

# Upper San Joaquin River Basin Storage Investigation



## Big Dry Creek Reservoir Modification

**A Joint Study by:**



**Bureau of Reclamation  
Mid-Pacific Region**



**California Department  
of Water Resources**

**In Coordination with:**



**The California Bay-Delta Authority**

October 2003



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*Big Dry Creek Dam and Detention Basin*

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# SURFACE WATER STORAGE OPTION

## TECHNICAL MEMORANDUM

### BIG DRY CREEK RESERVOIR MODIFICATION

#### UPPER SAN JOAQUIN RIVER BASIN STORAGE INVESTIGATION

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## Acronyms and Abbreviations

CEQA	California Environmental Quality Act
cfs	cubic feet per second
CNDDDB	California National Diversity Database
CNPS	California Native Plant Society
Corps	United States Army Corps of Engineers
CVP	Central Valley Project
DSOD	Department of Safety of Dams
DWR	Department of Water Resources
elevation	number of feet above mean sea level
FMFCD	Fresno Metropolitan Flood Control District
HEP	Habitat Evaluation Procedure
Investigation	Upper San Joaquin River Basin Storage Investigation
NEPA	National Environmental Policy Act
Reclamation	Bureau of Reclamation
ROD	Record of Decision
TAF	thousand TAF
TM	Technical Memorandum
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

## EXECUTIVE SUMMARY

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The Upper San Joaquin River Basin Storage Investigation (Investigation) considered several potential storage options in the eastern San Joaquin Valley. This Technical Memorandum describes a potential modification to an existing dam at Big Dry Creek. Big Dry Creek Dam and Reservoir are existing flood control structures in Fresno County, near Clovis, operated by the Fresno Metropolitan Flood Control District (FMFCD). The reservoir spans Dry Creek and associated smaller drainages to the north of Big Dry Creek. A zoned earthfill embankment, the dam creates a reservoir with a storage capacity of approximately 30 thousand TAF (TAF). However, due to seepage concerns and lack of inflows, the reservoir's total storage capacity has not been exploited.

Using the full 30 TAF of storage capacity would, at a minimum, require constructing a turnout from nearby Friant-Kern Canal, northeast of the reservoir. The turnout would be built at the point where the canal siphon passes under Big Dry Creek. Also, constructing an energy dissipation structure would reduce velocities of the new flows conveyed into the reservoir. The new conveyance would enable the reservoir to be operated as an off-stream storage facility for water diverted from Friant-Kern Canal. The stored water supplement or offset delivery to service areas along Friant-Kern Canal. Due to the flood control obligation of the reservoir, no carryover storage would be allowed into the wet season.

Dam safety concerns related to seepage make the viability of this option uncertain. The California Department of Water Resources, Division of Safety of Dams, has indicated that no more than 10 TAF can be stored in the existing reservoir, and only if the dam demonstrates satisfactory performance when the reservoir is filled to 25 percent of the dam height and again at the 50 percent level. Duration of storage also is restricted to at most 90 days, from April through September. The 25 percent level test had no significant seepage problems. FMFCD has not had adequate water to test the 50 percent requirement. Modification of the dam for water storage longer than 90 days may require extensive reconstruction of the dam.

Few environmental impacts would be expected from storing up to 30 TAF over periods longer than 90 days. Although some riparian habitat might be adversely affected, this option presents an opportunity to increase the total amount of riparian habitat. Vernal pools and some species of concern are known to exist in the area but not known to occupy the specific site that would be inundated.

This option has been dropped from further consideration in the Investigation because of uncertainty regarding the ability to convert this facility for long-term storage capacity, and the relatively small storage amount. However, the site may be suitable for integration with groundwater recharge facility operations. The existing facility can divert up to 700 cubic feet per second (cfs) of detained floodwater to the San Joaquin River through the Little Dry Creek Flood Channel. Releases of up to 150 cfs can also be made to Big Dry Creek and distributed to downstream detention basins in the FMFCD system to assist in recharging the regional groundwater basin.

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# CHAPTER 1. INTRODUCTION

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The Bureau of Reclamation, in cooperation with the California Department of Water Resources (DWR), is completing the Upper San Joaquin River Basin Storage Investigation (Investigation) consistent with the CALFED Bay-Delta Program Record of Decision (ROD), August 2000. The Investigation will consider opportunities to develop water supplies to contribute to water quality improvements in and restoration of the San Joaquin River, and to enhance conjunctive management and exchanges to provide high- quality water to urban areas. The ROD indicated that the Investigation should consider enlarging Friant Dam or developing an equivalent storage program to meet Investigation objectives.

The Investigation identified several potential surface storage sites to be initially considered through prefeasibility-level studies of engineering and environmental issues. This Technical Memorandum (TM), which was prepared as a technical appendix to the Phase 1 Investigation Report, presents findings from a prefeasibility-level review of potential modifications to the Big Dry Creek flood detention dam and basin.

## OPTION SUMMARY

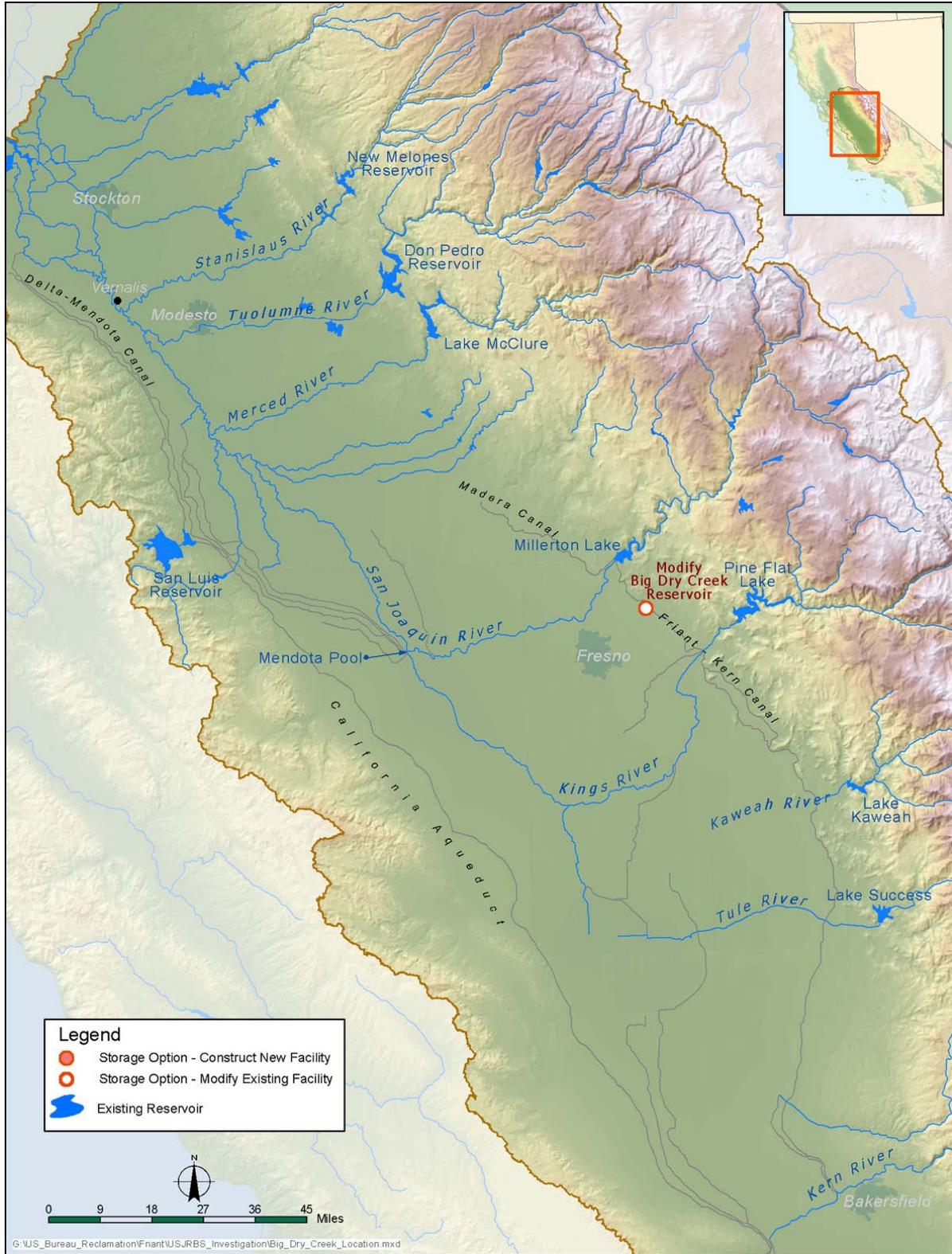
Big Dry Creek Dam and Reservoir are flood control facilities located on Dry Creek in Fresno County, near the community of Clovis, about 15 miles northeast of Fresno (Figure 1-1). The dam and reservoir also span smaller drainages immediately to the north of Dry Creek. Downstream of the dam, Dry Creek continues on to the southwest, passing through Fresno, for a distance of about 18 miles before it becomes the Dry Creek Canal, which services areas to the southwest of Fresno (Figure 1-2).

The facilities are operated by the Fresno Metropolitan Flood Control District (FMFCD), which makes controlled releases of flood runoff to downstream infiltration basins. This TM focuses on improvements that would allow the reservoir to be used more frequently for temporary storage of up to 10 thousand TAF (TAF).

