Friant-Kern Canal
Capacity Restoration

Draft
Environmental Assessment

SAN JOAQUIN RIVER
RESTORATION PROGRAM

Draft
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Table of Contents

Tables

Figures

Appendices

List of Abbreviations and Other Acronyms

°F	Fahrenheit
5N	5 North
5S	5 South
µin/sec	microinch per second
BMP	best management practice
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm	centimeter
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CO	carbon monoxide
CO_2	carbon dioxide
CVHM	Central Valley Hydrologic Model
CVP	Central Valley Project
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel
Delta	Sacramento–San Joaquin Delta
DFG	California Department of Fish and Game
EA	environmental assessment
EPA	U.S. Environmental Protection Agency
ESA	Federal Endangered Species Act
FERC	Federal Energy Regulatory Commission
FKC	Friant-Kern Canal
FKC Feasibility Report	Friant-Kern Canal Capacity Restoration Feasibility Report
FPA	Friant Power Authority
FPP	Friant Power Project
Friant Contractors	Central Valley Project Friant Division long-term contractors
FTA	Federal Transit Administration
FWA	Friant Water Users Authority
FWCA	Fish and Wildlife Coordination Act
GHG	greenhouse gas

GWh	gigawatt-hour
ID	irrigation district
in/sec	inches per second
ITA	Indian Trust Asset
L_{eq}	equivalent noise level
LV	velocity level in decibels, referenced to 1 microinch per second and based on the root mean square velocity amplitude
MAF	million acre-feet
MBTA	Migratory Bird Treaty Act
MCWPA	Madera-Chowchilla Water and Power Authority
MOA	memorandum of agreement
MP	milepost
MUD	municipal utility district
MW	megawatts
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_X	oxides of nitrogen
NRDC	Natural Resources Defense Council
NRHP	National Register of Historic Places
O&M	operation and maintenance
PEIS/R	program environmental impact statement/report
PM_{10}	respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less
$PM_{2.5}$	fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less
PPV	peak particle velocity
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RMS	root mean square
Settlement	Stipulation of the Settlement in *NRDC, et al., v. Kirk Rodgers, et al.*
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SJRRP	San Joaquin River Restoration Program
SJRRS Act	San Joaquin River Restoration Settlement Act
SJVAB	San Joaquin Valley Air Basin
SJVAPCD	San Joaquin Valley Air Pollution Control District
SMAQMD	Sacramento Metropolitan Air Quality Management District
SR	State Route

State Parks	California Department of Parks and Recreation
SWP	State Water Project
TAF	thousand acre-feet
TDS	total dissolved solids
TL	total length
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VdB	vibration decibels
VOC	volatile organic compound
WD	water district
WSD	water storage district

1.0 Purpose and Need for Action

1.1 Background

In 1942, the Department of the Interior, Bureau of Reclamation (Reclamation), as part of the Central Valley Project (CVP), completed construction of Friant Dam, located on the San Joaquin River 16 miles northeast of downtown Fresno, California. Friant Dam is a concrete gravity structure, 319 feet high, with a crest length of 3,488 feet. It controls the flows of the San Joaquin River and provides for: downstream releases to meet requirements above Mendota Pool; flood control; conservation storage; diversion into the Friant-Kern Canal (FKC) and Madera Canal; and the delivery of water to 1 million acres of agricultural land in Fresno, Kern, Madera, and Tulare Counties. Friant Dam was first used to store water on February 21, 1944. Millerton Lake, the reservoir behind Friant Dam, has a total capacity of 520,500 acre-feet, has a surface area of 4,900 acres, and is approximately 15 miles long. It provides for 45 miles of shoreline that varies from gentle slopes near Friant Dam to steep canyon walls further inland, and it allows for various recreational activities, such as boating, fishing, picnicking, and swimming.

Friant Dam serves the CVP Friant Division long-term contractors (Friant Contractors) through three separate river and canal outlets: the San Joaquin River outlet works, the FKC, and the Madera Canal. The FKC carries water over 151.8 miles in a southerly direction from Millerton Lake to the Kern River, 4 miles west of Bakersfield (Figure 1-1). The water is used as supplemental and irrigation supplies in Fresno, Tulare, and Kern Counties. Construction of the FKC began in 1945 and was completed in 1951. The majority of the FKC is concrete lined, with 15-percent earth lined. The FKC originally had a maximum capacity of 5,000 cubic feet per second (cfs) that gradually decreased to 2,500 cfs at its terminus in the Kern River. In the 1970s, Reclamation increased the FKC's concrete lining from the headworks, Milepost (MP) 0.00, to the Kings River Siphon, MP 28.50, increasing the maximum capacity in this reach to 5,300 cfs.

Since completion of construction by Reclamation in 1951, the FKC has lost its ability to fully meet its previously designed and constructed capacity, resulting in restrictions on water deliveries to the Friant Contractors. The reduction in capacity is a result of several factors, including original design limitations, ground subsidence, increased canal roughness, and changes in water delivery patterns. Hydraulic modeling, completed as part of the *Friant-Kern Canal Capacity Restoration Feasibility Report* (FKC Feasibility Report), authorized pursuant to Section 10201(a)(1)[1] of the San Joaquin River Restoration Settlement Act (SJRRS Act), in Public Law 111-11, confirmed the reduction in FKC capacity in several reaches.

[1] Section 10201(a)(1) also authorizes evaluation of the restoration of the capacity of the Madera Canal, which is being completed separately.

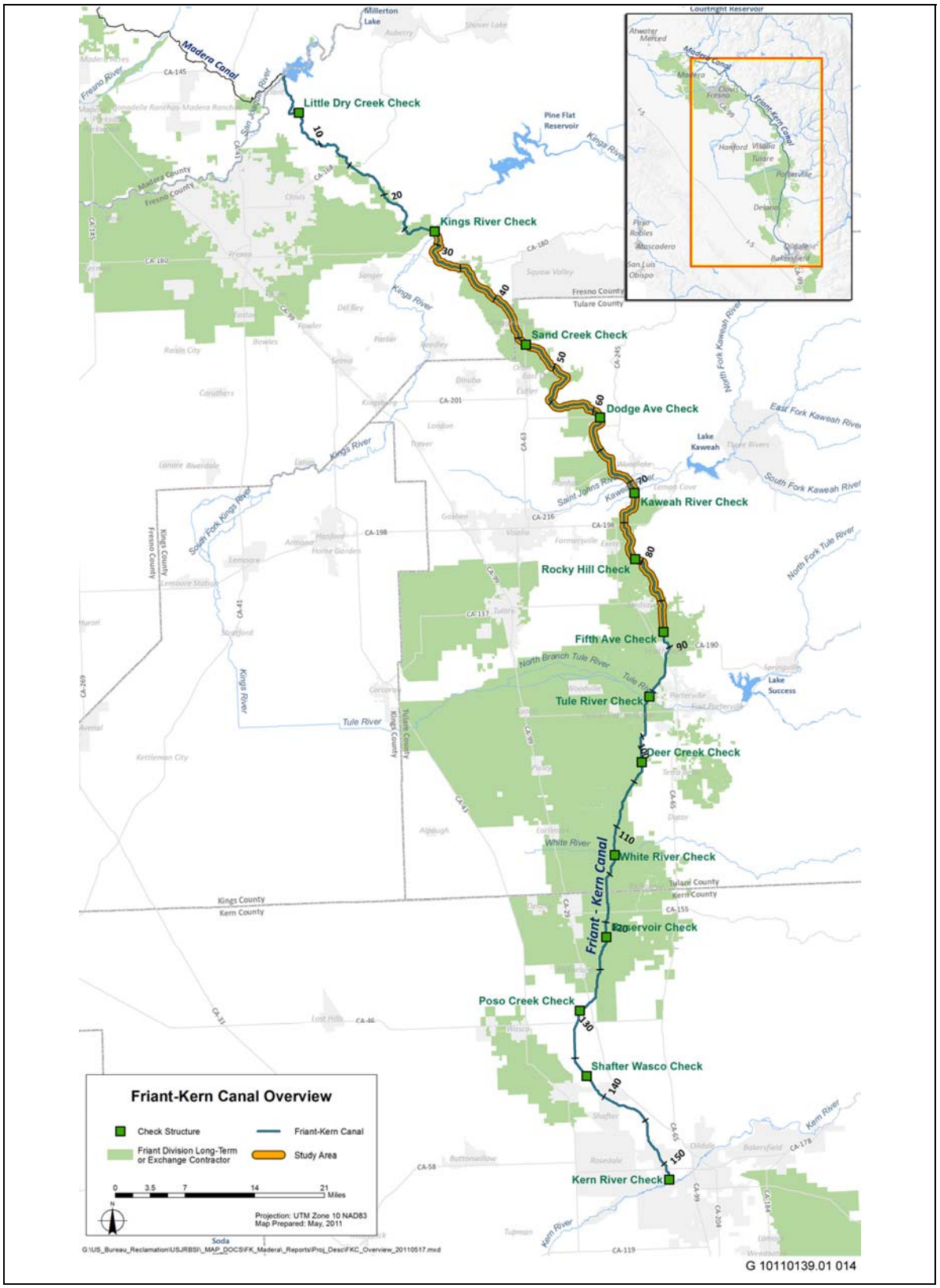

Figure 1-1.
Central Valley Project, Friant Division Location Map

1.1.1 Settlement and Act

In 1988, a coalition of environmental groups, led by the Natural Resources Defense Council (NRDC), filed a lawsuit, entitled *NRDC, et al., v. Kirk Rodgers, et al.*, challenging the renewal of long-term water service contracts between the United States and the Friant Contractors. On September 13, 2006, after more than 18 years of litigation, NRDC, the Friant Water Users Authority (FWA), and the U.S. Departments of the Interior and Commerce, collectively known as the "Settling Parties", agreed on the terms and conditions of the Stipulation of Settlement in *NRDC, et al., v. Kirk Rodgers, et al.*, (Settlement) subsequently approved by the U.S. Eastern District Court of California on October 23, 2006. The SJRRS Act authorizes and directs the Secretary of the Interior (Secretary) to implement the Settlement, which establishes two primary goals:

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

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

To achieve the Restoration Goal, the Settlement calls for releases of water from Friant Dam to the confluence of the Merced River (referred to as Interim and Restoration Flows), a combination of channel and structural modifications along the San Joaquin River below Friant Dam, and reintroduction of Chinook salmon. To achieve the Water Management Goal, Paragraph 16 of the Settlement and Part III of the SJRRS Act provide for certain activities to be developed and implemented to reduce or avoid adverse water supply impacts on all Friant Contractors. Specifically, Section 10201 of the SJRRS Act states:

> *(a) The Secretary of the Interior (hereafter referred to as the 'Secretary') is authorized and directed to conduct feasibility studies in coordination with appropriate Federal, State, regional, and local authorities on the following improvements and facilities in the Friant Division, Central Valley Project, California:*
>
> *(1) Restoration of the capacity of the Friant-Kern and Madera Canal to such capacity as previously designed and constructed by the Bureau of Reclamation.*
>
> *(2) […]*
>
> *(b) Upon completion of and consistent with the applicable feasibility studies, the Secretary is authorized to construct the improvements and facilities identified in subsection (a) in accordance with applicable Federal and State laws.*

> *(c) The costs of implementing this section shall be in accordance with Section 10203, and shall be a nonreimbursable Federal expenditure.*

Section 10203 of the SJRRS Act states:

> *(a) The Secretary is authorized and directed to use monies from the fund established under section 10009 to carry out the provisions of section 10201(a)(1), in an amount not to exceed $35,000,000.*

1.2 Purpose and Need

The National Environmental Policy Act (NEPA) regulations require a statement of "the underlying purpose and need to which the agency is responding in proposing the alternatives, including the Proposed Action (40 Code of Federal Regulation [CFR] 1502.13).

The purpose of the Proposed Action is to implement the provisions of the SJRRS Act pertaining to restoration of the capacity of the FKC to that previously designed and constructed by Reclamation. The need for the Proposed Action is to restore the capacity of the FKC to that previously designed and constructed by Reclamation to reduce or avoid water supply impacts on the Friant Contractors that may result from the Interim Flows and Restoration Flows required by the Settlement and SJRRS Act.

1.3 Reclamation's Legal and Statutory Authorities and Jurisdiction Relevant to the Proposed Action

The following Federal laws, permits, licenses, and policy requirements, as amended, updated, and/or superseded, are among those that have directed, limited, or guided the NEPA analysis and decision-making process of this environmental assessment (EA):

- Stipulation of Settlement in *NRDC, et al., v. Kirk Rodgers, et al.*;
- San Joaquin River Restoration Settlement Act, included in Public Law 111-11, the Omnibus Public Land Management Act of 2009;
- California State Water Resources Control Board, Division of Water Rights Decision 935;
- The Reclamation Act, Act of June 17, 1902 (32 Stat. 388), and acts amendatory and supplementary thereto;
- CVP re-authorization, (53 Stat. 1187), as amended and supplemented, July 2, 1956 (70 Stat. 483), June 21, 1963 (77 Stat. 68), October 12, 1982 (96 Stat. 1262), and October 27, 1986 (100 Stat. 3050), as amended;
- Central Valley Project Improvement Act, Title XXXIV of Public Law 102-575 (106 Stat. 4706); and
- Long-Term Water Service Contracts for Friant Division long-term contractors.

1.4 Implementing Agency Responsibility

Reclamation, as the lead Federal agency under NEPA, prepared this document. This Draft EA presents an analysis of the environmental effects of restoring the capacity of the FKC to that previously designed and constructed by Reclamation from MP 29.14 to MP 88.22, which includes modifications to Little Dry Creek Wasteway at MP 5.44.

1.5 Purpose and Intended Use of the EA

The purpose of this Draft EA is to disclose the potential direct, indirect, and cumulative impacts of implementing the Proposed Action, consistent with NEPA requirements. The Draft EA serves as an informational document for decision makers, public agencies, nongovernmental agencies, and the general public regarding the potential direct, indirect, and cumulative environmental consequences of implementing the alternatives.

1.6 Study Area

The Study Area for this Draft EA, shown in Figure 1-1, has been defined to evaluate potential direct, indirect, and cumulative effects associated with the restoring the capacity of the FKC. Located in the southeastern and south Central Valley of California, within Fresno and Tulare Counties, the Study Area includes locations along the FKC where construction activities would occur (the Little Dry Creek Wasteway at MP 5.44, and the reach of the FKC from MP 29.14 to MP 88.22). For some resource areas, the Study Area was more broadly defined to include land owned by the Friant Contractors served by the FKC. Most of the land within the Study Area is subject to agricultural, municipal, and industrial activities and provides habitat for wildlife.

1.7 Resources of Potential Concern

This EA describes the impacts of the No Action Alternative and Proposed Action, including cumulative impacts, on the following potentially affected resources: water resources, biological resources, aquatic resources, cultural resources, air quality, global climate change, noise, transportation, power and energy resources, socioeconomic resources, environmental justice, land use, agricultural resources, utilities, earth sciences, Indian Trust Assets, population and housing, visual resources, recreation, and public health and safety.

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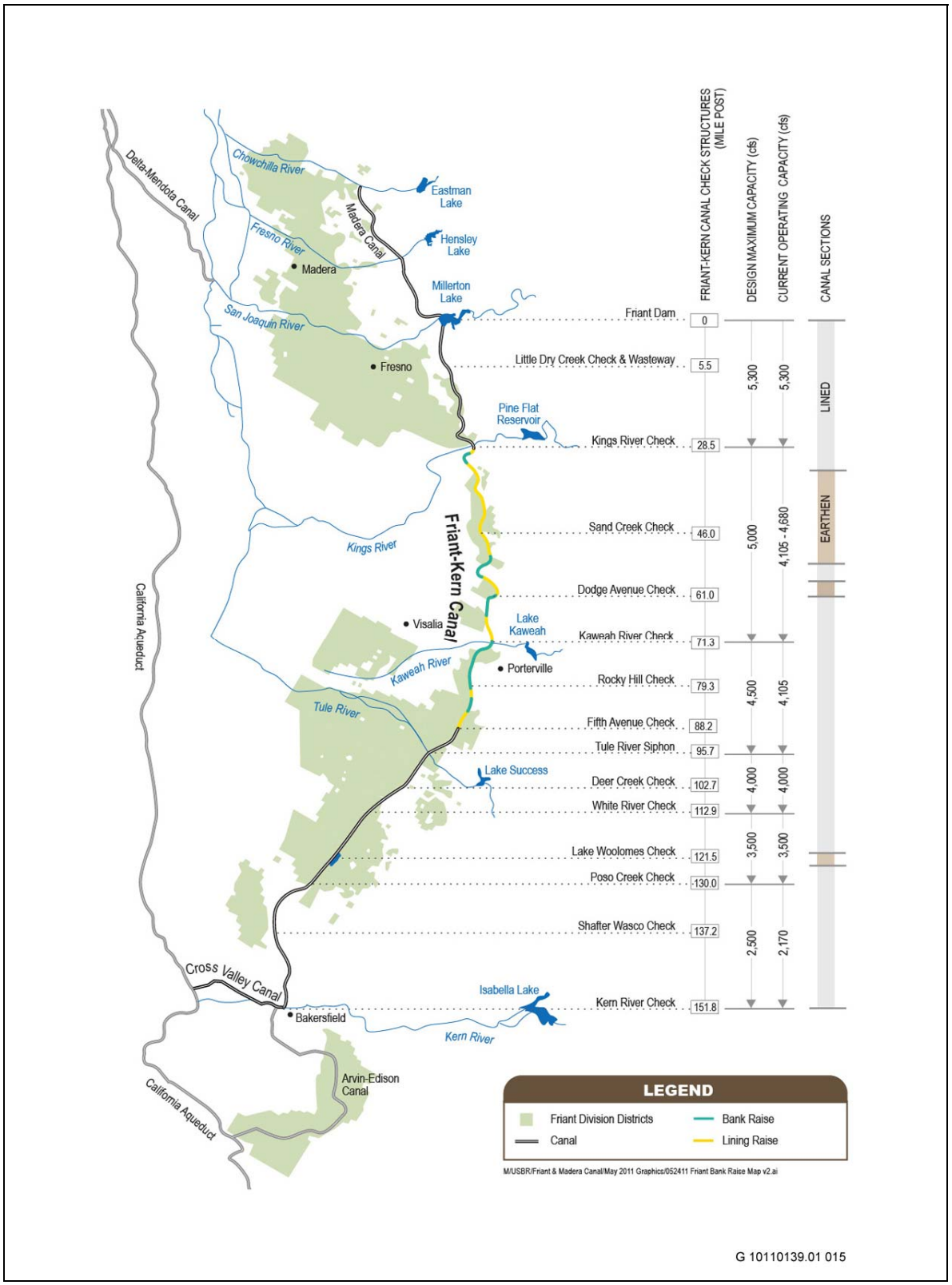
2.0 Alternatives Including Proposed Action

2.1 No Action Alternative

Under the No Action Alternative, San Joaquin River Restoration Program (SJRRP) flows provided in the Settlement would be implemented; however, Reclamation would not restore the capacity of the FKC, which is not consistent with the Secretary's direction pursuant to the Settlement or SJRRS Act. The FKC would continue to operate in its current capacity-restricted condition, limiting its ability to convey water during periods of peak demand, peak flow, or flood water from Millerton Lake. Water that could not be conveyed by the FKC would be lost, either through evaporation from Millerton Lake, or by spilling into the San Joaquin River. In response, the Friant Contractors may take alternative water supply actions, including increasing groundwater pumping, idling cropland, reducing landscape irrigation, or rationing water. Under the No Action Alternative, the current capacity-restricted condition of the FKC would limit the Friant Contractors' ability to divert water during periods of peak demand or peak flow for the purpose of reducing or avoiding impacts to water deliveries to all of the Friant Division long-term contractors caused by the Interim and Restoration Flows, as specified in the SJRRP Water Management Goal thus limiting Reclamation's ability to achieve the Water Management Goal in the Settlement.

2.2 Proposed Action

The Proposed Action would consist of restoring the capacity of the FKC from the current operating capacity of 4,605 to 4,105 cfs to the previously designed and constructed capacity of 5,000 to 4,500 cfs from MP 29.14 to MP 88.22, which includes modifications to the Little Dry Creek Wasteway at MP 5.44. The FKC's capacity deficiencies were identified by Reclamation through discussions with the FWA, on-site studies, surveying, and use of a USACE HEC-RAS model, as further described in the FKC Feasibility Report (Appendix A). Restoration of the FKC would occur over 59 miles, as shown in Figure 2-1 and Table 2-1. Proposed modifications to the FKC would include constructing raised sections of new lining attached to and above the existing concrete and earth lining; raising existing banks; modifying check structures and inlet/outlet structures; removing three timber farm bridges, possibly replacing one timber farm bridge with a concrete farm bridge, and possibly modifying up to 37 other bridges crossing the canal, for a total of 40 bridge modifications or removals; and modifying the Little Dry Creek Wasteway Facility at MP 5.44. The Proposed Action would not include any modifications to siphons. Construction activities on the FKC would be contained between the outside slope toes of the canal's existing embankments, except for roadway travel and mobilization. Ground disturbance would therefore be limited to existing disturbed areas of the FKC. Vegetation on the



1 **Figure 2-1.**
2 **Location Map of Modifications to the Friant-Kern Canal under the Proposed Action**

Table 2-1.
Modification Information for Proposed Action

Mileposts		Type of Lining	Lining Raise Length	Bank Raise Length	Bridge Work
From	To		Miles	Miles	Number of Bridges Potentially Modified
29.14	33.87	Concrete	4.73	0.72	2
33.89	34.92	Concrete	1.03	0.51	2
34.92	35.59	Earthen	0.67	0.11	1
35.62	36.30	Earthen	0.68	0.07	1
36.33	43.39	Earthen	7.06	--	8
43.42	43.95	Earthen	0.53	--	1
43.99	45.81	Earthen	1.82	--	1
45.89	46.17	Earthen	0.28	--	--
46.21	52.98	Earthen	6.77	0.95	1
52.98	57.13	Concrete	4.15	1.12	--
57.13	62.00	Earthen	4.87	0.31	5
62.00	66.47	Concrete	4.47	2.76	--
66.52	67.09	Concrete	0.57	--	--
67.12	67.95	Concrete	0.83	--	--
68.00	69.48	Concrete	1.48	--	1
69.54	71.30	Concrete	1.76	0.05	2
71.36	73.74	Concrete	2.38	0.45	1
73.78	75.19	Concrete	1.41	--	1
75.22	77.06	Concrete	1.84	1.19	2
77.08	85.56	Concrete	8.48	3.11	5
85.58	85.79	Concrete	0.21	0.21	1
85.81	86.87	Concrete	1.06	--	2
86.89	88.22	Concrete	1.33	--	3
TOTAL			**58.41**	**11.57**	**40**

Key: -- = not applicable

FKC's prism and embankments is limited to small pockets of non-native grasses and used by plant species that prefer disturbed areas.

