

# RECLAMATION

*Managing Water in the West*

## Upper San Joaquin River Basin Storage Investigation

Study Update  
November 2007



U.S. Department of the Interior  
Bureau of Reclamation



State of California  
Department of Water Resources

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The **Upper San Joaquin River Storage Basin Investigation** (Investigation) is a joint feasibility study by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation), and the California Department of Water Resources.

The purpose of the Investigation is to determine the **type and extent of Federal, State, and regional interests** in a potential project(s) in the upper San Joaquin River watershed to **expand water storage capacity; improve reliability and flexibility of the water management system** for agricultural, urban, and environmental uses; and support fish restoration efforts.

Progress and results of the Investigation are being documented in a series of interim reports and will culminate in a feasibility report and environmental impact statement/ environmental impact report (EIS/ EIR). All prior reports are available at [www.usbr.gov/mp/scca/storage](http://www.usbr.gov/mp/scca/storage).

A settlement geared to restore the San Joaquin River from Friant Dam

to the confluence of the Merced River has led to several refinements of the Investigation. Key among these is **refinement of the Investigation's planning objectives** in response to the increase in river releases from Friant Dam as outlined in the settlement.

This document addresses adjustments to the Investigation's plan formulation process and the **potential benefits** that could be realized if additional storage was created in the upper San Joaquin River watershed. It also includes updates on recent **geologic investigations**, preliminary water temperature **modeling findings**, and other study activities.

Three of an initial 22 possible reservoir sites are currently being evaluated. The number of reservoir sites will be reduced further as the feasibility study progresses towards identification of a preferred alternative. A No-Action/No-Project Alternative is also being evaluated, and is included as a basis for comparison.

## Storage Investigation Adjusts to River Restoration Settlement



The September 13, 2006, Stipulation of Settlement (Settlement) by Reclamation, the Friant Water Users Authority (FWUA), and a coalition of 14 environmental groups represented by the Natural Resources Defense Council seeks to resolve an 18-year case addressing restoration of the San Joaquin River. The Settlement describes water management actions and channel modifications to restore and maintain anadromous and other fish on the San Joaquin River from

Friant Dam to the confluence with the Merced River.

Implementation of the Settlement is subject to future legislation and appropriations by the U.S. Congress and appropriations by the State Legislature. From the onset of the Investigation, it has been anticipated that resolution of the litigation would have an effect on the Investigation and that any necessary adjustments would be made.

Prior to the Settlement, the Investigation's "without-project conditions" assumed that in the absence of any new storage project(s) in the upper San Joaquin River basin, existing and future water releases from Friant Dam would not include additional flows to support restoration of the San Joaquin River downstream, and that long-term average deliveries to water users would not be reduced.

As a result of the Settlement, Reclamation has reviewed and refined the Investigation's objectives, assumptions, scope, and schedule. A key change to the Investigation is a revision of the assumed without-project conditions to now include water releases from Friant Dam dedicated to restore and maintain fish populations in the San Joaquin River below Friant Dam to the confluence of the Merced River.

# Planning Objectives Refined

Since its inception in 2002, the Investigation has considered the primary objectives of contributing to San Joaquin River restoration; improving San Joaquin River water quality; facilitating additional conjunctive water management in the eastern San Joaquin Valley to reduce groundwater overdraft; and support exchanges that improve the quality of water delivered to urban areas. Primary objectives drive the formulation of alternatives.

As a result of the Settlement, the planning assumptions, objectives, and alternatives will be refined (see Primary Planning Objectives). For example, refinements to the restoration objective include management of cold water for restoration releases, and increasing flows during critical low years for meeting Settlement goals of restoring and maintaining naturally reproducing and self-sustaining anadromous fish in the San Joaquin River from Friant Dam to the Merced River.