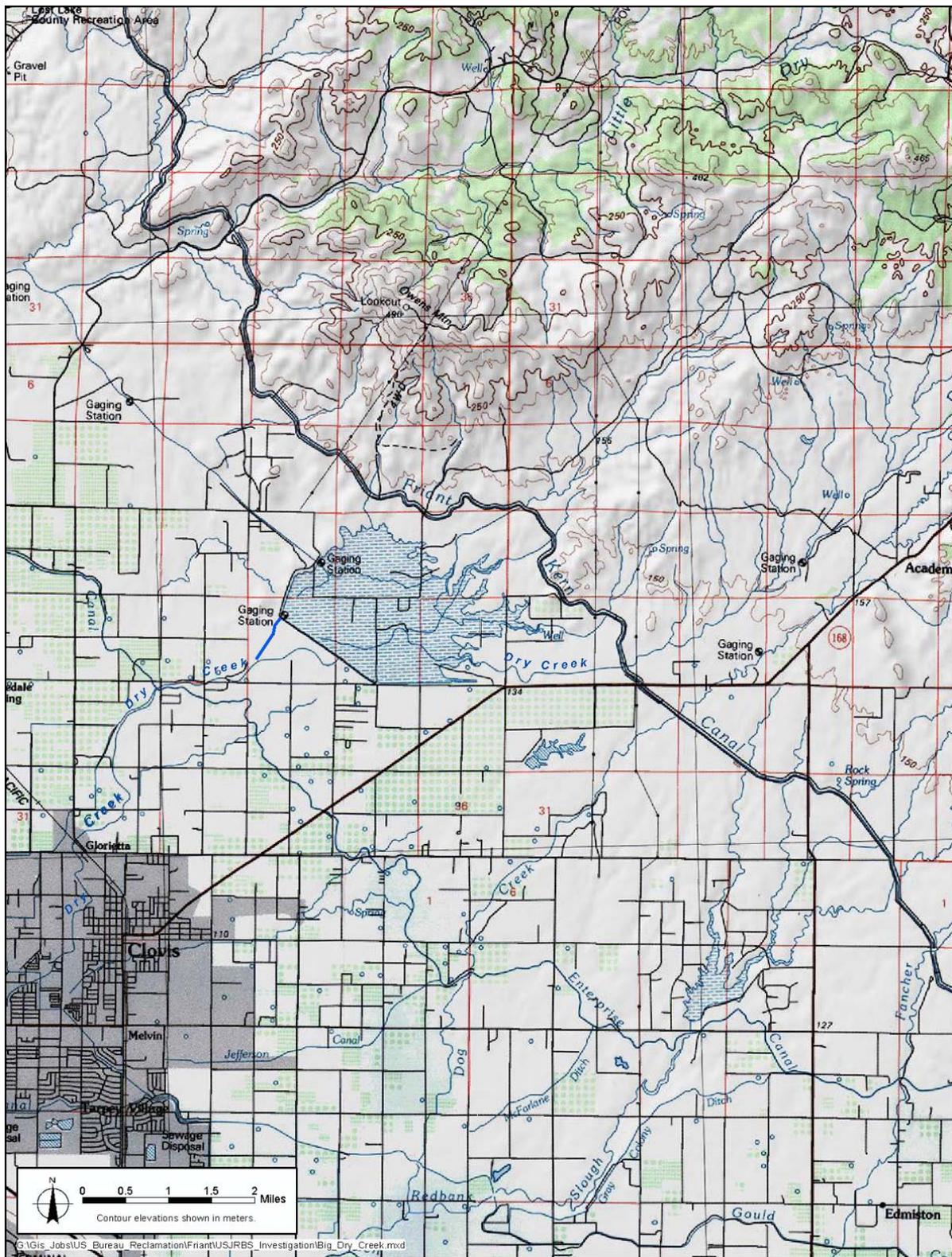
## EXISTING FACILITIES

Big Dry Creek Dam was constructed 1948 by the United States Army Corps of Engineers (Corps), turned over to the California State Reclamation Board, and finally transferred to Fresno County. It is currently owned and operated by FMFCD. The district operates the project to make beneficial use of flood runoff by controlled releases to infiltration basins.

Big Dry Creek Dam was originally constructed with a crest at an elevation of 435 feet above mean sea level (elevation 435) and a gross pool storage capacity of 16.5 TAF. In 1993, the dam crest was raised to elevation 442.2 and the reservoir's storage capacity was increased to 30.2 TAF with a gross pool at elevation 432.7.



**FIGURE 1-1. BIG DRY CREEK RESERVOIR LOCATION MAP**



**FIGURE 1-2. BIG DRY CREEK DAM AND RESERVOIR**

The dam is a homogeneous rolled earthfill type structure with a crest length of about 25,300 feet. The upstream slope of the embankment from the toe to elevation 438.5 is 3:1 (horizontal to vertical) and from elevation 438.5 to the crest is 2:1. The downstream slope of the embankment from the toe to elevation 438.5 is 2.25:1, and from elevation 438.5 to the crest is 2:1.

Controlled releases of detained flood flows are made through two low-level release structures to Big and Little Dry creeks. An ungated, 500-foot wide concrete ogee spillway at elevation 432.7 directs uncontrolled flood flows to the San Joaquin River via the Little Dry Creek Diversion Channel.

In a 1995 tripartite meeting of FMFCD, the Corps, and DWR Division of Safety of Dams (DSOD), DSOD stated that 10 TAF of water, which fills the reservoir to 50 percent of the dam height, could be stored between April and September for a time limit not to exceed 90 days. The DSOD stipulation, however, required that FMFCD first demonstrate that the embankment could perform satisfactorily when the reservoir was filled to 25 percent of the dam height, and then if excessive seepage was not observed, conduct a similar test at 50 percent of the embankment height.

The 25 percent level test was accomplished without significant seepage problems. FMFCD has not had the opportunity to perform a 50 percent test requirement because of lack of water. FMFCD has indicated that a temporary turnout from the Friant-Kern Canal could provide sufficient water to accomplish the 50 percent level test. If the embankment cannot hold the 50 percent level without seepage or other problems, reinforcement and seepage control of foundations and the embankment would be needed, at a minimum.

The City of Fresno has a Central Valley Project (CVP) contract for 60,000 TAF of water from Millerton Lake. The Senate Bill (passed in 1986) that authorized the contract authorizes water deliveries for groundwater recharge. Accordingly, FMFCD has built multiuse detention basins around Fresno for infiltration of this water.

## **SUMMARY OF PREVIOUS INVESTIGATIONS**

Several investigations of Big Dry Creek Dam have been completed previously. The first was the initial investigation in the late 1940s by the Corps, which led to construction of Big Dry Creek Dam in 1948.

In 1986, the Corps released Design Memorandum No. 1, a General Design for Redbank and Fancher creeks in California.

In 1990, the Corps released Design Memorandum No. 2, a Big Dry Creek Dam Feature Design for Redbank and Fancher creeks in California. This document preceded the raise of the dam to its present height.

## **POTENTIAL IMPROVEMENTS CONSIDERED**

Dam safety concerns leave in doubt whether the existing structure could accommodate storage of water for periods greater than 30 days. Therefore, this TM focuses on improvements that would enable more frequent temporary storage of up to 10,000 TAF.

Potential modifications to the existing facility include a gravity turnout from the Friant-Kern Canal and an energy dissipater. Friant-Kern Canal lies immediately to the northeast of Big Dry Creek Reservoir and siphons under Dry Creek about ½-mile north of the State Route 168 canal crossing. The turnout would be located at the point where the canal siphons under Dry Creek (Figure 1-3). A turnout capacity rate of 400 cubic feet per second (cfs) would allow Big Dry Creek Reservoir to be filled to the DSOD proposed maximum 10,000 TAF storage level in a 2-week period. The dam would not be raised.

These facilities also would be required if performance testing results were to indicate that long-term storage of water could become an option.