Modifications along the FKC would require the excavation of approximately 400,000 cubic yards of soil from existing canal embankments; the excavation of approximately 17,000 cubic yards of rock from existing escarpments within the raised canal sections; approximately 450,000 cubic yards of backfill, of which approximately 100,000 cubic

yards would be obtained from off-site pre-permitted facilities; approximately 35,000 cubic yards of concrete lining material; approximately 500,000 linear feet of aqualastic sealant; approximately 85,000 cubic yards of "beach-belting" riprap,[2] 25,000 cubic yards of roadway aggregate base course; 140,000 square yards of asphaltic cement coating; 65 acre-feet of water for dust abatement and soil conditioning; removal of three timber bridges and potential modifications of 37 other bridges crossing the canal for a total of 40 bridges; and fabrication and placement of splashboards at Little Dry Creek Wasteway. Excavated material would be temporarily stored on the embankment operation and maintenance (O&M) road, parallel to the FKC, until it would be reused as backfill or taken and disposed of off-site. Materials taken off-site would be transported to permitted locations for safe storage, use, and/or disposal.

2.2.1 Lining Raises

The Proposed Action would include raising the FKC's existing concrete and earthen lining to allow for the canal to convey its capacity as previously designed and constructed by Reclamation. Lining raises would vary from a minimum of 1.0 foot to a maximum of 4.0 feet, averaging 1.7 feet vertically and placed in 1-foot increments. The Proposed Action would not include relining the FKC's earthen sections with concrete.

Soil Embankment

Lining raises in soil embankment would be accomplished by removing the FKC's existing uncompacted embankment and demolishing and breaking up the existing roadway surfacing on the inside slopes (water side) of the canal with heavy equipment (e.g., bulldozer, front loader, scraper, excavator, Gradall). This excavation would be a minimum 8.0 feet wide in "no-bench" sections and 3.5 feet wide in "bench" sections to accommodate the use of heavy equipment, and approximately 1.0 to 4.0 feet deep. Select embankment backfill material would then be placed and compacted with heavy and hand-held equipment to reach the required top-of-lining elevation. If in a concrete-lined reach a new concrete lining segment would be formed and placed above and connected to the existing lining, either by modular forming methods or slip-forming methods, to the required top-of-lining height. In earth-lined sections, the "beach-belting" riprap would be placed on the water side slopes, in an excavated or formed void, about the water surface elevations expected to protect the newly raising lining. Then, for both the earthen and concrete reaches, backfill would be placed by heavy equipment to raise the canal bank to the required elevation. Finally, in places where the O&M road is covered by new lining and embankment fill material, typically the FKC right side, a replacement road of aggregate road base course would be constructed. Any soil material excavated would be temporarily stored on the sides of the FKC and/or in existing spoil piles for use as backfill, or removed from the FKC. Transport of the material would be accomplished using loaders and dump trucks (Table 2-2).

Rock Embankment

Embankment and lining raises that would occur in rock embankment, typically on the FKC left side, would be accomplished by excavating the rock with hand-excavation tools (e.g., drills, jackhammers). This excavation would be approximately 3.0 feet wide and 1.0

[2] Small river rocks placed on the earthen embankment to protect against erosion from wave action.

Table 2-2.
Equipment Required for Proposed Action by Activity

Activity Equipment	Soil Excavation	Rock Excavation	Backfill	Lining-Concrete	Lining-Earthen	Roadway Paving	Bridges	Little Dry Creek Wasteway
Asphalt Paver						X	X	
S205 & 250 Bobcat	X	X	X	X	X	X	X	X
323C & 433 E Compactor			X	X	X			
Grove 5240 Crane						X	X	
Grove 875B Crane						X	X	X
Fuel & Lube Truck	X	X	X	X	X	X	X	X
Hand Held Rammer		X						
Job Truck	X	X	X	X	X	X	X	X
Wheel Excavator	X						X	
Mortar Mixer				X		X	X	
Sandblaster				X		X		X
Telescopic Lift		X		X			X	X
Truck Chassis	X	X	X	X	X	X	X	X
Vibratory Grizzly	X	X	X	X	X	X		
Water Truck	X	X	X	X	X	X	X	
E160H Grader			X	X	X	X	X	
E25 Vibration Plate			X	X	X	X	X	
Discharge & Suction Hose	X	X	X	X	X	X	X	
E320CL Excavator	X	X					X	
E330CL Excavator	X	X					X	
E928G Wheel Loader	X	X	X	X	X	X	X	
Grove A60J Manlift		X		X			X	X
Concrete Pump Boom				X		X	X	
ECB-634D Compactor			X	X	X	X	X	

Table 2-2.
Equipment Required for Proposed Action by Activity

Activity Equipment	Soil Excavation	Rock Excavation	Backfill	Lining-Concrete	Lining-Earthen	Roadway Paving	Bridges	Little Dry Creek Wasteway
Ecent Pump				X		X	X	
ECFM 160 Diesel		X		X		X		X
ECFM 250 Diesel		X		X		X		
ECSAW26D				X			X	
ED4G & ED7R Dozer	X	X	X	X	X	X		
Flatbed Truck	X	X	X	X	X	X	X	X
EG10KWG Generator	X	X	X	X	X	X	X	X
ED20KWD Generator	X	X	X	X	X	X	X	
ED60KWD Generator	X	X	X	X	X	X	X	
Cat H100 Hoe Ram	X	X	X			X		
Cat H100S Hoe Ram	X	X	X			X		
EPAV-BRK						X	X	
EPS-150C Compactor			X	X	X	X		
ETRCT45K Truck	X	X	X	X	X	X	X	X
ETRD18CY Dump Truck	X	X	X	X	X	X	X	
ETRKCH22 Truck	X	X	X	X	X	X	X	X
ETRL40 Trailer	X	X	X	X	X	X	X	X
ETSD28T Office Trailer	X	X	X	X	X	X	X	X
EVIB Concrete Vibrator				X		X	X	
EWDLR300 Welder							X	X

to 4.0 feet deep. To protect the in-place lining material from damage, blasting would not be performed to remove the rock, unless absolutely necessary. If in a concrete reach new concrete lining would then be formed and placed, similar to the methods described above. If access to certain areas precludes utilizing the formed and placed method to replace the

concrete lining, concrete (shotcrete) will be conveyed through a hose and pneumatically projected onto the bank. In places where the O&M road would be covered by new lining and embankment fill material, a replacement road of aggregate road base course would be constructed. Any rock material excavated would be stored in existing spoil piles for use as backfill or removed from the FKC. Transport of the material would be accomplished using loaders and dump trucks (Table 2-2).

2.2.2 Bank Raises

The Proposed Action would include raising the FKC's banks to allow for the conveyance of the canal's designed maximum capacity. Bank raises would be placed in 1.0 foot increments, and would vary from a minimum of 1.0 foot high to a maximum of 3.0 feet high, averaging 1.0 foot high. Most bank raises would occur in the same reaches where lining raises are required and therefore would be accomplished at the same time.

Bank raises would be accomplished by using heavy equipment (e.g., scraper, loader) to remove any material or roadway surfacing on the top of the FKC's embankment. If required, any lining raises would be constructed as necessary. Heavy equipment would then place reused embankment fill and/or new backfill, as required, to the required bank elevation. Modification of check structures and inlet/outlet structures may require minor internal modifications of existing structures to accommodate increased water surface elevations in the canal. Finally, in places where the O&M road was removed, a replacement road aggregate road base course would be constructed (Table 2-2).

2.2.3 Bridge Modifications

The Proposed Action would require the removal of up to three bridges and the modification of up to 37 bridges crossing the FKC, for a total of 40 bridges, as shown in Tables 2-1 and 2-3. The bridges are owned by private individuals, counties, and the State of California. They are constructed of timber or concrete and, in some cases, also carry utilities, such as electrical, telephone, water, and gas lines. No utilities are expected to be permanently removed as part of the Proposed Action, though temporary construction-related disruptions may occur.

Farm – Timber Bridges

The Proposed Action would consist of one of two options for replacement or removal of timber bridges that would be submerged by implementation of the Proposed Action. These options are described below.

- *Option 1* - The timber bridge at MP 34.13 would be replaced with cast-in-place or a precast concrete bridge. If replaced with a cast-in-place, the existing abutments would be removed and new concrete abutments, piers, and roadway would be placed. New concrete abutments would be poured and then the concrete bridge would be delivered by flatbed trailer and positioned in place by a crane. The timber bridges at MP 33.80 and MP 34.91 would not be replaced due to close access to existing alternative bridges. Removal of these two existing timber bridges would be accomplished by dismantling the bridges and removing those sections with a crane located on the FKC embankment. The timber bridges would be recycled or disposed of in a permitted waste facility.

Table 2-3.
Bridge Modifications

No	MP	Activity	Clearance (feet)	Class	Material	Notes
1	33.34	Ensure Stability	-0.72	State Hwy	Concrete	State Highway 180
2	33.80	Remove	-0.02	Farm	Timber	Verify need for removal.
3	34.13	Remove	-0.29	Farm	Timber	Verify need for removal.
4	34.91	Remove	-0.22	Farm	Timber	Verify need for removal.
5	35.16	Ensure Stability	-0.36	County	Concrete	Alta Avenue
6	35.86	Ensure Stability	-0.57	County	Concrete	Jensen Avenue
7	36.78	Ensure Stability	-0.01	County	Concrete	Edgar Avenue
8	36.95	Ensure Stability	-0.88	County	Concrete	Crawford Avenue
9	38.74	Ensure Stability	-0.68	County	Concrete	Central Avenue
10	39.00	Ensure Stability	-0.70	County	Concrete	Cove Avenue
11	40.37	Ensure Stability	-0.65	County	Concrete	American Avenue
12	41.11	Ensure Stability	-0.56	County	Concrete	Anchor Avenue
13	41.75	Ensure Stability	-0.61	County	Concrete	Lincoln Avenue
14	42.90	Ensure Stability	-0.60	County	Concrete	Adams Avenue/Avenue 464
15	43.64	Ensure Stability	-0.41	County	Concrete	Hills Valley Road/Road 120
16	44.59	Ensure Stability	-0.10	County	Concrete	Parlier Avenue/Avenue 452
17	51.63	Ensure Stability	-0.16	County	Concrete	Avenue 416/El Monte Way
18	58.81	Ensure Stability	-0.32	County	Concrete	Avenue 394
19	59.13	Ensure Stability	-0.16	County	Concrete	Road 176
20	59.87	Ensure Stability	-0.30	County	Concrete	Road 180
21	60.50	Ensure Stability	-0.27	County	Concrete	Road 184
22	60.95	Ensure Stability	-0.23	County	Concrete	Dodge Avenue/Avenue 384

Table 2-3.
Bridge Modifications

No	MP	Activity	Clearance (feet)	Class	Material	Notes
23	69.23	Ensure Stability	-0.53	County	Concrete	Road 204
24	70.28	Ensure Stability	-0.63	County	Concrete	Avenue 328
25	71.18	Ensure Stability	-0.79	County	Concrete	Avenue 322
26	72.25	Ensure Stability	-0.49	State Hwy	Concrete	State Hwy 245/Avenue 314
27	74.71	Ensure Stability	-0.59	County	Concrete	Avenue 300
28	75.77	Ensure Stability	-0.43	County	Concrete	Spruce Avenue/Road 204
29	76.37	Ensure Stability	-1.61	County	Concrete	Marinette Avenue/Avenue 288
30	77.24	Ensure Stability	-0.39	County	Concrete	Wirth Avenue/Avenue 282
31	77.50	Ensure Stability	-0.06	County	Concrete	Exeter Avenue/Avenue 280/Rocky Hill Drive
32	81.56	Ensure Stability	-0.73	County	Concrete	Avenue 256/Sycamore Avenue
33	82.71	Ensure Stability	-0.81	County	Concrete	Avenue 248/Burr Avenue, 20'
34	85.12	Ensure Stability	-2.14	County	Concrete	Avenue 232, Tulare Road
35	85.67	Ensure Stability	-0.67	County	Concrete	Avenue 228/Round Valley Road
36	86.18	Ensure Stability	-0.38	County	Concrete	Avenue 224/Lindmore Avenue
37	86.68	Ensure Stability	-0.13	County	Concrete	Avenue 220/Waddel Avenue/2nd Avenue
38	87.18	Ensure Stability	-0.18	County	Concrete	Avenue 216/Citrus Avenue
39	87.68	Ensure Stability	-0.12	County	Concrete	Avenue 212/El Mirador Hwy
40	88.18	Ensure Stability	-0.15	County	Concrete	Avenue 208/5th Avenue

1

2

- *Option 2* – All three timber bridges would be removed using the methods described above. The timber bridges would be recycled or disposed of in a permitted waste facility.

Concrete Bridges

Potentially, the Proposed Action could require the modification of up to 37 concrete bridges. If modifications are found to be necessary, they would be accomplished by strengthening/hardening the bridges to ensure their stability during periods of sustained maximum flows. These modifications could include building parapet walls along the bridge length, adding anchor points from the bridge to the piers/abutments, and/or adding additional weight to the bridge superstructure. During construction, appropriate barricades and signage would be in place to control traffic.

2.2.4 Little Dry Creek Wasteway Modification

The Proposed Action would include modification to the Little Dry Creek Wasteway, located at MP 5.44, to increase the height of the existing wasteway radial gates. The increase in height is required to accommodate higher water surface elevations resulting from wind and wave action in this reach, which is currently overtopping the existing radial gates and flowing into the wasteway channel. Additionally, by restoring the capacity of the FKC from MP 29.14 to MP 88.22, higher water surface elevations may be seen in this reach. The modification would consist of cleaning and preparing the top of existing radial gates (two), fabricating steel plates to act as splashboard panels off-site, transporting those panels by flatbed truck to the site, hoisting them into position, securing and welding the panels in place on top of the radial gates, and finishing by applying a protective coating (Table 2-2).

2.2.5 Construction Considerations

Construction would occur within the existing rights-of-way of Reclamation and Reclamation's Operating Non-Federal Entity, FWA. Only existing infrastructure and rights-of-way would be used for staging areas and haul routes, except for limited on-highway traffic, and no additional land would be needed. Construction staging areas would be located on Reclamation and FWA properties, parts of which are currently being used as staging areas for ongoing O&M activities for the FKC. Most major travel and haul routes would occur on paved roads, with source piles for material being within 30 miles of the construction sites. Access to the local construction sites would occur via paved roads to within 5 miles of those sites. Within 5 miles of the local construction sites, existing paved/unpaved FKC O&M roads would be used during construction. Construction materials, including backfill material and concrete, would be obtained from permitted facilities or existing spoil piles. Surplus materials would be taken off-site to permitted locations for safe storage, use, and/or disposal. No new borrow or disposal sites would be developed as a part of the Proposed Action.

Construction activities would be phased over a period of up to 3 years. Lining and bank raises, and bridge modifications, would be completed consistent with approved best management practices (BMPs) and applicable Federal laws and regulations and would take advantage of low-flow conditions as available to avoid impacts to water deliveries or water quality issues. Approved BMPs would be put in place to avoid or substantially

reduce impacts to water quality resulting from placement of concrete and earthen lining in the upper portion of the canal prism, including limiting construction windows to when flows in the canal are normally reduced or when there is sufficient freeboard to avoid in-water work. Further, phasing of construction may also occur due to timing for sensitive species and in coordination with the appropriate regulatory authorities. Construction would be limited to sunrise to sunset, or as specified in local ordinances, to limit construction-related noise on-site. It is expected that a maximum of four construction teams consisting of an average workforce of 10-15 people would be operating on separate sections of the FKC at any point in time.

2.3 Environmental Commitments

This section presents the environmental commitments, as shown in Table 2-4, included in the Proposed Action to reduce potential environmental consequences. The discussion of environmental consequences in Chapter 3 assumes that the environmental commitments would be fully implemented.

2.4 Conservation Strategy for Biological Resources

The following strategy (Table 2-5) would be implemented in coordination with USFWS. The strategy's purpose is to serve as a tool built in to the project description to minimize and avoid potential impacts to sensitive species and habitats. These will help to guide the development and implementation of specific conservation measures for the Proposed Action. The strategy includes conservation goals and measures for species and communities (such as avoidance, minimization, monitoring, and management measures) consistent with adopted recovery plans. If avoidance and minimization measures are impractical or infeasible, then further consultation actions and mitigation measures will be pursued and developed in coordination with USFWS.

Table 2-4.
Environmental Commitments

Resource	Protection Measure
Biological Resources	**BIO-1**. Prior to implementation of the Proposed Action, Reclamation shall obtain any permits or other authorizations necessary to comply with Section 7 of the Endangered Species Act (ESA) and Sections 401 and 404 of the Clean Water Act (CWA). Reclamation shall comply with all terms and conditions thereof.
	BIO-2. Prior to initiating any construction activity between February 15 and September 1, Reclamation shall conduct a preconstruction survey within 250 feet of areas subject to disturbance for nesting birds protected under the Migratory Bird Treaty Act (MBTA). The survey shall be conducted no fewer than 14 days and no more than 30 days prior to the start of construction. If an active nest is found and disturbance cannot be avoided, appropriate and feasible avoidance and minimization measures mutually agreed to by Reclamation and the U.S. Fish and Wildlife Service (USFWS) shall be implemented.
Cultural Resources	**CULT-1**. Reclamation shall implement an inventory and evaluation process as follows. A qualified architectural historian shall draft a historic context for National Register of Historic Places (NRHP) evaluation of the bridges and the Little Dry Creek Wasteway Facility that shall provide a framework to evaluate the resources under the following associations: as a component of the Central Valley Project, and as individually eligible properties. The bridges shall also be assessed as a component of a system of historic roadway. The context shall explore the background history of the bridges and wasteway facility, including who constructed and who currently owns each resource. The NRHP nomination for the FKC shall also include detailed information on the resource's eligibility. The architectural historian, in consultation with Reclamation, shall make determinations of NRHP eligibility. Reclamation shall seek the consensus of the California State Historic Preservation Officer (SHPO). In addition, the bridges and wasteway facility shall be recorded by the architectural historian on appropriate California Department of Parks and Recreation (DPR) 523 forms, photographed, and mapped. The DPR forms will be produced and forwarded by the architectural historian to the appropriate Information Center. An archaeological survey will also be conducted to identify any such resources within the project area. Reclamation will make a finding of effect for project activities based on the outlined actions in the project description and the character-defining identified for each resource. If an adverse effect to any historic property is found, Reclamation will resolve those adverse effects with a Memorandum of Agreement (MOA) in consultation with the SHPO and the Advisory Council on Historic Preservation, if they choose to participate. The MOA will identify treatment measures to reduce, avoid, or mitigate adverse effects. Avoidance through project redesign is the preferred mitigation measure for resources that appear to be eligible for listing in the NRHP, but if avoidance is not feasible, other mitigation for historic properties would be identified. Typical treatment measures may include detailed documentation of the historic resource such as the Historic American Engineering Record (HAER) or data recovery for prehistoric resources.
Air Quality	**AQ-1**. Reclamation shall comply with the San Joaquin Valley Air Pollution Control District's (SJVAPCD's) series of rules and regulations for ozone and $PM_{2.5}$. In 2006, the San Joaquin Valley Air Basin achieved attainment for PM_{10}. Based on a review of the SJVAPCD's rules and regulations, the following regulations and rules would apply to the Proposed Action: Regulation VIII – Fugitive PM_{10} Prohibition: Addresses the control of PM_{10} emissions associated with construction activities, open areas and agricultural sources. Rule 3135 -- Dust Control Plan Fee: Requires an applicant to submit a fee in addition to a Dust Control Plan. The purpose of this fee is to recover the SJVAPCD's cost for reviewing these plans and conducting compliance inspections. Rule 4601 -- Architectural Coatings: Limits volatile organic compounds from architectural coatings. This rule specifies architectural coatings storage, clean up, and labeling requirements.

Table 2-4.
Environmental Commitments

Resource	Protection Measure
Noise	**NOI-1**. To reduce noise levels from on-site construction equipment, Reclamation shall implement the following measures during construction: Construction equipment shall be properly maintained and equipped with noise controls, such as mufflers, in accordance with manufacturers' specifications. Construction activities shall be limited to the hours specified in local ordinances, Monday through Friday, during which time such activities are exempt from noise levels identified in applicable standards. Emergency work to protect life or property is exempt from these hourly limits and applicable noise standards. If construction activities must run past exempted hours, any nearby sensitive receptors (less than 450 feet from those activities) must be given at least 48 hours notice of such activities. Before initiating construction activities during exempted hours, Reclamation shall prepare a plan demonstrating how appropriate noise-reducing measures (such as erecting temporary sound barriers) would be implemented to maintain the applicable noise level standards. The plan shall be implemented during all construction activities occurring outside of exempted hours. Construction equipment shall be arranged to minimize travel adjacent to noise-sensitive receptors and turned off during prolonged periods of nonuse. A disturbance coordinator shall be designated, and the person's telephone number conspicuously posted around the project site and supplied to noise-sensitive receptors. The disturbance coordinator shall receive all public complaints and be responsible for determining the cause of the complaint and implementing any feasible measures to alleviate the problem. Construction equipment shall be staged and construction employee parking shall be located in designated areas only.
Transportation	**TRANS-1**. Before initiating construction, Reclamation shall prepare and implement a Transportation Management Plan (TMP) that shall be provided to all emergency service providers in the area, as well as residents that rely on affected bridges for access to portions of their property. The TMP shall serve to notify all emergency service providers and these affected residents in the project corridor of the project construction schedule. The TMP shall identify anticipated dates and hours of construction, as well as any anticipated limits on access. Notice shall be provided at least 5 days before construction begins. If a temporary lane or road closure or a detour is required, the contractor shall notify emergency service providers of the closure or detour and the expected duration. The TMP shall consist of prior notices, adequate signposting, detours, phased construction, and temporary driveways where necessary. Adequate local and emergency access shall be provided at all times to adjacent uses. Proper detours and warning signs shall be established to ensure public safety. The TMP shall be devised so that construction shall not interfere with any emergency response or evacuation plans. Construction activities shall proceed in a timely manner to reduce impacts.

