish and Wildlife Service, 1988. Fish Passage Action Program for Red Bluff Diversion Dam. Final Report Appendices, USFWS Report No. FR1/FAO-88-19.

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ALTERNATIVES:

This chapter contains a description of the preferred alternative, the no action alternative and the alternatives that were considered but were not selected. The key considerations used in evaluating the suitability of each alternatives were fish passage (minimizing mortality and optimizing unrestricted passage) and water delivery (minimizing the impact of possible reduced water deliveries to existing users).

From these key considerations, the following set of criteria were developed: (Criteria (a) through (c) are for evaluating the pumps and criteria (d) is nonessential to pump type selection.)

a. Biological - to have minimal impact on fish passage.

Biological criteria was deemed to be of paramount importance. Therefore design specifications and operational considerations would have to be developed which would enable the optimum number of fish to pass the RBDD unimpeded. A corollary requirement for this criteria is optimizing the survival rate and minimizing the mortality rate of the fish that would be pumped and returned to the river.

b. Water delivery capability - to maintain normal water delivery, to the maximum extent possible.

A decision was made by Reclamation to provide all water users with the same amount of water as previously allocated. However, the Biological Opinion issued by the National Marine Fisheries Service now requires that the gates be opened an additional two months each year. Historic "gates-up" operations have been from November 1 through April 30. The new period has been stipulated as September 15 through May 14, and will be in effect beginning in 1994. These dates were based on the premise that the PPP would be completed and operating, beginning in October of 1993. Although completion of the PPP has been delayed to December, 1994, Reclamation is still required to meet these dates, which are the new base operation conditions for the Central Valley Project. When operational, the PPP will help insure that an adequate water supply will be made available to irrigation districts, wildlife refuges, and other water users. However, during construction, there will be times when the gates must be operated to accommodate construction activities. This could occur intermittently during mid-March through April, 1994 when gates on the right river bank may be closed to accomodate cofferdam construction, and again in late August, 1994 when the cofferdam is removed. Additional closing of the gates on the right bank may occur for up to four hours about once per month to aid divers checking cofferdam stability. Lake Red Bluff will not be reinstated prior to April 30, 1994. Reclamation is currently re-initiating consultation with the National Marine Fisheries Service to reach agreement on how these operational changes during construction should be carried out, so that the water delivery commitments along the TCC may be met, and fishery needs accommodated, until the PPP is fully operational.

c. System reliability - to ensure operation of at least one Archimedes screw pump at all times, a minimum of two pumps will be installed.

For system reliability, the requirement to have at least one Archimedes screw pump in operation at all times made it imperative that two pumps would have to be installed in the event of one Archimedes pump malfunctioning or for routine maintenance.

d. Evaluation opportunity - to allow performance assessment of more than one type of pump.

This criteria required the PPP to allow for the performance assessment of two different pumps. Hence, a helical pump was included in the design.

Selection of the Alternatives

Each of the alternatives considered were evaluated based upon whether it met the set of criteria listed above. For those that met all the criteria, the biological benefits to be derived were calculated and ranked. The selection was made based on this ranking.

No Action Alternative:

The no action alternative would result in gates-up operation for the period of September 15 through May 14, as required by the Biological Opinion addressing long-term operation of the CVP. Historic "gates-up" operations have been from November 1 through April 30. The new period has been stipulated as September 15 through May 14, and will be in effect beginning in 1994. These dates were based on the premise that the PPP would be completed and operating, beginning in October of 1993. Although completion of the PPP has been delayed to December, 1994, Reclamation is still required to meet these dates, which are the new base operation conditions for the Central Valley Project.

This alternative would not include the addition of any new structures or changes in existing operations at RBDD. In 1991 and 1992 five temporary pumps were installed at RBDD to enable delivery of water with gates-up operation. The operation of these five conventional pumps (25 cfs, each) with a total capacity of 125 cfs, would provide a limited supply of water to users along the TCC when gates are up. Additionally, four portable, submersible pumps (10 cfs, each) were added in 1992 to supplement gates-up operation and to ensure water supply.

Pilot Pumping Plant Alternative:

Reclamation is proposing to construct and operate a pilot pumping plant using a combination of pumps of varying speeds. Construction is anticipated to begin in April of 1994. The proposed operational date for the pilot pumping plant would be in December of 1994.

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The pilot pumping plant program consists of a combination of one helical (centrifugal) pump (100 cfs) and two closed Archimedes screw pumps (100 cfs, each). Limited previous evaluation indicates that the Archimedes screw pumps allow fish to pass through them with minimal impact. An additional pump either helical or Archimedes, (100 cfs) may be added in the future. Also included would be the continued operation of five conventional pumps with screened intakes. Reclamation intends to operate only those pumps that can be screened. Repositioning of the PPP inlet structure allows space for placement of four sets of screens, not five sets as initially planned. Therefore, only four of the five conventional pumps can be operated and only 100 cfs capacity will be realized, not the 125 cfs as originally intended.

The PPP, once it is completed, will provide a total of 300 cfs, with 270 cfs for water delivery and 30 cfs redirected to the fish bypass. Peak capacity of 370 cfs would potentially be available during 243 days of operation. During this time the RBDD gates would be open beginning September 15 through May 14.

