

State of California
The Resources Agency
Department of Water Resources
Office of State Water Project Planning

PROPOSED MITIGATED NEGATIVE DECLARATION AND INITIAL STUDY

Temporary Barriers Project 2001-2007

November 2000

GRAY DAVIS
Governor
State of California

MARY D. NICHOLS
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State of California
The Resources Agency
Department of Water Resources
Office of State Water Project Planning

PROPOSED MITIGATED NEGATIVE DECLARATION FOR TEMPORARY BARRIERS PROJECT 2000-2007

The Project

The Temporary Barriers Project consists of a proposal to seasonally install up to three rock flow control structures and one rock fish control structure in south Delta channels at various times during a seven-year period (2001-2007), or until permanent flow control structures are constructed.

The key purpose of the project is to protect San Joaquin salmon migrating through the Delta and provide an adequate agricultural water supply in terms of quantity, quality, and channel water levels to meet the reasonable and beneficial needs of water users in the South Delta Water Agency.

The Finding

The project will have a less than significant impact on the environment.

Basis for the Finding

Based on the Initial Study included herein, it was determined that there would not be any significant project impacts, nor would this project have any adverse environmental effects.

This document reflects the independent judgement of the Department of Water Resources. This Proposed Mitigated Negative Declaration is filed pursuant to Section 15073 of the Guidelines for Implementation of CEQA. Copies of this Proposed Mitigated Negative Declaration and Initial Study, as well as documents referenced therein are available for review by calling Mark A. Holderman, DWR program manager, at (916) 653-7429.

Katherine Kelly, Chief
Office of State Water Project Planning

Date_____

CHAPTER 1 – BACKGROUND OF PROJECT

The Temporary Barriers Project

The South Delta Temporary Barriers Project, initiated as a test project in 1991 and extended for five years in 1996, was partially in response to a lawsuit filed by the South Delta Water Agency. The project consists of four rock barriers across South Delta channels. In various combinations, these barriers improve south Delta water levels, water circulation, and conditions for San Joaquin River salmon migration. Of the four rock barriers, the HOR barrier serves as a fish barrier¹ and has been in place most years since 1963 between September 15 and November 30. It was also installed in the spring between April 15 and May 30 of 1992, 1994, 1996, 1997, and 2000 (high San Joaquin River flows prohibited installation in 1993, 1995, 1998 and 1999). The remaining three barriers serve as agricultural barriers² and are installed between April 15 and September 30 of each season. The Old River near Tracy barrier (ORT) has been installed since 1991 and the Middle River barrier (MR) has been installed since 1987. A rock barrier in Grant Line Canal (GLC) was first installed in spring 1996. It has since been installed in 1997, 1999, and 2000. The four rock barriers were not installed in 1998 due to high San Joaquin River flows.

Water levels and water circulation in the South Delta have improved with agricultural barrier installation. Migration conditions for San Joaquin River salmon have improved when the HOR barrier was installed. It is essential to continue barrier installations to protect San Joaquin River salmon migrating through the Delta, and to provide an adequate agricultural water supply for south Delta farmers. An adequate agricultural water supply must satisfy quantity, quality, and channel water levels to meet the reasonable and beneficial needs of water users in the South Delta Water Agency.

In addition to improving the water levels within the south Delta, several programs and agreements have been executed since the South Delta Temporary Barriers Project was first implemented. These programs and agreements call for the continuation of the construction and operation of rock barriers. They include:

1. The Central Valley Project Improvement Act, federal legislation enacted in October 1992, calls for the construction and operation of the barrier at the HOR to benefit salmon but to be operated in a manner that does not significantly impair the ability of local entities to divert water. In order to mitigate the impacts caused by the HOR barrier, the ORT and MR barriers have been installed and operated at the same time when the HOR barrier was in place.
2. On December 15, 1994, State and federal agencies and representatives of urban, agricultural, and environmental water interests signed the Principles for Agreement on Bay-Delta Standards between the State of California and the Federal Government. This Agreement calls for installation of a barrier at the HOR during April and May as a measure to achieve a doubling production of chinook salmon.
3. In May 1995, the State Water Resources Control Board adopted its Water Quality Control Plan for the San Francisco Bay/ Sacramento-San Joaquin Delta Estuary. The WQCP also calls for

¹ This barrier is referred to as a “fish barrier” because it is intended to primarily benefit migrating San Joaquin River chinook salmon.

² These barriers are referred to as “agricultural barriers” because they are intended to primarily benefit agricultural water users in the south Delta.

installation of the barrier at the head of Old River in the fall to help meet the dissolved oxygen objectives in the San Joaquin River near Stockton, which will be beneficial to migrating San Joaquin River salmon.

4. In D-1641, the State Water Resources Control Board's decision for the first seven phases of the Bay-Delta Water Rights Hearings, the Board required DWR and the USBR achieve certain water quality objectives in the south Delta. D-1641 recognizes that the barrier program may provide substantial benefits in meeting the south Delta water quality objectives.
5. The CALFED Stage I south Delta actions identified under the conveyance component of the program calls for the installation of operable barriers to ensure water of adequate quantity and quality to agricultural diverters within the south Delta. CALFED is recommending the annual installation of the temporary barriers until these permanent facilities can be built.

The continuation of the Temporary Barriers Project will comply with these agreements, laws, and programs, by providing interim protection for both south Delta agricultural water supply and San Joaquin River salmon, until permanent facilities can be completed. Construction of permanent facilities, or their functional equivalents, are expected to be complete by the end of 2007.

The South Delta Region

The South Delta study area comprises the lands and channels of the Sacramento-San Joaquin Delta southwest of Stockton (Figure 1). Included in this study area are the South Delta Water Agency, as defined in the Formation Act, California Statutes of 1973 and important features of the State Water Project and Central Valley Project. This area faces complex water rights, water supply, water quality, and environmental issues.

The area within the SDWA boundaries includes about 150,000 acres. Approximately 120,000 acres are used for irrigated agriculture and the remaining area consists of waterways, berms, channel islands, levees, and residential or industrial property. About 450,000 acre-feet of water is diverted from the South Delta channels each year to irrigate the fully developed, highly productive agricultural lands.

Major channels and waterways in the South Delta study area include: San Joaquin River, Old River, Middle River, Woodward Canal, North Victoria Canal, Victoria Canal, North Canal, Grant Line Canal, Italian Slough, Indian Slough, Tom Paine Slough, and Paradise Cut. The SWP export facilities are Clifton Court Forebay, John E. Skinner Delta Fish Protective Facility, the intake channel, Harvey O. Banks Delta Pumping Plant, and parts of the Governor Edmund G. Brown California Aqueduct. The CVP export facilities, operated by USBR, consist of the Tracy Fish Collecting Facility, the intake channel, the Tracy Pumping Plant, and the Delta-Mendota Canal.

Local Agricultural Diversions Improvements Needed

Water for lands within the SDWA boundaries is supplied almost exclusively from Delta channels. Water conditions in the area are influenced in varying degrees by: natural tidal fluctuations; San Joaquin River flow and quality; local agricultural drainage water; CVP, SWP, and local diversions; and channel capacity. These factors affect water levels, water quality, and water availability at some local diversion points. Local agricultural drainage water—aggravated by poor circulation—has affected channel water quality, particularly in shallow, stagnant, or dead-end channels. Channels that are too shallow and narrow restrict flow and the volumes of water available for diversion. The problems associated with

diverting water from south Delta channels have prompted a series of actions and agreements that began during the 1976-77 drought. The first of these actions was installing the temporary rock barrier in Old River to improve water conditions in the South Delta. Additional actions and agreements include a lawsuit filed by SDWA, modifications to Tom Paine Slough, a Joint Powers Agreement, and a Framework Agreement. These are discussed in following sections.

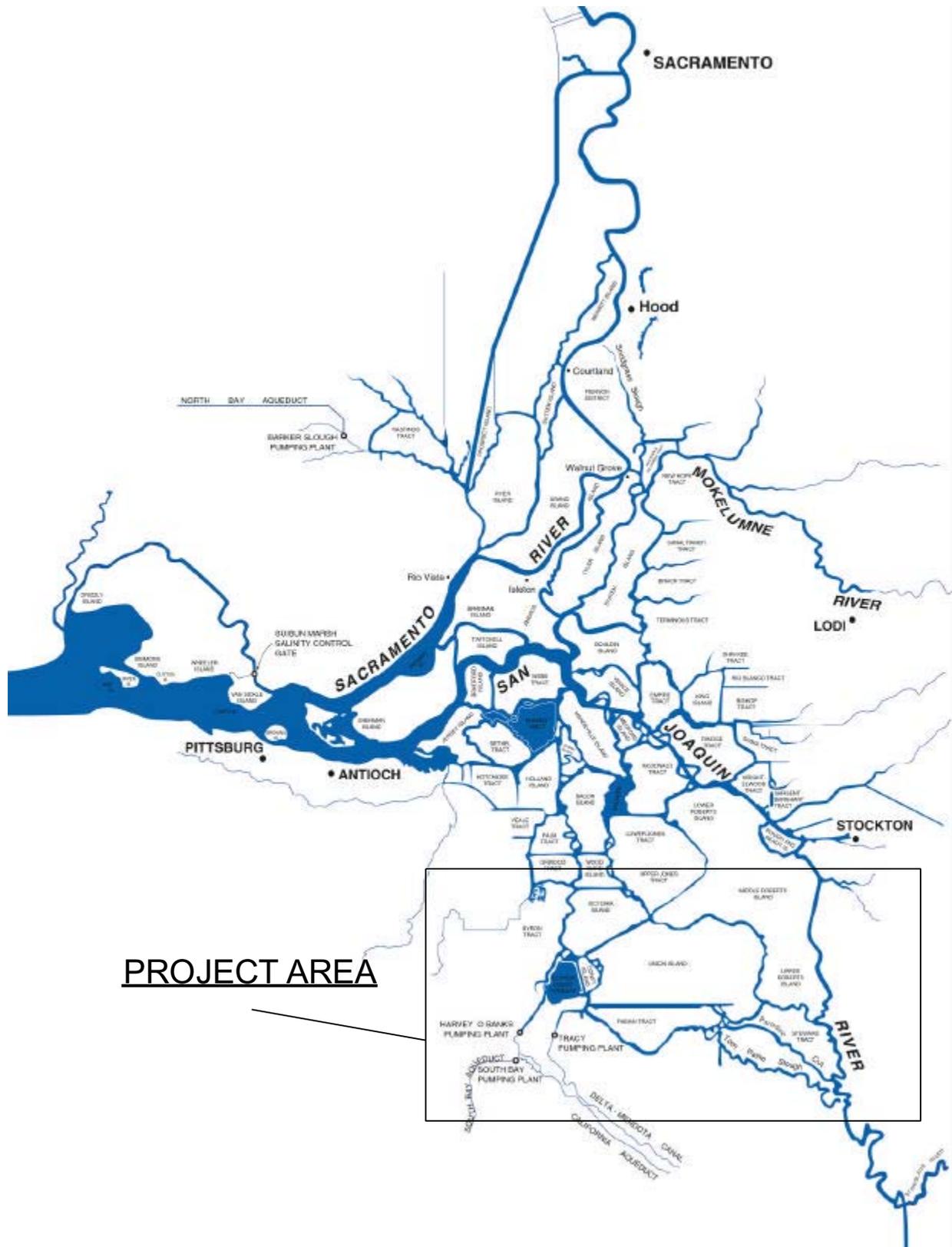


Figure 1. Project Area in the South Delta Region

South Delta Water Agency Lawsuit

The SDWA is a public agency formed for two main reasons: (1) to enter into contracts with the United States and the State of California to protect the water supply of lands within the agency's boundaries from salinity intrusion and (2) to assure a dependable supply of water to meet needs of water users within the SDWA. In July 1982, SDWA filed a lawsuit over the effects of SWP and CVP operations on the South Delta. The suit sought a declaration of the rights of the parties; a preliminary injunction; and a permanent injunction requiring that the projects be operated to protect the South Delta. The three main allegations found in the complaint by SDWA are:

1. CVP operations on the San Joaquin River, primarily Friant Dam, unlawfully reduce the quantity and quality of waters flowing from the San Joaquin River to the south Delta;
2. Operations of SWP and CVP pumps violate SDWA rights by lowering water levels, reversing flows, and diminishing the influence of the tides; and
3. The Secretary of the Interior's designation of the Stanislaus River basin for water allocation from New Melones Reservoir violates SDWA rights by not including the South Delta in the basin.

DWR's involvement in the suit is related to the effects of SWP pumps in the South Delta, while the other issues involve the USBR.

Tom Paine Slough Modifications

In May 1984, SDWA complained of low water levels in Tom Paine Slough. DWR responded by installing three stage-recorders on Tom Paine Slough; one below the tidal control structure, one above the structure, and another near the southern end of the slough.

In March 1985, SDWA again complained about insufficient water in Tom Paine Slough to meet irrigation needs. DWR made soundings along the slough and found high spots in the channel bottom both above and below the tidal control structure. DWR also found the gates functioning improperly, which DWR fixed. DWR also removed a small amount of sediment from around the control structure. However, in July 1985, SDWA claimed that water levels in Tom Paine Slough and southern Middle River were so low that adequate irrigation was impossible and crops were being lost. Emergency efforts concentrated on Tom Paine Slough where three portable pumps were installed to augment the water supply. Also, Clifton Court Forebay gate operation was modified to improve water levels in nearby channels.

In September 1985, DWR signed a letter of intent with SDWA describing conditions and responsibilities of these agencies to develop a permanent solution for the water level and water circulation concerns in South Delta channels affecting SDWA.

Joint Powers Agreement

In June 1986, DWR signed a joint powers agreement with SDWA regarding interim mitigation in SDWA channels. This agreement provided for dredging Tom Paine Slough (completed in October 1986), constructing siphons in Tom Paine Slough (completed in June 1989), and developing intake gate

operation criteria for Clifton Court Forebay which eliminates diversions during the low-low tide. All appropriate permits and certification required under regulatory and legislative acts were acquired.

Framework Agreement

In October 1986, DWR, USBR and SDWA entered into an agreement (South Delta Agreement) to provide a framework to settle SDWA's lawsuit (DWR, 1986). All three parties agreed to develop mutually acceptable, long-term solutions to the water supply concerns of water users within SDWA. To facilitate negotiations, the parties agreed to a stay of all actions in the litigation.

Draft Settlement Agreement

DWR, USBR and SDWA agreed to a draft settlement to the 1982 lawsuit by SDWA against DWR and USBR. SDWA held an election on September 17, 1991, in which the agreement was approved by 97 percent of the voters in SDWA service area. The draft agreement (DWR, 1990) focuses on short-term and long-term actions to resolve the water supply problems in the South Delta. It provides for interim releases by USBR from New Melones Reservoir to resolve the portion of the litigation relating to San Joaquin River flows, and provides the framework for USBR and SDWA to negotiate an amendment to the agreement. It also includes provisions for construction of temporary barrier facilities to test their effectiveness in meeting certain water quantity, quality, and levels in channels for water users located along portions of Old River, Middle River, and Grant Line Canal. Although the USBR has not obtained legislative approval to implement the agreement, DWR has opted to comply with the provisions of the agreement pertaining to the temporary barriers in an effort to minimize impacts to SDWA and a continuation of the lawsuit.

CALFED

Seeking solutions to the resource problems in the Bay-Delta, state and federal agencies signed a "Framework Agreement" in June 1994. The impetus to forge this joint effort came at the state level in December 1992 with the formation of the State Water Policy Council and the Bay-Delta Oversight Council, an advisory group to the State Water Policy Council. In September 1993, the Federal Ecosystem Directorate was created to coordinate federal resource protection and management decisions for the Bay-Delta. The Framework Agreement laid the foundation for the Bay-Delta Accord and CALFED. The Accord, also called the Principles for Agreement on Bay-Delta Standards between the State of California and the Federal Government, detailed interim measures for both environmental protection and regulatory stability in the Bay-Delta.

CALFED oversees the coordination and increased communication between Federal agencies, state agencies, and stakeholders in three areas outlined in the Framework Agreement:

1. Substantive and procedural aspects of water quality standard setting.
2. Improved coordination of water supply operations with endangered species protection and water quality standard compliance.
3. Development of a long-term solution to fish and wildlife, water supply reliability, flood control, and water quality problems in the Bay-Delta.

The CALFED Program (Program) is charged with responsibility for the third issue identified in the Framework Agreement. The Programmatic EIS/EIR evaluated this long-term program.

The Program completed a Final Programmatic Environmental Impact Statement/Environmental Impact Report (Programmatic EIS/EIR) in July 2000 and a Federal Record of Decision (ROD) and State Certification (CERT) in August 2000. Approval of the ROD/CERT of the Programmatic EIS/EIR provides the general direction for long-term implementation of the Program.

The mission of the Program is to develop and implement a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system. To practicably achieve this mission, the Program will concurrently and comprehensively address problems of the Bay-Delta system within each of four resource categories: ecosystem quality, water quality, water supply reliability, and levee system integrity. Important physical, ecological, and socioeconomic links exist between the problems and possible solutions in each of these categories. Accordingly, a solution to problems in one resource category cannot be pursued without addressing problems in the other resource categories. The Program includes a range of balanced actions that can be taken to move forward on a comprehensive, multi-agency approach to managing Bay-Delta resources. A comprehensive Program solution will also be supported by governance and finance mechanisms that overcome problem-specific or resource-specific limitations of previous, more narrowly focused, approaches.

Staged Implementation

The Program's strategic approach for implementation includes staged implementation and staged decision making. The Preferred Program Alternative is composed of hundreds of individual actions that will be implemented and refined over time. Stage 1 comprises the first seven years of implementation. The Stage 1 actions place an emphasis on Ecosystem Restoration, Water Use Efficiency/Recycling, Environmental Water Quality, Drinking Water Quality, Storage, Conveyance, Levees, Water Transfers, Watershed Management and the CALFED Science Program.