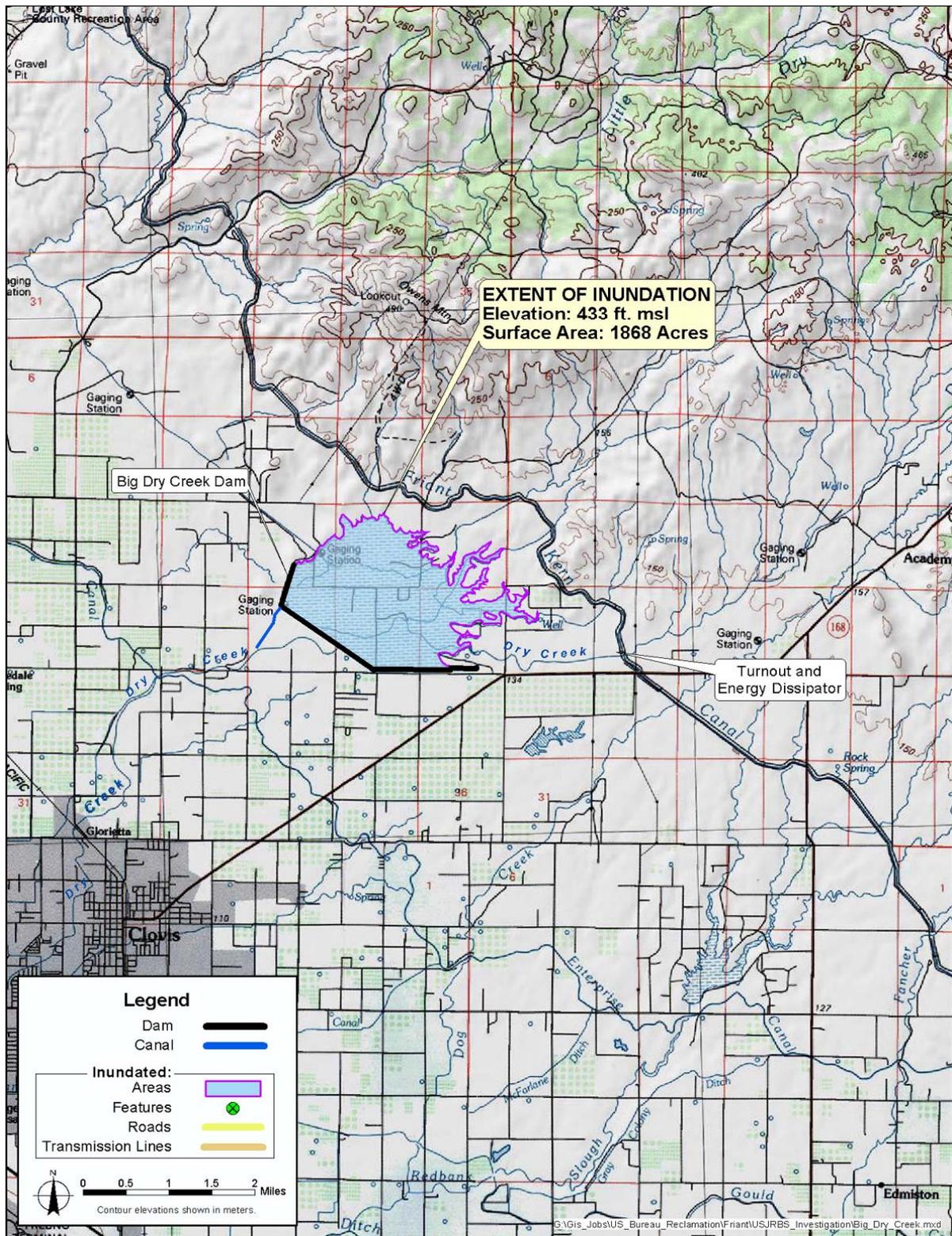
## **APPROACH AND METHODOLOGY**

This TM was prepared from a brief review of the documents listed above, an engineering field reconnaissance of the dam and reservoir conducted on June 13, 2002 (Appendix A), and an environmental field reconnaissance conducted on May 30, 2002 (Appendix B).

During the June 2002 field trip, engineers and geologists examined the site. Locations of existing and potential new structures were visually assessed. Topography, geology, geotechnical conditions, and utilities were noted. Access routes and possible staging and lay-down areas were considered.

During the May 2002 environmental field visit, specialists in botany, wildlife, aquatic biology, recreational resources, and cultural resources visually assessed existing environmental resources. Additional research was conducted, making use of prior studies and available literature, the California Natural Diversity Database (CNDDDB), and topographic maps. This information was used to preliminarily identify the extent to which potential environmental impacts might constrain storage options under consideration. Where evident and relevant, opportunities for improving environmental resources or mitigating adverse effects were also noted. Surveys were not conducted and consultations with external resource management or environmental agencies were not held.

The seismotectonic evaluation conducted by Reclamation for this study was based on readily available information considered appropriate for prefeasibility-level studies only. Detailed, site-specific seismotectonic investigations have not been conducted. Aerial/remotely sensed imagery was not evaluated. More detailed, site-specific studies would be required for higher-level designs. Designs and analyses for prefeasibility-level studies are typically quite general. Extensive efforts to optimize the designs have not been done, and only limited value-engineering techniques have been used.



**FIGURE 1-3. POTENTIAL MODIFICATIONS TO EXISTING FACILITY**

## **CHAPTER 2. TOPOGRAPHIC SETTING**

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The dam site is located in low rolling hills on the margin of the San Joaquin Valley. Regional topography is that of the nearly level floor of the San Joaquin Valley rising abruptly to moderately steep, northwest-trending foothills with rounded canyons. Dry Creek is a southwest- to west-flowing stream that drains a broad, gently sloping basin before the Sierra Nevada foothills.

Elevations in the immediate area of the dam site range from about elevation 400 to around elevation 460. Farther north and east, the land surface sharply steepens to the foothills of the Sierra Nevada mountain range. Shallow west-to southwest-draining stream valleys have been cut into the rolling terrain. Two rivers dominate the area, the San Joaquin River (about 7 miles northwest) and the Kings River (about 13 miles southeast).

The dam site is located across a broad area of low, rolling hills. The left abutment blends with the gently rising topography east of the main dam section. The right abutment ties into low hills north of the main dam section. The streambed axis at the downstream face of the dam is about elevation 400.

### **AVAILABLE TOPOGRAPHIC MAPPING**

Topographic mapping other than that available from the United States Geological Survey (USGS) appears to have been used by the Corps and would probably be available if additional detailed study is desired. FMFCD should also possess topographic maps.

### **AVAILABLE AERIAL PHOTOGRAPHY**

Aerial photography of various scales and imagery is available from USGS archive files. Additional aerial imagery may also be available from the United States Department of Agriculture, Reclamation, and the Corps. FMFCD may also possess site aerial photography. A specific search of available photography was not conducted for this TM nor was any aerial photography reviewed.

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## CHAPTER 3. GEOLOGIC AND SEISMIC SETTING

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The Big Dry Creek Dam and Reservoir area is located in an area that traverses the contact between alluvial deposits of the San Joaquin Valley portion of the Great Valley Geomorphic Province and the Sierra Nevada Geomorphic Province. The Great Valley basin is filled with thick accumulations of marine (at depth) and non-marine sediments shed largely from the Sierra Nevada mountain range. Recent alluvium of lake and river origin blankets most of the present-day surface, while dissected remnants of Pleistocene alluvial fans rim the valley margin.

The Sierra Nevada range is characterized by batholiths of Mesozoic granitic rock and Paleozoic roof pendants of the Calaveras Complex and related rocks. The Sierra Nevada foothills take the form of outliers of low to irregular hills of Mesozoic granitic and late Paleozoic to Mesozoic basic and ultrabasic rock (ophiolites), and other associated Mesozoic metamorphic rocks.

Overall, seismic hazard potential at the site is low. Preliminary earthquake loading analysis for this prefeasibility-level evaluation considered two types of potential earthquake sources: fault sources and areal/background sources (Reclamation, 2002).

Twenty-two potential fault sources for the site were identified, including those associated with the San Andreas fault, seven western Great Valley faults, seven eastern Sierra Nevada faults, the White Wolf fault of the southern San Joaquin Valley, and six faults of the Sierra Nevada Foothills fault system. No major through-going or shear zones have been identified in this area of the Sierra Nevada range and historic seismicity rates are low.

The areal/background seismic source considered was the South Sierran Source Block, the region surrounding the site. This region possesses relatively uniform seismotectonic characteristics.

Probabilistic seismic hazard analysis shows that the peak horizontal accelerations to be expected at the site are 0.13g with a 2,500-year return period, 0.17g with a 5,000-year return period, and 0.23g with a 10,000-year return period.

### SITE GEOLOGY

The material in the area consists of bedrock to alluvial formations, residual soil, and recent streambed material. The area lies within Seismic Zone 3.

Geologic units at the dam site and reservoir area range in age from Mesozoic bedrock units to recent stream deposits. The bedrock units are deeply weathered pre-Cretaceous meta-sedimentary and meta-volcanic rocks and Mesozoic granitics. The metamorphic units are essentially roof pendants to the granitic batholiths of the Sierra Nevada range. Weathered bedrock directly underlies the western, northern, and northeastern portion of the reservoir area.

Pleistocene sediments of the Riverbank Formation underlie the eastern and southern reservoir areas. The Riverbank unit consists of locally derived alluvial silt and sand.

The recent Modesto Formation occupies the area under the southwestern portion of the reservoir area. This alluvial fan unit is a locally derived deposit of alluvial silt, sand, and gravel.

A buried fault identified as the Clovis fault passes beneath the reservoir area, but it is not considered significant.

## **SITE GEOTECHNICAL CONDITIONS**

From the types of geologic units mapped at the Big Dry Creek Dam and Reservoir site, only the bedrock units under the northern portion of the reservoir area may be considered indurated, and the near surface bedrock is likely deeply weathered. The rest of the geologic units mapped in the area all appear to be unconsolidated and are likely to be very permeable.

## **CHAPTER 4. HYDROLOGIC SETTING**

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The drainage area for the Big Dry Creek Reservoir includes the drainages of two primary streams, Dry Creek and Dog Creek. Their combined drainage area is about 82 square miles. Elevations within the Dry Creek watershed range from roughly elevation 400 at the downstream outlet of Big Dry Creek Dam to about elevation 1,500 at the headwaters.

### **RAINFALL**

Rainfall in this Mediterranean climate region varies from about 6 inches per year in the valley to about 50 inches per year in the Sierra Nevada range. Normal annual precipitation over the general Dry Creek basin area varies from 10.5 inches east of Fresno to over 30 inches at the headwaters.

About 90 percent of the rainfall in the region occurs during November through April. Below about elevation 5,000, precipitation typically occurs as rain, while above that, as snow. However, warm winter storms may produce rain as high as elevation 11,000, and exceptionally cold fronts may drop snow on the valley floor.

### **EROSION, RUNOFF, AND RECHARGE**

Sheet and gully erosion affect the foothills and mountains of the San Joaquin Basin quite extensively. However, the foothills east of Fresno are considered well-managed grazing land and experience far fewer erosion problems than other San Joaquin Valley foothills.