A decision was made by Reclamation to provide all water users with the same amount of water as previously allocated. However, the Biological Opinion issued by the National Marine Fisheries Service now requires that the gates be opened an additional two months each year. Historic "gates-up" operations have been from November 1 through April 30. The new period has been stipulated as September 15 through May 14, and will be in effect beginning in 1994. These dates were based on the premise that the PPP would be completed and operating, beginning in October of 1993. Although completion of the PPP has been delayed to December, 1994, Reclamation is still required to meet these dates, which are the new base operation conditions for the Central Valley Project. When operational, the PPP will help insure that an adequate water supply will be made available to irrigation districts, wildlife refuges, and other water users. However, during construction, there will be times when the gates must be operated to accommodate construction activities. This could occur intermittently during mid-March through April, 1994 when gates on the right river bank may be closed to accomodate cofferdam construction, and again in late August, 1994 when the cofferdam is removed. Additional closing of the gates on the right bank may occur for up to four hours about once per month to aid divers checking cofferdam stability. Lake Red Bluff will not be reinstated prior to April 30, 1994. Reclamation is currently re-initiating consultation with the National Marine Fisheries Service to reach agreement on how these operational changes during construction should be carried out, so that the water delivery commitments along the TCC may be met, and fishery needs accommodated, until the PPP is fully operational.

The location for the pilot pumping plant is approximately 300 feet downstream of the RBDD on the right bank. The discharge water from all pump units would enter a separation facility where the fish are concentrated by a vertical screen and moved into the bypass flow to the evaluation facility. Most of the water (without fish), will be conveyed to the canal. The water from the bypass will flow through the evaluation facilities where there will be an inclined screen fish separator which will move fish into the holding tanks. Here, the condition of the fish can be monitored and the number and type of fish can be recorded. A video camera would be used for this surveillance. When the bypass flow is not being sampled, the fish will be conveyed via

separate 18-inch bypass pipes, which will be connected to the existing 60-inch bypass pipe, to allow easy diversion of the fish back to the river.

One of the primary purposes of this alternative is to design a test facility that minimizes salmonid mortality while allowing a thorough assessment of the appropriateness of this type of facility as a long term solution. However, even with the best initial design, subsequent evaluation may find unpredicted, unforeseeable sources of salmon mortality. Reclamation is committed to working with the participating agencies to correct, to the extent practicable, any design and/or operational sources of salmon mortality found during the evaluation studies (See Appendix F).

The project will be operated in two phases. During the first phase, the facility's principal purpose will be to allow an experimental evaluation of the potential for a larger facility of this type as a long-term solution, such as described in the Red Bluff Diversion Dam Fish Passage Program Appraisal Report. During this first phase, the facility will also be able to supply irrigation water and allow the RBDD gates to remain up for a longer period and subsequently benefit salmonid fish passage.

Depending on the outcome of this evaluation and other planning decisions, (such as the RBDD Appraisal Study), the project might enter a second phase in which it would be used as a conveyance facility to provide benefits to fish and water users.

The summary list of environmental commitments that Reclamation would implement as part of the pilot pumping plant alternative can be found in Appendix A - Environmental Commitments List.

Additional features of the RBDD PPP Alternative

A need has been identified to generate greater sweeping flows past the Red Bluff Diversion Dam Pilot Pumping Plant. Changes in the design of the PPP will be incorporated in order to generate these flows past the PPP intake. The changes include repositioning the intake (a 9 degree rotation which moves the upstream end of the intake about 5 feet and the downstream end about 30 feet further into the river).

Additionally, during the construction phase for the PPP, the fish screens for the temporary pumps will be removed prior to cofferdam construction, beginning in mid-March or early April 1994, and will remain out through late summer. It is anticipated that pumping will occur during the gates-up portion of this time period, as necessary, to meet water delivery needs. Screens will be replaced prior to pumping for the TCC canal when gates are raised on September 15, 1994.

Operational and design constraints of the PPP may require additional changes to the operation of the RBDD and the PPP as required by two Biological Opinions issued by the NMFS. For the temporary pumps these constraints include the following:

The fish screens must be removed prior to cofferdam construction because they are located within the cofferdam work area. The screens are large and bulky and would congest the space required for sheet pile placement. The screens must be in that location because the temporary pumps have been constructed there. The screens must have a large surface area to accomodate a slow approach velocity requirement of .33 feet/second and to get the required flow through them.

Reclamation is currently in the process of re-initiating consultation with NMFS to address this required change in the operation of the RBDD.

The implementation of additional measures to achieve increased flows will be initiated following construction of the PPP. Five possible courses of action have been recommended to facilitate greater sweeping flows at the intake of the PPP. A primary option consisting of gate manipulation (selective gate operation) and limited upstream dredging has been identified as the alternative that will be implemented initially. Only if this option fails to provide the necessary sweeping flows would other options be considered. A detailed explanation of all alternatives is provided in Appendix E of the Environmental Assessment.

All channel modifications that require structures in the river or extensive rechannelization will be subject to separate environmental documentation at a later date depending on their scope and nature, as developed and determined to be necessary, to generate adequate sweeping flow past the PPP.

Alternatives considered but eliminated from detailed study:

The alternatives considered but eliminated involved the operation of combinations of at least one or multiple sets of archimedes screw pump(s) with and without a helical pump. These alternatives included the existing pumps (125 cfs) to be operated in conjunction with a combination of the helical and archimedes screw pumps. These alternatives were compared in relation to operational constraints; specifically the number of days that the gates would be open. This information, was evaluated in relation to the number of winter-run chinook salmon that would normally be present with unrestricted passage. These alternatives were not selected because although they met all of the criteria, they were not cost effective.