Conveyance

As noted above, CALFED has already identified the broad actions that are needed to restore ecological health and improve water management for beneficial uses of the Bay-Delta system. The program included Delta conveyance among several components. The goal for Delta conveyance has specifically identified the need to improve the pumping capabilities of SWP export facilities to:

- Restore water project reliability and operational flexibility that have been eroded by recent protective fishery measures;
- Allow the Environmental Water Account to transfer and store water;
- Allow a reliable water transfers market to function;
- Allow SWP facilities to convey large amounts of water for urban use; and
- Provide greater capability for SWP facilities to be used to improve the reliability of CVP supplies for both its water users and wildlife refuges.

These actions also depend on subsequent project-specific environmental analyses as well as on subsequent review of financial and legislative proposals by State and Federal executive branches, Congress, and the State Legislature.

South Delta Actions

The CALFED Framework for Action includes actions related to providing for more reliable long-term export capability by the SWP and CVP, and protecting local diversions in the Delta. One specific action is to increase SWP pumping from the current limit between March 15 and December 15 of 6,680 cubic

feet per second (cfs) to 8,500 cfs. Full use of this increased pumping capability will require continued implementation of temporary barriers for the following reasons:

- CALFED has linked increased pumping to mitigation of pumping impacts to south Delta water users
- SWRCB Decision 1641 permits additional SWP and CVP joint points of diversion under a staged implementation dependent in part on the use of barriers.

As one of the projects being implemented to achieve overall CALFED goals, the Temporary Barriers Project is considered a second-tier CALFED project. As such, all environmental documentation must be based upon, and tier from the CALFED Final Programmatic EIS/EIR. The CALFED Record of Decision, page 48, specifically states, “In the interim, prior to installation of permanent operable barriers, DWR will apply for and obtain permits to allow the continued operation of the temporary barriers.” However, this Initial Study was initiated prior to the CALFED Record of Decision, can be considered a stand-alone document, and does not rely on the CALFED EIS/EIR for impact analyses or mitigation.

CHAPTER 2 – PROJECT PURPOSE AND NEED

Project Purpose

The principal purpose of continuing the Temporary Barriers Project is:

To protect San Joaquin salmon migrating through the Delta and provide an adequate agricultural water supply in terms of quantity, quality, and channel water levels to meet the reasonable and beneficial needs of water users in SDWA

Continued installation of the barriers will allow DWR to perform further monitoring, if required, to determine potential hydraulic effects on south Delta channels, and biological effects on vegetation and fisheries within the south Delta. The information gathered will be used to assist the development of long-term solutions to SDWA's problems according to provisions of the draft south Delta settlement agreement, applicable CALFED programs, and environmental laws. Using temporary barriers will also allow DWR to improve barrier designs and review alternative timing operations for the permanent barriers.

Need for the Barriers

Agricultural barriers

Agriculture, the principal economic activity in the south Delta, depends upon reliable diversions of water from Delta channels to farmlands. This need can only be met by acceptable water quality and adequate water levels.

Water circulation and levels in the south Delta are influenced by a variety of factors, including:

- natural tidal fluctuation;
- San Joaquin River inflow;
- local diversions;
- local agricultural return flows;
- channel capacity resulting in restricted circulation;
- fluctuations in barometric pressure;
- local wind direction and velocity; and
- water exports, primarily from the federal CVP and SWP.

When the CVP, SWP, and local farmers divert water, flows in local channels, many which are shallow and dead-end, can converge, creating “null zones.” A null zone is a reach of a channel where flow is essentially stagnant, due to poor water circulation patterns. Agricultural drainage is also returned to these same stagnant channels, from which water will again be diverted for local irrigation. This cycle of diversion from and drainage and to channels with poor circulation results in continuous degradation of water quality, especially in terms of salinity. Loss of seedlings due to high salinity of applied water (salt toxicity) is a serious concern for local farmers.

Some of the conditions that lead to poor water circulation are also related to problems with water levels in south Delta channels. Shallow and narrow channels restrict the flow and volume of water supply for local agricultural diversions, which can be aggravated by SWP and CVP export pumping, especially at low tides.

For SDWA, installing and operating the agricultural barriers is necessary because they provide relief from the farmers' operational problems caused by these low water levels and poor circulation. These problems include inadequate pump draft caused by low water levels and a decrease in crop yield caused by poor water quality due to poor circulation in the river channels. Low water levels at agricultural intakes cause pump cavitation, which increases pumping costs, deteriorates intake pumps, and lowers pumping reliability. Growers allege that inadequate pump draft results in reduction of crop yields. For example, seedlings can be lost when inadequate pump draft occurs at a critical growth stage.

More than two-thirds of the lands in the South Delta are irrigated from Middle River, Old River, Grant Line Canal, and the sloughs that derive their water from those channels. Analysis of data collected for the monitoring programs and Delta modeling studies show that the Old River near Tracy, Grant Line Canal, and Middle River barriers improve water levels, quality, and circulation upstream of the barriers. The barriers will not completely resolve the water quality problems in the San Joaquin River downstream of the head of Old River, but the HOR barrier alone or the three agricultural barriers together will help improve flows down the San Joaquin River and consequently relieve some of the dissolved oxygen problems in the San Joaquin River near Stockton.

Head of Old River Fish Barrier

The HOR barrier is installed twice each year, once in the spring and again in the fall. For most years since 1963, the fall barrier has been in place between September 15 and November 30. The barrier's purpose is to improve dissolved oxygen levels in the San Joaquin River between the HOR and Medford Island to aid adult salmon migration in the San Joaquin River.

Beginning in 1992, Fish and Game requested that DWR install a spring barrier facility at the HOR. The barrier was designed to reduce the loss of outmigrating San Joaquin fall-run chinook salmon smolts by significantly decreasing their diversions down Old River, consequently reducing their entrainment at the SWP and CVP pumps. Although San Joaquin fall-run chinook salmon is not listed as threatened or endangered, population levels have dropped significantly in past years.

CHAPTER 3 – PROJECT DESCRIPTION

The Temporary Barriers Project is a proposal to install up to three rock flow control structures and one rock fish control structure in south Delta channels at various times during a seven-year period (2001-2007), or until permanent flow control structures are constructed.

Three of the rock barriers—Old River near Tracy, Middle River, and Grant Line Canal—are tidal barriers that are designed to improve water levels and circulation for local South Delta farmers. The fourth barrier—the Head of Old River (HOR) barrier—is designed to improve migration conditions in the South Delta for salmon migrating in the San Joaquin River during the spring and fall.

The water level in the southern Delta waterways is reduced when the HOR barrier is in place. This is because the barrier restricts flows from the San Joaquin River into Old River. To mitigate for the restricted flows and reduced water levels downstream of the HOR barrier, the Middle River and Old River near Tracy barriers have been installed when the HOR barrier is in place. This project proposes that the Grant Line Canal (culverts tied open) also be installed when the HOR barrier is installed. The proposal to install the spring HOR barrier and the consequent agricultural impacts and need to mitigate for the HOR barrier were acknowledged in the Central Valley Project Improvement Act (CVPIA).

The spring HOR is normally installed from April 15 to May 15. The fall HOR barrier is installed between September 1 and November 30, when requested by DFG. DWR received a 1601 Streambed Alteration Agreement from Department of Fish and Game for the spring and fall HOR barrier installation. This agreement expires in 2005.

Each tidal barrier will help control water levels upstream so that agricultural pumps will have enough pump draft to operate efficiently during each tidal cycle. The channel section upstream of the barriers will fill with water when the tide is moving into the south Delta and the barrier will keep the water in the channel to increase the opportunities for agricultural pumping. Water quantities are not increased for the South Delta farmers, only the availability of adequate pump draft and pumping efficiency is improved.

The barriers will alter water circulation patterns. When all four barriers are in operation, incoming tide will be impounded between the upstream channels of the three agricultural barriers and the HOR barrier. Under this configuration, flap gates on Grant Line Canal barrier will be tied open to allow downstream flow and improve circulation. During times when the three agricultural barriers are operating alone, net tidal flow will tend to move upstream in all three channels, out Old River at Head, and down the San Joaquin River.

Barrier Locations

This project consists of the installation and removal of temporary rock barriers at the following locations:

- Old River near Tracy: in Old River about 0.5 mile east of the Delta-Mendota intake;
- Middle River near Victoria Canal: in Middle River about 0.5 mile south of the confluence of Middle River, Trapper Slough, and North Canal;

- Old River near San Joaquin River: in Old River within 0.1 mile west of the San Joaquin River confluence, and
- Grant Line Canal near Tracy Road Boulevard Bridge: in Grant Line Canal, 420 feet east of the bridge.

Figure 2 indicates the locations of the barriers in the south Delta.

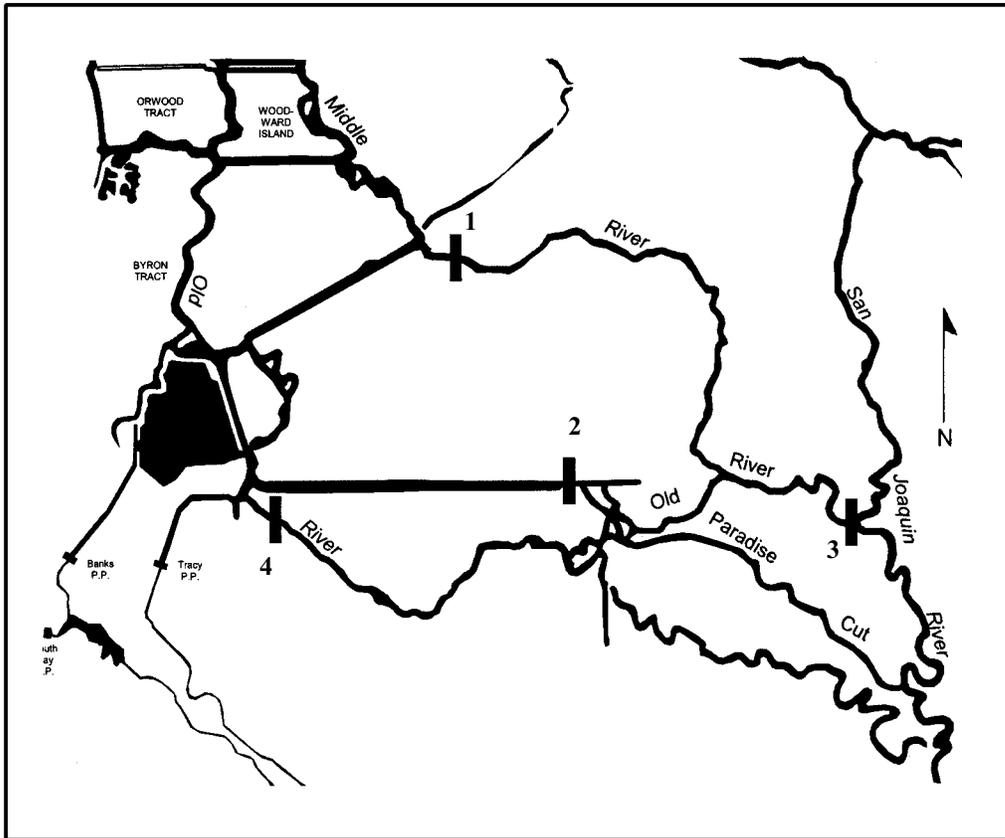


Figure 2. Location of Temporary Barriers in South Delta

- 1 = Middle River barrier
- 2 = Grant Line Canal barrier
- 3 = Head of Old River barrier
- 4 = Old River at Tracy barrier.

The following Table 1 shows the past installation and removal dates of the barriers under the previous test program.

Year	Middle River				Old River near Tracy (DMC)				Spring Head of Old River			
	Installation		Removal		Installation		Removal		Installation		Removal	
	Started	Completed	Started	Completed	Started	Completed	Started	Completed	Started	Completed	Started	Completed
1987		15-May	End of Sep	End of Sep								
1988	26-May	28-May	23-Sep	23-Sep								
1989		12-Apr	26-Sep	26-Sep								
1990		16-Apr	29-Sep	29-Sep								
1991	4-Apr	5-Apr	27-Sep	27-Sep	14-Aug	30-Aug	28-Sep	Oct-13 (I)				
1992	8-Apr	10-Apr	28-Sep	29-Sep	April-15 boat port on	May-01 May-09 boat port on	30-Sep	Oct-09(ii)	Apr-15 boat port on	April-23 @ 4ft April-26 @ 6ft May-01	Jun-02	Jun-08
1993	14-Jun	17-Jun	23-Sep	24-Sep	12-May	1-Jun	27-Sep	6-Oct				
1994					April-22 boat port on All culverts bed open (5/18 - 6/1)	April-24 May-01			April-21 boat port on	April-23 @ 10ft May-01		
1994	23-Apr	25-Apr	29-Sep	5-Oct			26-Sep	10-Oct			18-May	20-May
1995	8-Aug	11-Aug	10-Oct	10-Oct	3-Aug	8-Aug	27-Sep	6-Oct	(vii)			
1996	18-May	20-May	29-Sep	29-Sep	12-May	10-Jun (iii)	29-Sep	16-Oct	6-May	11-May	16-May	Sep-03 (iv)
1997	3-Apr	7-Apr	27-Sep	28-Sep	8-Apr	17-Apr	30-Sep	7-Oct	9-Apr	16-Apr	15-May	19-May
1998	(vii)				(vii)				(vii)			
1999	15-May	18-May	29-Sep	2-Oct	15-May	28-May	28-Sep	8-Oct	(vii)			
2000	4/4/2000	4/6/2000	10/1/2000	10/7/2000	4/4/2000	4/6/2000	10/1/2000	10/7/2000	5-Apr	16-Apr	19-May	2-Jun

Year	Fall Head of Old River (v)				Grant Line Canal			
	Installation		Removal		Installation		Removal	
	Started	Completed	Started	Completed	Started	Completed	Started	Completed
1987	9-Sep	11-Sep		28-Nov				
1988	22-Sep	28-Sep		2-Dec				
1989	27-Sep	28-Sep	27-Nov	30-Nov				
1990	10-Sep	11-Sep		27-Nov				
1991	9-Sep	13-Sep	22-Nov	27-Nov				
1992	8-Sep	11-Sep	30-Nov	4-Dec				
1993	8-Nov (vii)	11-Nov	3-Dec	7-Dec				
1994	6-Sep	8-Sep	28-Nov	30-Nov				
1995	(vii)							
1996	30-Sep	3-Oct	18-Nov	22-Nov	17-Jun	10-Jul	2-Oct	15-Oct
1997					21-May	4-Jun	26-Sep	15-Oct
1998	(vii)				(vii)			
1999	(viii)				15-May	3-Jun	23-Sep	5-Oct
2000	9/27/2000	10/7/2000			19-May	1-Jun	10/1/2000	10/7/2000

- (I) Barrier notched o Sept. 28, 1991. Construction resumed on Oct. 10 and finished on Oct. 13.
- (ii) Barrier notched on Sept. 30, 1992. Construction resumed on Oct. 2 and finished on Oct. 9.
- (iii) Construction was delayed on 5/17 and resumed on 6/5 due to high flows.
- (iv) Barrier was breached on 5/ 16 on an emergency basis, but complete removal wasn't done until 9/3, after Corps demanded permit compliance of complete removal.
- (v) Barrier was installed in previous years.
- (vi) Installation delayed due to high flows.
- (vii) Not installed due to high San Joaquin River flows.
- (viii) Not installed upon DFG's request.

Table 1. Historic Temporary Barriers Project Installation and Removal

Monitoring Plan

An integral part of the Temporary Barriers Project is the monitoring program. The monitoring program has been historically carried out in conjunction with the installation of the barriers. Monitoring has been completed for water quality, water circulation, water level, and biological data. In addition to the Temporary Barriers Project Monitoring Program, a six-year investigation of Middle River impacts was conducted.

Existing monitoring has been unable to show any significant adverse impacts to fish or wildlife due to barrier installation. Continued monitoring will be implemented for those elements that warrant additional studies. A revised monitoring plan (discussed in Chapter 11) will be conducted during the next seven years of project implementation.

Physical Descriptions

Head of Old River Barrier

This barrier is at the confluence of Old River and the San Joaquin River. It is installed annually during the spring, and again in the fall. In the spring, the barrier will be installed by April 15 and will be removed by May 15. The fall barrier has been in place most years since 1963, between September 15 and November 30.

The purpose of the spring barrier is designed to reduce the loss of out-migrating San Joaquin fall run salmon smolts by significantly decreasing the number of smolts that are diverted down Old River and thereby reducing entrainment at the State and federal pumps. The fall barrier is designed to improve dissolved oxygen levels in the San Joaquin River between the HOR and Medford Island in order to aid in-migrating adult salmon in the San Joaquin River.

The spring barrier will be a rock barrier with six 48-inch operable culverts and a 75-foot notch at an elevation of 6 feet MSL. It is approximately 225 feet long, 85 feet wide at the base of the barrier, has a crest elevation of 10 feet MSL, and is composed of approximately 12,500 tons of rock. See Figure 3 and Appendix A.

The fall barrier is similar in design except that the fall barrier is smaller in size. It will be constructed with six 48-inch operable culverts and a 20-foot notch at an elevation of 0 feet MSL. It is approximately 225 feet long, 55 feet wide at the base of the barrier, has a crest elevation of 4 feet MSL, and is composed of approximately 7,500 tons of rock. See Figure 3 and Appendix A.

In the past, all barrier components were removed from the channel when the barrier was removed. For the next seven years' installation, DWR proposes to leave the culverts in place at the southern abutment throughout the year. This will improve the safety during emergency breaching and reduce the construction time and cost.

Old River near Tracy

The Old River near Tracy (ORT) barrier has been installed since 1991. This barrier is near the Tracy Pumping Plant, in Old River approximately 0.5 miles east of Delta-Mendota Canal. The barrier is approximately 2,500 cubic yards of rock and sand, 250 feet long, and 60 feet wide. It has nine 48-inch culverts, each 56 feet long, with flapgates. See Figure 4 and Appendix A. The invert of the pipe is installed to minus 6.0 feet (MSL). The structure allows tidal flows to enter the channel upstream of the barrier and be retained as the tide ebbs. This will allow agricultural pumps to operate throughout each tidal cycle.

