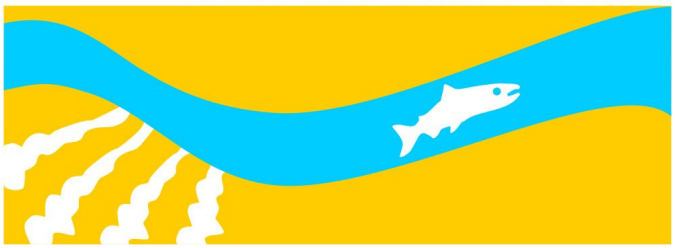
DRAFT Technical Memorandum

Alternatives Formulation Strategy

SAN JOAQUIN RIVER
RESTORATION PROGRAM



April 1, 2008

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List of Abbreviations and Acronyms

CEQA	California Environmental Quality Act
CVP	Central Valley Project
CalEPA	California Environmental Protection Agency
Delta	Sacramento-San Joaquin Delta
DFG	California Department of Fish and Game
DWR	California Department of Water Resources
FWUA	Friant Water Users Authority
IPAR	Initial Program Alternatives Report
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NRDC	Natural Resources Defense Council
P&G	Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (WRC, 1983)
PAR	Program Alternatives Report
PEIS/R	Program Environmental Impact Statement and Program Environmental Impact Report
PMT	Program Management Team
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RWA	Recovered Water Account
Settlement	*Natural Resources Defense Council et al. v. Kirk Rodgers et al.* Court Settlement
SJRRP	San Joaquin River Restoration Program
SWRCB	State Water Resources Control Board
TM	Technical Memorandum
USFWS	U.S. Fish and Wildlife Service

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This Draft Technical Memorandum (TM) was prepared by the San Joaquin River Restoration Program (SJRRP) Team as a draft document in support of preparing a Program Environmental Impact Statement/Report (PEIS/R). The purpose for circulating this document at this time is to facilitate early coordination regarding initial concepts and approaches currently under consideration by the SJRRP Team with the Settling Parties, Third Parties, other stakeholders, and interested members of the public. Therefore, the content of this document may not necessarily be included in the PEIS/R.

This Draft TM does not present findings, decisions, or policy statements of any of the Implementing Agencies. Additionally, all information presented in this document is intended to be consistent with the Settlement. To the extent that inconsistencies exist, the Settlement should be the controlling document, and the information in this TM will be revised prior to its inclusion in future documents. While the SJRRP Team is not requesting formal comments on this document, all comments received will be considered in refining the concepts and approaches described herein to the extent possible. Responses to comments will not be provided and this document will not be finalized; however, refinements will likely be reflected in subsequent SJRRP documents.

1.0 Introduction

In 1988, a coalition of environmental groups, led by the Natural Resources Defense Council (NRDC), filed a lawsuit challenging the renewal of long-term water service contracts between the United States and the Central Valley Project (CVP) Friant Division contractors. After more than 18 years of litigation of this lawsuit, known as *NRDC et al. v. Kirk Rodgers et al.*, a settlement (Settlement) was reached. On September 13, 2006, the Settling Parties, including NRDC, Friant Water Users Authority (FWUA), and the U.S. Departments of the Interior and Commerce, agreed on the terms and conditions of the Settlement, which was subsequently approved by the U.S. Eastern District Court of California on October 23, 2006.

The SJRRP will implement the San Joaquin River litigation Settlement. The "Implementing Agencies" responsible for managing the SJRRP are the U.S Department of the Interior, through the Bureau of Reclamation (Reclamation) and the Fish and Wildlife Service (USFWS); U.S Department of Commerce through the National Marine Fisheries Service (NMFS); and the State of California through the California Department of Water Resources (DWR), the California Department of Fish and Game (DFG), and the California Environmental Protection Agency (CalEPA). Consistent with the Memorandum of Understanding between the Settling Parties and the State, that was signed at the same time as the Settlement, the State, through DFG, DWR, the Resources Agency, and CalEPA, will play a major, collaborative role in planning, designing, funding, and implementing the actions called for in the Settlement.

The SJRRP is a comprehensive long-term effort to restore flows in the San Joaquin River from Friant Dam to the confluence of the Merced River, ensure irrigation supplies to Friant water users, and restore a self-sustaining fishery in the river. The SJRRP includes

many separate actions and projects that will be implemented at different times. The PEIS/R will consider the planned program as a whole, and thereby assemble and analyze the broadest range of direct, indirect, and cumulative impacts associated with the entire program rather than presenting detailed analyses of individual projects and actions within the program. With this approach, more detailed site-specific environmental documents for specific projects can be prepared in the future by focusing on the impacts of the proposed projects. The broader program-level impacts can be addressed by tiering the document off the PEIS/R.

