EXECUTIVE SUMMARY

The Upper San Joaquin River Basin Storage Investigation (Investigation) is a feasibility study being performed by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and the California Department of Water Resources (DWR). The Investigation is evaluating alternatives to develop water supplies from the San Joaquin River that could contribute to restoration of, and improve water quality in, the San Joaquin River and enhance conjunctive management and exchanges to provide high-quality water to urban areas. The Investigation is one of five surface water storage studies recommended in the CALFED Bay-Delta Program (CALFED) Programmatic Environmental Impact Statement/Report (PEIS/R) Record of Decision (ROD) of August 2000.

The Investigation is being prepared in two phases. Phase 1, which included preliminary screening of initial storage sites, was completed in October 2003. Initially, 17 surface water storage sites were considered, of which 6 were retained for further analysis. Phase 2 began in January 2004 with formal initiation of the environmental review processes consistent with Federal and State of California (State) regulations, and will continue through completion of all study requirements. The Investigation will culminate in a Feasibility Report (FR) and supporting environmental documents consistent with the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G) (WRC, 1983), Reclamation directives, DWR guidance, and applicable environmental laws. Reclamation and DWR are coordinating the Investigation with the California Bay-Delta Public Advisory Committee (BDPAC), which provides advice to the Secretary of the United States Department of the Interior regarding implementation of the CALFED Program, and the California Bay-Delta Authority (CBDA), which provides general oversight and coordination of all CALFED activities.

To facilitate coordination with other agencies and related ongoing studies, preparation of the FR will include two interim planning documents: an Initial Alternatives Information Report (IAIR) and a subsequent Plan Formulation Report (PFR). The IAIR describes without-project conditions and water resources problems and needs; defines study objectives and constraints; screens surface water storage measures; describes groundwater storage measures development; and identifies preliminary water operations rules and scenarios. Retained storage measures and preliminary water operations scenarios will be included in initial alternatives.

This IAIR will be used as an initial component of the FR. Conclusions and recommendations regarding further technical evaluations are expected to evolve as the Investigation progresses.

Topics Addressed in the Initial Alternatives Information Report

- Without-project conditions
- Water resources problems and needs
- Study objectives and constraints
- Surface water storage measures screening
- Groundwater storage measures development
- Preliminary water operations rules and scenarios

BASIS OF INVESTIGATION

The San Joaquin River basin experiences several water resources problems that could be alleviated through development and management of additional water supply. These include ecosystem conditions in the San Joaquin River, water quality of the San Joaquin River, and groundwater overdraft in the eastern San Joaquin Valley. In addition, opportunities exist to address related water resources problems and needs, including additional flood protection, hydropower generation, and recreation, through the development of additional water supply.

The purpose of the Investigation is to formulate and evaluate alternatives that develop additional San Joaquin River water supply primarily involving the enlargement of Friant Dam and Millerton Lake, or a functionally equivalent storage program in the region. As described in the CALFED ROD, the developed water supply would be managed to contribute to the restoration of, and improve water quality in, the San Joaquin River, and enhance conjunctive management and exchanges to provide high-quality water to urban areas. To the extent possible through meeting these objectives, alternatives will include features to address other related water resources opportunities.

STUDY AREA EMPHASIS

The study area emphasis for the Investigation encompasses the San Joaquin River watershed upstream of Friant Dam, the San Joaquin River from Friant Dam to the Sacramento-San Joaquin Delta (Delta), and the portions of the San Joaquin and Tulare Lake hydrologic regions served by the Friant-Kern and Madera canals, as highlighted in **Figure ES-1**. The study area includes all potential storage sites under consideration, the region served by the Friant Division of the Central Valley Project (CVP), the eastern San Joaquin Valley groundwater basins, and the portion of the San Joaquin River most directly affected by the operation of Friant Dam.

STUDY AUTHORIZATION

Federal authorization for the Investigation was initially provided in Public Law (PL) 108-7, the omnibus appropriations legislation for fiscal year 2003. Subsequent authorization was provided in PL 108-361, the Water Supply, Reliability, and Environmental Improvement Act, of 2004. Reclamation is the responsible Federal agency for preparing the FR and the Environmental Impact Statement (EIS). Section 227 of the State of California Water Code authorizes DWR to participate in water resources investigations. DWR is the State lead agency for the Investigation and preparation of the Environmental Impact Report (EIR).

