CONVEYANCE OF REFUGE WATER SUPPLY ENVIRONMENTAL ASSESSMENT AND INITIAL STUDY

SOUTH SAN JOAQUIN VALLEY STUDY AREA

Kern National Wildlife Refuge
Pixley National Wildlife Refuge

Lead Agencies:
U.S. Bureau of Reclamation
California Department of Fish and Game

FINAL

October 2003

U.S. Department of the Interior

U.S. Bureau of Reclamation
Mid-Pacific Region
Sacramento, California

FINAL FINDING OF NO SIGNIFICANT IMPACT

CONVEYANCE OF REFUGE WATER SUPPLY
SOUTH SAN JOAQUIN VALLEY STUDY AREA

Recommend: _____ Study Manager _____ 9/17/03 Date

Concur: _____ Regional Environmental Officer _____ 9/17/03 Date

Approved: _____ Regional Planning Officer _____ 9/17/03 Date

FONSI Number 03-06-MP

Final Finding of No Significant Impact

Conveyance of Refuge Water Supply
South San Joaquin Valley Study Area

Lead Agency:

U.S. Bureau of Reclamation
2800 Cottage Way
Sacramento, CA 95825

In accordance with the National Environmental Policy Act (NEPA) of 1969, as amended, and the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508), the Mid-Pacific Regional Office of the U.S. Bureau of Reclamation (USBR) has found that the preferred alternatives would not significantly affect the quality of the environment. Therefore, an Environmental Impact Statement is not required. Implementation of the preferred alternatives may take place immediately.

Background

The USBR in cooperation with the U.S. Fish and Wildlife Service (USFWS), and the California Department of Fish and Game (CDFG) proposes to construct and/or improve existing facilities to convey water supplies to the Kern and Pixley National Wildlife Refuges (NWR) within the southern San Joaquin Valley in California. These facilities would convey firm, average annual historical water deliveries (Level 2) in addition to an incremental amount of water supplies required for optimal wildlife management (Level 4) from Central Valley Project (CVP) or State Water Project (SWP) facilities to the boundary of each refuge as specified in Section 3406 (d)(5) of the Central Valley Project Improvement Act (CVPIA), Public Law 102-575, Title XXIV, enacted October 1992.

Alternative conveyance methods were identified for each of the two refuges, including taking no-action. Facilities included existing canals and conveyance facilities, in addition to new canals and pipelines. Each alternative was addressed in an equal level of detail, and a proposed action selected for each of the refuges. The identification of all potential alternatives was evaluated through feasibility studies and public meetings which are presented in the April 1995 *Decision Document Report of Recommended Alternatives Refuge Water Supply and San Joaquin Basin Action Plan Lands*. Additionally, the USBR and the USFWS further refined the alternatives selected in the Decision Document in May 1995 document titled *Refuge Water Supply Conveyance Alternatives Refinement Memorandum*. USBR further refined the preferred alternative for the Kern NWR in 2003.

Proposed Actions

The following are the proposed actions for each of the refuge areas:

1. Kern NWR – Alternative KER-1A/1B. Use existing Buena Vista Water Storage District facilities; improve West Side Canal; and use existing Main Drain Canal as a supplemental conveyance facility.
2. Pixley NWR – Alternative PIX-4B. Delano-Earlimart Irrigation District (DEID) facilities plus pipeline to refuge.

The No-Action Alternative was not selected because it would not comply with Sections 3406 (d)(1) and (d)(2) of the CVPIA, which specifies increasing water supplies to each of the refuges listed above.

Environmental Impacts

Implementation of the proposed actions are anticipated to result in the following beneficial impacts:

1. Increasing on-refuge habitat maintenance and enhancement opportunities
2. Decreasing disease outbreaks, especially botulism

The USBR prepared a draft Environmental Assessment/Initial Study (EA/IS) in March 1997, which analyzed the impacts of the alternatives. The draft document was circulated for public review but was not finalized. Subsequently, the USBR determined that a preferred alternative for conveying water supplies to the Pixley NWR involving new and existing facilities associated with DEID was preferable to other alternatives evaluated previously. In addition, further refinements were made to the preferred alternative in 2003 for the Kern NWR. Consequently, a new draft EA/IS was prepared and circulated for review in August 2003. The reasons why the impacts of the proposed actions are not significant, which are discussed in detail in the EA/IS, are as follows:

1. Impacts to land use will be less than significant because short- and long-term impacts to agricultural lands will be mitigated by the terms and conditions resulting from directly negotiations between the "USBR/water purveyor/district" and affected property owners/operators.

2. Impacts to wildlife and vegetation will be less than significant because the following measures will be implemented (complete mitigation measures are discussed fully in the Biological Resources section of the EA/IS):

    - Preconstruction surveys will be conducted in accordance with accepted protocols to determine the presence/absence of special-status plant and wildlife species.

    - Avoidance and minimization measures for the San Joaquin kit fox, Tipton kangaroo rat, blunt-nosed leopard lizard, and Buena Vista Lake shrew will be implemented in accordance with current USFWS guidance.

    - Avoidance and minimization measures for vernal pool habitat will be implemented in accordance with current USFWS guidance.

    - Preconstruction surveys for Swainson's hawks and other raptors will be conducted in accordance with the CDFG protocol and impacts mitigated if raptors are present.

    - Disturbed riparian habitat will be restored at a 2:1 replacement ratio. Success will be ensured through monitoring.

    - Impacts to wetlands will be minimized and replaced at a 2:1 ratio if avoidance is not possible. Success will be ensured through monitoring.

3. Short-term impacts to air quality may occur because of construction. Mitigation measures will be implemented that will reduce the level of impact to less than significant.

4. No impacts to hydrology/water quality are expected because instream construction will be limited to turbidity levels no greater than 20 percent over background levels, or as specified by the Central Valley RWQCB. Also, an Erosion Control and Sedimentation Plan and a Storm Water Pollution Prevention Plan will be developed and implemented.

5. No impacts to cultural resources are anticipated.

6. The proposed actions will not affect any Indian Trust Assets.
7. The proposed actions will not result in any disproportionately high and adverse human health effects on low-income or minority populations.

Finding

The USBR has found that implementation of the proposed actions will not have significant adverse impacts on the quality of the human environment. This finding is based on analysis of environmental impacts in the final EA/IS, which is incorporated by reference.

Mitigated Negative Declaration

Conveyance of Refuge Water Supply
South San Joaquin Valley Study Area

Lead Agency:

California Department of Fish and Game
1416 Ninth Street
Sacramento, CA 95814

Project Description and Alternatives

The U.S. Bureau of Reclamation (USBR) in cooperation with the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG) proposes to construct and/or improve existing facilities to convey water supplies to the Kern and Pixley National Wildlife Refuges (NWR) within the southern San Joaquin Valley. These facilities would convey firm, average annual historical water deliveries (Level 2) in addition to an incremental amount of water supplies required for optimal wildlife management (Level 4) from Central Valley Project (CVP) or State Water Project (SWP) facilities to the boundary of each refuge as specified in Section 3406 (d)(5) of the Central Valley Project Improvement Act (CVPIA).

Alternative conveyance methods were identified for each of the two refuges, including taking no action. Facilities included existing canals and conveyance facilities, in addition to new canals and pipelines. Each of the alternatives was addressed in an equal level of detail, and a recommended alternative selected for each of the refuges. The identification of all potential alternatives was evaluated through feasibility studies and public meetings which are were presented in the April 1995 *Decision Document Report of Recommended Alternatives Refuge Water Supply and San Joaquin Basin Action Plan Lands*. Additionally, the USBR and the USFWS further refined the alternatives selected in the Decision Document in a May 1995 document titled *Refuge Water Supply Conveyance Alternatives Refinement Memorandum*. Additional efforts took place in 2003 to refine the preferred alternative for the Kern NWR.

The USBR and the CDFG prepared a draft Environmental Assessment/Initial Study (EA/IS) in March 1997, which analyzed the impacts from the alternatives. The draft document was circulated for public review but was not finalized. Subsequently, the USBR determined that a preferred alternative for conveying water supplies to the Pixley NWR involving new and existing facilities associated with the Delano-Earlimart Irrigation District (DEID) was preferable to other alternatives evaluated previously. In addition, further refinements were made to the preferred alternative for the Kern NWR. Consequently, a new draft EA/IS was prepared and circulated for review in August 2003.

The following alternatives are recommended for each of the refuge areas:

- Kern NWR – Alternative-1A/1B. Use existing Buena Vista Water Storage District facilities; improve West Side Canal; and use existing Main Drain Canal as a supplemental conveyance facility.
- Pixley NWR – Alternative PIX-4B. DEID facilities plus new pipeline to refuge.

The No-Action Alternative was not selected because it would not comply with Sections 3406(d)(1) and (d)(2) of the CVPIA, which specifies increasing water supplies to each of the refuges listed above.

Project Location

The projects incorporate existing and proposed facilities adjacent to the Kern and Pixley NWRs within Kern and Tulare Counties in the southern San Joaquin Valley.

Finding

Implementation of the proposed projects are anticipated to result in the following environmental effects:

- Short- and long-term impacts to agricultural lands
- Short-term potential impacts to the habitat of the following federal and/or state listed species:
  - Tipton kangaroo rat
  - San Joaquin kit fox
  - Blunt-nosed leopard lizard
  - Buena Vista Lake shrew
- Short-term impacts to vegetation and wildlife habitat, including wetlands
- Short-term impacts to water quality because of erosion
- Potential disturbance of subsurface cultural resources
- Short-term impacts to local air quality

Mitigation Measures

The following mitigation measures have been identified to reduce impacts to a less-than-significant level. A more detailed list is included in the Initial Study prepared for the projects.

Land Use

- Short- and long-term impacts to agricultural lands will be directly negotiated between the "USBR/water/purveyor/district" and the affected property owners/operators.

Wildlife and Vegetation

- Preconstruction surveys will be conducted in accordance with accepted protocols to determine the presence/absence of special-status plant and wildlife species.
- Avoidance and minimization measures for the San Joaquin kit fox, Tipton kangaroo rat, blunt-nosed leopard lizard, and Buena Vista Lake shrew will be implemented in accordance with current USFWS guidance.
- Avoidance and minimization measures for vernal pool habitat will be implemented in accordance with current USFWS guidance.
- Preconstruction surveys will be conducted for Swainson's hawks and other raptors in accordance with the CDFG protocol and impacts mitigated if raptors are present.
- Disturbed riparian habitat will be restored at a 2:1 replacement ratio. Success will be ensured through monitoring.
- Impacts to wetlands will be minimized and replaced at a 2:1 ratio if avoidance is not possible. Success will be ensured through monitoring.

Hydrology/Water Quality

- Instream construction will be conducted to limit turbidity levels to no greater than 20 percent over background levels, or as specified by the Central Valley RWQCB.
- An Erosion Control and Sedimentation Plan and a Stormwater Pollution Prevention Plan will be developed and implemented.

Cultural Resources

- A qualified archaeologist will be notified if any previously unidentified cultural materials or human remains are discovered during construction.

Air Quality

- All active construction areas will be watered daily as necessary.
- Dust producing activities will be suspended when high winds create construction-induced visible dust plumes moving beyond the site in spite of dust control measures.
- All trucks hauling soil and other loose material will be covered.
- Soil stabilizers, such as paving, watering, or the application of gravel, will be applied to all unpaved access roads and staging areas at construction sites.
- Streets will be swept as necessary if visible soil material is carried onto adjacent public streets.
- Stockpiles will be covered or applied with a soil stabilizer when necessary.
- Traffic speeds will be limited to 15 miles per hour on unpaved roads.

Based on the above, and as further detailed in the attached EA/IS, CDFG has determined that the proposed projects <u>will not</u> have any significant environmental effects.

Determination

On the basis of this evaluation:

a. The projects will not have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish and wildlife species, cause a fish and wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare and endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory.

b. The projects will not have the potential to achieve short-term goals to the disadvantage of long-term environmental goals.

c. The projects will not have effects that are individually limited, but cumulatively considerable.

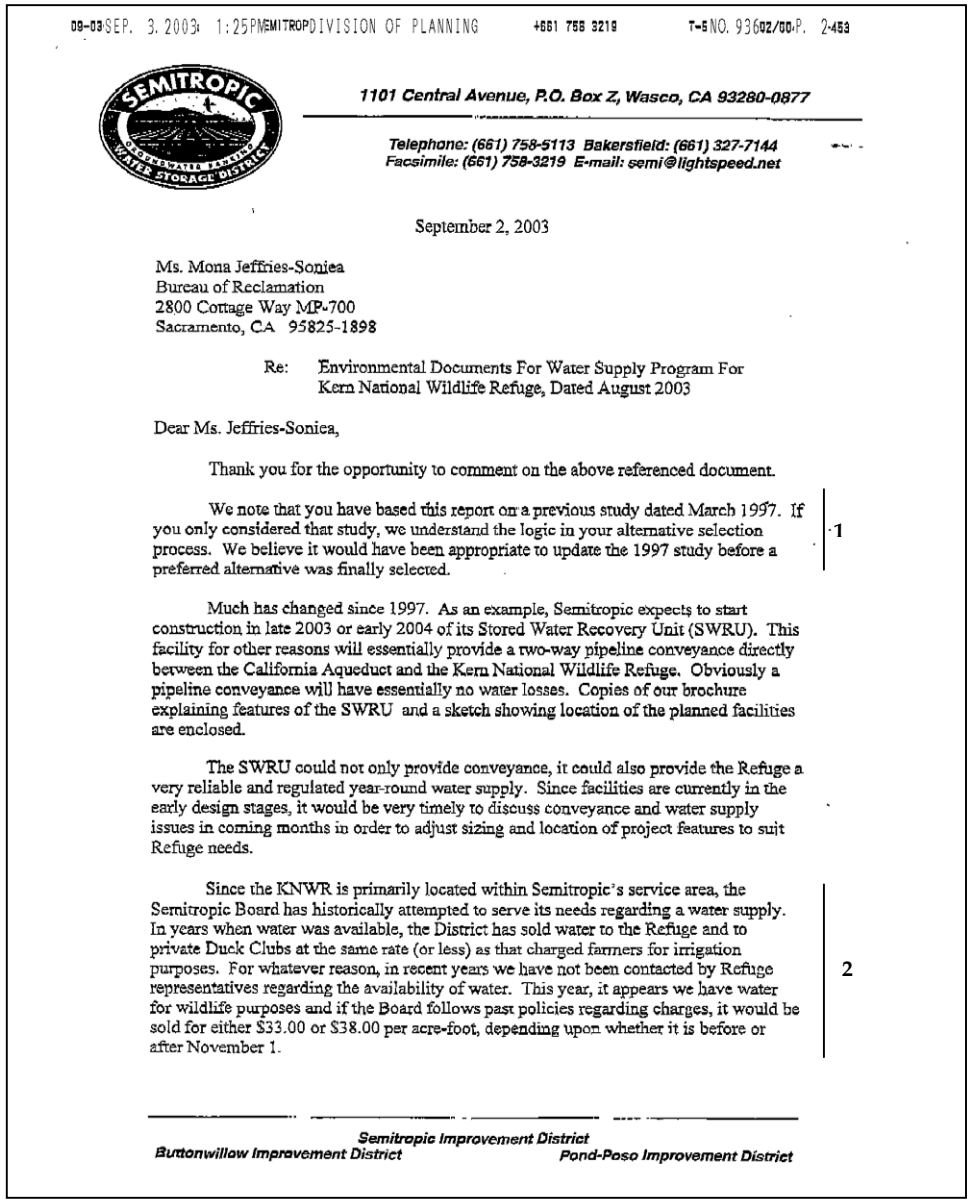
d. The projects will not have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly.

e. No substantial evidence exists that the projects will have a negative effect on the environment.

This Mitigated Negative Declaration is filed following the California Environmental Quality Act Guidelines. Comments may be submitted to CDFG at the address identified above.

Deputy Director, Wildlife and Inland Fisheries Division

10/14/03
Date



09-03 SEP. 3. 2003 1:25PM SEMITROP DIVISION OF PLANNING +661 758 3219 T-5 NO. 936 02/00 P. 2-453

SEMITROPIC WATER STORAGE DISTRICT

1101 Central Avenue, P.O. Box Z, Wasco, CA 93280-0877

Telephone: (661) 758-5113 Bakersfield: (661) 327-7144
Facsimile: (661) 758-3219 E-mail: semi@lightspeed.net

September 2, 2003

Ms. Mona Jeffries-Soniea
Bureau of Reclamation
2800 Cottage Way MP-700
Sacramento, CA 95825-1898

Re: Environmental Documents For Water Supply Program For Kern National Wildlife Refuge, Dated August 2003

Dear Ms. Jeffries-Soniea,

Thank you for the opportunity to comment on the above referenced document.

We note that you have based this report on a previous study dated March 1997. If you only considered that study, we understand the logic in your alternative selection process. We believe it would have been appropriate to update the 1997 study before a preferred alternative was finally selected. 1

Much has changed since 1997. As an example, Semitropic expects to start construction in late 2003 or early 2004 of its Stored Water Recovery Unit (SWRU). This facility for other reasons will essentially provide a two-way pipeline conveyance directly between the California Aqueduct and the Kern National Wildlife Refuge. Obviously a pipeline conveyance will have essentially no water losses. Copies of our brochure explaining features of the SWRU and a sketch showing location of the planned facilities are enclosed.

The SWRU could not only provide conveyance, it could also provide the Refuge a very reliable and regulated year-round water supply. Since facilities are currently in the early design stages, it would be very timely to discuss conveyance and water supply issues in coming months in order to adjust sizing and location of project features to suit Refuge needs.

Since the KNWR is primarily located within Semitropic's service area, the Semitropic Board has historically attempted to serve its needs regarding a water supply. In years when water was available, the District has sold water to the Refuge and to private Duck Clubs at the same rate (or less) as that charged farmers for irrigation purposes. For whatever reason, in recent years we have not been contacted by Refuge representatives regarding the availability of water. This year, it appears we have water for wildlife purposes and if the Board follows past policies regarding charges, it would be sold for either $33.00 or $38.00 per acre-foot, depending upon whether it is before or after November 1. 2

Semitropic Improvement District
Buttonwillow Improvement District Pond-Poso Improvement District

Responses to Comments – Letter 1

Response 1

Based on the commentor's description of the Stored Water Recovery Unit (SWRU), it appears that approximately 2-4 miles of new facilities (e.g., pipeline, canal) would be required to deliver water from Semitropic's proposed reservoir to an appropriate point along the refuge boundary. The preferred alternative (KER-1A/1B) would primarily use existing facilities, with improvements to approximately 2 miles of an existing canal and other minor site improvements. Although conveyance losses would be eliminated, it does not seem likely that an alternative using the SWRU would be substantially more cost effective given the new facilities and the oversizing of SWRU facilities that would be required. For this reason, the Lead Agencies disagree that this new alternative should be considered in detail.

Response 2

The comment letter has been forwarded to Mr. Dave Hardt, the Refuge Manager for the Kern NWR Complex.

09-03 SEP. 3. 2003 1:26PM SEMITROP DIVISION OF PLANNING +661 758 8219 T-5 NO. 9360 3/00 P. 3-453

Ms. Mona Jeffries-Soniea
Bureau of Reclamation
September 2, 2003
Page 2

We realize that water supply is somewhat off the subject, but we are not sure who is responsible for acquiring Refuge water. Please feel free to forward this letter to the appropriate individual.

For your information, Semitropic is also in the final stages of forming the "Semitropic Wildlife Improvement District." This improvement district will incorporate a number of water conveyance features and is intended to address all wildlife needs, including a water supply within the Semitropic Water Storage District boundary. 3

Again, we thank you for the opportunity to comment on your document and we trust you will re-evaluate the various alternatives considering 6 years have passed since the basic study was conducted. There could very well be a much better short term and more importantly, a long-term preferred alternative that meets the Refuge water conveyance and supply needs.

Sincerely yours,

Wilmar L. Buschman
General Manager

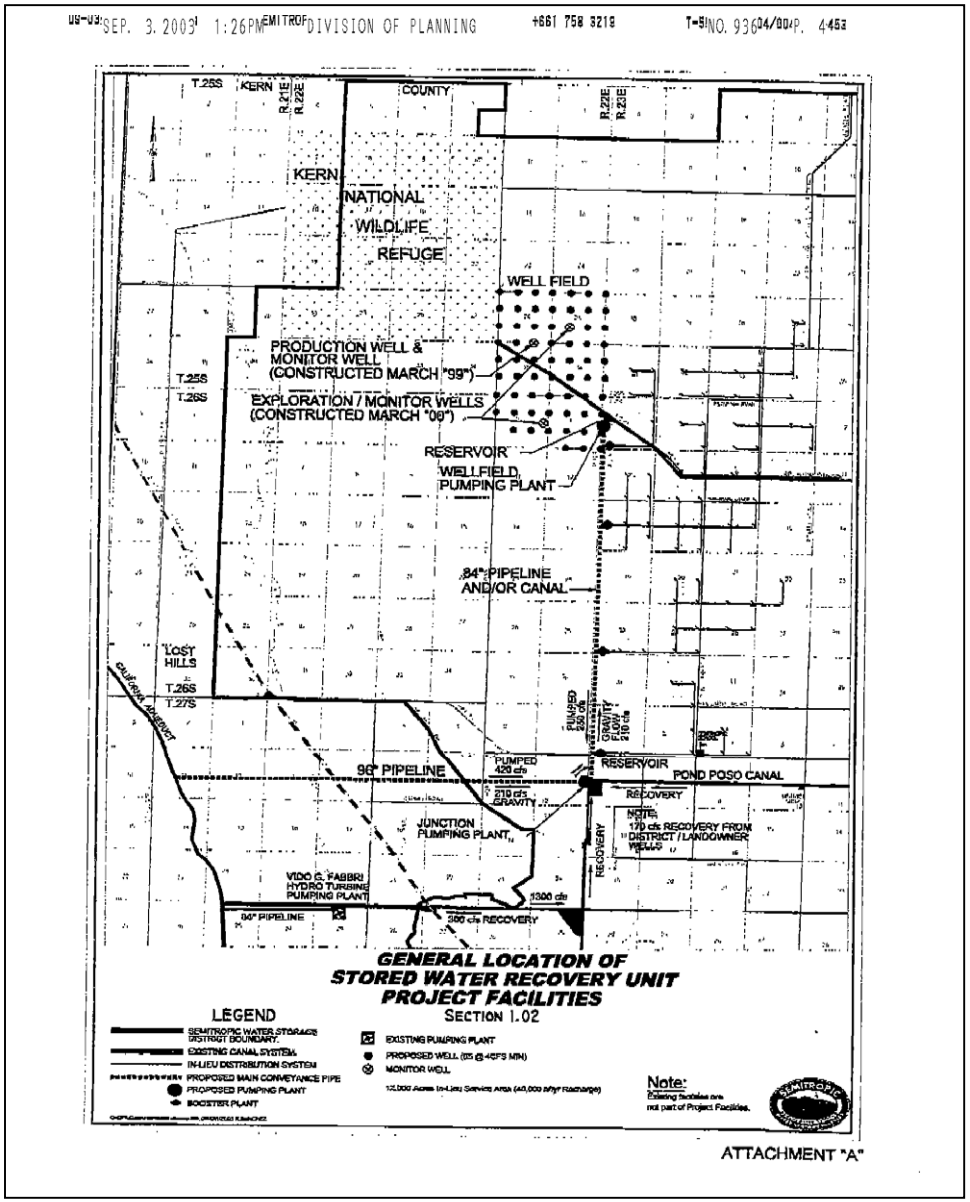
WLB:mp

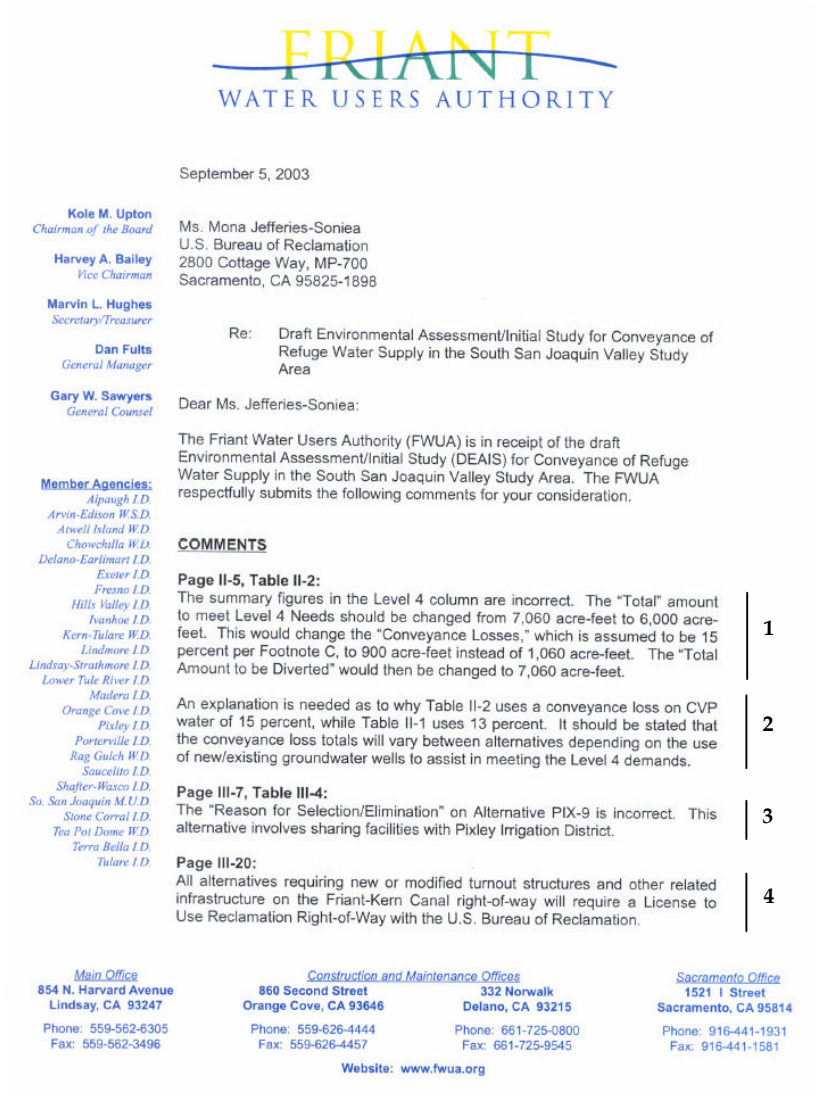
cc w/encl.: Mr. Paul Forsberg, CA Department of Fish and Game

MP_ KNWR_Water Supply 9.2.03.wpd

Response 3

Comment noted.