The Settlement also includes a water management goal to reduce or avoid adverse water supply impacts to the Friant Division long-term contractors that result from interim flows and restoration flows provided for in the Settlement. However, it does not specify actions to achieve this goal or the



Primary Planning Objectives	
Post-Settlement Refinement of Primary Objectives	Reasons for Primary Objectives
Enhance water temperature and flow conditions in the San Joaquin River from Friant Dam to the Merced River for restoring and maintaining naturally reproducing and self-sustaining anadromous fish.	Capability to release water from Friant Dam at suitable temperatures for anadromous fish in all year types, and increased flow during critical low years, will be important issues for meeting Settlement restoration goals.
Increase water supply reliability to Friant Division water users.	Water supply reliability problems in the southeastern San Joaquin Valley are evident through a long-term downward trend in groundwater levels and decreased surface water allocations in many years. Implementation of Settlement flows will exacerbate these problems.

volume of water to be replaced. FWUA has estimated that implementation of the Settlement may reduce the average annual delivery of water to long-term contract holders in the Friant Division of the Central Valley Project (CVP) by about 170,000 acre-feet.

The Settlement has led to additional consideration of how increased water storage may help alleviate the resulting water delivery reductions to the Friant Division. As a result of, and consistent with the Settlement, the evaluations of Investigation alternatives will be refined to consider improving water supply reliability in the Friant Division. This could be a combination of additional surface water deliveries and conjunctive management (which was already under consideration before the Settlement).

Implementation of Settlement flows are expected to improve San Joaquin River water quality. Additional improvements to San Joaquin River water quality that would result from new storage on the upper San Joaquin River are likely to be minor and incidental to flow releases made to meet restoration goals.



Because these flow releases are now assumed to be part of the without-project conditions, the objective to improve San Joaquin River water quality has been changed to a secondary objective for the Investigation. Other secondary objectives include increasing control of flood flows at Friant Dam; contributing to water supply for environmental protection; developing hydropower generation capacity; and developing additional recreation opportunities.

## Building Blocks for Alternative Plans

As previously mentioned, primary objectives drive the formulation of alternative plans. The primary building blocks for alternative plans include specific water management measures (physical or institutional) that can generally be grouped into three areas: storage, conveyance, and operations.



### Storage

Options to increase water storage capacity include enlarging existing reservoirs, creating new reservoirs, and facilitating additional conjunctive water management. Specific storage options for the Investigation are described under Retained Storage Sites.



### Conveyance

Conveyance is the delivery of water through canals, pipelines, and/or natural waterways. Conveyance options (new facilities or modifications to existing in-valley facilities) will be formulated to help facilitate greater operational flexibility for Federal and State projects in the Central Valley for the benefit of all water users.