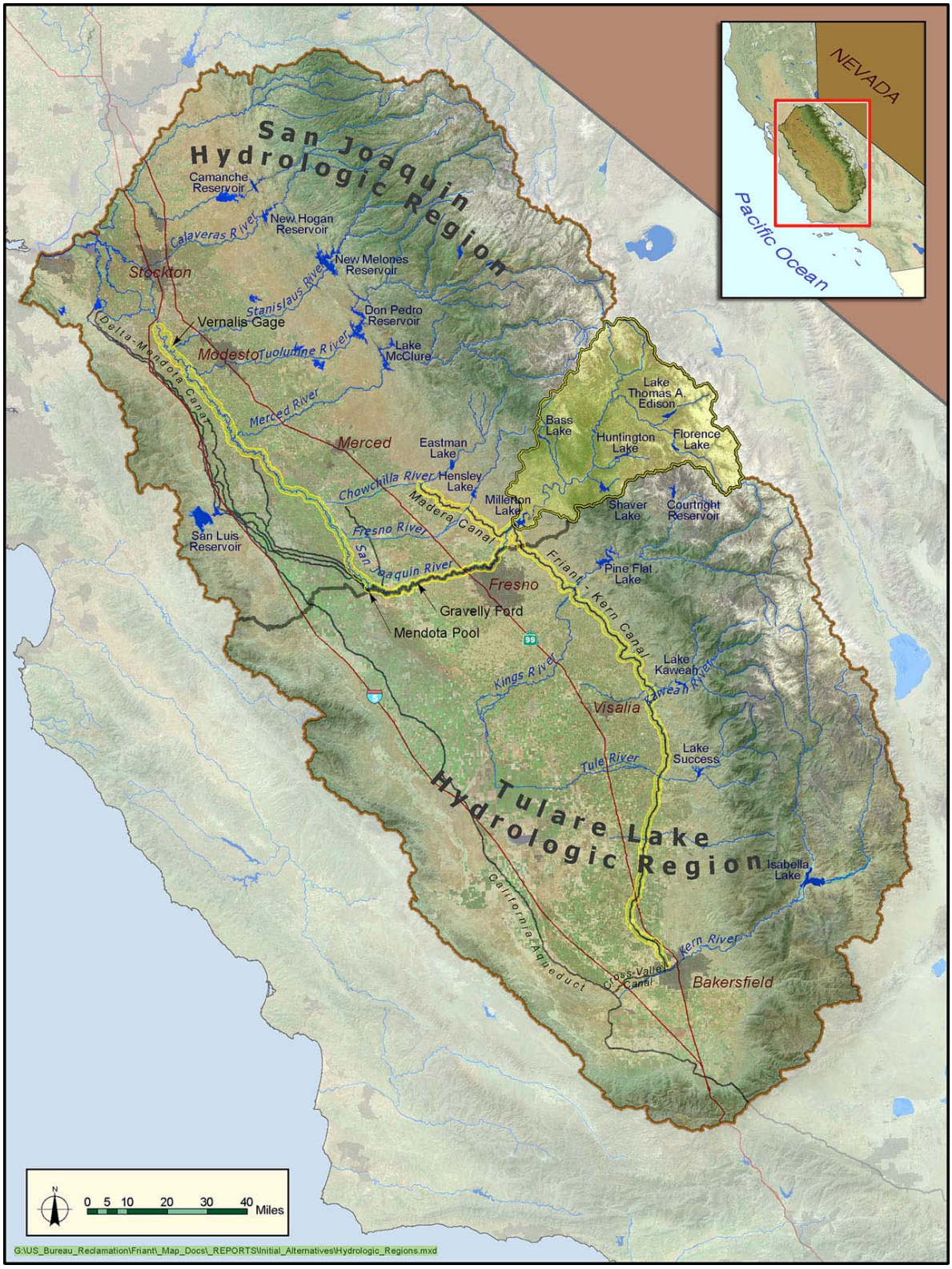

FIGURE ES-1.
UPPER SAN JOAQUIN RIVER BASIN STORAGE INVESTIGATION
STUDY AREA EMPHASIS

PROBLEMS, NEEDS, AND OPPORTUNITIES

Potential uses for additional water supply developed from the upper San Joaquin River basin were identified in the CALFED ROD. These include contributing to restoration of the San Joaquin River; improving water quality in the San Joaquin River; and facilitating conjunctive water management and water exchanges that improve the quality of water deliveries to urban communities. The development and management of new water supply presents an opportunity to address other related water resources problems and needs in the region.

Problems and Needs

- San Joaquin River ecosystem
- San Joaquin River water quality
- Water supply reliability

Opportunities

- Flood control
- Long-term EWA water supply
- Hydropower generation
- Recreation

San Joaquin River Ecosystem – The reach of the San Joaquin River from Friant Dam to the Merced River confluence does not currently support a continuous natural riparian and aquatic ecosystem. Since completion of Friant Dam, most of the water in the river has been diverted for agricultural and urban uses, with the exception of releases to satisfy riparian water rights upstream of Gravelly Ford and flood releases. Consequently, some reaches of the San Joaquin River between Friant Dam and the Merced River are often dry.

San Joaquin River Water Quality – Water quality in portions of the San Joaquin River has been a problem for several decades due to low flow, and discharges from agricultural areas, wildlife refuges, and municipal and industrial treatment plants. From Mendota Pool to Vernalis, the river is listed as an impaired waterbody under the Federal Clean Water Act Section 303(d).

Water Supply Reliability – The Friant Division provides surface water supplies to areas that rely on groundwater and is operated to support conjunctive water management to reduce groundwater use in the eastern San Joaquin Valley. Although surface water deliveries from Friant Dam help reduce groundwater pumping and contribute to groundwater recharge, groundwater basins in the eastern San Joaquin Valley remain in a state of overdraft in most years. Surface water supply reliability problems are associated with large variations in water availability from year to year and the limited capacity of water storage and conveyance facilities.

Flood Protection – Major storms during the past two decades have demonstrated that Friant Dam, among many other dams in the Central Valley, may not provide the level of flood protection that was intended at the time the flood management system was designed. Increased water storage capacity in the upper San Joaquin River basin could provide an opportunity to reduce the frequency and magnitude of damaging flood releases from Friant Dam.

Water Supply for Long-Term EWA – The San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta) is the largest estuary on the West Coast and provides essential habitat for a diverse array of fish and wildlife. Several water management programs have been established to assist in meeting numerous regulatory actions in the Delta region. The Environmental Water Account (EWA) was developed to provide water managers additional flexibility in meeting or exceeding Delta regulatory requirements without uncompensated losses to CVP and SWP water users. The management of additional water supply from the San Joaquin River presents an opportunity to provide less costly water for the EWA or a similar long-term program.