Table 2-5.
Conservation Measures for Biological Resources

Applicable Habitat and/or Species	Conservation Measure Description
Vernal pool habitats, fleshy (succulent) owl's clover, Hoover's spurge, San Joaquin Valley Orcutt grass, vernal pool fairy shrimp, and vernal pool tadpole shrimp.	If vernal pools or vernal pool species are anticipated within the Study Area, a qualified biologist shall identify and map vernal pool and seasonal wetland habitat potentially suitable for listed vernal pool plants, and invertebrates within the project footprint. Facility construction and other ground-disturbing activities shall be sited to avoid core areas identified in the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (Vernal Pool Recovery Plan) (USFWS 2005) because conservation of these areas is a high priority for recovering listed vernal pool species. If vernal pools are present, a buffer around the microwatershed or a 250-foot-wide buffer, whichever is greater, shall be established before ground-disturbing activities around the perimeter of vernal pools and seasonal wetlands that provide suitable habitat for vernal pool crustaceans or vernal pool plants. This buffer shall remain until ground-disturbing activities in that area are completed. Suitable habitat and buffer areas shall be clearly identified in the field by staking, flagging, or fencing. Appropriate fencing shall be placed and maintained around all preserved vernal pool habitat buffers during ground-disturbing activities to prevent impacts from vehicles and other construction equipment. Worker awareness training and on-site biological monitoring shall occur during ground-disturbing activities to ensure buffer areas are being maintained. If activities within the microwatershed or 250-foot-wide buffer for vernal pool habitat would be affected by the Proposed Action, Reclamation shall develop and implement a compensatory mitigation plan, consistent with the USACE and EPA April 10, 2008, Final Rule for Compensatory Mitigation for Losses of Aquatic Resources (33 CFR Parts 325 and 332 and 40 CFR Part 230) and other applicable regulations and rules at the time of implementation, that would result in no net loss of acreage, function, and value of affected vernal pool habitat. Unavoidable effects shall be compensated for through a combination of creation, preservation, and restoration of vernal pool habitat or purchase of credits at a mitigation bank approved by the applicable regulatory agency/agencies. Project effects and compensation shall be determined in consideration of the Vernal Pool Recovery Plan goals for core areas, which call for 95 percent preservation for habitat in the Grasslands Ecological Area and Madera core areas, and 85 percent habitat preservation in the Fresno core area (USFWS 2005). Appropriate compensatory ratios for loss of habitat both in and out of core areas shall be determined during coordination and consultation with USFWS as appropriate. If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures shall be developed as part of the USFWS coordination and consultation process. The mitigation plan shall include information on responsible parties for long-term management, holders of conservation easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations. Any impacts that result in a compensation purchase shall require an endowment for land management in perpetuity before any project groundbreaking activities.
California tiger salamander	If potential California tiger salamander habitat or species are anticipated within the Study Area, within 1 year before project construction activities, a qualified biologist shall identify and map potential California tiger salamander habitat (areas within 1.3 miles of known or potential California tiger salamander breeding habitat) within the project footprint. One week before ground-disturbing activities, a qualified biologist shall survey for and flag the presence of ground squirrel and gopher burrow complexes. Where burrow complexes are present, a 250-foot-wide buffer shall be placed to avoid and minimize disturbance to the species. Facility construction and other ground-disturbing activities shall be sited to avoid

	areas of known California tiger salamander habitat and avoidance buffers. To eliminate an attraction to predators of the California tiger salamander, all food-related trash items such as wrappers, cans, bottles, and food scraps, must be disposed of in closed containers and removed at least once every day from the entire project site. Before and during construction activities, construction exclusion fencing shall be installed just outside the work limit or around vernal pools where California tiger salamander may occur. This fencing shall be maintained throughout construction and shall be removed at the conclusion of ground-disturbing activities. No vehicles shall be allowed beyond the exclusion fencing. A USFWS-approved biological monitor shall be present on site, during intervals recommended by USFWS, to inspect the fencing. The biological monitor shall be on site each day during any wetland restoration or construction, and during initial site grading or development of sites where California tiger salamanders have been found. If CTS are anticipated within the project area, the biological monitor shall check for California tiger salamanders before the start of each work day under any equipment or materials to be used that day, such as vehicles or stockpiles of items such as pipes. If California tiger salamanders are present, they shall be allowed to leave on their own, before the initiation of construction activities for the day. To prevent inadvertent entrapment of California tiger salamanders during construction, all excavated, steep-walled holes or trenches more than 1 foot deep shall be covered, by plywood or similar materials, at the close of each working day or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they must be thoroughly inspected for trapped animals. Plastic monofilament netting (erosion control matting) or similar material shall not be used at the project site because California tiger salamanders may become entangled or trapped. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds. All ground-disturbing work shall occur during daylight hours. Clearing and grading shall be conducted between April 15 and October 15, in coordination with USFWS, and depending on the level of rainfall and site conditions. Revegetation of areas temporarily disturbed by construction activities shall be conducted with locally occurring native plants. If California tiger salamander, or areas within 1.3 miles of known or potential California tiger salamander breeding habitat, would be affected by the Proposed Action, Reclamation shall develop and implement a compensatory mitigation plan in coordination with USFWS, as appropriate. Unavoidable effects shall be compensated for through a combination of creation, preservation, and restoration of habitat or purchase of credits at a mitigation bank approved by the regulatory agencies. If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures shall be included in and developed as part of the USFWS coordination and consultation process. The mitigation plan shall include information on responsible parties for long-term management, holders of conservation easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations. Any impacts that result in a compensation purchase shall require an endowment for land management in perpetuity before any project groundbreaking activities.
Valley elderberry longhorn beetle	If elderberry shrubs and valley elderberry longhorn beetle are anticipated within the Study Area, not more than 1 year before the commencement of ground-disturbing activities, a qualified biologist shall identify any elderberry shrubs in the project footprint. Qualified biologist(s) shall survey potentially affected shrubs for valley elderberry longhorn beetle exit holes in stems greater than 1 inch in diameter. If elderberry shrubs are found on or adjacent to the construction site, a 100-foot-wide avoidance buffer – measured from the dripline of the plant – shall be established around all elderberry shrubs with stems greater than 1 inch in diameter at ground level and shall be clearly identified in the field by staking, flagging, or fencing. No activities shall occur within the buffer areas and worker awareness

	training and biological monitoring shall be conducted to ensure that avoidance measures are being implemented. Reclamation shall consult with USFWS to determine appropriate compensation ratios. Compensatory mitigation measures shall be consistent with the *Conservation Guidelines for Valley Elderberry Longhorn Beetle* (USFWS 1999) or current guidance. Compensatory mitigation for adverse effects may include transplanting elderberry shrubs during the dormant season (November 1 to February 15), if feasible, to an area protected in perpetuity, and performing any additional elderberry and associated native plantings required and approved by USFWS. If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures shall be included in the mitigation plan and must occur with full endowments for management in perpetuity. The plan shall include information on responsible parties for long-term management, holders of conservations easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations.
San Joaquin kit fox	A qualified biologist shall conduct preconstruction surveys no less than 14 days and no more than 30 days before the commencement of activities to identify potential dens more than 5 inches in diameter. Reclamation shall implement USFWS's (2011a) *Standardized Recommendations for Protection of the Endangered San Joaquin Kit Fox Prior to or During Ground Disturbance.* It shall notify USFWS in writing of the results of the preconstruction survey within 30 days after these activities are completed. If dens are located within the proposed work area, and cannot be avoided during construction activities, a USFWS-approved biologist shall determine if the dens are occupied. If occupied dens are present within the proposed work, their disturbance and destruction shall be avoided. Exclusion zones shall be implemented following the latest USFWS procedures (currently USFWS 2011a). Reclamation shall notify USFWS immediately if a natal or pupping den is found in the survey area. It shall present the results of preactivity den searches within 5 days after these activities are completed and before the start of construction activities in the area. Construction activities shall be conducted when they are least likely to affect the species (i.e., after the normal breeding season). This timing shall be coordinated with USFWS. Reclamation, in coordination with USFWS shall determine if kit fox den removal is appropriate. If unoccupied dens need to be removed, the USFWS-approved biologist shall remove these dens by hand-excavating them in accordance with USFWS procedures (USFWS 2011a). Reclamation shall present the results of den excavations to USFWS within 5 days after these activities are completed. Additional conservation measures shall be coordinated with USFWS and may include replacing dens, installing off-site artificial dens, acquiring compensation habitat, or other options to be determined. Compensation may include dedicating conservation easements, purchasing mitigation credits, or other off-site conservation measures, and the details of these measures shall be included in the mitigation plan and must occur with full endowments for management in perpetuity. The plan shall include information on responsible parties for long-term management, holders of conservations easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations.

3.0 Affected Environment and Environmental Consequences

This chapter identifies the affected environment and the potential environmental consequences and cumulative impacts associated with the No Action Alternative and the Proposed Action. The discussion of environmental consequences of the Proposed Action for each issue area assumes that all environmental commitments (Table 2-4) and conservation measures (Table 2-5) would be implemented.

3.1 Water Resources

This discussion of water resources, which addresses both surface-water sources and groundwater sources in the CVP Friant Division, identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.1.1 Affected Environment

The affected environment includes the CVP Friant Division and its associated groundwater basins, in addition to the flood control infrastructure within the San Joaquin River Basin.

Central Valley Project Friant Division

The CVP Friant Division's facilities consist of Friant Dam, Millerton Lake, and the FKC, which conveys water south to agricultural and urban water contractors in the eastern San Joaquin Valley. Historically, the Friant Division has delivered an average of about 1.3 million acre-feet (MAF) of water annually. The Friant Division provides water to more than 1 million acres of irrigable land on the east side of the southern San Joaquin Valley, from near the Chowchilla River in the north to the Tehachapi Mountains in the south. Friant Dam is also operated to provide flood protection to downstream areas by maintaining combined releases to the San Joaquin River at or below a flow objective of 8,000 cfs. This is accomplished through a large set of infrastructure, including bypasses, control structures, weirs, and dams. The Friant Division was designed and is operated to support conjunctive water management. Reclamation uses a two-class system of water allocation to support conjunctive water management and take advantage of water availability during wetter years:

- Class 1 supplies are based on a firm water supply. This water is generally assigned to municipal and industrial (M&I) and agricultural water users with limited access to quality groundwater, although most Friant Contractors have contracted for a combination of Class 1 and Class 2 supplies. During project operations, the first 800 thousand acre-feet (TAF) of annual water supply are allocated as Class 1 water.

- Class 2 water is a supplemental supply. This water is delivered directly for agricultural use or groundwater recharge, generally in areas that experience groundwater overdraft. Larger Class 2 contractors typically have access to good-quality groundwater supplies and can use groundwater during periods of surface-water deficiency. Many Class 2 contractors are located in areas where groundwater recharge capability is high, and operate dedicated groundwater recharge facilities. Total Class 2 contracts equal 1.4 MAF.
- Additional water can be provided in accordance with Section 215 of the Reclamation Reform Act of 1982. This law authorizes Reclamation to deliver water that cannot be stored and otherwise would be released in accordance with flood management criteria or unmanaged flood flows. Delivery of such water has enabled San Joaquin Valley groundwater to be replenished at higher levels than otherwise could be supported with Class 1 and Class 2 contract deliveries only.
- Additional water can also be provided in accordance with Paragraph 16(b) of the Settlement. This portion of the Settlement provides for the delivery of water during wet hydrologic conditions to Friant Division long-term contractors, at a cost of $10 per acre-foot, when water is not needed for Interim and Restoration flows. Paragraph 16(b) water would only be conveyed through the Friant-Kern canal when capacity is available.

Figure 3-1 shows the historical allocation of water to Friant Contractors. The actual deliveries are less than or equal to official allocations, as actual deliveries can be equal to, but not exceed allocations. As shown, annual allocation of Class 1 and Class 2 water varies widely in response to hydrologic conditions. From 1957 through 2007, annual allocations of Class 1 water were typically at or above 75 percent of contract amounts, except in 3 extremely dry years. In this same period, Class 2 water was fully allocated in about one-fourth of the years. During the extended drought of 1987–1992, no Class 2 water was available and Class 1 allocations were below full contract amounts in all years except one. During this and other historical drought periods, the Friant Contractors relied heavily on groundwater to meet water demands.

In addition to allocating Class 1 and Class 2 water and supporting conjunctive water management, the Friant Division operates a program of annual water transfers between districts. This program facilitates improved water management within the Friant Division's service area. In wet years, surplus water can be transferred by a district with little or no groundwater supply to another district that is able to recharge groundwater; conversely, in dry years, water is returned to districts with little or no groundwater supply. Thus, the Friant Division provides an ongoing informal groundwater banking program.

The Cross-Valley Canal, a locally financed facility completed in 1975, delivers water from the California Aqueduct to the east side of the southern San Joaquin Valley near the city of Bakersfield. A complex series of water purchase, transport, and exchange agreements allows water exchanges between the Arvin-Edison Water Storage District (WSD) (part of the Friant Division, located near Bakersfield) and seven entities with contracts for CVP water exported from the Delta. When conditions permit, water is

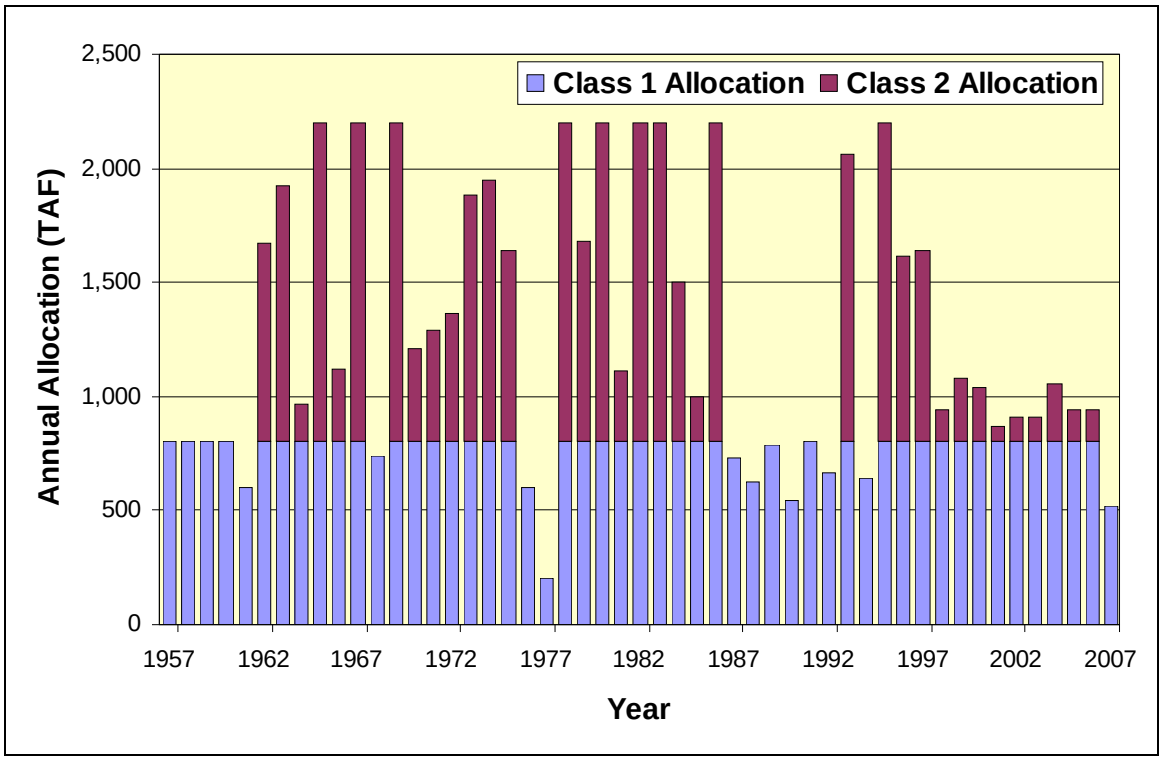


Figure 3-1.
Historical Water Allocation to CVP Friant Division Long-Term Contractors

delivered to the Arvin-Edison WSD from the California Aqueduct in exchange for water that would have been delivered from Millerton Lake.

Groundwater Basins and Subbasins

The San Joaquin Valley Groundwater Basin (Figure 3-2) makes up the southern two-thirds of the 400-mile-long, northwest-trending, asymmetric trough of the Central Valley's regional aquifer system (Page 1986). The San Joaquin Valley Groundwater Basin is bounded to the west by the Coast Ranges, to the south by the San Emigdio and Tehachapi mountains, to the east by the Sierra Nevada, and to the north by the Delta and the Sacramento Valley (DWR 2003).

The San Joaquin Valley Groundwater Basin, located in the southern extent of the Great Valley Geomorphic Province (Page 1986), comprises the San Joaquin River and Tulare Lake hydrologic regions. The San Joaquin River Hydrologic Region is composed of 3 basins while the Tulare Lake Hydrologic Region is composed of 13 basins. One of the basins in the San Joaquin River Hydrologic Region has nine subbasins; one of the Tulare Lake Hydrologic Region's basins has seven subbasins (DWR 2003). The Yosemite and Los Banos Creek Valley groundwater basins, both located in the San Joaquin River Hydrologic Region, are discrete, peripheral basins that are unconnected to the San Joaquin Valley Groundwater Basin, and will not be discussed further.

The San Joaquin River Hydrologic Region relies heavily on groundwater. Groundwater makes up approximately 30 percent of this hydrologic region's annual supply for

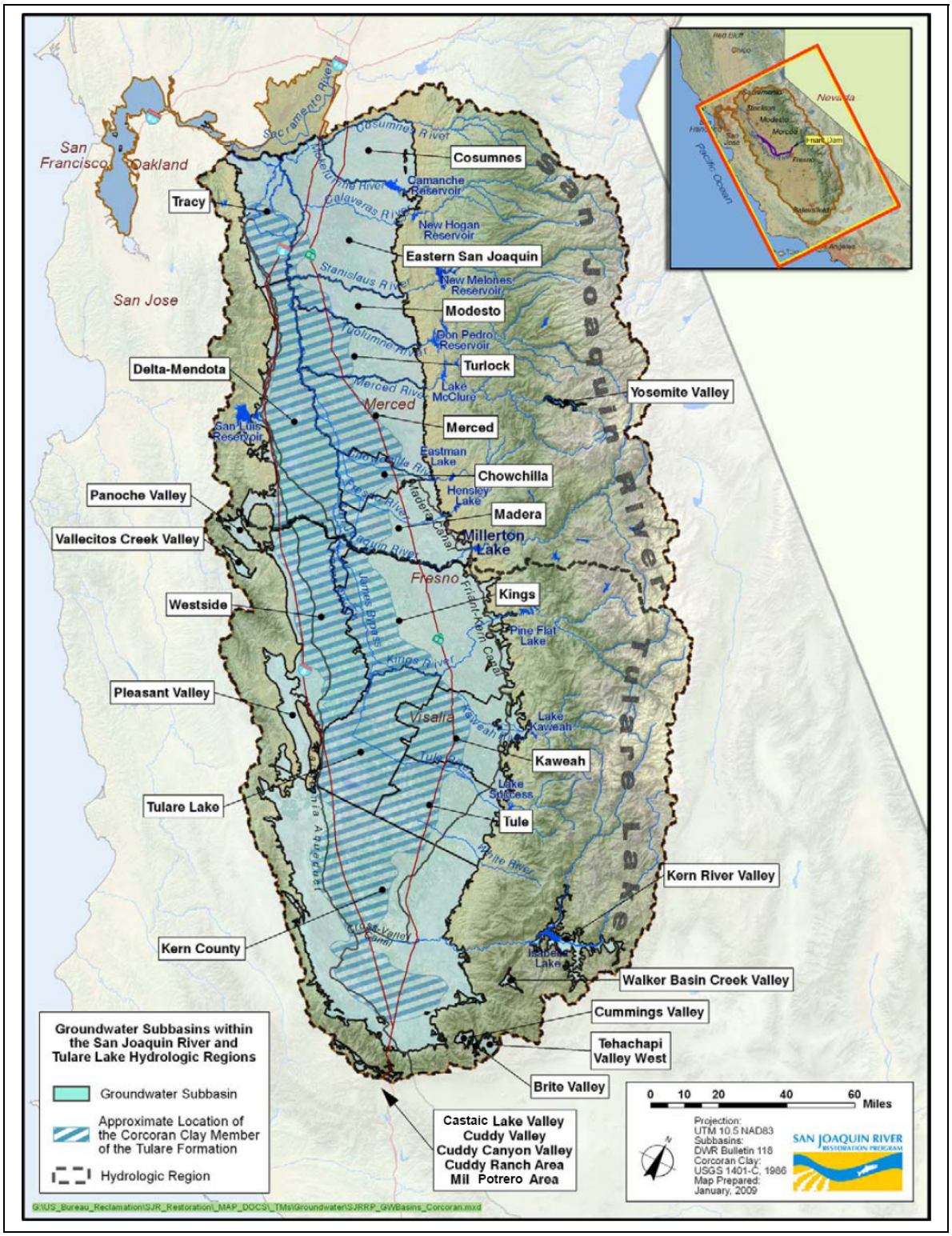


Figure 3-2.
Groundwater Subbasins of San Joaquin Valley Groundwater Basin Within San Joaquin River and Tulare Lake Hydrologic Regions

agricultural and urban uses (DWR 2003). The San Joaquin River Hydrologic Region consists of surface water basins that drain into the San Joaquin River system, from the Cosumnes River basin in the north through the southern boundary of the San Joaquin River watershed (DWR 1999). Aquifers in the San Joaquin Valley Groundwater Basin are thick, typically extending to depths of up to 800 feet.

The Eastern San Joaquin, Modesto, Turlock, Merced, Chowchilla, Madera, Delta-Mendota, Tracy, and Cosumnes groundwater subbasins lie within the northern half of the San Joaquin Valley Groundwater Basin in the San Joaquin River Hydrologic Region (DWR 1994). Groundwater in this region accounts for 5 percent of the state's total agricultural and urban water use (DWR 1998).Historically, the Tulare Lake Hydrologic Region has also been heavily reliant on groundwater supplies. The Tulare Lake Hydrologic Region is a closed drainage basin at the south end of the San Joaquin Valley, south of the San Joaquin River watershed. This hydrologic region encompasses surface-water basins that drain to the beds of Kern, Tulare, and Buena Vista lakes (DWR 1999). In the southern portion of the San Joaquin Valley Groundwater Basin the primary aquifer extends 1,000 feet below ground surface (DWR 2003).

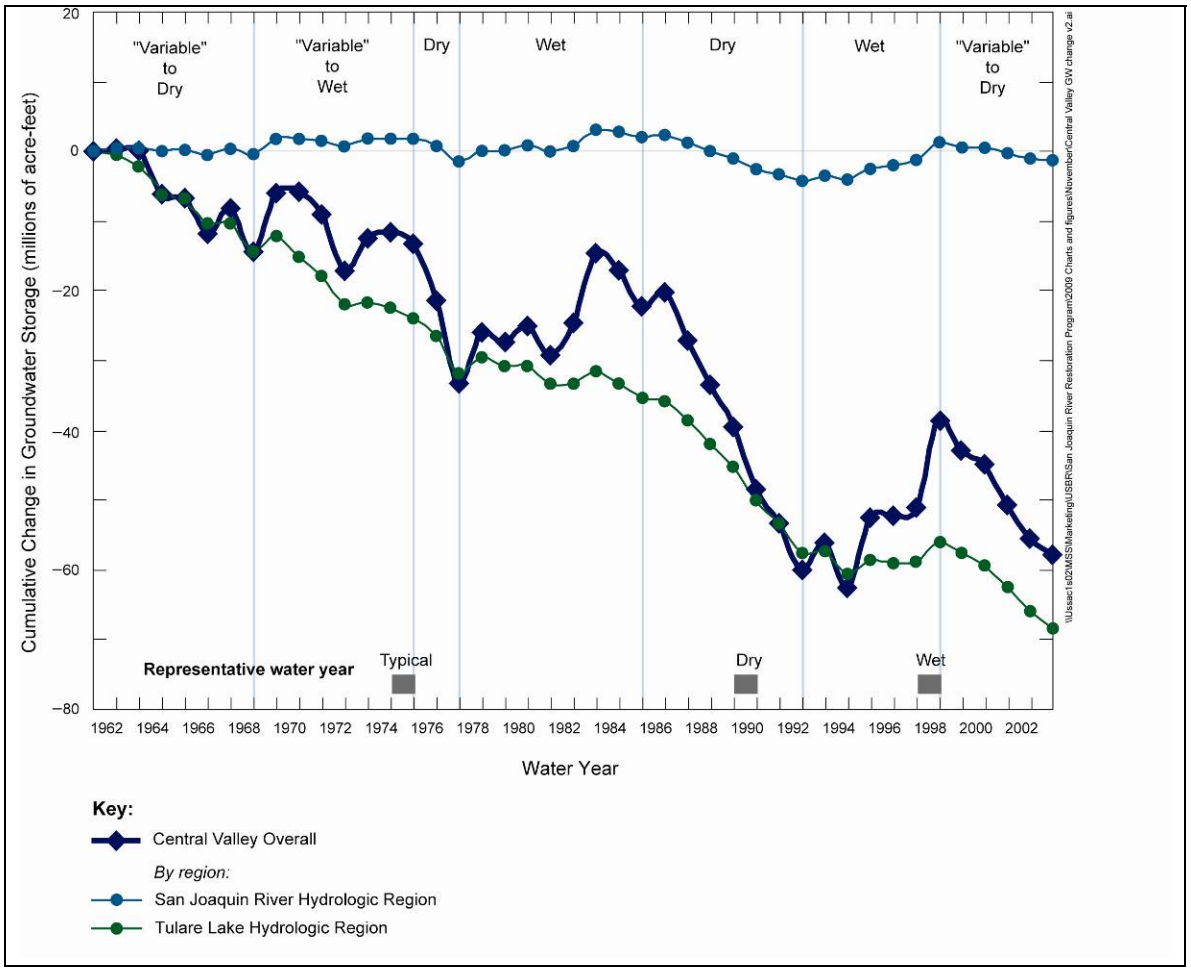
The Kings, Westside, Pleasant Valley, Kaweah, Tulare Lake, Tule, and Kern County groundwater subbasins lie within the southern half of the San Joaquin Valley Groundwater Basin, in the Tulare Lake Hydrologic Region. Groundwater use in this hydrologic region has historically accounted for 41 percent of the total annual water supply within the region and for 35 percent of all groundwater use in California. Groundwater use in this hydrologic region represents approximately 10 percent of the state's total agricultural and urban water use (DWR 1998).