### Operations

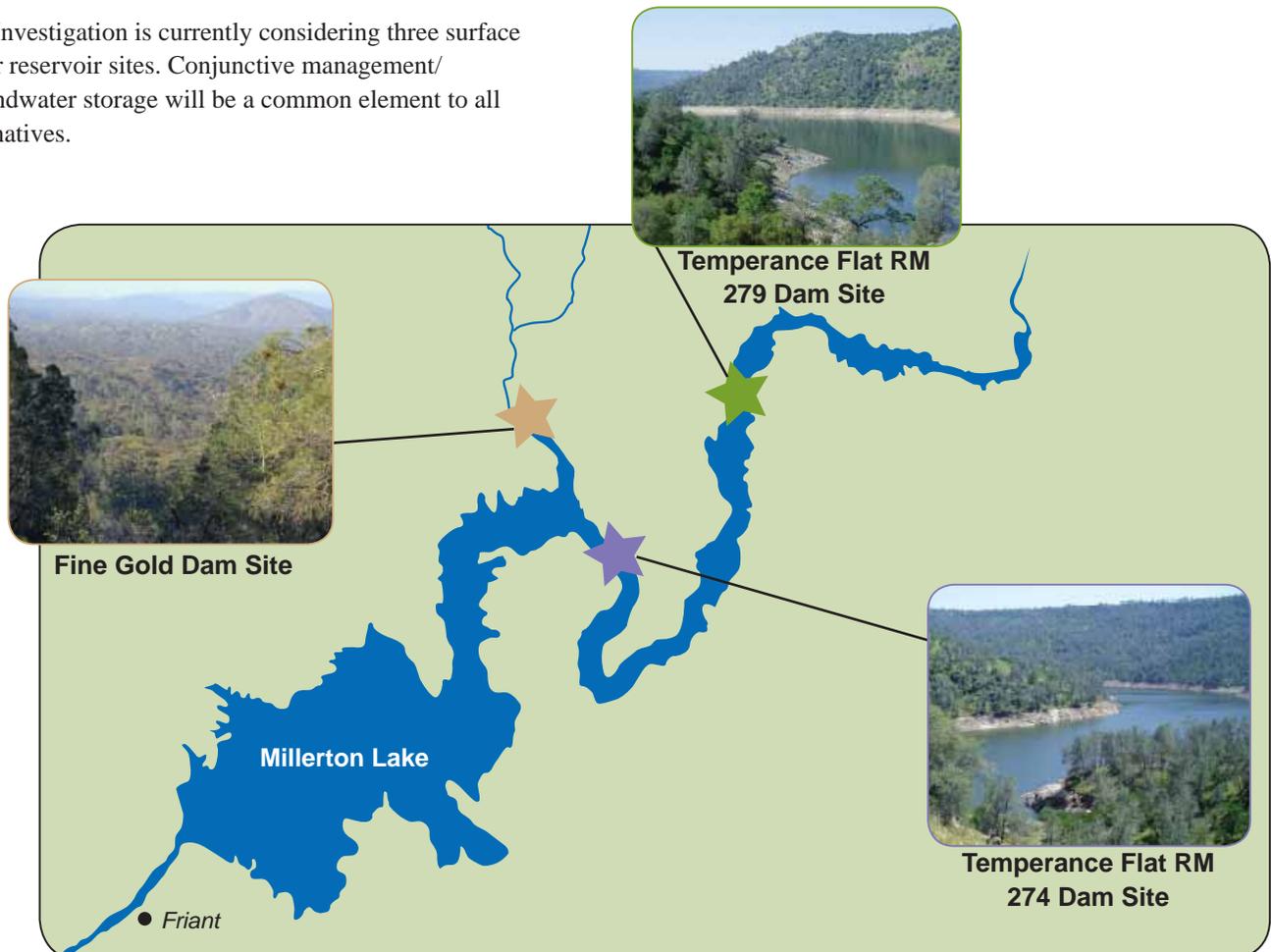
Operations are nonstructural activities that direct the management of water facilities

(reservoirs, conveyance features, etc.) and guide decisions on water storage, releases, and conveyance of water for increased system flexibility. Evaluations will consider how operations are prioritized among purposes such as water supply deliveries, ecosystem improvements, hydropower generation, recreation, and/or flood control.

A variety of options for operating storage and conveyance features will be addressed. To further evaluate the remaining potential reservoir sites, and formulate the range of alternatives to be evaluated in the Feasibility Report and EIS/EIR, plan formulation activities will address four key concerns:

## Retained Storage Sites

The Investigation is currently considering three surface water reservoir sites. Conjunctive management/groundwater storage will be a common element to all alternatives.



- Where the water can go.
- How it could be used.
- How it could get there.
- How a reservoir could be operated to achieve the most benefits.

The Investigation team expects that a range of combinations for storage-conveyance-operations will be identified through ongoing evaluations and input from stakeholders. Moreover, these choices significantly influence the type and

magnitude of potential benefits that may result from the alternatives.



**★ TEMPERANCE FLAT RM 274**

Temperance Flat River Mile (RM) 274 Reservoir would be created through construction of a dam within the existing Millerton Lake, approximately 6.8 miles upstream from Friant Dam and one mile upstream from the confluence of Fine Gold Creek and Millerton Lake. This reservoir site would provide up to 1,260 TAF of additional storage capacity.

**★ TEMPERANCE FLAT RM 279**

Temperance Flat RM 279 Reservoir would be created through construction of a dam within the existing Millerton Lake, approximately 12.6 miles upstream from Friant Dam. This reservoir site would provide up to 690 TAF of additional storage capacity.