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ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES CONSIDERED

No Action Alternative

The no action alternative would not address the problem of the declining number of winter-run chinook salmon. According to the California Department of Fish and Game, the estimate for the winter-run chinook salmon for 1992 was expected to be 1,180 adults. This estimate is up from an all time low of 191 returning in the 1991 season. Despite this year's gain, there is concern for future winter-run chinook salmon runs, particularly the progeny produced from the 191 adults.

Pilot Pumping Plant Alternative

The greatest potential impact during construction activities would take place during the installation of the sheet pile. However, after the sheet pile is installed, the resulting hydraulic isolation would prevent any further disturbance of the river.

The borrow area for the free draining material, to be used for building the cofferdam, will be located at a site further downstream. This site was previously used by Reclamation as a borrow area for another project. It is serviced by a permanent road approximately 3/4 mile long. No cultural resources or threatened and endangered species of vegetation or wildlife occur at this site. Approximately 9,000 cubic yards of free draining material will be obtained here. No additional disturbance will occur at this site.

Sheetpile installation is to be completed by the end of April. The addition of rip rap to strengthen both sides of the sheetpiling may occur at this time. With adherence to timely contracting procedures and with favorable weather conditions permitting, installation of the sheetpiling may begin earlier so that meeting the April 30 completion date may be assured.

(Please refer to the Environmental Commitments List, Appendix A, for a detailed discussion of the measures Reclamation has adopted in order to minimize environmental impact during various stages of construction).

This alternative would improve conditions for the winter-run chinook salmon as well as for other salmonid populations. In addition, this alternative would allow continued water deliveries to the water users, such as the irrigation districts and wildlife refuges, and will provide biological design data for a possible permanent pump installation. This alternative allows for greater unimpeded passage for fish by facilitating "gates-up" operation (Table 6).

Also with the PPP alternative, the risk of building a full scale pumping plant that may harm, rather than benefit fish will be avoided.

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Table 6 Summary of Benefits to Salmon From Extended "Gates Up" Operation at RBDD Resulting From the Construction of the PPP (These benefits were calculated using both wet and dry year passage data at RBDD)
From: Vogel, D.A. and K.R. Marine, 1991

% Unimpeded Passage at RBDD **Upstream adults**	Fall	Late Fall	Winter	Spring
No Action Alternative *	10	71	84	7
Pilot Pumping Plant Alternative **	55	100	90	12
% Unimpeded Passage at RBDD **Downstream juveniles**	Fall	Late Fall	Winter	Spring
No Action Alternative *	77	15	60	98
Pilot Pumping Plant Alternative **	89	28	68	98

* For the purposes of this analysis, the no action alternative assumed historical operation of the RBDD and was also based on the assumption that the PPP would be completed by October of 1993.

** For the PPP alternative - the PPP would allow flexibility to meet the present CVP operational requirements and facilitate an additional number of days with gates-up operation. Thus, the normal annual operating period will be from September 15 to May 14, an additional two months, when compared to historical operations.

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Reclamation's proposal to include a biological study, such as the one described earlier, will provide an opportunity for monitoring and evaluation. The inclusion of this proposed study or of any final study will allow for the immediate mitigation of any adverse impacts that may be experienced by the affected species.

Additional impact from the PPP may result as changes are incorporated to achieve greater sweeping flow. These include repositioning the intake (a 9 degree rotation which moves the upstream end of the intake about 5 feet and the downstream end about 30 feet further into the river.)

Additionally, during the construction phase for the PPP, the fish screens for the temporary pumps will be removed prior to cofferdam construction, beginning in mid-March or early April 1994, and will be replaced prior to pumping for the TCC canal when gates are raised on September 15, 1994. It is anticipated that pumping may occur during the gates-up portion of this time period, as necessary, to meet water delivery needs.

The implementation of additional measures to achieve increased sweeping flows at the intake will be initiated following construction of the PPP. Five possible courses of action have been suggested to facilitate greater sweeping flows at the intake of the PPP. A primary option consisting of gate manipulation (selective gate operation) and limited upstream dredging has been identified as the alternative that will be implemented initially. Only if this option fails to provide the necessary sweeping flows would other options be considered. A detailed explanation of all alternatives is provided in Appendix E of the Environmental Assessment.

All channel modifications that require structures in the river or extensive rechannelization will be subject to separate environmental documentation at a later date depending on their scope and nature, as developed and as determined to be necessary, to generate adequate sweeping flow past the PPP.

Both the no action and the proposed alternatives are evaluated for their impact on various resources in Table 7 which follows.

Table 7 - Comparison of Alternatives

Resource/Area of Impact	Proposed Alternative	No Action Alternative *
Fish	Provide protection for fish while facilitating project purpose to continue	No effect on fish
Recreation	Drought conditions & gates up operation may result in change from current year seasonal usage	No change in current seasonal usage
Vegetation & Wildlife	Minimal impact	No change
Hydrology/Water Quality	Short term impacts due to construction	No change
Noise	Short term impacts due to construction	No change
Cultural/ Historical	No significant cultural resources	No significant cultural resources
Social & Economic Considerations	Beneficial effect for water users	No change

* For the no action alternative - the base operation conditions for the Central Valley Project - Operations Criteria and Plan (CVP-OCAP), is the maintenance of the RBDD gates in an uninterrupted raised position from September 15 - May 14.

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AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The following is a discussion of the environmental consequences for the affected resource.

FISH:

Affected Environment

Threatened and Endangered Species

The winter-run chinook salmon is the only listed threatened species of fish that may be affected by this proposal. Effects on this species are discussed in the following paragraphs.