Overdraft in California's groundwater subbasins has not been comprehensively assessed since 1980; however, as noted in the *San Joaquin Valley Drainage Monitoring Program 2001, District Report*, the 1998 edition of the *California Water Plan Update* reports that three of the subbasins in the San Joaquin River Hydrologic Region (Chowchilla, Eastern San Joaquin, and Madera) are in a critical condition of overdraft (DWR 2005a). According to the *California Water Plan Update* (DWR 2005b), five subbasins (Kings, Tulare, Kern County, Kaweah, and Tule) in the Tulare Lake Hydrologic Region are in critical overdraft conditions.

A recent publication from the U.S. Geological Survey (USGS) (Faunt 2009) used the Central Valley Hydrologic Model (CVHM) to simulate cumulative change in groundwater storage in the Central Valley as a whole. The simulation included the hydrologic regions of interest, San Joaquin River and Tulare Lake (which the USGS publication referred to as the "San Joaquin Basin" and "Tulare Lake Basin") (Figure 3-3). The USGS study's simulations of annual recharge and discharge between 1962 and 2003 estimated a net loss of 57.7 MAF from aquifer storage in the Central Valley (Faunt 2009).

Water Quality

Surface water sources and the groundwater underlying the Friant Division are generally of good quality. Water from Millerton Lake delivered to the Friant Contractors via the



Source: Faunt 2009

Figure 3-3.
Simulated Cumulative Change in Groundwater Storage by Water Year for Central Valley and San Joaquin River and Tulare Lake Hydrologic Regions, 1962-2003

FKC is representative of water quality conditions at Millerton Lake and in the upper San Joaquin River watershed. Water upstream from Friant Dam is generally soft, with low concentrations of minerals and nutrients because of the insolubility of the watershed's granitic soils and the river's granite substrate (SCE 2007).

In general, groundwater quality throughout the region is suitable for most municipal and agricultural uses, with only local impairments. Primary constituents of concern for municipal uses are arsenic and nitrate; salinity—total dissolved solids (TDS)—is the primary constituent of concern for agricultural uses. Salinity is relatively low in most of the Friant Division and does not constrain agricultural uses; however, as with arsenic and nitrate, localized areas of elevated TDS, either affect crop choice or require blending of surface water and groundwater supplies.

Flood Control and Flood Releases.

Friant Dam is the principal flood damage reduction facility on the San Joaquin River and is operated to maintain combined releases to the San Joaquin River at or below a flow objective of 8,000 cfs. Several flood events in the past few decades have resulted in flows greater than 8,000 cfs downstream from Friant Dam and, in some cases causing flood damages.

The State of California constructed the San Joaquin River Flood Control Project, which includes flood damage reduction structures and facilities along the San Joaquin River from Friant Dam to the Merced River. Construction of the original system was initiated in 1959 and completed in 1966. These improvements were coordinated with the Federal Government to ensure the effectiveness of the Federal portion of the project. The bypass system consists primarily of man-made channels (Eastside, Chowchilla, and Mariposa bypasses), which divert and carry flood flows from the San Joaquin River at Gravelly Ford, along with inflows from the Kings River and other tributaries, downstream to the mainstem just above Merced River. The system consists of about 193 miles of levees, several control structures, and other appurtenant facilities, and about 80 miles of surfacing on existing levees. Operations and maintenance (O&M) of the completed state upstream bypass features of the project are accomplished by the Lower San Joaquin Levee District.

3.1.2 Environmental Consequences

Potential impacts of the No Action Alternative and the Proposed Action are associated with changes in the level and quality of groundwater and with changes in water deliveries to the Friant Contractors as part of the Settlement.

No Action Alternative

Under the No Action Alternative, existing conveyance facilities would be used as under current conditions and, generally, would have negative effects on water supply, groundwater, and water quality. Flood releases are not expected to change under the No Action Alternative.

Water Supply. With implementation of the Settlement, water deliveries to the Friant Contractors could be reduced by more than 15 percent in the coming years. As mentioned, Paragraph 16(b) of the Settlement provides that water supplies would be available for delivery to the Friant Contractors during wet hydrologic conditions, when water need not be released to the San Joaquin River, at a cost of $10 per acre-foot. Paragraph 16(b) water would be conveyed through the FKC only when capacity is available, without adversely affecting the requirement to meet existing contract deliveries to the Friant Contractors.

It is anticipated that the Friant Contractors would be able to accept delivery of some Paragraph 16(b) water using existing water conveyance and storage facilities. Under the No Action Alternative, canal conveyance deficiencies would continue to limit the ability of Friant Division districts to maximize water diversions during wet hydrologic conditions, as provided for by the Settlement.

Groundwater. Groundwater pumping from the San Joaquin Valley Groundwater Basin would be expected to continue to contribute to overdraft conditions in much of the basin. The No Action Alternative would contribute considerably to substantial degradation of groundwater levels in the Friant Division's service area relative to baseline conditions. Without additional recharge of the underlying groundwater subbasin, ground subsidence could continue, potentially causing the capacity of the FKC to be reduced further.

Water Quality. Groundwater quality in the Friant Division could be substantially degraded with implementation of the No Action Alternative because overdraft of the groundwater aquifer would continue, potentially leading to upwelling of more saline groundwater into the exercised aquifer. The No Action Alternative would contribute considerably to the degradation of groundwater quality and groundwater upwelling.

Surface water quality, including Delta water quality, is not expected to change with implementation of the No Action Alternative.

Flood Control and Flood Releases. The frequency and size of flood releases would not be expected to change with implementation of the No Action Alternative. Flood releases would continue to occur once per year on average.

Proposed Action

The Proposed Action would restore Reclamation's ability to deliver CVP water, including Paragraph 16(b) water supplies, as described previously. The Friant Division's main conveyance facilities would be improved, which would help the Friant Division to better serve water to the Friant Contractors. Modifications would be accomplished during low-flow periods to minimize impacts on resources, including water quality. Generally, the Proposed Action would have slight beneficial effects on water supply, groundwater, and water quality.

Water Supply. The Proposed Action provides the Friant Division with greater access to water supplies during wet conditions by improving the ability of the FKC to convey surface water from Friant Dam that would have otherwise been released into the San Joaquin River as a result of: (1) storage evacuations in preparation for high snowmelt conditions, (2) rainfall-dominated inflows that exceed the reservoir's physical capacity or regulated flood management capacity, (3) lack of conveyance capacity in the canals, and/or (4) storage for SJRRP Interim or Restoration Flows. On average, the Proposed Action improves the access of Friant districts to surface water supplies by 5–8 TAF/year (Table 3-1). Because the majority of these supplies occur during periods when agricultural demands are low, they would predominantly be applied to groundwater banking and recharge facilities. Table 6 shows the average annual, increase in captured surface water considering both the existing level of groundwater recharge infrastructure and the maximum future level of groundwater recharge infrastructure expected in the Friant Division. The anticipated level of groundwater recharge development is further described under Section 3.1.3, "Cumulative Impacts."

Table 3-1.
Average Annual Surface Water and Groundwater Increases from the Proposed Action

Analysis	Average Annual Increase in Captured Surface Water (TAF/year)	Average Increase in Groundwater Elevations[1] (feet)
Proposed Action with Existing Level of Groundwater Recharge Infrastructure	5	2.0
Proposed Action Considering Estimated Maximum Groundwater Development	8	3.6

Notes:
[1] Simulated increase in groundwater level over 25 years.
Key:
TAF = thousand acre-feet

Groundwater. The Proposed Action would not involve additional groundwater pumping; rather, it would help to mitigate the impacts of existing groundwater pumping on water levels. In particular, the increased ability to recharge available surface water supplies would help mitigate the ongoing and projected long-term decline in groundwater levels. While results would vary across the Friant Division, the Proposed Action is expected to raise groundwater levels by 2.0 to 3.6 feet by 2030 (Table 3-1), Also, the additional recharge of the groundwater basin would help reduce any further impacts related to ground subsidence. This groundwater impact would be beneficial.

Water Quality. Modifications to the FKC would be accomplished during low-flow periods to minimize impacts on resources, including water quality. The surface water supply has a lower salinity level than groundwater; therefore, the long-term infiltration of the surface-water supply would serve to maintain and enhance the generally good quality of groundwater underlying the Friant Division. The Proposed Action would have no impact, or slight beneficial effects, on groundwater quality.

Water quality of surface water supplied from Friant Dam is typically higher than water quality in the Delta. Under the Proposed Action, flows to the Delta from Friant Dam would be slightly reduced. This could slightly reduce Delta water quality; however, because of the quantity of water expected to be redirected, and the overall quantity of water within the Delta, this impact is expected to be negligible. The Proposed Action would have no impact on Delta water quality.

Flood Control and Flood Releases. The Proposed Action would slightly decrease the quantity of anticipated flood releases; however, the overall expected frequency of flood releases is expected to remain at one flood release per year. Overall spill volume from Friant Dam is expected to decrease by 3.5 percent. The Proposed Action would have slight beneficial effects on flood control and flood releases. A reduction in flood releases

would benefit this system because of reduced flood volumes and reduced stress on the flood control infrastructure.

3.1.3 Cumulative Impacts

As in the past, hydrological conditions and other factors would result in fluctuating water supplies. Conjunctive use of surface water and groundwater is regionally extensive on the east side of the San Joaquin River and Tulare Lake hydrologic regions. Several artificial recharge programs are currently operating in the Tulare Lake Hydrologic Region. Additional direct and in-lieu recharge groundwater banks have been proposed in the San Joaquin Valley by the Friant Contractors and non-Friant Division contractors (Tables 3-2 and 3-3).

Table 3-2.
Proposed In-Lieu Groundwater Banking and Recharge Projects

Project Name
Arvin-Edison WSD In-District, In-Lieu Groundwater Bank
Chowchilla WD Groundwater Recharge Pond and Recovery Well
City of Fresno Southeast Surface Water Treatment
Delano-Earlimart ID and Pixley ID Groundwater Banks
Friant-Kern Canal Turnout to Cawelo's North System—5N
Kern-Tulare/Rag Gulch WD Ninth Avenue Pipeline—5N
Orange Cove ID In-District Groundwater Recharge/Recovery Program
Pixley ID Distribution System Expansion
Semitropic New In-Lieu Service Area (P-565)—5S
Semitropic Stored Water Recovery Unit In-Lieu Service Areas—5S
Shafter-Wasco ID Interconnection on Kimberlina Road to Semitropic P-384 Distribution System—5S
Shafter-Wasco ID Interconnection on Madera Avenue to Semitropic B-320 Distribution System—5S
Southern San Joaquin MUD Interconnection with Semitropic P-1030 In-Lieu Service Area—5N
Terra Bella ID Connection of Distribution System to Tule River Distribution System

Key:
5N = 5 North
5S = 5 South
ID = irrigation district
MUD = municipal utility district
WD = water district
WSD = water storage district

Table 3-3.
Proposed Direct Groundwater Banking and Recharge Projects

Project Name
Arvin-Edison WSD Out-of-District Groundwater Bank
City of Fresno Northwest Recharge Project
City of Fresno Southeast Recharge Project
City of Fresno Southwest Water Bank
City of Fresno Westside Water Bank and Tertiary Treatment at Fresno/Clovis Regional Wastewater Reclamation Facility with Intertie to the San Joaquin River
Chowchilla WD Groundwater Recharge Pond and Recovery Well
Chowchilla WD River Channel Seepage Enhancement
Deer Creek Basin Water Banking Evaluation
Delano-Earlimart ID and Pixley ID Groundwater Banks
Delano-Earlimart ID Turnipseed Groundwater Banking Project—5N
Friant-Kern Canal Improvement and Conveyance to North Kern Recharge
Friant-Kern Canal Turnout to Cawelo's North System—5N
Fresno ID Water Development and Recovery Facility
Madera ID Water Supply Enhancement Project
Rag Gulch[1] Groundwater Banking Project—5N
Rancho de Kaweah Surface Water Banking Facility
Sausalito ID Distribution System Evaluation (Groundwater Banking Evaluation)
Semitropic Pond Poso Spreading Grounds—5S
Tulare ID Conjunctive Use Recharge Basin
Tulare ID Upstream Recharge Basin
Tulare ID Water Use Efficiency Basin
Upgrade of Shafter-Wasco ID Interconnection Facilities with North Kern—5S
White River Groundwater Banking in Rag Gulch WD[1]—5N

Notes:
[1] Rag Gulch WD merged with Kern-Tulare WD
Key:
5N = 5 North
5S = 5 South
ID = irrigation district
WD = water district
WSD = water storage district

The Proposed Action, when considered with other proposed projects, would improve management of water resources in the Friant Division and the region. There would be a cumulative beneficial effect on groundwater levels and quality because of the long-term increase in groundwater recharging capability when surface water is available.

3.2 Biological Resources

This discussion of biological resources identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.2.1 Affected Environment

The discussion of the affected environment includes both terrestrial and aquatic biological resources.

Terrestrial Resources

Review of aerial photographs (NAIP 2010) showing the FKC indicates that the canal is bordered primarily by agricultural land and grasslands. Sensitive biological resources that could occur in the Study Area consist of special-status plant and wildlife species, nesting migratory birds, roosting bats, and sensitive habitats (e.g., vernal pools).

For the purpose of this analysis, special-status species are those plants and animals protected under the Federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA). Special-status species that could occur in the Study Area were identified through a search of the species database of USFWS's Sacramento Fish and Wildlife Office (USFWS 2011b) and the California Department of Fish and Game (DFG)'s Natural Diversity Database (CNDDB) (2011). The USFWS species database was accessed to generate a list of Federally listed threatened and endangered species that may occur in the Study Area (Appendix B). The search included the following 7½-minute USGS quadrangles, which overlap the Study Area: Orange Cove North, Orange Cove South, Delano East, Piedra, Wahtoke, Stokes Mountain, Rocky Hill, Lindsay, Porterville, Ducor, Sausalito School, McFarland, Famoso, Oildale, and Rosedale. The CNDDB was searched for special-status species reported within 0.5 mile of the Study Area. The CNDDB is the most current and reliable tool for tracking occurrences of special-status species previously reported in California; however, because the CNDDB only includes previously documented occurrences submitted to DFG, the search results generated for this analysis do not represent a comprehensive inventory of special-status species that could occur in the Study Area.

Table 3-4 lists Federally listed threatened and endangered species that could occur in the Study Area, based on information obtained from the USFWS and CNDDB databases and on aerial photographs reviewed to evaluate the suitability of potential habitat (NAIP 2010). No field surveys were conducted as part of the habitat evaluation; therefore, no conclusive determinations have been made about the presence or absence of suitable habitat in the Study Area for any of the plants and animals listed in Table 3-4 and shown in Figure 3-4. However, based on the results of this preliminary evaluation, it is assumed that the Study Area includes potential habitat for the following Federally listed threatened and endangered species:

Table 3-4.
Federally Listed Species with the Potential to Be Present Within or Near the Study Area

Species	Habitat	Fed[1]	Potential for Occurrence in the Study Area
Plants			
Hoover's spurge Chamaesyce hooveri	Vernal pools	T	**Could occur.** No CNDDB occurrences within 0.5 mile of the Study Area. Critical habitat within the Study Area.
San Joaquin woollythreads Monolopia congdonii	Grassland and saltbush scrub	E	**Could occur.** Two CNDDB occurrences within 0.5 mile of the Study Area.
San Joaquin Valley orcutt grass Orcuttia inaequalis	Vernal pools	T	**Could occur.** No CNDDB occurrences within 0.5 mile of the Study Area. Critical habitat within the Study Area.
San Joaquin adobe sunburst Pseudobahia peirsonii	Woodlands and grasslands; clay soils	T	**Could occur**. Two CNDDB occurrences within 0.5 mile of the Study Area.
Invertebrates			
Valley elderberry longhorn beetle Desmocerus californicus dimorphus	Elderberry shrubs	T	**Could occur.** One CNDDB occurrence within 0.5 mile of the Study Area.
Vernal pool fairy shrimp Branchinecta lynchi	Vernal pools	T	**Could occur.** Three CNDDB occurrences within 0.5 mile of the Study Area. Critical habitat present within the Study Area.
Vernal pool tadpole shrimp Lepidurus packardi	Vernal pools	E	**Could occur.** No CNDDB occurrences within 0.5 mile of the Study Area. Critical habitat present within the Study Area.
Amphibians and Reptiles			
California tiger salamander Ambystoma californiense	Vernal pools and seasonal ponds	T	**Could occur.** Numerous CNDDB occurrences within 0.5 mile of the Study Area.
Blunt-nosed leopard lizard Gambelia sila	Grasslands and open scrub	E	**Could occur.** No CNDDB occurrences within 0.5 mile of the Study Area. Suitable habitat may be present in the Study Area.
Mammals			
San Joaquin kit fox Vulpes macrotis mutica	Grasslands and open scrub	E	**Could occur.** Numerous CNDDB occurrences in the Study Area.
Tipton kangaroo rat Dipodomys nitratoides	Grasslands and open scrub	E	**Could occur.** One CNDDB occurrence in the Study Area.

Sources: USFWS 2011b, CNDDB 2011, NAIP 2010
Key:
CNDDB = California Natural Diversity Database
T = Listed as Threatened under the Federal Endangered Species Act
E = Listed as Endangered under the Federal Endangered Species Act

1

- San Joaquin Valley orcutt grass (threatened),
- Hoover's spurge (threatened),
- San Joaquin woollythreads (endangered),
- San Joaquin adobe sunburst (threatened),
- valley elderberry longhorn beetle (threatened),
- vernal pool fairy shrimp (threatened),
- vernal pool tadpole shrimp (endangered),
- California tiger salamander (threatened),
- blunt-nosed leopard lizard (endangered),
- San Joaquin kit fox (endangered), and
- Tipton kangaroo rat (endangered).

The search of USFWS's species database for the selected USGS quadrangle identified additional Federally listed threatened and endangered species:

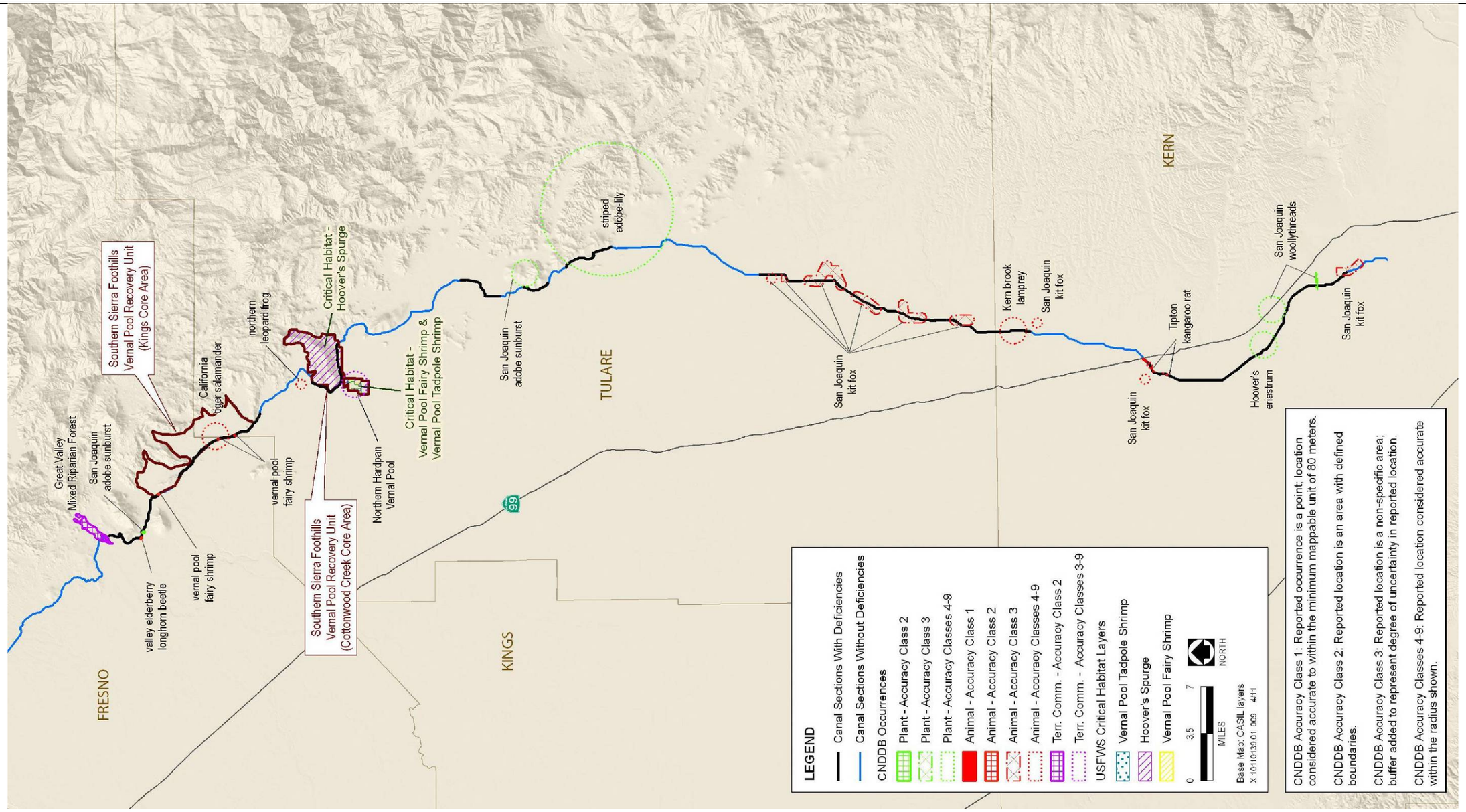
- Springville clarkia (threatened),
- California jewelflower (endangered),
- Bakersfield cactus (endangered),
- California red-legged frog (threatened),
- giant garter snake (threatened),
- Fresno kangaroo rat (endangered),
- Greene's tuctoria (endangered), and
- giant kangaroo rat (endangered).

None of these species are expected to occur because either suitable habitat appears to be absent or the Study Area is located outside of the species' current geographic range.