Hydropower – Hydropower long has been an important element of power supply in California, providing between 10 to 27 percent of California's annual energy supply. Due to its ability to rapidly increase and decrease power generation rates, hydropower often supports peak power loads in addition to base power loads. The Investigation is considering opportunities for additional hydropower generation capacity in association with the development and management of San Joaquin River water supplies.

Recreation – Demands for water-oriented recreational opportunities in the San Joaquin River basin are high. Some of these demands are served by reservoirs on the western slope of the Sierra Nevada Mountains. As population increases in the San Joaquin Valley, demands for water-based and land-based recreation are expected to increase.

STUDY OBJECTIVES

Primary and secondary planning objectives were developed based on CALFED Program and Investigation-specific goals as described in the ROD. CALFED Program goals include increasing water supply reliability, improving water quality for all beneficial uses, improving ecosystem conditions for Delta-dependent species, and improving Delta levee stability. Investigation-specific considerations include identified problems and needs in the study area in relation to study authorities, study planning principles, and Federal planning requirements.

As described in the IAIR, and recognized in the CALFED ROD and supporting documents, increasing the reliability of managed water supplies from the San Joaquin River is integral in addressing ecosystem restoration, water quality, and water management problems in the study area. Therefore, alternatives will be formulated with a focus on developing and managing new water supplies from the San Joaquin River that address the following primary objectives:

- Contribute to San Joaquin River restoration
- Improve San Joaquin River water quality
- Facilitate 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

To date, quantifiable restoration, water quality, and water management targets have not been established. Therefore, the Investigation will identify the extent to which alternatives can contribute to the primary objectives.

To the extent possible through pursuit of the primary planning objectives, alternatives will include features that address the following secondary objectives:

- Increase control of flood flows at Friant Dam
- Contribute to long-term EWA water supply
- Develop hydropower generation capacity in the upper San Joaquin River basin
- Develop additional recreational opportunities in the study area

DEVELOPMENT OF INITIAL ALTERNATIVES

Initial alternatives will combine one or more storage measures with operations scenarios for the management and use of new water supplies. Because targets for river restoration, river water quality, and exchange and conjunctive management actions have not been established, minimum accomplishments that each alternative must satisfy also have not yet been defined.

Surface Water Storage Measures Considered in the IAIR

Figure ES-2 shows the locations of surface water storage sites evaluated in the IAIR. These comprise six potential sites for developing a new surface reservoir or enlarging an existing reservoir retained from Phase 1 and five sites suggested during scoping. Each site could be configured at various storage sizes, with each configuration identified as a measure. The six surface storage sites retained from Phase 1 include the following:

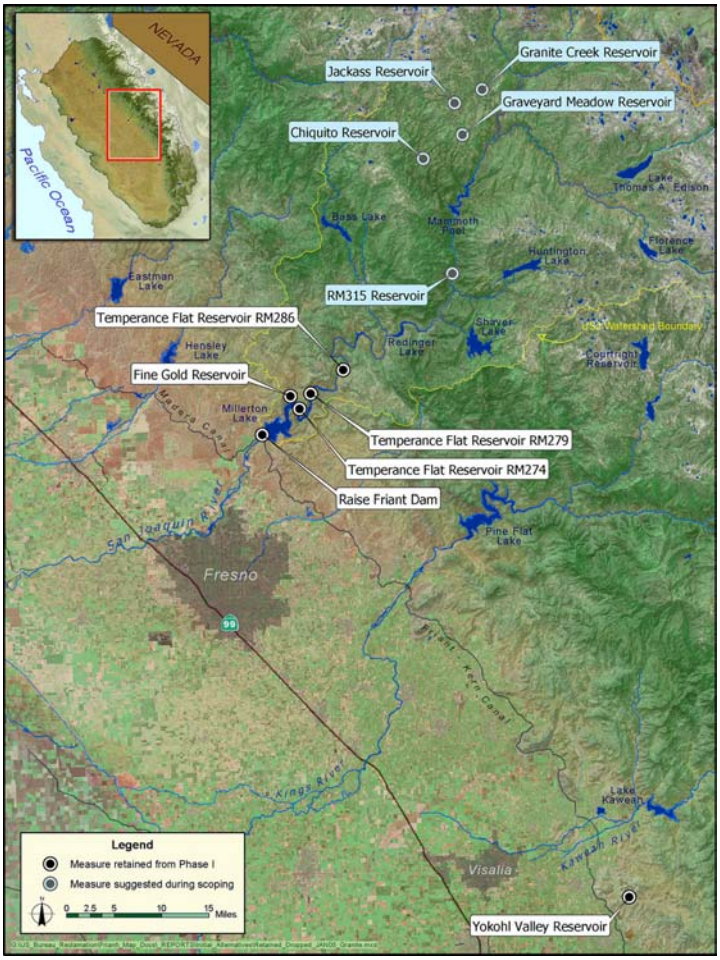

FIGURE ES-2.
SURFACE WATER STORAGE SITES RETAINED IN PHASE 1 AND SUGGESTED DURING SCOPING

- **Raise Friant Dam.** Raising Friant Dam up to 140 feet would increase Millerton Lake capacity by about 920 thousand acre-feet (TAF).
- **Temperance Flat Reservoir**. Constructing Temperance Flat dam and reservoir at one of three potential dam sites on the San Joaquin River between Friant and Kerckhoff dams, at River Mile (RM) 274, RM 279, or RM 286, could create a reservoir with storage capacity ranging from 450 TAF to over 2 million acre-feet.
- **Fine Gold Reservoir**. Constructing a dam on Fine Gold Creek could create a reservoir with storage capacity of up to 800 TAF that could store water diverted from the San Joaquin River or pumped from Millerton Lake.
- **Yokohl Valley Reservoir**. Constructing a dam in Yokohl Valley could create a reservoir with a capacity of up to 800 TAF to store water conveyed from Millerton Lake by the Friant-Kern Canal and pumped into the reservoir.