SEP. 3. 2003 1:26PM SEMITROP DIVISION OF PLANNING +661 758 3219 NO. 9360 P. 4/45
T.25S
KERN
R.21E
R.22E
COUNTY
R.22E
R.23E
KERN NATIONAL WILDLIFE REFUGE
WELL FIELD
PRODUCTION WELL & MONITOR WELL (CONSTRUCTED MARCH '99")
EXPLORATION / MONITOR WELLS (CONSTRUCTED MARCH '09")
T.25S
T.26S
RESERVOIR
WELLFIELD PUMPING PLANT
84" PIPELINE AND/OR CANAL
LOST HILLS
T.26S
T.27S
CALIFORNIA AQUEDUCT
PUMPED 420 cfs
GRAVITY FLOW 210 cfs
96" PIPELINE
210 cfs GRAVITY
RESERVOIR
POND POSO CANAL
RECOVERY
NOTE: 170 cfs RECOVERY FROM DISTRICT / LANDOWNER WELLS
JUNCTION PUMPING PLANT
VIDO G. FABBRI HYDRO TURBINE PUMPING PLANT
1300 cfs
84" PIPELINE
300 cfs RECOVERY
GENERAL LOCATION OF STORED WATER RECOVERY UNIT PROJECT FACILITIES
SECTION 1.02
LEGEND
SEMITROPIC WATER STORAGE DISTRICT BOUNDARY
EXISTING CANAL SYSTEM
IN-LIEU DISTRIBUTION SYSTEM
PROPOSED MAIN CONVEYANCE PIPE
PROPOSED PUMPING PLANT
BOOSTER PLANT
EXISTING PUMPING PLANT
PROPOSED WELL (05 @ 45FS MIN)
MONITOR WELL
12,000 Acres In-Lieu Service Area (40,000 afa/yr Recharge)
Note:
Existing facilities are not part of Project Facilities.
SEMITROPIC
ATTACHMENT "A"



FRIANT
WATER USERS AUTHORITY

September 5, 2003

Ms. Mona Jefferies-Soniea
U.S. Bureau of Reclamation
2800 Cottage Way, MP-700
Sacramento, CA 95825-1898

Re: Draft Environmental Assessment/Initial Study for Conveyance of Refuge Water Supply in the South San Joaquin Valley Study Area

Dear Ms. Jefferies-Soniea:

The Friant Water Users Authority (FWUA) is in receipt of the draft Environmental Assessment/Initial Study (DEAIS) for Conveyance of Refuge Water Supply in the South San Joaquin Valley Study Area. The FWUA respectfully submits the following comments for your consideration.

COMMENTS

Page II-5, Table II-2:
The summary figures in the Level 4 column are incorrect. The "Total" amount to meet Level 4 Needs should be changed from 7,060 acre-feet to 6,000 acre-feet. This would change the "Conveyance Losses," which is assumed to be 15 percent per Footnote C, to 900 acre-feet instead of 1,060 acre-feet. The "Total Amount to be Diverted" would then be changed to 7,060 acre-feet. 1

An explanation is needed as to why Table II-2 uses a conveyance loss on CVP water of 15 percent, while Table II-1 uses 13 percent. It should be stated that the conveyance loss totals will vary between alternatives depending on the use of new/existing groundwater wells to assist in meeting the Level 4 demands. 2

Page III-7, Table III-4:
The "Reason for Selection/Elimination" on Alternative PIX-9 is incorrect. This alternative involves sharing facilities with Pixley Irrigation District. 3

Page III-20:
All alternatives requiring new or modified turnout structures and other related infrastructure on the Friant-Kern Canal right-of-way will require a License to Use Reclamation Right-of-Way with the U.S. Bureau of Reclamation. 4

Main Office
854 N. Harvard Avenue
Lindsay, CA 93247
Phone: 559-562-6305
Fax: 559-562-3496

Construction and Maintenance Offices
860 Second Street
Orange Cove, CA 93646
Phone: 559-626-4444
Fax: 559-626-4457

332 Norwalk
Delano, CA 93215
Phone: 661-725-0800
Fax: 661-725-9545

Sacramento Office
1521 I Street
Sacramento, CA 95814
Phone: 916-441-1931
Fax: 916-441-1581

Website: www.fwua.org

Responses to Comments – Letter 2

Response 1

The commentor is correct in that the numbers in Table II-2 are incorrect. The table has been revised in the Final EA/IS.

Response 2

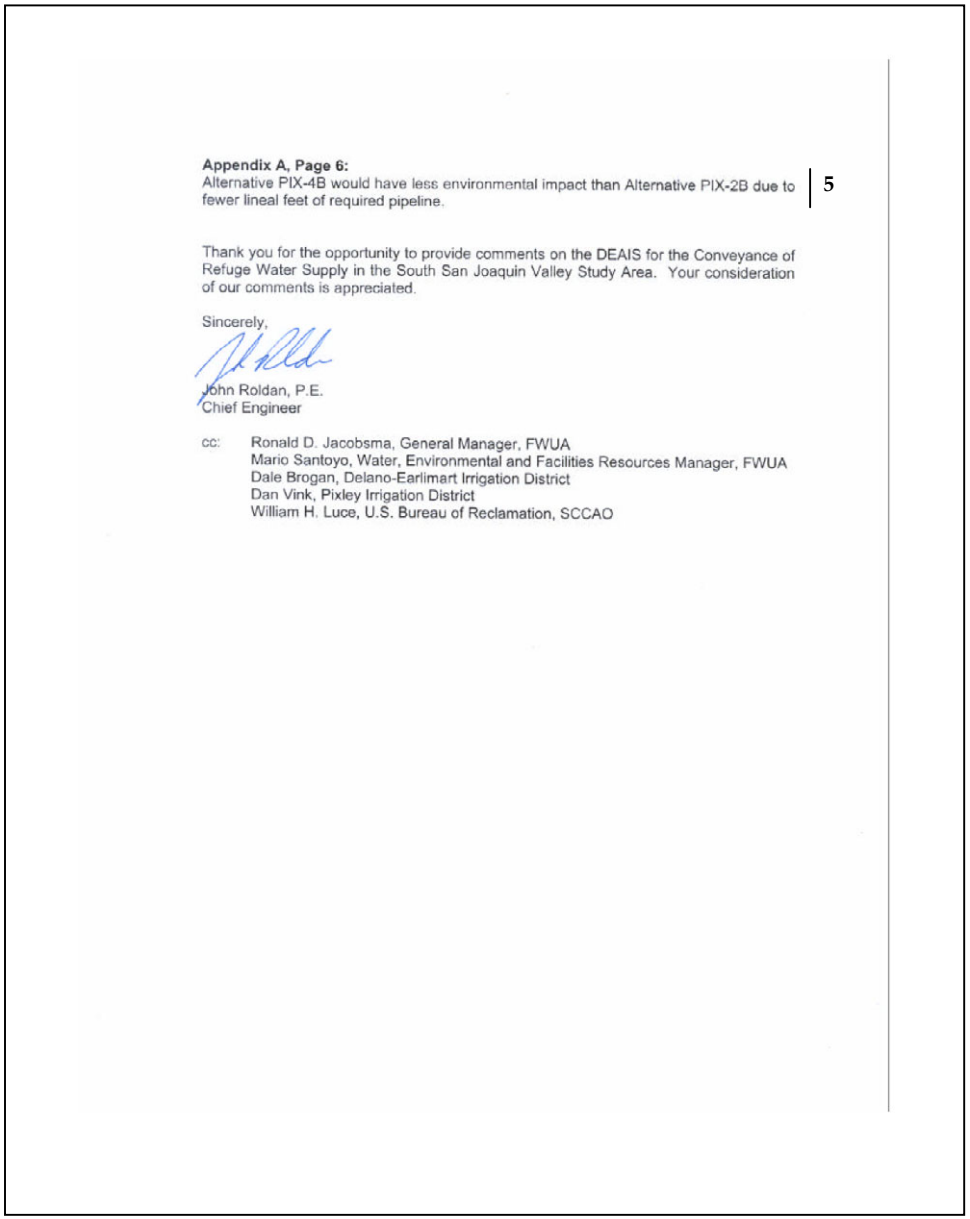
Table II-1 mistakenly states that the conveyance loss for CVP water is 13 percent. The text in the Final EA/IS has been corrected to state that the conveyance loss for SWP water is 13 percent. With regard to the commentor's suggestion that a statement should be added to state that conveyance losses will vary by alternative depending on the use of groundwater, the Lead Agencies agree that such a statement is warranted. The text has been revised accordingly.

Response 3

Response: The commentor is correct in that facilities under PIX-9 would be shared with the Pixley Irrigation District and not the Delano-Earlimart Irrigation District. This has been corrected in the Final EA/IS.

Response 4

The Lead Agencies acknowledge the commentor's statement of suggested additions to the discussion of Required Permits and Approvals. The Lead Agencies understand that various easements and encroachment permits will be required to construct either of the proposed alternatives.



Appendix A, Page 6:
Alternative PIX-4B would have less environmental impact than Alternative PIX-2B due to fewer lineal feet of required pipeline. | 5

Thank you for the opportunity to provide comments on the DEAIS for the Conveyance of Refuge Water Supply in the South San Joaquin Valley Study Area. Your consideration of our comments is appreciated.

Sincerely,

John Roldan, P.E.
Chief Engineer

cc: Ronald D. Jacobsma, General Manager, FWUA
Mario Santoyo, Water, Environmental and Facilities Resources Manager, FWUA
Dale Brogan, Delano-Earlimart Irrigation District
Dan Vink, Pixley Irrigation District
William H. Luce, U.S. Bureau of Reclamation, SCCAO

Response 5

The commentor is correct in that Alternative PIX-4B (55,000 linear feet) is shorter than Alternative PIX-2B (67,000 linear feet). This has been corrected in Appendix A of the Final EA/IS.

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List of Acronyms and Abbreviations

$\mu g/m^3$	micrograms per cubic meter
ac-ft	acre-feet
BVWSD	Buena Vista Water Storage District
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CNDDB	Natural Diversity Database
CNPS	California Native Plant Society
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DEID	Delano-Earlimart Irrigation District
EA/IS	Environmental Assessment/Initial Study
ESA	Endangered Species Act
gpm	gallons per minute
NEPA	National Environmental Policy Act
NWR	National Wildlife Refuge
PEIS	Programmatic Environmental Impact Statement
PID	Pixley Irrigation District
PM_{10}	particulate matter less than 10 microns
RWQCB	Regional Water Quality Control Board
SWP	State Water Project
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service

Chapter I
Introduction and Statement of Purpose and Need

Introduction

The Refuge Water Supply Program was implemented pursuant to Section 3406 (d)(5) of the Central Valley Project Improvement Act (CVPIA).[1] As a component of the overall program, the U.S. Bureau of Reclamation (USBR), in cooperation with the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG), is proposing to convey water supplies to the Kern National Wildlife Refuge (NWR) and Pixley NWR within the southern San Joaquin Valley in California (see Figure I-1). This Environmental Assessment/Initial Study (EA/IS) identifies the potential environmental impacts (both beneficial and adverse) that are associated with developing conveyance facilities for firm, historical average annual water deliveries (Level 2), and the incremental amounts of water required for optimal wildlife management (Level 4).

This document also updates a prior version, prepared in March 1997, that was circulated for public review but was not finalized. Subsequent to public review of the 1997 EA/IS, the USBR determined that a new alternative for conveying water supplies to the Pixley NWR was preferable to alternative that was previously identified as preferable. In addition, further refinements were made to the preferred alternative for the Kern NWR.

This EA/IS was developed to meet the requirements of the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA). The USBR, Mid-Pacific Region is the lead federal agency for NEPA, on behalf of the Department of Interior, in cooperation with the USFWS. CDFG is acting as the lead state agency for CEQA.

Purpose and Need

The USBR, in cooperation with the USFWS and the CDFG, is proposing to provide and/or improve existing local conveyance facilities to deliver those quantities of water required for optimal wildlife management on the Kern and Pixley NWRs.

This conveyance project will provide or upgrade local facilities to support the peak flow and year-round delivery of water supply requirements of the Kern and Pixley NWRs.

The need for the project is due to capacity constraints and/or maintenance requirements in existing local delivery systems. Currently, water supplies from non-federal entities are conveyed on an as-available basis, which is not consistent with refuge needs per CVPIA for reliable year-round supply.

[1] The CVPIA was signed into law on October 30, 1992, as Title XXXIV of Public Law 102-575. The CVPIA mandated changes in Central Valley Project (CVP) management, particularly to protect, restore, and enhance fish and wildlife. The CVPIA includes approximately 103 programs and activities.

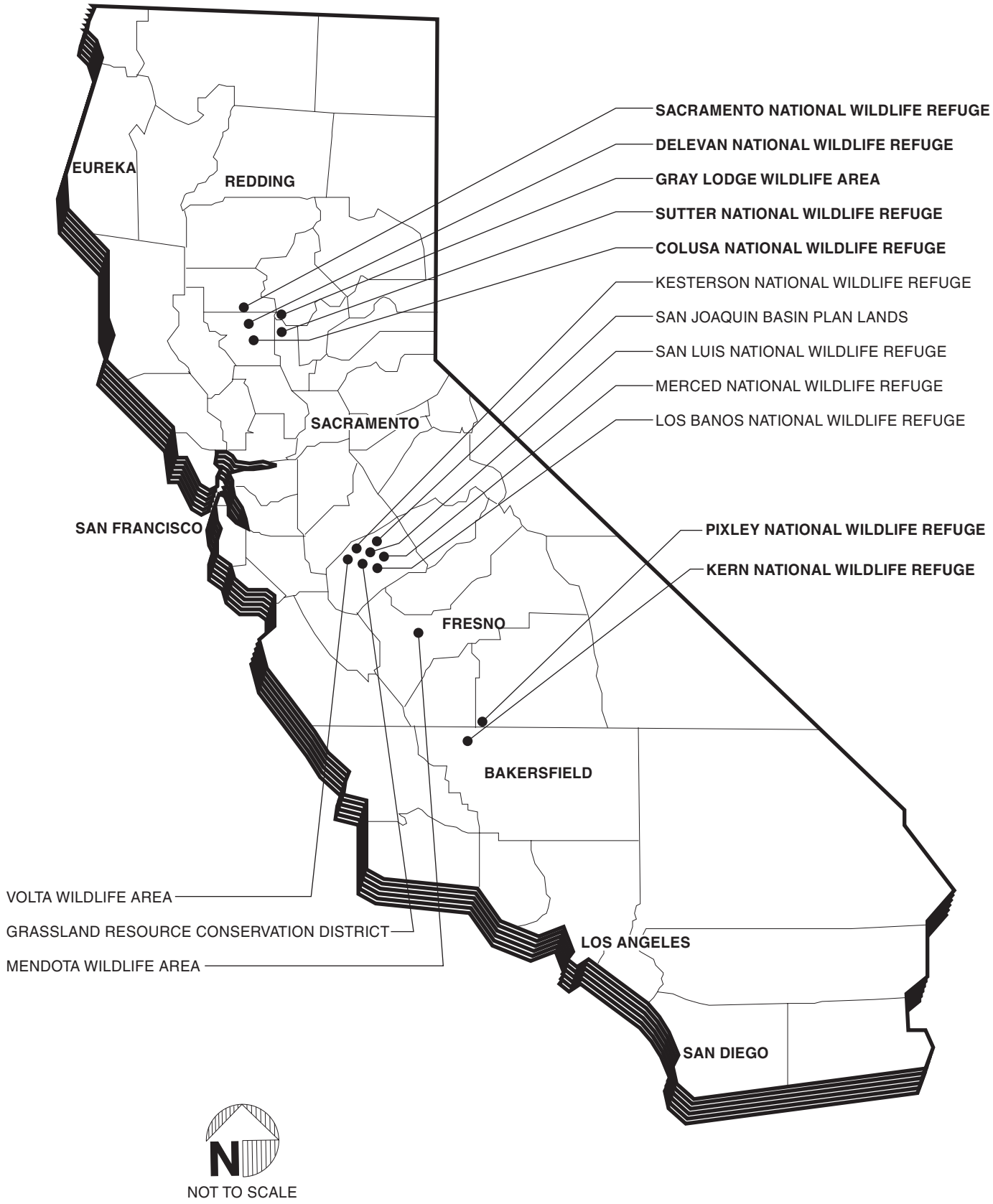

FIGURE I-1
WILDLIFE REFUGE AREAS IDENTIFIED IN CVPIA
U.S. BUREAU OF RECLAMATION
SOUTH SAN JOAQUIN VALLEY, CALIFORNIA

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Chapter II
Background

Relationship of this EA/IS to the CVPIA

In January 2001, the USBR completed a Programmatic Environmental Impact Statement (PEIS) evaluating the impact of CVPIA implementation. The PEIS provided NEPA compliance for Level 2 supplies and also addressed effects associated with the use of refuge and return flows associated with full Level 4 supplies. In addition, the PEIS also evaluated the impacts of implementing other provisions of the CVPIA, including the renewal of water supply contracts and the dedication of project yield for fish, wildlife, and habitat restoration. Specific conveyance improvements required to deliver Level 2 and Level 4 water supplies to the refuges were not evaluated in the PEIS, thereby requiring project-specific environmental review when such improvements were proposed. In addition, acquisition of Level 4 water supplies will be further analyzed in subsequent site-specific documents.

Introduction to South San Joaquin Valley Project Study Area

The South San Joaquin Valley project study area encompasses portions of Kern and Tulare Counties (Figure II-1). The project study area generally spans from the Friant-Kern Canal west to the Pixley NWR, and from the California Aqueduct (located near Interstate 5) to the Kern NWR. The area is primarily agricultural and rural. At one time, the project study area supported vast wetland habitats for migrating waterfowl. Although much of this land has been converted to agricultural use, small habitat areas remain. Agricultural land use surrounding the wetland habitat areas in this project study area involves the production of field crops, vineyards, and orchards. These lands are intensively farmed using irrigation supplies from surface-water rights, federal and state contracts, and groundwater pumping.

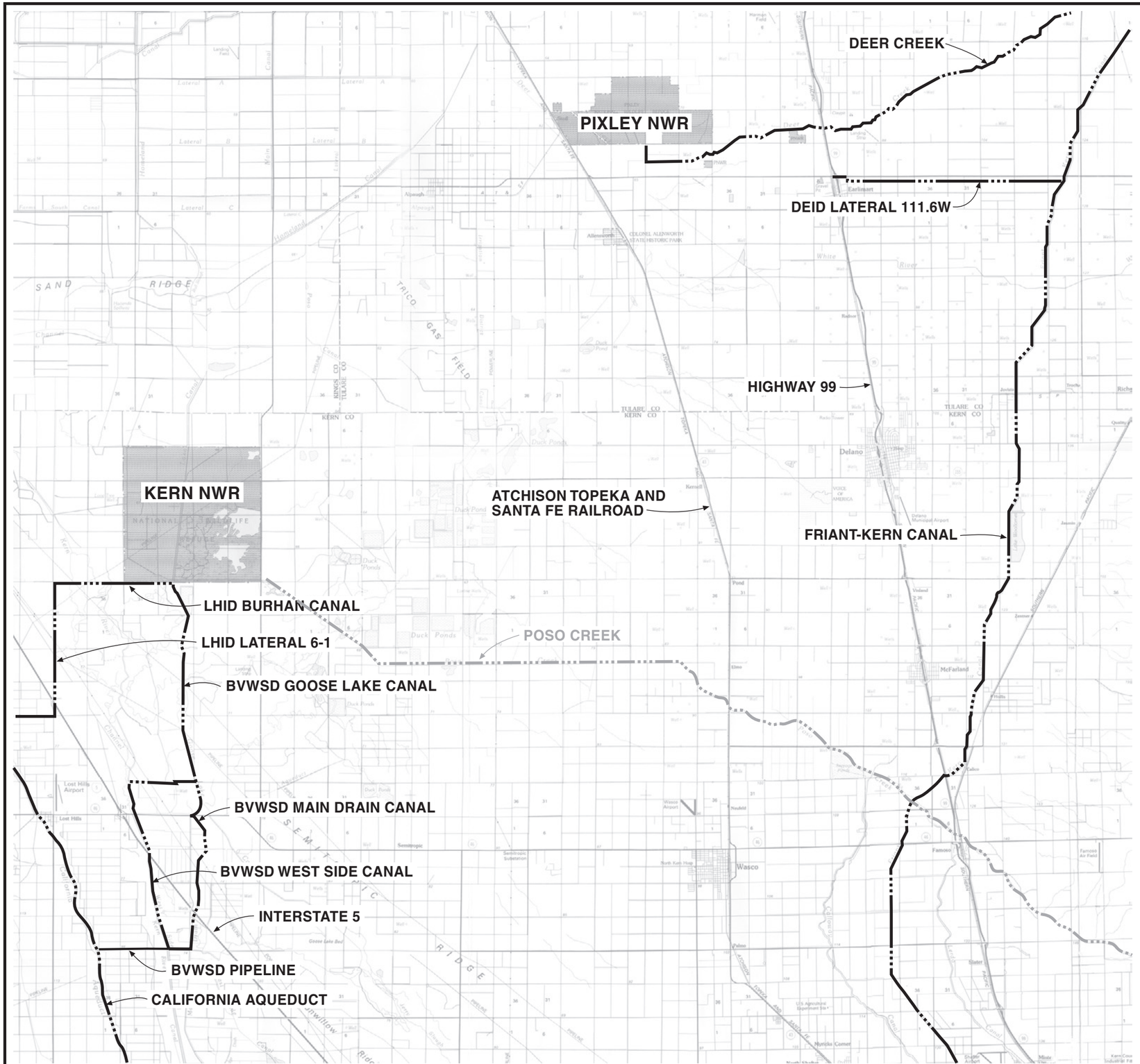
Two habitat areas, Kern and Pixley NWRs, were created to provide habitat within the project study area. The USFWS manages both refuges. The Buena Vista Water Storage District (BVWSD) serves Kern NWR, and the USBR provides the water supply. The water supply is delivered to the BVWSD via the California Aqueduct, which is part of the State Water Project (SWP). Pixley NWR is primarily served by an onsite well. The Pixley Irrigation District (PID) via Deer Creek also supplies water when surplus and flood flows are available.

Conveyance of Refuge Water Supplies

The CVPIA requires that the USBR provide Level 2 and Level 4 water supplies to the Kern and Pixley NWRs. Existing facilities that could be used to provide water to both refuges were not designed to convey peak refuge requirements. Various factors, including existing in-District customer demands or maintenance needs, effect existing capacity constraints, and therefore, are precluded from year-round delivery capability. Facility capacities must be able to support scheduled maximum peak flows for those refuge areas in the USBR's March 1989 *Report on Refuge Water Supply Investigations, Central Valley Hydrologic Basin, California,* which was incorporated by reference into the CVPIA. The report specified two primary levels of water supplies, Level 2 and Level 4. Water supplies must be provided for full habitat development needs of refuges. The following sections discuss specific refuge water supply requirements and constraints to meeting those requirements.