Canal segments with deficiencies are located within USFWS-designated critical habitat for Hoover's spurge, vernal pool fairy shrimp, and vernal pool tadpole shrimp (Figure 6). Deficient segments of the canals also intersect two core areas of the USFWS-designated Southern Sierra Foothills Vernal Pool Recovery Unit: the Kings Core Area and the Cottonwood Creek Core Area.

Many of the special-status species that could occur in the Study Area are associated with vernal pool and grassland habitat types. In addition to providing habitat for special-status species, vernal pools could be subject to Federal protection under Sections 404 and 401 of the Clean Water Act (CWA). The Study Area could also include other waters of the United States subject to USACE jurisdiction.

The Study Area provides potential nesting habitat for numerous species of birds protected under the Migratory Bird Treaty Act (MBTA) and could support active roosting sites for bats.



Source: CNDDB 2011

Figure 3-4.
CNDDB Occurrences Within 0.5 Mile of Canal Sections with Deficiencies

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Aquatic Resources

The FKC receives water from Millerton Lake on the San Joaquin River. Snowmelt from the Sierra Nevada is the primary source of water entering tributaries of the San Joaquin River Basin. In normal water years, unimpaired flows characteristically peak in May, June, and July as the snowpack melts in spring and summer, but are typically very low for the rest of the year. Kern brook lamprey (*Lampetra hubbsi*) is the only identified special-status fish species in the FKC, and is likely the only special-status fish species that regularly occupies the canal.

The Kern brook lamprey is a nonparasitic lamprey endemic to the east side of the San Joaquin Valley, in the San Joaquin River drainage in California. This species has been reported in the FKC and the Merced, San Joaquin, Kings, and Kaweah Rivers (Moyle 2002:103). Siphons in the FKC mimic habitat preferred by Kern brook lamprey, but spawning habitat is not available, so ammocoetes (larvae) that enter the canal do not reproduce in the canal (Moyle 2002:103).

Kern brook lamprey were proposed for listing under the ESA as threatened or endangered, but insufficient scientific information and commercial information were available; therefore, USFWS found Kern brook lamprey to not be warranted for listing (69 FR 77152, December 27, 2004). Populations of this species are thinly scattered throughout the San Joaquin River drainage and isolated from one another. Such a fragmented distribution makes local extirpations likely, without hope of recolonization, followed by eventual extinction of the species. The probability of local extirpation is increased because all known populations are located below dams, where streamflows are regulated irrespective of the needs of the lamprey (Moyle 2002:104).

3.2.2 Environmental Consequences

Impacts of the Proposed Action are associated with construction activities within and around the FKC.

No Action Alternative

Under the No Action Alternative, no canal modifications would occur; however, ongoing maintenance activities along the canal would continue to have minor impacts to the biological resources described above. The No Action Alternative would not result in any additional direct, indirect, or cumulative adverse impacts or beneficial effects on the terrestrial or aquatic biological resources described above, beyond those expected from approved O&M activities.

Proposed Action

Under the Proposed Action, project construction and associated disturbance would largely be limited to the disturbed right-of-way; construction would not require extending the land-side toe of the levees. However, construction activity associated with bank and lining raises would require modifying the existing levees, which would include removing vegetation and using fill material. The canal and levee may support special-status species (e.g., San Joaquin kit fox) and nesting birds protected under the MBTA (e.g., burrowing owl). Special-status species and sensitive habitats are also expected to occur immediately adjacent to the levees, and could be affected by implementation of the Proposed Action.

The potential to adversely affect sensitive biological resources is expected to be highest where canal modifications are proposed near vernal pools and other wetland habitats. Several canal sections with deficiencies are located near sensitive vernal pool habitat, which is known to support threatened and endangered species. Work in the northern portion of the Study Area would also occur within, or adjacent to, areas identified as critical habitat for four special-status plants and two special-status vernal pool invertebrates. With implementation of the Proposed Action, vernal pool habitat could be lost or degraded by ground disturbance and other construction activities that would occur near the land-side toe of the levees. These activities could also result in fill of seasonal and permanent aquatic habitat protected under the CWA. Although vernal pool habitat is not generally expected to occur within the proposed disturbance area, direct and indirect impacts could occur unless appropriate avoidance and minimization measures are implemented.

Project construction could also affect nesting migratory birds and roosting bats. Excavating material from the channel to restore channel capacity could affect nesting birds. Modifying bridges and overchutes that cross the canal could affect colonies of nesting swallows and roosting bats.

Implementation of biological protection measures as part of the Proposed Action (see Section 2.3, “Environmental Commitments,” and Section 2.4 “Conservation Strategy for Biological Resources” in Chapter 2.0, “Alternatives, Including Proposed Action”) would minimize impacts on critical habitat for listed species and on vernal pool recovery units. Implementation of these measures would also avoid direct and indirect impacts on special-status species, and would minimize impacts on seasonal and permanent wetlands protected under Sections 404 and 401 of the CWA; birds protected under the MBTA; and bats roosting in the Study Area.

Under the Proposed Action, construction would occur when flows in the canal are normally reduced or when there is sufficient freeboard to avoid in-water work. Additionally, approved BMPs would be put in place to avoid or substantially reduce impacts on water quality resulting from placement of concrete lining in the upper portion of the canal. Implementation of BMPs would reduce the impacts on fish in the FKC, particularly Kern brook lamprey.

In addition, no operational changes are anticipated to occur with the Proposed Action, only improved capacity conditions. Implementing BMPs would avoid and reduce impacts on the Kern brook lamprey during the operation of the FKC.

3.2.3 Cumulative Impacts

Terrestrial biological resources would continue to be affected by other types of activities that are ongoing or proposed but unrelated to the Proposed Action. Impacts on terrestrial biological resources from implementation of the Proposed Action would occur only during temporary and short-term construction activities. The Proposed Action, when added to other existing and proposed actions, would not contribute to the cumulative impact on terrestrial biological resources because construction activities would be short-

term and because effects on these resources would be avoided or minimized with implementation of the environmental commitments.

No cumulative impacts on fish, including Kern brook lamprey, would result from implementation of the Proposed Action in conjunction with other reasonably foreseeable future projects. The Proposed Action is the only construction-related project that would affect species in the FKC.

3.3 Cultural Resources

This discussion of cultural resources, which addresses both archaeological and historical resources, identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

"Cultural resources" are several different types of properties: prehistoric and historical archaeological sites; architectural properties such as buildings, bridges, and infrastructure; and resources important to Native Americans. Cultural resources known to exist along the FKC consist of the canal and associated features (e.g., siphons, drop structures, turnouts, inlet/outlet structures), concrete and timber (farm) bridges that cross the canal, and the Little Dry Creek Wasteway Facility. Archaeological remains could also be present along the canal, in undisturbed soils outside of the canal corridor. No archaeological surveys have been conducted for this undertaking.

The following discussion summarizes the historic context for the San Joaquin area from Friant Dam to the confluence with the Merced River.

3.3.1 Prehistoric Era

Prehistoric archaeological investigations have been limited within the middle San Joaquin River segment of the Central Valley and it is considered by many to be one of least understood regions in California. As a result, archaeologists working in this area have been forced to borrow chronologies from nearby areas, particularly the foothills to the west (the eastern foothills of the Diablo Range) and to the east (the western slope of the Sierra Nevada). These investigations of the western Sierra Nevada foothills have resulted in the formulation of local chronologies, notably the Chowchilla River/Buchanan Reservoir sequence.

Native American prehistoric occupation of the region began near the end of Pleistocene (circa 13,500 years ago) and continued until Spanish contact (in the late 1700s). Terminal Pleistocene (13,500–11,600 years ago) occupation in the region is represented by wide-ranging, mobile hunters and gatherers who periodically exploited large game. Throughout California, the Terminal Pleistocene is minimally represented and poorly understood. However, there is probable Terminal Pleistocene site near Tulare Lake at the southern end of the Central Valley, and isolated artifacts dating to this era have been recovered within the Study Area.

Evidence of Early Holocene (11,600–7700 years ago) human settlement is only rarely encountered in the Central Valley. Infrequent early Holocene sites in the foothills appear to have been seasonally occupied and include a robust ground stone assemblage focused on the processing of nuts. The lack of documented Central Valley early Holocene sites is undoubtedly due to sedimentation that has buried paleosurfaces of the time period. In the foothills, Middle Holocene (7,700–3,800 years ago) sites are dominated by expedient cobble tools for various purposes including grinding, chopping, and pounding, and preserved plant remains are mainly represented by acorns and pine nuts. A relative lack of middle Holocene evidence in the Central Valley is due in large part to the archaeological record being deeply buried by later sedimentation. Well-dated site of this age in the Valley are typically in buried contexts.

By 4500 years ago, distinctive lowland and upland adaptive patterns emerged in the region. Throughout the Late Holocene (after 3,800 years ago) the Central Valley was characterized by a complex socioeconomic strategy focused on riverine and marsh resources and extremely elaborate material culture. Notable attributes included dart points, mortars and pestles; use of acorns and pine nuts; new fishing technologies and numerous fish remains; basketry and cordage; ceramic items; diverse personal accoutrements of stone, bone and shell; and large, formal cemeteries areas.

Around 2,300 years ago, large populations were concentrated in major settlements along the river. Material culture included large dart points, mortars and pestles, millingstones, and bone spear points. Subsistence was concentrated on hunting and fishing and, based on secondary evidence, included hard seeds, with more limited use of acorns. Wide-ranging trade networks are documented and a nonegalitarian social organization and ascribed status may have emerged. With extended occupation at key settlements, large mounded villages were created. By 500 years ago, populations were much higher than previously, and noted developments in material culture include smaller arrow points and new types of items of personal adornment.

3.3.2 Native Peoples at the Time of European Contact

At the time of European contact, the Study Area was occupied by the Northern Valley Yokuts, who had lived in the region for some 4,500 years. The Yokuts were hunter-gatherers who divided themselves into named tribes, each with a dialect, territory, and discrete settlements. Each tribe was politically autonomous and occupied a permanent area, usually on high ground along a major drainage course. The San Joaquin River and its main eastern tributaries formed the core of the Northern Valley Yokuts homeland. Settlements west of the river tended to be in the foothills, concentrated along watercourses.

According to fragmentary information, the Yokuts exploited local subsistence resources from principal villages located on or near the San Joaquin River and other major streams. Villages were comprised of large, semi-subterranean, round or oval dwellings. Some of the more major establishments also included larger communal dance houses. These villages were supported to a large extent by the riverine resources and by a variety of terrestrial plants, most importantly the acorn. Occupation was essentially sedentary, with dispersals occurring only seasonally for the acquisition of particular resources. Trade was

focused along the river, where tule rafts were used for transportation. The Yokuts reportedly traded dogs to their Miwok neighbors in exchange for baskets and blankets. They acquired abalone and mussel shell from the coast and obsidian from the eastern slope of the Sierra Nevada.

Yokut populations at the time of Spanish contact have been estimated at about 41,000, with perhaps 5,000 living along the east side of the valley between the Merced and Kings rivers. These numbers dropped drastically as native people here and throughout California were decimated by European and Euro-American diseases in the early nineteenth century, and by the tremendous influx of nonnative people during the local gold-mining period from the midnineteenth and into the twentieth centuries. Today there are still several bands of Yokuts Indians living in the San Joaquin Valley, though none are known to practice the traditional, pre-contact way of life.

3.3.3 Historic Era

For some time only sporadic interaction took place between Native Californians and Europeans. The first Spanish expedition into the San Joaquin Valley was led by Pedro Fages in 1772 who sought a new route between San Diego and Monterey. In the 1820s, at the beginning of the Mexican Era, the objective of inland expeditions had changed from scouting new mission sites to punitive forays against the San Joaquin Valley Indians, both Yokuts and Miwoks. The Indians had engaged in sorties on missions, towns, and ranchos to steal livestock for food and transportation since the early 1800s. A cycle of raids and reprisals across the coastal mountains continued until American settlers took up permanent residence in the valley in the mid-1840s.

While Mexican troops engaged in punitive expeditions against the San Joaquin Valley tribes, American trappers and explorers made their first journeys into the region. The first was Jedediah S. Smith in 1827. Other trappers from the Hudson's Bay Company passed through the Central Valley, as well as Kit Carson and Peter Ogden Skene. Perhaps the most famous explorer in the region at this time was John C. Fremont who was in the vicinity in 1844. Fremont also remarked on the abundance of wild horses on the west side of the San Joaquin River, and the difficulty of travel because of the swampy terrain and sloughs.

Two small Spanish settlements developed in the Study Area near Fresno Slough sometime in the early decades of the 1800s called Pueblo de Las Juntas and Rancho de los Californios (California Ranch). Officially sanctioned colonial settlement of the San Joaquin Valley began in the 1840s when the Mexican government issued its first land grants to individuals who petitioned for land. Two Mexican ranchos were successfully patented at the northwest end of the Study Area on the west side of the San Joaquin River (Rancho Sanjon de Santa Rita and Orestimba Rancho), and a third claim in the foothills near Friant was rejected (Rancho Rio del San Joaquin).

In response to the gold rush, Americans quickly built a line of towns and roadside stations north and south across the 250-mile floor of the San Joaquin Valley, with Stockton as the central distributing point. The few towns in the Study Area established during the second half of the nineteenth century all have their origins as favorable places

to cross the San Joaquin River. A few were later sustained by agriculture or industry. For example, the settlement at the current site of Friant, on the San Joaquin River just below the Friant Dam, began as a ferry crossing on the San Joaquin River around 1854. Beginning in the early twentieth century, gravel mining emerged as a major industry in the vicinity of Friant. Several companies opened mines and the town benefitted economically. Boom times came with the construction of Friant Dam in the 1940s and gravel mines have continued to operate into recent years.

During the 1870s, the Central Pacific Railroad, and later the Southern Pacific, spawned a network of some fifty railroad stations, of which twenty-four became railroad townsites. About eight of these townsites became strategic trading centers stretching from Stockton south to Bakersfield; among them were towns in and near the Study Area at Merced (1871), Sycamore (1872) and Fresno (1872). The modern day town of Herndon, about ten miles northwest of downtown Fresno on the banks of the San Joaquin River was originally known as Sycamore and had its start as a railroad station stop on Southern Pacific's rail line along the east side of the San Joaquin Valley. Other early settlements emerged in the Central Valley more as a consequence of the Stockton-Los Angeles Road and Butterfield Overland Stage Company line which ran between the major urban centers of the state. For example, the town of Firebaugh in the western part of the Study Area on the San Joaquin River began in 1852 when a ferry was built at the site; it later had a toll road from the river crossing and a stage route also passed through Firebaugh.

Gold in southern Sierra Nevada foothills attracted the first large influx of settlers to what is now Merced, Madera, and Fresno counties beginning in 1849. Towns like Millerton, now under Millerton Lake, were established at this time. Soon thereafter, settlers began to occupy the eastern San Joaquin Valley in this area. These were luckless miners and newcomers who recognized the agricultural potential of the valley and the need for food in the mining camps. Numerous individuals purchased land and established ranches on the vast and largely vacant plains by the mid-1850s. Although private ranches of several hundred acres existed, much of the land was unreserved public domain and cattle grazed freely on an open range from the Sierra Nevada Foothills to the Coast Ranges.

Livestock ranching grew and prospered into the late 1860s. A large number of immigrants from the Ohio Valley and Missouri settled in the San Joaquin Valley during this era; many drove cattle with them across the plains from the Midwest. Along with their cattle, they brought with them the Anglo ranching traditions from the Midwest characterized by favoring European breeds, keeping fenced pastures, raising hay for winter feed, maintaining mixed herds of dairy cows and beef cattle, practicing selective breeding, and employing Anglo cowboys and ranch hands. Immigrants also established farms on the plains between the foothills and San Joaquin River lowlands where they primarily raised wheat during the 1860s and 1870s.

The need for water to irrigate the arid San Joaquin Valley became a priority for the economic development of Central Valley towns, especially those laid out along Southern Pacific's railroad track. In 1873, the California State Legislature passed a "No Fence Law," which established agriculture's dominance over ranching. By the late 1880s, small-scale irrigated agriculture was in the ascendancy and irrigation companies,

colonies, and districts were formed to help promote agriculture, for which the first canals were completed in the 1870s. Passage of the Wright Act in 1887 provided a legal mechanism for land owners to create public irrigation districts and finance major irrigation works to divert water from the major streams flowing west from the Sierra. Successful irrigation enterprises, including land colonies, in the Central Valley allowed specialty crop agriculture to flourish and redefined the region's economy. While crops such as grapes continued to be common in the early twentieth century, the small farm tradition established by the agricultural colonies began to fade.

Among the oldest and most important irrigation works constructed within the Study Area was built in the lower part of the Study Area and west of the San Joaquin River in 1871. The central unit of this vast canal and ditch system, constructed by Miller and Lux, was the so-called "Main Canal" of the San Joaquin and Kings River Canal and Irrigation Company. Over time canals became increasingly important and extensive.

Irrigation districts started in California after passage of the Wright Act in 1887 which allowed for public tax-supported and democratically controlled irrigation districts. Progressive legislation passed in 1911 through 1913 increased state supervision over district organization and financing, and made making investment in irrigation district bonds more attractive. Demand for agriculture products also grew around this time and remained high throughout World War I. These conditions contributed to a flurry of district formation in California and to the formation of the Fresno Irrigation District and the Madera Irrigation District.

The CVP was devised by the State of California, but ultimately built by the federal government, to resolve California's chronic water shortage problem. Studies undertaken between 1927 and 1931 resulted in a plan calling for a vast system of canals, massive dams, and reservoirs throughout the state, including most of what became the CVP. In 1935, Reclamation was charged with construction, which was completed in the early 1950s. Reclamation designed the CVP as five fundamental units, operating as an integrated system: Shasta Dam, the Delta-Mendota Canal, Friant Dam, the Madera and Friant-Kern Canals, and the Contra Costa Canal. The core of the system involved the coordinated operation of the other four units for the purpose of delivering Sacramento River water to the arid San Joaquin Valley.

Other water-related projects also flourished in the twentieth century. These include the San Joaquin Hatchery is situated one mile below the Friant Dam and extensive levee construction to control for flooding. Major levee construction efforts to control flooding in the lower San Joaquin River were related to state-wide flood control efforts. In 1913, with formation of the Sacramento and San Joaquin Drainage District, the San Joaquin River and its tributaries also came under jurisdiction of a federal flood control plan. Flood control works on the San Joaquin River in the Study Area did not begin to take shape until after World War II when the California State Reclamation Board began purchasing easements and right-of-way for large overflow areas along the San Joaquin River. In 1955, the state of California created the Lower San Joaquin Levee District which acted as a liaison with the U.S. Army Corps of Engineers, the California State Reclamation Board and the Department of Water Resources regarding construction of the

Lower San Joaquin Flood Control Project. Important aspect of it included the Chowchilla Canal Bypass, the Eastside Bypass, and the Mariposa Bypass, all of which were completed by 1966.

Throughout the historic era, transportation was an important focus of infrastructure development. Over time, foot travel and transportation by horse or stage coach, gave way to river, railroad, and ultimately automobile travel. In the early decades of the twentieth century the popularity of the automobile led to road improvement and a new state road building program. The main arterial along the eastside of the valley became the Golden State Highway in 1913 and then State Route 99. Around the same time, the east/west State Route 152 was also built, which crosses the Study Area in the vicinity of Santa Rita Park. The north/south running Madera Avenue State Route 145 crosses the San Joaquin River.

3.3.4 Prehistoric Resources

Although the project area is greatly disturbed and intact prehistoric resources are not expected to be found, there is a possibility of such resources being present in undisturbed areas. Any surface artifacts identified during survey may indicate the presence of prehistoric sites.

3.3.5 Historic Era Resources

A variety of known historic era resources are present within the project area: one conveyance feature, the FKC and associated features, which is considered eligible for inclusion in the National Register of Historic Places (NRHP) as a contributing component of the CVP; up to 40 bridges that cross the FKC; and the Little Dry Creek Wasteway Facility. The 40 bridges and Little Dry Creek Wasteway are unevaluated cultural resources.

Friant-Kern Canal and Associated Features

Reclamation is in the process of nominating the FKC, constructed in 1951, as part of the CVP NRHP Multiple Property Nomination. The FKC has been recommended as eligible for the NRHP under the themes of development, construction, and operation of the CVP. The associated features of the FKC have not yet been identified, and may include, but are not limited to, the berms, siphons, control structures, inlets, outlets, and check structures.

Bridges

The 40 timber (farm) and concrete bridges that cross the FKC have not been assessed for NRHP significance and thus their eligibility status is unknown.

Little Dry Creek Wasteway Facility

The Little Dry Creek Wasteway Facility has not been assessed for NRHP significance and thus its eligibility status is unknown.

3.3.6 Environmental Consequences

No Action Alternative

Under the No Action Alternative, no impacts on cultural resources would occur because the project would not be implemented.

Proposed Action

Under the Proposed Action, the original design capacity of the FKC would be restored. Proposed modifications include constructing raised sections of new lining attached to and above the existing concrete and earth lining and raising existing banks; modifications to check structures and inlet/outlet structures; the removal of the timber (farm) bridges and possible modification to the concrete bridges. The Little Dry Creek Wasteway Facility would also be modified.

Friant-Kern Canal and Associated Features. The Proposed Action would alter the FKC or associated features. Information is currently not available to determine the impact as documentation on the eligibility status of the canal is still being produced. Impacts will be identified and evaluated consistent with applicable regulations and available information.

Bridges. None of the bridges within the project area have been assessed for NRHP significance. The Proposed Action would remove the timber bridges and may alter the concrete bridges. Information is currently not available to determine the impact as the eligibility status of the bridges is currently unknown and will be produced. Impacts will be identified and evaluated consistent with applicable regulations and available information.

Little Dry Creek Wasteway Facility. The Little Dry Creek Wasteway Facility has not been assessed for NRHP significance. The Proposed Action would alter the wasteway's radial gates. Information is currently not available to determine the impact as documentation on the eligibility status if the facility is still being produced. Impacts will be identified and evaluated consistent with applicable regulations and available information. .

Archaeological Resources. The Proposed Action may result in ground disturbance, including areas surrounding the FKC and the levees on both sides of the canal, access roads, and potential borrow areas. Should archeological resources be identified, these resources will be evaluated and mitigated through consultations with the SHPO, Native American tribes, and interested parties.

If adverse impacts that cannot be mitigated are discovered through the process of the determination of eligibility and assessment of impacts from the implementation of the Proposed Action, another NEPA environmental document would be prepared and distributed for public comment and review.

3.3.7 Cumulative Impacts

The Proposed Action would not significantly contribute to any cumulative impacts on the FKC or the CVP.

3.4 Air Quality

This discussion of air quality identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.4.1 Affected Environment

The site of the Proposed Action is in the San Joaquin Valley Air Basin (SJVAB), the second largest air basin in the state. Air basins share a common "air shed," the boundaries of which are defined by surrounding topography. Although mixing between adjacent air basins inevitably occurs, air quality conditions are relatively uniform in a given air basin. The San Joaquin Valley has episodes of poor atmospheric mixing caused by inversion layers formed when temperature increases with elevation above ground or when a mass of warm, dry air settles over a mass of cooler air near the ground.