The Big Dry Creek project is designed to provide Standard Project Flood protection to the Fresno-Clovis area. Current flood operation procedures direct most floodwater (up to 700 cfs) to the San Joaquin River through the Little Dry Creek low-level release facility to the Little Dry Creek Flood Channel.

As currently designed, if reservoir storage were to exceed 30,200 TAF (elevation 432.7), excess floodwater would spill from the reservoir through an ungated spillway to the flood channel. As a flood event recedes, releases are made through the Big Dry Creek release facility (up to 150 cfs). When possible, these releases are distributed through the available detention basins in the FMFCD system throughout the City of Fresno to assist in recharging the ground water basin.

### **AVAILABLE FLOOD DATA**

Big Dry Creek Reservoir has a capacity of 30,200 TAF. However, the reservoir has never been filled to a level greater than 15,000 TAF during any flood event.

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## CHAPTER 5. STORAGE STRUCTURES AND APPURTENANT FEATURES

This chapter describes the storage structure and appurtenant features for the Big Dry Creek Dam and Reservoir modifications, and associated constructibility, cost, and systems operations.

### STORAGE STRUCTURE

The existing homogeneous rolled earthfill embankment dam needs to complete the 50 percent fill test to the satisfaction of DSOD before it is known whether the existing dam structure can accommodate increased water storage. It is anticipated that before the dam and reservoir could be fully used for long-term water storage, extensive modifications and possible reconstruction would be needed. However, the extent of required modifications is presently unknown.

### RESERVOIR AREA/ELEVATION/CAPACITY CURVES

A reservoir elevation vs. storage curve is shown in Figure 5-1. Although reservoir area data are not available at varying elevations and storages, at a maximum capacity of 30,100 TAF, the surface area of Big Dry Creek Reservoir would be approximately 2,200 acres.

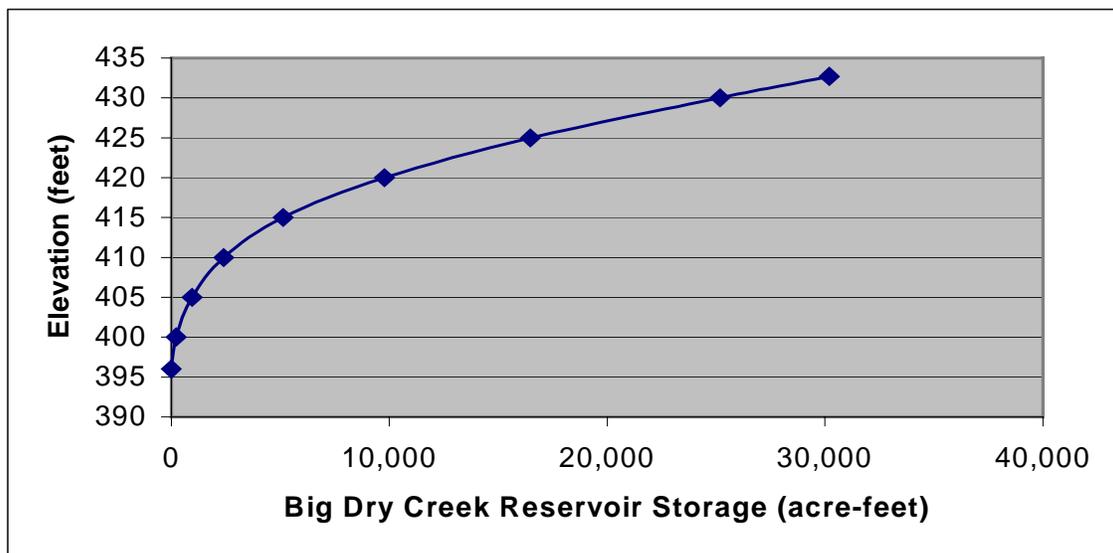


FIGURE 5-1. ELEVATION VS STORAGE CURVE

## **APPURTENANT FEATURES**

This section discusses other features that would be needed for the potential storage option.

### **Conveyance**

A turnout from the Friant-Kern Canal would be constructed. Releases from Big Dry Creek Reservoir would flow through the existing conveyance system to detention basins. Stream armoring may be needed to accommodate increased flow.

### **Pumping Plants**

No pumping plants are required or planned.

## **CONSTRUCTIBILITY**

This section discusses issues of concern related to modifying the dam, reservoir, and appurtenant features.

### **Land, Rights-of-Way, Access, and Easements**

All land and rights-of-way within the Big Dry Creek Dam and Reservoir area are owned by FMFCD and/or the City of Fresno.

### **Borrow Sources/Materials**

Borrow sources and materials are not applicable to this option, since dam reconstruction is not within the scope of the improvements currently under consideration.

### **Foundations**

In exploration of the Big Dry Creek Dam (Corps, 1986), underlying soils generally consisted of clayey sand with lesser amounts of silty sand, sandy clay, sandy silt, and clean sand. Grain-size distributions of the samples were 30 percent fines, 65 percent sand, and 5 percent gravel. Fines ranged from non-plastic to medium plasticity.

Distribution of the materials was random with the exception of a 500-foot wide section of clean sand where the dam intersects Dry Creek. This alluvial creek sand is well-graded and recently deposited.

### **Power Sources**

Nearby electrical power would be available.

### **Staging and Lay-Down Area**

Potential staging and lay-down areas are located within the reservoir area and immediately downstream of the dam.

## **Contractor Availability and Resources**

There are several local general engineering contractor or regionally based general engineering contractors capable of performing rock excavation, concrete forming and placement, and other associated construction tasks.

## **Construction Schedule and Seasonal Constraints**

Construction of the turnout would require dewatering a portion of the Friant-Kern Canal near its upper end. Close coordination with Reclamation would be required to complete construction of the turnout during an appropriate period.

## **Flood Routing During Construction**

Because primary work would be planned for the dry season, flood routing would not be needed during construction.

## **Environmental Impacts During Construction**

Environmental impacts during construction could be mitigated with proper planning and implementation of best management practices. Noise and visual impacts could be mitigated by conducting most of the work from the reservoir side of the dam. The access road into the reservoir would need to be restricted to the general public. Air quality issues could be mitigated by dust control measures. However, truck traffic and excavation equipment would discharge exhaust to the local air basin. A cultural survey should be conducted to identify and ancestral American Indian or historic artifacts and construction activities would be restricted in those areas. Importing rock from distant quarries would cause traffic impacts, but with proper planning and coordination with Caltrans, major impacts could be mitigated. All construction equipment should have spark arresters and fire control equipment should be kept readily accessible during construction. Construction water would have to be controlled and provisions made for runoff and erosion control. A spill control plan would be needed to control any construction-related fuels, lubricants, and other materials.

## **Permits**

It is probable that Federal and non-Federal sponsors would be involved in implementing this option. This probable joint sponsorship could complicate the permitting process as Federal projects are not subjected to the same level of permitting required for non-Federal projects.

Given the probable duality of sponsorship, and potential environmental and cultural impacts identified, at a minimum, certain permits could be required from the permitting agencies listed in Table 5-1.

**TABLE 5-1. POSSIBLE REQUIRED PERMITS**

Permit	Permitting Agency
Permit to Construct	DSOD, Fresno County
Encroachment	Caltrans, Fresno County
Air Quality	CARB, Fresno County
Low/No Threat NPDES	RWQCB
Waste Discharge	RWQCB
401 Certification	SWRCB
Blasting	Fresno County
Stream Bed Alteration	CDFG
Fire/Burn	CDF, Fresno County
Key: CARB California Air Resources Board CDF California Department of Forestry CDFG California Department of Fish and Game DSOD Department of Safety of Dams NPDES National Pollutant Discharge Elimination System RWQCB Regional Water Quality Control Board SWRCB State Water Resources Control Board	

In addition, the following agencies could be involved in the review of permit conditions:

- Bureau of Land Management
- State Historic Preservation Office
- Advisory Council on Historic Preservation
- United States Fish and Wildlife Service (USFWS)

In obtaining these various permits, several plans would have to be prepared and submitted to the responsible agencies for review and approval:

- Construction Plan and Summary Documents
- Quality Control Inspection Plan
- Highway Notification Plan
- Blasting Plan
- Noise Monitoring Plan
- Water Quality Monitoring Plan
- Noxious Weed Control Plan
- Bat Protection Plan
- Management Plan for Avoidance and Protection of Historic and Cultural Properties
- Storm Water Pollution Prevention Plan
- Spill Prevention/Containment Plan
- Visual Quality Control Plan
- Dust Control and Air Quality Plan

Another important regulatory requirement involves compensation/mitigation for habitat loss. In October 1998, the USFWS issued its draft Coordination Act Report and Habitat Evaluation Procedure (HEP Analysis). The HEP Analysis delineates how compensation for adversely affected baseline habitat and wildlife conditions is to be determined.

In addition, if power generation is included in a project or is modified for an existing project, the Federal Energy Regulatory Commission may become involved in the permitting process.

## **COSTS**

Costs discussed for this option are for initial construction costs. Cost estimate details are contained in Appendix C.

### **Initial Construction Costs**

The total estimated first cost is \$1.1 million. This includes \$500,000 for the Friant-Kern Canal turnout with a capacity of 400 cfs. This estimate is based on a 200 cfs turnout from the Friant-Kern Canal for North Kern Water Storage District in a Proposition 13 Grant Application, dated December 2001, submitted to DWR. Additionally an energy dissipater and stream armoring may be needed at an estimated 25 percent of the turnout cost (\$125,000). Total field costs represent the estimated cost to construct identified features, plus provisions for unlisted items (15 percent), contingencies (25 percent), and mitigation (5 percent). Total costs include field costs plus estimated costs for future analyses and planning documentation, development of designs, and construction management (15 percent).