Most of the surface water storage measures retained from Phase 1 would result in a net loss in power generation. In March 2004, Reclamation and DWR held a series of scoping meetings to initiate development of the EIS and EIR. During scoping, power utilities that own and operate hydropower projects in the upper San Joaquin River basin raised concerns about impacts of lost power generation and the ability of retained measures to develop adequate replacement power. These hydropower stakeholders suggested additional potential reservoir sites that could store water supplies from the upper San Joaquin River without adversely affecting existing hydropower facility operations.

Suggested surface water storage measures include **RM 315 Reservoir** on the San Joaquin River between Redinger Lake and Mammoth Pool, and **Granite Project** (Granite Creek and Graveyard Meadow reservoirs) and **Jackass-Chiquito Project** (Jackass and Chiquito reservoirs) on tributaries to the San Joaquin River upstream of Mammoth Pool. The scoping comments also suggested combining these upstream storage measures with a diversion tunnel from Kerckhoff Lake to a Fine Gold Reservoir.

Surface Water Storage Measures Screening

A two-step approach was used to screen surface water storage measures for inclusion in initial alternatives. The first step focused on characteristics of individual reservoir sites. Construction cost, new water supply, environmental impacts, effects to existing hydropower generation, and potential to develop replacement power generation capacity were considered for various configurations of dam type, dam height, and reservoir size at each site. This resulted in the selection of specific storage sizes and replacement power options for raising Friant Dam, Fine Gold Creek Reservoir, and the three Temperance Flat reservoir sites. Based on these evaluations, Yokohl Valley Reservoir and all upstream storage measures suggested during scoping (RM 315 Reservoir, Granite Project, and Jackass-Chiquito Project, and Fine Gold Reservoir with diversion from Kerckhoff Lake) were dropped from further consideration. The upstream storage measures suggested during scoping were dropped because they would provide much less new water supply than the larger storage measures retained in Phase 1 at a similar cost. Further consideration of these measures would require participation by a non-Federal sponsor with an interest in power development. Results of the first screening step are summarized in **Table ES-1**.

The second step in screening measures for inclusion in initial alternatives involved comparing measures that provide similar amounts of new water supply based on construction cost, environmental impacts, hydropower facility impacts, and potential to develop replacement power generation capacity. These comparisons resulted in the selection of six surface water storage measures for inclusion in initial alternatives, as identified in **Table ES-2**.

Table ES-3 presents summary information about surface water storage measures retained for inclusion in initial alternatives. Retained surface storage measures range in size from 130 TAF (raise Friant Dam 25 feet) to about 1,310 TAF (Temperance Flat RM 274). These storage measures could provide average annual new water supply ranging from about 24 to 165 TAF/year and would have construction costs ranging from about $220 million to $1 billion. Construction costs are preliminary and do not include environmental mitigation, new or relocated recreation facilities, acquisition of impacted power facilities, or compensation for lost future power generation. As shown in **Table ES-3,** four retained surface water storage measures would affect the operation of existing hydropower facilities upstream of Millerton Lake.

TABLE ES-1.
SUMMARY OF SURFACE WATER STORAGE MEASURES SCREENING – STEP 1

Surface Water Storage Measure	New Storage Capacity (TAF)	New Water Supply (TAF/year)	Status Following Site Evaluations[1]	Key Findings from Site Evaluations
Raise Friant Dam				
25-foot Raise	130	24	Retained	A raise greater than 60 feet would result in extensive residential relocation, significant power generation losses, and environmental impacts around Millerton Lake, along the San Joaquin River, and in the Fine Gold Creek watershed.
60-foot Raise	340	68	Retained	
140-foot Raise	920	146	Dropped	
Temperance Flat RM 274				
Elevation 800	460	88	Retained	Measures larger than 1,310 TAF storage capacity were dropped because the small incremental new water supply would be associated with significant additional impacts to power generation and environmental resources, and higher construction costs.
Elevation 865	725	122	Retained	
Elevation 985	1,310	165	Retained	
Elevation 1,100	2,110	197	Dropped	
Temperance Flat RM 279				
Elevation 900	450	86	Retained	Measures larger than 1,350 TAF storage capacity were dropped because the small incremental new water supply would be associated with significant additional impacts to environmental resources and higher construction costs.
Elevation 985	725	122	Retained	
Elevation 1,115	1,350	168	Retained	
Elevation 1,200	1,910	188	Dropped	
Elevation 1,300	2,740	215	Dropped	
Temperance Flat RM 286				
Elevation 1,200	460	88	Retained	No measures ranging from 460 to 1,360 TAF were dropped because large changes in incremental cost or impacts to hydropower and environmental resources were not evident in the evaluation.
Elevation 1,275	725	122	Retained	
Elevation 1,400	1,360	169	Retained	
Fine Gold Reservoir Measures				
Elevation 900	120	17	Dropped	The 120 TAF measure was dropped because it has a significantly higher unit cost than larger sizes of Fine Gold Reservoir.
Elevation 1,020	400	65	Retained	
Elevation 1,110	800	113	Retained	
Yokohl Valley Reservoir				
Elevation 790	450	60	Dropped	Yokohl Valley Reservoir is the least cost-effective surface storage measure retained from Phase 1 due to operational constraints and conveyance limitations along the Friant-Kern Canal.
Elevation 860	800	97	Dropped	
Storage Measures Suggested During Scoping				
Granite Project	114	23	Dropped	No storage measures suggested during scoping were found cost-effective as water supply measures. Further consideration would require participation by a non-Federal sponsor with an interest in power development.
Jackass-Chiquito Project	180	37	Dropped	
RM 315 Reservoir	200	40	Dropped	
Fine Gold Reservoir Elevation 960[2]	230	80	Dropped	

