

CHAPTER 9. NEXT STEPS AND KEY ISSUES

The plan formulation stage will identify alternatives to be carried forward for detailed environmental review. The plan formulation approach will include technical evaluations to identify the beneficial and adverse effects of alternatives. A broader range of technical evaluations than those completed for the IAIR will be required to support evaluation, comparison, and refinement of initial alternatives. Analytical methods and tools to support evaluations of monetary and non-monetary benefits and impacts will be developed, cost estimates will be refined, operations scenarios will be applied, and initial alternatives will be refined and screened. Plan formulation will culminate with a set of complete alternatives that appear feasible in meeting the planning objectives.

This chapter includes two sections. The first describes technical studies and activities that will be completed during the plan formulation stage. The second section describes key issues that will need to be addressed during plan formulation and resolved prior to the completion of a final FR.

TECHNICAL STUDIES TO SUPPORT PLAN FORMULATION

Studies to support plan formulation will proceed in several key technical areas. As described in **Chapter 8**, technical teams are being established, each with a unique area of technical responsibility, comprising Reclamation, DWR, and cooperating agency staff that possess technical knowledge and skills to assist the Investigation. Technical teams include engineering, water operations, environmental resources, economics, conjunctive management, hydropower, and flood protection. Specific areas of focus for each technical team are described below.

Water Operations

Water operations results presented in the IAIR are based on preliminary evaluations that will be revised and expanded during the plan formulation stage. Estimates of new water supply for storage measures presented in **Chapter 6** are based on preliminary CALSIM simulations completed in Phase 1, which quantified the amount of new water supply that could be developed with additional storage. Operations scenarios described in **Chapter 7** were developed using an operations screening model to identify the range of operational decisions to be considered. As the Investigation proceeds, considerable additional work will be needed to evaluate potential uses of new water supplies and to identify project benefits. To support these needs, water operations evaluations initially will focus on the areas described below.

CALSIM Model Refinements

Several refinements will be made to the CALSIM model to incorporate operational criteria that will be developed and evaluated through use of the operations screening model. Model refinements will involve extending the hydrologic period through 2003 and better defining the interactions of hydrology and water quality upstream from the Merced River. Further refinements to methodology and assumptions will likely be identified during the plan formulation stage as guidance and comments are received from cooperating agencies, stakeholders, and interested participants, and as the breadth of analysis is better defined.

Water Quality Modeling

Evaluations during plan formulation will focus on how storage can be operated to contribute to restoration and improve water quality in the San Joaquin River. Water-quality-related models for river water quality, and reservoir and river water temperature will be required to support these evaluations.

San Joaquin River Water Quality

Using results from the hydrology development described above, representation of the San Joaquin River from Friant Dam to the Merced River will be disaggregated for calculating San Joaquin River water quality. Water quality attributes will be assigned to each hydrologic component and a linkage between source water and return flows will be established. This evaluation will rely on information from other studies, such as the Exchange Contractors' work in relating the quality of delivered water and resulting return flows and information collected by Reclamation and others during a sustained flood release from Friant Dam during spring 2005.

The CALSIM model will be modified to include water quality calculations for the reach from Mendota Pool to the Merced River. In addition, the CALSIM model will be used to identify the effects of changes in San Joaquin River flow and quality on the lower San Joaquin River near Vernalis. Reclamation is currently revising the CALSIM water quality module for the lower San Joaquin River in a separate study. It estimates water quality in the San Joaquin River upstream of the confluence of the Stanislaus River and simulates the operation of New Melones Reservoir to meet water quality standards in the San Joaquin River as it enters the Delta. The Investigation will utilize the most current versions of the models to identify water flow and quality effects to the Delta.

Reservoir and San Joaquin River Water Temperature

It is anticipated that some restoration plans will include water temperature requirements for releases from Friant Dam. Evaluating how storage can contribute to restoration will require developing and applying reservoir water temperature models for existing and potential expanded configurations of Millerton Lake, and for all other surface storage measures included in initial alternatives. Temperature evaluations also will be needed at key downstream locations in the San Joaquin River.

A river temperature model will be required that can estimate changes in water temperature along the river in response to releases from Friant Dam, losses, gains from local streams, inflow from the DMC, agricultural return flows, and ambient atmospheric conditions. Both the reservoir and river temperature models will be developed in close coordination with agencies and stakeholders, and will use information from other ongoing studies to the extent possible.

Development of Multiple-Purpose Operations Scenarios

Preliminary evaluations demonstrated that water allocated to a specified project purpose also could contribute to other purposes. As the investigation proceeds, scenarios will be developed to address multiple operational objectives rather than targeting single purposes.