### **Operations and Maintenance Costs**

Operations and maintenance costs were not computed in any previous studies of the potential Big Dry Creek Dam modification and have not been prepared for this stage of the Investigation.

## **SYSTEMS OPERATIONS**

Operations of the existing system are discussed briefly in the “Erosion, Runoff, and Recharge” section of Chapter 4. If modifications were to be implemented, systems operations would be coordinated with the CVP, Friant Division, to release water from the Friant-Kern Canal into the Big Dry Creek Reservoir area. In turn, the Big Dry Creek Reservoir would be regulated to control inflows from the Friant-Kern Canal and releases to detention basins downstream of the dam.

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## **CHAPTER 6. HYDROELECTRIC POWER OPTIONS**

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Various hydroelectric power options were considered for each surface storage site, including Big Dry Creek Dam and Reservoir.

### **PUMPED STORAGE CONSIDERATIONS**

Pumped storage is not viable for this option.

### **ADDED HYDROELECTRIC POWER TO EXISTING STRUCTURES**

There are no existing water storage or hydroelectric structures on Dry Creek.

### **NEW HYDROELECTRIC POWER**

Hydroelectric power generation is not considered feasible for the dam on Dry Creek.

### **TRANSMISSION AND DISTRIBUTION**

Transmission and distribution systems would not be required for the modifications.

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## CHAPTER 7. ENVIRONMENTAL CONSIDERATIONS

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The environmental setting descriptions provided in this chapter pertain to the area of potential inundation.. For Big Dry Creek Dam, this description addresses the existing reservoir pool area.

In addition, this chapter describes existing environmental resources at the site and qualitatively describes potential effects of reservoir modification, indicating the extent to which expected or potential environmental effects might pose a constraint to the storage option being considered. Where evident, opportunities for improving environmental resources or for mitigating any adverse effects have been noted. Analysis focused on botany, terrestrial wildlife, aquatic biology, water quality, recreational resources, cultural resources, and existing land uses. Mining and other known past activities that might affect site conditions are also briefly discussed, along with the potential presence of hazardous or toxic materials.

Identification of constraints was conducted at a preliminary, prefeasibility-level of planning, consistent with the current phase of the Investigation. Criteria considered were based, in part, on criteria commonly used to evaluate environmental impacts of projects under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). Application of criteria that may be used for NEPA or CEQA evaluation does not imply that the analysis is at a level necessary to support an Environmental Impact Statement or Environmental Impact Report. Considerations included presence of special status species (e.g., species listed as endangered or threatened), species of concern, or sensitive habitats; relative amounts of affected riparian or wetland habitat; effects on native or game fish; conflict with established recreational uses or land uses; presence of nationally registered historic places, sacred Native American sites, or traditional cultural properties; permanent disruption or division of established communities; and loss of energy production facilities.

### **BOTANY**

Annual grassland habitats and some riparian habitat vegetation are present. There are also wetlands from the current residual pool, and vernal pools could be present as well.

Eight special-status species are known to occur in the region around the Big Dry Creek flood control reservoir: Hartweg's pseudobahia, Tulare pseudobahia, San Joaquin Valley Orcutt grass, Greene's tuctoria, succulent owl's-clover, Sanford's arrowhead, spiny-sepaed button-celery, and Madera linanthus. The first five species have both State and Federal status as rare, threatened, or endangered species. The remaining three species have California Native Plant Society (CNPS) List 1B status. Four of the eight species occur in vernal pools, and all but one of these is present on the CNPS List.

## **Constraints**

Riparian habitat constraints would be minimal. The biggest constraint would be vernal pools with one or more listed species. The CNDDDB does not report any special-status species in the area of the existing flood control reservoir, but surveys may be required to determine whether any species are in fact present.

## **Opportunities**

Creating wetland and riparian habitat may be possible by manipulating reservoir water levels.

## **WILDLIFE**

Most of the area consists of relatively open grassland except along the northern section of the dam where a large riparian bosque is well established. Wildlife species typical of grassland and Sierran foothill habitats are expected here. The area of grasslands may have vernal pools. Vernal pools in this area are inhabited by vernal pool fairy shrimp, which are listed as threatened by Federal agencies.

The riparian stand could host California endangered yellow-billed cuckoos, and Federally listed (threatened) willow flycatchers. CNDDDB only records four species of special concern: vernal pool fairy shrimp, yellow-billed cuckoo, willow flycatcher, and San Joaquin kit fox.

## **Constraints**

CNDDDB records do not specifically place any endangered or threatened species or species of special concern at this site, but they must be considered as potentially present until biological field studies can confirm their presence or absence. The kit fox is most likely present, but would not constitute a large constraint as impacts to the kit fox can be mitigated.

## **Opportunities**

The relatively flat terrain of this site would allow expansion of riparian habitat if water were retained at the site for longer periods. Expansion of riparian habitat would benefit a wide range of wildlife species. If the yellow-billed cuckoo and willow flycatcher are present, increasing habitat would likely support additional pairs. If these birds are not present, additional riparian habitat might create a threshold that would support them. Regardless, an increase of riparian habitat would benefit wildlife.

## **AQUATIC BIOLOGY/WATER QUALITY**

Dry Creek, which would be partially inundated by the reservoir, was dry at the time of the field visit and probably flows only during periods of rain. It has no direct connection to other waterways and probably contains no significant aquatic biological resources. Water stored in the reservoir would be diverted from the Friant-Kern Canal and would likely be of good quality.

## **Constraints**

Big Dry Creek Reservoir would have no carryover storage because of the flood control function of the dam. Therefore, the reservoir would have no permanent aquatic habitat and could only support a put-and-take fishery.

## **Opportunities**

Because of the relatively low reservoir elevation and shallow depth, water in the reservoir would be warm and only warm-water species would survive.

## **RECREATION**

The Big Dry Creek flood control area is situated on undeveloped property owing to its use for flood control. No recreation facilities are located in the immediate area, which is flat and dry, and not conducive to recreation activities. The nearby Friant-Kern Canal is fenced to discourage access.

## **Constraints**

No developed recreation facilities are present in the Big Dry Creek flood control area. Furthermore, dispersed use is unlikely. Significant impacts to recreation resources are not expected.

## **Opportunities**

Since the modifications are not expected to result in impacts to recreation, no mitigation would be required. The relatively small size of this reservoir and the limited storage schedule would not likely support development of major recreation facilities. Minor improvements such as nature viewing trails and platforms may be desirable if wildlife is present.

## **CULTURAL RESOURCES**

The Dry Creek and Little Dry Creek drainages were traditional territory of the Gashowu Foothill Yokuts people. The majority of Southern Valley and Foothill Yokuts people now live on the Tule River Indian Reservation, near Porterville, although many Gashowu descendants probably live at Table Mountain Rancheria east of Friant.

Specific information is presently unavailable regarding history of the Big Dry Creek area. More extensive riparian growth in the past would suggest a moderate probability of prehistoric archaeological sites, including bedrock milling stations and hunting camps in the area. A variety of sites is likely to be present associated with agriculture and other activities. In May 2002, a probable homestead site was noted north of Dry Creek.

## **Constraints**

At least some cultural resources are likely to be present in the area. Inundation of archaeological sites (prehistoric or historic) can result in loss of important scientific data. Because an existing dam structure would be used, however, additional water storage at Big Dry Creek Reservoir would likely cause no adverse effects to sites above and beyond those effects that may occur from the flood control function of the facilities as presently designed. No properties eligible for the National Register of Historic Places are known to be present. No Native American sacred sites or Traditional Cultural Places are known to occur, but this does not rule out their presence.

## **Opportunities**

Because no adverse effects are anticipated, mitigation opportunities do not pertain to this potential measure.

## **LAND USE**

Most of the land within the reservoir inundation area is used for grazing. Several orange groves are also present in the southeastern portion of the reservoir urban area.

Residential development within the immediate vicinity of the existing flood control area is sparse, but growing.

## **Constraints**

No land use constraints are foreseen. The options considered would involve re-operation of an existing facility; therefore, no change would occur in the maximum potential water elevation of the facilities, as designed, and surrounding uses would remain the same.

## **Opportunities**

The site is undeveloped and the options considered would create minimum potential for disruption of an existing community. No specific opportunities were identified for land use development in association with implementation of options considered.

## **MINING AND OTHER PAST ACTIVITIES**

There is no evidence of mining or other prior discontinued human activities in the area of the existing project.

## **Constraints**

No constraints have been identified.

## **HAZARDOUS AND TOXIC MATERIALS**

There is no evidence of former occupations within the reservoir area that could have involved use of hazardous or toxic materials.

### **Constraints**

No constraints have been identified.

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## CHAPTER 8. FINDINGS AND CONCLUSIONS

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This TM considered the potential to modify Big Dry Creek Dam and Reservoir for water storage. The reservoir spans Dry Creek and associated smaller drainages to the north of Big Dry Creek. The reservoir is formed by a zoned earthfill embankment and has a storage capacity of approximately 30,000 TAF.