Key:
elevation – elevation in feet above mean sea level
RM – river mile
TAF – thousand acre-feet
Notes:

[1] Status following evaluation of surface water storage measures at a specific reservoir site.

[2] Fine Gold Reservoir at elevation 960 (230 TAF capacity) was evaluated in combination with RM 315 Reservoir at 200 TAF capacity and a gravity diversion tunnel from Kerckhoff Lake.

TABLE ES-2.
SUMMARY OF SURFACE WATER STORAGE MEASURES SCREENING – STEP 2

Surface Water Storage Measure	New Storage Capacity (TAF)	New Water Supply (TAF/year)	Status Following Measures Comparison[1]	Key Findings from Comparison of Measures that Provide Similar New Water Supply
New Water Supply Range of 0 to 50 TAF/year				
Raise Friant Dam 25 Feet Elevation 603	130	24	Retained	Appears to be cost-effective and would result in no loss of power generation.
New Water Supply Range of 50 to 100 TAF/year				
Raise Friant Dam 60 Feet Elevation 638	340	68	Dropped	Residential relocation and power impacts.
Temperance Flat RM 274 Elevation 800	460	88	Dropped	Highest cost of measures producing similar new water supply and similar environmental impacts.
Temperance Flat RM 279 Elevation 900	450	86	Retained	Greatest potential for replacement power.
Temperance Flat RM 286 Elevation 1,200	460	88	Dropped	Largest power and environmental impacts for measures providing similar new water supply.
Fine Gold Reservoir Elevation 1,020	400	65	Retained	No impacts to existing power facilities, pumping requirements similar to power losses for other retained measures, few residential relocations.
New Water Supply Range of 100 to 150 TAF/year				
Temperance Flat RM 274 Elevation 865	725	122	Dropped	Dropped because larger sizes would result in similar impacts to environmental resources and power generation and appear more cost-effective.
Temperance Flat RM 279 Elevation 985	725	122	Retained	Greatest potential to develop replacement power.
Temperance Flat RM 286 Elevation 1,275	725	122	Dropped	Largest power and environmental impacts for measures providing similar new water supply.
Fine Gold Reservoir Elevation 1,110	800	113	Retained	No impacts to existing power facilities, pumping requirements similar to power losses for other retained measures, few residential relocations.
New Water Supply Range Greater than 150 TAF/year				
Temperance Flat RM 274 Elevation 985	1,310	165	Retained	Less extensive impacts to environmental resources and lower cost than other measures providing similar new water supply.
Temperance Flat RM 279 Elevation 1,115	1,350	168	Dropped	Greatest impacts to environmental resources and more costly than other measures providing similar new water supply.
Temperance Flat RM 286 Elevation 1,400	1,360	169	Dropped	Greatest net power loss for measures providing similar new water supply.

Key:
Elevation – elevation in feet above mean sea level
RM – river mile
TAF – thousand acre-feet
Notes:
[1] Status following comparison of measures at different sites that provide similar water supply. Retained measures are included in initial alternatives.

TABLE ES-3.
SURFACE WATER STORAGE MEASURES IN INTIAL ALTERNATIVES

		Raise Friant Dam 25 feet	Fine Gold Reservoir		Temperance Flat RM 274	Temperance Flat RM 279[1]			
Capacity and Water Supply	New Storage Capacity (TAF)	130	400	800	1,310	450		725	
	Gross Pool Elevation (feet above mean sea level)	603	1,020	1,110	985	900		985	
	Average New Water Supply (TAF/year)[2]	24	65	113	165	86		122	
Environmental	Number of Potentially Impacted Regulated Species	24	10	10	24	24		24	
	Inundation of Aquatic Diversity Management Area	Yes	Yes	Yes	No	No		No	
	Total Inundated Acres[3]	870	3,400	5,400	5,000	2,300		3,500	
Power	Affected Hydropower Facilities								
	Kerckhoff (38 MW)	No	No	No	Yes	Yes		Yes	
	Kerckhoff No. 2 (155 MW)	Yes[4]	No	No	Yes	Yes		Yes	
	Wishon (20 MW)	No	No	No	No	No		No	
	Big Creek No. 4 (100 MW)	No	No	No	No	No		No	
	Potential Replacement Facilities	Additional 5 MW capacity at Friant	N/A[8]	N/A[8]	100 MW PH at RM 274 Dam	Up to 120 MW PH at RM 279 Dam[5]	Up to 120 MW PH on ext. K2 tunnel, 15 MW PH at RM 279 Dam[5]	120 MW PH at RM 279 Dam	120 MW PH on ext. K2 tunnel, 15 MW PH at RM 279 Dam
	Lost Generation (GWh/year)[6]	-32	N/E[8]	-154[8]	-507	-507	-507	-507	-507
	New Generation (GWh/year)[7]	32	N/E[8]	114[8]	291	N/E	N/E	386	484
	Net Generation (GWh/year)	0	N/E[8]	-40[8]	-216	N/E	N/E	-121	-23
	Construction Cost ($ Million)[3,9]	220	470	640	1,000	670	800	870	1,000

Key:
GWh – gigawatt hour
K2 - Kerckhoff No. 2 PH
MW – megawatt
N/A – not applicable
N/E – not evaluated
PH – powerhouse
RM – river mile
TAF – thousand acre-feet

Notes:

[1] The two sets of replacement power facilities, power generation values, and cost values for the RM 279 measures represent different replacement power options. See Chapter 6 for more details.