Each initial alternative will address the SJRRP's purpose and need through both the SJRRP's Restoration Goal and Water Management Goal, as specified in the Settlement:

- **Restoration Goal –** To restore and maintain fish populations in "good condition" in the mainstem San Joaquin River below Friant Dam to the confluence with the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish.

- **Water Management Goal –** To reduce or avoid adverse water supply impacts to all of the Friant Division long-term contractors that may result from the Interim Flows and Restoration Flows provided for in the Settlement.

Reclamation and DWR have initiated environmental compliance documentation for the SJRRP. The Implementing Agencies have organized a Program Management Team (PMT) and several Technical Work Groups to develop a plan for implementing the Settlement through a joint National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) process, which includes preparation of a PEIS/R. Reclamation is the lead NEPA agency and DWR is the lead CEQA agency for the SJRRP.

To satisfy NEPA and CEQA requirements, the PEIS/R needs to consider a reasonable range of alternatives that can achieve these goals. There is no requirement to consider every possible alternative, but the document should provide rationale for developing, evaluating, and selecting a reasonable range of alternatives for meeting the SJRRP's purpose that will foster informed decision-making and public participation.

Preparation of the PEIS/R document will integrate compliance with NEPA, CEQA, and Section 404(b)(1) of the Clean Water Act. The process to develop and analyze the alternatives will satisfy all three acts:

- **National Environmental Policy Act** – NEPA requires Federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed actions, and reasonable alternatives to those actions.
- **California Environmental Quality Act** – Environmental documentation under CEQA has four main purposes:

  - Inform governmental decision-makers and the public about the potential significant environmental effects of proposed activities.
  - Identify the ways that environmental damage can be avoided or significantly reduced.
  - Prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible.
  - Disclose to the public the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved.

- **Section 404(b)(1) of the Clean Water Act.** Section 404(b)(1) stipulates that no discharge of dredged or fill materials into waters of the United States, which include wetlands, shall be permitted if there is a practicable alternative that would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant environmental consequences.

1.1 Document Organization

The strategy for alternatives development for the SJRRP Draft PEIS/R is a multistep, multiple document process that involves Implementing Agency team members and consultants, stakeholders, and the public.

This Draft TM describes the strategy for formulating SJRRP options (projects and management actions) into alternatives for evaluation in the PEIS/R. In May 2008, the Initial Program Alternatives Report (IPAR) will present preliminary results of alternatives formulation based on the process presented in this TM. The Program Alternatives Report (PAR) will build on the IPAR by refining the alternatives, ultimately leading to the range of alternatives selected for evaluation in the PEIS/R by October 2008. Comments received throughout this process will help refine the process and the resulting alternatives.

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2.0 General Methodology for Alternatives Formulation and Analysis

Given the numerous potential options that could be assembled to form alternatives for the SJRRP, a systematic methodology is needed to formulate a reasonable range of alternatives for analysis in the PEIS/R.

The methodology begins with defining the purpose, need, and objectives for the SJRRP, and identifies and develops planning constraints and assumptions. These in turn help to narrow the potential range of alternatives and focus on what the Implementing Agencies want to achieve. For example, the PEIS/R will evaluate alternative approaches to implement the provisions of the Settlement, but will not evaluate alternatives to the Settlement other than the required No-Action Alternative.

Identifying the study area, and developing screening criteria and approach for the options and alternatives provides further definition to focus the alternatives formulation process. Application of several stages of screening criteria allows selection of the most promising options and alternatives for meeting the SJRRP goals. The result of the methodology will be a short list of action alternatives (likely three to five) for detailed evaluation in the PEIS/R.

This methodology is based on an 11-step process that involves team members and stakeholders, and considers public comments received during the formal project scoping period in August and September 2007 (Figure 2-1) and described in the Public Scoping Report (December 2007). Additional comments received throughout application of this process will help refine the methodology and the resulting alternatives.

The results of the 11-step process to develop alternatives will be evaluated in reports prepared for review before the PEIS/R alternatives impact analysis begins. The IPAR will document the results of Steps 1 through 8 of the alternatives formulation process (Figure 2-1). The IPAR will present an initial range of alternatives to stakeholders and the public. The PAR will present the results of Steps 9 through 11 (Figure 2-1). A final PEIS/R will be prepared addressing comments received during the draft PEIS/R process.