Fish

During the period of construction (April - December 1994) four races of chinook salmon (fall, late fall, winter and spring) could be present adjacent to the construction site either as adults migrating upstream or as outmigrant fry, juveniles or smolts. Additionally, steelhead, lampreys, sturgeon (green and white), shad, minnow, squawfish, catfish, sucker, mosquitofish, stickleback, striped bass, sunfish and bass could also be present. A complete list of these fish species that may be encountered at the construction site is presented in Table 1. The Sacramento sucker and Sacramento squawfish are present in high numbers near the RBDD during certain seasons and the squawfish is a significant predator of juvenile salmon. Predation by the squawfish below RBDD contributes significantly to the mortality of downstream migrating juvenile salmonids.

Environmental Consequences

Operations in 1992 involved gates-down operation from May 1 to November 1. During part of the construction period (April - December 1994) that would occur for the pumping plant alternative, it is anticipated that the gates at RBDD would be closed. As a result, fish passage at RBDD would be impeded during this period due to construction activity. The impediment will be limited to the period when sheetpiling is being installed or removed. Upstream passage of fish, however, is possible via two of three fish ladders (west, center, east).

Additionally, during the construction phase for the PPP, the fish screens for the temporary pumps will be removed prior to cofferdam construction, beginning in mid-March or early April 1994, and will be replaced prior to pumping for the TCC canal when the gates are raised on September 15, 1994. It is anticipated that pumping will occur during the gates-up portion of this time period, as necessary, to meet water delivery needs.

Analysis of migration timing of winter-run chinook salmon (Vogel, 1991) suggests that on the average 69 percent of the adult winter run chinook salmon would have migrated past RBDD by April 1, when construction is anticipated to commence. It is possible therefore that up to 31 percent of the adults may

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migrate past the project site during construction activities. These estimates may change somewhat in any given year, as timing of migration is variable and is dependent on downstream flow, water temperature, and whether it is a wet or dry year. The greatest potential impact during construction would take place during the installation of the sheet pile. However, after the sheet pile is installed, the hydraulic isolation that will result would prevent any further disturbance of the river. Downstream passage will be accomplished by fish passing beneath the gates of RBDD or through the existing screened bypass of the TCC Facility.

Construction of the PPP will facilitate the gates remaining open for two additional months each year compared to historic operations. This will reduce the overall impact on fish passage.

VEGETATION AND WILDLIFE:

Affected Environment

Threatened and Endangered Species

Elderberry shrubs are host to the Valley Elderberry Longhorn Beetle, (VELB), (Desmocerus californicus dimorphus), which is listed as an endangered species. If elderberry exists on the site, they must be protected from physical damage resulting from contractor operations. If contract requirements compel removal of elderberry shrubs, a Section 7 consultation with the FWS will be initiated. The proposed site of the PPP has been previously cleared during construction activity that occurred for the Tehama Colusa Canal Fish Screen Project. One of the corrective actions to which Reclamation was committed was the replacement of elderberry shrubs that were affected. The replanted shrubs however, were not successfully re-established and consequently, elderberry shrubs are not currently present. Reclamation intends to replant replacement elderberry shrubs at an adjacent site.

The Northwestern pond turtle, (Clemmys marmorata marmorata) is a Category 2 candidate for Federal listing and is also a State Species of Concern. It occurs in the area but is not affected by the project. Factors that have contributed to its decline include historical commercial exploitation, alteration of aquatic and adjacent upland habitats, introduction of predators, population fragmentation, and drought (Holland and Bury, 1992).
Also listed as an endangered species is the bald eagle, (Haliaeetus leucocephalus). Other candidate species include the Sacramento splittail, (Pogonichthys macrolepidotus), the green sturgeon (Acipenser medirostris), the California red-legged frog, (Rana aurora draytonii), silky cryptantha, (Cryptantha crinita) and the adobe lily (Fritillaria pluriflora). Due to the location and nature of the project and the absence of suitable habitat at the project site, Reclamation has determined that the construction and operation of the pilot pumping plant will not affect these species.

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Vegetation

The predominant natural plant communities near RBDD are valley grassland and riparian vegetation. Grassland, which prevails in the hilly terrain on either side of the river, is characterized by annual grasses interspersed with oak woodlands. Much of this community has been replaced by agriculture; predominantly in the form of orchards. The riparian vegetation bordering the river includes cottonwoods, willows, alders, sycamores, and an understory of blackberries and other woody shrubs. In the immediate vicinity of RBDD, riparian vegetation is sparse. Much of it has been removed as a result of development and flood control activities along the river.

The actual construction site is steeply sloped (2 to 1) and is vegetated predominantly with grasses, star thistle, wild oats, wild grapes, a few small willows and a black walnut tree. The site is bordered by the Sacramento River to the left and a service road to the right. Near the site a sheet pile structure is present, beginning at the end of the west fish ladder. The southern boundary of the project site is bordered by a water quality monitoring station.

Wildlife

The riparian corridor along the Sacramento River near RBDD supports a variety of wildlife, even though the surrounding area is highly developed for agricultural and urban uses. Existing vegetation and shorelines in the project area provide a suitable environment for blacktailed deer, raccoon, weasel, gray fox, badger, muskrat, jackrabbit, cottontail, tree and ground squirrel, striped and spotted skunk, beaver, and river otter. Many species of waterbirds, waterfowl, raptors, gamebirds, and songbirds frequent the area. These species, many of which are migratory, include the mourning dove, California quail, pheasant, wood duck, great blue heron, great egret, belted kingfisher, golden eagle, band-tailed pigeon, and acorn woodpecker. Previous construction activities at the RBDD have resulted in conditions at the project site where species that may once have been present are no longer evident.