Kern National Wildlife Refuge

The Kern NWR was created by the Migratory Bird Conservation Commission in 1958. The approximately 10,600-acre refuge is located approximately 6 to 7 miles east of Interstate 5,



N

NOT TO SCALE

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FIGURE II-1
SOUTH SAN JOAQUIN VALLEY STUDY AREA
EXISTING STREAMS AND CANALS
U. S. BUREAU OF RECLAMATION
SOUTH SAN JOAQUIN VALLEY, CALIFORNIA

approximately 35 miles northwest of the City of Bakersfield, and 19 miles west of the City of Delano, in northern Kern County.

Because of its strategic location along the Pacific Flyway, the Kern NWR serves as winter habitat for thousands of early migrant pintail ducks that once concentrated in the Tulare Lake Basin in August and September. Given water supplies necessary for full habitat management (Level 4), the Kern NWR has the potential to provide 7,000 acres of migratory waterfowl/ waterbird habitat. The refuge's current Master Plan sets aside 2,260 acres as a natural research area for desert plants and three endangered species, the blunt-nosed leopard lizard, the San Joaquin kit fox and the Tipton kangaroo rat (USFWS, 1986). Cattle grazing is permitted when winter rains are sufficient to provide adequate forage from winter annual grasses.

In addition to providing habitat for migratory waterfowl, the Kern NWR was established to restore a portion of the wetland habitat lost because of the drainage of Buena Vista, Kern, Goose, and Tulare Lakes. Land uses include wetlands, croplands, and uplands.

CVPIA Water Requirements

Water supply requirements for the Kern NWR are presented in Table II-1. Historical water delivery to the refuge is identified as Level 2, and the required water delivery to meet the objectives of Public Law 102-575, Title 34 of the CVPIA is Level 4. Conveyance losses associated with delivery of Level 2 and Level 4 supplies are also identified.

Management/water application of Level 2 water consists of spring and summer irrigation of moist soil units and fall/winter flooding of units for wintering and migrating waterfowl and water birds. This quantity of water allows for the maintenance of 1,300 to 3,000 acres of seasonally flooded marsh and riparian habitat.

TABLE II-1
Water Supply Requirements for Kern NWR

Month	Level 2 Needs[a] (ac-ft)	Level 4 Needs (ac-ft)
January	0	1,000
February	0	700
March	0	600
April	0	400
May	1,900	1,900
June	850	1,500
July	0	1,500
August	0	2,500
September	2,400	3,800
October	1,200	4,300
November	1,800	3,800
December	1,800	3,000
Total	**9,950**	**25,000**
Conveyance Losses	1,487[b]	3,250[b]
Total Amount to be Diverted	11,437	28,250

[a]USBR. 1989a. *Report on Refuge Water Supply Investigations*. March.
[b]Conveyance loss on SWP water is assumed to be 13 percent. Conveyance losses will vary by alternative depending on the use of groundwater

Note:
ac-ft = acre-feet

The increase to the Level 4 water supply (25,000 ac-ft per year) will increase available habitat and water for spring/summer irrigations. On-refuge habitat needs and management are described in the EA/IS for Refuge Water Supply – Long-term Contracts (South San Joaquin Valley).

Current Delivery Methods

The Kern NWR currently receives Level 2 water supplies from BVWSD facilities via the California Aqueduct. Water is diverted at BVWSD Turnout 1B and conveyed through a pipeline to either the West Side Canal or the Main Drain Canal, which in turn convey the water to the Goose Lake Canal. The Goose Lake Canal conveys the water to the southern boundary of the Kern NWR, where it is diverted into the refuge's internal distribution system.

Capacity in the West Side and Main Drain Canals lack capacity to the full Level 2 and Level 4 refuge water supplies.

Both the West Side Canal and the Main Drain Canal have capacity limitations during peak demand periods. The Goose Lake Canal is normally shut down for 2 to 3 weeks in late September or early October and again in March for seasonal maintenance. In wet years, Kern NWR takes floodwaters from Poso Creek.

Pixley National Wildlife Refuge

The Pixley NWR was established in 1959, and consists of approximately 6,300 acres of grasslands and wetlands. The refuge is located in southwest Tulare County, approximately 12 miles northeast of the Kern NWR and 5 miles southwest of the community of Pixley. Portions of the Pixley NWR lie within the historical Tulare Lake Bed.

Approximately 5,040 acres are set aside as habitat for three federally endangered species, the blunt-nosed leopard lizard, the San Joaquin kit fox, and the Tipton kangaroo rat and are also currently used for livestock grazing. In addition to providing habitat for migratory waterfowl, the primary objective of the Pixley NWR is habitat restoration for the endangered lizard.

The refuge has no firm surface water supplies. In the past, floodwaters from Deer Creek have been diverted by PID, which provides excess water to a small area within the refuge for groundwater recharge. The refuge is located in an area of groundwater overdraft with groundwater levels between 100 to 200 feet below the ground surface. Groundwater is currently the only reliable water available to the refuge. The groundwater is suitable for refuge uses.

CVPIA Water Requirements

Water supply requirements for the Pixley NWR are presented in Table II-2. Historical water delivery to the refuge is identified as Level 2, and the required water delivery to meet the objectives of Public Law 102-575, Title 34 of the CVPIA is Level 4. Conveyance losses associated with delivery of Level 2, and Level 4 supplies are also identified.

Management/water application of Level 2 water consists of spring and summer irrigation of moist soil units and fall/winter flooding of units for wintering and migrating waterfowl and water birds. Existing wetland impoundments allow for a total of 950 acres, which the Level 2 quantity of water can support only 500 acres.

The increase to the Level 4 water supply (6,000 ac-ft per year) will increase available habitat and water for spring and cropland irrigations. At Level 4, an additional 4,720 ac-ft will be used for irrigation and fall/winter habitat maintenance. The crops and irrigated pasture will provide food resources for waterfowl and other wildlife.

Current Delivery Methods

The Pixley NWR currently relies almost exclusively on a single groundwater well for regular water supply. The well was installed in 1993 near the southern boundary of the refuge. The well draws from the deep aquifer beneath the Corcoran clay layer and production varies depending upon the season. The well produces

approximately 1,700 to 1,800 gallons per minute (gpm), or 3.8 to 4.0 cubic feet per second (cfs) in the spring months, and approximately 1,300 to 1,500 gpm, or 2.9 to 3.3 cfs later in the season. The well is 1,200 feet deep and has a 150-horsepower pump motor. Well capacity is minimally sufficient to meet Level 2 needs.

During extremely wet years when flood flows occur in Deer Creek, surface-water diversions from the creek can be made at check structures along the southern boundary of the refuge. This has occurred only twice since the early 1980s and is not considered a reliable water supply.

TABLE II-2
Water Supply Requirements for Pixley NWR

Month	Level 2 Needs[a,b] (ac-ft)	Level 4 Needs[a] (ac-ft)
January	500	250
February	600	250
March	100	0
April	80	400
May	0	650
June	0	350
July	0	350
August	0	600
September	0	800
October	0	950
November	0	700
December	0	700
Total	**1,280**	**6,000**
Conveyance Losses	0	900[c]
Total Amount to be Diverted	1,280	6,900

[a]USBR. 1989a. *Report on Refuge Water Supply Investigations*. March.
[b]Estimated amounts, flood flows not measured.
[c]Conveyance loss on CVP water is assumed to be 15 percent. Conveyance losses will vary by alternative depending on the use of groundwater
Note:
May 2001 memo to the USBR.

Chapter III
Description of Alternatives

Introduction

This section provides additional background information on alternatives development and identifies alternative conveyance methods for providing firm refuge water supplies to the Kern and Pixley NWRs, including the alternative of No Action. The preferred alternative for each refuge and selection process is identified in the refuge-specific alternative descriptions below.

Alternatives Development and Screening Criteria

Alternative means of providing Level 2 and Level 4 supplies have been considered. The initial consideration of alternatives was based, in part, on the previous studies completed by the USBR regarding refuge water supply. Four primary investigations were considered in the initial development of the following alternatives:

- *Report on Refuge Water Supply Investigations, Central Valley Hydrologic Basin, California*, 1989
- *San Joaquin Basin Action Plan/Kesterson Mitigation Action Plan Report*, 1989
- *Refuge Water Supply Study, Plan Coordination Team Interim Report*, 1992
- *Refuge Water Supply, Proposed Plan of Study Report*, 1993

In addition to the recommendations presented in these investigations, the study team considered additional alternatives. The alternatives that were considered during this effort included various means of providing Level 2 and Level 4 supplies, including conjunctive use of groundwater resources and alternative conveyance routing options.

Following the development of the preliminary alternatives for each refuge, an initial screening process was employed. This initial screening process was used to eliminate from further consideration any alternatives that had fatal flaws, resulting from excessive costs, unreasonable engineering requirements, or unacceptable environmental impacts. Following initial screening of the alternatives, the remaining alternatives were further developed.

The process used to determine feasibility and the results of these investigations are presented in the April 1995 *Decision Document Report of Recommended Alternatives Refuge Water Supply and San Joaquin Basin Action Plan Lands*. In addition, the USBR and the USFWS further refined the alternatives selected in the Decision Document in a May 1995 document titled *Refuge Water Supply Conveyance Alternatives Refinement Memorandum*. This process included discussions with each of the potential water purveyors to verify system constraints and necessary improvements.

This EA/IS analyzes alternatives that were determined feasible as presented in the *Memorandum*. Primary screening criteria used to determine feasibility included the following:

- Cost
- Reliability of water supply
- Environmental constraints
- Social/institutional constraints

In addition, selections were predicated on ensuring a broad, reasonable range of alternatives to carry through the NEPA/CEQA process. This EA/IS evaluates the potential environmental impacts of implementing any of the proposed alternatives to each refuge, in addition to discussing the anticipated social and institutional constraints.

Public Involvement and Scoping

Public involvement meetings were held with interested parties for refuge water supplies, including meetings in Tulare (June 5, 1995) and Santa Nella (June 6, 1995) that specifically addressed the Kern and Pixley NWRs. A key

objective of these meetings was to review the alternatives being considered for the investigation, receive input and comments on these alternatives, and solicit additional alternatives for consideration.

The primary issues raised included the following:

- Clear descriptions of Level 2 water and Level 4 water quantities
- Impacts to land use from taking of property and disruption of farming activities
- Endangered species concerns related to increased species populations
- Water delivery timing
- Anticipated source of water supplies
- Third-party impacts resulting from water transfers/land retirement
- Concern regarding groundwater overdraft, particularly in the South San Joaquin Valley given existing groundwater overdraft
- Cost savings associated with using existing water systems versus new conveyance systems
- Appropriateness of using CVP power for refuge uses

Additional comments beyond the scope of this environmental document included questions about project funding and agreements and terms with water districts in the vicinity of each refuge. While these issues are not analyzed in this document, they are key issues in determining a recommended alternative for each refuge and were used in the selection process.

Recommended Alternatives

Following the selection of a reasonable range of alternatives to be carried forward for detailed evaluation, additional screening took place to select a preferred alternative for each refuge. The selection of a recommended alternative for each refuge area was based on input from the USBR, USFWS, and CDFG staff, including staff from the refuges. In order to document the selection process, it was determined that a number of factors should be identified, which could be used across refuge areas and weighted according to their relative importance. The following six factors were identified (the proportionate weighting factor is indicated in parenthesis) as best capturing the primary issues:

- Water supply reliability (30)
- Water quality (15)
- Environmental issues (20)
- Cost effectiveness (20)
- Implementation (10)
- Engineering (5)

Using these six factors and weighting approach, matrices were created to rank each of the alternatives addressed in detail in this EA/IS. The recommended alternative was the alternative that received the highest overall score. A summary of the alternative selection process is described below. A full description of each alternative, including No-Action, follows this discussion. See Appendix A for additional information on the alternatives screening process.

The following two alternatives for providing Level 2 and Level 4 supplies to the Kern NWR were carried forward for detailed analysis:

- KER-1A/1B. Use existing Buena Vista facilities; improve West Side Canal and use existing Main Drain Canal as a supplemental conveyance facility.
- KER-7. Use existing Lost Hills Irrigation District facilities and clean Burhan Canal to reduce water losses.

The KER-1A/1B alternative was selected as the recommended alternative and ranked higher than KER-7 in all categories except water quality because of the greater potential for interaction with agricultural return flows. Comparisons across factors were close, including capital cost. The greatest differential was within the environmental category, where KER-1A/1B was ranked higher because of fewer construction impacts and fewer resultant impacts.

The following four alternatives for providing Level 2 and Level 4 supplies to the Pixley NWR were carried forward for detailed analysis:

- PIX-2B ! New pipeline from Friant-Kern Canal to refuge
- PIX-4B ! Delano-Earlimart Irrigation District (DEID) facilities plus new pipeline to refuge
- PIX-8 ! Conjunctive use program with new on-refuge ground water wells, in lieu recharge with the PID
- PIX-9 ! New pipeline similar to PIX-2B, upsized to include lands in the PID

The PIX-4B alternative was selected as the recommended alternative because of its cost-effectiveness, water supply reliability and water quality ranking. PIX 2B and PIX-9 were ranked lower but were viewed as close in most categories except cost, where PIX-9 was determined to be the most costly. While PIX-8 was the least capital-intensive alternative, it was ranked lowest based on a number of factors, including groundwater management concerns and difficult implementation issues.

No-Action Alternative

Implementation of the No-Action Alternative would result in no additional firm supplies for the two refuge areas. Each refuge would continue to receive deliveries through the existing delivery systems according to existing agreements. These supplies would not be firm in many cases and would not exceed Level 2 supplies.

The No-Action Alternative incorporates ongoing activities, projects, and the operation and maintenance of projects that would continue regardless of the proposed actions. In terms of related future actions, this document is based on the assumptions developed in the preparation of the CVPIA PEIS. Therefore, this alternative incorporates anticipated development and conditions in 2020. This year was selected to provide a reasonable basis from which to compare alternatives. It is assumed that by 2020 CVP and SWP supplies will be essentially fully used because of urban growth and continued agricultural demands. Other key overall assumptions that are a part of the No-Action Alternative for the CVPIA PEIS include the following:

- Existing CVP and SWP project features and management policies (such as 1992 CVP Long-term Operating Criteria and Plan) as of October 1, 1995, remain in effect
- CVPIA implementation programs existing as of October 1, 1995, would continue
- Long-term biological opinion for winter-run Chinook salmon, and the 1995 biological opinion for Delta smelt would be met by the CVP and SWP in compliance with the federal and state Endangered Species Acts (ESA)
- Use of existing CVP and SWP facilities would continue in accordance with the Coordinated Operations Agreement between the USBR and the Department of Water Resources
- May 1995 Bay-Delta Water Quality Control Plan standards would be met

Conveyance Alternatives Screening for Kern NWR

The results of the alternatives screening process for the Kern NWR are presented in Table III-1. Alternatives determined to be feasible, as presented in the Memorandum, are highlighted in bold.

This section describes the two feasible alternatives for providing a reliable water supply for the Kern NWR (Figure III-1). Conveyance facilities that would be needed on-refuge are not included. Facility sizing was based on the design criteria presented in previous documents and on the Level 4 design flow.

Table III-1
Results of Alternative Screening Process for Kern NWR

Alternative	Selection (Y/N)	Reason for Selection/Elimination	Potential Issues/Conflicts (Selected Alternatives Only)
KER-1A/1B	**Y**	**Feasible Alternative – Provides for reasonable range of alternatives. Enlarge an existing canal. Modify and replace hydraulic structures.**	**Impacts to wildlife/habitat from enlarging an existing canal.**
KER-3 (SWSD Intake Canal/Goose Lake Storage Project	N	Goose Lake Project has met with significant opposition, including the U.S. Army Corps of Engineers (USACE). Potential for perched water table impacts.	N/A
KER-4 (SWSD Intake Canal/Pond-Poso Canal/Poso Creek)	N	A 61-mile conveyance route through Poso Creek with potentially high water losses.	N/A
KER-5	N	High losses expected within Poso Creek, also concerns about water availability.	N/A
KER-6 (Groundwater Banking/Poso Creek)	N	A 61-mile conveyance route through Poso Creek with potentially high water losses.	N/A
KER-7	**Y**	**Feasible Alternative – Provides for reasonable range of alternatives. Use existing pipeline and canal; canal may be decreased in size and/or relined with concrete.**	**Conveyance losses associated with use of unlined canals, and impacts to wildlife/habitat from disturbing or relining existing canals.**

KER-1A/1B – Existing Canal Improvements

Under the KER-1A/1B alternative, water would be diverted from the California Aqueduct at Buena Vista's Turnout 1B (or potentially Turnouts 2 or 6) and conveyed through an existing pipeline (BVWSD Pipeline) to the West Side Canal. The Main Drain Canal will be used for supplementary conveyance purposes. Water from either the West Side Canal (via the Cross Canal) or the Main Drain Canal would be discharged into the Goose Lake Canal for ultimate delivery to the refuge's turnout structure.

The maximum future delivery flow-rate to the Kern NWR is estimated to be approximately 80 cfs. This maximum flow is based on providing 2,500 ac-ft in August, over a 15-day period, as needed to avoid conflicts with Buena Vista's normal irrigation operations.

The West Side Canal's existing capacity is approximately 30 cfs, while the projected peak delivery rate to the refuge is 90 cfs (includes 10 cfs to account for conveyance losses in the canal). Improvements to the West Side Canal are necessary so that it can be used as the primary conveyance system. Improvements will include adding a new takeout structure, modification of a check structure, replacement of two culverts, and 2 miles of canal enlargement.

A new takeout structure will be constructed to deliver water from the BVWSD pipeline to the downstream side of a check structure in the West Side Canal. This takeout will be installed in addition to the existing takeout that currently conveys water to the upstream side of the check structure. This check structure, which is located near the existing BVWSD Pipeline, will be modified to allow water to be checked up on the upstream and downstream side. The culverts to be replaced are located at the beginning and the end of the Cross Canal and will each consist of two 48-inch pipes. The entire length of the Cross. Canal will be enlarged and regraded, consisting of widening the canal prism by 4 feet and lowering the invert by 6 inches to 1 foot.

N

0 5,000 10,000 20,000 FT

SCALE IS APPROXIMATE

POSO CREEK

INTERSTATE 5

KER-1A/1B
BVWSD MAIN DRAIN CANAL

KER-1A/1B
BVWSD GOOSE LAKE CANAL

KERN NWR

DELIVERY POINT

KER-1A/1B
BVWSD CROSS CANAL

KER-7
LHID BURHAN CANAL

KER-1A/1B
BVWSD WEST SIDE CANAL

KER-1A/1B
BVWSD PIPELINE

CALIFORNIA AQUEDUCT

BVWSD
TURNOUT 1B

KER-7
LHID LATERAL 6-1

FIGURE III-1
KERN NWR
PROPOSED ALTERNATIVES
U.S. BUREAU OF RECLAMATION
SOUTH SAN JOAQUIN VALLEY, CALIFORNIA

W032003012RDD_06a (8/5/03)

Most of the excavation will likely take place on the south side of the Cross Canal.

Once these modifications to KER-1A/1B have been completed, the West Side Canal will serve as the primary conveyor for Kern NWR. However, most flow deliveries during the summer irrigation period would likely be made from the Main Drain Canal because it will be conveying water already.

Seepage from the West Side Canal could increase when duration and magnitude of flows are increased after canal improvements are implemented. However, in recent years, much of the land adjacent to the West Side Canal is no longer used for regular irrigation purposes.

In addition, this alternative assumes that a long-term agreement will be in place to convey refuge water supplies through Buena Vista's facilities. Facilities needed for this alternative are presented in Table III-2.

Table III-2
Proposed Facilities for Alternative KER-1A/1B

Item	Description
1	New Takeout Structure from BV-1B turnout pipeline
2	Modify existing check structure
3	Replace two culvert structures • Capacity: 90 cfs
4	Enlarge and regrade Cross Canal • Length: 2 miles

KER-7 ! Existing Canal Improvements

This alternative would use existing Lost Hills Irrigation District facilities to deliver water from the California Aqueduct to the Kern NWR. Water diverted from the California Aqueduct would be conveyed through an existing pipeline to a canal that runs past the southwest corner of the refuge. A new pump station would transfer the water into the Burhan Canal, which parallels the southern edge of the refuge, for conveyance to the Goose Lake Canal. From the Goose Lake Canal, the water would be distributed to the refuge lands.

Based on estimated evaporation and seepage losses of 25 percent, 112 cfs would be diverted from the California Aqueduct, providing 89 cfs of delivery to the refuge. Actual losses will need to be determined for the canal alignments. Ownership of the Burhan Canal has not been established at this time. The grade, capacity, and condition of the canal are not known. Portions of the canal viewed during the field visit contained heavy vegetation in and along the canal. Approximately 90 percent of the vegetation loss would be salt cedar (tamarisk), which is an exotic tree (USFWS, 1996).

In addition, this alternative assumes that a long-term agreement will be in place to convey refuge water supplies through Buena Vista's facilities. Facilities required for this alternative are presented in Table III-3.

Table III-3
Proposed Facilities for Alternative KER-7

Item	Description
1	Pump Station at Canal Transfer Point • Total dynamic head: 10 feet • Design flow: 89 cfs • Horsepower: 135

Conveyance Alternatives Screening for Pixley NWR

The alternatives screening process results for Pixley NWR are presented in Table III-4. Alternatives determined to be feasible as presented in the Memorandum are highlighted in bold.

This section describes the four proposed alternatives for developing an increased, reliable water supply for the Pixley NWR (Figure III-2). Conveyance facilities that would be needed on-refuge are not included. Facility sizing was based on the design criteria presented in previous documents and on the Level 4 design flow, and on the results of cursory groundwater modeling of the area.

Table III-4
Results of Alternative Screening Process for Pixley NWR

Alternative	Selection (Y/N)	Reason for Selection/Elimination	Potential Issues/Conflicts (Selected Alternatives Only)
PIX-1 (FKC/Deer Creek)	N	A 17-mile conveyance route using Deer Creek with potentially high water losses.	N/A
PIX-2A (FKC/concrete canal)	N	Concerns over encumbrance of agricultural land; vineyards present to the east.	N/A
PIX-2B	**Y**	**Feasible Alternative – Provides for reasonable range of alternatives. "Nonmechanical" conveyance alternative.**	**Temporary impacts to agricultural operations/loss of production.**
PIX-2C (FKC/pressure pipeline)	N	Most costly of the parallel system alternatives (PIX-2A, PIX-2B, and PIX-2C); considered less reliable than PIX-2B (gravity pipeline along the same alignment).	N/A
PIX-3 (new wells on Pixley NWR/recharge in Deer Creek from FKC)	N	Water quality concerns, expected losses through Deer Creek.	N/A
PIX-4A (New wells and recharge basins on Pixley NWR/DEID pipeline to recharge)	N	Limited capacity of DEID facilities; large capital costs.	N/A
PIX-4B	**Y**	**Feasible Alternative – Provides for reasonable range of alternatives. Brought back per discussions with DEID and the USFWS.**	**Temporary impacts to agricultural operations/loss of production.**
PIX-5A (FKC/Deer Creek/DEID pipeline)	N	A 17-mile conveyance route using Deer Creek with potentially high water losses.	N/A
PIX-5B (Same as PIX-5A/new wells on Pixley NWR)	N	Water quality and reliability concerns	N/A
PIX-6 (Same as PIX-3/PID-sponsored conservation program)	N	Water quality and reliability were determined to be potential issues; cost is undefined. Difficult to quantify benefits.	N/A
PIX-7 (Water banking program/Deer Creek)	N	Similar concerns as PIX-6 in addition to expected losses within Deer Creek during conveyance to the refuge.	N/A
PIX-8	**Y**	**Feasible Alternative – Provides for reasonable range of alternatives. In lieu of groundwater exchange between PID and Pixley NWR.**	**Water quality and water levels associated with new groundwater wells.**
PIX-9	**Y**	**Feasible Alternative – Provides for reasonable range of alternatives. Brought back per discussions with PID and the USFWS.**	**Temporary impacts to agricultural operations/loss of production.**

N

0 5,000 10,000 20,000 FT

SCALE IS APPROXIMATE

HIGHWAY 99

PIXLEY NWR

DEER CREEK

PIX-9
GRAVITY PIPELINE

PIX-2B, 4B, -9
GRAVITY PIPELINE

PIX-2B
GRAVITY PIPELINE

PIX-8 GROUNDWATER
EXTRACTION WELLS

PIX-2B, 4B, 9
PROPOSED PIPELINE
DISCHARGE POINT

PIX-4B
GRAVITY PIPELINE

PIX-4B
GRAVITY PIPELINE

PIX-4B
EXISTING DEID LATERAL 111.6W

ATCHISON-TOPEKA-
SANTA FE RAILROAD

SOUTHERN PACIFIC RAILROAD

FRIANT-KERN CANAL

FIGURE III-2
PIXLEY NWR
PROPOSED ALTERNATIVES
U. S. BUREAU OF RECLAMATION
SOUTH SAN JOAQUIN VALLEY, CALIFORNIA

W032003012RDD_08A (SSJ) (8/1/03)

PIX-2B ! Gravity Pipeline

This alternative would divert water from the Friant-Kern Canal and convey water through a proposed 67,000-foot gravity pipeline to the center of the Pixley NWR's southern boundary. Design flow for the pipeline would be 14 cfs, and the pipeline diameter would be 27 inches. In addition, this alternative assumes that a long-term agreement will be in place to convey water through the Friant-Kern Canal. Facilities required for this alternative are presented in Table III-5. A layout of the pipeline alignment is presented on Figure III-2.