**★ FINE GOLD RESERVOIR**

Fine Gold Reservoir would be created through construction of a dam on Fine Gold Creek at Millerton Lake, and saddle dam(s) in the Fine Gold Creek watershed. Water stored at this reservoir would be pumped out of Millerton Lake. This reservoir site would provide up to 780 TAF of additional storage capacity.



**CONJUNCTIVE MANAGEMENT**

The Friant Division of the CVP (Friant Dam, and Friant-Kern and Madera canals) is one of California’s largest conjunctive management projects with a decades-long record of reducing groundwater overdraft in the eastern San Joaquin Valley. Friant Division contractors have developed groundwater recharge and distribution facilities based on the availability of surface water supplies. This system works effectively, but would benefit from additional storage to capture unregulated flood flows.

Work to date suggests that conjunctive management as a stand-alone alternative would not be effective in meeting the Investigation’s planning objectives. However, the development of additional surface water storage capacity in combination with additional recharge capacity would increase the amount of water that could be provided for conjunctive management.

# Potential Benefits

The following are potential benefits that could be provided by any of the alternative plans. Some benefits can be quantified in monetary terms through traditional economic evaluations, while others, such as ecosystem improvements, result in broad public benefits that must be addressed in a qualitative, nonmonetary manner.



## Ecosystem Benefits

could result from

improvements in cold

water management flexibility and supplemental flows that enhance conditions for restoration of the San Joaquin River and improvement of the Delta ecosystem.



## Agricultural Water Supply Reliability Benefits

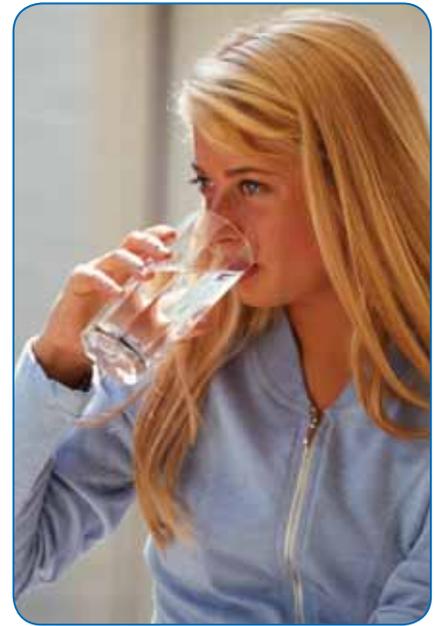
- Water supply developed through additional storage could be provided to Friant Division water users, which would reduce reliance on pumping over-drafted groundwater, and would increase net farm income.
- Avoided groundwater pumping in the Friant Division resulting from increased reliability of surface water deliveries could provide groundwater recovery benefits within the Friant Division and in adjacent areas.

- Integration of additional storage and increased conveyance capacity with south-of-Delta system operations could result in increased water supply reliability to agricultural water users.
- Dairy industry benefits could result from increased water supply reliability in the Friant Division by avoiding the need to import hay and silage from distant locations.



## Municipal and Industrial Water Supply Reliability Benefits

- Potential water supply reliability benefits to Friant Division municipal and industrial (M&I) contractors could include avoided costs for groundwater pumping; facilitation of in-lieu groundwater recharge; reduction of potential groundwater degradation resulting from declining groundwater levels; and avoidance of costs associated with alternative water supply development.
- Similar to Agricultural Water Supply Reliability Benefits, the integration of additional storage and increased conveyance capacity with south-of-Delta system operations could result in increased water supply reliability for M&I water users.



## M&I Water Quality Benefits

could result from water quality exchanges that provide higher quality water to urban areas. Potential scenarios include delivery of Delta water supplies to Friant Division contractors during the irrigation season, in exchange for late summer and early fall supplies of Friant Division water. Opportunities also exist for water exchanges within the San Joaquin Valley.