The ORT barrier will be constructed with boat portage facilities that consist of two boat launching ramps and an operated vehicle that can tow a universal boat trailer. The boat launching ramps are constructed along the north bank of Old River, allowing boater access and portage on each side of the barrier. The ramps are constructed as a floating dock system and surfaced with concrete matting.

When barrier operations have concluded all rock is removed and stockpiled for future use. The installation of this facility in the channel does not compromise the integrity of the levees or impede flood flows.

Middle River Barrier

The Middle River (MR) barrier has been installed since 1987. The MR rock barrier is constructed with a removable center section. It consists of approximately 2,300 cubic yards of rock and sand placed across Middle River. The rock barrier will be a rock barrier with six 48-inch culverts and a 140-foot notch at an elevation of one foot MSL. It is approximately 270 feet long and 50 wide at the base. The ends of the barrier near the abutments each contain three 48-inch pipes with flapgates. The barrier abutments continue to remain in place throughout the year. The tide gates are tied open when the center section is removed. The existing boat portage facility at this site is a gravel ramp, which can be used to carry or drag a small boat across the barrier. See Figure 5 and Appendix A.

Grant Line Canal Barrier

The Grant Line Canal (GLC) barrier has been installed since 1996. The barrier construction consists of approximately 12,600 tons of rock, and has a 140-foot wide notch. See Figure 6 and Appendix A. The notch has the flexibility to be operated at minus 1, 0, or plus 1 foot MSL, as needed to maintain adequate water circulation. It is approximately 300 feet long and 50 feet wide at the base. The elevation of the barrier abutments will be 2 feet MSL. The barrier also includes six 48-inch diameter culverts with flapgates on the upstream end of the culverts to permit tidal flow to enter the channel upstream and be retained as the tide ebbs. The flapgates can be tied open if required, or when the HOR barrier is concurrently operating. The culverts will be installed under the abutment on the south side of the canal, allowing the abutment to remain in place throughout the year. A boat portage facility, similar to the one at the Tracy barrier, will be provided on the north side of the canal.



Figure 3. Head of Old River Barrier (Spring)



Figure 4. Old River at Tracy Barrier



Figure 4. Middle River Barrier (water overtopping weir)



Figure 5. Grant Line Canal Barrier (water overtopping weir)

Barrier Operations Schedule

Existing Operation Schedule

Middle River Barrier. This barrier shall not be fully closed or operated until after April 15. If HORB is installed and then removed prior to May 31, the Middle River barrier gates shall be secured in an open position until June 1. The barrier shall be breached by October 1 and completely removed by October 15.

Old River at Tracy Barrier. This barrier shall not be fully closed or operated until after April 15. If HORB is removed prior to May 31, the operation of Old River near Tracy barrier shall be discontinued and the gates secured in an open position until no salmon smolt is captured by DFG trawling at Mossdale for five consecutive sampling days. If no salmon smolt has been captured by DFG trawling at Mossdale for five consecutive sampling days prior to removal of the head of Old River barrier, the gates at the Old River near Tracy barrier may remain in continuous operation. In any case, operation of the Old River near Tracy barrier could resume on June 1. The barrier shall be breached by October 1 and completely removed by October 15.

Head of Old River Barrier. This barrier shall not be fully closed or operated until after April 15 and shall not be operated simultaneously with the Grant Line Canal Barrier. The barrier shall be completely removed by June 1. Initiation of installation and operation of HORB in the fall is at the discretion of the DFG. The fall barrier historically has been operated from mid September through the end of November in most years. A Memorandum of Understanding between DWR and SDWA was signed in 1999 to facilitate coordination of the HORB culvert operations.

Grant Line Canal Barrier. This barrier shall not be fully closed or operated until after May 31. However, if HORB is removed prior to May 31, operation of the Grant Line Canal Barrier may occur earlier, provided that no salmon smolt is captured by DFG trawling at Mossdale for five consecutive sampling days. The barrier shall be removed by October 1, in a manner consistent with the terms of the DFG §1601 Agreement. This agreement states that the barrier must be removed by October 1, however, the section containing the culverts adjacent to the south levee may remain in the channel.

Grant Line Canal as a Hydraulic Barrier. In the event that HORB cannot be installed due to flows in the San Joaquin River in excess of 7,500 cfs, the Grant Line Canal Barrier may be installed in conjunction with the Middle River and Old River near Tracy barriers to create a hydraulic barrier. Under this scenario, the barrier shall not be fully closed or operated until after April 15 and installation is under the discretion of the Corps and USFWS, which will receive at least two weeks advance notice of the anticipated installation by DWR.

Proposed Operation Schedule

Figure 8 shows the proposed operations schedule for the Temporary Barriers Project. The schedule differs from that implemented over the past years as shown in Table 2.

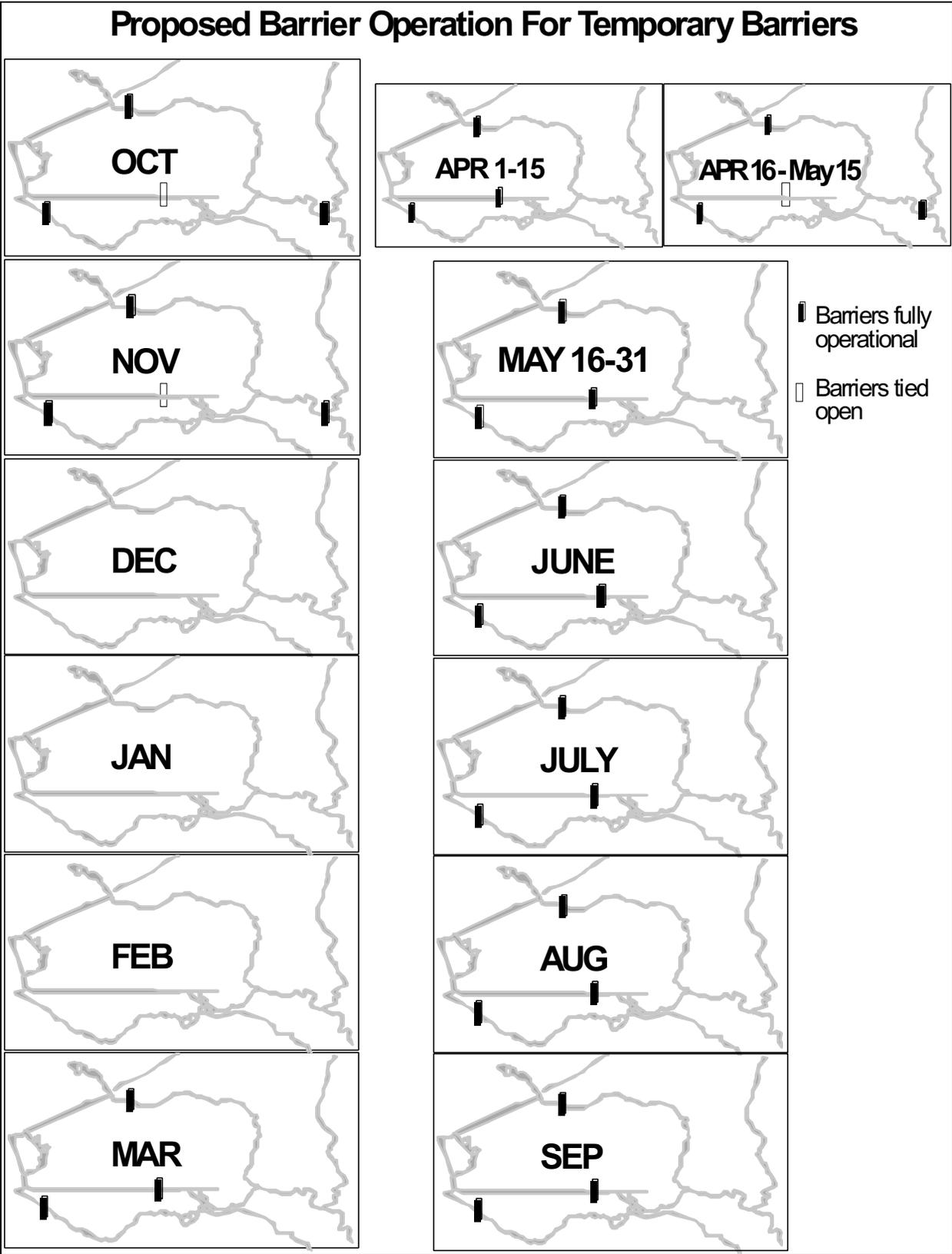


Figure 6. Proposed Barrier Operation for Temporary Barriers

Month	Proposed Operation	Old Operation
March	Three agricultural barriers	No barriers
April	Three agricultural barriers from April 1—April 30, however the Grant Line Canal barrier culverts are tied open during April 15—April 30 when the HOR barrier is installed. HOR barrier installed from April 15—30.	No barriers from April 1—14. Old River at Tracy, Middle River, and HOR barriers installed from April 15—30.
May	Three agricultural barriers from May 1—May 31, however the Grant Line Canal barrier culverts are tied open during May 1—May 15 when the HOR barrier is installed. HOR barrier installed from May 1—15	Old River at Tracy, Middle River, and HOR barriers installed from May 1—15. Old River at Tracy and Middle River barriers tied open when HOR removed from May 16—31.
October	Three agricultural barriers from October 1—October 31, however the Grant Line Canal barrier culverts are tied open during October when the HOR barrier is installed. HOR barrier normally installed from October 1—31 if requested by DFG.	No agricultural barriers operate in October. HOR barrier normally installed from October 1—31 if requested by DFG
November	Same as October	Same as October

Table 2. Proposed Changes to Historic Temporary Barriers Operations Schedule

Proposed Changes to Historic Temporary Barriers Operations

The hydrodynamic changes shown in the following tables were extracted from the modeling studies done for this project. The modeling is discussed and detailed tables are provided in Appendix B.

March

Description. In March all three agricultural barriers would be installed. These barriers would not be installed during years of above normal spring flows if DWR forecasts indicate it would be unsafe to install them. However, these barriers are less vulnerable to high flows than the HOR barrier, and their flapgates can be secured open to accommodate high flow events.

Justification. March has historically been one of the worst months for the south Delta water users relative to water levels and salinity, particularly during dry water years. Proposed SWP exports to a maximum of 8,500 cfs year-round (part of the CALFED Phase I actions), would allow the SWP to increase exports in March over historical amounts. Consequently, water levels in the south Delta would be reduced over historical levels. This would occur during times when south Delta farmers are beginning to pre-irrigate their fields in preparation for planting. Operating the three agricultural barriers in March would help reduce this impact.

A significant portion of the outmigration of salmon smolts occurs at times other than when the 30 days the HOR barrier is operating (April 15—May 15). Use of the three agricultural barriers before and after the spring HOR barrier is operating will provide a hydraulic barrier effect that keeps more San Joaquin River water flowing in the main channel instead of being diverted down Old River. This would help more outmigrating salmon smolts avoid being diverted down Old River towards the pumps.

Impacts to Fish. While the installation of the three agricultural barriers in March would provide benefits to some outmigrating salmon smolts on the San Joaquin River, by creating a hydraulic barrier and keeping more flow in the San Joaquin River, those salmon smolts that do migrate down Old River may suffer impeded migrations by the presence of the three barriers. Impeding salmon smolt migration though the south Delta may expose the smolts to greater risk of diversion through local agricultural diversions, and increase their exposure to predators. However, this impact on salmon smolts in the south Delta could be offset by the benefit of keeping more of the San Joaquin River flow in the main channel past the Head of Old River.

The installation of three agricultural barriers in March would result in increased flows and higher velocities in the channels through which central Delta fishes of concern (delta smelt, splittail, and winter-run Chinook salmon smolts) could be carried toward the SWP pumps. Specifically, more of the San Joaquin River flows would be directed down Turner and Columbia Cuts and through the central Delta because of the effect of the hydraulic barrier created by the three agricultural barriers. Data is lacking concerning the correlation of net current flows and velocities in central Delta channels to the number of fishes of concern drawn into SWP pumps, consequently the impact of a March installation of the three agricultural barriers is unknown. However, the increased net current velocity indicates an increased potential for greater numbers of central Delta fishes to be drawn to the SWP pumps, particularly as a March installation extends the period when barrier operation coincides with migration through the central Delta of the fishes of concern (RMI, 1995). Table 3 shows the effects on flows and velocities in these channels and on Old River near Clifton Court (Hwy 4)

Mitigation. Proposed mitigation for the possible impacts on fishes of concern are discussed in Chapter 9, Conservation Strategies, and the ASIP.

Channel		Net Water Movement Toward SWP Pumps*			
		(1) No Project	(2) Three Ag Barriers	(3) Difference	(4) Percent Increase (Decrease)
Turner Cut	Net flow (cfs)	-642	-848	-206	32%
	Net Velocity (fps)	-0.07	-0.09	-0.02	29%
Columbia Cut	Net flow (cfs)	-523	-905	-382	73%
	Net Velocity (fps)	-0.03	-0.07	-0.04	133%
Old River at Hwy 4	Net flow (cfs)	-1226	-1836	-610	50%
	Net Velocity (fps)	-0.18	-0.28	-0.10	56%

(1) No barriers are in place

(2) Ag barriers are at Old River near Tracy, Middle River, and Grant Line Canal

(3) Column (2) minus column (1)

(4) Column (3) divided by column (1)

* Represents monthly average over 1976-1991 hydrology. Net flows and velocities are used to represent the great variability in flows and velocities in a channel over a 25-hour semidiurnal tidal cycle. Negative numbers represent “reverse flows,” indicating the net flow or velocity is opposite the normal downstream flow in a channel.

Table 3. Comparison of March Central Delta Inflows Toward the SWP With and Without Three Agricultural Barriers in Place

April 1—15

Description. In April 1—15 all three agricultural barriers would continue to operate. If necessary, their flapgates can be secured open to accommodate high flow events.

Justification. Historically, the HOR barrier was being installed during this time in order to be complete and operable by April 15. A more complex HOR barrier with operable culverts and a removable clay center section has been installed since 2000 and has required over 10 days to install. During this time, the flows from the head of Old River to the south Delta area are gradually reduced as the HOR installation progresses. These reduced flows into the south Delta begin to adversely impact water levels and water circulation. Similarly to March, the proposed SWP exports to a maximum of 8,500 cfs year-round (part of the CALFED Phase I actions), would allow the SWP to increase exports in the first half of April over historical amounts. Consequently, water levels in the south Delta would be reduced over April historical levels as well. This would occur during times when south Delta farmers are continuing to pre-irrigate their fields in preparation for planting. Operating the three agricultural barriers in early April would help reduce this impact.

A significant portion of the outmigration of salmon smolts occurs at times other than when the 30 days the HOR barrier is operating (April 15—May 15). Use of the three agricultural barriers before and after the spring HOR barrier is operating will provide a hydraulic barrier effect that keeps more San Joaquin River water flowing in the main channel instead of being diverted down Old River. This would help more outmigrating salmon smolts avoid being diverted down Old River towards the pumps.

Impacts to Fish. While the operation of the three agricultural barriers in early April would provide benefits to some outmigrating salmon smolts on the San Joaquin River, by creating a hydraulic barrier and keeping more flow in the San Joaquin River, those salmon smolts that do migrate down Old River may suffer impeded migrations by the presence of the three barriers. Impeding salmon smolts migration though the south Delta may expose the smolts to greater risk of diversion through local agricultural diversions, and increase their exposure to predators. However, this impact on salmon smolts in the south Delta could be offset by the benefit of keeping more of the San Joaquin River flow in the main channel past the Head of Old River.

The operation of three agricultural barriers in early April would result in increased flows and higher velocities in the channels through which central Delta fishes of concern (delta smelt, splittail, and winter-run chinook salmon smolts) could be carried toward the SWP pumps. Specifically, more of the San Joaquin River flows would be directed down Turner and Columbia Cuts and through the central Delta because of the effect of the hydraulic barrier created by the three agricultural barriers. Data is lacking concerning the correlation of net current flows and velocities in central Delta channels to the number of fishes of concern drawn into SWP pumps, consequently the impact of an early April operation of the three agricultural barriers is unknown. However, the increased net current velocity indicates an increased

potential for greater numbers of central Delta fishes to be drawn to the SWP pumps, particularly as a April 1—15 installation extends the period when barrier operation coincides with migration through the central Delta of the fishes of concern. Table 4 shows the effects on flows and velocities in these channels and on Old River near Clifton Court (Hwy 4)

Mitigation. Proposed mitigation for the possible impacts on fishes of concern are discussed in Chapter 9, Conservation Strategies, and the ASIP.

Channel		Net Water Movement Toward SWP Pumps*			
		(1) No Project	(2) Three Ag Barriers	(3) Difference	(4) Percent Increase (Decrease)
Turner Cut	Net flow (cfs)	-473	-669	-196	41%
	Net Velocity (fps)	-0.05	-0.07	-0.02	40%
Columbia Cut	Net flow (cfs)	-120	-498	-378	315%
	Net Velocity (fps)	0.01	-0.03	-0.04	400%
Old River at Hwy 4	Net flow (cfs)	-713	-1285	-572	80%
	Net Velocity (fps)	-0.08	-0.18	-0.10	125%

(1) No barriers are in place

(2) Ag barriers are at Old River near Tracy, Middle River, and Grant Line Canal

(3) Column (2) minus column (1)

(4) Column (3) divided by column (1)

* Represents averages over 1976-1991 hydrology. Net flows and velocities are used to represent the great variability in flows and velocities in a channel over a 25-hour semidiurnal tidal cycle. Negative numbers represent “reverse flows,” indicating the net flow or velocity is opposite the normal downstream flow in a channel.