Table III-5
Proposed Facilities for Alternative PIX-2B

Item	Description
1	Turnout Structure, Friant-Kern Canal into Pipeline • Design flow: 14 cfs
2	Gravity RCP Pipeline • Length: 67,000 linear feet • Diameter: 27 inches • Design flow: 14 cfs
3	Pipeline Crossings – Bore-and-Jack • Highway 99 • Southern Pacific Railroad
4	Pipeline Crossings – Trenching • Ten local road crossings

PIX-4B ! New Pipeline and Existing Facilities

This alternative conveys water diverted from the Friant-Kern Canal to the refuge via DEID Lateral 111.6W and a new gravity pipeline. It should be noted that Lateral 111.6W is a buried pipeline not an open canal. This new 30-inch-diameter pipeline would be approximately 55,000 feet long and would be designed to carry up to 16 cfs. The connection to Lateral 111.6W would be north of the lateral between Road 160 and Deer Creek Road. Existing deliveries along Lateral 111.6W would not be affected. The pipeline would be designed and located to deliver water from August through May, to the NWR to meet fluctuating seasonal water demands. A new well would be needed to provide required flows during the months of June and July. The capacity of the diversion of the Friant-Kern Canal into Lateral 111.6W would need to be increased by approximately 16 cfs. In addition, this alternative assumes that a long-term agreement will be in place to convey refuge water supplies through DEID facilities. Facilities required for this alternative presented in Table III-6.

Table III-6
Proposed Facilities for Alternative PIX-4B

Item	Description
1	Gravity RCP Pipeline • Length: 55,000 linear feet • Diameter: 30 inches • Design flow: 16 cfs
2	Pipeline Crossings – Bore-and-Jack • Highway 99 • Southern Pacific Railroad
3	Pipeline Crossings – Trenching • Eight local road crossing • Deer Creek (siphon)
4	Extraction Well • Depth 1,200 feet • Design withdrawal: 1,600 gpm

PIX-8 ! Six New Groundwater Wells

This alternative was developed during discussions with personnel from Pixley NWR and PID. It would involve an in-lieu groundwater exchange between PID and the Pixley NWR. Currently, some members of the district pump from the deep aquifer to irrigate their lands. Under the exchange proposal, these members would decrease their annual pumping by 6,000 ac-ft and receive an equivalent amount of surface water from the Friant-Kern Canal through existing district facilities. This 6,000 ac-ft of surface water would be the water normally purchased to supply the refuge.

Six new deep aquifer groundwater wells would be installed on the refuge and used to provide the full Level 4 demand of 6,000 ac-ft. The net change in annual withdrawals from the deep aquifer would be zero. Facilities required for this alternative are presented in Table III-7.

Table III-7 Proposed Facilities for Alternative PIX-8	
Item	**Description**
1	Extraction Wells • Number: Six • Depth: 1,200 feet • Depth to groundwater: 250 feet • Design withdrawal: 1,000 gpm each • Casing diameter: 16 inches • Pumps: 6 total, 150 horsepower each
2	Well Field Transmission Pipelines • Length: 21,000 feet • Diameter: 10 to 18 inch • Design Flow: 1.75 to 7 cfs

PIX-9 ! Gravity Pipeline

This alternative was developed during discussions with PID staff. This alternative is similar to PIX-2B in that it would use a new gravity flow pipeline to convey water from the Friant-Kern Canal to the refuge. However, the pipeline would be sized and routed to supply both the Pixley NWR and the southern portion of the PID service area. An agreement for shared funding of the pipeline would be developed. The percentage of flow capacity in the pipeline dedicated to each of the two uses could be the basis for cost-sharing. Because the pipeline would be owned and maintained by PID, this alternative assumes that a long-term agreement will be in place to convey refuge water supplies through PID facilities. Facilities required for this alternative are presented in Table III-8.

Table III-8 Proposed Facilities for Alternative PIX-9	
Item	**Description**
1	Turnout Structure, FKC into Pipeline • Design flow: 24 to 64 cfs
2	Gravity RCP Pipeline • Length: 66,000 feet • Diameter: 36 to 48 inch • Design flow: 24 to 64 cfs
3	Pipeline Crossings – Bore-and-Jack • Highway 99 • Southern Pacific Railroad
4	Pipeline Crossings – Trenching • 10 local road crossings: 400 feet

Mitigation Included in the Alternatives

Table III-9 summarizes all anticipated impacts and recommended mitigation for the construction of the conveyance alternatives to each refuge area. As indicated in the table, implementation of the recommended mitigation will result in all impacts being less than significant. Impacts and mitigation associated with each of the issue areas, such as Biological Resources, are further discussed in Chapter IV, Affected Environment and Environmental Consequences.

Alternatives Considered but Eliminated from Detailed Study

As described previously in the Screening Criteria section, USBR investigated a number of alternatives capable of delivering additional water supplies to each of the refuges. These alternatives are presented in Tables III-1 and III-4, with a brief representation of the selected alternatives. Alternatives, which were determined to be infeasible based on the screening criteria, included variations of the selected alternatives, and incorporated pipelines, canals, pump stations, and other facilities. A full account of the selection process and identification of eliminated alternatives is available in the April 1995 Decision Document.

Table III-9
Summary of Project Impacts and Mitigation Measures

Impact		Mitigation		Level of Significance After Mitigation
Land Use				
LU-a	Alternatives PIX-2B, PIX-4B, or PIX-9 could temporarily impact between 250 and 350 agricultural production acres for one season.	LU-1	Schedule construction to minimize impacts to crop production.	LS
		LU-2	Minimize workspace required to install facilities.	
		LU-3	Compensate landowners for any loss of crop production or impacts to agricultural operations.	
LU-b	Alternative PIX-2B could permanently impact residential and other structures.	LU-4	Route conveyance facilities to avoid residences and other structures.	LS
		LU-5	Compensate landowners for any loss of property.	
LU-c	Alternatives KER-7, PIX-2B, PIX-4B, and PIX-9 could impact existing residential powerlines.	LU-6	Route conveyance facilities to avoid powerlines.	LS
Biological Resources				
BR-a	Alternatives KER-1A/1B, KER-7, PIX-2B, PIX-4B, and PIX-9 could impact special-status plants.	BR-1	Conduct pre-construction surveys prior to final design to identify locations of special-status plants following the procedures outlined in *Guidelines for Assessing the Effects of Proposed Developments on Rare and Endangered Plants and Plant Communities*. Surveys must be timed to coincide with the flowering seasons of the targeted species. Following pre-construction surveys, develop measures to avoid impacts to special-status plants.	LS
		BR-2	Where avoidance of special-status plants is not practicable, develop and implement measures for mitigating impacts, including relocation or re-establishment of special-status plant populations. Mitigation would involve creating suitable habitat in non-suitable habitat by providing soil, water, and vegetation to replicate conditions needed to establish special-status species populations.	
BR-b	Alternatives PIX-2B, PIX-4B, and PIX-9 could impact 2.7 acres of riparian habitat.	BR-3	Prior to final design, map and quantify riparian habitat and other important natural plant communities. Develop measures to avoid or minimize impacts to these habitats.	LS
		BR-4	Develop and implement mitigation measures for unavoidable impacts to riparian habitat. Where possible, disturbed riparian habitat should be restored onsite following completion of construction activities. Permanently eliminated riparian habitat should be replaced at a 2:1 ratio (i.e., 2 acres of habitat created for each acre eliminated). Mitigation would involve creating riparian habitat in non-riparian habitat by providing soil, water, and vegetation.	

Notes:
LU = Land Use
BR = Biological Resources
LS = Less than Significant

Summary of Project Impacts and Mitigation Measures			
Impact		**Mitigation**	**Level of Significance After Mitigation**
Biological Resources			
BR-b continued	BR-5	Develop and implement a revegetation plan for temporarily disturbed construction sites. The revegetation plan should incorporate seeding and planting of species that will resist invasion by noxious weeds.	
	BR-6	Develop and implement a monitoring plan to assess the success of mitigation measures for impacts to vegetation and special-status species. Plantings on the revegetation and compensation sites should be monitored during the growing season (March through September) to determine growth rates for 3 years from the date of transplant or planting. A yearly report should be submitted to USFWS, including dates of watering, growth rates, cover rates, and mortality figures. Monitoring could be curtailed after 3 years if success is demonstrated. (Success is achieved when plant cover of the mitigation site is at least 80 percent of the cover at the impact site prior to project disturbance and vegetative composition of the dominant [> 20 percent of the cover] and characteristic species [typical, regularly occurring in the habitat but not dominant] exceeds 80 percent of that which was present at the impact site.) Monitoring of special-status plant mitigation sites could be curtailed after 3 years if overall survival rates of seeded, planted, or transplanted plants exceed 80 percent of projected survival rates.	
	BR-7	Pre-construction surveys should be conducted for raptors prior to the peak March through August nesting period. Construction during the critical nesting period (March through August) will be avoided; or, if nesting pairs and fledglings are identified within 0.25 mile of construction, a monitoring program will be initiated in consultation with the CDFG. If Swainson's hawks are present, site surveys will be conducted to identify nesting activity. If nests are located within 0.5 miles of the project site with a direct line of sight to the activity, CDFG will be consulted to establish proper mitigation. As stated above for other raptors, seasonal restrictions (March through August) on project activities may be appropriate.	LS

Notes:
BR = Biological Resources
LS = Less than Significant

Summary of Project Impacts and Mitigation Measures				
Impact		**Mitigation**		**Level of Significance After Mitigation**
Biological Resources				
BR-c	Alternatives KER-1A/1B, KER-7, PIX-2B, and PIX-9 could impact habitat used by San Joaquin kit fox.	BR-8	Before staging and construction, have a USFWS-approved biologist survey for dens and other kit fox sign such as scat, prey remains, and tracks. The biologist shall follow the USFWS's Standard Recommendations for Avoidance of the San Joaquin Kit Fox(1997). If any evidence of kit fox activity is found, contact the USFWS's Sacramento Fish and Wildlife Office to initiate consultation. A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the habitat types and sign listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. To avoid inadvertent entrapment of animals in holes during construction, all excavated, steep-walled holes or trenches more than 2 feet deep should be covered at the close of each working day by plywood or similar materials or provided with one or more escape ramps constructed of earth fill or wooden planks. All construction pipes, culverts, or similar structures, with a diameter of 4 inches or greater that are stored at a construction site for one or more overnight periods, should be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed daily. Restrict use of rodenticides and herbicides to prevent secondary poisoning. In the event that take cannot be avoided, contact the USFWS for information before starting the action.	LS

Notes:
BR = Biological Resources
LS = Less than Significant

Summary of Project Impacts and Mitigation Measures				
	Impact		**Mitigation**	**Level of Significance After Mitigation**
	Biological Resources			
BR-d	Alternatives KER-1A/1B, KER-7, PIX-2B, PIX-4B, and PIX-9 could impact habitat used by Tipton kangaroo rat.	BR-9	Before any ground-disturbing activities, have a USFWS-approved biologist survey for the presence of the plant associations considered habitat for the Tipton kangaroo rat. The USFWS-approved biologist must survey for the presence of Tipton kangaroo rat sign such as burrow systems, haystacks, and areas of clipped vegetation. A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers. In the event that take cannot be avoided, contact the USFWS for information before starting the action.	LS
BR-e	Alternative KER-1A/1B, KER-7, PIX-2B, PIX-4B, and PIX-9 could impact habitat used by blunt-nosed leopard lizard.	BR-10	Before staging and construction, have a USFWS-approved biologist survey for the presence of the habitat types used by this species and signs of leopard lizards such as burrows. The protocol developed by the CDFG shall be used to survey for this species. During the blunt-nosed leopard lizard's hibernation time, surveys are unreliable and cannot be used to determine absence of this species. Notice will be given to the CDFG and the USFWS 30 days before beginning construction to determine whether capture is desired.	LS

Notes:
BR = Biological Resources
LS = Less than Significant

Summary of Project Impacts and Mitigation Measures			
Impact		**Mitigation**	**Level of Significance After Mitigation**
Biological Resources			
BR-e continued		For projects from 5 to 10 acres in size (or 5 to 10 linear miles), within suitable habitat, should schedule surface disturbance activities during the active season (approximately April 15 to October 15). A USFWS-approved biologist will survey any trenches in the morning and late afternoon to remove lizards that fall into the trench. A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the habitat types and sign listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed daily. In the event that take cannot be avoided, contact the USFWS for information before starting the action.	
BR-f	Alternative KER-7 contains potential vernal pools and swales.	BR-11	If any vernal pools or vernal swales will be impacted (i.e., if construction activities will occur within 250 feet of the edge of a pool or swale), pre-construction surveys should be conducted for fairy shrimp and tadpole shrimp. During final design, avoid by 250 feet all features containing listed shrimp. Surveys should be conducted according to methods	LS

Notes:
BR = Biological Resources
LS = Less than Significant

Summary of Project Impacts and Mitigation Measures		
Impact	**Mitigation**	**Level of Significance After Mitigation**
Biological Resources		
BR-f continued	outlined in *Interim Guidelines for Surveys for the Endangered Conservancy Fairy Shrimp, Longhorn Fairy Shrimp, Riverside Fairy Shrimp, Vernal Pool Tadpole Shrimp, and the Threatened Vernal Pool Fairy Shrimp*. Stay at least 250 feet from the margin of the pool/swale edge. When conducting activities beyond 250 feet from habitat, be careful to avoid activities that will eventually result in effects to the pool/swale through changes in hydrology, sedimentation, or contamination of the habitat. Adequate fencing will be placed and maintained around any avoided (preserved) vernal pool habitat to prevent impacts from vehicles. If habitat is avoided (preserved) onsite, then a USFWS-approved biologist (monitor) will inspect any construction-related activities at the proposed project site to ensure that no unnecessary take of listed species or destruction of their habitat occurs. The biologist will have the authority to stop all activities that may result in take or destruction until appropriate corrective measures have been completed. The biologist also will be required to report immediately any unauthorized impacts to the USFWS and CDFG. All onsite construction personnel will receive instruction regarding the presence of listed species and importance of avoiding impacts to these species and their habitat. The applicant will ensure that activities that are inconsistent with the maintenance of the suitability of remaining habitat and associated onsite watershed are prohibited. This includes, but is not limited to, the following: - Alteration of existing topography or any other alteration or uses for any purposes - Use of fire protection activities not required to protect existing structures at the project site	

Notes:
BR = Biological Resources
LS = Less than Significant

Summary of Project Impacts and Mitigation Measures			
Impact		**Mitigation**	**Level of Significance After Mitigation**
Biological Resources			
BR-f continued		- Use of pesticides or other toxic chemicals, including the exploration for or development of mineral extraction Placement of any new structures on these parcels - Dumping, burning, and/or burying of rubbish, garbage, or any other wastes or fill materials - Building of any new roads or trails - Killing, removal, alteration, or replacement of any existing native vegetation - Placement of stormwater drains In the event that take cannot be avoided, contact the USFWS for information before starting the action.	
		BR-12 A monitoring plan should be developed and implemented to assess the success of mitigation measures for impacts to special-status wildlife. Success criteria should be clearly defined for all measures implemented to mitigate for project impacts to wildlife. Yearly reports should be submitted to the USFWS and the CDFG. If success criteria are being met after 3 years of monitoring, no additional monitoring is necessary.	
BR-g	Alternatives KER-1A/1B, KER-7, PIX-2B, PIX-4B, and PIX-9 could impact habitat used by Buena Vista Lake shrew.	BR-13 Before any ground-disturbing activities, have a USFWS-approved biologist survey for the presence of the wetland plant associations considered habitat for the Buena Vista Lake shrew. Avoid areas in, or adjacent to, the Kern Lake Preserve. A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat.	LS

Notes:
BR = Biological Resources
LS = Less than Significant

Summary of Project Impacts and Mitigation Measures		
Impact	**Mitigation**	**Level of Significance After Mitigation**
Biological Resources		
BR-g continued	No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed daily. In the event that take cannot be avoided, contact the USFWS for information before starting the action.	
BR-h KER-7, PIX-2B, PIX-4B, and PIX-9 could impact between 2.4 to 8.2 acres of jurisdictional wetland.	BR-14 Pre-construction delineations should be conducted of wetlands and other waters of the U.S. Request a verification of the delineated boundaries from the USACE. Following verification of the delineation boundaries, measures to avoid impacts to jurisdictional wetlands should be developed. BR-15 After final design, impacts to wetlands and other waters should be quantified. Submit to USACE a permit application for discharge of fill material into waters of the U.S., following Section 404 of the Clean Water Act. BR-16 Install and maintain appropriate erosion and sedimentation controls during and following construction as specified in the required Erosion Control Plan (see Hydrology and Water Quality section). BR-17 A streambed alteration agreement with the CDFG should be obtained, following Section 1601 of the Fish and Game Code, before initiating construction within the 100-year floodplain of any stream crossing. BR-18 Develop and implement mitigation plans for impacts to wetlands. Eliminated wetlands should be replaced at a 2:1 ratio. Temporarily impacted wetlands should be restored onsite. Stockpile topsoil removed from wetlands and store in upland landscape positions. Following construction disturbance, restore the land surface contours and backfill the top 6 to 12 inches with stockpiled topsoil.	LS

Notes:
BR = Biological Resources
LS = Less than Significant

Summary of Project Impacts and Mitigation Measures		
Impact	**Mitigation**	**Level of Significance After Mitigation**
Biological Resources		
BR-h continued	BR-19 Following project completion, monitor the site to assess mitigation success. Success criteria should be clearly defined for all measures implemented to mitigate for project impacts to wetlands. Yearly reports should be submitted to the USFWS and the USACE. If success criteria are being met after 3 years of monitoring, no additional monitoring is necessary.	
Cultural Resources		
CR-a Alternative KER-7 could impact a prehistoric site.	CR-1 Restrict KER-7 construction activities in the area of CA-KER-2100 to the existing canal alignment and restrict the movement of equipment to the south levee in this area. As the south levee has by far the better road surface, this should not impose a burden on the construction crew.	LS
CR-b Alternatives PIX-2B, PIX-4B, and PIX-9 could impact adjacent historical residences.	CR-2 Avoid the three historical structures near the PIX-2B, PIX-4B, and PIX-9 alignments. If avoidance of impact to any of these structures is not feasible, then additional historical research should be conducted to determine significance and develop a suitable plan for mitigation of adverse effect, if necessary.	LS
Hydrology and Water Quality		
HWQ-a Alternatives KER-1A/1B, KER-7, PIX-2B, PIX-4B, and PIX-9 would temporarily impact surface water quality.	HWQ-1 Schedule construction within the banks of all streams during the dry season. HWQ-2 Develop and implement an Erosion and Sediment Control and Storm Water Pollution Prevention plan that identifies methods to minimize sedimentation during construction.	LS
Recreation		
	No mitigation is required.	
Socioeconomics		
	No mitigation is required.	
Energy		
	No mitigation is required.	

Notes:

BR = Biological Resources
CR = Cultural Resources
LS = Less than Significant
HWQ = Hydrology and Water Quality

Summary of Project Impacts and Mitigation Measures				
Impact		**Mitigation**		**Level of Significance After Mitigation**
Air Quality				
AQ-a	Alternatives KER-1A/1B, PIX-2B, PIX-4B, PIX-8, and PIX-9 would temporarily impact air quality.	AQ-1	All active construction areas will be watered daily as necessary.	LS
		AQ-2	Dust producing activities will be suspended when high winds create construction-induced visible dust plumes moving beyond the site in spite of dust control measures.	
		AQ-3	All trucks hauling soil and other loose material will be covered.	
		AQ-4	Soil stabilizers, such as paving, watering, or the application of gravel, will be applied to all unpaved access roads and staging areas at construction sites.	
		AQ-5	Streets will be swept, as necessary, if visible soil material is carried onto adjacent public streets.	
		AQ-6	Stockpiles will be covered or applied with a soil stabilizer when necessary.	
		AQ7	Traffic speeds will be limited to 15 miles per hour on unpaved roads.	

Notes:

AQ = Air Quality

LS = Less than Significant

Required Permits and Approvals

Construction of either of the preferred alternatives is subject to review and approval by several other agencies, and is described as follows:

- USACE. Construction of the PIX-4B alternative is expected to require a Nationwide Permit in accordance with Section 404 of the federal Clean Water Act. This requirement is associated with construction activities within jurisdictional waters of the U.S. (e.g., Deer Creek). A permit under Section 404 of the Clean Water Act is not expected be required for the KER-1A/1B alternative.
- Regional Water Quality Control Board (RWQCB). In accordance with an existing statewide permit, construction of both the PIX-4B and KER-1A/1B alternatives will require that Stormwater Pollution Prevention Plans be developed prior to the start of construction. In addition, any required Nationwide Permit under Section 404 of the Clean Water Act will also require consultation with the RWQCB.
- CDFG. Construction of the PIX-4B alternative is expected to require a Streambed Alteration Agreement for the crossing of Deer Creek in accordance with Section 1601 of the California Fish and Game Code. A permit under Section 1601 is not expected to be required for the KER-1A/1B alternative.
- USFWS. A Biological Opinion was issued for construction of refuge water supply conveyance facilities on June 28, 1999. In accordance with the requirements of the Biological Opinion, detailed accounting of site-specific impacts will be provided to the

USFWS during the final engineering design effort.

- State Historic Preservation Officer. The State Historic Preservation Office issued a letter on September 3, 1997 concurring that USBR has satisfied its requirements under Section 106 of the National Historic Preservation Act. No further action is required.

Chapter IV
Affected Environment and Environmental Consequences

This chapter describes the environmental conditions that may be affected by the construction of any of the conveyance alternatives for the two refuge areas. All mitigation is incorporated into each of the alternatives. The criteria for determining significance are presented for each issue area and are based on guidance from the NEPA Regulations, CEQA Guidelines, and professional judgment. The scoping process determined the following issue areas warranted analysis:

- Land Use
- Biological Resources
- Cultural Resources
- Hydrology/Water Quality
- Recreation
- Socioeconomics
- Energy
- Air Quality

Other issues typically discussed in a NEPA/ CEQA document, such as geology, aesthetics, and public health and safety, are either discussed as part of other issue area analyses, or, in the case of geology, are determined to be unaffected by the proposed actions.

Typical Construction and Operations/Maintenance Impacts

Construction impacts would vary for each of the conveyance alternatives depending on the type of facility used to convey water. Alternatives that incorporate new conveyance facilities would typically involve some degree of clearing, excavating, and grading along a linear corridor. Impacts associated with turnout structures, siphons, weirs, or pumps would be limited and site-specific in nature. Impacts resulting from operations and maintenance would also depend on the facility constructed. The typical impacts associated with the various facilities required among the alternatives are described in the following sections. The particular facilities proposed for each alternative are presented in Table IV-1. Figures IV-1 and IV-2 illustrate the areas of construction associated with each alternative by refuge.