1. Define Purpose, Need, and Objectives
2. Develop Planning Constraints and Assumptions
3. Identify Study Area
4. Develop Screening Criteria and Approach
5. Identify Themes for Restoration and Water Management Activities
6. Define Potential Options
7. Conduct First-Stage Options Screening
8. Combine Remaining Options into Alternatives for Each Goal
9. Conduct Second-Stage Screening of Alternatives
10. Combine Alternatives to Meet Both Goals
11. Conduct Third-Stage Screening of Combined Alternatives

Figure 2-1.
Eleven-Step Process to Develop Alternatives for the SJRRP

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3.0 Eleven-Step Process to Develop Alternatives

3.1 Step 1 – Define Project Purpose, Need, and Objectives

A purpose and need statement briefly explains why an action is being considered. It sets the overall direction of the environmental review process and serves as an important screening criterion for identifying, evaluating, and determining which alternatives are reasonable and should be evaluated in the PEIS/R. This direction is described below in the purpose, need, and objectives subsections.

3.1.1 Purpose

The SJRRP team has prepared a draft TM, Purpose and Need for Action (October 2007) that provides the cornerstone for alternatives development. As defined in the TM, the purpose of the SJRRP is to implement the Settlement by meeting the Restoration Goal and Water Management Goal.

3.1.2 Need

The Purpose and Need for Action TM identified a three-fold need for the SJRRP:

1. The need for action arises from the historic operation of Friant Dam, which has resulted in portions of the mainstem San Joaquin River between Friant Dam and the confluence of the Merced River being dry during significant portions of the year in most years, with corresponding impacts on fisheries downstream from Friant Dam. Interim Flows and Restoration Flows, in addition to other improvements providing for channel capacity, fish habitat, related flood protection, fish passage, and fish screening, are necessary elements for meeting the Restoration Goal.

2. The Interim Flows and Restoration Flows would create a substantial loss in water supplies to Friant Division long-term contractors. The need for action to develop and implement water management actions is essential to reduce or avoid these adverse water supply impacts, and is equal in significance to the needs of the Restoration Goal.

3. From a legal perspective, the need for action is in response to the Settlement in *NRDC et al. v. Kirk Rodgers et al.*, which was approved by the Court in October 2006.

Accordingly, the need for action is justified from a biological, water supply, and legal basis.

3.1.3 Objectives

The Draft Purpose and Need for Action TM identified several objectives that need to be met to successfully achieve the two SJRRP goals:

- Improve channel capacity, fish habitat, related flood protection, fish passage, and fish screening
- Release flows from Friant Dam to create conditions conducive to restoration
- Reintroduce spring-run and fall-run Chinook salmon to the San Joaquin River below Friant Dam
- Develop and implement a plan to recirculate, recapture, reuse, exchange, or transfer water released for Restoration Flows consistent with certain criteria identified in the Settlement
- Create a Recovered Water Account (RWA) that provides an opportunity to make water available to Friant Division long-term contractors with water supply reductions as a direct result of Interim Flows or Restoration Flows
- Employ an adaptive management strategy that determines the best means for effectively and efficiently achieving the goals and objectives of the SJRRP

More detailed numerical objectives from technical analyses may be available between the IPAR and the PAR to assist in refining the alternatives.

3.2 Step 2 – Develop Planning Constraints and Assumptions

The Settlement provides the basic framework for the alternatives. U.S. House Resolution 4074, if enacted, would provide Federal direction to implement the Settlement. In some cases, the provisions of the legal actions are very specific and leave little room for modification in assembling alternatives. In other cases, the provisions are less specific and leave more discretion to the SJRRP team developing the alternatives.

3.2.1 Stipulation of Settlement

The Settlement (September 2006) is a court document approved by the U.S. District Court. The Settlement is more specific about meeting the Restoration Goal than about meeting the Water Management Goal. Restoration and water management activities are primarily described in the following paragraphs of the Settlement:

- **Paragraph 11 – Channel and Structural Improvements.** This paragraph describes options in the form of channel and structural improvements. A reach-by-reach list of improvements is included with more specific improvements listed for some reaches than others. Modification of the channel capacity in Reach 2B, creation of a bypass channel around Mendota Pool, and potential modifications to the channel capacity in Reach 4B are the major channel improvements identified in the paragraph. The improvements also include a variety of juvenile fish screens, adult fish barriers, and flow control structures. The paragraph identifies

Phase 1 improvements that must be completed by December 31, 2013, and Phase 2 improvements that must be completed by December 31, 2016.