Table 4. Comparison of April 1—15 Central Delta Inflows Toward the SWP With and Without Three Agricultural Barriers in Place

April 16—May 15

Description. During April 15—May 15 all three agricultural barriers would be installed. However, because the HOR barrier is installed and operating during this time, the Grant Line Canal barrier culverts would be tied open to allow better water circulation and fish movement.

Justification. The HOR barrier, with culverts closed, blocks San Joaquin River flows from entering Old River and flowing into the south Delta. This reduces water levels and adversely impacts agricultural diversions. Historically, the Old River at Tracy and the Middle River barriers were installed and operated during this time to mitigate for the impacts of the HOR barrier. The proposed project with the Grant Line Canal barrier included would help ensure water levels were maintained at adequate levels to support agricultural diversions, in the channels upstream of the Grant Line Canal barrier. Without the Grant Line Canal barrier, more culverts at the HOR barrier would have to be opened and for longer times to maintain adequate downstream water levels. During the 2000 HOR barrier operation, DWR was

required to have culverts opened at the HOR barrier for the entire time the barrier was in place. The open culverts had a detrimental impact on outmigrating San Joaquin salmon smolts that were diverted through the culverts and down Old River. With the Grant Line Canal barrier in place, low water levels in the south Delta would occur less frequently. Consequently, the HOR barrier culverts would have to be opened less frequently as well.

Impacts to Fish. The proposed operation of the Grant Line Canal barrier during this period when historically only the Old River and Middle River agricultural barriers, and the HOR barrier were operating would not change the impact on central Delta fishes of concern. The HOR barrier already directs most of the San Joaquin River flows down the San Joaquin River main channel instead of flowing down Old River. The operation of the Grant Line Canal barrier does not increase this flow, so reverse flows at Turner and Columbia Cuts would not change over historical levels.

Table 5 shows the effects on flows and velocities in these channels and on Old River near Clifton Court (Hwy 4). These effects would be similar to those experienced under the historic barriers operations schedule.

Mitigation. Proposed mitigation for the possible impacts on fishes of concern are discussed in Chapter 9, Conservation Strategies, and the ASIP.

Channel		Net Water Movement Toward SWP Pumps*			
		(1) No Project	(2) Three Ag Barriers and HORB	(3) Difference	(4) Percent Increase (Decrease)
Turner Cut	Net flow (cfs)	-473	-1138	-665	141%
	Net Velocity (fps)	-0.05	-0.13	-0.08	160%
Columbia Cut	Net flow (cfs)	-120	-1275	-1155	963%
	Net Velocity (fps)	0.01	-0.10	-0.11	-1100%
Old River at Hwy 4	Net flow (cfs)	-712	-2661	-1949	274%
	Net Velocity (fps)	-0.08	-0.39	-0.31	388%

(1) No barriers are in place

(2) Ag barriers are at Old River near Tracy, Middle River, and Grant Line Canal

(3) Column (2) minus column (1)

(4) Column (3) divided by column (1)

* Represents averages over 1976-1991 hydrology. Net flows and velocities are used to represent the great variability in flows and velocities in a channel over a 25-hour semidiurnal tidal cycle. Negative numbers represent “reverse flows,” indicating the net flow or velocity is opposite the normal downstream flow in a channel.

Table 5. Comparison of April 16—May 15 Central Delta Inflows Toward the SWP With and Without Three Agricultural Barriers in Place and the HOR Barrier

May 16—31

Description. In May 16—31 all three agricultural barriers would continue to operate. If necessary, their flapgates can be secured open to accommodate high flow events.

Justification. Late May has historically been a time of concern for SDWA irrigators, as the SWP and CVP projects begin ramping up exports after the May 15 removal of the HOR barrier. Also, proposed SWP exports to a maximum of 8,500 cfs year-round (part of the CALFED Phase I actions), would allow the SWP to increase exports in late May over historical amounts, exacerbating this ramping up effect on water levels. Consequently, water levels in the south Delta would be reduced over historical levels. This would occur during times when south Delta farmers are well into the irrigation season. Operating the three agricultural barriers in late May would help reduce this impact.

A significant portion of the outmigration of salmon smolts occurs at times other than when the 30 days the HOR barrier is operating (April 15—May 15). Use of the three agricultural barriers before and after the spring HOR barrier is operating will provide a hydraulic barrier effect that keeps more San Joaquin River water flowing in the main channel instead of being diverted down Old River. This would help more outmigrating salmon smolts avoid being diverted down Old River towards the pumps.

Impacts to Fish. While the operation of the three agricultural barriers in late May would provide benefits to some outmigrating salmon smolts on the San Joaquin River, by creating a hydraulic barrier and keeping more flow in the San Joaquin River, those salmon smolts that do migrate down Old River may suffer impeded migrations by the presence of the three barriers. Impeding salmon smolts migration though the south Delta may expose the smolts to greater risk of diversion through local agricultural diversions, and increase their exposure to predators. However, this impact on salmon smolts in the south Delta could be offset by the benefit of keeping more of the San Joaquin River flow in the main channel past the Head of Old River.

The operation of three agricultural barriers in late May would result in increased flows and higher velocities in the channels through which central Delta fishes of concern (delta smelt, splittail, and winter-run chinook salmon smolts) could be carried toward the SWP pumps. Specifically, more of the San Joaquin River flows would be directed down Turner and Columbia Cuts and through the central Delta because of the effect of the hydraulic barrier created by the three agricultural barriers. Data is lacking concerning the correlation of net current flows and velocities in central Delta channels to the number of fishes of concern drawn into SWP pumps, consequently the impact of a late May operation of the three agricultural barriers is unknown. However, the increased net current velocity indicates an increased potential for greater numbers of central Delta fishes to be drawn to the SWP pumps, particularly as a May 16—31 operation extends the period when barrier operation coincides with migration through the central Delta of the fishes of concern. Table 6 shows the effects on flows and velocities in these channels and on Old River near Clifton Court (Hwy 4)

Mitigation. Proposed mitigation for the possible impacts on fishes of concern are discussed in Chapter 9, Conservation Strategies, and the ASIP.

Channel		Net Water Movement Toward SWP Pumps*			
		(1) No Project	(2) Three Ag Barriers	(3) Difference	(4) Percent Increase (Decrease)
Turner Cut	Net flow (cfs)	-478	-664	-186	39%
	Net Velocity (fps)	-0.05	-0.07	-0.02	40%
Columbia Cut	Net flow (cfs)	-76	-440	-364	479%
	Net Velocity (fps)	0.01	-0.03	-0.04	400%
Old River at Hwy 4	Net flow (cfs)	-1195	-1741	-546	46%
	Net Velocity (fps)	-0.15	-0.25	-0.10	67%

(1) No barriers are in place

(2) Ag barriers are at Old River near Tracy, Middle River, and Grant Line Canal

(3) Column (2) minus column (1)

(4) Column (3) divided by column (1)

* Represents averages over 1976-1991 hydrology. Net flows and velocities are used to represent the great variability in flows and velocities in a channel over a 25-hour semidiurnal tidal cycle. Negative numbers represent “reverse flows,” indicating the net flow or velocity is opposite the normal downstream flow in a channel.

Table 6. Comparison of May 16—31 Central Delta Inflows Toward the SWP With and Without Three Agricultural Barriers in Place

CHAPTER 4 – CHRONOLOGY OF RELATED PROJECTS / EVENTS

October 1973	SDWA created by act of Legislature.
1974	DWR, DFG, U.S. Bureau of Reclamation and U.S. Fish and Wildlife Service sign statement of intent that agencies will provide protection of Delta fish and wildlife.
1978	State Board issues WaterRights Decision 1485 requiring CVP and SWP operation to meet Delta water quality standards.
July 9, 1982	SDWA filed suit against U.S. Department of Interior (USBR) and the State (DWR).
March 1985	DWR modified Clifton Court Forebay gate operations to help relieve the effects of SWP diversions on water levels.
July 1985	SDWA claimed farmers were losing crops due to hot weather and insufficient water supply. DWR took emergency action to alleviate the problem in Tom Paine Slough.
September 1985	DWR and SDWA signed a letter of intent on actions to improve water levels in the South Delta.
November 1985	Workplan issued for an interim program for the mitigation of South Delta water level problems.
June 1986	Joint Powers Agreement for Tom Paine Slough between DWR, SDWA, and Pescadero Reclamation District signed and approved.
August 18, 1986	Pescadero Reclamation District signed construction contract to dredge Tom Paine Slough.
October 1986	Framework agreement (South Delta Agreement) for settling SDWA litigation signed by USBR, DWR, and SDWA.
October 28, 1986	Dredging of Tom Paine Slough completed (100,000 cubic yards).
November 4, 1986	Corps issued Permit No. 9205 to construct Middle River barrier.
January 1987	South Delta agricultural water supply project three-agency work plan published.
September 1991	Draft South Delta Contract was finalized by DWR, USBR, and SDWA. Local voters approved agreement.
October 1991	Temporary barrier in Old River near DMC installed.
October 1991	SWRCB report on Delta Water Quality was released.
November 1991	Agreement was signed by DWR and DFG to use Twitchell and Sherman Islands as mitigation for forebay expansion.
April 1992	Temporary barriers installed—two on Old River and one on Middle River.

April 6, 1992	Governor's Water Policy was announced. The policy proposed appointing and Oversight Task Force, called for establishing interim Delta water quality standards, and listed South Delta facilities as an immediate interim action.
October 30, 1992	CVP Improvement Act, Title 34 of HR 429 (PL 102-575).
December 9, 1992	Governor signed Executive Order creating a 22 member Bay-Delta Oversight Council to assist and advise the new Water Policy Council.
December 10, 1992	Draft of Water Right Decision 1630 (interim Delta water quality standards) available for public review.
February 12, 1993	Winter-Run Salmon Biological Opinion issued for the Operation of CVP/SWP.
March 5, 1993	Delta Smelt listed as Federal Threatened Species.
December 1994	State/federal Bay/Delta Accord. Principles for Agreement on Bay-Delta Standards between the State of California and the Federal Government
May 1995	SWRCB adopted its Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary
April 1996	Corps and DFG issued permits to allow the barrier project for an additional 5 years
1996 – 2000	DWR implemented a fish screening project on Sherman Island as mitigation for the Temporary Barriers Project
December 1998	DWR completed purchase of habitat credits on Kimball Island as mitigation for the Temporary Barriers Project
December 1999	San Joaquin River Agreement adopted by SWRCB, implements the Vernalis Adaptive Management Plan, requiring a spring HOR barrier to improve migration for salmon
April 2000	Culvert structure added to HOR barrier to improve water levels downstream on Old River.
August 2000	CALFED Record of Decision includes recommendation for temporary barriers as interim measure until permanent barriers are built

CHAPTER 5 – ENVIRONMENTAL SETTING

Location

The Delta is near the center of the Central Valley at the confluence of the Sacramento and San Joaquin rivers. The Delta is a unique and valuable resource that provides important environmental, economic, and water supply benefits to many Californians. The south Delta study area is the portion of the Delta southwest of Stockton (Figure 1).

Climate

The climate of the Delta is similar to that of the Mediterranean, with warm dry summers and cool moist winters. The annual average temperature is about 60° F, with extremes ranging from 100° F in summer (June to September) to 30° F in winter (December to March). Average summer and winter temperatures are 75° F and 45° F, respectively.

In spring and summer, winds from the Pacific Ocean enter the Delta through the Carquinez Strait, at times reaching 50 miles per hour. This inflow of marine air moderates what would otherwise be a hot, dry climate. During winter, land breezes prevail and temperatures vary from 43° F to 82° F. During late fall and winter, a dense ground fog periodically covers the Delta for several days at a time.

Average annual precipitation in the south Delta is about 12 inches. Rainfall during the fall and winter seasons account for most of this precipitation. Because of this mild climate, the local rainfall is supplemented by irrigation water readily available from the surrounding waterways. Stockton has an average of 324 frost-free days per year; consequently, farmers often plant and harvest two crops annually.

Soils

Two main types of soils can be found in the South Delta Region. The first soil type is peat, which is composed of organic matter from the ancestral wetland and mineral rich alluvial soils deposited by the rivers. Peat soils cover most of the central part of the Delta. The second type is mineral soils, derived from weathered rock and deposited on the lower slopes of the surrounding valley plains. Mineral soils predominate on the periphery of the Delta and in most of the lands within the SDWA's jurisdiction.

The original elevation of the Delta was close to mean sea level; however, much of the Delta is now below sea level and many islands are 20 feet or more below MSL. The northern portion of Victoria Island has the lowest surface elevation (14 feet below MSL).

Peat soils form many of the levee foundations in the Delta. While peat is excellent for growing crops, as a foundation material it creates levee maintenance and stability problems. Levee instability has existed since the original 5-foot high tidal levees were constructed, and has become more acute in recent years due to land subsidence.

As cultivation continues and the land subsides, water pressure on the levee increases and more material must be added to create broader and higher levees. Some South Delta lands have subsided at rates up to 3.0 inches annually, but subsidence is not a problem on mineral soils that comprise most of the study area. As a result of subsidence, some of today's levees in the delta now stand over 30 feet high. A US

Geologic Survey subsidence investigations, initiated in 1986, indicate that the primary cause of all Delta island subsidence is accelerated biochemical oxidation of peat soils from cultivation and dewatering.

Water Quality

Water conditions in the South Delta are influenced by tidal action, project and local pump diversions, inflows to the Delta, agricultural return flow, and channel capacity. Water quality in the project area is variable, depending on the type of water year, flow conditions, and on the salt load which enters the river upstream of the Delta, particularly via Salt and Mud Sloughs. Salt concentrations are lowest during wet water years and are highest during critically dry years. Salinity is typically highest in July and August, regardless of the type of year. However, salinity may increase dramatically as early as May.

South Delta channels are used to deliver both irrigation water and return local agricultural drainage. Water applied during the commonly used irrigation practices tends to concentrate the salts naturally occurring in the water. These concentrated salts return to the water supply through agricultural drainage. This drainage is the predominant source of the salt load that drains into the river from the CVP westside service area via Salt and Mud Sloughs. The river then carries the salt load downstream to the South Delta. During heavy irrigation seasons, drainage water is recycled several times when flows are insufficient to flush the channels. Consequently, the water quality deteriorates in dead-end channels such as Tom Paine Slough and Paradise Cut as well as in reaches of Old River and the San Joaquin River.

Land Use

The area within the South Delta contains about 150,000 acres, of which 120,000 acres are used for agriculture. The remaining area consists of waterways, levees, and lands devoted to residential, industrial, and municipal uses.

Fully developed and productive irrigated lands depend on in-channel irrigation—about 450,000 acre-feet annually. Seventy-five miles of major channels in the southern Delta also serve as drainage and floodwater canals, habitat and migratory routes for fish, and routes for recreational boating. The major waterways to the east are also used for commercial shipping.

Navigation and Recreation

Navigation in the channels of the south Delta is primarily recreational. In addition to recreational boaters, small commercial vessels also use the south Delta channels. Grant Line Canal is a popular water ski area. The installation of the temporary rock barriers has lowered water levels downstream of the Grant Line Canal and Old River at Tracy barriers approximately 0.5-feet. The combination of lower water levels and sediment deposition filling in the channels has adversely impacted recreation and navigation around the local marinas and the Islands. These impacts are being addressed through the South Delta Dredging Project.

Vegetation

Vegetation in a region can consist of several plant communities, which are assemblages of plant species commonly growing together under similar environmental conditions. Plant communities in the south Delta include coastal and valley freshwater emergent marsh, riparian scrub, riparian forest, ruderal, and agricultural.

Coastal and Valley Freshwater Marsh is a natural wetland community found throughout the south Delta, although it is much reduced from its historic area and distribution. It is now usually restricted to narrow bands of vegetation along riverbanks and strings of small islands within Delta channels. This community is dominated by dense stands of perennial emergent monocots, such as cattails and hardstem bulrush. The freshwater marsh may extend along a gradual gradient through the intertidal zone including species, such as sedges and rushes, that require/tolerate a regular exposure and inundation cycle.

Riparian scrub is commonly found on levee banks and upland areas of instream islands. It consists of shrubby vegetation dominated by thickets of blackberries, wild rose, willows, alders, and/or buttonbush.

Riparian forest is only a remnant plant community in the south Delta, found only in narrow bands along rivers or on islands. Large trees with understories of smaller trees, shrubs, and vines dominate this community. Common species include cottonwood, valley oak, Gooding's willow, arroyo willow, alder, and boxelder. This group includes the following specific communities distinguished by their dominant species: Great Valley Cottonwood Riparian Forest, Great Valley Mixed Riparian Forest, and Great Valley Valley Oak Riparian Forest.

Much of the vegetation along levees is ruderal or weedy. Nonnative annual grasses and forbs such as wild mustard, milk thistle, riggut brome, and Bermuda grass dominate this community. Giant reed (*Arundo donax*) is a tall nonnative perennial grass that may dominate large areas on levee banks competing with native riparian vegetation.

Agriculture is the dominant land use in the south Delta. Agricultural vegetation varies from irrigated pastures to row crops to orchards. Fallow fields are often covered by ruderal vegetation.

Air Quality

The lands within the project area are primarily used for agriculture. Air quality within agricultural areas can be affected by discing, burning, crop dusting and other agricultural practices. Air quality in the project area is also affected by car emissions from traffic on Highway 4. Highway 4 is about 0.5 miles from Del's Boat Harbor and about 4.5 miles from Tracy Oasis Marina. Emission limits for pollutants including suspended particulate matter are regulated under the National Ambient Air Quality Standards and California Ambient Air Quality Standards.

Noise

Noise levels in the project area are primarily affected by agricultural activities, road traffic, and watercraft. The San Joaquin County General Plan limits exterior noise levels in residential developments to 65 dB Ldn (a composite 24-hour average noise level descriptor) and the Contra Costa and Alameda counties policies set a limit of 60 dB Ldn.