Despite years of improvements, the SJVAB does not meet all state and Federal health-based air quality standards. To protect health, the San Joaquin Valley Air Pollution Control District (SJVAPCD) is required by Federal law to adopt stringent control measures to reduce emissions. On November 30, 1993, the U.S. Environmental Protection Agency (EPA) promulgated final general conformity regulations in 40 CFR 93 Subpart B for all Federal activities except those covered under transportation conformity. The general conformity regulations apply to a proposed Federal action in a nonattainment or maintenance area if the total amount of direct and indirect emissions of the relevant criteria pollutants and precursor pollutant caused by a proposed action equal or exceed certain emissions thresholds, thus requiring the Federal agency to make a conformity determination. Table 3-5 presents the emissions thresholds covering the air basin in which the Proposed Action would be implemented.

3.4.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no impact on air quality because no construction would take place and operations would not change.

Proposed Action

Temporary and short-term air quality impacts would be associated with construction and would generally arise from dust generation (fugitive dust) and operation of construction equipment. Fugitive dust results from land clearing, grading, excavation, concrete work, and vehicle traffic on paved and unpaved roads. It is a source of airborne particulates, including respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less (PM_{10}) and fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less ($PM_{2.5}$). Large earth-moving equipment, trucks, and

Table 3-5.
San Joaquin Valley Attainment Status and Emissions Thresholds for Federal Conformity Determinations

Pollutant	Federal Attainment Status[a]	Threshold for Federal Conformity Determinations (tons/year)[b]	Threshold for Federal Conformity Determinations (pounds/day)
VOC (as an ozone precursor)	Nonattainment/serious (8-hour ozone standard)	50	274
NO_X (as an ozone precursor)	Nonattainment/serious (8-hour ozone standard)	50	274
PM_{10}	Attainment[c]	100	548
$PM_{2.5}$	Nonattainment	100	548
CO	Attainment/unclassified	100	548

Notes: CO = carbon monoxide; NO_x = oxides of nitrogen; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; VOC = volatile organic compounds.

[a] Source: SJVAPCD 2009a

[b] Source: 40 CFR 93.153

[c] On September 25, 2008, EPA redesignated the San Joaquin Valley to attainment for the PM_{10} national ambient air quality standard and approved the PM_{10} maintenance plan.

other mobile sources powered by diesel or gasoline are also sources of combustion emissions, including oxides of nitrogen (NO_X), carbon monoxide (CO), volatile organic compounds (VOC), sulfur dioxide, PM_{10} and $PM_{2.5}$, and small amounts of air toxics. Table 3-6 provides a summary of the estimated emissions anticipated during construction of the Proposed Action.

Construction criteria pollutant and precursor pollutant emissions were estimated using the SJVAPCD *Guide for Assessing and Mitigating Air Quality Impacts* and guidance provided by SJVAPCD staff (SJVAPCD 2002). The construction emission estimates for the construction equipment were calculated using the Sacramento Metropolitan Air Quality Management District's (SMAQMD's) Road Construction Emissions Calculator (SMAQMD 2008). The calculator estimates emissions from the construction equipment and support equipment, including dump trucks, concrete trucks, and water trucks, as well as from worker trips. The canal geometry modification would restore the canal to the design capacity or in some segments widen the bottom of the canal. It would require the cut of 5,285 cubic yards of soil with no fill. It also would require the use of dump trucks, two rollers, an excavator, and a front-end loader. All off-road construction equipment was estimated using default fleet characteristics, which are the most conservative emissions factors.

Table 3-6.
Estimated Emissions during Construction of the Proposed Action and Federal and Local Emissions Thresholds (Tons per Year)

Pollutant	Federal Attainment Status	Threshold for Federal Conformity Determinations[a]	Local Significance Thresholds[b]	Estimated Project Emissions[c]
VOC (as an ozone precursor)	Nonattainment/serious (8-hour ozone standard)	50	10	0.17
NO_X (as an ozone precursor)	Attainment/unclassified	50	10	6.23
PM_{10}	Attainment	100	15	3.07
$PM_{2.5}$[d]	Nonattainment	100	--	3.07
CO	Attainment/unclassified	100	--	3.98

Notes: CO = carbon monoxide; NO_x = oxides of nitrogen; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; VOC = volatile organic compounds.

[a] Source: 40 CFR 93.153

[b] Source: SJVAPCD 2002

[c] Construction emissions estimated by AECOM in 2011; assumes four construction crews working simultaneously.

[d] The EMFAC 2007 model does not calculate $PM_{2.5}$.

It is anticipated that up to four crews performing canal modifications would work simultaneously. To ensure that the most conservative emission estimate is captured, the emissions estimates for each type of canal modification were reviewed, the single highest estimate quadrupled, and a yearly emissions estimate calculated.

The estimated emissions were less than the thresholds for Federal conformity determinations and less than SJVAPCD thresholds (Table 3-6). The SJVAPCD approach for attaining the $PM_{2.5}$ standard has two components: (1) implementing existing PM_{10} reduction strategies, which would reduce the fugitive dust component of $PM_{2.5}$ emissions in the district, and (2) implementing NO_X reduction strategies throughout the basin, which would reduce the formation of $PM_{2.5}$. In addition, because the emission estimate for PM_{10} was compared to $PM_{2.5}$ thresholds, if the PM_{10} emission estimate is below the $PM_{2.5}$ thresholds, then $PM_{2.5}$ must also be below the thresholds. Furthermore, the Proposed Action would be required to comply with SJVAPCD's Regulation VIII (SJVAPCD 2009b) control measures for construction emissions of PM_{10}. One of these control measures includes the use of water with all "land clearing, grubbing, scraping, excavation, land leveling, grading, cut-and-fill, and demolition activities" for fugitive dust suppression. Compliance with SJVAPCD Regulation VIII would reduce emissions below the estimates presented in Table 3-6.

No change to the operation of the two canals is proposed; therefore, there would be no change to operational emissions.

3.4.3 Cumulative Impacts

SJVAPCD defines cumulative impacts as two or more individual effects that, when considered together, are considerable or that compound or increase other environmental impacts. SJVAPCD's cumulative impacts determination guidance states that if there would be no significant impact from implementing an action, then there would be no cumulative impact. All the Proposed Action's emissions would be individually below the SJVAPCD and Federal thresholds. Table 3-6 presents the emissions estimate for four canal modification construction crews working simultaneously in the SJVAB; no more than four crews would operate simultaneously during construction of the Proposed Action. Because the combined emissions would be below the thresholds, the cumulative impact from implementing the Proposed Action would not be adverse.

3.5 Global Climate Change

This discussion of global climate change identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.5.1 Affected Environment

"Global climate change" refers to the substantial change in measures of climate (e.g., temperature, precipitation, wind) lasting for decades or longer. Many environmental changes (e.g., solar intensity, ocean circulation, deforestation, urbanization, fossil fuel combustion) can contribute to global climate change (EPA 2009).

Gases that trap heat in the atmosphere are called greenhouse gases (GHGs). Some GHGs, such as carbon dioxide (CO_2), occur naturally and are emitted into the atmosphere through natural processes and human activities. Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. The principal GHGs that enter the atmosphere because of human activities are CO_2, methane, NO_X, and fluorinated gases (EPA 2009). During the past century, humans have substantially added to the amount of GHGs in the atmosphere by burning fossil fuels such as coal, natural gas, oil, and gasoline to power cars, factories, utilities, and appliances. The added gases, primarily CO_2 and methane, are increasing the natural greenhouse effect and likely contributing to an increase in global average temperature and related climate changes. At present, there are uncertainties associated with the science of global climate change (EPA 2009).

More than 20 million Californians rely on regulated diversion, storage, and delivery of water resources through facilities such as the CVP and SWP, as well as on established water rights from rivers. Increases in air temperature may lead to changes in precipitation patterns (snow versus rain), changes in runoff timing and volume, sea level rise, and changes in the amount of irrigation water needed related to modified evapotranspiration rates. These changes may lead to impacts on the state's water resources and water project operations. Although there is general consensus in these trends, the magnitude and timing of impacts are uncertain and scenario dependent (Anderson et al. 2008).

The effect of increased GHGs as they relate to global climate change is inherently an adverse environmental impact. Although the emissions of one project would not cause a significant impact on global climate change, GHG emissions from millions of projects and automobiles throughout the world are creating a cumulative impact with respect to global climate change. Consequently, global climate change is by definition a cumulative effect.

3.5.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no impacts on global climate change because no construction would take place and operations would not change.

Proposed Action

The Proposed Action would involve short-term impacts consisting of emissions during construction, which have been estimated at approximately 851 metric tons of CO_2, which is negligible compared to the threshold for annually reporting GHG emissions (25,000 metric tons per year) (CEQ 2010:3). As discussed in Section 3.8, "Power and Energy" Resources, there could potentiall be a small change to the energy produced from the system, and this change could result in a slight realignment of where the energy is produced. The total change anticipated is less than one percent; this change is so small that any change to the potential GHG emissions associated with the project whether positive or negative are considered negligible.

3.5.3 Cumulative Impacts

GHG impacts are considered to be cumulative impacts. Although no project construction would occur under the No Action Alternative, the cumulative effects of projects in California and the world would increase over the foreseeable future such that impacts on global climate change would continue to increase. The Proposed Action, when added to other existing and proposed actions, would not contribute to cumulative impacts on global climate change because of the *de minimis* magnitude of annual GHG emissions and the short-term nature of construction-related GHG impacts. Implementing the Proposed Action would not change operations and, therefore, would not change long-term impacts on global climate change. Furthermore, according to SJVAPCD's definition of cumulative impacts, the Proposed Action would not contribute to global climate change.

3.6 Noise

This discussion of noise identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.6.1 Affected Environment

Noise is defined as unwanted or objectionable sound. Sound is usually considered unwanted when it interferes with normal activities, when it causes physical harm, and

when it has adverse effects on health. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and, in the extreme, hearing impairment.

Decibel (dB) is the unit of measure used to describe the loudness of sound. Because the range of sound that humans can hear is quite large, the dB scale is logarithmic, making calculations more manageable. A number of factors affect people's perception of sound, including the actual level of noise, the frequencies involved, the period of exposure to the sound, and changes or fluctuations in the sound level during exposure. To measure sound in a manner that accurately reflects human perception, several measuring systems or scales have been developed. The A-weighted scale reflects the fact that the human ear does not perceive all pitches or frequencies equally; therefore, decibel measurements are adjusted (or weighted) to compensate for the human lack of sensitivity to low-pitched and high-pitched sounds. The adjusted unit is known as the A-weighted decibel (dBA).

To reflect the fact that ambient noise levels from various sources vary over time, they are generally expressed as an equivalent noise level (L_{eq}), which is a computed steady noise level over a specified period as the noise varies. L_{eq} values are commonly expressed for 1-hour periods, but different averaging times may be specified.

For the evaluation of community noise effects, community noise equivalent level (CNEL) is often used. CNEL represents the average A-weighted noise level during a 24-hour day with a 5-db addition for the period from 7:00 p.m. to 10:00 p.m. and a 10-db addition for the period from 10:00 p.m. to 7:00 a.m.

The Proposed Action includes several construction sites along the FKC in Fresno and Tulare Counties. Most of the land surrounding the FKC is agricultural in nature; some sections are located near residential uses. Potentially affected existing sensitive receptors include any residential areas, schools, convalescent and acute care hospitals, parks and recreational areas, and churches located within approximately 1,000 feet of any construction sites associated with the Proposed Action. The existing noise environment in the Proposed Action area is generally influenced by surface transportation noise emanating from vehicle traffic on local roads, agricultural equipment operations, and natural sounds (e.g., birds, water, wind, insects). In urban areas noise levels are higher from increased traffic and other activities of the population.

3.6.2 Environmental Consequences

No Action

Under the No Action Alternative, the proposed improvements to the FKC would not occur. Consequently, there would be no corresponding noise generation from construction, associated traffic, or operations; no adverse noise effects would occur.

Proposed Action

Noise Effects from On-Site Construction Activities. Construction activities are expected to take up to 3 years to complete, although construction crews would move from site to site, and construction would occur for short periods at any one site. It is

anticipated that the Proposed Action would be constructed by using four separate construction crews operating simultaneously at different sites. Construction activities would include modifications to the FKC in discrete segments up to several miles long. The exact type of construction equipment is unknown at this time; however, on-site construction equipment would likely include haul trucks, concrete trucks, pump trucks, excavators, front loaders, graders, compactors, and rollers. Based on the assumption that this construction equipment would be used, noise levels for individual equipment would range from 77 to 85 dBA at 50 feet (Table 3-7).

Table 3-7.
Construction Equipment Noise Emission Levels

Equipment Type	Typical Noise Level (dBA) at 50 Feet
Concrete truck	79
Compactor	83
Excavator	81
Front loader	79
Grader	85
Haul truck	77
Pump truck	81
Roller	80

Source: FHWA 2006
Notes:
dBA = A-weighted decibels
Noise levels are for equipment fitted with properly maintained and operational noise control devices, per manufacturer specifications.

It is anticipated that the compactor, excavators, front loaders, grader, and haul trucks could be operated simultaneously and daily during all phases of construction. Using the typical noise levels for these five pieces of equipment identified above, and applying typical equipment usage factors (percentage of an hour the equipment is typically operating), operation of on-site equipment could result in combined intermittent noise levels up to approximately 84 dBA at 50 feet from the center of the site. Based on these equipment noise levels and a typical noise-attenuation rate of 6 dBA per doubling of distance, construction activities could result in noise levels at sensitive receptors that exceed 65 dBA CNEL at 450 feet and 50 dBA L_{eq} at 2,200 feet from construction activities.

Noise levels at the closest sensitive receptor in each local jurisdiction were calculated and are presented in Table 3-8.

As shown in Table 3-8, noise levels from construction activities associated with the Proposed Action would exceed applicable noise regulations at nearby sensitive receptors. It should be noted that each local jurisdiction exempts construction noise from applicable regulations if they take place during hours exempted by the local noise ordinance or

Table 3-8.
Noise Levels at Closest Sensitive Receptors

Receptor Type	Jurisdiction	Local Noise Standard (dBA L_{eq})	Distance from Construction Activity (feet)	Noise Level (dBA L_{eq})
Single-family residence	Fresno County[a]	50	100	78
Single-family residence	Tulare County[b]	60	130	75
Single-family residence	Kern County[c]	65	175	73
Single-family residence	City of Orange Cove[d, e]	50	190	72
Single-family residence	City of Shafter[f]	65	170	73
Single-family residence	City of Bakersfield[g]	65	105	77

Notes:
dBA = A-weighted decibels.
L_{eq} = steady noise level over a specified period.
Noise levels were calculated using an attenuation rate of 6 dB per doubling of distance and a reference noise level of 84 dB at 50 feet.
[a] Source: Fresno County 2000
[b] Source: Tulare County 2001
[c] Source: Kern County 2007
[d] Source: Fresno County 2000
[e] Because the City of Orange Cove has no noise standard, the standard of the county in which it is located (Fresno County) was used.
[f] Source: City of Shafter 2005
[g] Source: City of Bakersfield 2002

general plan. Construction activities for the Proposed Action would take place between hours specified in local noise ordinances, as stated in Chapter 2, "Alternatives, Including Proposed Action."

If, for unforeseen reasons, construction activities were to occur during the more noise-sensitive hours (i.e., evening, nighttime, and early morning), or if construction equipment is not properly equipped with noise control devices, noise levels generated during construction of the Proposed Action would exceed the applicable standards at nearby noise-sensitive receptors and result in a substantial temporary increase in the ambient noise environment, resulting in noise effects on sensitive receptors in the area.

Implementation of Protection Measure NOI-1 as part of the Proposed Action (see Section 2.3, "Environmental Commitments") would avoid and minimize adverse noise effects on sensitive receptors. Implementation of Protection Measure NOI-1 would ensure that noise effects from the Proposed Action would be reduced to the extent feasible and that no adverse noise effects would occur during construction activities.

Noise Effects from Off-Site Construction Traffic. As described in Chapter 2, "Alternatives, Including Proposed Action," construction of the Proposed Action would require approximately four construction crews with 13 on-site employees at any given time (52 total employees). Assuming two total one-way trips per day per employee and up to 27 one-way trips per day associated with the transport of equipment and materials,

construction activities would result in a maximum of approximately 131 one-way daily trips. However, these trips would be spread across four different sites. Therefore, each individual site would have approximately 33 daily one-way trips associated with construction. Typically, traffic volumes must double before the associated increase in noise levels is noticeable (3 dBA CNEL) along roadways (Caltrans 2009:7-5). The addition of these daily trips to existing roadways would be unlikely to double the existing volume of local roadways, so the resulting change would be imperceptible. Consequently, construction of the Proposed Action would not result in a noticeable change in the traffic noise contours of area roadways. In addition, such increases in traffic would be temporary and would occur during the less noise-sensitive daytime hours. Therefore, no adverse noise effects would occur from off-site construction activities.

Noise Effects from Long-Term Operations. Long-term operation of the Proposed Action would not result in any new, long-term sources of operational noise. Routine inspection and maintenance of the canals at all sites would generally continue as they do today. Because no new noise sources would be created and activities at the canals would remain similar to those under existing conditions, no adverse noise effects would occur from long-term operations.

Effects from Groundborne Vibration and Groundborne Noise. Construction activities have the potential to result in varying degrees of temporary groundborne vibration, depending on the specific construction equipment used and operations involved. Vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. Table 3-9 shows vibration levels for typical construction equipment.

Table 3-9.
Typical Construction-Equipment Vibration Levels

Equipment	PPV at 25 feet (in/sec)	Approximate LV at 25 feet
Haul truck	0.076	86
Roller	0.210	94

Source: FTA 2006:12-12b
Notes:
in/sec = inches per second.
LV = velocity level in decibels (VdB) referenced to 1 microinch per second and based on the root mean square velocity amplitude.
PPV = peak particle velocity.

The exact type of construction equipment is unknown at this time; however, on-site construction equipment would likely include haul trucks, rollers, a compactor, a concrete truck, an excavator, a front loader, a grader, and a pump truck. According to the Federal Transit Administration (FTA), rollers would generate the highest vibration levels of the equipment anticipated to be operated at each site. Rollers can create vibration levels of 0.210 inch per second (in/sec) peak particle velocity and 94 vibration decibels (VdB)

referenced to 1 microinch per second based on the root mean square velocity amplitude at 25 feet, as shown in Table 3-9.

Using FTA's recommended procedure for applying a propagation adjustment to these reference levels, which accounts for the decrease in vibration levels with an increase in distance from the source to receptor, vibration levels would exceed the California Department of Transportation's recommended standards with respect to the prevention of structural building damage (0.2 in/sec peak particle velocity for normal buildings) and FTA's recommended maximum-acceptable-vibration standard with respect to human response (80 VdB for residences and buildings where people normally sleep) at approximately 26 feet and 75 feet, respectively, of nearby existing vibration-sensitive land uses (FTA 2006:8-3). No receptors would be within these distances of operating construction equipment. In addition, construction activities would be restricted to the hours outlined in the project description, consistent with local noise ordinances, thus eliminating the potential for sleep disruption.

Long-term operation of the Proposed Action would not involve any vibration sources, and construction activities would not generate excessive ground-borne vibration or ground-borne noise levels. As a result, no adverse effects from ground-borne vibration and ground-borne noise would occur.

3.6.3 Cumulative Impacts

Implementation of recently approved and reasonably anticipated projects in the vicinity of the Proposed Action would most likely result in noise effects at some level. Although noise effects from on-site construction activities and construction traffic associated with cumulative projects could occur in the same timeframe as the Proposed Action, construction activities would likely not occur within the same proximity of sensitive receptors as the Proposed Action. In addition, the Proposed Action would generate noise for only a limited period (3 years) and construction would move from site to site, so only temporary effects would occur. Therefore, implementing the Proposed Action would not contribute to the cumulative noise effect related to on-site construction activities, off-site construction traffic, and noise from other actions. Because no adverse effects from operations or ground-borne vibration and ground-borne noise would occur, implementing the Proposed Action would not contribute to the cumulative effects related to operations or ground-borne vibration or noise.

3.7 Transportation

This discussion of transportation identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.7.1 Affected Environment

The FKC can be accessed by paved local county roads and unpaved local farm roads. These roads are primarily used for interregional trips between local residences and nearby rural communities, as well as for agriculture-oriented maintenance trips (e.g.,

transportation of harvested crops, farm equipment). Neither type of road is heavily used. County roads primarily have two lanes, one in each direction, whereas farm roads are primarily one lane, requiring one vehicle to pull off to one side of the road when another vehicle approaches from the opposite direction.

The canal can also be accessed by unpaved maintenance roads that are located on top of the levees that run adjacent to the canals throughout the Study Area.

Two state highways (State Route [SR] 180 and SR 245), pass through the Study Area and over the FKC, but do not provide access to the canals. SR 245 provides connectivity between the Woodlake, Farmersville, Visalia, and Exeter communities, and SR 180 provides connectivity between Fresno and the Squaw Valley community.

There are 203 bridges that traverse the entire length of the FKC, and 40 bridges within the Study Area. These bridges provide connectivity for interregional trips between homes and communities, as well as between crop plots within contiguous farm operations that include land on both sides of the affected canals. Bridges are mainly owned by Reclamation and county governments constructed of timber or concrete. In some cases, telephone, water, or gas lines are attached to the bridges.

3.7.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, the proposed improvements to the canal would not occur. No trips would be necessary on local roads to access the project site, and there would be no corresponding effect on local traffic. There would be no hardening or raising of any of the bridges. Maintenance roads would not be altered. There would therefore be no temporary or permanent impact on local traffic access between nearby communities, residences, or plots of agricultural land.

Proposed Action

Construction of the Proposed Action would result in additional trips of construction-related vehicles on local roads, farm roads, and state highways during construction. Trips related to transporting workers and equipment to the project site, as well as transporting materials to and from the project site, would occur.

Construction activities are expected to be phased over a period of 3 years. Construction would be limited to approximately 10 hours per day, and it is expected that a maximum of four construction teams would operate on separate sections of the canal, at any point in time during the 3 years of construction. Construction crews would move from site to site during the 3 years. Excavated materials would be stored on-site until they were backfilled. Effects on the local transportation system are anticipated to be minor because construction would occur over an extended period, during limited hours each day, and on different portions of the affected roadways over the course of the construction period. In addition, the roadways that would be used do not experience substantial traffic delays, and the number of workers and pieces of construction equipment used would not be substantial.

Certain elements of the Proposed Action would affect maintenance roads alongside the canals. Bank raises would require removing the existing maintenance road and placing a new road. The maintenance roadways would be narrowed. In addition, changes to channel geometry might involve modifying the maintenance roadways. Because access to the canals for maintenance purposes would remain open throughout project construction, despite the temporary closure of maintenance roads, no impacts on canal access are anticipated.

Fifty-seven rides/overcuts passing over the FKC might need to be hardened or raised to allow the canals to convey design flows. All disturbance associated with hardening would occur in the Study Area. For those bridges to be raised, regrading of the road (about 150 feet on each side of bridges) would occur, which would take place on the roads or the disturbed shoulder areas.

Currently paved bridges would be repaved as needed. These bridges would likely be closed during construction on each specific bridge, which could slow normal traffic and emergency services response times to affected areas. Implementation of Protection Measure TRANS-1 as part of the Proposed Action (see Section 2.3, “Environmental Commitments”) would avoid and minimize adverse effects on transportation over bridges.

Although utility lines are attached to some of the affected bridges, no utilities are expected to be permanently removed as part of the Proposed Action, although temporary construction-related disruptions may occur.