Environmental Consequences

The proposed alternatives would not significantly affect the species discussed in the previous section, including the Northwestern pond turtle. Specifically, the construction and operation of the pilot pumping plant would occur in an area exhibiting minimal habitat values.

While the Northwestern pond turtle occurs in the area, construction of the RBDD PPP should not impact this species because the construction site is too steep and is unsuitable for nesting. This species prefer nesting sites out of the channnel proper and requires a soft soil that allows females to excavate and deposit eggs 6-8 inches deep (Personal conversation 7/10/92, Hartwell Welsh, Redwood Sciences Laboratory). In addition, the Northwestern pond turtle hibernates in upland sites from the fall until about April, thus insulating itself from much of the proposed operational activities.

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Construction of the RBDD PPP would require the removal of several small willows and the black walnut tree. Other vegetation on site, which creates riparian habitat, or serves to control erosion, should be preserved to the extent possible. All land surfaces having vegetative removal should be suitably replanted to prevent subsequent erosion. (Please refer to the Environmental Commitments List, Appendix A, for a more detailed discussion of construction activity).

RECREATION:

Affected Environment

Throughout the Sacramento River basin, recreation and tourism are considered to be very important and growing economic activities. The Sacramento River is nationally recognized for its diverse recreation opportunites. Construction of RBDD has significantly affected the recreation patterns of the local community. For example, RBDD created Lake Red Bluff which created an opportunity for lake oriented recreation and motorized boating in particular. On the other hand, RBDD reduced the opportunity for recreational fishing in the Sacramento River at the lake and further upstream. Visitors and residents use Lake Red Bluff and adjacent lands for fishing, boating, swimming, jet skiing, camping, picnicking, photography, nature viewing, boat racing and sight seeing. The high-use period at the lake begins in early May and extends through the Labor Day weekend.

Federal, State, county, and city governments and private industry have been instrumental in providing recreation facilities and opportunities at the lake. Six public recreation areas have been developed adjacent to the reservoir. These areas, provide a variety of services and account for most of the visitor use.

Environmental Consequences

The proposed alternative would, if implemented, facilitate gates-up operation for an additional two months of the year. However, the period of recreation available with the formation of Lake Red Bluff during gates down operation would last approximately four months and coincide with the high-use period. Current operations would be relatively unchanged and consequently, recreation is expected to be minimally impacted.

The no action alternative would not involve any change in the normal period of operation. The base operation conditions for the Central Valley Project - Operations Criteria and Plan (CVP-OCAP), is the maintenance of the RBDD gates in an uninterrupted raised position from September 15 to May 14.

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HYDROLOGY AND WATER QUALITY:

Affected Environment

The water quality of the Sacramento River at RBDD varies throughout the year. Average water temperature in the river near the dam is 50 degrees Fahrenheit in winter and 58.5 degrees Fahrenheit in the summer. The water is suitable for most domestic and industrial uses and is classified as class 1 for irrigation use. Quality is somewhat poor during heavy runoff because of an increase in suspended sediment.

None of the characteristics of Sacramento River water at RBDD, except water temperature, violates State water quality standards or objectives. Water temperatures immediately above the dam during summer and fall are high and are considered the most important water quality factor controlling survival, development and growth of fish eggs and juvenile fish. Since 1987, water temperatures above the dam have been controlled to the extent possible by releasing colder water from Shasta Reservoir during summer and fall, when cooler temperatures are required for growth and survival of the winter-run fry.

Although there is an accumulation of sediment in the river at RBDD, particularly during high flows, it does not cause water quality problems. The sediment load of the river is contributed by tributary inflow, bank erosion, and development along the river.

Environmental Consequences

The proposed alternative would result in a temporary and minor degradation of the water quality in the immediate vicinity of the pilot pumping plant during construction. After operation of the PPP begins, however, the two additional months of gates-up operation may result in cooler water for that period as the warming effect of the reservoir is eliminated.

During construction, Reclamation guidelines would be followed to minimize the effects of lower water quality that may result in the Sacramento River. All construction work would be performed by methods that would prevent accidental spillage or entrance of solid matter or other pollutants or wastes into the water. Additionally, all precautions would be taken to comply with Federal and State standards regarding turbidity that could result in the river. There should be no net effect on water quality following construction of the pilot pumping plant. These precautions would also apply to activity in the river during removal of the cofferdam.

Although the greatest potential impact during construction will take place during the installation of the sheet pile, the hydraulic isolation that will result after its installation will prevent any further disturbance of the river. In addition, the Contractor would be required to comply with applicable Federal, State, and local laws, orders, regulations, and water quality standards concerning the control and abatement of water pollutants.

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Additionally, the Contractor's construction activities would be performed by methods that would prevent entrance or accidental spillage of solid matter, contaminants, debris, or other pollutants into streams, whether flowing or dry watercourses. Precautions shall be taken to prevent excavated material from being washed away by high water or storm runoff.

The Contractors's methods of dewatering, unwatering, excavating or stockpiling of earth and rock materials will include appropriate measures to control siltation. Wastewater from general construction activities, such as drainwater collection, drilling, grouting, or other construction operations, would not be permitted to enter watercourses without the use of approved turbidity control methods. These methods may include, but are not restricted to: interception ditches, settling ponds, gravel-filter entrapment dikes, flocculating processes, recirculation, or combinations thereof.