Allocation and Storage Rules to Support Multiple Purposes

Developing multiple-purpose operations scenarios will require the addition of several key decision-making features to the CALSIM model. The scenarios will integrate a set of rules to guide allocation and reservoir storage levels based on a broad range of objectives that could include river restoration needs, reservoir water temperature, water delivery objectives, reservoir biological conditions, hydropower operations, flood management, and recreation. The screening model will continue to be used for this purpose as operations objectives for multiple purposes are developed. Information to guide reservoir operations in support of some of the possible operations objectives will be developed through the cooperating agency technical teams.

Project-Specific Operations

Integrated operations of proposed facilities with the existing system for various objectives will be evaluated. Proposed facilities will be integrated into the existing system and their unique characteristics will be reflected. Integrated operations will evaluate strategies to balance storage levels among facilities in a manner that maximizes the ability to meet project objectives.

Potential Downstream Recapture of Released Water

It is possible that water supply that could be developed with additional storage would not be sufficient to support the flow objectives of all restoration plans. The Investigation also may consider opportunities to release some currently allocated water supplies that could be recaptured at downstream locations, thereby increasing flows for restoration and potentially improving water quality in the San Joaquin River. Recapture provides an opportunity to convey all or a portion of the water released for restoration or water quality purposes to Friant Division water users. Downstream recapture will not be included in initial alternatives, but may be added to address specific restoration flow and water delivery objectives.

Environmental Resources Evaluations and Issues

Evaluation of initial alternatives will include more detailed descriptions of environmental effects. This will include potential impacts to environmental resources that would be affected by development of surface storage measures and potential beneficial or adverse effects in areas downstream from Friant Dam. Two cooperating agency technical teams will be formed to address these issues; one focused on reservoir area environmental resources, another on downstream environmental resources. Brief descriptions of initial areas of focus for these teams are described below.

Reservoir Area Environmental Resources

A preliminary summary of environmental resources in the potential reservoir areas, derived from readily available published information and comments received during scoping, is presented in **Chapter 3**. This information was used for preliminary comparisons of storage measures presented in the IAIR. As the Investigation proceeds, more detailed information will be needed to identify potential impacts to biological, cultural, and social resources, and to develop potential mitigation measures. In coordination with cooperating agencies, the Investigation team will develop an inventory of aquatic, botanic, wildlife, cultural, historic, and archeological resources in and around Millerton Lake upstream to Kerckhoff Lake, and the Fine Gold Creek watershed.

Impact assessment methodologies will be developed for each resource that will be based, in part, on output from water operations evaluations. Operations objectives to minimize adverse effects or provide desirable conditions for specific species will be developed and provided to the water operations team. Initial alternatives will be evaluated to identify the type and extent of changes that would affect species health and abundance, and potential impacts to cultural resources. Preliminary mitigation measures will be developed as the investigation proceeds.

Downstream Environmental Resources

As described in **Chapter 2**, restoration plans for the San Joaquin River are under various stages of development through other ongoing efforts. Although the Investigation is not developing a restoration plan for the San Joaquin River, alternatives will be evaluated, in part, based on their ability to support ecosystem restoration. It is expected that multiple plans will become available for consideration in the Investigation during the coming months. These plans will likely identify various flow and water temperature requirements for Friant Dam releases and potential physical modifications to the river system downstream of Friant Dam to achieve a specified level of ecosystem restoration.

Potential restoration strategies may range from targeting a resident fishery in a limited portion of the San Joaquin River to a naturally producing anadromous fishery from Friant Dam to the Delta. Evaluating the manner in which storage could contribute to various restoration plans will require development and application of additional models, such as reservoir and river temperature models, as described above.

The downstream environmental resources technical team will review restoration strategies and plans developed through other studies and will identify a range of specific operations objectives to be considered in the Investigation. Evaluation of preliminary alternatives will require development and application of hydraulic and temperature models and other analytical tools to identify the extent to which an alternative could support restoration objectives.

Based on the potential new water supply that could be developed with additional storage, as described in this report, it is likely that additional storage alone may not be adequate to fully support the needs of all possible restoration plans. It is likely that other actions would be needed to provide additional water supplies and implement potential modifications to river channels and structures that may be described in the restoration plans. The Investigation will identify the extent to which an alternative can contribute to a given restoration plan, but will not identify specific additional actions that would be included for a comprehensive restoration plan and water supply alternative. It is anticipated that each alternative will consider a range of operations to identify the manner in which the restoration plan could be most reliably supported with the

development and management of additional water supplies in the upper San Joaquin Rive Basin. However, a mechanism for comprehensive evaluation, comparison, and decision-making regarding San Joaquin River restoration will be needed.