**Hydropower Benefits**

could include new energy generation and associated power revenues from new powerhouse features included in the alternative plans, as well as additional power generation at Friant Dam. The reservoir alternatives could also provide opportunities for pumped storage and integration with wind power during off-peak hours. Hydropower evaluations will also consider statewide power system benefits, such as operational flexibility.



**Flood Damage Reduction Benefits**

could result from an increase in total reservoir storage capacity and reduce the frequency and magnitude of flood releases from Friant Dam. These reduced flood flows could provide benefits to downstream lands by reducing corresponding flood damages compared to the existing system.



**Reservoir Recreation Benefits**

could result from newly created recreation opportunities at existing reservoirs, including Millerton Lake, or creating recreation at or near new reservoirs. This could include new recreation sources or enhancement of existing recreation opportunities.

**Other Considerations**

In addition to the preceding benefits, the Investigation will consider regional economic effects and other social effects of the alternative plans. Regional economic effects in the six-county region comprising and surrounding the Friant Division – Fresno, Kern, Kings, Madera, Merced, and Tulare Counties – will be estimated for economic performance. This may include models that measure the effects that changes in crop production (or other resources) may have on the regional economy. These effects may be quantified in terms of changes in industry output, employment, and income. Also to be evaluated are other social and community effects of the alternative plans, such as income distribution, community impacts, and environmental justice effects.

Other economic considerations to be evaluated include hydropower impacts such as the inundation of the Kerckhoff powerhouses with the Temperance Flat Reservoir alternatives, and energy requirements for the pumping operation integral to storing water in Fine Gold Reservoir.



## Initial Water Temperature Evaluations

As part of initial evaluations of cold water management flexibility and ecosystem benefits, the team conducted preliminary water temperature modeling for a variety of reservoir operating scenarios. Results of this modeling have shown that total cold water volumes with surface water storage alternatives would be greater than if no additional storage was created.

Although these results vary considerably among the alternatives and operations, all temperature modeling simulations demonstrate that increasing reservoir storage capacity

and managing cold water releases with the use of temperature control devices (TCD), could help preserve cold water during winter and spring months for release in the summer and early fall (see figure on opposite page). The significantly increased total storage capacity provided by the alternatives results in a larger cold water pool, while the use of TCDs at Friant Dam and at potential upstream reservoirs for the storage alternatives provides flexibility in managing the cold water pool.

Ongoing plan formulation activities will further explore and verify these initial findings.

The Investigation alternatives also provide the opportunity to release supplemental flows for restoration of the San Joaquin River during periods when no additional flows are stipulated by restoration provisions of the Settlement (critical low years).

Specific temperature objectives have not yet been established for San Joaquin River restoration provisions of the Settlement.