The no action alternative would not result in a marked change in the water quality given normal operating procedures. The only changes that may occur would be the result of the drought.

NOISE:

Affected Environment

RBDD lies in the unincorporated area of Tehama County, and a local noise ordinance is nonexistent. Currently, Caltrans is constructing a bridge upstream from the dam site in a residential area. Construction is allowed as close as 150 feet from the nearest residence. Therefore, the proposed construction of the pilot pumping plant is not subject to any restrictions.

Environmental Consequences

For the proposed alternative, all construction activity would take place on Bureau of Reclamation property. Construction activity to install the pilot pumping plant, would occur approximately two and one-half miles from the nearest residence and approximately one mile from a hospital. Construction activity would be too far away to affect them.

The no action alternative would not result in any construction activity, and noise will not be a problem, other than what may occur during normal operations at the dam.

CULTURAL AND HISTORICAL:

Affected Environment

The vicinity of the Sacramento River is an important cultural resource. It was the area of the most concentrated populations in Western North America of aboriginal peoples, who used the resources of the river for food and shelter. Later peoples - Spanish, Mexicans, Europeans - who settled the area, used the river for transportation and for a water supply to develop farms, cities, and industries.

In the reach of the river between Anderson and Red Bluff, there are 60 recorded archeological sites. Most are near the city of Red Bluff. One is listed in the California Historical Plan. California Historical Landmarks in the immediate vicinity of Red Bluff are Mrs. John Brown's House, and the Ide Adobe, which is also listed on the National Register.

The RBDD PPP will be located in an area completely altered by the construction of the TCC. Prior surveys, and subsequent studies made in the area of potential effect, found no evidence of cultural resources.

Environmental Consequences

Both the proposed alternative and the No Action Alternative would not affect any known cultural resource sites in the area. In addition, there are no other existing facilities eligible for historic recognition.

If any cultural resources are encountered during construction, all work in the area of the find would be halted until it is evaluated by the Regional Archeologist or his designated representative, and the State Historic Preservation Officer has been consulted (36 CFR 800.11).

SOCIAL AND ECONOMIC CONSIDERATIONS:

Affected Environment

Historically, the county's economy has been based on the development and use of two of its natural resources - abundant forests and grazing lands with fertile soils. As more people settled in the county, manufacturing of forest and agricultural products became increasingly important.

Also providing employment in the more urbanized areas, particularly in the city of Red Bluff, are wholesale and retail trades, services, and public administration. In recent years, recreation and tourism have become important sources of new jobs throughout the county.

Although the population of Tehama County (estimated at 49,735 for 1990) is expected to increase in the future, growth rates are expected to decline. Most people live in communities along the major highways in the central part of the county. The greater Red Bluff area will remain the population center of the county, and development of land along the river at Red Bluff for recreational and residential purposes will continue.

Since RBDD was constructed, residential areas and some commercial enterprises have been developed along the shoreline of Lake Red Bluff. It is likely that many of these residential and commercial developments would have occurred with or without the lake, as river-front properties are very valuable because of the esthetics. One existng problem is the appearance of bare zones that occur as water levels recede. This is caused by both seasonal changes in water flow and by the operation of the dam.

Electrical power for the PPP will be supplied from existing Central Valley Project (CVP) resources. The new pilot project pumping loads will necessitate incremental power generation for Federal CVP power customers. We estimate this impact to be negligible.

Environmental Consequences

The proposed alternative, would have a beneficial effect for those water users along the TCC receiving water deliveries during the eight months of gates-up operation. The combination of both the helical and Archimedes screw pumps in coordinated operation with the existing pumps would help ensure adequate delivery of water.

For the no action alternative, gates-up operation would take place during November 1 through April 30, with existing pumps in operation. Water deliveries would remain unchanged from current operations at RBDD.

For both the pilot pumping plant alternative and the no action alternative, the receding water levels would continue to cause unattractive bare zones around the lake. However, as discussed above, many of these residential and commercial developments would have occurred with or without the Lake. For both alternatives, the Red Bluff-Tehama County Chamber of Commerce Boat Drag Races would not be affected, because gates would be down during the Memorial Day weekend, thereby ensuring the formation of the lake.

For the proposed alternative, there may be a small risk of potential impact on environmental quality due to incremental fossil fuel power generation. The impacts associated with this risk are assumed to be negligible.

C-089595

GROWTH INDUCING IMPACTS:

The PPP is not intended to increase the amount of water diverted, but rather to change the mechanism by which it is diverted, from gravity to pumped water, thereby permitting extended gates-up operation of the dam. Existing water delivery and existing authorized CVP delivery will be maintained during eight month of the year. No new development is proposed. Therefore, project implementation would not have any significant growth-inducing impacts. Construction activities associated with the project may temporarily generate a small number of jobs. The project is not expected to increase the possibility of land use changes downstream of the RBDD.

UNAVOIDABLE ADVERSE EFFECTS:

No significant unavoidable adverse impacts would occur with the construction and operation of the RBDD pilot pumping plant. During cofferdam construction, fish screens for the temporary pumps will be removed. Some pumping will occur during gates-up operation, around April - May, 1994.

RELATIONSHIP OF SHORT TERM USES AND LONG TERM PRODUCTIVITY:

Construction activities would be short-term. Less than five acres would be temporarily utilized for construction, with approximately two acres of land to be permanently covered by project facilities.