Table IV-1
Construction and Operations and Maintenance
Impacts for Proposed Facilities

Alternative	Pipeline (distance in feet)	Pump	Install Groundwater Wells	Improve Existing Canal	Turnout Structure, Siphon, and/or Weir
Kern NWR					
KER-1A/1B				X	X
KER-7		X		X	X
Pixley NWR					
PIX-2B	X (67,000)				X
PIX-4B	X (55,000)		X		X
PIX-8			X		
PIX-9	X (66,000)				X

N

0 5,000 10,000 20,000 FT

SCALE IS APPROXIMATE

KER-1A/1B
REPLACE
CULVERT

KER-1A/1B
BVWSD MAIN DRAIN

KER-1A/1B
BVWSD GOOSE LAKE CANAL

KER-1A/1B
INSTALL NEW
TAKE OUT STRUCTURE
ON BVWSD PIPELINE

KERN NWR

DELIVERY POINT

KER-1A/1B
BVWSD CROSS CANAL

KER-1A/1B
MODIFY CHECK
STRUCTURE

KER-1A/1B
BVWSD PIPELINE

KER-7
LHID BURHAN CANAL

KER-1A/1B
BVWSD WEST SIDE CANAL

KER-1A/1B
ENLARGE
CANAL

KER-1A/1B
REPLACE
CULVERT

KER-7
INSTALL
PUMP STATION

CALIFORNIA AQUEDUCT

BVWSD
TURNOUT 1B

KER-7
LHID LATERAL 6-1

INTERSTATE 5

FIGURE IV-1
KERN NWR
CONSTRUCTION
AREAS BY ALTERNATIVE
U. S. BUREAU OF RECLAMATION
SOUTH SAN JOAQUIN VALLEY, CALIFORNIA

W032003012RDD_16 (5/12/03)

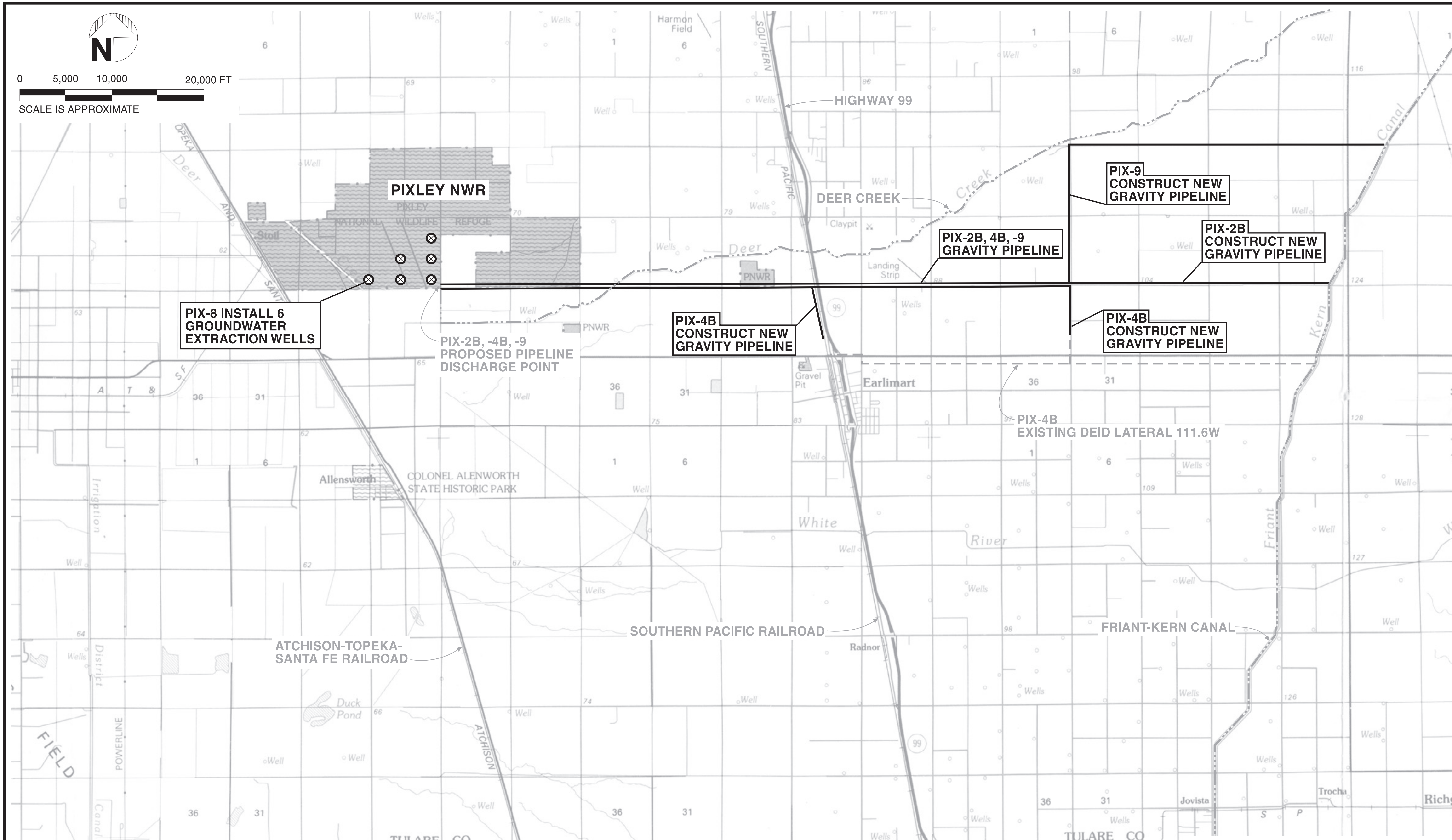
N
0 5,000 10,000 20,000 FT
SCALE IS APPROXIMATE
PIXLEY NWR
HIGHWAY 99
DEER CREEK
PIX-9
CONSTRUCT NEW
GRAVITY PIPELINE
PIX-2B, 4B, -9
GRAVITY PIPELINE
PIX-2B
CONSTRUCT NEW
GRAVITY PIPELINE
PIX-8 INSTALL 6
GROUNDWATER
EXTRACTION WELLS
PIX-2B, -4B, -9
PROPOSED PIPELINE
DISCHARGE POINT
PIX-4B
CONSTRUCT NEW
GRAVITY PIPELINE
PIX-4B
CONSTRUCT NEW
GRAVITY PIPELINE
Earlimart
PIX-4B
EXISTING DEID LATERAL 111.6W
Allensworth
COLONEL ALENWORTH
STATE HISTORIC PARK
White River
SOUTHERN PACIFIC RAILROAD
FRIANT-KERN CANAL
ATCHISON-TOPEKA-
SANTA FE RAILROAD
Radnor
Duck Pond
Jovista
TULARE CO
KERN CO
Duck Ponds

FIGURE IV-2
PIXLEY NWR
CONSTRUCTION
AREAS BY ALTERNATIVE
U. S. BUREAU OF RECLAMATION
SOUTH SAN JOAQUIN VALLEY, CALIFORNIA

W032003012RDD_18 (SSJ) (8/1/03)

CH2M HILL

Pipeline

Impacts for the construction of an underground pipeline would tend to be short term because vegetation, other than large trees, would be either re-seeded or allowed to naturally reestablish within the impacted area. The anticipated width of impact for pipeline installation ranges from approximately 150 to 200 feet. Clearing and grading would typically be limited because of the flat terrain and absence of trees. Large creek crossings, canals, and roads would likely be accomplished by boring or installing siphons. Although this technique requires excavation on either side of the feature and subsequently a greater right-of-way width than the open-cut method, impacts to stream habitats, road and rail traffic, and water conveyance would be minimized. Minor road, creek, and canal crossings would be installed by open trenching across the feature. Installation of a pipeline within a roadway would require pavement cutting if the road were paved or simply trenching if the road were unpaved. No clearing would be required.

Impacts from operations and maintenance would be limited to the unlikely need to repair the pipeline or remove a large tree from the right-of-way.

Pump

The installation of pumps to lift water from one conveyance facility to another would temporarily impact no more than approximately 0.25 acre. Impacts associated with operations and maintenance would be limited to periodic inspections and repair as necessary.

Wells

Impacts associated with the construction of wells would be primarily short term in nature and would be limited to an area no greater than 500 square feet to install the well and necessary pumps. Additional impacts would occur from the installation of ancillary pipelines (see Pipeline section) to connect the wells to the discharge points. In most cases, electric distribution lines would need to be installed to provide power to each well or group of wells. All lines required on-refuge would be placed underground according to USFWS policy. Monitoring wells would not require pipeline interconnections. Approximately 10 square feet of area would be permanently affected by each well. Long-term impacts would likely be inconsequential. Operation and maintenance impacts would be limited to routine maintenance and the unlikely need to replace a well.

Turnout Structure or Weir

New turnout structures or the enlargement of existing structures on streams and canals designated as water sources are required as part of many of the alternatives. The size and type of these structures will vary depending on the alternative, but would likely impact a small area (less than one acre) adjacent to the water source.

Impacts associated with operations and maintenance would be limited to the unlikely need to repair a structure resulting in potential impacts to water quality of the watercourse.

Land Use

Affected Environment

The Kern NWR study area is situated in northern Kern County. The Kern study area, as shown on Figure IV-1, contains a small portion of the California Aqueduct at the BVWSD Turnout 1B and portions of the BVWSD pipeline, Goose Lake Canal, BVWSD West Side Canal, BVWSD Main Drain Canal, BVWSD Cross Canal, LHID Lateral 6-1, and LHID Burhan Canal. The terrain is relatively flat and is traversed by numerous irrigation ditches and creeks. Large tracts of rangeland and lands dominated by native vegetation are also prevalent within the Kern NWR study area. Goose Lake Canal crosses through the center of the Kern NWR study area and Interstate 5, two electric transmission lines, and an underground pipeline traverse the study area in a northwest-southeasterly direction. County roads run east/west and north/south.

The Pixley NWR study area is situated in the valley floor portion of Tulare County at the southern end of the San Joaquin Valley. The Pixley study area, as shown on Figure IV-2, contains portions of Deer Creek and the Friant-Kern Canal, near DEID Lateral 111.6W, and parallels Deer Creek Avenue, Road 160, and Avenue 80 between the towns of Pixley and Earlimart. The terrain is relatively flat and is traversed by numerous irrigation ditches and creeks. State Highway 99 and the SPRR cross through the center of the Pixley NWR study area, in addition to county roads that run east/west and north/south.

Agricultural. The primary land use within the Kern NWR study area is agricultural. Kern County designates lands within the study area as Agriculture. Typical parcel minimums are 20 acres or larger. The majority of these lands are irrigated for the production of field crops. Typical crops within the region include cotton and other field crops. The primary land use within the Pixley NWR study area is agricultural. Tulare County designates lands within the study area as Rural Valley Lands. The majority of these lands are irrigated for the production of field crops. Vineyards are present within the easternmost portion of the study area.

The planting and/or harvesting schedules for hay, and orchard crops typically include the periods of February through March and September through November.

Residential/Structural. Structures within the Pixley NWR project area include residences along Deer Creek Avenue, Road 160, and Avenue 80 (PIX-2B and PIX-9 alignments) and the Dole processing plant on Road 160 (PIX-9). There are no structures in the vicinity of the Kern NWR alternative alignments.

Infrastructure. Residential powerlines are located along Deer Creek Avenue, Road 160, and Avenue 80 (PIX-2B and PIX-9 alignments) within the Pixley NWR study area. Pipelines and electric transmission lines run northwest-southeast approximately one to three miles west of the Kern NWR study area. Additionally, natural gas lines lie along, across and adjacent to, KER-1A/1B.

Environmental Consequences

Criteria for Determining Significance. Impacts to existing land use would be considered significant if they would result in any one of the following:

- Conflicts with adopted environmental plans and goals of the community where the project is located
- Encroachment on residential uses, including substantial increases in noise levels
- Conversion of prime agricultural land to non-agricultural use
- Impairment of the agricultural productivity of prime agricultural land
- Demolition of a residence or a permanent agricultural structure

Land use impacts and mitigation measures are summarized in Table IV-2.

Agricultural. Given that the majority of lands are used for agricultural purposes, land use impacts include temporary loss of production of up to 362 acres and inconvenience to farming operations. All alternatives would impact agricultural operations and crop production in the short term, depending on the time of year construction is scheduled.

The alternatives that involve construction of new pipeline facilities (PIX-2B, PIX-4B, and PIX-9) would impose a temporary short-term (one-season) impact on crop production and operations. Although production would be expected to fully recover within 1 to 3 years, this would be a significant impact. Land disturbance could also result in the spread of noxious weeds.

Impacts by alternative are as follows:

- KER-1A/1B. Improvements to existing Buena Vista Water Storage District facilities. No significant disturbance to crops.
- KER-7. Improvements to existing Lost Hills Irrigation District facilities. No significant disturbance to crops.

- PIX-2B. The PIX-2B alignment follows the length of Deer Creek Avenue (a distance of approximately 4.5 miles) and goes cross-country for approximately 8.5 miles. Installation of a pipeline along the PIX-2B alignment would create a temporary disturbance within the approximately 200-foot-wide corridor centered along Deer Creek Avenue. Crops surround the PIX-2B alignment along its entire length. Crops planted along the PIX-2B alignment include cotton, grapes, alfalfa, grain sorghum, and deciduous orchards. The temporary loss of agricultural production associated with this approximately 13-mile corridor corresponds to approximately 312 acres.
- PIX-4B. The PIX-4B alignment follows Road 160 for approximately 0.75 miles, and goes cross-country for approximately 9.75 miles. Installation of a pipeline along the PIX-4B alignment would create a temporary disturbance within the approximately 200-foot-wide corridor. Crops surround the PIX-4B alignment along most of its length. Crops planted along the PIX-4B alignment include cotton, grapes, alfalfa, and grain sorghum. The temporary loss of agricultural production associated with this approximately 10.5-mile corridor corresponds to approximately 246 acres.
- PIX-8. On-refuge improvements. No impact to land use.
- PIX-9. The PIX-9 alignment follows Avenue 80 for approximately 2.5 miles, Road 160 for approximately 2 miles, Deer Creek Avenue for approximately 3.5 miles and goes cross-country for approximately 7.5 miles. Installation of a pipeline along the PIX-9 alignment would create a temporary disturbance within the approximately 200-foot-wide corridor. Crops surround the PIX-9 alignment along its entire length. Crops planted along the PIX-9 alignment include cotton, grapes, alfalfa, and deciduous orchards. The temporary loss of agricultural production associated with this approximately 15.5-mile corridor corresponds to approximately 362 acres.

Table IV-2
Land Use Impacts and Mitigation Measures

Impact		Mitigation		Level of Significance After Mitigation
LU-a	Alignments PIX-2B, PIX-4B, or PIX-9 could temporarily impact agricultural production of 250 to 350 acres for one season.	LU-1	Schedule construction to minimize impacts to crop production and operations.	LS
		LU-2	Minimize workspace required to install facilities.	
		LU-3	Compensate landowners for any loss of crop production or impacts to agricultural operations.	
LU-b	Alignment PIX-2B could permanently impact residential and other structures.	LU-4	Route conveyance facilities to avoid residences and other structures.	LS
		LU-5	Compensate landowners for any loss of property.	
LU-c	Alignments KER-7, PIX-2B, PIX-4B, and PIX-9 could impact existing residential powerlines.	LU-6	Route conveyance facilities to avoid powerlines.	LS

Note:
LU = Land Use
LS = Less than Significant

Residential/Structural. Permanent residences and/or outbuildings are located within, or directly adjacent to, the 200-foot-wide pipeline corridors. Impacts to buildings located within this corridor would be permanent; impacts to buildings adjacent to the corridor would be temporary and limited to the construction period. Such impacts would be considered significant.

Impacts by alternative are as follows:

- KER-1A/1B. No structures present.
- KER-7. No structures present.
- PIX-2B. One residence on the south side of Deer Creek Avenue, and one on the north side. All structures are located within 50 feet of Deer Creek Avenue.
- PIX-4B. No structures present.
- PIX-8. No structures present.
- PIX-9. No structures present.

Infrastructure. Interstate 5, Highway 46, two electric transmission lines, and an underground pipeline traverse the Kern study area in a northwest-southeasterly direction. County roads (Lost Hills Road and Carmel Road) run east/west and north/south. State Highway 99 and the SPRR cross through the center of the Pixley study area. County roads (Deer Creek Avenue, Road 160, and Avenue 80) run east/west and north/south through the area.

Impacts by alternative are as follows:

- KER-1A/1B. Improvements to existing Buena Vista Water Storage District facilities; no significant disturbance to infrastructure.
- KER-7. Residential powerlines run along north side of the existing Lost Hills Water District Burhan Canal.
- PIX-2B. Residential powerlines along the entire length (approximately 4.5 miles) of Deer Creek Avenue, alternating back and forth on the north and south sides of the road.
- PIX-4B. Residential powerlines along the 0.75-mile stretch of Road 160 just south of Deer Creek Avenue that pertains to this alternative.
- PIX-8. On-refuge improvement.
- PIX-9. Residential powerlines along the entire length (approximately 4.5 miles) of the alignment (2.5 miles along Avenue 80 and 2.0 miles cross-country), alternating back and forth on the north and south sides of the road.

Residential powerpoles in the Pixley NWR study area may need to be relocated on occasion. The potential presence of underground utilities in both the Kern and Pixley study areas will be investigated prior to the commencement of construction.

Mitigation

The following mitigation measures are included as part of each alternative and will reduce the impacts identified above to a less-than-significant level:

- LU-1. Schedule construction to minimize impacts to crop production and operations.
- LU-2. Minimize workspace required to install facilities to lessen impacts to available cropland and decrease potential for spread of noxious weeds.
- LU-3. Compensate landowners for any loss of crop production or impacts to agricultural operations.
- LU-4. Route conveyance facilities so as to avoid residences and other structures.
- LU-5. Compensate landowners for any loss of property.
- LU-6. Route conveyance facilities so as to avoid powerlines.

Biological Resources

This section discusses the existing biological setting and anticipated impacts to biological resources in the study area. The USFWS, through joint initial site evaluation field meetings conducted on November 14 and 15, 1994, for the South San Joaquin Valley refuges,

provided guidance for the preparation of this section. Subsequent surveys were conducted in the fall of 1995 and spring of 2003 (Kern NWR only). Additional database record searches and updating of mitigation requirements were conducted January 2003. The USFWS's Endangered Species Division provided further guidance in April 1996 and January 2003. In addition, the USFWS provided species lists and suggested surveys be conducted to determine the potential effects of the action on federally listed, proposed, and species of concern or their habitat. Information and guidance was also provided by the CDFG in 1994 and 2003.

This section also summarizes on-refuge benefits related to additional habitat associated with providing additional water supplies. The benefits would be identical for each alternative, as all alternatives would convey water supplies up to the Level 4 quantity, which will be used to enhance and provide additional habitat.

Affected Environment

Vegetation. Vegetation in the vicinity of the two refuges has been strongly influenced by agricultural conversion and associated water diversions. Currently, the vast majority of the study area is intensively managed as farmland. The most prevalent agricultural practice in the study area is cotton and grape farming. Alfalfa fields and orchards are also common. Unfarmed and fallow lands are used for grazing.

Prior to agricultural conversion, the study area was a vast complex of marshes, riparian forests, valley grasslands, and alkali sinks and scrub lands. Under existing conditions only remnant examples of these plant communities occur, primarily in isolated or fragmented patches which are often associated with ditches or canals. Because of agricultural conversion and other landscape alterations, plant species in areas where these native habitats still occur have also become isolated, influenced by exotic species, and in some cases, extirpated. The refuge areas themselves are the primary source of habitat for waterfowl.

Plant communities within the alternative corridors and impact areas were classified according to the habitats defined in the California Native Plant Society's (CNPS) *Inventory of Rare and Endangered Plants of California* (Tibor, 2001). CNPS habitats observed in the study area include chenopod scrub, valley and foothill grassland, marshes and swamps, riparian woodland, and riparian scrub.

Special-Status Species. Special-status plant species are vascular plants that are as follows:

- Designated as rare, threatened, or endangered by the state or federal governments
- Proposed for rare, threatened, or endangered status
- Designated as state candidates or federal species of concern
- Included on the CNPS Lists 1A, 1B, and 2 (Skinner and Pavlik, 2001)

Special-status plant species that potentially occur in the anticipated impact areas were determined by the following:

- Reviewing the most current lists of special-status plants (USFWS, 1995a, 1995b; Federal Register, 1996)
- Conducting literature review and searches of the CDFG's California Natural Diversity Database (CNDDB) and the CNPS Electronic Inventory
- Reviewing species lists provided by the USFWS (USFWS, 2003)
- Conducting reconnaissance-level habitat evaluations at each proposed refuge conveyance system site or corridor

Field evaluations conducted in the fall of 1995 and spring 2003 consisted of driving and walking proposed corridors and improvement sites to determine potential occurrences of special-status plant species. These determinations were based on the types and conditions of existing habitats within the proposed corridors and improvement sites. Field notes were recorded describing plant communities within the proposed corridors and improvements sites. These notes describe vegetation, locations of sensitive resource areas

where special-status plants are most likely to occur (e.g., vernal pools, alkali scrub), and observed locations of special-status plants. No substantial change in land use that has occurred since 1995 has altered habitat presence.

Table IV-3 displays the special-status plant species that could potentially occur in the area. These special-status plant species occur in the following six CNPS-defined habitat types:

- Valley and foothill grassland
- Chenopod scrub
- Vernal pools
- Cismontane woodland
- Riparian scrub
- Marshes and swamps

Of these six habitat types, valley and foothill grassland, chenopod scrub, and riparian scrub were observed in the impact areas and alternative corridors.

Listed plants that have the potential to occur in valley and foothill grassland habitat are *Atriplex erecticaulis* (Earlimart orache), *Atriplex subtilis* (subtle orache), and *Layia munzii* (Munz's tidy-tips). Listed plants that have the potential to occur in chenopod scrub habitat are limited to *Atriplex vallicola* (Lost Hills crownscale).

Threatened or endangered plants that have the potential to occur in the project area are *Lembertia congdonii* (San Joaquin woollythreads) and *Eremalche kernensis* (Kern mallow).

Wildlife. The South San Joaquin Valley region is an important area for several endangered species, and is a key area for migratory species of the Pacific Flyway, thereby attracting large numbers of ducks, geese, and shorebirds during the fall and winter months. Many resident and migratory wildlife species occur within the South San Joaquin Valley region. Resident species include numerous amphibians and reptiles, large and small mammals, and various shorebirds, waterfowl, raptors, and songbirds. Wildlife habitats present in the study area were characterized according to *A Guide to the Wildlife Habitats of California* (Mayer and Laudenslayer, 1988). Wildlife habitats occurring within the proposed project sites or corridors include valley-foothill riparian, alkali desert scrub, annual grassland, fresh emergent wetland, pasture, riverine, and cropland.

Special-Status Species. For the purposes of this evaluation, special-status wildlife species include taxa that are as follows:

- Designated as threatened or endangered by the state or federal governments (i.e., "listed species")
- Proposed or petitioned for federal or state threatened or endangered status
- Designated as state or federal candidate species
- Identified by the USFWS as a "Species of Concern" or by CDFG as a "Species of Special Concern"

Potential presence of special-status wildlife species within the study area was determined by the following:

- Reviewing the most current lists of special-status wildlife species (USFWS, 1995a, 1995b; Federal Register, 1996)
- Conducting literature review and record searches of the CNDDB
- Reviewing species lists provided by the USFWS (2003)
- Coordinating field surveys

Field evaluations were undertaken in fall of 1995 and spring 2003 and consisted of driving and walking proposed corridors and improvement sites to determine potential occurrences of special-status wildlife species. These determinations were based on the types and conditions of existing wildlife habitats within the proposed corridors and improvement sites. Field notes were recorded describing wildlife habitats within the proposed corridors and improvement sites.

These notes describe habitats, locations of habitat elements where special-status wildlife species are most likely to occur (e.g., vernal pools, alkali scrub, riparian woodland), and Wildlife-Habitat Relationship plant communities, which were delineated on 1:24,000-scale maps. No substantial change in

Table IV-3
Potential Floral Species of Concern at the
South San Joaquin Valley Study Area

Scientific Name	Common Name	Habitat[a]	Status[b] Fed/CA/CNPS
Atriplex cordulata	Heartscale	ChScr, VFGrs	SC/-/1B
Atriplex depressa	Brittlescale	ChScr, VFGrs	-/-/1B
Atriplex erecticaulis	Earlimart orache	VFGrs	SC/-/1B
Atriplex persistens	Vernal pool smallscale	VnPls	SC/-/1B
Atriplex subtilis	Subtle orache	VFGrs	SC/-/1B
Atriplex vallicola	Lost Hills crownscale	ChScr, VFGrs	SC/-/1B
Caulanthus californicus	California jewelflower	ChScr, VFGrs	FE/CE/1B
Cirsium crassicaula	Slough thistle	RpScr, ChScr, VFGrs	SC/-/1B
Delphinium recurvatum	Recurved larkspur	CmWld, ChScr, VFGrs	SC/-/1B
Eremalche kernensis	Kern mallow	ChScr, VFGrs	FE/-/1B
Eriastrum hooveri	Hoover's eriastrum	CmWld, VFGrs	FT/-/4
Lasthenia glabrata ssp.coulteri	Coulter's goldfields	VNPls, MshSw	-/-/1B
Layia munzii	Munz's tidy tips	ChScr, VFGrs	SC/-1B
Lembertia congdonii	San Joaquin woollythreads	ChScr, VFGrs	FE/-/1B
Myosurus minimus	Little mousetail	VnPls	SC/-/3

[a]Habitat Definitions:

VFGrs Valley and Foothill Grassland
ChScr Chenopod Scrub
VnPls Vernal Pools
CmWld Cismontane Woodland
MshSw Marshes and Swamps
RpScr Riparian Scrub

[b]Status Definitions:

Federal
FE Federally Listed Endangered
FT Federally Listed Threatened
SC Federal Species of Concern

State
CE California Endangered

CNPS
1B Considered rare, threatened, or endangered in California and elsewhere
3 Plants about which more information is needed (The CNPS Review List)
4 Plants of limited distribution

land use that has occurred since 1995 has altered habitat presence.