## Geologic Investigations Update

### Dam Site Investigations

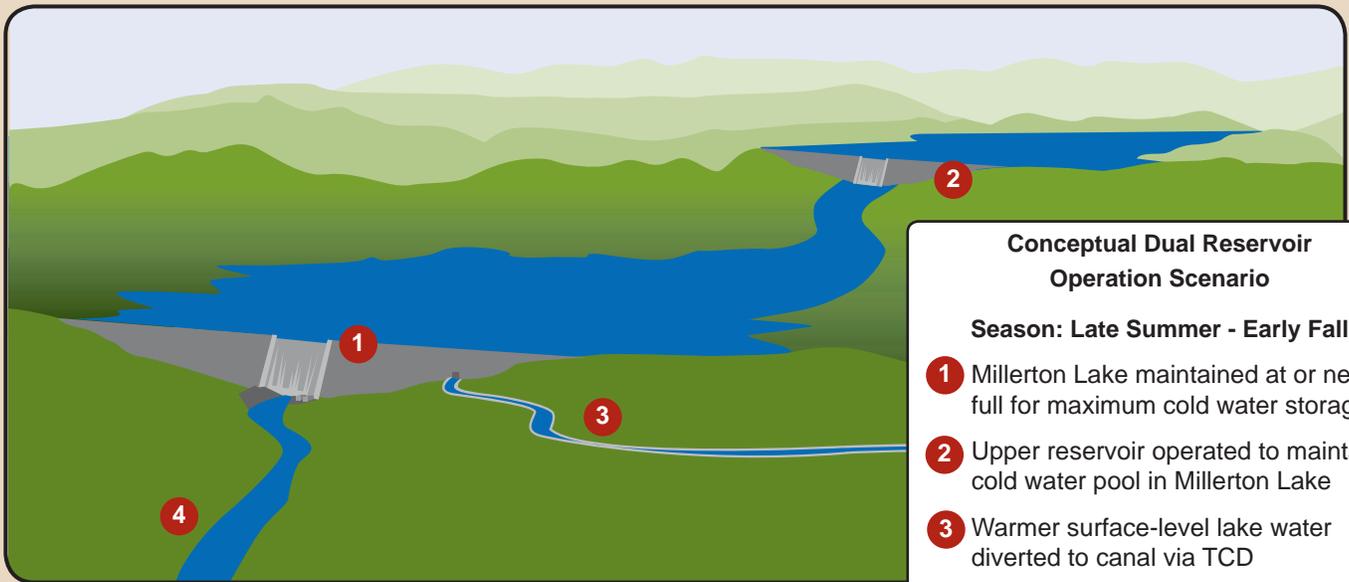
Geologic drilling investigations were performed at the Temperance Flat RM 274 and RM 279 dam sites from July through November 2006. Sixteen drill holes were completed to provide the engineering team with geologic data relevant to the suitability of the dam sites. The major rock types encountered were quartz diorite at the RM 274 site and diorite at the RM 279 site. Based on results of the drilling investigations, it was concluded that the rock at both dam sites has adequate strength and stability for a variety of dam types, including embankment, rock fill, concrete gravity, roller-compacted concrete, and concrete arch.

Geologic investigations at the potential Fine Gold dam site were performed between September 2003 and March 2004. Major rock types encountered at the Fine Gold site were metasedimentary rock on the right abutment and granitic rock on the left abutment. Based on the results of the preliminary drilling investigations, the Fine Gold dam site appears to be suitable for either a concrete or embankment dam. Additional drilling investigations may be required.

### Borrow Site Drilling

Potential borrow sites that could be used as a source of fine material for embankment dam construction are being considered in Auberry Valley and the Temperance Flat area. Geologic drilling investigations were conducted at these potential borrow sites in late July 2007. Archaeological monitoring was performed at the Temperance Flat borrow drilling sites.





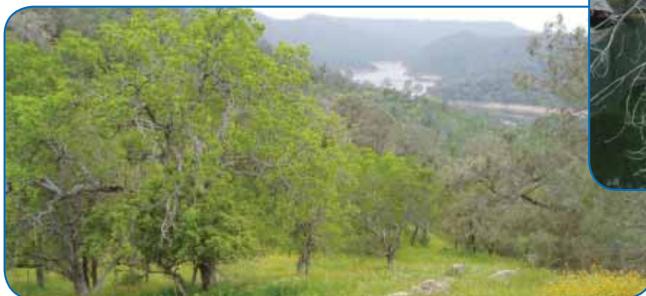
**Conceptual Dual Reservoir  
Operation Scenario**

**Season: Late Summer - Early Fall**

- 1** Millerton Lake maintained at or near full for maximum cold water storage
- 2** Upper reservoir operated to maintain cold water pool in Millerton Lake
- 3** Warmer surface-level lake water diverted to canal via TCD
- 4** Cold, lower level lake water diverted to river via TCD for the fishery

## Environmental Compliance Activities Currently Underway

Studies are underway to evaluate potential impacts of Investigation alternatives on environmental resources in the study area. Biological field studies in progress include habitat mapping and wetland delineations across the study area, as well as surveys of threatened, endangered, and sensitive species. Cultural resources evaluations have identified prehistoric- and historic-era sites, and discussions are taking place with Native American representatives to identify Native American sites of concern. Additional environmental evaluations include identification of potential impacts to physical and socioeconomic resources in the study area.