[2] New water supply is defined as the average annual supply that could be developed in excess of historic water deliveries from Friant Dam.

[3] Cost and acreage values have been rounded to two significant figures.

[4] Kerckhoff No. 2 powerhouse would remain operational with a 25-foot raise of Friant Dam. A concrete wall to protect K2 access would be constructed.

[5] Replacement hydropower evaluations were not performed for RM 279 with a capacity of 450 TAF. Unit sizes estimated from 725 TAF reservoir size.

[6] Lost generation represents the estimated average future without-project generation at the affected power generation facilities. For Fine Gold Reservoir, it represents energy to pump water from Millerton Lake.

[7] New generation represents the average generation at the potential replacement power facilities.

[8] Fine Gold Reservoir would not impact any existing power facilities. More energy would be required for pump-back than would be generated by releases through a new powerhouse at the base of Fine Gold Dam.

[9] All cost estimates are preliminary. Construction cost represents the sum of field costs and indirect costs for planning, engineering, design, and construction management, estimated at 25 percent of field costs. Costs do not include environmental mitigation, new or relocated recreation facilities, acquisition of impacted power facilities, or compensation for lost future power generation.

Water Operations for Initial Alternatives

Implementing any of the storage measures and operating the new water supply for release to the San Joaquin River or diversion to the Friant-Kern and Madera canals could cause significant changes in water management in the San Joaquin Valley. Changes could occur in Friant Division canal water deliveries, San Joaquin River flow and water quality, project operations on tributaries to the San Joaquin River, New Melones Reservoir operations, south-of-Delta CVP and SWP deliveries, and Delta and upstream system operations. Water operations evaluations began during Phase 1 and continued through preparation of the IAIR. Two distinct evaluations were completed. These evaluations included single-purpose analyses to estimate available new water supplies, as presented in the Phase 1 Investigation Report, and development of preliminary water operations scenarios presented in the IAIR.

Preliminary operations scenarios developed during preparation of the IAIR focused on the use of water supply allocation and reservoir storage rules to manage new water supplies for a variety of uses. Six scenarios were evaluated for a hypothetical increase in storage of 1,400 TAF. This capacity was selected to generally correspond with the largest surface water storage measure retained for inclusion in initial alternatives. The evaluations were designed to identify how modifying water supply allocation and reservoir carryover storage rules would affect the development and management of new water supplies. All initial scenarios assume existing contracts, existing flood control operations, existing minimum downstream riparian and contractual requirements (116.7 TAF), and no reallocation of existing supplies. New water supply is defined as the average annual supply that could be developed in excess of historic water deliveries from Friant Dam. Initial water operations scenarios were grouped into two themes, as summarized in **Table ES-4**. Four scenarios were developed that would provide water supply for river uses (restoration or water quality) and two scenarios were developed that would provide water supply for canal uses. Preliminary results presented in **Table ES-5** were developed and evaluated using a screening tool based on the CALSIM model. As the investigation proceeds, the CALSIM model will be modified to include multiple-purpose operations rules and scenarios to support evaluation of the initial alternatives. Initial operations scenarios and preliminary results are informational only and are not intended to represent the final set of operations rules or project accomplishments.

TABLE ES-4.
INITIAL WATER OPERATIONS SCENARIOS

San Joaquin River Supply Scenarios	
Scenario 1	Allocate new supply for San Joaquin River restoration, with Mendota Pool diversions
Scenario 2	Allocate new supply for San Joaquin River restoration, with Mendota Pool bypass flow
Scenario 3	Allocate new supply for San Joaquin River restoration, constant annual allocation
Scenario 4	Allocate new supply to improve San Joaquin River water quality
Canal Supply Scenarios	
Scenario 5	Allocate new supply for canal delivery
Scenario 6	Allocate new supply for canal delivery, emphasizing multiyear reliability