- **Paragraph 12 – Additional Channel and Structural Improvements.** This paragraph acknowledges that additional channel or structural improvements are likely needed (including, for example, additional fish screening, restoration of side channel habitat, and augmentation of spawning gravel) to help achieve the Restoration Goal.

- **Paragraph 13 – Restoration Flows.** This paragraph provides for specific volumes (0 acre-feet to 555,568 acre-feet) of water releases from Friant Dam for different year types (critically low to wet). The paragraph provides for up to an additional 10 percent water volume to meet the Restoration Goal.

- **Paragraph 14 – Reintroduction of Salmonids.** This paragraph provides for reintroduction of spring-run and fall-run Chinook salmon between Friant Dam and the confluence with the Merced River by December 31, 2012. However, it gives priority to restoring self-sustaining populations of wild spring-run Chinook salmon if competition, inadequate spatial or temporal segregation, or other factors beyond control make restoring spring-run and fall-run Chinook salmon infeasible.

- **Paragraph 15 – Interim Research Program and Releases.** This paragraph provides for beginning Interim Flows commencing no later than October 1, 2009, and continuing until full Restoration Flows begin. The flows shall be those identified in Paragraph 13 provided that they do not impede or delay completion of the Phase 1 items in Paragraph 11 or exceed channel capacity. The Interim Flows shall be as follows:

  - In 2009, release flows from October 1 through November 20.
  - In 2010, release flows from February 1 through December 1.
  - In 2011 and 2012, release flows from February 1 through May 1. In addition, from May 1 through September 1, release only flows to wet the channel down to the Chowchilla Bifurcation Structure to collect information regarding infiltration losses.
  - In subsequent years, release all Restoration Flows that do not interfere with construction of channel improvements or exceed channel capacities.

- **Paragraph 16 – Water Management.** This paragraph provides for a broad plan for recirculation, recapture, reuse, exchange, or transfer of the Interim and Restoration Flows to reduce or avoid impacts to water deliveries to all Friant Division long-term contractors. The paragraph also provides for an RWA to track water that is not returned to the water users through recapture, reuse, exchange, or other means, allowing those water users to purchase water during wet hydrologic conditions offset their delivery reduction.

- **Paragraph 20 – Changes to the Restoration Flows.** This paragraph provides for maintaining the Restoration Flows until December 31, 2025, unless they are augmented by water acquisitions from willing sellers or by written agreement. After December 31, 2025, the Restoration Flows shall not be changed unless they are augmented by water acquisitions from willing sellers, by written agreement, or a final recommendation of the State Water Resources Control Board (SWRCB) and a final Order of the Court.

3.2.2 Federal Legislation

U.S. House Resolution 4074, if enacted, would authorize implementation of the Settlement.

3.2.3 Other Key Issues to Be Addressed

Prior studies, the Settlement, studies conducted for this analysis, and input from the Implementing Agencies, stakeholders, and interested public revealed many issues to be considered during development and evaluation of alternatives in the PEIS/R. The Public Scoping Report (December 2007) summarizes the comments received as a result of a formal public scoping comment period that included four public scoping meetings held in August and September 2007. Some comments related to analyses should be included in the PEIS/R impact analysis. Other comments provided specific suggestions for options to include in the impact analysis. In addition, review of this material revealed issues that need to be addressed during alternatives formulation:

- **Strict time frame.** The Settlement calls for Interim Flows to begin no later than October 1, 2009, and for spring-run Chinook salmon to be reintroduced as soon as possible, but no later than December 31, 2012. Full Restoration Flows shall commence no later than January 1, 2014. The highest priority channel and structural improvements shall be completed no later than December 31, 2013, and other needed improvements shall be completed no later than December 31, 2016.
- **Limited funding.** Estimates of program costs have ranged between $250 million and $800 million, but costs for program implementation based on ongoing studies are yet to be determined. While firm commitments by funding sources are not final, expected funding is about $450 million, with about $19 million annually in addition.
- **Seepage from the river.** Some reaches of the river have carried little water over the past 50 years and landowners have concerns that seepage from the river will damage crops and adversely affect agricultural production.
- **Lack of channel capacity.** Reach 2B and Reach 4B do not currently have channel capacity to carry the anticipated Restoration Flows.
- **Irrigation flows.** Portions of the river must continue to function as conveyance for irrigation flows.
- **Restoration Flows.** Seepage from the river and flows needed for restoration may be greater than the hydrographs identified in the Settlement. The Settlement provides for acquiring additional water from willing sellers if needed. Water

required beyond the hydrographs shall not increase water delivery reductions to any Friant Diversion long-term contractors.