No new access roads would be built as part of the Proposed Action, and only existing transportation infrastructure would be used as haul routes. Most of the major travel/haul routes would be paved roads, and access to construction sites would occur via paved roads to within 5 miles of construction sites. Within 5 miles of construction sites, unpaved maintenance roads could be used during construction.

3.7.3 Cumulative Impacts

Implementing the Proposed Action would result in temporary impacts on roads used for construction purposes, as well as access impacts on trips over the FKC. However, after project construction is complete, access routes would be similar to those present before project construction. Accordingly, no cumulative impacts on transportation are anticipated.

3.8 Power and Energy Resources

This discussion of power and energy resources, which addresses the Friant Power Project (FPP) owned by the Friant Power Authority (FPA) and the powerhouses along the Madera Canal owned by the Madera-Chowchilla Water and Power Authority (MCWPA), identifies the affected environment and environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.8.1 Affected Environment

The FPP (FERC Project No. 2892) consists of three powerhouses located on the downstream side of Friant Dam: the Friant-Kern, Madera, and River Outlet powerhouses. The combined installed capacity of the three powerhouses is 30.6 megawatts (MW). The River Outlet Powerhouse generates electricity using water released from Friant Dam to the San Joaquin River. The other two powerhouses generate electricity using water released from Friant Dam to irrigation canals. These facilities are owned and operated by the Friant Power Authority (FPA) and all electricity produced from these three powerhouses is sold to PG&E under a Power Purchase Agreement.

MCWPA owns and operates four powerhouses along the Madera Canal. Three powerhouses are combined in one Federal Energy Regulatory commission (FERC) license (FERC Project No. 2958) and are located at MP 17.67, 21.79, and 35.93. The fourth powerhouse is licensed separately under FERC (FERC Project No. 5765) and is located at MP 35.64.

The FERC project numbers, names, license dates, and installed generation capacity for the FPP and the powerhouses owned by the MCWPA are shown in Table 3-10.

Table 3-10.
Hydropower Projects

FERC Project No.	FERC Project Name	Number of Powerhouses	Date License Issued	Date License Expires	Water Body	Owner	Total Installed Capacity (MW)
02892	Friant	3	September 30, 1982	August 31, 2032	San Joaquin River	FPA	30.6
2958	Madera Canal	3	June 8, 1982	May 31, 2032	Madera Canal	MCWPA	3.645
5765	Madera Canal	1	September 8, 1983	August 31, 2033	Madera Canal	MCWPA	0.4

Source: FERC 2008
Key:
FERC = Federal Energy Regulatory Commission.
FPA = Friant Power Authority.
MCWPA = Madera- Chowchilla Water and Power Authority.
MW = megawatt.

There are no hydropower projects along the FKC itself; therefore, the discussion below focuses only on the FPP and the MCWPA.

3.8.2 Environmental Consequences

Impacts of the Proposed Action are associated with the shift in flows between the FKC, Madera Canal, and San Joaquin River and resulting potential changes to energy production.

No Action Alternative

Under the No Action Alternative, use of existing conveyance facilities would be unchanged. As a result, there would be no impacts on power-generating facilities at the FPP, as shown in Table 3-11, or on power-generating facilities along the Madera Canal.

Table 3-11.
Hydropower Production for Friant Power Project Under No Action Alternative and Proposed Action

FPP Powerhouse	Energy Production Under No Action Alternative (GWh)	Energy Production Under Proposed Action (GWh)	Percent Change in Energy Production[1]
Friant-Kern	44.8	44.7	<-1%
Madera	12.0	12.2	1.67%
River Outlet	17.1	17.1	0%
Total FPP	73.9	74.0	<1%

Key:
FPP = Friant Power Project.
GWh = gigawatt-hour.
Note:
[1] Change in energy production for Proposed Action compared to No Action Alternative.

Proposed Action

Under the Proposed Action, annual flows through each of the three FPP powerhouses would shift, resulting in slight changes to energy production for the FPP, as shown in Table 3-11.

The Friant-Kern Powerhouse would generate less power because under the Proposed Action, more water would be delivered to the FKC, which would lower the following month's Millerton Lake storage. The decreased storage would result in decreased lake levels, which would decrease the pressure head behind the turbines, sometimes below levels needed for power generation at the Friant-Kern Powerhouse. Madera Canal power generation would increase because, under current operations, in some months, the head at Millerton Lake would be above the maximum allowable pressure head for power generation. Under the Proposed Action, more water would go to the FKC, resulting in a lower pressure head, thus allowing the Madera Powerhouse to generate power. Implementing the Proposed Action would shift energy production from the Friant-Kern Powerhouse to the Madera Powerhouse with a less than 1 percent overall increase in energy production. Because power produced at Friant Dam, regardless of the powerhouse where it is generated, is sold to PG&E, and total power production is anticipated to increase by less than 1 percent, implementing the Proposed Action would have no adverse effects on energy production at the FPP.

A shift in flow to the Madera Canal could result in slight changes to energy production at the powerhouses along the Madera Canal. The monthly change in flow expected at the Madera Canal is summarized in Table 3-12.

Table 3-12.
Monthly Flow Change in Madera Canal

	Monthly Change in Madera Canal Flow (cfs)
Minimum	294
Maximum	-197
Average	0

Key:
cfs = cubic feet per second

Because there would be no change in average flow to the Madera Canal, implementing the Proposed Action would have no adverse effects on energy production at the powerhouses owned by the MCWPA.

3.8.3 Cumulative Impacts

Changes in annual energy production at the FPP and at the powerhouses owned by the MCWPA would not result in adverse effects and are not additive. Therefore, implementing the Proposed Action would have no cumulative impact on power-generating facilities.

3.9 Socioeconomic Resources

This discussion of socioeconomic resources identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.9.1 Affected Environment

Based on January 2010 estimates published by the California Department of Finance, Kern County supported about 254,000 housing units and a population of about 839,000, Fresno County supported about 314,000 housing units and a population of about 953,000, and Tulare County supported about 142,000 housing units and a population of 447,000 (California Department of Finance 2010).

According to the 2000 Census, median household income in Kern County was approximately $35,000, with about 21 percent of the population falling below the poverty level. Median household income in Fresno County was approximately $34,000, with about 23 percent of the population falling below the poverty level. Median household income in Tulare County was approximately 34,000, with about 24 percent of the population falling below the poverty level (U.S. Census Bureau 2000).

Agriculture is the principal source of jobs in the region. Fresno County ranked first among all counties in the state in 2007 for the total value of agricultural production. Tulare ranked second and Kern County third. Fresno County had 1,636,224 acres in agricultural production, with a market value of $3,730,546,000 in products sold (U.S. Department of Agriculture 2007a). Tulare County had 1,168,684 acres in agricultural production, with a market value of $3,335,014,000 in products sold (U.S. Department of Agriculture 2007b). Kern County had 2,361,765 acres in agricultural production, with a market value of $3,204,147,000 in products sold (U.S. Department of Agriculture 2007c).

Regional agriculture in the semiarid southern San Joaquin Valley relies on irrigation water supplies, such as those provided by the FKC.

3.9.2 Environmental Consequences

No Action Alternative

Water deliveries by the FKC are currently below the design capacity. Under the No Action Alternative, these deliveries would remain below capacity and would decrease the viability of agricultural operations served by the FKC. Reduced water supply would cause reduced agricultural production, leading to losses in crop revenues and farm employment, along with additional losses in related manufacturing, trade, and service industries. Accordingly, adverse impacts on socioeconomic resources would occur under the No Action Alternative.

Proposed Action

In the short term, implementing the Proposed Action would provide a temporary increase in construction-related jobs and related expenditures. As a result, there would be a slight beneficial impact on socioeconomic resources. In the long term, implementing the Proposed Action would restore the capacity of the FKC to that previously designed and constructed by Reclamation, which would subsequently help maintain and increase the economic viability of irrigated agriculture in the region.

3.9.3 Cumulative Impacts

It is difficult to estimate the cumulative effects of existing and future actions on socioeconomics in the Study Area because the factors affecting socioeconomics are complex. The availability of water supply is undeniably a key factor affecting the area's economy, especially agricultural production and related services.

Implementing the Proposed Action would result in a return of the FKC to design capacity, which would help sustain and improve the economy of irrigated agriculture. When added to other similar existing and proposed actions, implementing the Proposed Action would contribute to beneficial cumulative impacts on socioeconomics or help offset any adverse cumulative effects from other actions.

3.10 Environmental Justice

This discussion of environmental justice identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

"Environmental justice" refers to the fair treatment of peoples of all races, income levels, and cultures with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. "Fair treatment" implies that no person or group of people should shoulder a disproportionate share of negative impacts resulting from the execution of Federal programs. Executive Order 12898, dated February 11, 1994, establishes the achievement of environmental justice as a Federal agency priority. The memorandum accompanying the order directs heads of departments and agencies to analyze the environmental effects of Federal actions, including human health, economic, and social effects, when required by NEPA, and to address significant and adverse effects on minority and low-income communities.

3.10.1 Affected Environment

The FKC improvements would take place in a rural, agricultural setting, with limited single-family residences in the immediate vicinity. Project improvements would occur 2 miles east of the Cutler community and 1 mile east of the Exeter community.

The FKC improvements could affect economically disadvantaged communities, such as Cutler (39 percent of residents below poverty level) and Exeter (19 percent of residents below poverty level) (U.S. Census Bureau 2000). These communities rely to a large extent, either directly or indirectly, on agriculture for employment, and a substantial portion of the residents in these communities are of Hispanic or Latino origin.

3.10.2 Environmental Consequences

No Action Alternative

Implementing the No Action Alternative might result in a slight adverse impact on minority or low-income populations near the project location. Without the ability to return the FKC to capacity, the number of farm-related jobs, which these communities rely heavily on, could decrease.

Proposed Action

In the short term, because of the distance from the proposed improvements, construction would have no adverse effect on minority or economically disadvantaged populations in Cutler or Exeter. Implementing Protection Measures NOI-1 and AQ-1 as part of the Proposed Action (see Section 2.3, "Environmental Commitments") would minimize construction-related noise and air quality impacts, respectively.

In the long term, implementing the Proposed Action would restore the capacity of the FKC to that previously designed and constructed by Reclamation. This would subsequently help to maintain and increase the economic viability of irrigated agriculture in the region, helping to support the minority and economically disadvantaged

populations in the area that rely on agricultural and related jobs for employment. As a result, there would be beneficial impacts on environmental justice with implementation of the Proposed Action.

3.10.3 Cumulative Impacts

The Proposed Action, when considered with other existing and proposed actions, would have a slight beneficial contribution to cumulative impacts associated with environmental justice. Implementing the Proposed Action would help to support and maintain jobs that minority and economically disadvantaged populations rely on, especially in the agricultural industry.

3.11 Land Use

This discussion of land use identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.11.1 Affected Environment

Friant-Kern Canal Service Area

The FKC carries water more than 151.8 miles in a southerly direction from Millerton Lake to the Kern River, 4 miles west of Bakersfield. The water is used for supplemental and irrigation supplies in Fresno, Tulare, and Kern Counties. FWA is responsible for operating the FKC (Reclamation 2010).

Improvements to the FKC under the Proposed Action would occur over approximately 59 miles in discrete segments. These improvements would occur in a rural area that includes rural residential neighborhoods, undeveloped land, and agricultural land currently in production.

3.11.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, no significant changes to land use would occur, and the FKC would continue to operate as it has in the past, supporting existing irrigated agriculture at a reduced capacity.

Proposed Action

Construction improvements would restore design capacity in the FKC. Existing concrete lining and bank height would be raised on both sides of the canal, and canal cleaning and changes in channel geometry would occur. Some bridges and overchutes that cross the canal would also be modified.

Only existing right-of-way and infrastructure would be used for project construction, staging areas, and haul routes, and no right-of-way would be acquired for project construction. Land uses in the Study Area would not change; the current use of the canal

for supplemental and new irrigation supplies would remain the same, but the canal would carry additional water for agricultural purposes.

Implementing the Proposed Action would not support development of additional lands to irrigated agriculture because it would return the canal to its original capacity, not increase its capacity. Accordingly, the main purpose of the Proposed Action would be to deliver water to existing users at the capacity previously designed and constructed by Reclamation; therefore, there would be no adverse impacts on existing land uses.

3.11.3 Cumulative Impacts

In recent years, land use changes in Fresno, Tulare, and Kern Counties have involved urbanization of agricultural lands. Restoring the capacity of the FKC could ultimately have the beneficial effect of rehabilitating an incremental water supply that had been reduced over time and thereby providing a beneficial effect on the continued viability of agricultural uses on lands in the areas served by these two canals. Accordingly, a slight beneficial cumulative impact on land use is anticipated.

3.12 Agricultural Resources

This discussion of agricultural resources identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.12.1 Affected Environment

In 1990, growers earned $1.9 billion in revenue from growing more than 90 varieties of crops on 837,079 acres irrigated by the Friant Division. Fruits alone provided a $1.3 billion contribution to that total, and oranges, tangerines, almonds, and cotton were the most profitable crops. In 1992, the Friant Division provided supplemental irrigation services to 1,067,672 acres of farmland, 808,496 acres of which were actually irrigated. A total of 12,589 farms were provided irrigation services by the Friant Division, which produced crops valued at a total of $1.65 billion (Reclamation 2010).

3.12.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, no changes to the FKC would occur, and the canal would continue to operate as it has in the recent past, supporting existing irrigated agriculture at reduced capacity. The inability to provide agricultural producers with the amount of water the canal was designed to distribute would continue to limit the viability of farming operations in the Friant Division's service area, causing an adverse impact on agricultural resources.

Proposed Action

Some bridges and overchutes that cross the canal would be modified, requiring bridge closures during construction. Such closures could adversely and temporarily affect agricultural production because these bridges are used to transport crops, farm

equipment, and workers. Although alternative routes exist, using those routes could cause delays in transport, which could reduce the productivity of affected farming operations. Implementing Protection Measure TRANS-1 as part of the Proposed Action (see Section 2.3, "Environmental Commitments") would minimize transportation-related impacts on agricultural production during construction.

Only existing right-of-way and infrastructure would be used for project construction, staging areas, and haul routes. No right-of-way would be acquired for project construction, and no agricultural land would be eliminated or removed from production on a temporary, short-term, or long-term basis.

The Proposed Action would not support development of additional lands to irrigated agriculture because it would involve returning the canal to its original capacity rather than increasing its capacity. Accordingly, the main purpose of the Proposed Action would be to deliver water to existing users at the capacity previously designed and constructed by Reclamation; therefore, there would be a slight beneficial impact on existing agricultural resources.

3.12.3 Cumulative Impacts

In recent years, land use changes in Fresno, Tulare, and Kern Counties have involved urbanization of agricultural lands. Restoring the capacity of the FKC would have the beneficial effect of rehabilitating an incremental water supply that had been reduced over time and thereby providing a beneficial effect on the continued viability of agricultural uses on lands in the areas served by the canal. Accordingly, a slight beneficial cumulative impact on agricultural resources is anticipated.

3.13 Utilities

This discussion of utilities identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.13.1 Affected Environment

A variety of utilities crosses the FKC, both aboveground and belowground. Electrical and telephone lines cross overhead, and gas, telecommunication, and electrical infrastructure likely crosses underneath the canal. In addition, telephone, water, and gas lines are attached to some of the bridges.

3.13.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, no utilities would be disturbed or replaced. Accordingly, no adverse impacts are associated with utility infrastructure.

Proposed Action

No utilities are expected to be permanently disturbed or removed as part of the Proposed Action. Utility providers would be contacted before project construction to determine the location of any underground utilities, and all utilities in the Study Area would be avoided during project construction. None of the Proposed Project activities would require moving overhead utility infrastructure, such as power and telephone lines or poles. Although bridge modifications would affect bridges to which utility lines are attached, only temporary construction-related disruptions may occur. No adverse effects on utilities are anticipated under the Proposed Action.

3.13.3 Cumulative Impacts

Implementing the Proposed Action would not permanently disturb or result in the replacement of any utilities. When considered with other similar existing and planned future actions, the Proposed Action would not contribute to any cumulative impacts on utilities.

3.14 Earth Sciences

This discussion of earth sciences, which addresses geology, soils, and paleontological resources, identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.14.1 Affected Environment

Construction of the FKC began in 1945 and was completed in 1951. The FKC was constructed with local materials, including expansive clays, which led to collapse and sloughing of banks in some areas. These areas were repaired over the years by mixing and applying soils with granular quicklime (Garver 1987). In the 1970s, Reclamation increased the FKC's concrete lining from the headworks to the Kings River Siphon, increasing the maximum capacity in this reach to 5,300 cfs.

Implementing the Proposed Action would result in ground disturbance only in areas that have been completely disturbed previously, including the canal and the levees on both sides of the canal. Because the proposed ground-disturbing actions are limited to previously disturbed soils, there is no potential to adversely affect paleontological resources, and they are not discussed further.

3.14.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no impacts on earth resources because there would be no ground-disturbing activities, and conditions would remain the same as under existing conditions.

Proposed Action

The soils lining the canals and comprising the canal banks are heavily reworked from construction and subsequent repairs. Implementing the Proposed Action would not disturb soils outside the canal and the canal banks. Needed borrow materials would come from existing stockpiles of material or from commercially available and permitted sources. Most spoil materials would be stored temporarily on the canal banks or at local established staging areas and would be reused at nearby locations in the canal; excess spoil materials would be disposed of through commercially available and permitted sources. Therefore, implementing the Proposed Action would have no impacts on earth resources.

3.14.3 Cumulative Impacts

The Proposed Action, when considered with other existing and planned future projects, would not contribute to cumulative impacts on earth resources because it would have no effect on earth resources.

3.15 Indian Trust Assets

This discussion of Indian Trust Assets (ITAs) identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.15.1 Affected Environment

ITAs are legal interests in property held in trust by the United States for Federally recognized Indian tribes or individual Indians. An Indian trust has three components: (1) the trustee, (2) the beneficiary, and (3) the trust asset. ITAs can include land, minerals, Federally reserved hunting and fishing rights, Federally reserved water rights, and instream flows associated with trust land. Beneficiaries of the Indian trust relationship are Federally recognized Indian tribes with trust land; the United States is the trustee. By definition, ITAs cannot be sold, leased, or otherwise encumbered without the approval of the United States. The characterization and application of the U.S. trust relationship have been defined by case law that interprets congressional acts, executive orders, and historic treaty provisions.

The Federal government, through treaty, statute, or regulation, may take on specific, enforceable fiduciary obligations that give rise to a trust responsibility to Federally recognized tribes and individual Indians possessing trust assets. Courts have recognized an enforceable Federal fiduciary duty with respect to Federal supervision of Indian money or natural resources, held in trust by the Federal government, where specific treaties, statutes, or regulations create such a fiduciary duty.

Consistent with President William J. Clinton's 1994 memorandum, "Government-to-Government Relations with Native American Tribal Governments," Reclamation assesses the effect of its programs on tribal trust resources and Federally recognized tribal governments. Reclamation is tasked to actively engage Federally recognized tribal governments and consult with such tribes on a government-to-government level when its

actions affect ITAs (59 FR 22951–22952, May 4, 1994). The U.S. Department of the Interior (DOI) Departmental Manual Part 512.2 ascribes the responsibility for ensuring protection of ITAs to the heads of bureaus and offices (DOI 1995). DOI is required to "protect and preserve Indian trust assets from loss, damage, unlawful alienation, waste, and depletion" (Reclamation 2000). It is the general policy of the DOI to perform its activities and programs in such a way as to protect ITAs and avoid adverse effects whenever possible. Reclamation complies with procedures contained in Departmental Manual Part 512.2 guidelines, which protect ITAs. It carries out its activities in a manner that protects trust assets and avoids adverse impacts when possible. When Reclamation cannot avoid adverse impacts, it provides appropriate mitigation or compensation. Reclamation is responsible for assessing whether the Friant-Kern Canal Capacity Restoration Project has the potential to affect ITAs.

The nearest ITA is a Public Domain Allotment approximately 2 miles northeast of the Study Area.

3.15.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no impacts on ITAs because there would be no ground-disturbing activities or facilities construction, and operations would remain the same as under existing conditions.

Proposed Action

Construction activities on the FKC would be contained between the canal's existing outside embankment edges, except for required roadway travel and mobilization, and ground disturbance would be limited to existing disturbed areas.

There are no tribes possessing legal property interests held in trust by the United States in the lands involved with the Proposed Action; therefore, implementing the Proposed Action would not affect ITAs.

3.15.3 Cumulative Impacts

Implementing the Proposed Action would have no impact on ITAs; therefore, it would not contribute to cumulative impacts on ITAs.

3.16 Population and Housing

This discussion of population and housing identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.16.1 Affected Environment

The population, number of housing units, median household income, and percentage of residents below the poverty level in each affected county are detailed in Section 3.9, "Socioeconomic Resources." In addition, the percentages of residents below the poverty

level in communities in the project vicinity are detailed in Section 3.10, "Environmental Justice."

As of March 2011, the unemployment rate of Fresno County was 18.4 percent, Kern County's unemployment rate was 17.5 percent, and Tulare County's unemployment rate was 18.7 percent (EDD 2011).

As of 2000, Fresno County had a 7 percent vacancy rate, and 56 percent of homes in the county were owner occupied. Kern County had a 10 percent vacancy rate, and 38 percent of homes were owner occupied. Tulare County had an 8 percent vacancy rate, and 38 percent of homes were owner occupied (U.S. Census Bureau 2000). As of January 2011, the median price of a house sold in Fresno County was $135,000 and in Kern County, it was $120,000 (EDD 2011).

3.16.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, Reclamation would not restore capacity to the FKC. No increases in population, employment, or housing would be generated under this alternative, and the FKC would continue to operate as it has in the past, supporting existing irrigated agriculture. Although continued population growth is expected in the region (DWR 2009: TL-44), increased housing and employment opportunities would not be generated under the No Action Alternative. As a result, no adverse effects on population and housing would be associated with implementing this alternative.

Proposed Action

In the short term, implementing the Proposed Action would provide a temporary increase in construction-related jobs and related services. However, because of the high unemployment rates in the affected counties, it can reasonably be assumed that construction jobs would be filled by existing residents. Therefore, project construction would not increase population or the demand for housing. Adverse effects associated with population and housing are not anticipated.

In the long term, implementing the Proposed Action would restore the capacity of the FKC to that previously designed and constructed by Reclamation. Although this would help to maintain the economic viability of irrigated agriculture in the region, it would not create new permanent jobs. Therefore, no increases in population and, consequently, no new housing related to operation of the Proposed Action are anticipated.

Project construction would occur in the existing right-of-way, and no housing is expected to be acquired, altered, or demolished as part of the Proposed Action. No residents would be displaced as a result of project construction.

3.16.3 Cumulative Impacts

Since 2000, the total population of Fresno, Tulare, and Kern Counties increased by approximately 412,000 residents (California Department of Finance 2010). Although recent economic trends would likely slow that growth, it is expected that this region

would continue to experience continued population growth. However, implementing the Proposed Action would not contribute to increased population or housing in the region. Accordingly, no cumulative impacts on population or housing are anticipated.

3.17 Visual Resources

This discussion of visual resources identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.17.1 Affected Environment

The FKC carries important water supplies for 152 miles through the relatively flat San Joaquin Valley. A mix of agriculturally developed and natural landscapes characterizes the region. The predominant visual impression of the area is vast areas of tree and field crops extending across the valley floor to the foothills. Orchards, vineyards, pastures, farm structures, tractors, and residences are some of the agricultural features that combined or individually can be visually pleasing or monotonous because the views are typical in the region.