Cultural and Historical Resources

A previous cultural resource study was conducted for the Middle River Barrier, Old River at Tracy Barrier, and Head of Old River Barrier (West 1994). This study included a background record search, field survey, and contacting the Native American Heritage Commission (West 1994). The study concluded that no historic properties were present within the 3 project areas, and therefore no historic properties would be effected. No further study or action is required at this time for the Middle River Barrier, Old River at Tracy Barrier, and Head of Old River Barrier. Thus only one temporary barrier, the

Grant Line Canal Barrier, is the subject of the current cultural resource study. The current study concluded that no historic properties were present within the Grant Line Canal Barrier project area, and therefore no historic properties will be effected by the Temporary Barriers Project.

This project is subject to both state and federal cultural resource regulations. The National Historic Preservation Act (NHPA) of 1966, as amended (16 USC 470f), provides for the protection, preservation and consideration of historic and archaeological resources on Federal lands, or lands potentially effected by Federal actions, pursuant to Section 106 of the NHPA. The historic preservation review process is mandated by Section 106 outlined in regulations issued by the Advisory Council on Historic Preservation. These regulations, codified in 36 C.F.R. Part 800, include: identification of historic properties in the area of potential effects; assessment of adverse effects; and, resolution of adverse effects.

The California Environmental Quality Act (CEQA) requires a lead agency to determine whether a project may have a significant effect on historical resources. A project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment (CEQA Section 21084.1). If it is determined that a proposed action will have an adverse effect on an historic resource, prudent and feasible measures eliminating or mitigating the adverse effects shall be adopted (PRC 5024.5).

The effort to identify historical resources in the Grant Line Canal Barrier project area included a record search, contacting the Native American Heritage Commission and interested Native American parties, and a field survey. Each of these is discussed below.

A record search was conducted at the Central California Information Center (CCIC) of the California Historic Resources Information System (CHRIS), located at California State University, Stanislaus in Turlock, California. The record search, conducted by CCIC staff on August 28, 2000, included a review of the state's records for archaeological and historical resources, as well as the following resource inventories: National Register of Historic Places, California Inventory of Historic Resources, California Historical Landmarks, California Points of Historical Interest, and Historic Properties Directory. The search criteria specified the retrieval of all records within a 1/8 mile radius of the project area. The records search revealed no previously recorded cultural resources within the project area or within the 1/8th mile radius.

The Native American Heritage Commission (NAHC) was contacted to obtain information from their sacred lands files as well as to obtain a list of Native American individuals and other organizations potentially interested in the project. All parties identified by the NAHC were contacted by letter; DWR has received no responses from these parties to date. While comments have not been received, DWR will document and address any Native American concerns or inquiries as they arise.

A DWR Associate State Archaeologist conducted an intensive pedestrian survey on September 8, 2000. No natural contours remain within the survey area. The Grant Line Canal is confined by artificial levees on both sides. The levee banks are steep and heavily vegetated with blackberries, willow, and grasses. Riprap is present on both the northern and southern banks of the canal. Dirt roads are present on the top of both levees. Land to the north and south of both levees consists of agricultural fields and canals. No cultural materials were observed during the survey.

The cultural resource study for Head of Old River Barrier, Old River at Tracy Barrier, and Middle River Barrier, conducted by West (1994), concluded that no historic properties would be affected by the temporary barriers in those project areas. The cultural resource study for the Grant Line Canal Barrier

project area, documented herein, resulted in the identification of no cultural resources or historic properties. In conclusion, no historic properties will be effected by the Temporary Barriers Project.

CHAPTER 6 – PROJECT ALTERNATIVES

Alternatives to Barriers

The proposals described below provide a comparison of other projects that have been suggested as alternatives to the barriers. These alternatives were considered during the contract negotiation selection process that led to the South Delta Agreement and the Temporary Barriers Project.

The ten proposals discussed below provide a comparison to the barriers project in terms of environmental impacts, physical or institutional implementation difficulties, and the ability to produce similar expected results as the barriers, i.e., improve water level, water circulation, water availability, and improved conditions for San Joaquin salmon migrations.

No Action

Description: In 2001- 2007, no barriers would be installed at Old River near Tracy, at the Head of Old River (spring or fall), Middle River, or Grant Line Canal.

Analysis: No action would result in no improvement in water levels, water quality, water availability, San Joaquin salmon migration. No additional field data with the barriers in place will be collected to aid in developing criteria for the operation of the future permanent barriers. A no action proposal could result in the reactivation of the SDWA lawsuit against DWR and the USBR. The reactivation of the lawsuit has the potential for a lengthy and expensive legal battle before a court decision is reached. The litigation costs are difficult to estimate, but would likely be hundreds of thousand of dollars.

Roberts Island Canal Plan

Description: The plan consists of a 2,200 cfs pumping plant on Middle River which would convey 1,100 cfs through a constructed canal on Roberts Island to a flood control structure at the San Joaquin River. This plan also would pump water through Middle River to a flood control structure into Old River. The canal through Roberts Island would be approximately 2.5 miles long and extend from Middle River near Howard Road to the San Joaquin River, approximately 3.5 miles south of French Camp Slough. The maximum water level would be +5 feet and at least two bridges would be required for farming operations.

This plan also includes dredging Middle River and a flow control structure in the San Joaquin River downstream from its bifurcation with Old River. In addition to dredging the entire length of Middle River, this plan would require levee improvements. The Roberts Island Canal Plan is discussed in DWR *Alternative Report, Southeast Delta Water Control Facilities*, April 20, 1976 Report and November 8, 1977 Supplement.

Analysis: Estimated costs would include pump installation and operation, canal construction on Roberts Island, purchase of easements or fee titles, flood control structures, and dredging.

The environmental impacts of this proposal include the canal that would divide Roberts Island. The canal would increase seepage on the island along the Middle River and reduce the amount of agricultural land. Pumping operations would have an incremental increase on fish losses through entrainment. The flood control structures would interfere with navigation. Dredging disturbs the river channel bed as well as fish and wildlife in the area. Disposal of dredged material may adversely impact the area, depending

upon where it is deposited. It was anticipated that the dredged material could be deposited on agricultural land on Roberts Island, which may be a less than significant impact to the environment. However, dredged material would be tested for hazardous waste contaminants and the results of this testing could influence how and where the material is deposited. If the dredged material tested as toxic, special removal and disposal procedures could be necessary.

An increase in energy requirements would also be needed to pump the water. Based upon the 1976 study, estimates of average annual energy consumption for the proposal was 2.4 million kilowatt- hours. The barriers will have less of an environmental impact than the Roberts Island Canal proposal because the barriers do not require dredging, creating a new waterway, pumping, or loss of agricultural land. The barriers take advantage of the natural changes in the tides instead of artificially changing flows in the affected area.

In addition, the Roberts Island Canal proposal does not produce similar results as the barriers. The barriers project is designed to improve circulation and water levels for the entire SDWA area, but the Roberts Island Canal proposal would improve water levels and circulation for only part of the area. This proposal would not improve salmon migration in the San Joaquin River.

Delta-Mendota Canal Westley Wasteway Plan

Description: The plan consists of rechannelizing the end of Westley Wasteway to provide water from the Delta-Mendota Canal.

The Westley Wasteway is approximately 20 miles southeast of Tracy and is a man-made channel connecting the DMC to the San Joaquin River approximately 4 miles upstream of the Tuolumne River.

The plan also includes a pumping plant on Middle River, dredging of Middle River between the old Peripheral Canal site and the pumping plant site, and a flow structure in the San Joaquin River. Flow pumped into Middle River would be less than the Roberts Island Canal plan, however it would be supplemented by releases from the DMC into the San Joaquin River via the Westley Wasteway. The quality of water released into the San Joaquin River would be similar to that of the South Delta, however, some temperature differences may occur from the travel time in the DMC. The DMC Westley Wasteway Plan is discussed in *DWR Alternative Report, Southeast Delta Water Control Facilities* April 20, 1976 Report and November 8, 1977 Supplement.

Analysis: Estimated costs for this project include rechannelizing the wasteway, pumping plant construction and operation, dredging of Middle River, and building a flow control structure.

Impacts from dredging and rechannelizing include depositing dredged material. Possible impacts and concerns from dredging are discussed above in the Roberts Island Canal analysis. In addition, rechannelizing at the end of Westley Wasteway would remove riparian habitat and impact wildlife.

The Delta-Mendota Plan would increase direct fish losses because of increased project pumping for wasteway releases to augment San Joaquin River flow. In addition, increases in fish losses would occur from entrainment due to the pumping plant in Middle River. A significant increase in energy requirements is also required to pump additional water. Based upon the 1976 study, estimates of average annual energy consumption for the proposal range from 29.3 to 63.0 million kilowatt-hours.

The barriers will have less of an impact on fish and wildlife because the barriers project does not include a new pumping plant and does not require dredging and rechannelizing. The barriers take advantage of

the natural changes in the tides instead of artificially changing flows in the affected area. In addition, the Delta-Mendota Plan will not provide all the results expected from barrier installation because it does not increase water levels in the SDWA area or significantly improve salmon migration.

In order to make this project work, watermaster service from the Westley to Vernalis along the San Joaquin River would probably be required. Getting the approval of all or a majority of diverters poses some significant institutional problems.

Programs Upstream of the Delta

Description: These programs include reallocating New Melones water supplies, conjunctive use of Stanislaus and Calaveras rivers supplies, changing San Joaquin valley land use, obtaining Turlock Irrigation District water, and Modesto Irrigation District water.

Analysis: The costs of these upstream programs involve purchasing water services and undetermined potential land use changes. All of these programs could provide some possible improvements to South Delta water problems and are being studied in other ongoing programs. The upstream programs, however, would not provide all the results that could be obtained from the barriers. The upstream programs would not increase water levels in the SDWA area. The August 27, 1990 draft settlement agreement between DWR, USBR, and SDWA has concepts for using New Melones supplies to augment the improvements provided by the barriers.

Obtain Hetch Hetchy Water Supplies for SDWA

Description: More water would be allowed to flow down the Tuolumne River into the South Delta area to improve water quality.

Analysis: The Hetch Hetchy proposal would require changes in federal and State water laws and contracts. The City of San Francisco, which has the water rights to Hetch Hetchy supplies, has been buying water for its own needs and would be unlikely to sell water for use in the Delta. Costs to obtain Hetch Hetchy water supplies could be quite high. Obtaining necessary legislative changes and negotiating contracts could take years or perhaps may never occur. The costs and institutional problems involved in this proposal, as well as the fact that it would not increase water levels, make it an unlikely solution to the water problems in the SDWA area.

Pay for Agriculture Pump Damage

Description: DWR would pay for damaged agricultural pumps. This option would allow SDWA's problems to continue and compensate individual farmers for repairs or replacement.

Analysis: Estimated costs include repair or replacement of damaged agricultural pumps in the SDWA area. In general, replacing an agricultural pump could cost less than \$10,000. The SDWA area has approximately 400 agricultural pumps, but DWR does not know how many of these pumps would need replacing every year. In general, however, assuming few pumps per year would need replacing, the cost for pump repair or replacement would be relatively low compared to a barrier installation and operation. The environmental impact from the repair or replacement of pumps includes disturbing the pump area, such as the channel waters and subsurface lands. Wildlife and habitat probably would be disturbed, but the adverse impacts would likely be temporary and minor. Pump repairs or replacement, however could lead to increased water diversions if the farmers need to restart irrigation after an interruption.

Although the environmental impacts from the repair of pumps may be less than the barriers project, the repair of pumps would not provide the expected results that would be obtained from the barriers. The pump repair proposal does not prevent the SDWA problems from occurring, it only compensates farmers for pumps when the pumps break. The proposal could improve availability of water supply to SDWA irrigators if repairs and replacement are done quickly. However, interruptions in irrigation can easily ruin entire crops. DWR could be liable for crop damages if pump repairs are not made quickly. The pump proposal will not improve the SDWA water quality by improving water circulation patterns, it will not improve water levels, and it will not improve conditions for San Joaquin River salmon migration.

Treatment of Agricultural Drainage Water

Description: An agricultural drainage water collection system would be designed and constructed for each island in the SDWA area. Treatment facilities also would be designed and constructed on each island in order to remove total dissolved solids, pesticides, organics, and other contaminants from the collected drainage water. The treatment facilities would reduce the amount of agricultural contaminants in the channel waters and thereby improve water quality in the SDWA area.

Analysis: Agricultural drainage water treatment is a new technology and estimating costs is difficult. An example of the possible treatment technology is reverse osmosis. Reverse osmosis treatment could involve costs of at least \$500 per acre-foot, not including costs for a conveyance system around each island and for disposal of the filtration residue. The SDWA uses approximately 450,000 acre-feet per agricultural season. Based on this rough estimate, the cost of treating agricultural drainage water would be significantly greater than the installing and operating the barriers.

The impacts of installing treatment facilities and collection systems on each SDWA island are not well defined. One impact might include loss of agricultural land and wildlife habitat. Another concern is how to dispose of the treatment facility's filtration residue; the requirements for disposal would depend on the residue contents.

In addition, the treatment proposal will not provide all of the expected results obtained from the barriers project. Treating drainage water probably would improve water quality in the area, but would not raise water levels nor improve San Joaquin salmon migration.

Reduce SWP/CVP Exports

Description: The SWP and the CVP would reduce pumping and exports from the Delta.

Analysis: The costs to reduce SWP/CVP Delta exports during the SDWA agricultural season could be estimated based upon various considerations. One such consideration would be a loss of SWP/CVP revenue from reduced water deliveries, or loss of water user's revenue from reduced water deliveries, or loss of water user's revenue due to lack of needed water, or losses due to third parties that relied on water user products. Users could include municipal, industrial, and agricultural water users. These costs are difficult to determine, but an analogy to revenue losses experienced during the years of drought (1987-1992) could be used since the drought essentially forced the SWP and CVP to reduce exports. Based on the economic impacts from the drought, estimated annual revenue losses from this proposal could range as high as \$1 billion.

Comparing the field monitoring results from reduced SWP/CVP exports to the barriers project indicates that the reduced exports would not provide the water improvements provided by the barriers project. Studies of flows, water levels, and exports are unable to show that discontinuing SWP/CVP exports would provide the water levels and circulation to the South Delta that is provided by the barriers project.

Reducing CVP/SWP pumping and exports, however, causes an adverse impact on the water quality in some channels of the South Delta. This occurs because the CVP and SWP pumps draw better quality water into the South Delta from the Central Delta. On the other hand, reducing exports is likely to reduce the impacts to San Joaquin fish pulled into Old River by pumping activities.

Dredging SDWA Channels

Description: Dredging SDWA channels.

Analysis: Estimated costs of dredging depend on the contents of the dredged material. If the dredged material is nontoxic and the material can be deposited locally, dredging costs probably would be less than the costs for installing the barriers.

Environmental impacts from dredging are discussed under the Roberts Island Canal Plan. Impacts would depend on the contents of the dredged material and the location chosen for disposal. Consequently, impacts from dredging could be less than or more than environmental impacts associated with the barriers.

Dredging probably would not be as effective in improving the SDWA water problems as would the barriers project. Dredging would result in a greater volume of water in the South Delta channels, but would not increase water levels. The deeper channels could allow irrigators to lower the agricultural pumps, which would improve water supply reliability. In theory, the increased water volume should increase water circulation; however, DWR modeling runs do not indicate that water quality is improved by dredging in the SDWA area. Additionally, this option would not improve the salmon migration through the South Delta area.

Pumping Water From Clifton Court Forebay to SDWA

Description: Water would be pumped from Clifton Court Forebay to SDWA farmers through pipelines on both sides of Old River.

Analysis: Pumping water from Clifton Court Forebay to SDWA agricultural users is expensive because of the cost of irrigation systems and of installing pipelines around each island. The piping is estimated to cost more than \$100 million. The estimated cost for maintaining and operating the pipeline could be \$500,000 annually. The costs of this proposal far exceed the costs of the barriers project.

The delivery of water from Clifton Court Forebay would improve the water quality for SDWA agricultural users. Under this option, agricultural users could reduce, or eliminate pumping, which in turn could reduce any existing problems of entrainment of fish at agricultural pumps. However, additional water would have to be drawn into the forebay and pumped to meet SDWA water needs and would add to the direct loss of fish experienced in Clifton Court Forebay and the pumping plants. Although the pumping of water proposal could provide many of the results provided by the barriers, the cost makes pumping impractical. In addition, the pumping proposal would not improve San Joaquin salmon migration.

CHAPTER 7 – OTHER RELATED PROJECTS AND ACTIVITIES

Proposed South Delta Improvements Program

The South Delta Improvements Program will improve the reliability of existing SWP facilities and operations within the South Delta. In addition it will ensure that water of adequate quantity and quality is available for diversions to beneficial use within the SDWA service area, as well as contribute to restoring the ecological health of aquatic resources in the lower San Joaquin River and South Delta. The proposed SDIP would cost \$53.9 million to construct and includes the following project components:

- Construction and operation of a new screened intake structure for the SWP Clifton Court Forebay. This new intake would be located on Byron Tract north of the Forebay and would use a new channel to move water from the screens into the Forebay.
- Possible channel dredging in a reach of Old River north of Clifton Court Forebay.
- Construction and seasonal operation of a permanent barrier in spring and fall to improve fishery conditions for salmon migrating along the San Joaquin River, this barrier is also referred to as the Head of Old River Barrier.
- Construction and operation of permanent flow control structures on Middle River and Old River near the Delta Mendota Canal (possibly in Grant Line Canal also) to improve existing water levels and circulation patterns for agricultural users in the south Delta and
- Increased diversions into Clifton Court Forebay up to a maximum of 20,430 acre-feet per day on a monthly averaged basis. This results in the ability to pump an average of 10,300 cfs at Banks Pumping Plant (with additional annual average SWP water deliveries of 46,000 acre feet per year under existing demand conditions and 122,000 acre feet per year under future demand conditions, estimated for the year 2020).

The SDIP is the follow-on project to the Temporary Barriers Project, and provides permanent facilities to replace the temporary rock barriers. The permanent facilities provide far greater flexibility in operations than the rock barriers, and provide improved boat passage and fish passage capabilities.