# Stakeholder Briefings to Parallel Feasibility Report and EIS/EIR Development

Briefings tailored to facilitate public and stakeholder involvement during the plan formulation process will continue. The figure below illustrates important steps in the Investigation planning process and the documents in which they will be addressed.

The briefings are part of an outreach program to collect public and stakeholder comments and input as the study progresses.

Stakeholder briefings will continue as a combination of proactive outreach by the Investigation study team, response to requests for presentations from stakeholder groups, and elements that meet Reclamation’s commitment to environmental justice. It is anticipated that the majority of these briefings will be held in the primary study area, which includes Fresno, Kern, Kings, Madera, Merced, and Tulare Counties.

Stakeholder groups include, but are not limited to, local landowners, elected officials, the environmental community, Native American tribes, water purveyors, resource agencies, and local media.



*Stakeholder field trip to Temperance Flat*

Other outreach activities will include direct mail of information materials similar to this update and posting of information on the study web site:

[www.usbr.gov/mp/sccao/storage](http://www.usbr.gov/mp/sccao/storage)

## Planning Process

With consideration of the San Joaquin River Settlement

- Refine planning objectives and constraints
- Refine and/or replace management measures
- Refine/reevaluate measures and alternative plans
- Define final alternatives
- Conduct impact analysis
- Evaluate final alternatives
- Complete cost allocation
- Determine financial feasibility
- Recommend preferred alternative

}  
Plan Formulation  
Progress Report

}  
Draft FR/EIS/EIR

}  
Final FR/EIS/EIR – ROD/NOD

## Glossary

**alternative plan** — A complete plan that describes all actions necessary to accomplish specific objectives, including a combination of measures and operating rules to address primary planning objectives.

**anadromous** — In general, this term refers to fish such as salmon or steelhead trout that hatch in freshwater, migrate to, and mature in, the ocean, and return to freshwater as adults to spawn.

**conjunctive management** — The planned and managed operation of a groundwater basin and a surface storage system combined through a coordinated conveyance infrastructure to maximize the efficient use of surface and groundwater resources.

**Environmental Impact Statement/ Environmental Impact Report (EIS/EIR)** — An analysis required by the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), respectively, for major actions that could significantly affect the environment.

**Feasibility Report** — A report for consideration by Congress on the technical, environmental, economic, and financial feasibility of potential water resources project alternatives. For the Investigation, the Feasibility Report is being preceded by several interim documents, including an Initial Alternatives Information Report and a Plan Formulation Report.

**No-Action/No-Project Alternative** — This alternative represents the future conditions that would occur if none of the action alternatives are implemented. The No-Action/No-Project Alternative is required by both NEPA and CEQA, respectively.

**plan formulation** — An iterative process of assembling alternative plans that achieve a set of planning objectives, reviewing interim results, and adjusting the plans to increase anticipated benefits as more information becomes available.

**Environmental Justice** — Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect

to the development, implementation, and enforcement of environmental laws, regulations, and policies.

**temperature control device** — A multilevel, in-reservoir intake structure that allows water for release to be withdrawn from a range of depths, thereby accessing varying water temperatures to meet a targeted operating objective.

**water exchange** — A voluntary two-way transaction wherein a water user transfers water to another water user to be returned at a later date.

**without-project conditions** — A planning baseline for alternatives comparison that is developed by projecting the effects of reasonably foreseeable changes on existing physical, biological, cultural, and socioeconomic conditions. In NEPA documents, the without-project conditions are the same as the No-Action Alternative.

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## Upper San Joaquin River Basin Storage Investigation Website

Visit [www.usbr.gov/mp/sccao/storage](http://www.usbr.gov/mp/sccao/storage) to stay informed of news, activities, and Investigation efforts. Here are some actions you can take on the website:

- Update your contact information
- Download investigation related documents
- Stay informed of investigation activities and events

Look for additional information, documents and notices in the future.

If you do not visit the website to request that information be sent to you via email or to be removed from the mailing list, you will continue to receive information by mail. Receiving email updates and notifications, and visiting the website often, will ensure the most timely and direct access to information.

For additional information, contact:

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