TABLE ES-5.
PRELIMINARY RESULTS FROM INITIAL WATER OPERATIONS SCENARIOS

	Operations Scenario[1] Difference from Without-Project Results (TAF)[2]					
	1	**2**	**3**	**4**	**5**	**6**
Operations Scenario Criteria						
Operating Objective	San Joaquin River Restoration			SJR Water Quality	Canal Delivery	
	Diversions at Mendota Pool	Flow Past Mendota Pool	Diversions at Mendota Pool	Diversions at Mendota Pool	Increase Annual Delivery	Increase Multiyear Reliability
Annual Water Supply Allocation	Variable		Constant	Variable		
Reservoir Carryover Storage Rule	Existing[3]		Proportional to Supply[4]		Existing[3]	Prop. to Supply[4]
Change in Friant Operations						
Total Canal Diversion	-1	-1	-1	0	+165	+128
Friant Class 1 Delivery[5]	-3	-3	-16	-12	+11	+34
Friant Class 2 Delivery[6]	+116	+116	+127	+119	+261	+187
Section 215 Delivery[7]	-114	-114	-112	-107	-107	-92
Friant Dedicated Release to SJR	+194	+194	+175	+161	0	0
Friant Spills to SJR	-198	-198	-183	-172	-174	-148
Total Friant Release to SJR	-4	-4	-8	-11	-174	-148
Change in San Joaquin River Flow and Operations						
SJR Flow to Mendota Pool	-44	-44	-51	-19	-162	-137
DMC Flow to Mendota Pool	-72	+45	-61	-97	+43	+39
SJR Flow Upstream from Merced River	-116	+1	-112	-117	-119	-98
Groundwater Recharge from Gravelly Ford to Merced River	Increase				Minor decrease from reduction in flood flow	
SJR Flood Flow at Vernalis	Decrease in all scenarios					
SJR Flow at Vernalis (non-flood periods)	No change	Potential increase	No change			
Effect on April/May SJR Flow w/o VAMP	Potential decrease	Potential decrease or increase	Potential decrease			

Key:
DMC – Delta-Mendota Canal
MP – Mendota Pool
SJR – San Joaquin River
TAF – thousand acre-feet
TDS – total dissolved solids
VAMP – Vernalis Adaptive Management Plan
w/o – without

Notes:

[1] All operations scenarios assume existing contracts, existing flood control operations, existing Friant minimum downstream riparian and contractual requirements (116.7 TAF), no reallocation of existing supplies, and 1,400 TAF additional storage.

[2] Results and scenarios are preliminary and will change in the future.

[3] The existing end-of-September carryover target is 130 TAF.

[4] End-of-September carryover target increases above existing target in proportion to supply when supply exceeds 800 TAF.

[5] Class 1 contracts are based on a firm water supply and represent the first 800 TAF of annual water supply delivered. These contracts are generally assigned to M&I and agricultural water users who have limited access to good-quality groundwater.

[6] Class 2 water is a supplemental supply and is delivered directly for agricultural use or for groundwater recharge, generally in areas that experience groundwater overdraft. Class 2 contractors typically have access to good-quality groundwater supplies and can use groundwater during periods of surface water deficiency.

[7] Section 215 water is defined under Section 215 of the Reclamation Reform Act of 1982 as unstorable irrigation water to be released because of flood control criteria or unmanaged flood flows.

Scenarios 1, 2, and 3 were developed to identify how new storage could be operated to contribute water to support restoration of the San Joaquin River. However, because restoration plans have not been identified, the scenarios did not include specific restoration flow targets. As indicated in **Table ES-5**, these scenarios included either diversions at Mendota Pool or flow past Mendota Pool, which allowed a preliminary assessment of potential effects on other water project operations in the San Joaquin Valley. No site-specific assumptions were made regarding the manner in which water would flow past Mendota Pool.

The annual allocation of new water supply for restoration releases in Scenarios 1 and 2 was based on total annual water supply available with no provision for carryover storage other than the current minimum operating level of 130 TAF in Millerton Lake. In Scenario 3, a constant annual amount of new water supply would be released to the San Joaquin River each year. In the case of the 1,400 TAF reservoir assumed in the operations scenarios, the long-term average new water supply would be about 175 TAF/year. To facilitate an annual supplemental water demand, a variable carryover storage target was used to assure that 175 TAF would be available for river release each year. In this scenario, supplemental releases made from Friant Dam to the San Joaquin River that reach Mendota Pool would be available for diversion at Mendota Pool. The use of carryover storage in Scenario 3 has the effect of reducing the average annual new water supply resulting from new storage, as compared to a scenario where all water supplies are allocated each year. The carried-over water would be available in dry years, thereby increasing dry year water supplies.

Scenario 4 was developed to assess how water supplies from new storage could be released from Friant Dam specifically to improve San Joaquin River water quality. Carryover and allocation rules were used to emphasize the availability of new water supply in dry and below-normal years, when water quality problems are prevalent.

Scenarios 5 and 6 were developed to identify how additional storage could affect water deliveries in the Friant Division. Scenario 5 assumes new water supply would be delivered based on contract demands to the maximum extent possible in any year, similar to the existing project operation. Scenario 6 introduced a carryover rule to reserve a portion of the available water supply for subsequent years. The application of this rule would reduce average annual deliveries by about 25 percent and increase dry year deliveries as compared to Scenario 5.

The six water operations scenarios will provide the basis for initial alternatives analysis as the Investigation proceeds. The scenarios will be applied to the retained storage measures, and modified as needed to evaluate the contribution of new storage to meeting specific restoration, water quality, or water supply reliability objectives, as plans developed through other studies become available.

Groundwater Storage and Conjunctive Management Measures

Many stakeholders have suggested that additional water supplies could be developed at Friant Dam through the implementation of groundwater storage and conjunctive management measures. In response, an approach to identifying potential groundwater storage and conjunctive management measures for the Investigation was developed in coordination with DWR's Conjunctive Water Management Program and with stakeholder input.

Potential Groundwater and Conjunctive Management Projects to be Considered for Inclusion as Measures in the Investigation

- Eastern San Joaquin County Groundwater Bank
- Gravelly Ford
- Madera Ranch
- Merced Irrigation District Groundwater Banking
- Westlands Water District Conjunctive Use Water Management Project
- Waldron Banking Facility Expansion
- Raisin City Recharge
- Arvin-Edison Water Storage District Expansion
- Kern Water Bank Expansion
- Semitropic Water Bank Expansion
- Poso Creek
- Deer Creek Expansion

The approach began with a theoretical analysis to evaluate the potential for groundwater recharge and determine if groundwater storage should be further considered as a measure. Analysis focused on estimating the amount of water that could be made available at Friant Dam for groundwater recharge if adequate recharge facilities were in place. The outcome of this evaluation, as presented in the Phase 1 Investigation Report (October 2003), suggested groundwater storage may be possible to support Investigation purposes, but that specific facilities had not yet been identified.