Residential development along the length of the canal is limited to a sparse number of isolated residences and farms throughout the region. Project improvements on the FKC would occur 2 miles east of the Cutler community and 1 mile east of the Exeter community.

3.17.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, no changes or modifications would occur to the FKC. The visual appearance of the canal and nearby viewsheds would not change.

Proposed Action

In the short term, because of the distance from the proposed improvements, construction would have no adverse visual resources effect on residents in Cutler or Exeter. There are few residences in the area, and only a small number of individuals would have views of the FKC during construction. Project construction effects on the existing visual character are considered minor because of the short-term nature of the construction activities and the relatively small area that would be affected for any given viewer. In addition, construction sites along the canal would be returned to preconstruction conditions after the canal is returned to design capacity.

In the long term, implementing the Proposed Action would restore the capacity of the FKC and would not substantially alter its original design or visual context. Existing concrete lining and bank height would be raised on both sides of the canal, and canal cleaning and changes in channel geometry would occur. Some bridges and overchutes that cross the canal would also be modified. These modifications, however, would not change the visual character of the canal or the surrounding viewsheds. The views

associated with the canal and its operation would remain as it is currently, and there would not be any adverse effects on visual resources.

3.17.3 Cumulative Impacts

Implementing the Proposed Action would not change the visual character of the canal or the surrounding viewsheds. When considered with other similar existing and planned future actions, the Proposed Action would not contribute to any cumulative impacts on visual resources.

3.18 Recreation

This discussion of recreation identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.18.1 Affected Environment

The FKC traverses counties with diverse opportunities for those seeking recreational activities. The Kern County Parks and Recreation Department manages eight regional and 40 neighborhood parks that include boating, fishing, and camping amenities, along with numerous golf course and ballparks (Kern County Parks and Recreation 2009). The County Parks Unit in Fresno County maintains a variety of regional parks and landscaped areas ranging from Kearney Park in the city of Fresno to the Shaver Lake Launch Ramp (Fresno County Public Works and Planning 2010). The Tulare County Parks and Recreation Division oversees 460 acres of parklands throughout the county (Tulare County Resource Management Agency 2008).

Several recreation areas are located within a 2-mile radius of the Study Area:

- Wahtoke Park is an area of open space located 2 miles south of the Study Area in Reedley in Fresno County.
- Ledbedder County Park, which has picnic facilities for day use, is located 2 miles east of the Study Area in the community of Cutler in Tulare County.
- Dobson Field and Athletic Park are located in the town of Exeter and located 1 mile east of the Study Area. Dobson Field is a 17-acre area available for rent by the public.
- Olive Park East and Olive Park West are located 1.25 miles east of the Study Area in the city of Bakersfield in Kern County. These parks have public playgrounds.
- Emerald Cove Park, which has sport facilities, is located in Bakersfield, 1.75 miles northwest of the Study Area.

3.18.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, no recreation facilities would be disturbed or replaced. No existing or proposed recreational opportunities would be adversely affected. Accordingly, there would be no adverse impacts on recreation.

Proposed Action

Implementing the Proposed Action would not generate demand for recreation facilities, nor would it require the construction or expansion of recreation amenities. Parks and recreation facilities in the area of the canal would not receive additional or fewer recreational visits as a result of implementing the Proposed Action. In addition, implementing the Proposed Action would not restrict access to any recreation facilities located near the canal; therefore, no adverse effects on recreation facilities, parks, or existing or future recreational opportunities are anticipated under the Proposed Action.

3.18.3 Cumulative Impacts

Implementing the Proposed Action would not disturb or replace any recreation facilities. When considered with other similar existing and planned future actions, the Proposed Action would not contribute to any cumulative impacts on recreation facilities, parks, or existing or future recreational opportunities.

3.19 Public Health and Safety

This discussion of public health and safety identifies the affected environment and potential environmental consequences, including cumulative impacts, associated with implementing the Proposed Action and the No Action Alternative.

3.19.1 Affected Environment

The FKC serves agricultural users in Fresno, Kern, and Tulare Counties. The entirety of the Study Area is located in unincorporated portions of these counties.

Those portions of the Proposed Action located in unincorporated portions of the affected counties are served by county fire and police protection departments. Emergency services are provided by the fire and police protection departments that serve the Study Area, as well as by hospitals located throughout the project vicinity.

3.19.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, the proposed improvements to the canal would not occur. No temporary closures of bridges would be required, and temporary increases in congestion related to construction-related traffic would not occur. There would be no potential for hazardous wastes to spill in the Study Area.

Proposed Action

Construction of the Proposed Action would result in additional trips of construction-related vehicles on local roads, farm roads, and state highways during construction. These trips could increase congestion on roadways used by emergency vehicles, thereby increasing response times to emergencies located in the project vicinity. However, construction would occur over an extended period, during limited hours each day, and on different portions of the affected roadways over the course of the construction period. In addition, the roadways that would be used do not experience substantial traffic delays, and the number of workers and pieces of construction equipment used would not be substantial. Therefore, effects on the local transportation system are not anticipated to be substantial enough to affect emergency response times.

Forty bridges/overcuts passing over the FKC might need to be hardened or raised to allow the canals to convey design flows. The individual bridges would likely be closed during construction of each particular bridge, which could slow normal traffic and emergency services response times to affected areas. Implementation of Protection Measure TRANS-1 as part of the Proposed Action (see Section 2.3, "Environmental Commitments") would avoid and minimize transportation-related impacts on public health and emergency services response times.

Implementing the Proposed Action would not directly generate or involve the routine transfer or disposal of hazardous materials. Although construction of the Proposed Action would involve ground disturbance that could expose previously unknown sources of contaminants, Underground Service Alert would be contacted 48 hours before construction to allow underground utilities to identify the location of their underground facilities and thus greatly reduce the possibility of hitting an underground source of hazards, such as a gas line. Any potentially contaminated areas, if encountered during project construction, would be evaluated by a qualified hazardous material specialist in the context of applicable Federal, state, and local regulations governing hazardous waste. No adverse effects are anticipated.

Construction of the Proposed Action would involve small quantities of commonly used materials, such as fuels and oils, to operate construction equipment. The potential for spillage of these materials exists; however, standard construction procedures would be implemented to reduce this potentially adverse effect.

3.19.3 Cumulative Impacts

Implementing the Proposed Action would result in temporary impacts on roads used for construction purposes, as well as access impacts on trips that use bridges that cross the FKC. However, after project construction is complete, access routes would be similar to those present before project construction. In addition, any hazardous materials discovered or discharged during project construction would be addressed at that time. The potential for hazardous spills or accidents is remote, and, if such spills or accidents occur, they would be localized and highly unlikely to occur simultaneously with spills from other existing and future projects. Accordingly, no cumulative impacts on hazardous materials or emergency response times are anticipated.

3.20 Irreversible and Irretrievable Commitments of Resources

NEPA requires a discussion of the irreversible and irretrievable commitments of resources that may be involved should an action be implemented. An irreversible and irretrievable commitment of resources is the permanent loss of resources for future or alternative purposes. Irreversible and irretrievable resources are those that cannot be recovered or recycled, or those that are consumed or reduced to unrecoverable forms. The Proposed Action would result in the irreversible and irretrievable commitment of construction materials and nonrenewable energy.

The Proposed Action would commit material resources to construction actions related to bank raises and canal lining. The Proposed Action would commit only a small quantity of these material resources relative to anticipated residential, commercial, industrial, and institutional development. Therefore, the commitment of these material resources would not result in a permanent loss of this resource for the future or alternative purposes. In addition, if the amount of material if aggregate material is not obtained from existing commercial sources, that is, if this fill material is obtained from private or public lands, the Proposed Action would not commit aggregate resources that would deprive other purposes.

Implementing the Proposed Action would commit nonrenewable energy in the form of electricity, gasoline, diesel fuel, and oil for equipment and transportation vehicles that would be needed for the construction, operation, and maintenance of actions. However, these commitments of nonrenewable energy resources used are not expected to adversely affect other activities that require electricity, gasoline, diesel fuel, and oil. Moreover, no actions are proposed that would change the capacity of the hydroelectric plant at Friant Dam.

4.0 Consultation and Coordination

Several Federal laws, permits, licenses, and policy requirements have directed, limited, or guided the NEPA analysis and decision-making process of this EA.

4.1 Fish and Wildlife Coordination Act (16 USC Section 651 et seq.)

The Fish and Wildlife Coordination Act (FWCA) requires that Reclamation consult with fish and wildlife agencies (Federal and state) on all water development projects that could affect biological resources. The amendments enacted in 1946 require consultation with USFWS and state fish and wildlife agencies whenever the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted or otherwise controlled or modified" by any agency under a Federal permit or license. Consultation is to be undertaken for the purpose of "preventing the loss of and damage to wildlife resources." The Proposed Action consists of rehabilitating existing facilities to restore the capacity of the FKC to that previously designed and constructed by Reclamation. The *Draft Fish and Wildlife Coordination Act Report on the Friant-Kern Canal Capacity Correction Project* has been included as Appendix C of this document.

4.2 Endangered Species Act (16 USC Section 1531 et seq.)

Section 7 of the Endangered Species Act requires Federal agencies to ensure that discretionary Federal actions do not jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of the critical habitat of these species. Reclamation will consult with USFWS, conduct preconstruction biological surveys before any ground-disturbing activities are initiated, implement biological protection measures as part of the Proposed Action (see Section 2.3, "Environmental Commitments" and Section 2.4 "Conservation Strategy for Biological Resources"), and will complete any consultation that might be necessary with USFWS.

4.3 National Historic Preservation Act (16 USC Section 470 et seq.)

The National Historic Preservation Act (NHPA) of 1966, as amended, is the primary Federal legislation that outlines the Federal government's responsibility to consider the effects of its actions on historic properties. The 36 CFR Part 800 regulations that implement Section 106 of NHPA describe how Federal agencies address these effects. Additionally, Native American human remains, cultural objects, and objects of cultural patrimony are protected under the Native American Graves Protection and Repatriation

Act of 1990 (25 U.S. Code [USC] 32) and its implementing regulation outlined at 43 CFR Part 10. The Archaeological Resources Protection Act of 1979 (16 USC 470aa), as amended, and its implementing regulations at 43 CFR 7, protect archaeological resources on Federal land. Pending completion of NRHP evaluation of bridges known to be present in the Study Area and SHPO concurrence with the findings, the Proposed Action is anticipated to have no impact on historic properties. Any such impacts would be minimized by implementing Protection Measure CULT-1 as part of the Proposed Action (see Section 2.3, "Environmental Commitments"), and through execution and implementation of a memorandum of agreement between Reclamation and SHPO.

4.4 Indian Trust Assets

ITAs are legal interests in property held in trust by the United States for Federally recognized Indian tribes or individual Indians. An Indian trust has three components: the trustee, the beneficiary, and the trust asset. ITAs can include land, minerals, Federally reserved hunting and fishing rights, Federally reserved water rights, and instream flows associated with trust land. Beneficiaries of the Indian trust relationship are Federally recognized Indian tribes with trust land; the United States is the trustee. By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the United States. The characterization and application of the U.S. trust relationship have been defined by case law that interprets congressional acts, executive orders, and historic treaty provisions. Implementing the Proposed Action would not affect any ITAs. The nearest ITA is a Public Domain Allotment approximately 2 miles northeast of the project location.

4.5 Migratory Bird Treaty Act (16 USC Section 703 et seq.)

The MBTA implements various treaties and conventions between the United States, Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Unless permitted by regulations, the MBTA provides that it is unlawful to pursue, hunt, take, capture or kill, possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried, or received any migratory bird, part, nest, egg, or product, manufactured or not. Subject to limitations in the MBTA, the Secretary of the Interior may adopt regulations determining the extent to which, if at all, the hunting, taking, capturing, killing, possessing, selling, purchasing, shipping, transporting, or exporting of any migratory bird, part, nest, or egg will be allowed, having regard for temperature zones, distribution, abundance, economic value, breeding habits, and migratory flight patterns. Implementing the Proposed Action would not change the land use patterns of the cultivated or fallowed fields that have value to listed species of birds protected by the MBTA. Pending the results of the preconstruction survey for nesting birds protected under the MBTA, it is anticipated that implementing the Proposed Action would have no effect on birds protected by the MBTA. If an active nest is found and disturbance cannot be avoided, appropriate protection measures shall be implemented as specified in Protection Measures BIO-2 as part of the Proposed Action (see Section 2.3, "Environmental Commitments").

4.6 Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands)

Executive Order 11988 requires Federal agencies to prepare floodplain assessments for actions located in or affecting floodplains. Executive Order 11990 places similar requirements regarding actions in wetlands. Implementing the Proposed Action could affect wetlands adjacent to the existing right-of-way.

4.7 Clean Air Act (42 USC Section 176 et seq.)

Section 176(c) of the Clean Air Act (42 USC 7506[c]) requires that any entity of the Federal government that engages in, supports, or in any way provides financial support for, licenses or permits, or approves any activity must demonstrate that the action conforms to the applicable State Implementation Plan (SIP) required under Section 110(a) of the Clean Air Act (42 USC 7401 [a]) before the action is otherwise approved. In this context, conformity means that such Federal actions must be consistent with a SIP's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards and achieving expeditious attainment of those standards. Each Federal agency must determine that any action that is proposed by the agency and that is subject to the regulations implementing the conformity requirements will, in fact conform to the applicable SIP before the action is taken. As described in Section 3.4, "Air Quality," implementing the Proposed Action would not result in air quality impacts that would exceed Federal, state, or local thresholds.

4.8 Clean Water Act (16 USC Section 703 et seq.)

4.8.1 Section 401

Section 401 of the CWA (33 USC Section 1311) prohibits the discharge of any pollutants into navigable waters, except as allowed by permit issued under Sections 402 and 404 of the CWA (33 USC Sections 1342 and 1344). If new structures (e.g., treatment plants) are proposed that would discharge effluent into navigable waters, relevant permits under the CWA would be required for the project applicant(s). Section 401 requires any applicant for an individual USACE dredge and fill discharge permit to first obtain certification from the state that the activity associated with dredging or filling will comply with applicable state effluent and water quality standards. This certification must be approved or waived before the permit for dredging and filling is issued. Because the Proposed Action could include fill jurisdictional wetlands, a certification under Section 401 of the CWA could be required.

4.8.2 Section 404

Section 404 of the CWA authorizes USACE to issue permits to regulate the discharge of "dredged or fill materials into waters of the United States" (33 USC Section 1344). Implementing Protection Measure BIO-1 as part of the Proposed Action (see Section 2.3, "Environmental Commitments") will meet Section 404 requirements.

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6.0 References

Anderson, J., F. Chung, M. Anderson, L. Brekke, D. Easton, M. Ejeta, R. Peterson, and R. Snyder. 2008. Progress on Incorporating Climate Change into Management of California's Water Resources. *Climatic Change* 87:S91–S108, doi 10.1007/s10584-007-9353-1.

California Department of Finance. 2010 (May). E-5 Population and Housing Estimates for Cities, Counties and the State, 2001–2010, with 2000 Benchmark. Sacramento, CA.

California Department of Transportation. 2009 (November). *Technical Noise Supplement*. Sacramento, CA.

California Department of Water Resources. 1994. *The California Water Plan Update.* Bulletin 160-93. Sacramento, CA.

———. 1998. *The California Water Plan Update.* Bulletin 160-98. Sacramento, CA.

———. 1999. *California State Water Project Atlas*. Sacramento, CA.

———. 2003 (October). *California's Water*. Bulletin 118, Updated 2003. Sacramento, CA.

———. 2005a (November). *San Joaquin Valley Drainage Monitoring Program 2001*. District Report. San Joaquin District.

———. 2005b. *The California Water Plan Update.* Bulletin 160-05. Sacramento, CA.

———. 2009. California Water Plan Update 2009. Volume 3: Regional Reports. *Integrated Water Management: Tulare Lake*. Bulletin 160-09. South Central Region Office. Fresno, CA.

California Employment Development Department. 2011. Labor Market Info. Available: http://www.labormarketinfo.edd.ca.gov/?pageid=1006. Accessed May, 5, 2011.

California Natural Diversity Database. 2011 (March). Results of electronic data search. Sacramento: California Department of Fish and Game, Wildlife and Habitat Data Analysis Branch.

Caltrans. *See* California Department of Transportation.

CEQ. *See* Council on Environmental Quality.

City of Bakersfield. 2002 (December). *City of Bakersfield General Plan* Noise Element. Bakersfield, CA.

City of Shafter. 2005 (April). *City of Shafter General Plan Environmental Hazards Program*, Noise. Shafter, CA.

CNDDB. *See* California Natural Diversity Database.

Council on Environmental Quality. 2010. Draft NEPA Guidance On Consideration of the Effects of Climate Change And Greenhouse Gas Emissions. Available: http://ceq.hss.doe.gov/nepa/regs/Consideration_of_Effects_of_GHG_Draft_NEPA_Guidance_FINAL_02182010.pdf. Accessed May 2011.

DOI. *See* U.S. Department of the Interior

DWR. *See* California Department of Water Resources.

EDD. *See* California Employment Development Department.

EPA. *See* U.S. Environmental Protection Agency.

Faunt, C. C. (ed.). 2009. *Groundwater Availability of the Central Valley Aquifer*. U.S. Geological Survey Professional Paper 1766.

Federal Energy Regulatory Commission.2011. Complete List of Issued Licenses. Available: http://www.ferc.gov/industries/hydropower/gen-info/licensing/licenses.xls. Last updated May 5, 2011. Accessed May 12, 2011.

Federal Highway Administration. 2006 (January). Roadway Construction Noise Model Version 1.0 (FHWA RCNM V. 1.0). Washington, DC.

Federal Transit Administration. 2006 (May). T*ransit Noise and Vibration Impact Assessment*. Washington, DC.

FERC. *See* Federal Energy Regulatory Commission.

FHWA. *See* Federal Highway Administration.

Fresno County. 2000 (October). *Fresno County General Plan* Health and Safety Element, Noise Chapter. Fresno, CA.

Fresno County Public Works and Planning. 2010. Parks and Reservation Information. Available: http://www2.co.fresno.ca.us/4510/4360/Parks/parksresvinfo.htm. Accessed July 7, 2010.

FTA. *See* Federal Transit Administration.

Garver, L. L. 1987. Canal Repair Techniques Using Lime-Stabilized Soil. In *Lime for Environmental Uses*, ASTM STP 931, ed. K. A. Gutschick, 115–120. Philadelphia, PA: American Society for Testing and Materials.

Kern County. 2007 (March). *Kern County General Plan* Noise Element. Bakersfield, CA.

Kern County Parks and Recreation. 2009. Who We Are. Available: http://www.co.kern.ca.us/parks/who-we-are.asp. Last updated January 26, 2009. Accessed July 7, 2010.

Moyle, P. B. 2002. *Inland Fishes of California*. Second edition. Davis: University of California Press.

NAIP. *See* National Agricultural Imagery Program.

National Agricultural Imagery Program. 2010. Ask FSA. United States Department of Agriculture, Farm Service Agency. Available: http://www.apfo.usda.gov/FSA/apfoapp?area=contact&subject=landing&topic=landing. Accessed July 1, 2010.

Page, R. W. 1986. Geology of the Fresh Groundwater Basin of the Central Valley, California, with Texture maps and Sections. U.S. Geological Survey Professional Paper 1401-C.

Reclamation. *See* U.S. Department of the Interior, Bureau of Reclamation.

Sacramento Metropolitan Air Quality Management District. 2008. Roadway Construction Emissions Computer Model Version 6.3. Available: http://www.airquality.org/ ceqa/index.shtml. Last updated (Version 6.3.2) July 2009, in Excel – 4 Mb. Accessed April 2011.

San Joaquin Valley Air Pollution Control District. 2002. *Guide for Assessing and Mitigating Air Quality Impacts* (GAMAQI). Fresno, CA. Available: http://www.valleyair.org/transportation/CEQA%20Rules/GAMAQI%20Jan%202002%20Rev.pdf. Accessed April 2011.

———. 2009a. Ambient Air Quality Standards & Valley Attainment Status. Available: http://www.valleyair.org/aqinfo/attainment.htm. Accessed April 2011.

———. 2009b. Rule 8011 General Requirements. Available: http://www.valleyair.org/rules/1ruleslist.htm#reg8. Accessed April 2011.

SCE. *See* Southern California Edison.

SJVAPCD. *See* San Joaquin Valley Air Pollution Control District.

Southern California Edison. 2007 (February). *Amended Preliminary Draft Environmental Assessment. Application for New License(s) for the Mammoth Pool (Project No. 2085), Big Creek Nos. 1 and 2 (Project No. 2175), Big Creek Nos. 2A, 8, and Eastwood (Project No. 67), Big Creek No. 3 (Project No. 120. 120, 2085, and 2175), Hydroelectric Projects.* Rosemead, CA.

Tulare County. 2001 (December). *Tulare County General Plan* Noise Element. Visalia, CA.

Tulare County Resource Management Agency. 2008. County Parks. Available: http://www.co.tulare.ca.us/government/rma/parks/parklocation.asp. Accessed July 7, 2010.

U.S. Census Bureau. 2000. Census 2000, Summary File 3. Available: http://factfinder.census.gov/servlet/DTGeoSearchByListServlet?ds_name=DEC_2000_SF3_U&_lang=en&_ts=296499362967. Accessed July 7, 2010.

U.S. Department of Agriculture. 2007a. 2007 Census of Agriculture County Profile: Fresno County, California. Available: http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/California/cp06019.pdf. Accessed June 29, 2010.

———. 2007b. 2007 Census of Agriculture County Profile: Tulare County, California. Available: http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/California/cp06107.pdf. Accessed June 29, 2010.

———. 2007c. 2007 Census of Agriculture County Profile: Kern County, California. Available: http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/California/cp06029.pdf. Accessed June 29, 2010.

U.S. Department of the Interior. 1995 (December). Departmental Responsibilities for Indian Trust Resources. Departmental Manual, Part 512, Chapter 2.

U.S. Department of the Interior, Bureau of Reclamation. 2000 (April). Principles for Discharge of the Secretary's Trust Responsibility. Order No. 3215.

———. 2010. Friant Division Project Web site. Available: http://www.usbr.gov/projects/Project.jsp?proj_Name=Friant+Division+Project. Accessed June 29, 2010.

U.S. Environmental Protection Agency. 2009. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2005*. Available: http://www.epa.gov/climatechange/emissions/ downloads11/US-GHG-Inventory-2011-Executive-Summary.pdf. Accessed April 2011.

U.S. Environmental Protection Agency. 2009. *Greenhouse Gas Emission Reductions*. Available: <http://www.epa.gov/greeningepa/ghg/>. Accessed May 2011.

U.S. Fish and Wildlife Service. 1999 (July 9). *Conservation Guidelines for the Valley Elderberry Longhorn Beetle*. Sacramento, CA.

———. 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon*.

———. 2011a. *U.S. Fish and Wildlife Service Standardized Recommendations for Protection of the Endangered San Joaquin Kit Fox Prior to or During Ground Disturbance*. Sacramento, CA. January.

———. 2011b. Sacramento Fish and Wildlife Office Species Database. Available: http://www.fws.gov/sacramento/es/spp_lists/auto_list_form.cfm. Last updated February 2, 2010. Accessed July 1, 2010. Sacramento, CA.USFWS. See U.S. Fish and Wildlife Service.