Table IV-4 displays the special-status wildlife species that could potentially occur in the study area. Of these, four species were determined to be of particular concern based on listing status (i.e., federally and/or state-listed as threatened or endangered) and observations of their habitats within the project corridors and sites. These species include the following:

- Tipton kangaroo rat
- San Joaquin kit fox
- Blunt-nosed leopard lizard
- Buena Vista Lake Shrew

Burrows were observed during the spring 2003 survey along the West Side Canal and a portion of the Main Drain Canal that may provide habitat for the kangaroo rat species listed in Table IV-4. Vernal pools and swales were observed adjacent to the study corridor at KER-7, and may provide habitat for the fairy shrimp and tadpole shrimp species listed in Table IV-4.

Wetlands/Waters. Wetlands are defined for regulatory purposes as "areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Features potentially meeting the required hydric vegetation, hydric soil, and wetland hydrology criteria were observed during the surveys. Other waters of the U.S. that likely do not qualify as wetlands are present at various stream crossings (e.g., Deer Creek crossing of the Pixley NWR alternatives).

The study area contains an extensive network of irrigation canals and ditches. Unlined canals and ditches may support wetland and riparian vegetation, but these features generally do not qualify as jurisdictional wetlands. Similarly, some agricultural fields and other croplands in the study area may be located on former wetlands, but these are likely regarded as "prior-converted wetlands" by federal regulatory agencies.

On-Refuge Wetlands/Waters. The Kern and Pixley NWRs contain thousands of acres of permanent ponds, seasonal wetlands, irrigated watergrass units, and uplands. These habitat types and particularly the wetlands support watergrass and invertebrate populations that serve as a foodsource for migratory waterfowl, marsh, and other water birds. Upland areas of the refuge support large concentrations of geese, upland birds, and other wildlife species.

Environmental Consequences

As part of the evaluation of the potential impacts to vegetation and wildlife, all habitat types within a corridor/alternative alignment were evaluated. The majority of habitat within the study area is intensively managed cropland. This habitat provides benefits to many common wildlife species found in the Valley, including waterfowl, marsh and water birds, pheasants, and small mammals. However, the evaluation of the alternatives found that any permanent impacts to croplands would be very small, and therefore, less than significant for the proposed actions.

Potential project-related effects on biological resources of installing the proposed conveyance facilities will result primarily from the vegetation clearing and ground disturbance associated with construction activities. These types of construction impacts for pipeline installation are generally temporary. Construction of facilities, such as siphons, entails both permanent impact areas (the footprint of the constructed feature) and temporary impact areas (e.g., equipment staging sites). Intensively managed agricultural fields typically have either (1) low biological functions and values, or (2) the functions and values are distributed broadly over large areas.

Most potential adverse impacts to biological resources will be minimal if pipelines are placed in existing roadways wherever practicable.

Table IV-4
Potential Wildlife Species of Concern at the South San Joaquin Study Area

Scientific Name	Common Name	Status[a] Fed/CA
Invertebrates		
Branchinecta lynchi	Vernal pool fairy shrimp	FE/-
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	FT/-
Linderiella occidentalis	California linderiella fairy shrimp	SC/-
Lytta hoppingi	Hopping's blister beetle	SC/-
Lytta molesta	Molestan blister beetle	SC/-
Amphibians		
Rana aurora draytonii	California red-legged frog	FT/CSC
Scaphiopus hammondii	Western spadefoot	SC/CSC
Reptiles		
Clemmys marmorata	Western pond turtle	SC/CSC
Gambelia sila	Blunt-nosed leopard lizard	FE/CE
Masticophis flagellum ruddocki	San Joaquin whipsnake	SC/-
Anniella pulchra pulchra	Silvery legless lizard	SC/CSC
Phyrnosoma coronatum frontale	California horned lizard	SC/-
Birds		
Plegadis chihi	White-faced ibis	SC/CSC
Buteo regalis	Ferruginous hawk	SC/CSC
Buteo swainsoni	Swainson's hawk	SC/CT
Haliaeetus leucocephalus	Bald eagle	FT/CE
Falco peregrinus anatum	American peregrine falcon	SC/CE
Ammodramus savannarum	Grasshopper sparrow	SC/-
Spizella breweri	Brewer's sparrow	SC/-
Grus canadensis tabida	Greater sandhill crane	-/CT
Charadrium montanus	Mountain plover	PT/CSC
Charadrius alexandrinus nivosus	Western snowy plover	SC/CSC
Numenius americanus	Long-billed curlew	-/CSC
Chlidonias niger	Black tern	SC/CSC
Asio flammeus	Short-eared owl	-/CSC
Speotyto cunicularia	Burrowing owl	SC/CSC
Chaetura vauxi	Vaux's swift	-/CSC
Empidonax traillii	Willow flycatcher	-/CE
Elanus leucurus	White-tailed kite	SC/FP
Lanius ludovicianus	Loggerhead shrike	SC/CSC
Agelaius tricolor	Tricolored blackbird	SC/CSC

Table IV-4
Potential Wildlife Species of Concern at the South San Joaquin Study Area

Scientific Name	Common Name	Status[a] Fed/CA
Melanerpes lewis	Lewis' woodpecker	SC/-
Selasphorus rufus	Rufous hummingbird	SC/-
Calypte costae	Costa's hummingbird	SC/-
Carduelis lawrencei	Lawrence's goldfinch	SC/-
Toxostoma redivivum	California thrasher	SC/-
Mammals		
Sorex ornatus relictus	Buena Vista Lake shrew	FE/-
Corynorhinus townsendii townsendii	Pacific western big-eared bat	SC/CSC
Myotis yumanensis	Yuma myotis	SC/-
Myotis volans	Long-legged myotis	SC/-
Myotis cilolabrum	Western small-footed myotis	SC/-
Eumops perotis californicus	California mastiff bat	SC/CSC
Ammospermophilis nelsoni	San Joaquin antelope squirrel	SC/CT
Dipodomys nitratoides exilis	Fresno kangaroo rat	FE/CE
Dipodomys nitratoides nitratoides	Tipton kangaroo rat	FE/CE
Dipodyms nitratoides bevinasus	Short-nosed kangaroo rat	SC/-
Onychomys torridus ramona	Southern grasshopper mouse	SC/CSC
Onychomys torridus tularensis	Tulare grasshopper mouse	SC/CSC
Perognathus inornatus inornatus	San Joaquin pocket mouse	SC/-
Vulpes macrotis mutica	San Joaquin kit fox	FE/CT

[a]Status Definitions:

Federal

- FE Federal Endangered
- FT Federal Threatened
- SC Federal Species of Concern

State

- FP Fully Protected
- CE California Endangered
- CT California Threatened
- CSC California Species of Special Concern

Outside of roadways, pipelines and canals routed around wetland and aquatic habitats (including non-jurisdictional canal habitat) will also minimize adverse impacts to biological resources.

Anticipated Benefits. The construction of any of the conveyance alternatives will result in on-refuge habitat benefits by providing an additional, reliable water supply as detailed in the Background section, including the following:

- Increased availability of habitat and water for spring/summer irrigations.
- Maintenance of additional acres of both summer water and permanent pond habitat types of both wildlife use and vegetation improvement.
- Increased acreage of watergrass (millet) and increased frequency of irrigations, if necessary, to provide a high-quality carbohydrate food source; while easing potential waterfowl crop depredation problems.
- Increased "flow-through" of maintenance water levels in all wetlands habitat units to decrease the potential of disease outbreaks, especially botulism, in wildlife species using these habitats.
- Maintenance of water depths, using the year-round water delivery, which provide optimum foraging conditions for the majority of avian species.

Criteria for Determining Significance. The following identifies the criteria used to determine the significance of potential impacts to vegetation, wildlife, and wetlands/waters resources.

Vegetation. Impacts to vegetation are considered significant if they would result in any one of the following:

- Eliminate portions of important natural communities such as freshwater marshes or riparian habitats
- Cause direct mortality of state-listed or federally listed plant species
- Substantial reductions in the size of a special-status plant species population
- Substantial reductions in the extent or value of habitats in which special-status plant populations occur

Wildlife. Impacts to wildlife are considered significant if they would result in any one of the following:

- Direct mortality of state-listed or federally listed wildlife species
- Temporary impacts to habitats such that listed species suffer increased mortality or lowered reproductive success
- Permanent loss of habitat critical to listed wildlife species
- Substantial reductions in the size of a special-status wildlife species population
- Substantial reduction in the extent or value of habitats in which special-status and other wildlife populations occur

Wetlands. Impacts to wetlands and other waters are considered significant if they would result in any one of the following:

- Permanent elimination of any amount of high-quality wetland and/or riparian habitat such as freshwater marshes, riparian, or annual grassland habitats
- Temporary or permanent damage or elimination of substantial amount of any wetland and/or aquatic habitat
- Substantial degradation of water quality

Figures IV-3 and IV-4 show the location of habitat (including wetlands) that could be used by special-status species along each alternative corridor. Table IV-5 displays a matrix of plant, wildlife, and wetland resource issues by proposed improvement corridor/site that are anticipated to be impacted by project construction activities. These potential impacts are discussed below. Tables IV-6 through IV-15 identify habitat type, temporary and permanent impact acreage and mitigation for alternatives that will result in impacts. These estimates are conservative and may over-estimate impacts, as they assume the entire 200-foot corridor would be impacted. It is the intent of Interior to minimize impacts to the greatest extent possible during final routing. Table IV-16 summarizes impacts and mitigation measures.

N

0 5,000 10,000 20,000 FT

SCALE IS APPROXIMATE

POSO CREEK

INTERSTATE 5

POTENTIAL WETLANDS AND SPECIAL- STATUS PLANTS AND ANIMALS

KER-1A/1B BVWSD GOOSE LAKE CANAL

KER-1A/1B BVWSD MAIN DRAIN

KERN NWR

DELIVERY POINT

KER-1A/1B BVWSD CROSS CANAL

POTENTIAL WETLANDS (INCLUDING VERNAL POOLS) AND SPECIAL-STATUS PLANTS AND ANIMALS

KER-7 LHID BURHAN CANAL

KER-1A/1B BVWSD WEST SIDE CANAL

KER-1A/1B BVWSD PIPELINE

POTENTIAL WETLANDS AND SPECIAL- STATUS PLANTS AND ANIMALS

KER-7

CALIFORNIA AQUEDUCT

BVWSD TURNOUT 1B

KER-7 LHID LATERAL 6-1

FIGURE IV-3
KERN NWR
POTENTIAL BIOLOGICAL RESOURCE AREAS
U. S. BUREAU OF RECLAMATION
SOUTH SAN JOAQUIN VALLEY, CALIFORNIA

W032003012RDD_006 (7/7/03)

N

0 5,000 10,000 20,000 FT

SCALE IS APPROXIMATE

PIXLEY NWR

HIGHWAY 99

POTENTIAL WETLANDS AND SPECIAL-STATUS PLANTS AND ANIMALS

DEER CREEK

PIX-9

PIX-2B

PIX-4B

PIX-2B, 4B, -9

PIX-2B, -4B, -9

POTENTIAL WETLANDS AND SPECIAL-STATUS PLANTS AND ANIMALS

PIX-4B
EXISTING DEID LATERAL 111.6W

ATCHISON-TOPEKA-
SANTA FE RAILROAD

SOUTHERN PACIFIC RAILROAD

FRIANT-KERN CANAL

Harmon Field
Allensworth
COLONEL ALENWORTH STATE HISTORIC PARK
Earlimart
Radnor
Delano
Jovista
Deer Creek
White River
Duck Pond
Duck Ponds
Landing Strip
Claypit
Radio Tower
TULARE CO
KERN CO

FIGURE IV-4
PIXLEY NWR
POTENTIAL BIOLOGICAL RESOURCE AREAS
U. S. BUREAU OF RECLAMATION
SOUTH SAN JOAQUIN VALLEY, CALIFORNIA

W032003012RDD_10 (7/703)

Table IV-5
Potential Resource Issues by Proposed Improvement Site or Corridor

Proposed Site or Corridor Name	Special-Status Plant Issues[a]	Special Status Wildlife Issues	Number of Stream Crossings[b]
KER-1A/1B	ChScr, MshSw, and RpScr	San Joaquin kit fox, Tipton kangaroo rat, blunt-nose leopard lizard, and Buena Vista Lake shrew	0
KER-7	ChScr, MshSw, and VnPls species	San Joaquin kit fox, Tipton kangaroo rat, blunt-nose leopard lizard, Buena Vista Lake shrew, Kern mallow, San Joaquin woollythreads and Fairy/tadpole shrimp	0
PIX-2B	ChScr, MshSw, RpScr and VnPls species	San Joaquin kit fox, Tipton kangaroo rat, blunt-nose leopard lizard, Buena Vista Lake shrew, San Joaquin woollythreads, and Kern mallow	1
PIX-4B	ChScr, MshSw, RpScr and VnPls species	San Joaquin kit fox, Tipton kangaroo rat, blunt-nose leopard lizard, Buena Vista Lake shrew, San Joaquin woollythreads, and Kern mallow	1
PIX-9	ChScr, MshSw, RpScr and VnPls species	San Joaquin kit fox, Tipton kangaroo rat, blunt-nose leopard lizard, Buena Vista Lake shrew, San Joaquin woollythreads, and Kern mallow	1

[a]Habitat Definitions:
ChScr = Chenopod Scrub
MshSw = Marshes and Swamps
RpScr = Riparian Scrub
VnPls = Vernal Pools
[b]Does not include canals or irrigation ditches; only jurisdictional features.

Table IV-6
KER-1A/1B Impacts by Habitat Type and Mitigation Measures

Habitat Type	Approximate Impact Acreage			Potential Special Status Wildlife	Potential Listed Plants[a]	Mitigation Measures
	Permanent	Temporary	Total			
ASC	0	19.22	19.22	Yes	Yes	1-19
CRO	0	55.04	55.04	Yes[a]	No	7, 8, 12
VRI	0	6.46	6.46	Yes	Yes	2-10, 12-19

[a]Cropland habitats may contain microsites that have special-status species.

Notes:
VRI = Valley Foothill Riparian
ASC = Alkali Desert Scrub
CRO = Cropland

Table IV-7
KER-7 ! Impacts by Habitat Type and Mitigation Measures

Habitat Type	Approximate Impact Acreage			Potential Special Status Wildlife	Potential Listed Plants[a]	Mitigation Measures
	Permanent	Temporary	Total			
FEW	0	11.2	11.2	Yes	Yes	2-10,12-19
ASC	0	12.7	12.7	Yes	Yes	1-19
CRO	0	9.45	9.45	Yes	No	7, 8, 12
BAR	0	3.25	3.25	No	No	N/A

[a]Potential impacts to plants coincide with ASC and FEW Habitat Types and occur in limited locations. See Figure IV-4.

Notes:
FEW = Fresh Emergent Wetland
ASC = Alkali Desert Scrub
CRO = Cropland
BAR = Barren

Table IV-8
PIX-2B ! Impacts by Habitat Type and Mitigation Measures

Habitat Type	Approximate Impact Acreage			Potential Special Status Wildlife	Potential Listed Plants[a]	Mitigation Measures[b]
	Permanent	Temporary	Total			
VRI	0	2.7	2.7	Yes	No	2-14,17-23
ASC	0	42.2	42.2	Yes	Yes	1-23
OVN/CRO	0	236.5	236.5	Yes	No	7-10,17
URB	0	2.1	2.1	No	No	7, 17
BAR	0	25.5	25.5	No	No	N/A
RIV	0	3.0	3.0	No	Yes	1, 2, 6

[a]Potential impacts to plants coincide with ASC and RIV Habitat Types and occur in limited locations. See Figure IV-4.
[b]Impacts and mitigation are summarized in Table IV-16.

Notes:
VRI = Valley Foothill Riparian
ASC = Alkali Desert Scrub
OVN = Orchard/Vineyard
CRO = Cropland
URB = Urban (Rural Residential/Commercial)
BAR = Barren
RIV = Riverine

Table IV-9
PIX-4B ! Impacts by Habitat Type and Mitigation Measures

Habitat Type	Approximate Impact Acreage			Potential Special Status Wildlife	Potential Listed Plants[a]	Mitigation Measures
	Permanent	Temporary	Total			
VRI	0	2.7	2.7	Yes	No	2-14,17-23
ASC	0	42.8	42.8	Yes	Yes	1-23
OVN/CRO	0	194.5	194.5	Yes	No	7-10,17
URB	0	1.5	1.5	No	No	7, 17
BAR	0	13	13	No	No	N/A
RIV	0	3.0	3.0	No	Yes	1, 2, 6

[a]Potential impacts to plants coincide with ASC and RIV Habitat Types and occur in limited locations. See Figure IV-4.

Notes:
VRI = Valley Foothill Riparian
ASC = Alkali Desert Scrub
OVN = Orchard/Vineyard
CRO = Cropland
URB = Urban (Rural Residential/Commercial)
BAR = Barren
RIV = Riverine

Table IV-10
PIX-9 ! Impacts by Habitat Type and Mitigation Measures

Habitat Type	Approximate Impact Acreage			Potential Special Status Wildlife	Potential Listed Plants[a]	Mitigation Measures
	Permanent	Temporary	Total			
VRI	0	2.7	2.7	Yes	No	2-10,12-19
ASC	0	41.8	41.8	Yes	Yes	1-19
OVN/CRO	0	297.8	297.8	Yes	No	7, 8, 12
URB	0	31	31	No	No	7, 12
BAR	0	2.5	2.5	No	No	N/A
RIV	0	3.0	3.0	No	Yes	1, 2, 6

[a]Potential impacts to plants coincide with ASC and RIV Habitat Types and occur in limited locations. See Figure IV-4.

Notes:
VRI = Valley Foothill Riparian
ASC = Alkali Desert Scrub
OVN = Orchard/Vineyard
CRO = Cropland
URB = Urban (Rural Residential/Commercial)
BAR = Barren
RIV = Riverine

Table IV-11
KER-1A/1B ! Jurisdictional Wetlands Acreage Impacts

Wetland Type	Impact Acreage	
	Permanent	Temporary
ASC	0	16.64
VRI	0	6.45

Notes:
VRI = Valley Foothill Riparian
ASC = Alkali Desert Scrub

Table IV-12
KER-7 ! Jurisdictional Wetlands Acreage Impacts

Wetland Type	Impact Acreage	
	Permanent	Temporary
ASC/FEW	0	2.4

Notes:
ASC = Alkali Desert Scrub
FEW = Fresh Emergent Wetland

Table IV-13
PIX-2B ! Jurisdictional Wetlands Acreage Impacts

Wetland Type	Impact Acreage	
	Permanent	Temporary
VRI	0	2.7
ASC/AGR	0	8.2
RIV	0	3

Notes:
VRI = Valley Foothill Riparian
ASC = Alkali Desert Scrub
AGR = Annual Grassland
RIV = Riverine

Table IV-14
PIX-4B ! Jurisdictional Wetlands Acreage Impacts

Wetland Type	Impact Acreage	
	Permanent	Temporary
VRI	0	2.7
ASC/AGR	0	8.2
RIV	0	3

Notes:
VRI = Valley Foothill Riparian
ASC = Alkali Desert Scrub
AGR = Annual Grassland
RIV = Riverine

Table IV-15
PIX-9 Jurisdictional Wetlands Acreage Impacts

Wetland Type	Impact Acreage	
	Permanent	Temporary
VRI	0	2.7
ASC/AGR	0	8.2
RIV	0	3

Notes:
VRI = Valley Foothill Riparian
ASC = Alkali Desert Scrub
AGR = Annual Grassland
RIV = Riverine

Table IV-16
Biological Resources Impacts and Mitigation Measures

Impact		Mitigation		Level of Significance After Mitigation
BR-a	Alternatives KER-1A/1B, KER-7, PIX-2B, PIX-4B, and PIX-9 could impact special-status plants.	BR-1	Conduct pre-construction surveys prior to final design to identify locations of special-status plants following the procedures outlined in *Guidelines for Assessing the Effects of Proposed Developments on Rare and Endangered Plants and Plant Communities*. Surveys must be timed to coincide with the flowering seasons of the targeted species. Following pre-construction surveys, develop measures to avoid impacts to special-status plants.	LS
		BR-2	Where avoidance of special-status plants is not practicable, develop and Implement measures for mitigating impacts, including relocation or re-establishment of special-status plant populations. Mitigation would involve creating suitable habitat in non-suitable habitat by providing soil, water, and vegetation to replicate conditions needed to establish special-status species populations.	
BR-b	Alternatives PIX-2B, PIX-4B, and PIX-9 could impact 2.7 acres of riparian habitat.	BR-3	Prior to final design, map and quantify riparian habitat and other important natural plant communities. Develop measures to avoid or minimize impacts to these habitats.	LS
		BR-4	Develop and implement mitigation measures for unavoidable impacts to riparian habitat. Where possible, disturbed riparian habitat should be restored onsite following completion of construction activities. Permanently eliminated riparian habitat should be replaced at a 2:1 ratio (i.e., 2 acres of habitat created for each acre eliminated). Mitigation would involve creating riparian habitat in non-riparian habitat by providing soil, water, and vegetation.	
		BR-5	Develop and implement a revegetation plan for temporarily disturbed construction sites. The revegetation plan should incorporate seeding and planting of species that will resist invasion by noxious weeds.	
		BR-6	Develop and implement a monitoring plan to assess the success of mitigation measures for impacts to vegetation and special-status species. Plantings on the revegetation and	

Table IV-16
Biological Resources Impacts and Mitigation Measures

Impact		Mitigation		Level of Significance After Mitigation
			compensation sites should be monitored during the growing season (March through September) to determine growth rates for 3 years from the date of transplant or planting. A yearly report should be submitted to USFWS, including dates of watering, growth rates, cover rates, and mortality figures. Monitoring could be curtailed after 3 years if success is demonstrated. (Success is achieved when plant cover of the mitigation site is at least 80 percent of the cover at the impact site prior to project disturbance and vegetative composition of the dominant [> 20 percent of the cover] and characteristic species [typical, regularly occurring in the habitat but not dominant] exceeds 80 percent of that which was present at the impact site.) Monitoring of special-status plant mitigation sites could be curtailed after 3 years if overall survival rates of seeded, planted, or transplanted plants exceed 80 percent of projected survival rates.	
		BR-7	Pre-construction surveys should be conducted for raptors prior to the peak March through August nesting period. Construction during the critical nesting period (March through August) will be avoided; or, if nesting pairs and fledglings are identified within 0.25 mile of construction, a monitoring program will be initiated in consultation with the CDFG. If Swainson's hawks are present, site surveys will be conducted to identify nesting activity. If nests are located within 0.5 miles of the project site with a direct line of sight to the activity, CDFG will be consulted to establish proper mitigation. As stated above for other raptors, seasonal restrictions (March through August) on project activities may be appropriate.	LS
BR-c	Alternatives KER-1A/1B, KER-7, PIX-2B, and PIX-9 could impact habitat used by San Joaquin kit fox.	BR-8	Before staging and construction, have a USFWS-approved biologist survey for dens and other kit fox sign such as scat, prey remains, and tracks. The biologist shall follow the USFWS's Standard Recommendations for Avoidance of the San Joaquin Kit Fox (1997). If any evidence of kit fox activity is found, contact the USFWS's Sacramento Fish and Wildlife Office to initiate consultation. A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the habitat types and sign listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. To avoid inadvertent entrapment of animals in holes during construction, all excavated, steep-walled holes or trenches more than 2 feet deep should be covered at the close of each working day by plywood or similar materials or provided with one or more escape ramps constructed of earth fill or wooden planks.	LS

Table IV-16
Biological Resources Impacts and Mitigation Measures

Impact		Mitigation		Level of Significance After Mitigation
			All construction pipes, culverts, or similar structures, with a diameter of 4 inches or greater that are stored at a construction site for one or more overnight periods, should be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed daily. Restrict use of rodenticides and herbicides to prevent secondary poisoning. In the event that take cannot be avoided, contact the USFWS for information before starting the action.	
BR-d	Alternatives KER-1A/1B, and KER-7, PIX-2B, PIX-4B, and PIX-9 could impact habitat used by Tipton kangaroo rat.	BR-9	Before any ground-disturbing activities, have a USFWS-approved biologist survey for the presence of the plant associations considered habitat for the Tipton kangaroo rat. The USFWS-approved biologist must survey for the presence of Tipton kangaroo rat sign such as burrow systems, haystacks, and areas of clipped vegetation. A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers. In the event that take cannot be avoided, contact the USFWS for information before starting the action.	LS

Table IV-16
Biological Resources Impacts and Mitigation Measures

	Impact		Mitigation	Level of Significance After Mitigation
BR-e	Alternative KER-1A/1B, and KER-7, PIX-2B, PIX-4B, and PIX-9 could impact habitat used by blunt-nosed leopard lizard.	BR-10	Before staging and construction, have a USFWS-approved biologist survey for the presence of the habitat types used by this species and signs of leopard lizards such as burrows. The protocol developed by the CDFG shall be used to survey for this species. During the blunt-nosed leopard lizard's hibernation time, surveys are unreliable and cannot be used to determine absence of this species. Notice will be given to the CDFG and the USFWS 30 days before beginning construction to determine whether capture is desired. For projects from 5 to 10 acres in size (or 5 to 10 linear miles), within suitable habitat, should schedule surface disturbance activities during the active season (approximately April 15 to October 15). A USFWS-approved biologist will survey any trenches in the morning and late afternoon to remove lizards that fall into the trench. A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the habitat types and sign listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed daily. In the event that take cannot be avoided, contact the USFWS for information before starting the action.	LS
BR-f	Alternative KER-7 contains potential vernal pools and swales.	BR-11	If any vernal pools or vernal swales will be impacted (i.e., if construction activities will occur within 250 feet of the edge of a pool or swale), pre-construction surveys should be conducted for fairy shrimp and tadpole shrimp. During final design, avoid by 250 feet all features containing listed shrimp. Surveys should be conducted according to methods outlined in *Interim Guidelines for Surveys for the Endangered Conservancy Fairy Shrimp, Longhorn Fairy Shrimp, Riverside Fairy Shrimp, Vernal Pool Tadpole Shrimp, and the Threatened Vernal Pool Fairy Shrimp*.	