Following the completion of the theoretical analysis, DWR initiated a regional Conjunctive Management Opportunities Study (Study), which is being conducted in parallel with the Investigation. The objective of the Study is to identify potential conjunctive management projects and programs in the San Joaquin River and Tulare Lake hydrologic regions that could contribute to the overall CALFED Program objectives of water supply reliability, water quality, and ecosystem restoration. The first phase of the Study identified groundwater sub-basins in the San Joaquin Valley that possess the greatest potential for groundwater recharge, and assessed potential conjunctive management opportunities within these regions. Preliminary results from the Study identified 12 potential projects in the San Joaquin Valley, at locations ranging from San Joaquin County in the north to Kern County in the south.

Upon completion of the Conjunctive Management Opportunities Study, the Investigation will review the recommended projects for their potential as conjunctive management and groundwater storage measures. The evaluation will consider the extent to which a project could contribute to Investigation objectives, either individually or in combination with surface water storage measures. A set of evaluation criteria will be applied to assess the applicability of each recommended conjunctive management or groundwater storage project for inclusion as a measure in the Investigation.

PUBLIC AND AGENCY PARTICIPATION

A public and agency participation program that is integrated with the progress of technical work supports the Investigation. The program, initiated during Phase 1, is designed to address issues of interest and concern to stakeholders engaged in local and regional water resource planning. To date, public and agency involvement has including the following:

- Structured series of interactive public meetings and workshops
- Briefings for governmental and nongovernmental agencies and coalitions
- Briefings for tribal representatives
- Coordination with local water resources planning and management groups
- Coordination with agencies
- Interviews with water management agency representatives
- Tours of Millerton Lake and portions of the upper San Joaquin River
- Distribution of informative brochures, fact sheets, and documents that provided background and updates on the Investigation's progress
- Distribution of Investigation documents via a Web site

The IAIR was initiated concurrent with a set of public scoping meetings in Sacramento, Modesto, Friant, and Visalia, California, to inform interested groups and individuals about the Investigation and to solicit ideas and comments. Two public meetings were held during preparation of the IAIR to provide updates on study progress and receive input on preliminary findings.

Cooperating agency teams are being formed to address several technical issues relevant to the Investigation. These include water operations, reservoir area environmental resources, river restoration, hydropower, flood damage reduction, engineering, economics, and conjunctive management. As the Investigation proceeds, involvement of cooperating agency teams will become increasingly important. Cooperating agencies will assist in data collection, provide guidance on incorporating restoration plan information from other sources, aid in developing impact analysis methodologies, and review findings from impact and benefit analyses.

INFORMATIONAL MATERIALS AND DOCUMENT ACCESS

An Investigation Web site, hosted by Reclamation at http://www.usbr.gov/mp/sccao/storage, contains technical documents prepared for the Investigation to date, presentations used at public workshops and meetings, the Phase 1 Investigation Report, the IAIR and technical appendices, contact information for the study team, and a gateway for contacting the study team. The Web site has been a key feature in outreach efforts and will continue to be expanded as the Investigation proceeds.

NEXT STEPS

During plan formulation, 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. Studies to support plan formulation will proceed in several key technical areas, as described below.

Water Operations – Water operations evaluations will focus on evaluating potential uses of new water supplies and identifying project benefits. The CALSIM model will be modified to incorporate operations criteria described in the IAIR and a water quality module for the San Joaquin River below Mendota Pool. The revised CALSIM model will be used to evaluate multiple purpose operations to address Investigation objectives.

Reservoir Area Environmental Resources – In coordination with cooperating agencies, the Investigation team will inventory aquatic, botanic, wildlife, cultural, historic, and archeological resources in and around areas that would be affected by the retained measures and develop impact assessment methodologies. Impacts of alternatives on species health and abundance, and cultural resources will be identified. Operations objectives for specific species and preliminary mitigation measures will be developed.

Downstream Environmental Resources – It is expected that restoration plans for the San Joaquin River under development by others will soon be available for consideration by the Investigation. 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. 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. This will require the development and use of additional models, such as reservoir and river temperature models.

Designs and Cost Estimates – Designs and cost estimates for retained storage measures will be developed and updated. 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. Feasibility-level cost estimates will be prepared for the preferred alternative when it is identified.

Hydropower – Hydropower studies 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 be coordinated with operators of power facilities in the upper San Joaquin River basin. Project alternatives that include development of new hydroelectric generating facilities would likely require non-Federal partnership for the long-term operation of facilities.

Flood Control – 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. Issues to be addressed include incidental flood benefits that would accrue from enlarging storage with no change in dedicated storage space; future floodplain development; and effects of channel and levee modifications for river restoration on flood protection.

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.

Groundwater Storage and Conjunctive Management Measures – Additional work is needed to develop specific conjunctive management and groundwater storage measures for inclusion in Investigation alternatives. Specific projects recommended in the DWR Conjunctive Management Opportunities Study will be evaluated for inclusion in the Investigation. Retained groundwater storage and conjunctive management measures will be combined with surface water storage measures in project alternatives.

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