- **Flood control.** Flood control is a primary authorized purpose of Friant Dam, and nothing shall limit, affect, or interfere with the ability of the Secretary of the Interior to carry out flood control operations.

Many of these issues provide constraints to the alternatives development process.

3.3 Step 3 – Identify Study Area

The IPAR will describe the preliminary study area to be considered in the PEIS/R. It will also include the area that could be impacted by the proposed options or that could experience other future changes that might affect implementation and operation of the SJRRP. At a minimum, the study area includes Millerton Lake, a band along the San Joaquin River from Friant Dam to the confluence of the San Joaquin and Sacramento rivers, the Sacramento-San Joaquin Delta (Delta), and the CVP's Friant water service area.

3.4 Step 4 – Develop Screening Criteria and Approach

Given the large number of potential options, and combinations of options to be developed into initial alternatives, screening criteria and an overall approach are needed to identify reasonable and feasible options and alternatives. Three stages of screening are anticipated to result in a reasonable range of alternatives that will be evaluated in detail in the PEIS/R. The proposed screening criteria will be developed and presented in the IPAR, scheduled for review in May 2008.

The SJRRP team will consult several documents as screening criteria are developed:

- Guidance documents for Clean Water Act Section 404(b)(1), NEPA, and CEQA
- Reclamation's draft NEPA Handbook (2005)
- Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G) (WRC, 1983)
- SJRRP Public Scoping Report (December 2007)
- NEPA Notice of Intent (August 2, 2007)
- CEQA Notice of Preparation (August 22, 2007)
- Program Management Plan (May 1, 2007)
- SJRRP Purpose and Need for Action Draft TM (October 2007)

3.4.1 Screening Criteria

Specific and consistent screening criteria and assumptions will be developed to screen SJRRP options, logically aggregate options to assemble alternatives, and screen alternatives to determine reasonable alternatives for meeting the SJRRP purpose. Examples of potential screening criteria include the following:

- **Program Purpose.** Contributes to meeting the SJRRP purpose of implementing the Settlement, and meeting Restoration and/or Water Management goals and objectives (see Step 1 above).
- **Technical Feasibility.** Has no unreasonable engineering or geotechnical constraints, questionable or untested technologies, or unreliable availability of resources.
- **Environmental Acceptability.** Presents no major unacceptable environmental effects.
- **Cost.** Can effectively be completed according to overall Program cost constraints.
- **Implementation Timing.** Can be implemented within schedules identified in the Settlement.

3.4.2 Screening Approach

The Implementing Agencies have two related but distinct SJRRP goals that both must be met for an alternative to be considered complete, practicable, and feasible. The alternatives analysis will be structured so that identified options are screened to determine whether they can reasonably contribute to the SJRRP objectives. This first-stage screening will be performed on the initial list of individual options before they are combined into alternatives. First-stage screening will be used to remove options that cannot reasonably contribute to the SJRRP's purpose.

During second-stage screening efforts, the SJRRP team will assemble groups of options into initial alternatives to meet either the Restoration Goal or the Water Management Goal. The second-stage screening will be performed to retain a reasonable range of alternatives for meeting one of the SJRRP's two goals. This approach ensures that all possible combinations of potentially practicable alternatives will be evaluated in the alternatives analysis. Separate alternatives for meeting either the Restoration Goal or the Water Management Goal will be combined into potentially practicable alternatives that then meet both goals. Ultimately, an alternative must meet both goals to be considered complete and practicable. Each stage of evaluation will result in more specific analyses with greater resolution; options and alternatives that pass any one stage of screening are more likely to be implemented and require greater documentation to ascertain whether they are retained or rejected. The initial stage of screening will rely largely on engineering analyses; environmental effects will also be considered, but only at a general or reconnaissance level. Environmental effects will become more detailed in each subsequent stage of screening.

Alternatives (likely three to five) that emerge from these two screening stages and the final stage (described in Step 11) of the three-stage screening process will be subjected to

detailed evaluation in the PEIS/R, and result in identification of a preferred alternative, or proposed action. This detailed evaluation will also identify the environmentally preferred program alternative(s). Steps 5 through 11 below define the specifics of the alternatives formulation strategy.

3.5 Step 5 – Develop Themes for Restoration and Water Management Activities

The SJRRP team concluded that themes for each alternative would facilitate choosing options to achieve the alternative, and potentially identify new options. Although the themes would emphasize a particular restoration or water management aspect, they would not be mutually exclusive. Themes for restoration activities and themes for water management would be considered separately before the parts would be combined in Step 8.