The proposed pilot pumping plant may provide for the long-term pumping needs of water users affected by the RBDD. Depending on the outcome of the evaluation and other planning decisions (such as the RBDD Appraisal Study), the project might enter a second phase in which it would be used as a long-term, non-experimental facility. As an added benefit, it may increase the survival rate of all runs of chinook salmon with gates-up operation which would occur eight months of the year.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES:

See discussion above. Project implementation would involve the irreversible commitment of manpower, energy, and materials necessary to complete construction.

CONSULTATION AND COORDINATION:

Scoping Process

Interagency design sessions were held at various locations including the Sacramento and Red Bluff offices of the Bureau of Reclamation. Participants included representatives from Reclamation, FWS, CDFG and NMFS.

The first Draft EA was issued to local, State and Federal agencies and concerned publics in November, 1992. The second draft EA which incorporated all of the proposed modifications necessary, was issued to local, State and Federal agencies and concerned publics in June, 1993.

Endangered Species Act Consultation

Consultation has occurred with the FWS and the NMFS, pursuant to Section 7 of the Endangered Species Act. Reclamation requested a listing from the FWS and NMFS of endangered and threatened species that might be affected by the construction and operation of the pilot pumping plant. The FWS provided a list of listed, proposed and candidate species on August 3, 1992.

Reclamation has prepared a biological assessment of the project area. Based on the assessment and analyses in this EA, Reclamation has determined that the construction and operation of the pilot pumping plant would not affect any of the species identified by the FWS if outlined mitigation measures are undertaken. Reclamation is seeking concurrence on this determination.

The biological assessment was also provided to NMFS to initiate consultation on the winter-run. A non-jeopardy opinion was issued on February 2, 1993. A re-initiaition of consultation is currently in progress to include the proposed changes (i.e. channel modification).

Reclamation will survey the staging area and provide survey results to FWS and continue coordination pursuant to the Endangered Species Act as required.

Fish and Wildlife Coordination Act

The FWS provided comments to Reclamation on the proposed project through a planning aid memorandum on September 4, 1992 reviewing the Draft EA. The FWS indicated that the EA adequately describes the wildlife and sensitive plant resources that would be affected by the proposed action.

FWS also provided a draft Fish and Wildlife Coordination Act (FWCA) Report on July 16, 1993. This draft report states the FWS's support of the Red Bluff PPP Program and includes nine recommendations relative to the construction and operation of the PPP. Due to the accelerated schedule for this project, FWS will finalize the Coordination Act Report after the comment period ends for the draft FWCA Report on August 16, 1993. Discussions with FWS have indicated that the recommendations in the draft FWCA Report will not change sustantially when the report is finalized.

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The recommendations provided by FWS for the most part are minor project modifications that are already incorporated into the project, or monitoring studies that Reclamation has planned to implement. Reclamation intends to comply with, or incorporate all of the recommendations in the Draft FWCA Report.

U.S. Army Corps of Engineers - Section 404 Nationwide Permit (Dredge and Fill Permit)

Reclamation is currently in the process of consulting with the U.S. Army Corps of Engineers on the need for a Clean Water Act, Section 404, dredge and fill permit.

California Department of Fish and Game - Section 1601 Lake and Streambed Alteration Agreement

Reclamation is currently in the process of applying for this agreement.

State Regional Water Quality Control Board - Water Quality Certification (Section 401, Clean Water Act)

Reclamation has obtained this certification.

National Historic Preservation Act

Based on field examinations and in-house record searches, including the National Register of Historic Places and recent updated records, there is no evidence of cultural resources immediately downstream of the project site. Reclamation is continuing consultation with the California State Historic Preservation Officer (SHPO). Reclamation has requested concurrence from the SHPO that no impact to cultural resources are expected to occur under the proposed action.

Farmland Protection Act

No prime or unique farmlands will be affected by the proposed action.

C-089598

BIBLIOGRAPHY

Holland, D.C. and R.B. Bury. 1992. Status of the western pond turtle (Clemmys marmorata) in 1991. In Presentation at the Western Section of the Wildlife Society Annual Meeting 1992. San Diego, CA.

Liston, Charles R. and Perry L. Johnson. April 1992 Design Criteria and Environmental Setting for a Pilot Pumping Installation at Red Bluff Diversion Dam on the Sacramento River, California

United States Department of the Interior, Bureau of Reclamation, Mid-Pacific Region, Sacramento, California. February, 1992. Appraisal Report, Red Bluff Diversion Dam Fish Passage Study

Medlicott, George B. May, 1992. Design Data Report

State Historic Preservation Officer. 1988. Letter of No Effect, Fish Screen/Bypass System/Water Intake Tehama-Colusa Canal.

Treganza, A.E., Edwards, R. L. and T.F. King. 1965. Archeological Survey and Excavations along the Tehama-Colusa Canal, Central California. Report on a joint acheological project carried out under terms of a contract (No. 14 - 10-0434-1414) between the Frederic Burk Foundation for Education and the U.S. National Park Service, Western Region.

Vogel, D. A. and K. R. Marine. 1991. Guide to Upper Sacramento River Chinook Salmon Life History. Rep. Prepared for Bureau of Reclamation, Central Valley Project, by: CH2M Hill, Redding, California. 55 pp+ Appendix

West, G. James. May, 1992. Design Data Report - Cultural Resources Portion.

West, G. James. 1988. Testing of deposits for Teh-233 (Lindauer Site): an archeological site recorded on the Tehama-Colusa Canal right-of-way.