Dam safety concerns related to seepage make the viability of this option uncertain. DWR DSOD has indicated that no more than 10,000 TAF can be stored in the existing reservoir, and only if the dam demonstrates satisfactory performance when the reservoir is filled to 25 percent of the dam height and again at the 50 percent level. The duration of storage is also restricted to at most 90 days, from April through September. The 25 percent level test was accomplished without significant seepage problems. FMFCD has not had adequate water to test the 50 percent requirement. Modification of the dam for water storage longer than 90 days may require extensive reconstruction of the dam.

In addition to uncertain potential modifications to the dam, this option would require construction of a turnout from nearby Friant-Kern Canal and an energy dissipation structure that would reduce velocities of the new flows conveyed into the reservoir. These modifications would enable the Big Dry Creek Reservoir to be operated as an off-stream storage facility for water diverted from Friant-Kern Canal. The stored water would supplement or offset delivery to service areas along Friant-Kern Canal. Due to the flood control obligation of the reservoir, no carryover storage would be allowed into the wet season.

Few environmental impacts would be expected from storing up to 30,000 TAF over periods longer than 90 days. Although some riparian habitat might be adversely affected, this option presents an opportunity to increase the total amount of riparian habitat. Vernal pools and some species of concern are known to exist in the area but not known to occupy the specific site that would be inundated.

This option has been dropped from further consideration in the Investigation because of uncertainty regarding the ability to convert this facility for long-term storage capacity, and the relatively small storage capacity. However, the site may be suitable for integration with groundwater recharge facility operations.

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## CHAPTER 9. LIST OF PREPARERS

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### ACKNOWLEDGMENTS

The preparers acknowledge the valuable assistance provided by FMFCD personnel, District Engineer Gerald Lakeman, and Mr. Kurt Hupp; Mr. Edward Perez, DWR, San Joaquin District; by DSOD personnel, Mr. Mutaz Mihyar, Ms. Andrea Lobato, and Mr. Chuck Wong; and by Mr. Perry Metzger of the Corps.

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## CHAPTER 10. REFERENCES

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## **APPENDIX A**

**Engineering Field Trip Report**

**Big Dry Creek Reservoir**



Field Trip Log - Engineering			
<b>Trip Log Number:</b>	11	<b>Project No.:</b>	1003032.01180502
<b>Dates:</b>	6/12/02	<b>Times:</b>	1620-1640
<b>Site Name:</b>	Big Dry Creek Reservoir	<b>Location:</b>	Clovis
<b>Prepared By:</b>	DKR/JMH/WAM	<b>Reviewed By:</b>	
<b>Date:</b>	6/12/02	<b>Date:</b>	

Attendees/Visitors Name	Organization/Phone/Email
DKR	MWH, 925.685.6275 x125, david.k.rogers@mwhglobal.com
JMH	MWH, 925.685.6275 x143, james.m.herbert@mwhglobal.com
WAM	MWH, 425.602.4025 x1060, william.a.moler@mwhglobal.com

**Weather Conditions:**  
 Clear, haze, warm (low 90s), light breeze

**Access Route (attach map):**  
 Highway 99, Herndon (E) through Madera, to Toll House / Highway 168 (N), to Shepherd Av (W), to DeWolf Av (N)

<b>Attachments:</b>	Yes	No
---------------------	-----	----

Photo Log	✓	
Photos	✓	
Video Log (available)	✓	
Dictation Log (available)	✓	
Topographic Map	✓	

**Purpose:**

Review existing embankment presently used for flood control for possible use for temporary storage.

**Field Observations:**

**Existing Structures/Cultural Features:**

Big Dry Creek reservoir is impounded by a zoned earthfill embankment having a crest length of ~ 3 ½ miles, a crest elevation of ~ 442.2 ft, and a storage capacity of ~ 30,200 ac-ft. The Friant-Kern Canal passes along the northern shoreline of the reservoir (URS, 2000).

The land within the embankments is used for agriculture. A citrus grove was observed in the southeast portion of the reservoir and the rest appeared to be used as grazeland.

**Right of Way/Access Restrictions:**

Public roads lead to and enter the Big Dry Creek reservoir area. A single-lane asphalt road accessed the central portion of the reservoir area.

**Overhead/Buried Utilities:**

None observed, with the exception of high voltage lines extending across the foot of the mountains to the north.

**Description of Potential Structures (attached a field sketch or sketch on a topo map):**

Facilities would be needed to transfer excess spring and summer storage to the reservoir could be access via the Friant-Kern Canal.

**Description of Appurtenant Features:**

Facilities would be needed to transfer excess spring and summer storage to the reservoir could be access via the Friant-Kern Canal.

**Briefly Describe Geologic/Geotechnical Site Conditions:**

Big Dry Creek Reservoir is located at the boundary of the Sierra Nevada foothills and the Great Valley. The state geologic map shows that the reservoir is surrounded by Mesozoic granitic, pre-Cretaceous meta-volcanic, and meta-sedimentary rocks on the west and northwest, Mesozoic granitic rocks on the northeast, and Pliocene non-marine sediments (older alluvium) on the south. Recent alluvium extends to the southwest for Dry Creek (CDMG, 1965).

As with most sites in the region, studies indicate that there are no faults in the area capable of producing ground motions greater than those generated by four known regional sources that include the San Andreas fault system, the Sierra Frontal fault system, the White Wolf fault, and the Garlock fault (COE, 1990).

**Location/Description of Nearest Borrow Areas (attach map or show on topo map):**

Not applicable to modifications.

**Location/Description of Equipment/Material Staging and Lay Down Areas (attach map or show on topo map):**

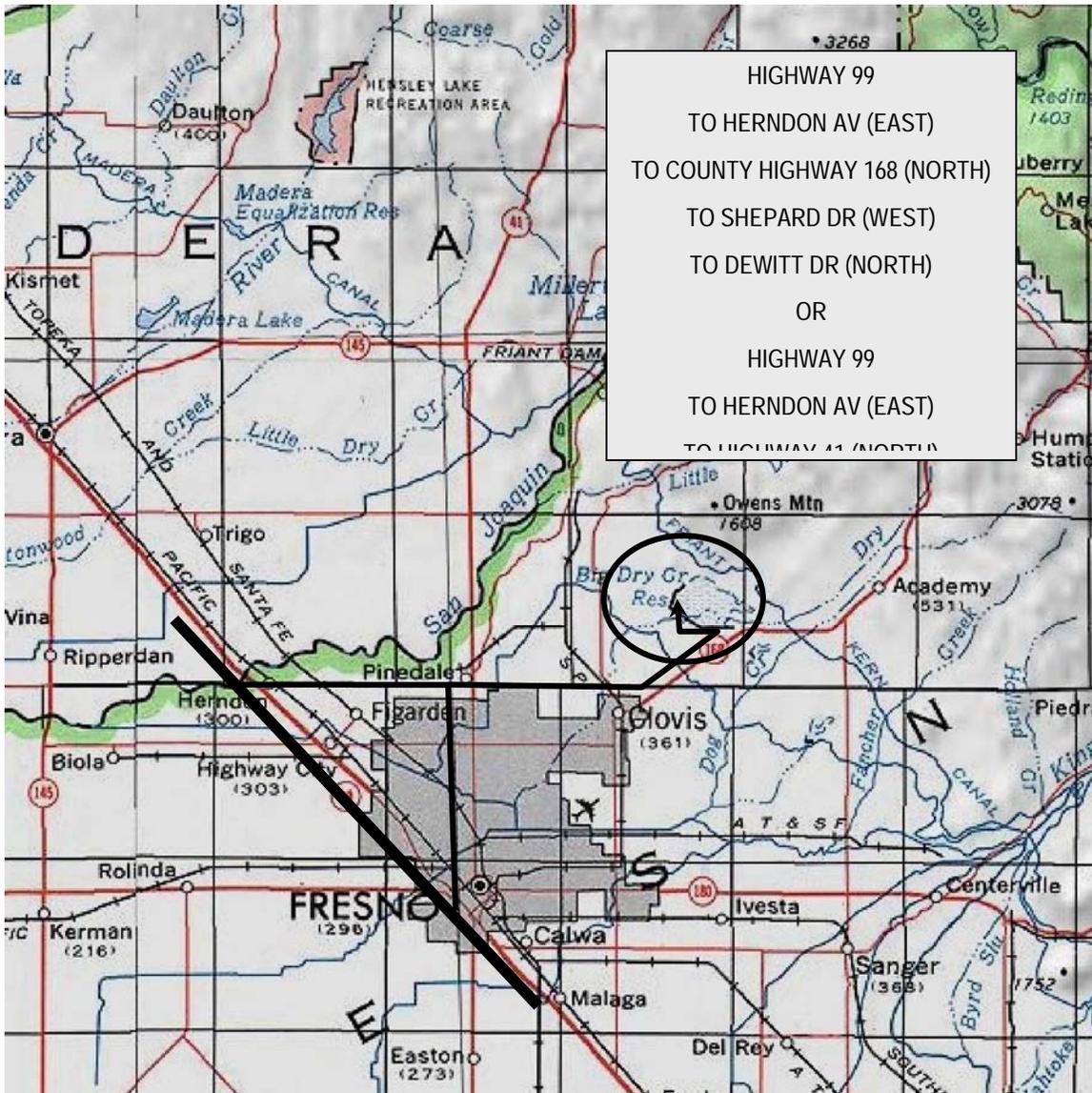
Potential staging and lay-down areas are present within the existing reservoir.

**Identification of Environmental Sensitive Areas (wetlands, springs, rivers, streams, endangered/threatened species habitats, etc.):**

A sparse riparian habitat follows Dry Creek within the reservoir.

**Description of Mining or Other Anthropologic Activities:**

None noted.