The preliminary list of themes shown below will be refined in the IPAR. Results of technical studies such as those for water temperature may require modification in options selection or may present ideas for new themes.

Examples of possible restoration themes include the following:

- **Fish Transport Theme.** The alternative developed for this theme would include options that focus on using Reach 1 for all salmon spawning, rearing, and holding. The river and/or bypasses downstream from Reach 1 would be improved, as needed, to facilitate transport of fish upstream and downstream, but would not encourage salmon rearing or holding.
- **Full River Salmon Habitat Theme.** The alternative developed for this theme would use options that enhance all reaches of the river to provide broad habitat opportunities for salmon. River reaches downstream from Reach 1 would be improved to provide rearing and holding habitat. This alternative may represent a set of options that supports a practical upper limit of salmon production potential of the river.
- **Riparian Corridor Theme.** The alternative developed for this theme would use options that enhance river vegetation to create a diverse, continuous riparian corridor for movement of both fish and wildlife species while using the bypasses strictly for passing flood flows. The alternative would concentrate more on creating a living river than on constructing specific salmon habitat.
- **Strategic Channel Capacity Theme.** The alternative developed for this theme would minimize the need for new levees and channel improvements by using the existing channel capacities to the extent possible. The alternative would make only strategic improvements in the existing channel capacities to improve restoration opportunities where necessary. This alternative would rely on the Chowchilla, Eastside, and Mariposa bypasses to carry a portion of the Restoration Flows.

All themes will be aimed at restoring both fall-run and spring-run Chinook salmon. Alternatives may be reformulated if technical analyses indicate that competition, inadequate spatial or temporal segregation, or other factors make achieving the restoration of both spring-run and fall-run Chinook salmon infeasible (Paragraph 14 of Settlement). In this case, the alternatives will consist of options that support restoration of spring-run salmon.

Examples of possible water management themes include the following:

- **Existing Conveyance Facilities Theme.** The alternative developed under this theme would maximize use of existing and planned facilities to minimize the need for new conveyance facilities for water recirculation, recapture, reuse, exchange, transfer, and moving water made available by the RWA.
- **Maximize Water Recapture Theme.** The alternative developed under this theme would size diversion, conveyance, and storage facilities to recapture as much of the Interim Flows, Restoration Flows, and water made available by the RWA as possible.
- **Base Conveyance Theme.** The alternative developed under this theme would size diversion and conveyance facilities to efficiently operate throughout the year without large unused capacities for large portions of the year.
- **Accounting and Water Sale Theme.** The alternative developed under this theme would use the RWA and sale of wet period water, including new and upsized facilities, to move that water to demand centers, without recapturing the Interim Flows and Restoration Flows.

These example themes for restoration and water management are examples only. The SJRRP team is expected to develop descriptions for a range of themes once the range of options is determined. The team may decide to organize similar types of themes together in a hierarchal fashion. For example, two themes could be based on a range of locations for rearing habitat. Each of these themes could be further described by a range of subthemes for species type and then another range of subthemes by flow path. A similar hierarchal organization may be appropriate for the water management themes. For example, a range of diversion location themes may also be further described by a range of subthemes on conveyance sizes and a range of subthemes for storage or conveyance improvements to move wet period water from the RWA to the demand centers. In addition, there may be opportunities for partnerships with other agencies for some of the water management facilities.

3.6 Step 6 – Define Potential Options

As shown in Step 2, the Settlement stipulated many options for implementation. While some of the options are very specific, other options are concepts that require evaluation to refine how they could be used.

In addition, more than 18 years of litigation culminating in the Settlement in September 2006, resulted in many studies during this period that added to the understanding of the San Joaquin River and contributed to reaching the Settlement. (See the program library on the SJRRP Web portal http://www.restoresjr.net/.) These studies included hydrology, river hydraulics, geomorphology, ecosystem conditions, land use, fisheries, and many other topics. These studies provide insights into potential opportunities for and limitations on river restoration and water management, and give context for developing alternatives to meet SJRRP planning objectives.