Welsh, Hartwell. July 10, 1992. Conversation with Serge Birk.

APPENDIX A

ENVIRONMENTAL COMMITMENT LIST

C-089600

ENVIRONMENTAL COMMITMENT LIST

The following is a summary list of environmental commitments that Reclamation would implement as part of the proposed alternative to lessen the effects on the environment. Additionally, Reclamation is committed to working with the participating agencies to correct to the extent practicable any design and/or operational sources of salmon mortality found during the evaluation studies.

1. Construction will begin in April, which would have the least impact on the winter-run in the Sacramento River adjacent to the proposed construction site.

The borrow area for the free draining material to be used for building the coffer dam, will be located at a site further downstream. This site was previously used by Reclamation as a borrow area for another project. It is serviced by a permanent road approximately 3/4 mile long. No endangered species of vegetation or wildlife occur at this site. Approximately 12,000 cubic yards of free draining material will be obtained here. No additional disturbance will occur at this site.

Sheetpiling installation is scheduled to be completed by end of April. The addition of rip rap to strengthen both sides of the sheetpiling may occur at this time. With adherence to timely contracting procedures and with favorable weather conditions permitting, installation of the sheetpiling may begin earlier so that the April 30 completion date may be assured.

During some phases of construction, work may take place at night, which will require lighting portions of the river at the construction site. This may affect fish in the vicinity by increasing the predation factor, especially of juveniles. Reclamation intends to minimize the need and the frequency of such lighting during construction.

2. Topsoil at the embankment area will be stockpiled, prior to excavation, for use in revegetation at the site. Embankment hauling will be limited to a maximum number of trucks at a frequency to be determined, in order to minimize highway traffic impacts.

3. All roads will be maintained during construction and repaired, as necessary, following completion of construction. Temporary roads should be scarified after restoring their cross section to their original grades. Surface drainage should be installed, where necessary, to avoid hydraulic rutting and soil removal during precipitation and runoff. No vegetation should be required where the restored slopes are less than 5%.

4. Reclamation will notify local authorities prior to any major construction activity.

5. Truck travel within the construction area will be restricted to speed limits as regulated locally. To minimize disturbance, construction and staging areas will be marked so as to confine equipment to those areas. Adequate erosion controls must also be implemented.

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6. Access to the construction site will be restricted and controlled. Public access to the haul roads may also be restricted, if warranted from a safety standpoint.

7. Traffic control will be utilized where necessary. Likely areas include the entrance to the Reclamation facilities at the intersection of Altube Avenue and Road 99W.

8. Reclamation will require the Contractor to obtain encroachment permits from Caltrans for any required traffic control operations. Reclamation will coordinate with Tehama County for use of any road(s) for hauling. Reclamation will notify the California Highway Patrol prior to initiation of hauling.

9. Dust abatement measures will be required and implemented, including watering dirt roads, exposed areas, and soil piles, and covering soil piles in staging areas if piles in staging areas will be worked in the short-term.

10. The contractor will be required to comply with applicable Occupational Safety and Health Administration guidelines. All construction equipment will be required to use properly maintained, factory equipped sound suppression equipment such as mufflers.

11. Although the greatest potential impact during construction will take place during the installation of the sheet pile, the hydraulic isolation that will result after its installation will prevent any further disturbance of the river. In addition, the Contractor would be required to comply with applicable Federal, State, and local laws, orders, regulations, and water quality standards concerning the control and abatement of water pollutants.

Additionally, the Contractor's construction activities would be performed by methods that would prevent entrance or accidental spillage of solid matter, contaminants, debris, or other pollutants into streams, whether flowing or dry watercourses. Precautions shall be taken to prevent excavated material from being washed away by high water or storm runoff.

The Contractor's methods of dewatering, unwatering, excavating or stockpiling of earth and rock materials would include appropriate measures to control siltation. Wastewater from general construction activities, such as drainwater collection, drilling, grouting, or other construction operations, would not be permitted to enter watercourses without the use of approved turbidity control methods. These methods may include, but are not restricted to: interception ditches, settling ponds, gravel-filter entrapment dikes, flocculating processes, recirculation, or combinations thereof.

12. If oak trees of any species are found on the project site, they will be protected if at all possible. If removal is unavoidable, Tehama County will be contacted. Any restrictions they may have on oak tree removal, will be incorporated into the specifications.

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13. Other vegetation on site, which creates riparian habitat, or serves to control erosion, will be preserved to the extent possible. All land surfaces having vegetative removal will be suitably replanted to prevent subsequent erosion.

14. If any suspected cultural resources are encountered during construction, all work in the area of the find will be halted until it is evaluated by the Regional archeologist or his designated representative, and the State Historic preservation officer has been consulted (36 CFR 800.11).

15. Additionally, during the construction phase for the PPP, the fish screens for the temporary pumps will be removed prior to cofferdam construction, beginning in mid-March or early April 1994, and will remain out through late summer. They will be replaced prior to pumping for the TCC canal, scheduled to resume on September 15, 1994. It is anticipated that pumping may occur during the gates-up portion of this time period, as necessary, to meet water delivery needs.

16. Biological evaluation studies as listed in Appendix F will be implemented.

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APPENDIX B

RESPONSES TO COMMENT LETTERS RECEIVED ON THE DRAFT ENVIRONMENTAL ASSESSMENT

First Public Comment Period: November 6, 1992 - November 27, 1992

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Comment Letters and Response

First Public Comment Period: November 6, 1992 - November 27, 1992