**BIG DRY CREEK SITE VICINITY MAP**



Dry Creek – Westward view along Big Dry Creek embankment



Eastward view along embankment



Northward view across flood control basin from top of embankment



Northwestward view across basin

## **APPENDIX B**

**Environmental Field Trip Report**

**Big Dry Creek Reservoir**



# **ENVIRONMENTAL FIELD TRIP REPORT - BIG DRY CREEK RESERVOIR**

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A team of environmental specialists completed an initial field trip to the Big Dry Creek Reservoir site on May 31, 2002. The field trip was the first task in the environmental study of several potential surface storage options identified for initial review during the Upper San Joaquin River Basin Storage Investigation. For initial consideration, the environmental review focused mainly on construction and potential upstream impacts associated with surface storage sites. The site visit provided an opportunity to conduct preliminary reconnaissance of existing resources at the various locations for the following resource areas: terrestrial biology; aquatic biology and water quality; recreation; cultural resources; and land use.

This appendix includes a brief overview of the resource specialists' observations, trip logs prepared by team members, photographs taken during the field trip, and maps used to identify and review existing resources.

## **SUMMARY OF FIELD OBSERVATIONS**

This option would involve using the existing Big Dry Creek flood control area to capture and store flood flows. The Big Dry Creek flood control area is on private property, which is undeveloped due to its use as a flood control area. Existing facilities include paved and unpaved roads.

### **Botany**

- There is open grassland throughout most of the area behind the levee with a large riparian bosque in the western and northwestern area.
- Existing riparian habitat could be affected
- Vernal pools, if present, could be affected.
- Possible impacts to special status species, but disturbance from operating area for flood control may have eliminated them.
- Ground assessments would be needed.

### **Wildlife**

- The sensitive species possibly within this area include the San Joaquin antelope squirrel, giant kangaroo rat, short-nosed kangaroo rat, Fresno kangaroo rat, San Joaquin pocket mouse, San Joaquin kit fox, blunt-nosed leopard lizard, giant garter snake, coast horned lizard and willow flycatcher.
- The relatively flat topography of the site would allow for creation of riparian woodland bosques as mitigation.

### **Aquatic Biology/Water Quality**

- Dry Creek was dry at the time of the field visit and probably flows only during periods of rain.
- The creek has no connection to other waterways.
- It is unlikely that creek contains any significant aquatic biological resources.
- Construction of a reservoir would create new aquatic habitat and fisheries opportunities, primarily for exotic fish species.
- No significant water quality issues are expected.

### **Recreation**

- This Big Dry Creek Reservoir is situated on private property, which is undeveloped owing to its use as a flood control area.
- The area is flat and dry and not conducive to recreation activities. As such, there are no recreation facilities in the area.

### **Cultural Resources**

- Present-day grasslands may not be representative of prehistoric vegetation. It is possible that there was formerly more extensive riparian growth, including Valley Oaks.
- There is a moderate probability of prehistoric archaeological sites including bedrock mortar (BRM) stations, and hunting camps, associated with Big Dry Creek. Historic sites are likely, associated with agriculture and other activities.
- A probable homestead site was noted north of Dry Creek, with big eucalyptus and palm trees.

### **Land Use**

- There is no residential development within the immediate vicinity of the existing flood control area that would be used for the reservoir.
- Travel on adjacent roads would be disrupted during construction.

Environmental Team Field Trip Log - Botany		
<b>Trip Log Number:</b>	S5	<b>Project No.</b> 8004094
<b>Dates:</b>	May 29, 2002	
<b>Site Name:</b>	Big Dry Creek Reservoir Excess Utilization	
<b>Location:</b>	Big Dry Creek flood control area	
<b>Prepared By:</b>	Jeff Glazner/Barry Anderson/David Stevens	
<b>Date:</b>	June 3, 2002	

<b>Weather Conditions:</b>	Hot and dry
<b>Areas Covered (attach map with notations)</b>	
<b>Attachments</b>	
<b>Photo Log</b>	Yes
<b>Photos</b>	Yes
<b>Topographic Map(s)</b>	No

**Field Observations:**

**Existing Facilities:**

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Big Dry Creek dam and reservoir.

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**Existing Environmental Features as Appropriate to Discipline (hydrology; aquatic-water quality; terrestrial—plants; wildlife; recreation; cultural resources; land use; aesthetic)**

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There is open grassland throughout most of the area behind the levee with a large riparian bosque in the western and northwestern area. Much of the reservoir area is grassland. Some riparian habitat in the northwest portion. This area could support

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special status species, especially vernal pool species, although this might be reduced or eliminated by inundation.

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**Need for additional (engineering/hydrological, or other) information on measures**

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Soil or geology maps

Hydrology maps showing the limits of low, normal, and high inundation

Locations of work pads, new roads, and other construction areas

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**Additional data needs (within each specific discipline)**

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CNDDDB report

CNPS report

Ceres report

Field surveys for wetlands and special status species and habitats

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Environmental Team Field Trip Log - Wildlife		
<b>Trip Log Number:</b>	S5	<b>Project No:</b> 8004094
<b>Dates:</b>	May 29, 2002	
<b>Site Name:</b>	Big Dry Creek Reservoir Excess Utilization	
<b>Location:</b>	Big Dry Creek flood control area	
<b>Prepared By:</b>	Dave Stevens, Stephanie Murphy	
<b>Date:</b>	June 5, 2002	

<b>Weather Conditions:</b>	Hot and dry
<b>Areas Covered (attach map with notations)</b>	
<b>Attachments</b>	
<b>Photo Log</b>	
<b>Photos</b>	
<b>Topographic Map(s)</b>	

**Field Observations:**

**Existing Facilities:**

---

Existing earthfill embankment.

---

**Existing Environmental Features as Appropriate to Discipline (hydrology; aquatic-water quality; terrestrial—plants; wildlife; recreation; cultural resources; land use; aesthetic)**

---

There is open grassland throughout most of the area behind the levee with a large riparian bosque in the western and northwestern area. The sensitive species possibly within this area include the San Joaquin antelope squirrel, giant kangaroo

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rat, short-nosed kangaroo rat, Fresno kangaroo rat, San Joaquin pocket mouse, San Joaquin kit fox, blunt-nosed leopard lizard, giant garter snake, coast horned lizard and willow flycatcher. A closer field study is necessary to fully assess the potential for these species. However, since it is an existing water storage site, it may be devoid of these sensitivities. The relatively flat topography of the site would allow for creation of riparian woodland bosques as mitigation.

---

**Need for additional (engineering/hydrological, or other) information on measures**

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Need information on inundation area.

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**Additional data needs (within each specific discipline)**

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Need to coordinate with resource agency biologists and agency files on known distribution of sensitive species for this area.

Further studies and field visits will be necessary to determine the extent of wildlife impacts that may occur due to this alternative.

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<b>Environmental Team Field Trip Log – Fish and Water Quality</b>		
<b>Trip Log Number:</b>	S5	<b>Project No:</b> 8004094
<b>Dates:</b>	May 29, 2002	
<b>Site Name:</b>	Big Dry Creek Reservoir Excess Utilization	
<b>Location:</b>	Big Dry Creek flood control area	
<b>Prepared By:</b>	Philip Unger	
<b>Date:</b>	June 10, 2002	

<b>Weather Conditions:</b>	Hot and dry
<b>Areas Covered (attach map with notations)</b>	Big Dry Creek flood control area
<b>Attachments</b>	
<b>Photo Log</b>	No
<b>Photos</b>	No
<b>Topographic Map(s)</b>	Yes

**Field Observations:**

**Existing Facilities:**

---

This option would use the existing Big Dry Creek flood control area to capture and store flood flows. The Big Dry Creek flood control area is situated on private property, which is undeveloped owing to its use as a flood control area. Existing facilities include an earth-fill dam to the south and west of the inundation area, as well as paved and unpaved roads.

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**Existing Environmental Features as Appropriate to Discipline (hydrology; aquatic-water quality; terrestrial—plants; wildlife; recreation; cultural resources; land use; aesthetic)**

---

Dry Creek runs through the southern portion of the flood control area. The stream was dry at the time of the field visit and the stream channel was shallow, broad and sandy. The channel terminates at the flood control dam. Most of the reservoir area is covered with grassland. The Friant-Kern Canal is located northeast of the area.

---

**Need for additional (engineering/hydrological, or other) information on measures**

---

Need the following estimates for potential reservoir:

Mean depth for each month, April – October.

Mean surface area of shallow water habitat (less than 15 feet deep) in each month, April – October.

Mean rate of water level fluctuation for each month, April – October.

---

**Additional data needs (within each specific discipline)**

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No additional information is needed.

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<b>Environmental Team Field Trip Log – Recreation</b>		
<b>Trip Log Number:</b>	S5	<b>Project No.</b> 8004094
<b>Dates:</b>	May 29, 2002	
<b>Site Name:</b>	Big Dry Creek Reservoir Excess Utilization	
<b>Location:</b>	Big Dry Creek flood control area	
<b>Prepared By:</b>	Sandra Perry	
<b>Date:</b>	June 3, 2002	

<b>Weather Conditions:</b>	Hot and dry
<b>Areas Covered (attach map with notations)</b>	Big Dry Creek flood control area
<b>Attachments</b>	
<b>Photo Log</b>	No
<b>Photos</b>	No
<b>Topographic Map(s)</b>	Yes

**Field Observations:**

**Existing Facilities:**

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This option would involve utilizing the existing Big Dry Creek flood control area to capture and store flood flows. The Big Dry Creek flood control area is situated on private property, which is undeveloped owing to its use as a flood control area. Existing facilities include paved and unpaved roads.