Even though previous studies resulted in a wealth of information on the San Joaquin River system, additional detailed analyses are required to better define reasonable options, sensitive environmental resources in the area, types of potential impacts, and costs for various options (e.g., physical changes, operations, management practices) that could be included in alternatives. Four technical work groups (Water Management, Fisheries Management, Engineering and Design, and Environmental Compliance and Permitting) are reviewing technical details that affect the suitability of different structural and nonstructural options. These analyses are considering the following:

- Specific features such as fish screens and diversion structures
- Reach-by-reach evaluation of channel capacities, hydraulic characteristics, use, and needed improvements for fisheries benefits
- System-wide considerations such as water temperature and geomorphology
- Layout of potential options for water recirculation, recapture, reuse, exchange, or transfer of the Interim Flows and Restoration Flows to reduce or avoid impacts to water deliveries to all Friant Division long-term contractors
- Real estate analysis, including identification and record management of land ownership information

The Technical Work Groups will identify the possible options that are consistent with Steps 1 and 2 above and present that information in an appraisal-level Water Management and Fish Options TM. This will be supported by TMs on water recapture opportunities, river seepage, restoration flow guidelines/RWA, and other ongoing evaluations. Information in these TMs will be used to help assemble options into alternatives and guide the evaluation of alternatives.

3.7 Step 7 – Conduct First-Stage Options Screening

Possible options will be subjected to the first-stage screening criteria (see Step 4 above for examples of screening criteria that may be considered in the IPAR). The screening is expected to remove options that clearly do not meet SJRRP goals, and options that do not meet other screening criteria, rendering them impracticable or infeasible for implementation. For example, if a member of the public suggests enhancing the Merced River as a more cost-effective method of producing salmon, this concept would be eliminated from further consideration because it does not contribute to the Restoration Goal for the San Joaquin River below Friant Dam. Other similar concepts will be briefly described and the reasons for elimination clearly identified.

The IPAR will present results of the first-stage options screening and the reasons for retaining or eliminating options.

3.8 Step 8 – Combine Remaining Options into Alternatives for Each Goal

Given the range of options that may meet the first-stage screening criteria (output from Step 7), there are numerous ways of combining them into alternatives. This step defines logical combinations of options that would work together in alternatives. Once the range of potential options is defined, the SJRRP team will consider how to combine them based on various themes for alternatives.

3.8.1 Common Options

The SJRRP team expects that some options will not vary in size or implementation and need to be included in each alternative. These "common options" will be packaged together with an explanation of why they should be included in all alternatives. An example of a common option is the RWA developed by the Water Management Work Group. Another common option may be a particular restoration action such as the Mendota Pool bypass channel.

3.8.2 Range of Options

Each type of option passing the Step 7 screening is expected to have a range of possible variations in implementation. For example, the flow path from Friant Dam to the confluence with the Merced River could take a number of routes among the river and the flood bypasses. Also, there is a range of potential fish control structures, and a range of methods to control vegetation. The SJRRP team will define a probable range of implementation for each type of option passing the Step 7 screening. Documenting the range of options will facilitate combining options when formulating initial alternatives.

Potential ranges for different types of options are shown in Table 3-1 examples only. The IPAR will present draft ranges of options for further refinement.

Table 3-1.
Potential Range of Options

Type of Option (partial list for illustration only)	Example Ranges
Volume of water released from Friant Dam	• 110 percent of Exhibit B (Settlement) hydrographs • Additional amount of water that may need to be acquired from willing sellers
Flow path from Friant Dam to confluence with Merced River[1]	• No flow to Reach 4B • Flow of 475 cfs to Reach 4B • Full 4,500 cfs to Reach 4B
Channel capacity improvements, including floodplains, levees, etc.	• No grading other than needed for channel capacity • Grading to provide floodplain habitat in all or some reaches
Vegetation management	• None • Full riparian corridor
Structures	• Flow control structures based on flow path • Addition of fish screens in Reach 1
Gravel pits	• Isolation of high priority gravel pits from the river • Isolation and/or filling all gravel pits
Other Settlement Paragraph 12 measures not covered by ranges for above options	• No Paragraph 12 measures necessary • Paragraph 12 measures
Water recirculation, recapture, reuse, and exchange	• No diversion • Low capacity diversion that can operate for most of year • High capacity diversion to capture majority of flows

Note:
[1] Restoration Area
Key:
cfs = cubic feet per second

3.8.3 Assemble Options into Initial Alternatives

Using the themes as a guide, the SJRRP team will assemble a preliminary list of initial alternatives based on each theme. Each theme will be supported by a different list of options selected from the range of options.

Initial alternatives that satisfy the Restoration Goal and initial alternatives that satisfy the Water Management Goal will be developed separately and presented along with brief descriptions of existing conditions and the no-action future conditions in the IPAR. Formulating and evaluating these initial alternatives will provide an understanding of how options work together at various sizes and combinations, and will identify potential system-wide effects and opportunities. The IPAR will identify and document criteria and assumptions used to forecast the most likely with-project conditions expected under each initial alternative plan.