Table IV-16
Biological Resources Impacts and Mitigation Measures

Impact	Mitigation	Level of Significance After Mitigation
	Stay at least 250 feet from the margin of the pool/swale edge. When conducting activities beyond 250 feet from habitat, be careful to avoid activities that will eventually result in effects to the pool/swale through changes in hydrology, sedimentation, or contamination of the habitat. Adequate fencing will be placed and maintained around any avoided (preserved) vernal pool habitat to prevent impacts from vehicles. If habitat is avoided (preserved) onsite, then a USFWS-approved biologist (monitor) will inspect any construction-related activities at the proposed project site to ensure that no unnecessary take of listed species or destruction of their habitat occurs. The biologist will have the authority to stop all activities that may result in take or destruction until appropriate corrective measures have been completed. The biologist also will be required to report immediately any unauthorized impacts to the USFWS and the CDFG. All onsite construction personnel will receive instruction regarding the presence of listed species and importance of avoiding impacts to these species and their habitat. The applicant will ensure that activities that are inconsistent with the maintenance of the suitability of remaining habitat and associated onsite watershed are prohibited. This includes, but is not limited to, the following: - Alteration of existing topography or any other alteration or uses for any purposes - Use of fire protection activities not required to protect existing structures at the project site - Use of pesticides or other toxic chemicals, including the exploration for or development of mineral extraction - Placement of any new structures on these parcels - Dumping, burning, and/or burying of rubbish, garbage, or any other wastes or fill materials - Building of any new roads or trails - Killing, removal, alteration, or replacement of any existing native vegetation - Placement of stormwater drains In the event that take cannot be avoided, contact the USFWS for information before starting the action.	LS

Table IV-16
Biological Resources Impacts and Mitigation Measures

Impact	Mitigation	Level of Significance After Mitigation
	BR-12 A monitoring plan should be developed and implemented to assess the success of mitigation measures for impacts to special-status wildlife. Success criteria should be clearly defined for all measures implemented to mitigate for project impacts to wildlife. Yearly reports should be submitted to the USFWS and the CDFG. If success criteria are being met after 3 years of monitoring, no additional monitoring is necessary.	
BR-g Alternatives KER-1A/1B, KER-7, PIX-2B, PIX-4B, and PIX-9 could impact habitat used by Buena Vista Lake shrew.	BR-13 Before any ground-disturbing activities, have a USFWS-approved biologist survey for the presence of the wetland plant associations considered habitat for the Buena Vista Lake shrew. Avoid areas in, or adjacent to, the Kern Lake Preserve. A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed daily. In the event that take cannot be avoided, contact the USFWS for information before starting the action.	LS
BR-h KER-7, PIX-2B, PIX-4B, and PIX-9 could impact between 2.4 to 8.2 acres of jurisdictional wetland.	BR-14 Pre-construction delineations should be conducted of wetlands and other waters of the U.S. Request a verification of the delineated boundaries from the USACE. Following verification of the delineation boundaries, measures to avoid impacts to jurisdictional wetlands should be developed. BR-15 After final design, impacts to wetlands and other waters should be quantified. Submit to USACE a permit application for discharge of fill material into waters of the U.S., following Section 404 of the Clean Water Act. BR-16 Install and maintain appropriate erosion and sedimentation controls during and following construction as specified in the required Erosion Control Plan (see Hydrology and Water Quality section).	

Table IV-16
Biological Resources Impacts and Mitigation Measures

Impact	Mitigation	Level of Significance After Mitigation
	BR-17 A streambed alteration agreement with the CDFG should be obtained, following Section 1601 of the Fish and Game Code, before initiating construction within the 100-year floodplain of any stream crossing. BR-18 Develop and implement mitigation plans for impacts to wetlands. Eliminated wetlands should be replaced at a 2:1 ratio. Temporarily impacted wetlands should be restored onsite. Stockpile topsoil removed from wetlands and store in upland landscape positions. Following construction disturbance, restore the land surface contours and backfill the top 6 to 12 inches with stockpiled topsoil. BR-19 Following project completion, monitor the site to assess mitigation success. Success criteria should be clearly defined for all measures implemented to mitigate for project impacts to wetlands. Yearly reports should be submitted to the USFWS and the USACE. If success criteria are being met after 3 years of monitoring, no additional monitoring is necessary.	LS

Notes:

LS = Less than Significant

BR = Biological Resources

Vegetation. As described previously, impacts to plant communities are likely to result from vegetation clearing and ground disturbances related to construction activities. If avoidance of special-status plants is determined infeasible, impacts associated with pipeline construction would typically be short term, but may be significant. Temporarily disturbed habitat is also susceptible to invasion by noxious weeds and non-native grasses.

Although not prevalent, significant impacts are also most likely to occur in the form of eliminated riparian and wetland habitat. While vernal pools were observed only within the KER-7 alignment, some of the "vernal pool" plant species listed in Table IV-3 often occur in other seasonally wet features. Therefore, potential impacts to listed plant species are possible.

Wildlife. Construction impacts to wildlife would occur primarily because of habitat disturbance and, potentially, as disruptions of breeding efforts by special-status species.

Direct mortality to listed species may occur during clearing, grading, and excavating activities if relatively immobile species are encountered. Of the listed species discussed previously, the San Joaquin kit fox, Tipton kangaroo rat, blunt-nosed leopard lizard, and Buena Vista Lake shrew are vulnerable to construction-related disruption during their vulnerable nesting periods. During the vulnerable periods, the burrows are more active. Construction could potentially disturb the burrow, and therefore, disrupt the species' nesting period.

The vulnerable period for the San Joaquin kit fox is generally from February to July. The fox will occupy the burrow for these 6 months during the birth and weaning of the offspring. The Tipton kangaroo rat occupies the burrow year-round and are generally more active during the spring; however, they can breed throughout the year. The remaining time the burrow is unoccupied. The blunt-nosed leopard lizard has a vulnerable nesting period from June to August.

The lizard does live in the burrow year-round; however, most construction-related disturbance would occur during the nesting period. The Buena Vista Lake shrew has a vulnerable nest period from February through October. The shrew prefers moist microhabitats, though it is widespread in terms of occupied habitat (Vestal, 1938).

Wetlands/Waters. Potentially significant impacts to wetlands and other waters may result from the following:

- The discharge of fill into these habitats
- The dewatering of wetland and aquatic habitats
- Substantial temporary increases in water turbidity or pollutants

These impacts can occur wherever the project corridors bisect wetlands or other waters. Alternatives that contain greater estimated wetland acreage and a greater number of stream crossings (see Tables IV-11 through Table IV-15) are more likely to have impacts.

On-Refuge Wetlands/Waters. The increase in water available for use on the Kern and Pixley NWRs from increasing total supplies to Level 4 will result in a number benefits, which are further described earlier in this section and the Background section. Benefits include the ability for earlier flood-up for seasonal marsh to allow for increased use, including increased flexibility in terms of habitat management throughout other times of the year. The increased supplies will also allow for increased "flow through" of maintenance water levels in all wetlands habitat units which will in turn reduce the potential of disease outbreaks such as botulism. The additional increment of water will also be used to increase the acreage of water grass (millet), and early marsh. The existing and proposed management plans and policies for the two refuges are further detailed in the following documents:

- *Kern National Wildlife Refuge Master Plan*, April 1986
- *Pixley National Wildlife Refuge Master Plan,* April 1986

Mitigation

The following mitigation measures are included as part of each alternative and will reduce all impacts to vegetation, wildlife, and wetlands/waters discussed above to less-than-significant levels.

Vegetation. Following are the mitigation measures for biological resource impacts to vegetation:

- BR-1. Conduct pre-construction surveys prior to final design to identify locations of special-status plants following the procedures outlined in *Guidelines for Assessing the Effects of Proposed Developments on Rare and Endangered Plants and Plant Communities*. Surveys must be timed to coincide with the flowering seasons of the targeted species. Following pre-construction surveys, develop measures to avoid impacts to special-status plants.
- BR-2. Where avoidance of special-status plants is not practicable, develop and implement measures for mitigating impacts, including relocation or reestablishment of special-status plant populations. Mitigation would involve creating suitable habitat in non-suitable habitat by providing soil, water, and vegetation to replicate conditions needed to establish special-status species populations.
- BR-3. Prior to final design, map and quantify riparian habitat and other important natural plant communities. Develop measures to avoid or minimize impacts to these habitats.
- BR-4. Develop and implement mitigation measures for unavoidable impacts to riparian habitat. Where possible, disturbed riparian habitat should be restored onsite following completion of construction activities. Permanently eliminated riparian habitat should be replaced at a 2:1 ratio (i.e., 2 acres of habitat created for each acre eliminated). Mitigation would involve creating riparian habitat in non-riparian

habitat by providing soil, water, and vegetation.

- BR-5. Develop and implement a revegetation plan for temporarily disturbed construction sites. The revegetation plan should incorporate seeding and planting of species that will resist invasion by noxious weeds.

- BR-6. Develop and implement a monitoring plan to assess the success of mitigation measures for impacts to vegetation and special-status species. Plantings on the revegetation and compensation sites should be monitored during the growing season (March through September) to determine growth rates for 3 years from the date of transplant or planting. A yearly report should be submitted to USFWS, including dates of watering, growth rates, cover rates, and mortality figures. Monitoring could be curtailed after 3 years if success is demonstrated. (Plant cover of the mitigation site is at least 80 percent of the cover at the impact site prior to project disturbance and vegetative composition of the dominant [> 20 percent of the cover] and characteristic species [typical, regularly occurring in the habitat but not dominant] exceeds 80 percent of that which was present at the impact site.) Monitoring of special-status plant mitigation sites could be curtailed after 3 years if overall survival rates of seeded, planted, or transplanted plants exceed 80 percent of projected survival rates.

Wildlife. Following are the mitigation measures for impacts to wildlife:

- BR-7. Pre-construction surveys should be conducted for raptors prior to the peak March-through-August nesting period. Construction during the critical nesting period (March through August) will be avoided, or if nesting pairs and fledglings are identified within 0.25 mile of construction, a monitoring program will be initiated in consultation with the CDFG.

  If Swainson's hawks are present, site surveys will be conducted to identify nesting activity. If nests are located within 0.5 miles of the project site with a direct line of sight to the activity, CDFG will be consulted to establish appropriate mitigation. As stated above for other raptors, seasonal restrictions (March through August) on project activities may be appropriate.

- BR-8. Before staging and construction, have a USFWS-approved biologist survey for dens and other kit fox sign such as scat, prey remains, and tracks. The biologist shall follow the USFWS's Standard Recommendations for Avoidance of the San Joaquin Kit Fox (1997). If any evidence of kit fox activity is found, contact the USFWS's Sacramento Fish and Wildlife Office to initiate consultation.

  A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the habitat types and sign listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat.

  To avoid inadvertent entrapment of animals in holes during construction, all excavated, steep-walled holes or trenches more than 2 feet deep should be covered at the close of each working day by plywood or similar materials or provided with one or more escape ramps constructed of earth fill or wooden planks.

  All construction pipes, culverts, or similar structures, with a diameter of 4 inches or greater that are stored at a construction site for one or more overnight periods, should be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way.

  No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat.

  No domestic animals (pets) shall be allowed on the project site.

On unposted roads, vehicle speeds shall not exceed 25 miles per hour.

Trash shall be disposed of in covered containers and removed daily.

Restrict the use of rodenticides and herbicides to prevent secondary poisoning.

In the event that take cannot be avoided, contact the USFWS for information before starting the action.

- BR-9. Before any ground-disturbing activities, have a USFWS-approved biologist survey for the presence of the plant associations considered habitat for the Tipton kangaroo rat. The USFWS-approved biologist must survey for the presence of Tipton kangaroo rat sign such as burrow systems, haystacks, and areas of clipped vegetation.

  A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species.

  Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat.

  No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat.

  No domestic animals (pets) shall be allowed on the project site.

  On unposted roads, vehicle speeds shall not exceed 25 miles per hour.

  Trash shall be disposed of in covered containers.

  In the event that take cannot be avoided, contact the USFWS for information before starting the action.

- BR-10. Before staging and construction, have a USFWS-approved biologist survey for the presence of the habitat types used by this species and signs of leopard lizards such as burrows. The protocol developed by the CDFG shall be used to survey for this species. During the blunt-nosed leopard lizard's hibernation time, surveys are unreliable and cannot be used to determine absence of this species. Notice will be given to the CDFG and the USFWS 30 days before beginning construction to determine whether capture is desired.

  For projects from 5 to 10 acres in size (or 5 to 10 linear miles), within suitable habitat, should schedule surface disturbance activities during the active season (approximately April 15 to October 15).

  A USFWS-approved biologist will survey any trenches in the morning and late afternoon to remove lizards that fall into the trench.

  A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species.

  Confine surface disturbance to areas that do not exhibit the habitat types and sign listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat.

  No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat.

  No domestic animals (pets) shall be allowed on the project site.

  On unposted roads, vehicle speeds shall not exceed 25 miles per hour.

  Trash shall be disposed of in covered containers and removed daily.

  In the event that take cannot be avoided, contact the USFWS for information before starting the action.

- BR-11. If any vernal pools or vernal swales will be impacted (i.e., if construction activities will occur within 250 feet of the edge of a pool or swale), pre-construction surveys should be conducted for fairy

shrimp and tadpole shrimp. Surveys should be conducted according to methods outlined in *Interim Guidelines for Surveys for the Endangered Conservancy Fairy Shrimp, Longhorn Fairy Shrimp, Riverside Fairy Shrimp, Vernal Pool Tadpole Shrimp, and the Threatened Vernal Pool Fairy Shrimp.*

Stay at least 250 feet from the margin of the pool/swale edge. When conducting activities beyond 250 feet from habitat, be careful to avoid activities that will eventually result in effects to the pool/swale through changes in hydrology, sedimentation, or contamination of the habitat.

Adequate fencing will be placed and maintained around any avoided (preserved) vernal pool habitat to prevent impacts from vehicles.

If habitat is avoided (preserved) onsite, then a USFWS-approved biologist (monitor) will inspect any construction-related activities at the proposed project site to ensure that no unnecessary take of listed species or destruction of their habitat occurs. The biologist will have the authority to stop all activities that may result in take or destruction until appropriate corrective measures have been completed. The biologist also will be required to report immediately any unauthorized impacts to the USFWS and the CDFG.

All onsite construction personnel will receive instruction regarding the presence of listed species and the importance of avoiding impacts to these species and their habitat.

The applicant will ensure that activities that are inconsistent with the maintenance of the suitability of remaining habitat and associated onsite watershed are prohibited. This includes, but is not limited to the following:

- Alteration of existing topography or any other alteration or uses for any purposes
- Use of fire protection activities not required to protect existing structures at the project site
- Use of pesticides or other toxic chemicals, including the exploration for or development of mineral extraction
- Placement of any new structures on these parcels
- Dumping, burning, and/or burying of rubbish, garbage, or any other wastes or fill materials
- Building of any new roads or trails
- Killing, removal, alteration, or replacement of any existing native vegetation
- Placement of stormwater drains

In the event that take cannot be avoided, contact the USFWS for information before starting the action.

- BR-12. A monitoring plan should be developed and implemented to assess the success of mitigation measures for impacts to special-status wildlife. Success criteria should be clearly defined for all measures implemented to mitigate for project impacts to wildlife. Yearly reports should be submitted to the USFWS and the CDFG. If success criteria are being met after 3 years of monitoring, no additional monitoring is necessary.
- BR-13. Before any ground-disturbing activities, have a USFWS-approved biologist survey for the presence of the wetland plant associations considered habitat for the Buena Vista Lake shrew. Avoid areas in, or adjacent to, the Kern Lake Preserve.

  A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species.

  Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat.

No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat.

No domestic animals shall be allowed on the project site.

On unposted roads, vehicle speeds shall not exceed 25 miles per hour.

Trash shall be disposed of in covered containers and removed daily.

In the event that take cannot be avoided, contact the USFWS for information before starting the action.

Wetlands/Waters. The following are the mitigation measures for impacts to wetlands/waters:

- BR-14. Pre-construction delineations should be conducted of wetlands and other waters of the U.S. Request a verification of the delineated boundaries from the USACE. Following verification of the delineation boundaries, measures to avoid impacts to jurisdictional wetlands should be developed.
- BR-15. After final design, impacts to wetlands and other waters should be quantified. Submit to the USACE a permit application for discharge of fill material into waters of the U.S., following Section 404 of the Clean Water Act.
- BR-16. Install and maintain appropriate erosion and sedimentation controls during and following construction as specified in the required Erosion Control Plan (see Hydrology and Water Quality section).
- BR-17. A streambed alteration agreement with the CDFG should be obtained, following Section 1601 of the Fish and Game Code, before initiating construction within the 100-year floodplain of any stream crossing.
- BR-18. Develop and implement mitigation plans for impacts to wetlands. Eliminated wetlands should be replaced at a 2:1 ratio. Temporarily impacted wetlands should be restored onsite. Stockpile topsoil removed from wetlands and store in upland landscape positions. Following construction disturbance, restore the land surface contours and backfill the top 6 to 12 inches with stockpiled topsoil.
- BR-19. Following project completion, monitor the site to assess mitigation success. Success criteria should be clearly defined for all measures implemented to mitigate for project impacts to wetlands. Yearly reports should be submitted to USFWS and USACE. If success criteria are being met after 3 years of monitoring, no additional monitoring is necessary.

Cultural Resources

Affected Environment

Prehistoric/Ethnographic Resources. The Central Valley region was among the first in the state to attract intensive fieldwork, and research has continued to the present day. This has resulted in a substantial accumulation of data, but the emphasis has been in the northern portion of the valley.

Because of this early work, an elaborate culture complex was defined for the late prehistoric period. This complex can be ascribed to the Yokuts and their direct ancestors. The material culture of this late temporal period complex included steatite vessels and beads, finely made projectile points, pottery, shaped stone mortars, *Tivela* disc beads, use of asphaltum, and the presence of metates and manos. Flexed burials were the predominant interment mode. Earlier mortuary practices included extended rather than flexed burial position, a situation analogous to that of the northern valley (Gifford and Schenck, 1926; Lillard, et al., 1939; Moratto, 1972).

Ethnographic literature is often uncertain in definition of cultural boundaries for Indian groups. Early displacement by white intrusion resulted in population shifts to avoid conflict with the Spanish, and later with the miners and settlers. The ravages of disease and warfare decimated the native people, further weakening cultural identity. Informants were often

uncertain of original territories of the various tribal groupings.

The Southern Valley Yokuts were members of the Penutian language family which occupied all of the Central Valley, San Francisco Bay Area, and the Pacific Coast from Marin County to near Point Sur. The Yokuts differed from other California Indians in that they had true tribal divisions with group names. Each tribe spoke an individual dialect, although these were similar enough to other Yokuts dialects that they were mutually intelligible (Kroeber, 1925). The tribe controlling the Pixley study area at the time of Euro-American contact was the Wowol, who controlled the southern shores of Tulare Lake. Their principal village, *Sukwutnu*, was some distance south of the lake, 15 miles west of Delano (Latta, 1949). The lower Kern River, incorporating the Kern project area, was the homeland of the Chuxoxi (Wallace, 1978). Settlements were oriented along the water ways, with their village sites normally placed adjacent to these features for nearby water and food resources. House structures varied in size and shape (Latta, 1949; Kroeber, 1925). Housepit depressions ranged in diameter from between 3 to 18 meters.

Trade was well developed, with mutually beneficial interchange of needed or desired goods. Obsidian, rare in the San Joaquin Valley, was obtained by trade with Paiute and Shoshoni groups on the eastern side of the Sierra Nevada, where numerous sources of this material are located, and to some extent from the Napa Valley to the north. Shell beads, obtained by the Yokuts from coastal people, and acorns, rare in the Great Basin, were among many items exported to the east by Yokuts traders (Davis, 1961).

The rivers, streams, and sloughs, which formed a maze within the valley, provided abundant food resources such as fish, shellfish, and turtles. Game, wild fowl, and small mammals were trapped and hunted to provide protein augmentation of the diet. In general, the eastern portion of the San Joaquin Valley provided a lush environment of varied food resources, with the estimated large population centers reflecting this abundance (Cook, 1955; Baumhoff, 1963).

Historical Resources. Most of the Pixley NWR study area lies in an area of checkerboard land grants to the railroad. Portions of the study area were swamp and overflow land that could not be worked for agriculture until USBR work had taken place. Early settlers in the sections open to settlement tried to homestead the land in the 1870s and 1880s, but they never proved up, and a number of claims were cancelled in the 1880s. The 1920s topographic maps show a number of small rectangular ponds and a system of ditches, apparently part of the irrigation system for the region.

Historical site types that might be present in the study area include residential structures, farm or ranch outbuildings, fences, ditches, canals, water diversion or impound features, wells, and railroad construction or maintenance camps. The overall sensitivity for the presence of historical sites could be rated as low.

In the Kern NWR study area, there is an Indian site shown on the General Land Office plat of 1854 at the edge of Tulare Lake near the study area. Apparently, the site was still occupied at that time by a large group of Indians. This site appears to correspond to the location of "Bubal," a village on the shore of Tulare Lake first visited by Spanish missionaries from Mission San Miguel in 1804. The village was visited repeatedly by the Spanish and Mexicans who ventured into the San Joaquin Valley. A well-marked trail existed from Bubal to the Mission in the 1820s. The Indians of this study area were rounded up and sent to a reservation at Fort Tejon in 1859, and camps relating to this could be present.

The study area lies in the swampy remnant of sloughs associated with Tulare Lake. Prior to USBR efforts, the land had little value for agriculture; and consequently, there were few early settlers in the study area. There were some attempts to homestead the land in the 1880s to 1910s, but many of the homesteads were relinquished once or twice before they were finally taken up in the 1920s to 1940s. One of the main land uses in the 1920s appears to have been the establishment of gun clubs for waterfowl hunting.

Historical site types could include early trails, campsites, roads, fences, farm complexes, levees, canals, and other water control features, and structures for the gun clubs. The presence of a protohistoric site with known early Mission contacts that endured into the 1850s, early trails, and potential for other post-contact sites indicates that the area could be a sensitive one for historical resources.

Environmental Consequences

Criteria for Determining Significance. Under federal regulations, significant cultural resources are those that qualify for inclusion in the National Register of Historic Places. The criteria for inclusion on the register are as follows:

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and

A. *that are associated with events that have made a significant contribution to the broad patterns of our history; or*

B. *that are associated with the lives of persons significant in our past; or*

C. *that embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or*

D. *that have yielded, or may be likely to yield, information important in prehistory or history. (36 CFR 60.4)*

Exceptions are made to these criteria for cemeteries, birthplaces or graves of historical figures, religious properties, structures that have been moved, reconstructed historical buildings, properties that are primarily commemorative in nature, and properties less than 50 years old. Such properties may be eligible for the register if they are of exceptional importance.

Cultural Resource impacts and mitigation measures are summarized in Table IV-17.