West Delta Water Management Program

The objective of the West Delta Program is to implement a land-use management program for effectively controlling subsidence and soil erosion on Sherman and Twitchell islands while also providing habitat for wildlife and waterfowl. DWR and DFG have jointly developed the wildlife management plan for the two islands. That plan is also designed to benefit species of wildlife that occupy wetland, upland, and riparian habitats and provide recreational opportunities for hunting and viewing. In addition, property acquired and habitat developed through DWR's effort will be available for use as mitigation for impacts associated with DWR's ongoing Delta water management programs.

As a result of implementing the wildlife management plan, subsidence would be significantly reduced through minimizing oxidation and erosion of the peat soils on the islands. Minimizing oxidation and erosion would be accomplished by replacing present agricultural practices with land-use management practices designed to stabilize the soil. Those practices range from minimizing tillage to establishing wetland habitat. Altering land-use practices could result in up to 13,600 acres of managed wildlife and

waterfowl habitat; increased flood control; additional protection of water quality in the Delta; increased reliability of SWP and CVP water supplies; and additional recreational opportunities in the Delta. Establishing wetland and wildlife habitats on the two islands also is consistent with national and State policies designed to enhance and expand wetlands.

CHAPTER 8 – CONSULTATION AND COORDINATION

Fisheries

All of the barriers require USACE permits. Numerous meetings have been held with USFWS, NMFS, DFG, EPA, and USACE to establish monitoring, evaluation and management plans for the Temporary Barriers Project while it was underway as a “test” project. Consultation with the agency representatives will continue to determine the monitoring and evaluation plans needed for the next seven years. These consultations are expected to continue until the USACE makes a final decision on the permit application. It is expected that the USACE permit will include a requirement for a revised monitoring plan that will be based on documentation of monitoring done to date.

Input relevant to the barriers has also been provided in other forums. The USFWS provided input about the barriers in the draft Fish and Wildlife Coordination Act Report for the South Delta Water Management Program. Discussions of fisheries issues relating to the temporary barriers were held at the Article VII negotiations sessions on October 3 and November 7, 1990. This review approach will continue during the environmental monitoring of all four temporary barriers.

Boating

USBR and DWR met periodically during 1990 and 1991 with boating representatives for their input into the design of boating mitigation. USBR's Denver office identified conceptual portage alternatives for the Old River barrier site at Tracy. USBR and DWR identified the detailed alternatives. Following this, DWR met with the Department of Boating and Waterways, the San Joaquin County Sheriff's Department, and representatives of the boating community to identify boat portage alternatives. Additional boat surveys were performed in 1988, 1991, 1992, and 1994 in order to gather further information. Results of the additional surveys are presented in Chapter 10.

Agriculture

South Delta negotiations between DWR, USBR, and agricultural representatives from the SDWA have continued since 1986. The Draft Settlement Agreement provided an interim agreement, at the regional level, with SDWA, USBR, and DWR. DWR and USBR will continue to meet with SDWA as appropriate.

CHAPTER 9 – ANALYSIS OF ENVIRONMENTAL IMPACTS

Introduction

History. In DWR's 1986 proposal to construct and install the first temporary barrier in Middle River, no studies had been completed to determine the effects of the barrier. Although significant environmental impacts were not expected, USFWS expressed concerns that not enough was known about the project's potential impacts. As a result, the involved agencies established a monitoring plan that would help develop more definitive information. The results of the monitoring studies were compiled into annual reports from 1988 to 1992 (DWR 1988-1992).

In 1991, DWR applied for a permit to install two barriers on Old River; one near Tracy for agricultural purposes similar to the Middle River Barrier and one near the HOR for out-migrating San Joaquin salmon. Because of concerns expressed by reviewing agencies, it was only possible to install the Old River barrier at Tracy for the month of September. DWR then reapplied for a permit in 1992 for the two barriers.

As part of the ongoing environmental analysis, a USACE jurisdictional wetlands delineation survey was prepared for DWR by a consultant, and is summarized below. DWR then prepared a biological assessment (DWR 1992), required as part of the endangered species process, which discussed potential impacts of the project on listed species and species proposed for listing. At the same time, DFG staff prepared an assessment (DFG 1992) on potential impacts of the barriers on other non-endangered species. The DFG assessment of impacts on non-endangered species of fish, wildlife, and plant community resources are summarized below.

The previous studies did not specifically identify any other significant adverse impacts due to the proposed barrier installation. They did identify some possible adverse impacts, however, and concluded that it could not be determined that there were no significant impacts based on available data. As a result they recommended further studies to develop better information on the potential impacts of the barriers. A Monitoring, Evaluation and Management Plan was developed with input from DFG, USFWS, NMFS, EPA, and USACE. The plan incorporated the studies required for the last year of the Middle River barrier installation and includes a number of monitoring elements. These elements include a five-year plant community study, fish community sampling, monitoring of adult and juvenile salmon, a test to determine salmon smolt survival through the South Delta, water quality studies, and additional modeling studies and verification. Several mitigation elements are also included. If studies for Mason's lilaepsis show populations falling below a particular level, replacement or other remedial actions are required. Because of concerns about impacts to fish population, DWR agreed to monitor several agricultural diversions in the area and, if the agencies determined that screens would reduce fish losses, DWR also agreed to screen the two diversions. In addition, if any of the studies showed that significant impacts were occurring, the USACE could require remedial action, including removing the barriers.

DWR also prepared background information for USACE regarding other environmental concerns not included in the fish, wildlife and vegetation assessments. Subjects such as flood control, erosion and accretion patterns, historic sites, energy consumption, navigation, and safety were included in this information. The discussion of other environmental impacts is found later in this chapter.

In 1995, DWR sought an extension to the Temporary Barriers Project, extending the project to 2000. An Initial Study/negative declaration was written and filed in compliance with CEQA (DWR 1995). A 1995 supplemental biological assessment was accomplished (DWR 1995) and was used to secure necessary USACE and DFG permits. The 1995 Initial Study for the Proposed Test Program Temporary Barriers Project was relied upon to help prepare this 2000 Initial Study.

Current Situation and Coordination with CALFED. The CALFED Bay-Delta Program, a consortium of state and federal agencies, is working toward a set of common goals in developing and implementing a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta System. These goals are to be reached through the implementation of dozens of projects, occurring throughout the solution area. One such project is the South Delta Temporary Barriers Project, which is the focus of this environmental document.

The CALFED Framework Agreement states that the Temporary Barriers Program will serve as an interim action to protect south Delta water levels and circulation until CALFED Stage 1 actions for South Delta improvements are implemented.

In July 2000, CALFED issued its final Programmatic EIS/EIR which included a Multiple Species Conservation Strategy (MSCS). The CALFED MSCS was developed to address the conservation of species and habitats across a large portion of California where CALFED actions will be conducted. The MSCS serves as a programmatic biological assessment (BA) under Section 7 of the federal Endangered Species Act (ESA) and a programmatic Natural Community Conservation Plan (NCCP) under the Natural Community Conservation Planning Act for species, habitats, and CALFED actions evaluated in the MSCS.

On August 28, 2000, the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) each issued a programmatic biological opinion (BO) under Section 7 and the California Department of Fish and Game (DFG) issued a NCCP determination under NCCPA based upon the information in the MSCS.

The MSCS established a process for entities implementing individual or bundles of CALFED actions to more efficiently comply with ESA, California ESA (CESA), and NCCPA because of the regional benefits to species and habitats that result from implementing the MSCS across the focus area. To receive the benefits of streamlining with ESA, CESA, and NCCPA, an entity proposing to implement CALFED actions must develop an Action Specific Implementation Plan (ASIP) for the proposed action. An ASIP is the functional equivalent of a biological assessment. All CALFED ASIPs must be based upon, and tier from the CALFED MSCS and final Programmatic EIS/EIR.

An ASIP was prepared by DWR for the South Delta Temporary Barriers Project under the guidelines of the CALFED document “User Guide for Preparing an Action Specific Implementation Plan (ASIP) under the CALFED Programmatic Multi-species Conservation Plan” and is tiered from the CALFED Programmatic EIR/EIS, Certified/Record of Decision issued August 28, 2000. ***The ASIP in whole is incorporated by reference as a part of this Initial Study.***

The Temporary Barriers Project is no longer considered an experimental facility. It has been determined that the Temporary Barriers Project accomplishes the goal of raising water levels and improving water circulation in the South Delta to the benefit of local agricultural diversions within the SDWA. Consequently, for the next permitted operation period, the Temporary Barriers Project will serve as an

interim action to protect south Delta water levels, water circulation, and improve conditions for migrating San Joaquin River chinook salmon, until CALFED stage 1 actions for South Delta improvements are implemented. The CALFED Bay-Delta Program Framework Agreement projects permanent barrier facilities, or their functional equivalents, will be fully implemented by 2007.

As one of the projects being implemented to achieve overall CALFED goals, the Temporary Barriers Project is considered a second-tier CALFED project. As such, all environmental documentation must be based upon, and tier from the CALFED Final Programmatic EIS/EIR and MSCS. The CALFED MSCS is an approach that implementing agencies may use to comply with FESA, CESA, and NCCPA. The MSCS species and NCCP communities addressed for this project are listed in Table 7. The primary species considered to be at risk to the project have previously been identified through a substantial history of reports and documentation, including the initial studies, biological assessments, and biological opinions shown below.

Biological Assessments

1992 plus appendices
1993
1993 Amendment 1
1995 Supplemental
1996
2000 Supplemental

CEQA/DFG Documents

1992 DFG Assessment
1992 Draft Negative Declaration
1992 Initial Study and proposed test program
1995 Initial Study and proposed test program

Consultations

1996 DFG Biological Opinion
1996 USFWS Biological Opinion for delta smelt and conference opinion for splittail
1997 USFWS Biological Opinion for delta smelt and conference opinion for splittail
1997 NMFS Draft Biological Opinion for winter-run
1998 NMFS Biological Opinion for winter-run

These species have been the focus of past consultations and operational requirements of the Temporary Barriers Project, thus the ASIP reviews and re-evaluates the potential impacts of the Temporary Barriers Project on these species, and incorporates an evaluation of the communities documented in the MSCS. The MSCS also list two fish groups that should be addressed, anadromous and estuarine species. The potential impacts on the fish species comprising these groups will be addressed through the individual species-specific assessments. Previous analyses on the impacts of the Temporary Barriers Project on the species listed in Table 7, as well as others not included in this ASIP, can be found in the documents listed above.

MSCS Species	Status
Winter-run chinook salmon, <i>Oncorhynchus tshawytscha</i>	FE, SE
Delta smelt, <i>Hypomesus transpacificus</i>	FT, ST
Spring-run chinook salmon, <i>Oncorhynchus tshawytscha</i>	FT, ST
Steelhead, <i>Oncorhynchus mykiss</i>	FT
Splittail, <i>Pogonichthys macrolepidotus</i>	FT, SSC
Fall- and late fall-run chinook salmon, <i>Oncorhynchus tshawytscha</i>	FSC, SSC
Swainson's hawk, <i>Buteo swainsoni</i>	FSC, ST
Mason's lilaepsis, <i>Lilaeopsis masonii</i>	FSC, SR, CNPS 1B

Status: FE = federal endangered, FT = federal threatened, FSC = federal species of concern, SE = state endangered, ST = state threatened, SSC = state species of concern, SR = state rare, CNPS (California Native Plant Society) 1B = rare or endangered in CA and elsewhere.

MSCS NCCP Communities
Tidal perennial aquatic*

*Sub habitats of tidal perennial aquatic are detailed in ASIP.

Table 7. CALFED MSCS species and communities evaluated for this project

Summary of Wetlands Delineation Actions

All of the barrier sites involve disposal of fill material into the waters of the United States and are thus subject to Section 404 of the Clean Water Act. Section 404 requires that a permit be obtained from the USACE for such activities. The USACE requires that all wetlands within their jurisdiction be delineated.

As part of the 1992 permit process, the USACE requested wetland delineation for the whole area that might be affected by changes in flow caused by the Middle River barrier, Old River barrier at Tracy, and Grant Line Canal barrier (at the west end of the canal).

DWR hired a consultant, The Botanical Research Group, to conduct the wetland delineation. Below is a summary of this report. Copies of the report may be obtained from DWR.

Wetland Delineation Summary Prepared by Botanical Research Group

Introduction. This report identified wetlands in the San Joaquin Delta that could potentially represent wetlands under the jurisdiction of the USACE following Section 404 of the Clean Water Act. The wetlands delineated were designated in the South Delta Water Management Program as areas potentially affected by the proposed placement of the four barriers. These barriers present potentially direct affects on jurisdictional wetlands. Furthermore, according to hydrological modeling information provided by DWR, potential changes in wetlands could occur as a result of increases in water levels due to the placement of the barriers.

Methods. This study of the wetlands surveyed all areas that would potentially be affected by the proposed project including those directly affected by the barriers as well as those areas where there are projected changes in water levels. Effects on the wetlands as a result of the proposed project may increase, decrease or leave unchanged these wetland areas. As directed by USACE, all wetlands that

may fall under the jurisdiction of USACE in the study area were delineated. However, since it was not possible to determine the effects on the wetlands from the proposed project until after monitoring, this study delineated all wetlands that were immediately adjacent to the affected area and those extending beyond the zone of predicted water level increase.

Waters of the United States, including wetlands, were delineated following the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (January 10, 1989). This manual was used as opposed to the 1987 manual based on approval from USACE for the South Delta Water Management Program. Routine on-site methods found in the Federal Manual were used. Wetland indicator plant species status was based on the National List of Plant Species That Occur in Wetlands: California (Region 0).

Wetlands were mapped from the rivers in a small boat and from the levees by foot, car, or bike between August 5 and December 17, 1991. Field mapping was done onto acetate overlays on black and white aerial photographs or directly onto USGS topographic maps.

Wetlands identified and delineated on the aerial photographs were transferred to 7.5-minute scale USGS topographic maps.

Results. A total of 97.39 acres of wetlands and 978.66 acres of Waters of the United States were delineated within the project area. USGS 7.5-minute topographic maps for the Clifton Court Forebay quadrangle, Holt quadrangle, Union Island quadrangle, Stockton West quadrangle, Holt quadrangle, Union Island quadrangle, Stockton West quadrangle and Lathrop quadrangle were submitted with the report and show all wetlands delineated within the study area.

Hydrophytic Vegetation and Communities. The following Table 8 lists the community types representing wetlands identified and delineated in the study area and the associated cumulative acreage for each of the four barriers:

Community Type I	GLC* (Acres)	OR (Acres)	HOR (Acres)	MR (Acres)
Mixed Riparian	2.30	11.00	2.00	4.00
Willow Scrub	15.44	17.50	4.60	13.1.0
Fresh Water Marsh	1.03	5.70	-----	2.60
Arundo donax thicket	0.52	0.50	-----	14.50
Wetland Scrub	-----	1.20	-----	1.40
Total	19.29	35.90	6.60	35.60
River Length (miles)	7.0	18.4	13.1	12.3

* GLC barrier at west site

Table 8. Community Types Representing Wetlands Delineated for the Barriers

Mixed Riparian - This wetland community type was characterized by a dominance of *Salix goodingii*, *Salix lasiandra*, *Quercus lobata*, and *Populus fremontii* in the tree stratum. The scrub stratum was dominated by saplings of the above species as well as *Salix hinsiana*. The woody vine layer, when present, was dominated by *Vitis Californica*.

Willow Scrub - This wetland community was dominated by a tree and/or scrub stratum of *Salix hinsiana*. A co-dominant of the shrub stratum was *Rubus procerus*.

Freshwater Marsh - This community was dominated by *Typha latifolia* or *Scirpus acutus* and *Scripus californicus*. Included in this community was freshwater emergent vegetation that was dominated by *Ludwigia peploides*.

Arundo donax thicket - This community was dominated by *Arundo donax*.

Wetland Scrub - This community was dominated by *Rubus procerus* and *Rosa Californica*.

Hydric Soils. All the soils within the river and canal corridors, including the fluvial islands have been mapped by the Soil Conservation Service (unpublished maps for San Joaquin County) as fluvaquents. The aquic moisture regime due to tidal flooding indicates that the mapped areas are hydric soils. However, portions of the sloping channel levees are not fluvaquents by definition. This soil type primarily includes flooded areas having a slope of 0-2 percent. In some cases the levees have partially slipped into the channels and have since become hydric according to the description for fluvaquents in the Contra Costa County and San Joaquin County soil surveys. Our soil samples were used to determine the upper limit of the hydric soil boundary. Soil matrix color of sample 1A had a Munsell color of 10 YR 4/2 and soil mottle colors of 10 YR 4/6 and 7.5 YR 5/8 providing field indication of hydric soils. These hydric soils were observed along a levee bank densely covered with upper limit of a mean high tide with a slope of approximately 2-4 percent. A contrasting sample approximately eight feet higher up the levee bank (sample 1B) had a soil matrix Munsell color of 10 YR 4/3 and lacked mottles and was, therefore, found not to have field indicators for hydric soils. This second sample site was also in an area densely vegetated with hydrophytic vegetation and was within the upper limit of extreme high tide. The levee slope at this sample location was greater than 15 percent.

Hydrology. The areas surveyed are within the tidally influenced San Joaquin Delta. Field indicators within the zone of mean high tide included drift lines, staining on plant stems and branches and oxidized root channels in the soil. Hydric soil field indicators fairly closely correlated with hydrology field indicators in terms of position along the levee bank.

Areas of wetlands that potentially fall under section 404 of the Clean Water Act in the study area have been identified, mapped and their acreage determined. Supporting evidence for the findings is in the report and in associated documentation in the form of maps and field data forms.