Ongoing litigation regarding potential releases from Friant Dam will continue during preparation of the PFR. The current assumption, that without-project conditions would be a continuation of existing operations, could be changed by judicial decision. Under such circumstances, plan formulation efforts would be modified to reflect the then-current without project conditions, and project objectives would be reviewed and revised as necessary.

Engineering

The engineering technical team will update designs and cost estimates for retained storage measures, as needed, to support evaluation of initial alternatives. Refinements will include enhancements of dam and associated infrastructure designs for specific elevations, establishing consistent levels of design for all features, and a common price level for all costs. All designs and cost estimates will be developed in accordance with Reclamation standards for feasibility studies. Initial work will focus on standardizing at a pre-feasibility level of detail. The level of detail will be increased as the number of alternatives is reduced during plan formulation. Feasibility-level cost estimates will be prepared for the preferred alternative when it is identified.

Hydropower Evaluations and Issues

Power generation results presented in the IAIR are considered preliminary and subject to change because of simplifying assumptions, including large time step and preliminary facility sizes considered in the analyses. Hydropower studies to be completed during plan formulation will address the affects of multiple-purpose water operations on hydropower generation, ancillary benefits of hydropower facilities, regional transmission, time-step refinement, and pumped storage opportunities for peak and off-peak conditions. These studies will require close coordination with PG&E and SCE to assure proper consideration of system effects associated with the loss of existing generating capabilities and to evaluate approaches to integrate new power generation with existing power systems.

As described in Chapter 6, several storage measures would result in significant impacts to the operation of existing hydropower generation facilities and include various options for the generation of replacement power. Project alternatives that include development of new hydroelectric generating facilities would likely require non-Federal partnership for the long-term operation of the facilities.

Flood Control Evaluations and Issues

As discussed in **Chapter 6**, development of additional storage provides opportunities for additional control of flood flows through the dedication of additional flood management space. Preliminary evaluations presented in the IAIR identified potential changes in flood damages that could result from increasing dedicated flood management space at Friant Dam and operating the space under existing and reduced objective releases.

Additional evaluations to be completed during plan formulation will address trade-offs between dedicated flood management space and new water supply. These evaluations will help refine the definition of flood management in the formulation of multiple-purpose alternatives.

The flood protection scenarios did not consider the potential incidental flood benefits that would accrue from enlarging storage with no change in dedicated storage space or objective releases. These benefits are likely significant in comparison to the additional benefits provided by enlarging dedicated storage or changing objective flows. A methodology to identify flood benefits that would result with no change in flood management space will be considered.

The flood protection evaluations also did not consider downstream channel modifications. Channel modifications to support restoration could involve relocating and strengthening levees, thereby increasing their ability to provide flood protection. Future studies will need to consider the flood protection effects that would result from channel and levee modifications to support ecosystem restoration.

Economics

Economic analyses will focus on developing and applying methodologies to estimate benefits of a broad range of monetary and non-monetary outputs. These outputs include water supply reliability, river restoration, improved river water quality, improved urban water quality, lost and replacement hydropower generation, flood damage reduction, and recreation. Issues to be considered will include seasonal and multiyear effects resulting from changes in the availability of water for irrigation, municipal, and environmental uses. Development of economic methods will be coordinated with the water operations, environmental resources, hydropower, and flood protection technical teams.

Groundwater Storage and Conjunctive Management

As described in **Chapter 6**, additional work is needed to develop specific conjunctive management and groundwater storage measures for inclusion in Investigation alternatives. Next steps will include a set of evaluations and more rigorous screening criteria. An analysis of surface water availability for use in conjunctive management projects will be performed as the next step in further evaluation of retained conjunctive management projects. The evaluation would include development and application of a screening model to determine which rivers (or combinations of rivers) have the greatest potential to supply water for conjunctive management projects that could support Investigation goals and objectives. Those with the greatest potential would be subjected to detailed modeling and analyses, including the application of water quality standards and Delta operating rules, to quantify the amount of surface water available.

Specific projects also will be evaluated for consideration in alternatives. Evaluation criteria will be developed to quantify additional water supply, estimate capital and annual project costs, identify specific institutional arrangements that would be required for implementation, and identify local entities that would implement the project to support Investigation objectives. Potential evaluation criteria are described in **Chapter 6**. Once specific groundwater storage and conjunctive management measures are selected for consideration in the Investigation, they will be combined with surface water storage measures in project alternatives.