Each initial alternative will be developed to a level of detail sufficient to support preparation of appraisal-level cost estimates. Each initial alternative will be described in a one to two page format, including a detailed map; schematic diagram; list of options and narrative discussion of facilities including capacities, configurations, and locations; and

institutional/implementation issues. The following information will be included in the description of each initial alternative:

- **Operations.** Assumed operational criteria
- **Schedule.** Estimated time to construct and bring facility online
- **Land requirements.** Right-of-way requirements and feasibility of obtaining the required rights-of-way
- **Permitting requirements.** List of permits by agency with estimated lead times to procure, with emphasis on permits requiring long lead times
- **Environmental effects and opportunities.** Biological, physical, cultural, socioeconomic, and recreation; preliminary assessment of mitigation measures
- **Constructability.** Terrain considerations, utility requirements and impacts, and staging requirements

The main purpose of the initial alternatives in the IPAR will be to gain information on how combinations of options function together in different alternatives. It is unlikely that any of the initial alternatives will eventually become the preferred program alternative in the PEIS/R. Some reformulation of the alternatives can be expected in the PAR based on results of technical analyses.

3.9 Step 9 – Conduct Second-Stage Screening of Alternatives

The possible initial alternatives resulting from Step 8 will be subjected to second-stage screening criteria (see Step 4 above for examples of screening criteria). The results of this screening will be presented in the PAR. Information from other SJRRP TMs (Step 6) will be used to help guide evaluation of alternatives and reformulation alternatives.

3.10 Step 10 – Combine Alternatives to Meet Both Goals

To form complete alternatives, the alternatives retained after Step 9 second stage screening must be combined to form alternatives that meet both the Restoration Goal and Water Management Goal. The SJRRP team will look for logical combinations of the alternatives that avoid conflicts between the two goals and represent the full range of alternatives from Step 9.

3.11 Step 11 – Conduct Third-Stage Screening of Combined Alternatives

The combined alternatives resulting from Step 10 will be subjected to third-stage screening criteria (see Step 4 for examples of screening criteria). This final screening is a last check that the alternatives do not contain internal conflicts between the Restoration Goal and Water Management Goal, and that the alternatives are still implementable. The results of this screening and the final alternatives will be presented in the Program Alternatives Report (PAR) for evaluation in the PEIS/R. The final PEIS/R, scheduled for completion in July 2009, will identify a preferred program alternative that may be a hybrid of the Program Alternatives contained in the PAR.

SJRRP alternatives development progress as of February 29, 2008, is shown in Figure 3-1.

- **Step 1 – Define Project Purpose, Need, and Objectives.** Completed in October 2007
- **Step 2 – Develop Planning Constraints and Assumptions.** Settlement completed in September 2006, scoping completed in December 2007, and Federal legislation still in progress
- **Step 3 – Identify Study Area.** Work in progress expected in draft form in IPAR in May 2008
- **Step 4 – Develop Screening Criteria and Approach.** Work in progress expected in draft form in IPAR in May 2008
- **Step 5 – Identify Themes for Restoration and Water Management Activities**
- **Step 6 – Define Potential Options.** Technical Work Group products expected to be compete by end of February 2008

Remaining steps will begin in March 2008 when options from Step 6 are available.

Figure 3-1.
SJRRP Alternatives Development Progress as of February 29, 2008

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4.0 References

Natural Resources Defense Council, The Bay Institute of San Francisco, Trout Unlimited of California, California Sportfishing Protection Alliance, California Trout, Friends of the River, Nor-Cal Fishing Guides and Sportsmen's Association, Pacific Coast Federation of Fisherman's Associations, San Joaquin Raptor Rescue Center, Sierra Club, Stanislaus Audubon Society, Inc, United Anglers of California, California Striped Bass Association, and National Audubon Society v. Kirk Rodgers, as Director of the Mid-Pacific Region of the United States Bureau of Reclamation, Dirk Kempthorne, as the Secretary of the Interior, Carlos Gutierrez, as the Secretary of the United States Department of Commerce, Rodney McInnis, as Regional Administrator of the National Marine Fisheries Service, Steve Thompson, as California and Nevada Operations Manager of the United States Fish and Wildlife Service. 2006. Stipulation of Settlement. U.S. District Court, Eastern District of California (Sacramento Division). September 13.

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