Grant Line Canal Barrier, East Site

Subsequent to the wetlands delineation done by The Botanical Research Group, the proposed location of the Grant Line Canal barrier was changed from the west end of the canal to the east end, near Tracy Road Blvd. Wetland delineation was done by DWR with the following results:

Community Type I	GLC* (Acres)
Nonnative Grasses	0.02
Riparian Scrub	0.027
Shaded Mudflat	0.011
Shallow-water Habitat	0.411
Intertidal Vegetation	0.25
Total	0.719

*GLC barrier east site

Table 9. Community Type of Wetlands Delineated at Grant Line Canal East Site

Habitat Loss Mitigation

The site-specific impacts of the barriers are relatively small. The HOR barrier site has been used in most years since 1968 and Middle River since 1986—no additional wetlands areas are likely to be affected. The Old River barrier at Tracy was given a one-month permit in 1991. As a part of that permit process, it was determined that 0.25 acres of wetland would be directly affected by the construction. DWR agreed to purchase mitigation land to compensate for the loss. In 1994, mitigation work was completed on Staten Island. The work was done on the waterside of the Staten Island levee, south of Beaver Slough.

Mitigation for the Grant Line Canal barrier impacts and an additional portion of the Old River at Tracy barrier impacts to wetlands was accomplished through purchase of property at the Kimball Island Mitigation Bank at the ratio of 1:1. The purchase was completed in February 1999.

Through purchases of mitigation bank property, DWR has fully complied with its USACE permit conditions to mitigate for all habitats lost due to construction of all four south Delta temporary barriers.

Summary of the Biological Assessment for the South Delta Barriers Project (Non-Endangered Species Assessment)

This assessment examined the possible impacts to existing fish, wildlife, and plant communities near the test barrier program facilities, which were not covered in the endangered species biological assessment.

Many different species of wildlife are present in the proposed test area. Since there is no comprehensive habitat data for nesting of the species in the testing area, this report was to review those species that could be impacted by the test barrier structures.

In the test study area, the fish species of interest were the chinook salmon (fall-run), striped bass, white sturgeon, American shad, and resident fish. In addition, wildlife resources and plant life were examined within this test study area. The habitats of interest were emergent marsh, South Delta open water channels vegetation, riparian vegetation, channel island vegetation, and the heavily shaded riparian aquatic areas. Table 10 below summarizes the results of the assessment.

Fish	Anticipated Impacts
Chinook Salmon	Possible increased predation, agricultural entrainment, also some probable improvements
Striped Bass	Possible impact in some areas
White Sturgeon	Possible small increase of entrainment at facilities
American Shad	Possible entrainment at facilities, agricultural diversions, and predation
Resident South Delta Fish	Some short-term impacts on some fish, benefits for some others

Wildlife Resources	Anticipated Impacts
Emergent Marsh	Possible impacts
Riparian	Possible impacts
Open Channel Area	Possible impacts, some improvements

Table 10. Summary of 1992 Environmental Assessment of Anticipated Impacts

Summary of Action Specific Implementation Plan for the South Delta Temporary Barriers Project

The TBP has received considerable environmental review since its inception in 1992. It is through the numerous environmental reviews and reports that the potentially affected species (Table 7) have been identified for the ASIP. The species listed in Table 7 have been the focus of past consultations and operational requirements of the TBP, thus the ASIP will review and re-evaluate the potential impacts of the TBP on those species, as well as incorporate an evaluation of the communities documented in the MSCS.

Potentially significant adverse impacts on aquatic species posed by the Temporary Barriers, which were identified in the July 2000 CALFED Final Programmatic EIS/EIR include:

- Blocked access to habitat and potentially altered water quality and flow conditions.
- Short-term disturbance of existing biological communities and species habitat, mobilized sediments, and input contaminants from construction activities.
- Reduced frequency and magnitude of net natural flow conditions in the south and central Delta.

The CALFED Final Programmatic EIS/EIR also stated generally that implementing certain CALFED actions may result in deleterious impacts to habitat types that presently exist in the Delta through either project construction or implementation.

The CALFED MSCS lists impact mechanisms associated with implementing water conveyance facilities in the south Delta. Three of these impact mechanisms may directly apply to the TBP:

- Change in timing and water movement in the Delta.
- Change in tidal stage.
- Demolition, construction, excavation, grading, and maintenance activities associated with construction and operation of facilities.

These potential impacts identified by CALFED briefly summarize a wide range of impacts identified in previous evaluations of the Temporary Barriers. The ASIP tiers off of the CALFED Final Programmatic EIS/EIR by presenting the current state of knowledge on these potential impacts through a review of all available information. The methods used to evaluate the impacts of the TBP in the ASIP, as well as in previous evaluations, includes evaluating information gained from the literature as well as a number of research and monitoring programs in the Bay-Delta, including the following:

- Temporary Barriers Project fish monitoring
- South Delta egg and larva survey
- Fish Salvage operations at the SWP and CVP
- Other on-going monitoring programs
- Hydrodynamic modeling

NCCP Habitats

The CALFED MSCS NCCP habitats located in the project area will be affected by project activities. Tidal perennial aquatic habitat will be temporarily impacted during construction activities associated with building the barriers, as well as during project implementation. Construction related impacts include physical disturbances such as increased turbidity and noise levels resulting from the placement of

the rock fill material. Project implementation impacts include tidal perennial habitat that will be covered with the rock fill material for approximately 9 months per year while the barriers are in place, and the decreased tidal prism within the habitat upstream of the barriers. It is difficult to predict exactly how the reduced tidal flux and nearly constant high water levels will affect these habitats because the functional role of the tides for these habitats is not clearly understood. It is likely that the tides play an important role in the transport of nutrients and other constituents through these habitats, but exactly how these functions may be affected by the project is unclear.

MSCS Evaluated Species

Impacts to fish. The primary potential impacts of the project on the MSCS fish species are summarized on a month-by-month basis in Table 11. Expanded evaluations of specific impacts on each of the species are presented in detail in the ASIP.

Month	CALFED MSCS Fish Species and Impacts
January	<ul style="list-style-type: none"> No project
February	<ul style="list-style-type: none"> No project
March	<ul style="list-style-type: none"> Winter-run: juveniles – export losses; adults/juveniles – increased reverse flow Fall-run: juveniles – export losses Late fall-run: adults – increased reverse flow Steelhead: juveniles – export losses, increased reverse flow Delta smelt: adults/juveniles/larvae – export losses
April	<ul style="list-style-type: none"> Winter-run: adult/juvenile – } Spring-run: adults – } Fall-run: juveniles – }— blocked passage; increased reverse flow Steelhead: juveniles – } Delta smelt adults/juveniles/larvae – } Splittail: adults/juveniles – }
May	<ul style="list-style-type: none"> Winter-run: adults/juveniles – } Spring-run: adults – } Fall-run: juveniles – }— blocked passage; increased reversed flow Steelhead: juveniles – } Delta smelt: adults/juveniles/larvae – } Splittail: adults/juveniles – }
June	<ul style="list-style-type: none"> Fall-run: juveniles – } Delta smelt: juveniles/larvae – }— blocked passage Splittail: adults/juveniles – }
July	<ul style="list-style-type: none"> Delta smelt: larvae – increased reverse flow; juveniles/larvae: blocked passage Splittail: adults/juveniles – blocked passage

August	<ul style="list-style-type: none"> ● Splittail: juveniles – increased reverse flow
September	<ul style="list-style-type: none"> ● Fall-run: adults – increased reverse flow ● Splittail: juveniles – increased reverse flow
October	<ul style="list-style-type: none"> ● Winter-run juveniles: export losses; increased reverse flow ● Fall-run: adults – increased reverse flow ● Late fall-run: adults – increased reverse flow ● Steelhead: adults – increased reverse flow; blocked passage
November	<ul style="list-style-type: none"> ● Spring-run: juveniles – export losses; increased reverse flow ● Late fall-run: juveniles – export losses; adults/juveniles – increased reverse flow ● Steelhead: adults – blocked passage; increased reverse flow
December	<ul style="list-style-type: none"> ● No project

Table 11. Summary of potential project related impacts of TBP to CALFED MSCS fish species

Water year type and the specific distribution of fishes during a particular month may influence degree of project impacts. The potential impacts are described below:

Blocked passage due to barriers: Barriers impede or delay fish movements, resulting in increased risk to young fish of predation or entrainment in agricultural diversions, and reduced reproductive success of adult fish attempting to return to natal streams to spawn. The Fall HOR barrier is designed to improve salmon migration in the San Joaquin River but it may also block salmon that migrate through the interior Delta. The barrier is notched in the center to facilitate salmon passage. The three agricultural barriers will also be notched in the fall.

Increased reverse flow: Increased net upstream flow in channels leading from the central to the south Delta due to HOR barrier or three agricultural barriers acting together to form a hydraulic barrier. Result in transport of eggs and larvae to the south Delta, causing increased risk of predation, entrainment and other mortality. Also may and disorient migrating fish resulting in straying of juveniles and adults, causing increased mortality and reduced growth and reproductive success.

Export losses: Includes increased direct export losses due to entrainment, predation, and salvage losses at the SWP and CVP south Delta facilities. Also includes increased indirect losses due to effects of export pumping on in-Delta flow patterns, which affects transport and straying as described above.

Construction impacts to fish. Construction activities may temporarily impact fish populations. The placement of the rock fill material into the channels to build the barriers has the potential to harass and displace fishes present in the general area of the construction activity. Additionally, the increased turbidity levels associated with construction may negatively impact fish populations temporarily through reduced availability of food, reduced feeding efficiency, and exposure to toxic sediments released into the water column. Conditions will return to normal soon after barrier installation or removal. The barrier installation and removal is subject to conditions imposed by the Regional Water Quality Control Board as part of a Clean Water Act Section 401 water quality certification.

Passage impacts to fish. The physical presence of the TBP facilities may block the passage of migratory or highly mobile fish in the Delta. To date, there is no direct blockage data available for any fish species, thus the potential impacts discussed below are inferred from historical migration timing and occurrence

in the south Delta. The California Department of Fish and Game will be conducting a salmon tracking study during the fall of 2000 which, in part, is designed to assess the potential for migration blockage of the Temporary Barriers on fall- and late fall-run chinook salmon. Information gained from this study can be used in the future to further assess impacts to migratory fish species.

Conservation Strategies

The CALFED MSCS indicated that measures designed to offset adverse effects would be undertaken by entities implementing CALFED actions. In the case of the TBP, DWR is responsible for measures to avoid, minimize, and compensate for the project's adverse effects. These measures are described below.

Additionally, operation of the barriers is managed so that the protection of sensitive fish species is a primary consideration. The barriers are installed each year at the discretion of the regulatory agencies. Thus, if conditions are such that even with mitigation measures, project operations would jeopardize sensitive fish species, the barriers may not be installed.

Aquatic Impacts. The CALFED Final Programmatic EIS/EIR recognized the uncertainty of existing information on the response of species to south Delta barriers. The document stated "impacts are expected to be reduced to a less-than-significant level through mitigation strategies, including monitoring and focused studies." Listed below are the mitigation measures DWR has done for the present permitted project operation period, followed by the mitigation measures DWR proposes for the next permitted operation period. The proposed conservation/mitigation measures for the next operational period are subject to CALFED regulatory agency approval. DWR will continue with a monitoring plan for the project in attempt to learn more about the environmental impacts caused by the placement of barriers in the south Delta. The elements of the monitoring plan are presented in Chapter 11.

Past mitigation measures.

Under Terms and Conditions 1 (e) of the USFWS Biological Opinion (4/26/96), DWR was required to install at least three fish screens on agricultural diversions per year in the Delta. To date, DWR has installed a total of 14 screens on agricultural diversions and has capped another diversion at Sherman Island, for a total of 15 screens (3 screens per year for the permit period). DWR also contributed to funding a study that examined the entrainment patterns of two side-by-side screened and unscreened diversions at Sherman Island.

Under Terms and Conditions 3 of the USFWS Biological Opinion (4/26/96), DWR was required to mitigate for the footprint of the Grant Line Canal barrier. DWR fulfilled this requirement by acquiring a 1:1 ratio of 0.064 acres of riparian scrub, 0.011 acres of shaded mudflat, 0.411 acres of shallow water, and 0.250 acres of intertidal vegetation at Kimball Island.

Under Condition 11 of the DFG 1601 Agreement (5/2/96), DWR was required to mitigate for the impact to shallow water habitat. DFG agreed to credit the Kimball Island mentioned above habitat purchase to satisfy this mitigation requirement.

Under Condition 16 of the DFG 1601 Agreement (5/2/96), DWR was required to screen two agricultural diversions in the Bay-Delta Estuary. The fish screen project at Sherman Island fulfilled this requirement.

Proposed mitigation measures for the next operational period

Appropriate mitigation for the adverse environmental impacts caused by the Temporary Barriers Project will be developed through ESA consultation with the CALFED regulatory agencies. The development of mitigation measures through the consultation process will ensure that all adverse impacts are fully mitigated, and that the mitigation is consistent with the goals and objectives of the CALFED program. Mitigation measures required will become part of the project description and be included in the Final Mitigated Negative Declaration and Initial Study prior to the project beginning.

In addition to the mitigation developed through consultation, DWR will continue the operation and maintenance of all 14 fish screens that have been installed at Sherman Island. The previously mentioned DWR study on the entrainment patterns of two side-by-side screened and unscreened diversions at Sherman Island provided evidence that screens can protect fish from entrainment into agricultural diversions (Nobriga and others 2000).

An additional mitigation/conservation measure will be to notch each of the agricultural barriers similar to the HORB fall barrier to provide passage for migrating adult salmon that have strayed into Old and Middle Rivers and Grant Line Canal.

Swainson's hawk. Under the Conservation Measures for Swainson's Hawk in the DFG Biological Opinion (5/3/96), DWR was required to develop and grant a conservation easement to DFG for one-acre of riparian forest at the Grizzly Slough or other area suitable to the DFG. DFG and DWR have agreed upon a one-acre riparian forest located at Grizzly Slough to satisfy this mitigation requirement. The final arrangements for this project are being finalized at DWR's Land and Right of Way Office. Other construction and removal related mitigation requirements are detailed in the ASIP.

Mason's lilaepsis. Appropriate mitigation for the adverse environmental impacts caused by the Temporary Barriers Project will be developed through ESA consultation with the CALFED regulatory agencies. The development of mitigation measures through the consultation process will ensure that all adverse impacts are fully mitigated, and that the mitigation is consistent with the goals and objectives of the CALFED program. Mitigation measures required will become part of the project description and be included in the Final Mitigated Negative Declaration and Initial Study prior to the project beginning.

Potential mitigation strategies could include acquiring potential habitat for Mason's lilaepsis in a mitigation bank such as Kimball Island or contributing funds for the study of Mason's lilaepsis' ecology and habitat requirements.

CHAPTER 10 – ENVIRONMENTAL CHECKLIST

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
I. AESTHETICS — Would the project:				
a) Have a substantial adverse effect on a scenic vista?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

- c) The barriers have a minor impact on the aesthetics in the area. They are low in height and generally not very visible. The rock barriers would be made of the same type of rock commonly used for riprap protection of levees throughout the Delta. When they are removed, the area will resume its usual appearance.

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
II. AGRICULTURAL RESOURCES				
In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use? (The Farmland Mapping and Monitoring Program in the California Resources Agency, Department of Conservation, maintains detailed maps of these and other categories of farmland.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Involve other changes in the existing environment which, due to their location or nature, could individually or cumulatively result in loss of Farmland, to non-agricultural uses?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
III. AIR QUALITY				
Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Expose sensitive receptors to substantial pollutant concentrations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Create objectionable odors affecting a substantial number of people?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

- b) The barriers will not impact air quality except briefly during construction and removal. A small number of construction equipment at each site would be the only source of emissions. This impact is not considered significant. During this time DWR will meet air quality standards.

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
IV. BIOLOGICAL RESOURCES — Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Have a substantial adverse impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established resident or migratory wildlife corridors, or impede the use of wildlife nursery sites?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Discussion:

- a) Appropriate mitigation for the adverse environmental impacts caused by the Temporary Barriers Project will be developed through ESA consultation with the CALFED regulatory agencies. The development of mitigation measures through the consultation process will ensure that all adverse impacts are fully mitigated, and that the mitigation is consistent with the goals and objectives of the CALFED program. Mitigation measures required will become part of the project description and be included in the Final Mitigated Negative Declaration and Initial Study prior to the project beginning.

Potential mitigation strategies could include acquiring potential habitat for Mason's lilaeopsis in a mitigation bank such as Kimball Island or contributing funds for the study of Mason's lilaeopsis' ecology and habitat requirements.

- c) One of the elements of a previous Monitoring Plan is a study of the effects of the barriers on wetland vegetation communities. Because of concerns about unquantifiable impacts to plant life, DWR agreed to monitor several transects of endangered and unique species near the barrier area. No negative impacts have been reported and no significant adverse impacts are expected in the future. If any future studies show that significant impacts were occurring, DWR would modify barrier operations or remove the barriers.

- d) Barriers impede or delay fish movements, resulting in increased risk to young fish of predation or entrainment in agricultural diversions, and reduced reproductive success of adult fish attempting to return to natal streams to spawn. The Fall HOR barrier is designed to improve salmon migration in the San Joaquin River but it may also block salmon that migrate through the interior Delta. The barrier is notched in the center to facilitate salmon passage. The three agricultural barriers will also be notched in the fall.

The Grant Line Canal location is near a Swainson's Hawk nest. The barriers will only be put in when USFWS and DFG agree that the barriers can be installed in compliance with state and federal endangered species laws.

There is an increased net upstream flow in channels leading from the central to the south Delta due to the HOR barrier or three agricultural barriers acting together to form a hydraulic barrier. This results in transport of eggs and larvae to the south Delta, causing increased risk of predation, entrainment and other mortality. Flow changes also may and disorient migrating fish resulting in straying of juveniles and adults, causing increased mortality and reduced growth and reproductive success. Appropriate mitigation for these possible adverse environmental impacts will be developed through ESA consultation with the CALFED regulatory agencies, and will be included in the Final Mitigated Negative Declaration and Initial Study.