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**Existing Environmental Features as Appropriate to Discipline (hydrology; aquatic-water quality; terrestrial—plants; wildlife; recreation; cultural resources; land use; aesthetic)**

There are no recreation facilities situated in the immediate area. The area is flat and dry and not conducive to recreation activities. The nearby Friant-Kern Canal is fenced to discourage access.

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**Need for additional (engineering/hydrological, or other) information on measures**

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No additional information is needed.

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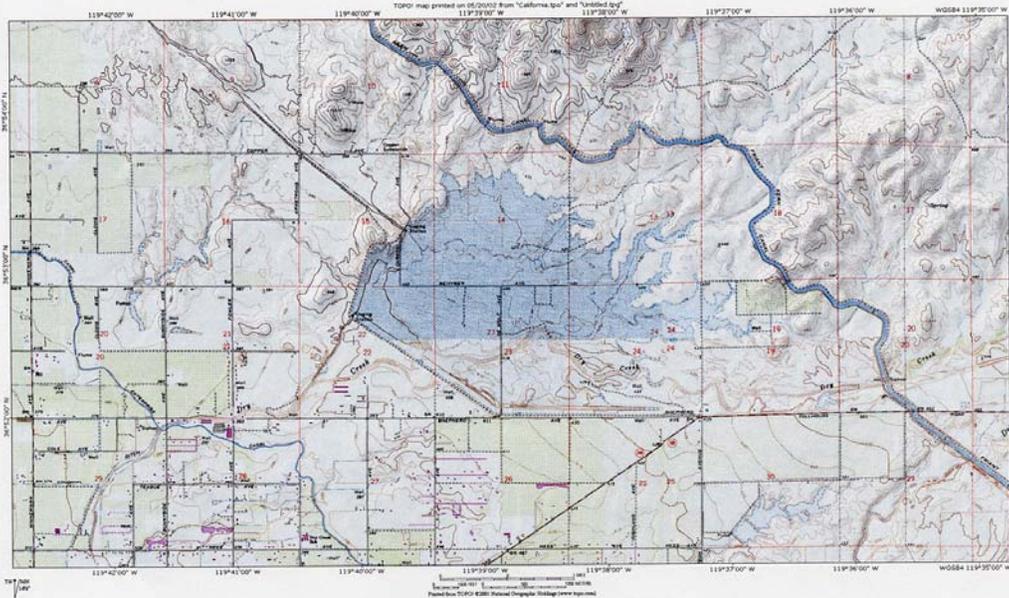
**Additional data needs (within each specific discipline)**

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No additional information regarding recreation is needed.

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Big Dry 7.5



NO recreation  
Friant Kern canal fenced to discourage use (e.g. fishing)

<b>Environmental Team Field Trip Log – Land Use</b>		
<b>Trip Log Number:</b>	S5	<b>Project No.</b> 8004094
<b>Dates:</b>	May 29, 2002	
<b>Site Name:</b>	Big Dry Creek Reservoir Excess Utilization	
<b>Location:</b>	Big Dry Creek flood control area	
<b>Prepared By:</b>	Irina Torrey	
<b>Date:</b>	June 3, 2002	

<b>Weather Conditions:</b>	Hot and dry	
<b>Areas Covered (attach map with notations)</b>	Big Dry Creek flood control area	
<b>Attachments</b>		
<b>Photo Log</b>	Yes	
<b>Photos</b>	Yes	
<b>Topographic Map(s)</b>	No	

**Field Observations:**

**Existing Facilities:**

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This option would involve use of the existing Big Dry Creek flood control area to capture and store flood flows. The Big Dry Creek flood control area is on private property, which is undeveloped due to its use as a flood control area. Existing facilities include paved and unpaved roads.

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**Existing Environmental Features as Appropriate to Discipline (hydrology; aquatic-water quality; terrestrial—plants; wildlife; recreation; cultural resources; land use; aesthetic)**

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There is no residential development within or immediately adjacent to the Big Dry Creek flood control area. Travel on nearby roads would be disrupted during construction.

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**Need for additional (engineering/hydrological, or other) information on measures**

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Need to know the area of inundation and the length of the construction period.

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**Additional data needs (within each specific discipline)**

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No additional information is needed.

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<b>Environmental Team Field Trip Log – Cultural Resources</b>		
<b>Trip Log Number:</b>	S5	<b>Project No.</b> 8004094
<b>Dates:</b>	May 29, 2002	
<b>Site Name:</b>	Big Dry Creek Reservoir Excess Utilization	
<b>Location:</b>	Big Dry Creek flood control area	
<b>Prepared By:</b>	David White	
<b>Date:</b>	May 30 2002	

<b>Weather Conditions:</b>	Hot & dry
<b>Areas Covered (attach map with notations)</b>	Vehicular reconnaissance May 30, at De Wolf and Behymer Roads
<b>Attachments</b>	
<b>Photo Log</b>	Yes – MWH 0205
<b>Photos</b>	Yes – nos. 70-76
<b>Topographic Map(s)</b>	Clovis and Friant quads

**Field Observations:**

**Existing Facilities:**

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Existing levee; roads traverse the area

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**Existing Environmental Features as Appropriate to Discipline (hydrology; aquatic-water quality; terrestrial—plants; wildlife; recreation; cultural resources; land use; aesthetic)**

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Cultural resources:

Prehistoric: present-day grasslands may not be representative of prehistoric vegetation. Possibly more extensive riparian growth, Valley Oaks. Moderate probability of prehistoric archaeological sites including BRM stations, hunting

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camp, associated with Big Dry Creek.

Historic: Various sites likely, associated with agriculture and other activities. A probable homestead site was noted north of Dry Creek, with big eucalyptus and palm trees.

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### **Need for additional (engineering/hydrological, or other) information on measures**

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Need precisely mapped footprint of reservoir, with various potential dam levels; also need footprint of all associated ground disturbance areas, to include but not be limited to offices and maintenance buildings, construction set-up and lay-down areas, access roads, electric transmission lines, water conveyance structures, and all other facilities.

Need to know who administers/manages the existing flood control reservoir.

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### **Additional data needs (within each specific discipline)**

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Need archaeological records search with California Historic Resources Inventory System (CHRIS) clearinghouse. Clearinghouse: Southern San Joaquin Valley Info Center, CSU-Bakersfield.

Need consultation with the appropriate agency cultural resource specialist (if any) regarding sites that may not be recorded with the CHRIS information center.

Also need brief review of archaeological and ethnographic literature pertaining to the area. Minimal level of effort: (1) to identify types of archaeological remains expected, time periods represented; and (2) to identify Native American tribes historically occupying the area, along with published information on major named villages or other ethnographic sites.

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Picture: P5300081 Big Dry Creek panorama view beginning NW, clockwise to E, May 30, 2002, afternoon



Picture: P5300082 Big Dry Creek: panorama view beginning NW, clockwise to E, May 30, 2002, afternoon



Picture: P5300083 Big Dry Creek: panorama view beginning NW, clockwise to E, May 30, 2002, afternoon



Picture: P5300084 Big Dry Creek: panorama view beginning NW, clockwise to E, May 30, 2002, afternoon



Picture: P5300085 Big Dry Creek: panorama view beginning NW, clockwise to E, May 30, 2002, afternoon



Picture: P5300086 Big Dry Creek: view E along the stream, May 30, 2002, afternoon



Picture: P5300087 Big Dry Creek: view W along the stream, May 30, 2002, afternoon

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## **APPENDIX C**

### **Cost Estimate Summary**

# **Big Dry Creek Reservoir Modification**



<b>Upper San Joaquin River Basin Storage Investigation</b>		
<b>Cost Estimate</b>		
<b>BIG DRY CREEK RESERVOIR MODIFICATION</b>		
400 cfs turnout from Friant-Kern Canal including energy dissipation structure and channel armoring Extrapolated from 2001 grant application to DWR		
<b>FIRST COST ITEMS</b>		<b>ESTIMATED COST</b>
DAMS    Diversion Dam/Cofferdam Diversion Works/Tunnel Main Dam Spillway Outlet Works		
<b>SUBTOTAL</b>		\$                    -
CONVEYANCE FACILITIES Power intake, tunnels & penstocks Diversion Tunnel Tunnel Canals/Pipelines Pumping Stations Regulating Reservoirs		\$                    625,000
<b>SUBTOTAL</b>		\$                    625,000
PERMANENT OPERATING EQUIPMENT Powerplants, generators & turbines Transmission Lines, switchyards, & substns.		
<b>SUBTOTAL</b>		\$                    -
<b>TOTAL, LISTED ITEMS</b>		\$                    625,000
<b>UNLISTED ITEMS (15%; rounded)</b>		\$                    94,000
<b>TOTAL, CONSTRUCTION ITEMS (rounded)</b>		\$                    720,000
<b>CONTINGENCIES ON CONSTRUCTION (25%; rounded)</b>		\$                    180,000
<b>TOTAL, CONSTRUCTION COST</b>		\$                    900,000
<b>MITIGATION (5%; rounded)</b>		\$                    50,000
<b>TOTAL FIELD COSTS</b>		<b>\$                    950,000</b>
<b>INVESTIGATION, DESIGN, &amp; CONSTRUCTION MNGMT (15%; rounded)</b>		\$                    140,000
<b>LAND</b>		\$                    -
<b>TOTAL FIRST COST</b>		<b>\$                    1,100,000</b>

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