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
V. CULTURAL RESOURCES — Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Disturb any human remains, including those interred outside of formal cemeteries?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

a) This project is a continuation of a previously authorized project. All four barriers will be installed at the same sites as in the past. No cultural resources have previously been found. The areas are either man-made channels, or have been entirely modified and the likelihood of disturbance of cultural resources is very low.

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
VI. GEOLOGY AND SOILS — Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Div. of Mines and Geology Special Publication 42.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ii) Strong seismic ground shaking?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iii) Seismic-related ground failure, including liquefaction?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iv) Landslides?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Result in substantial soil erosion or the loss of topsoil?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
VII. HAZARDS and HAZARDOUS MATERIALS — Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the likely release of hazardous materials into the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
VIII. HYDROLOGY AND WATER QUALITY — Would the project:				
a) Violate any water quality standards or waste discharge requirement?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Otherwise substantially degrade water quality?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
j) Inundation by seiche, tsunami, or mudflow?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

- c) The Temporary Barriers Project will change flow patterns in South Delta channels, however, no change in the location or amount of present agricultural drainage will occur. There will be constant water movement in the channels, which will help eliminate any additional siltation.

- d) The purpose of the project is to increase low water levels upstream of the barriers by retaining tidal flow for a longer duration and to change the flow and circulation patterns to improve water quality for irrigation purposes. In the case of the barrier in Old River at Head, it will also change the flow of the San Joaquin River to improve migration patterns for San Joaquin chinook salmon. High tides or flood elevations will not be increased.

The barriers will not change the amount of surface water in the channels. Rather, the barriers increase the time of high water levels on the upstream side of the barriers, thus reducing the time of low water levels. The volume of flow into the area will stay the same.

- e) Placing and removing rock in river channels will cause short-term turbidity in the immediate area. This is not considered a significant adverse impact. Conditions will return to normal soon after installation or removal is completed. Installation is subject to conditions established by the CRWQB. See Chapter 11 on Monitoring.
- f) Model studies indicate that the Temporary Barriers Project will change circulation and benefit water quality in South Delta channels by removing some null zones. A null zone is a reach of a channel where flow is essentially stagnant, due to poor water circulation patterns. Some fisheries may also benefit from the removal of these null zones.

Modeling studies show that the barriers will improve water quality. Water quality is expected to improve because the barriers create positive circulation effects. Better circulation means higher dissolved oxygen, less turbid water, lower temperature, less salinity, and improved water current patterns. The monitoring program discussed in Chapter 11 contains elements for water quality monitoring.

- h) Due to the timing of installing and removing the barriers, this project will not alter flood control functions. The barriers would be installed after the primary flood season ends and taken out before it begins. However, in March the barriers would not be installed if forecasted river flows indicate installation would be unsafe. If March flows were high, the barriers would not be needed to maintain adequate water levels in the south Delta. Once installed, the barrier culverts would be tied open to pass unusual high flow events if necessary.
- i) The HORB incorporates an emergency removal plan which requires removal of the barrier whenever San Joaquin River flows exceed barrier design limits. This plan serves as a mitigation measure to ensure that overtopping and consequent erosion of the barrier does not occur. Uncontrolled erosion of the barrier could cause temporary high velocity flows through a barrier breach, that may damage adjacent local levees. This plan is in effect for the spring HORB only, when San Joaquin River flows tend to be high.

Additional. The project will not effect inflow, outflow, exports, agriculture diversions, or consumptive use. Inflow, outflow, and exports will remain the same because the project does not change existing diversion permits or water supply contracts. Changes are expected in interior channels in the south Delta. The impacts of such changes on fish, wildlife, and vegetation are discussed in previous sections and in the ASIP. As shown by modeling studies, the redirected flow will not alter flows in the lower San Joaquin River or change Delta Cross Channel flows. Agriculture diversions and consumptive use will not increase because farmers will continue to farm the same amount of acreage and use the same pumps. More discussion of this issue is in Chapter 2.

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
IX. LAND USE AND PLANNING — Would the project:					
a)	Physically divide an established community?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b)	Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c)	Conflict with any applicable habitat conservation plan or natural community conservation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
))					
X. MINERAL RESOURCES — Would the project:					
a)	Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b)	Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XI. NOISE — Would the project result in:					
a)	Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b)	Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c)	A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d)	A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f)	For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

d) The area that encompasses the sites for the barriers are generally rural agricultural land with low density residential development. Most residences are more than 500 feet from the barrier sites. Noise levels in the area would increase slightly during installation and removal of the barriers and then return to normal. To reduce noise impacts to less than significant, construction and removal of the barriers will be limited to daytime working hours.

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XII. POPULATION AND HOUSING — Would the project:					
a)	Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b)	Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c)	Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XIII. PUBLIC SERVICES					
a)	Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Fire protection?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Police protection?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Schools?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Parks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Other public facilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

- a) The Coast Guard and the local sheriff need immediate use of the channels. DWR has provided 24-hour phone numbers in case they need assistance to cross the temporary barriers at night. DWR agreed to provide 24-hour boat portage if this plan does not provide service fast enough. Thus far, no requirement for 24-hour portage has been requested.

The San Joaquin County Sheriff and the Coast Guard agreed to test this approach for 1992. In addition, as required by the Coast Guard, all buoys installed were approved by the Coast Guard in accordance with their regulations.

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XIV. RECREATION					
a)	Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b)	Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Discussion:

- b) The channels attract boaters for fishing, water-skiing, and other forms of recreation. Waterborne recreation will be impacted for a short time during installation and removal. This impact is mitigated by the inclusion of boat portage facilities in the barriers at Old River near Tracy and Grant Line Canal. No portage is available at the HOR barrier because boat traffic has historically been very light during the times that this barrier is operating. When the barriers are operational, the small boaters will have access to the channels during the day via these facilities at the barrier locations. However, traffic may be delayed for a short period. Some larger boats may not be able to be portaged across the barriers, however, large boat traffic is rare in the effected channels. The barriers may affect boating access in the project area, but access is already limited due to shallow channels, especially on Middle River.

Although marina owners are concerned the barriers will have a detrimental impact on their business, DWR is trying to alleviate any impact by providing boat portage where possible.

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XV. TRANSPORTATION/TRAFFIC — Would the project:					
a)	Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b)	Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c)	Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d)	Substantially increase hazards to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e)	Result in inadequate emergency access?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f)	Result in inadequate parking capacity?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g)	Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

Navigation Concerns. Navigation may be impacted, but DWR has and will continue to mitigate for this by providing boat portage.

Representatives from the boating community were present at a June 28, 1994 public meeting. At that time, they expressed their preference of having the barrier on the East Side of Tracy Boulevard Bridge. Even so, they stated that boat portage facilities still would be necessary.

Boat surveys were performed in 1988, 1991, 1992, and 1994. Boat surveys have been done to determine the impact the barriers may have on the boaters in the Delta. Summary tables are included below. It should be noted the eastern location for the Grant Line Canal site was only surveyed in 1995.

Barrier Site	Wed 9/7/88	Holiday 5/27/91	Wed 6/5/91	Sat 6/8/91
Grant Line	38	303	50	213
HORB	8	163	54	277
Middle River	16	14	0	12

Table 12. Boat Survey Data for 1991

Barrier Site	Wed 7/22/92	Sat 7/25/92	Wed 8/19/92	Sat 8/22/92	Holiday 9/5/92	Wed 9/16/92	Sat 9/19/92
Grant Line	50	283	52	209	215	21	211
HORB	40	179	67	198	224	25	111
Middle River	4	7	3	No survey	9	4	5

Table 13. Boat Survey Data for 1992

Barrier Site	Wed 7/12/95	Sat 7/15/95	Wed 8/9/95	Sat 8/12/95	Holiday 9/2/95	Wed 9/6/95
East Grant Line	16	111	38	230	102	28
West Grant Line	25	285	33	170	208	36
HORB	4	65	20	70	63	18
Middle River	4	19	0	14	9	5
Old River at Tracy	3	38	No survey	No survey	No survey	No survey

Table 14. Boat Survey Data for 1995

DWR conducted a short answer survey for the boaters in 1992 at both Old River sites. The boaters responded to four questions while their boats were ported across the barrier. The survey asked the boaters how they felt about the current barrier operation and asked for any suggestions. Almost all responses were positive (99 percent) toward the operation and facilities in Old River.

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XVI. UTILITIES AND SERVICE SYSTEMS. Would the project:					
a)	Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b)	Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c)	Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d)	Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e)	Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f)	Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g)	Comply with federal, state, and local statutes and regulations related to solid waste?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

ENVIRONMENTAL ISSUES		Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XVII. MANDATORY FINDINGS OF SIGNIFICANCE					
a)	Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b)	Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c)	Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Discussion:

CHAPTER 11 – TEMPORARY BARRIERS PROJECT MITIGATION MONITORING PLAN

A Monitoring Plan has been an integral part of the Temporary Barriers Project since 1992. A Monitoring Plan is required by Section 21081.6 of the Public Resources Code when adopting a Negative Declaration. At the time of adoption of the notice of Determination and final Negative Declaration, the Department of Water Resources (DWR) will adopt a reporting or monitoring program including changes made to the project or conditions to mitigate or avoid significant effects on the environment. The Monitoring and Reporting Plan is designed to ensure mitigation compliance during project implementation. In addition, the CALFED Multi-Species Conservation Strategy (MSCS) requires an Adaptive Management and Monitoring Plan Chapter in an Action Specific Implementation Plan (ASIP). The following will serve both for the CEQA requirement and the component of the ASIP for the Temporary Barriers Project permit extension project.

Mitigation Monitoring Plan

The Temporary Barriers Project Mitigation Monitoring and Reporting Plan is designed to ensure compliance with the mitigation measures necessary to reduce project impacts to a less than significant level. Because mitigation measures will be refined through endangered species consultation with DFG, USFWS and NMFS, this monitoring plan will be refined as well and finalized prior to approval of the project by DWR. The results will be reported by March 1 of each year for the monitoring of the previous year. This will give the agencies including DFG, DWR and USGS sufficient time to analyze the data and report on their findings before the beginning of the next Temporary Barriers Project operational season.

The Monitoring Plan consists of three primary elements: Fish, Water quality and hydrodynamics, and Vegetation. Each element consists of existing and new programs designed to better understand the physical and biological processes in the south Delta. The elements of the Monitoring Plan are listed below, and are followed by brief descriptions of each program.

Fisheries and Shallow Water Habitat

The analysis of the monitoring data will attempt to evaluate whether or not the implemented avoidance, mitigation or project operational measures are effective at reducing impacts to the sensitive fish species.

A number of studies and monitoring efforts are underway that relate to the Temporary Barriers Project. These include the USFWS salmon smolt survival studies through the Delta as part of the Vernalis Adaptive Management Program (VAMP), the DFG San Joaquin River salmon smolt outmigration monitoring and the DFG Adult Salmon Migration Tracking Study. The VAMP is a plan to experimentally manipulate flows in the lower San Joaquin River and exports to determine what combination of factors improves survivorship of salmon smolts outmigrating through the delta. The spring Head Old River barrier is an integral part of this program. The DWR provides funds to the USFWS through the Interagency Ecological Program (IEP) and the results of the study are reported by the USFWS.

The adult salmon migration study is a DFG study funded by CALFED. Although it is not a Temporary Barriers Project funded project, it is described here because it will provide valuable information on Temporary Barriers Project impacts to adult chinook salmon. This study will use sonic tags to track the migration of San Joaquin adult salmon through the southern delta channels to determine if the area of the seasonal dissolved oxygen sag or the barriers present a hindrance to the upstream migration. The results

of this migration study will be used to adaptively manage the Temporary Barriers Project if it is determined to be necessary. DFG is responsible for implementing this study as well as the San Joaquin smolt outmigration study and therefore they are responsible for the annual reporting.

Fish Community Sampling. Since 1992, DFG has conducted the fish community sampling for the Temporary Barriers Project. This program was designed to determine the impacts of the Temporary Barriers Project on fish communities in the southern Delta. Unfortunately, the program was not able to answer this question because of very limited pre-project monitoring. Additionally, the monitoring effort was conducted throughout numerous barrier operational scenarios and hydrologic year types. Additional similar monitoring will provide limited additional information.

The field element of the fish community-sampling program will be discontinued and an extensive analysis of the existing data will be conducted. Because the program has established a large database through extensive sampling in the south Delta with a variety of gear types, it will be used to examine the factors driving the fish communities of the southern Delta. Comparing the data analysis results to environmental conditions posed by the Temporary Barriers Project will be the most effective method to assess the impacts of the Temporary Barriers Project to fish communities in the southern Delta.

A replacement fish-sampling program may be developed cooperatively between DFG and DWR. The focus of such a program would be an evaluation of fish passage past the barriers.

Salmon Smolt Monitoring Through the Head of Old River Barrier (DFG). Another effort that DWR will continue to fund is the DFG sampling of salmon smolts passing through the head of Old River barrier in the spring. This program is designed to evaluate the potential impacts of entrainment of juvenile salmon through the culverts in the Head of Old River barrier. DFG conducted a preliminary study in 1997. Studies were not conducted in 1998 or 1999 because the Head of Old River barrier was not installed due to high San Joaquin River flows, however the study was conducted again in 2000. Objectives of the study include: 1) determining the numbers of coded-wire-tagged (cwt) and untagged salmon smolts that pass from the San Joaquin River into Old River through the culverts, 2) determine the diurnal effects of smolt passage, and 3) determine if cwt salmon released at Mossdale pass through the culverts in proportion to the percentage of flow diverted.

The Head of Old River Barrier is mitigation for the impacts of salmon smolt entrainment in the SWP Delta diversion facilities. DWR is investigating the feasibility of installing a USBR fish screen upstream of the culverts in the head of Old River Barrier in the spring to mitigate for impacts to salmon smolts, and potentially splittail juveniles, being entrained through the culverts. The culverts often need to be opened to improve conditions for the SDWA diverters downstream of the barrier. If the USBR screen is installed, the effectiveness of the screen will be monitored as well and the results reported annually.

Sherman Island Agricultural Diversion Evaluation. Partial mitigation under the USACE permit for the operation of the South Delta Temporary Barriers Project Project called for DWR to fund screen installations on multiple agricultural siphons on Sherman Island. These agricultural diversion screens are intended to offset potential south delta project impacts to delta smelt. However, the effectiveness of siphon screens and their overall benefit to delta fishes is not well understood. The purpose is to compare entrainment losses of fishes between side by side screened and unscreened siphons over several diel cycles during a dry year irrigation season. This is to provide data on the site-specific impact of the Horseshoe Bend diversions and the effectiveness of screening. This study is funded through both the Temporary Barriers Project and the Interagency Ecological Program.

In 2000, DWR conducted an agricultural diversion evaluation on Horseshoe Bend. Conditions for that study to occur are not predictable, however, if the conditions exist in the year 2001, DWR will conduct a subsequent evaluation of the effectiveness of fish screens at this location. A summary of the results of the study in 2000 will be reported in the next IEP Newsletter. This is an ongoing effort to evaluate the effectiveness of fish screens on agricultural diversions.

Temporary Barriers Project Impact on Fish Salvage. DWR proposes to prepare an annual summary report of fish salvage at the SWP and Central Valley Project (CVP) diversion facilities in the Delta and associated environmental conditions for the period of the operation of the Temporary Barriers Project each year. This is to: 1) monitor the effectiveness of the operation of the spring Head of Old River Barrier in reducing entrainment into Old River from the San Joaquin River, and 2) evaluate the operation of the culverts in the agricultural barriers in reducing entrainment of fish into the Delta diversion facilities. The results of this analysis will be used to adaptively manage the Temporary Barriers Project if it is determined to be necessary.

Water Quality and Hydrodynamics

A number of water quality and hydrodynamic studies and monitoring efforts are underway that relate to the Temporary Barriers Project.

Water Elevations and Flows in the Southern Delta. DWR annually conducts monitoring of water elevations, flows and water quality in the southern Delta channels to evaluate the effects of the Temporary Barriers Project. The barriers are mitigation for impacts to the South Delta Water Agency diverters due to a lowering of water elevations and reduction in water quality due to diversions at the SWP and CVP diversion facilities during the irrigation season. DWR will continue to conduct and annually report on the monitoring and the results will be used to adaptively manage the Temporary Barriers Project if it is determined to be necessary.

Southern Delta Continuous Water Quality Monitoring. The water quality sampling effort was expanded in 1999 to include the use of continuous recording multi-parameter instruments. This new effort will provide increased frequency and duration of sampling and the number of water quality parameters sampled. Interim water quality monitoring to insure compliance with turbidity standards required by the Regional Water Quality Control Board will continue as well. This monitoring will continue annually through the period of the Temporary Barriers Project permit extension.

Hydrologic Modeling. The USGS and DWR annually monitor flows and velocities in the southern Delta channels. The data are summarized on an annual basis to record the actual hydrodynamics in the southern Delta. The data are incorporated into the hydrodynamic and particle modeling efforts. Multi-agency review of the models, including USGS, is accomplished through the Particle Tracking Project Work Team and the Bay-Delta Modeling Forum. This effort will continue and the results will be used to adaptively manage the Temporary Barriers Project if it is determined to be necessary.

Vegetation

Mason's Lilaepsis. Since 1993, DWR has monitored Mason's lilaepsis populations up and downstream of the agricultural barriers. The methods changed over time to compensate for the dynamic nature of the plant's distribution. The results have been variable and it has been difficult to attribute a cause to the decline in number and surface area of the plant populations. The trend, however, over the period of the Temporary Barriers Project monitoring has indicated a decline in the populations. Therefore DWR staff have concluded that the Temporary Barriers Project may have impacted the Mason's lilaepsis populations in the vicinity of the barriers. DWR will work with the resource agencies

and CALFED through the consultation process, if necessary, to determine appropriate mitigation and monitoring for Mason's lilaeopsis.

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Several sources were utilized in the preparation of this Initial Study. These sources, along with the additional references cited at the end of the document, are available for review at the Department of Water Resources by contacting:

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APPENDIX A

Temporary Barriers Plans, Profiles, and Sections

APPENDIX B

CALSIM AND DSM2 MODELING RESULTS