Prehistoric/Ethnographic Resources. A record search was requested from the South San Joaquin Valley Information Center of the California Historical Resources Information System at California State University, Bakersfield. The reply from that agency indicated that no cultural resources exist within or closely adjacent to the Pixley NWR. Two

Table IV-17
Cultural Resource Impacts and Mitigation Measures

Impact		Mitigation		Level of Significance After Mitigation
CR-a	Alignment KER-7 could impact a prehistoric site.	CR-1	Restrict KER-7 construction activities in the area of CA-KER-2100 to the existing canal alignment and restrict the movement of equipment to the south levee in this area. As the south levee has by far the better road surface, this should not impose a burden on the construction crew.	LS
CR-b	Alignments PIX-2B, PIX-4B, and PIX-9 could impact adjacent historical residences.	CR-2	Avoid the three historical structures near the PIX-2B, PIX-4B, and PIX-9 alignments. If avoidance of impact to any of these structures is not feasible, then additional historical research should be conducted to determine significance and, if necessary, develop a suitable plan for mitigation of adverse effect.	LS

Notes:

CR = Cultural Resources
LS = Less than Significant

previous cultural resources inventories incorporated small portions of the current study area, however, no resources were recorded during these surveys. The Kern NWR has eight prehistoric sites recorded in the vicinity, primarily within the wildlife refuge (Arguellas and Moratto, 1983). One of these, CA-KER-2100, was recorded adjacent to the KER-7 alignment and may extend under the levee on the north side of the existing ditch that forms the centerline of the proposed project. This site is a diffuse and highly disturbed surface scatter of lithic tools and debitage. Another site, CA-KER-168, is a major village located south of the alignment based on ethnographic writings by Frank Latta in 1950. This location has not been verified by field examination.

Three Indian and three non-Indian sites are recorded on the Pixley NWR (Arguelles and Moratto, 1983). The KER-7 alignment follows an existing canal, dry at the time of the survey, excavated some 4 or 5 feet below ground level with large levees on both sides. This degree of disturbance suggests that the survival of intact cultural resources within the immediate construction area would be low.

The location of CA-KER-2100 adjacent to the KER-7 alignment was carefully inspected, but no artifacts could be found on the surface. The location examined was correct because the sketch map accompanying the site record by Breschini and Haversat was detailed and accurate. The 1986 site record notes that artifacts were only observed on eroded surfaces at widely scattered locations. The site consisted largely of obsidian, chert, and basalt debitage (waste flakes from lithic tool manufacture). Only two completed tools were observed in a site area defined as 105 meters by 80 meters in extent. It is not uncommon for a diffuse lithic scatter of this type to "disappear" due to differing light conditions and angles (the previous survey was in April) and soil erosion over time. We assume that a site, of some sort, is still present at the location.

CA-KER-168 was recorded, minimally, in 1950. There is no description of the appearance of the site other than the notation "Indian village site" on the site record. It is not clear from the record if Latta ever was physically on the site. The location is given only as "at the old Broder well or tule pump." The location is apparently near the south side of the KER-7 alignment where ground visibility is poor. On the other hand, the extensive disturbance of this area over the 45 years since the site was recorded argues against preservation of the site in this area, even if it extended this far north in the first place. There is some possibility that the agricultural use of the area could have obscured evidence of the site; however, no soil discoloration existed in the area that would indicate a midden associated with a long-term residential site.

Historical Resources. The only potential historical resources identified in the Pixley NWR survey area were existing occupied residences at the edges of the PIX-2B, PIX-4B, and PIX-9 corridors. Because no existing structures will be impacted by the proposed project, the field crew did not record these structures. Three of these structures appear on the 1929 U.S. Geological Survey maps of the area: T23S, R25E north boundary of Section 30 about 1,600 feet west of the northeast section corner; Section 24, center of south boundary of section; and T23S, R26E, southeast corner of Section 19. The latter is closest to the PIX-2B alignment and is a modest, but well maintained, example of a rural craftsman bungalow. The only structure in the KER-7 corridor is a small pump house.

Mitigation

The following mitigation measures are incorporated as part of each alternative and will reduce the impacts identified to a less than significant level:

- CR-1. Restrict KER-7 construction activities in the area of CA-KER-2100 to the existing canal alignment and restrict the movement of equipment to the south levee in this area. As the south levee has by far the better road surface, this should not impose a burden on the construction crew. If this is done, impact to CA-KER-2100 can be avoided. The area involved is approximately 140 meters in length extending east from the southwest

corner of the refuge. If this recommendation is not feasible, then a program of exploratory subsurface testing should be conducted to define the boundaries and research significance of the site. Because the site is within a federal NWR, this would require the consent of the USFWS and an excavation permit under the Archaeological Resources Protection Act would be required.

- CR-2. Avoid the three historical structures near the PIX-2B, PIX-4B, and PIX-9 alignments. If avoidance of impact to any of these structures is not feasible, then additional historical research should be conducted to determine significance and develop a suitable plan for mitigation of adverse effect, if necessary.

There is no indication that other subsurface cultural deposits are in either project area. However, the possibility of buried cultural remains cannot be totally eliminated. If artifacts or unusual amounts of stone, bone, or shell are uncovered during construction activities, excavation should cease in the area of the find and a qualified archeologist should be consulted for on-the-spot evaluation. If bone is uncovered on non-federal lands that could be human, state law requires that the County Coroner be contacted. If the coroner determines that the bone is likely to be Native American in origin, then activities must comply with state law and regulation. On federal lands, the Native American Graves Protection and Repatriation Act and its regulations must be followed.

Hydrology and Water Quality

Affected Environment

Surface Water. The primary source of water for the two refuge areas varies from surface water supplies from the CVP and SWP, and groundwater. Kern NWR is primarily served by the Buena Vista Water Storage District, which obtains SWP water from the Kern County Water Agency through the California Aqueduct. In addition, Kern NWR infrequently receives water from the USBR through the Friant-Kern Canal and subsequently Poso Creek. The PID via Deer Creek primarily serves Pixley NWR when surplus flows are available. PID obtains water from the Friant-Kern Canal at Millerton Lake.

Groundwater. Currently, Pixley NWR has one operating well and Kern NWR has nine wells, including one domestic well. The Pixley NWR well draws water from the deep aquifer and supplies the refuge with a portion of the Level 2 supplies. Wells on the Kern NWR have not been used for a significant water supply since the early 1970s because of a receding water table and high operation costs. The wells on both refuges are used on an as-needed basis. Groundwater resources in the area are experiencing continued overdraft conditions (USBR, 1994).

Drainage. Both of the refuge areas sit within the Tulare Lake Bed, which covers approximately 200,000 acres. While the vast majority of this lake bed is under cultivation, the area still has been inundated as recently as 1983. The historical hydrology has been greatly altered, with the majority of flow, which at one time reached the lake bed, now controlled through dams, reservoirs, and irrigation features. The primary drainage features within the study area are Deer Creek, Poso Creek, the Goose Creek Canal, and the Kern River Channel. There are no return flows from either Pixley or Kern NWRs except in extremely wet years. Kern NWR is used to accept floodwater from Poso Creek.

Water Quality. Surface-water quality in Millerton Lake, the San Joaquin River at and upstream of the PID diversion, and in subsequent canals and systems is adequate for refuge and agricultural uses (USBR, 1994). For example, this water is widely used for irrigation and drinking water after disinfection. Water quality within the Friant-Kern Canal and PID and Buena Vista conveyance canals is similar in quality to water from Millerton Lake. This is demonstrated by its current, successful use for irrigation of sensitive agricultural crops and wildlife habitat.

Studies conducted by the U.S. Geological Survey found that few pesticides were detected at each refuge site and that those detected were far below levels at which adverse effects would

be apparent. Trace element concentrations were also found to be low and pose little threat to wildlife.

Environmental Consequences

Criteria for Determining Significance. Impacts to hydrology and water quality would be considered significant if they would result in any one of the following:

- Substantial degradation of water quality
- Contamination of public water supply
- Substantial degradation or depletion of groundwater resources
- Substantial interference with groundwater discharge

Hydrology and water quality impacts and mitigation measures are in Table IV-18.

Surface Water. Construction of any of the conveyance alternatives for the two refuge areas would have no effect on San Joaquin River water quality. Impacts to water quality would be limited to the short term during the construction at the following locations:

- KER-1A/B: West Side Canal, Cross Canal, Main Drain Canal
- KER-7: Burham Canal (canal has not been maintained, supports extensive riparian vegetation dominated by tamarisk).
- PIX-2B: Deer Creek
- PIX-4B: (Same as PIX-2B)
- PIX-9: (Same as PIX-2B)

Impacts from the installation of the alternatives at the locations listed above would require disturbing the streambed, resulting in increases in turbidity and the generation of sediment. This impact would be considered significant because of potential impacts to beneficial uses.

Groundwater. Impacts to groundwater are not anticipated from the construction of any of the conveyance facilities because the disturbance will be short term and will generally be limited to activities above the groundwater aquifer.

Hydrographs were analyzed for 12 groundwater wells in or within the confined aquifer beneath the Corcoran Clay layer. Four of the wells were located in the Pixley NWR and eight were within 7,500 feet of the boundary. Groundwater elevations in three wells within the refuge have not decreased significantly over the last 30 years; one of the wells exhibited a slight increase in elevation. Groundwater elevations in three wells north of the refuge have decreased up to 75 feet over the last 35 and 45 years. Southwest of the refuge, groundwater elevations have decreased up to 100 feet in two wells. These wells were monitored between 1987 and 1994, which was a general period of drought. Southeast of the refuge, groundwater elevations have remained approximately constant in three wells and have increased slightly in one well since 1960. Results of this analysis indicate that

Table IV-18
Hydrology and Water Quality Impacts and Mitigation Measures

Impacts		Mitigation		Level of Significance After Mitigation
HWQ-a	Alignments KER-1A/1B, KER-7, PIX-2B, PIX-4B, PIX-9 would temporarily impact surface water quality.	HWQ-1	Schedule construction within the banks of all streams during the dry season.	LS
		HWQ-2	Develop and implement an Erosion and Sediment Control and Storm Water Pollution Prevention plan that identifies methods to minimize sedimentation during construction.	

Note:
LS = Less than Significant
HWQ = Hydrology and Water Quality

groundwater elevations in the aquifer have been relatively stable since 1960. According to the Department of Water Resources, water levels have increased during the past decade, particularly since the end of the drought in the 1990s (DWR, 2002). The current and proposed wells on the Pixley NWR pump from the confined aquifer beneath the Corcoran Clay layer, which is not necessarily influenced by the upper aquifer monitored by DWR. However, deep well production, while it fluctuates seasonally, rebounds each year to original levels, indicating that there is adequate recharge in the aquifer beneath the clay.

The installation of one additional well on the Pixley NWR associated with PIX-4B would not be considered a significant impact to groundwater supplies. The design withdrawal would be up to 1,600 gpm, and the well would only be used to supplement deliveries during the months of June and July.

The installation of six additional wells on the Pixley NWR associated with PIX-8 would be considered a significant impact to groundwater supplies given the current status of the aquifer; however, an in-lieu recharge via the Friant-Kern Canal is incorporated as part of this alternative in response to this concern. The Pixley NWR currently pumps Level 2 supplies of up to 1,280 ac-ft annually from the deep aquifer. For PIX-8, to supply the refuge with Level 4 supplies of 6,000 ac-ft, other agricultural interests, which also pump from this aquifer, would be delivered 6,000 ac-ft of surface-water supplies from the Friant-Kern Canal in lieu of pumping. The proposed on-refuge pumps, included as part of this alternative, and existing pump would draw 6,000 ac-ft annually. The net impact on the aquifer would be positive because the refuge would increase their draw from the aquifer by 4,720 ac-ft (the difference between Level 2 and Level 4), while agricultural demands on the same aquifer would decrease by 6,000 ac-ft. Implementation of this alternative would result in a net reduction of aquifer withdrawal by 1,280 ac-ft. This would be considered a beneficial impact; no mitigation would be required.

Drainage. Increasing flows from Level 2 to Level 4 will not alter the existing status of the two refuge areas to accept all water without any subsequent drainage or return flow. Therefore, there will be no drainage-related impact to off-refuge water quality.

Water Quality. Potential impacts to water quality are discussed under the Surface Water, Drainage, and Groundwater sections.

Mitigation

The following mitigation measures are incorporated as part of each alternative and will reduce impacts identified above to a less than significant level:

- HWQ-1. Schedule construction within the banks of all streams listed above within the dry season when these channels have reduced flows, or as specified by the CDFG and/or the USACE when obtaining permit approvals from these agencies. Isolate flows to the extent possible to minimize downstream siltation.
- HWQ-2. Develop and implement an Erosion and Sediment Control Plan and Storm Water Pollution Prevention Plan that identifies methods to minimize sedimentation during construction in addition to slope stabilization and revegetation techniques. This plan should be prepared in coordination with the CDFG, Central Valley RWQCB, and USACE.

Recreation

Affected Environment

Recreational opportunities in the vicinity of the refuges include hunting, nature viewing, fishing, and water-related activities. Within the region, the Kern River traverses the San Joaquin Valley, offering a large variety of recreational venues. Private hunting clubs are scattered around the perimeter of the refuges and are heavily used. Recreational opportunities exist at Millerton and other CVP reservoirs. Other forms of recreation

are somewhat limited because of a lack of public land and extensive agricultural land use (USBR, 1994).

The NWRs are intensively managed areas that provide wildlife habitat in addition to the hunting (consumptive) and wildlife viewing (non-consumptive) recreational opportunities. Most recreationalists use the Kern and Pixley NWRs in a non-consumptive manner, for activities such as wildlife viewing and walking or driving the auto-tour route. Pixley NWR is closed to all but non-consumptive uses such as bird watching and wildlife photography. These activities are restricted to specific areas. Portions of Kern NWR are designated for hunting uses and are managed accordingly. Hunting is allowed only on designated days, and the number of hunters is regulated (USBR, 1994).

Environmental Consequences

Criteria for Determining Significance. Criteria for determining the significance of impacts from the perspective of recreational opportunities at Kern and Pixley NWRs include the following:

- Introducing conflicts with established recreational uses of the area
- Conflicts with local or regional recreation management plans

Recreation impacts and mitigation measures are summarized in Table IV-19.

Recreational opportunities along the Kern River and local reservoirs would not change because of the delivery of additional water to wetland habitat areas via any of the conveyance alternatives. No impact would occur. Recreational opportunities on the Kern NWR will increase at full development (Level 4). Nonconsumptive visitors will have access to two auto tour routes with turn-outs and hiking trails. An expanded visitor contact point will be developed at the Refuge entrance. The tour routes will have developed turn-out and interpretive signs and displays. Currently only one auto tour route is available with limited interpretive signs.

Hunting opportunities will also increase with the increase in available habitat. The Refuge Compatibility Statement for waterfowl and upland game (pheasant) hunting states that the refuge will provide 1,000 acres of closed area or sanctuary before any waterfowl hunting begins. After the sanctuary is established and as additional wetlands are created, hunting will increase to a 55/45 percent ratio of sanctuary to hunt area. Based on alternatives in the Draft EA for the Kern NWR Comprehensive Conservation Plan, hunting will be permitted on a maximum of 40 percent of refuge lands while 60 percent will be closed to hunting. If this alternative is selected, approximately 4,000 acres of wetlands will be open to hunting. This procedure will only apply at Level 4 or full development and in years when the full water supply is available.

Available hunting would start small and increase, as the habitat is flooded, until full capacity is reached.

Currently, the Kern NWR receives approximately 6,300 visits annually. This includes approximately 3,100 visitor days from waterfowl hunters. At Level 4 water supply visitation will increase dramatically with an increase in available user facilities and public hunting area. An estimate of visitation at full development for non-consumptive use is approximately 20,000 visits per year with additional 4,800 visits for waterfowl hunting for 24,800 visits annually.

Table IV-19
Recreation Impacts and Mitigation Measures

Impacts	Mitigation	Level of Significance After Mitigation
	No mitigation is required.	

Recreational opportunities on the Pixley NWR will increase at full development (Level 4). At Level 2 non-consumptive visitation is limited to a self-guided interpretive trail or by Special Use Permit or special guided tour. At full development, visitors will be directed to two visitor contact points by directional signing and have access to parking areas, observation points and two self-guided foot trails. No consumptive (hunting or fishing) use is now available and will not be available at full development.

Currently, visitor use at Pixley is approximately 350 visits annually. At full development visitor use will increase approximately 5,000 visits annually.

Mitigation

No mitigation is required.

Socioeconomics

Affected Environment

The socioeconomic environment for this EA/IS encompasses the Fresno, Kings, Tulare, and Kern Counties. The study area is essentially rural in nature, with the major urban areas being Fresno, Bakersfield, and Visalia. The primary industry is agriculture.

Outdoor Recreation. As described in the Recreation discussion, recreational opportunities vary from on-refuge hunting and nature viewing to off-refuge hunting and recreation associated with local reservoirs and the Kings Canyon area. On-refuge recreational use contributes primarily to the local economies of Pixley, Earlimart, Delano, and Wasco because of their proximity to the refuges through purchases of supplies, food, and lodging. Expenditures tend to be highest during the fall and winter in conjunction with duck hunting. Hunting is also a key off-refuge recreational use because of the number of private hunting clubs in the area. The majority of the remaining recreational use is focused on local reservoirs and the Kings Canyon area, where expenditures are generated through fishing, boating, and camping opportunities.

Environmental Consequences

Criteria for Determining Significance. Impacts to the socioeconomic environment would be considered significant if they would result in any one of the following:

- Induce substantial growth or concentration of population
- Substantially impact local housing supplies
- Substantially impact local health and safety by exceeding or degrading local public service capabilities
- Substantially impact the regional agricultural economy in the short or long term

Socioeconomic impacts and mitigations are summarized in Table IV-20.

Recreation. If additional water supplies result in increased use by waterfowl, implementation of any of the alternatives associated with the refuges would result in a long-term beneficial socioeconomic impact. Increased numbers of waterfowl would translate to increased opportunities for wildlife viewing and hunting, with resultant increases in expenditures on supplies, lodging, and food within the local economy.

Table IV-20
Socioeconomic Impacts and Mitigation Measures

Impacts	Mitigation	Level of Significance After Mitigation
	No mitigation is required.	

Construction. Alternatives that require construction of major pipeline facilities, such as PIX-2B, PIX-4B, and PIX-9, would require a local or regional contractor to install the necessary facilities. The construction effort would likely result in local expenditures in terms of lodging, food, and construction-related materials and equipment purchases.

Alternative PIX-8 would also generate a minor degree of beneficial impacts in terms of increased local spending, but to a much lesser degree because of the relatively minor improvements required.

Mitigation

No mitigation is required.

Energy

Affected Environment

This EA/IS encompasses the counties of Fresno, Kings, Tulare, and Kern with respect to energy. The study area is essentially rural in nature, with the major urban areas being Fresno, Bakersfield, and Visalia. The primary industry is agriculture.

Kern and Pixley NWRs both have on-refuge wells. The Kern NWR wells are currently not used because of poor water quality and expense involved in pumping. The Pixley NWR wells are used to supplement the unreliable supplies from Deer Creek.

Energy is required to convey water to the refuges. Pixley has received CVP power since 1994. The conveyance of water throughout the CVP and SWP system requires a great deal of power associated with electrical pumping. Large-scale pumping occurs at various locations along the CVP, including the Delta. Hydropower facilities generate power from reservoir releases at the CVP Friant Dam. Water-year conditions and CVP operating criteria may necessitate changes to reservoir releases, and these changes can affect reservoir operation and power generation potential.

Environmental Consequences

Implementation of the proposed action would provide additional CVP and SWP supplies to the refuges compared to the No-Action Alternative. This is a small increase in the total water available to the refuges. The delivery of this supplemental CVP/SWP water associated with the Kern NWR alternatives and PIX-2B and PIX-4B is not expected to affect CVP/SWP yield or storage in an amount that would impact power generation or use significantly. On-refuge power use would increase on the Pixley NWR if PIX-8 and PIX-4B were implemented; however, off-refuge pumping would decrease by a greater amount, due to the in-lieu exchange of surface water. This would be a beneficial impact.

Criteria for Determining Significance. Impacts to energy would be significant if they would result in any one of the following:

- Activities that result in the use of large amounts of energy
- Use of energy in a wasteful manner

Energy impacts and mitigation measures are summarized in Table IV-21.

Table IV-21
Energy Impacts and Mitigation Measures

Impacts	Mitigation	Level of Significance After Mitigation
	No mitigation is required.	

Mitigation

No mitigation is required.

Air Quality

Air quality data are discussed in terms of defined air basins and focus on federal and state criteria pollutants. The South San Joaquin Valley basin area lies within the San Joaquin Valley Air Basin, which includes San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and most of Kern Counties. Currently, Kern and Tulare Counties are designated as nonattainment areas for the federal and state ambient air quality standards for ozone and particulate matter less than 10 microns (PM_{10}). The potential for the proposed action to significantly contribute to criteria pollutant levels (i.e., particulates) by way of disturbance to fallowed fields currently in non-attainment, will be addressed.

Affected Environment

The geographic area for the focus of this analysis is limited to the San Joaquin Valley Air Basin. Assessment of air quality within the region can be based on several factors.

Total suspended particulates are airborne particles small enough to remain suspended in air for long periods. PM_{10} includes dust, sand, mineral particles, pollen, and smoke. The most common artificial sources of PM_{10} in the air basin are agricultural operations, demolition and construction activities, road dust from vehicles, and wood burning. Airborne dust and wind erosion of exposed surfaces also represents significant sources of PM_{10}. Regulation of air quality is achieved through both national and state ambient air quality standards and emission limits for individual sources of pollutants. The national ambient PM_{10} standard is 150 micrograms per cubic meter ($\mu g/m^3$), whereas the more stringent state standard is an annual average of 20 $\mu g/m^3$ not to be exceeded, and retention of the 24-hour standard of 50 $\mu g/m^3$ not to be exceeded.

PM_{10} concentrations in the air basin have exceeded the state 24-hour ambient standards each of the past 8 years and exceeded the national standard six times in 1999 (California Air Resource Board, 2002). The entire air basin is designated as a non-attainment area for the national and state PM_{10} standards.

The San Joaquin Valley Unified Air Pollution Control District is the regional agency empowered to regulate air pollutant emissions in the air basin. The Air District prepared a PM_{10} Air Quality Attainment Plan in 1991. The Plan contains measures to reduce emissions, including those generated by agricultural lands, but does not contain measures that apply to wetlands habitat areas (San Joaquin Valley Unified Air Pollution Control District, 1991).

Environmental Consequences

Criteria for Determining Significance. Impacts to air quality would be considered significant if they resulted in any one of the following:

- Violation of any ambient air quality standard
- Substantial contribution to an existing or projected air quality violation
- Exposure of sensitive receptors to substantial pollutant concentrations

Air quality impacts and mitigations are summarized in Table IV-22.

Dust emissions from construction activity of alternatives KER-1A/1B, PIX-2B, PIX-4B, PIX-8 and PIX-9, will result in increased levels of PM_{10}. Emission sources would include vehicles and construction equipment traveling over dirt surfaces, site clearing, grading, cut and fill operations, and wind-blown dust. Impacts to air quality would be limited to the short term during the construction period for the alternatives but could be significant.

Table IV-22
Air Quality Impacts and Mitigation Measures

Impacts		Mitigation		Levels of Significance After Mitigation
AQ-a	Alignments KER-1A/1B, PIX-2B, PIX-4B, PIX-8, and PIX-9 would temporarily impact air quality.	AQ1	All active construction areas will be watered daily as necessary.	LS
		AQ2	Dust producing activities will be suspended when high winds create substantial construction-induced visible dust plumes moving beyond the site in spite of dust control measures.	
		AQ3	All trucks hauling soil and other loose material will be covered as necessary.	
		AQ4	Soil stabilizers, such as paving, watering, or the application of gravel, will be applied to all unpaved access roads and staging areas at construction sites.	
		AQ5	Roads will be swept, as necessary, if visible soil material is carried onto adjacent public streets.	
		AQ6	Stockpiles will be covered or applied with a soil stabilizer when necessary.	
		AQ7	Traffic speeds will be limited to 15 miles per hour on unpaved roads.	

Notes:
LS = Less than Significant
AQ = Air Quality

No additional changes to air quality for the South San Joaquin Valley are anticipated from implementation of the proposed action. Land use management on- and off-refuge would not be affected by implementation of the proposed action. Therefore, no changes to traffic or soil erosion are anticipated that could affect air quality within the basin. Given the air basin is in non-attainment for PM_{10}, contributions to PM_{10} levels would be temporarily increased and mitigation would be required for this short-term impact.

Mitigation

The following mitigation measures are incorporated as part of each alternative and will reduce short-term construction-related impacts identified above to a level of less than significant:

- AQ1. All active construction areas will be watered daily as necessary.
- AQ2. Dust producing activities will be suspended when high winds create substantial construction-induced visible dust

plumes moving beyond the site in spite of dust control measures. AQ3. All trucks hauling soil and other loose material will be covered as necessary.

- AQ4. Soil stabilizers, such as paving, watering, or the application of gravel, will be applied to all unpaved access roads and staging areas at construction sites.
- AQ5. Roads will be swept, as necessary, if visible soil material is carried onto adjacent public streets.
- AQ6. Stockpiles will be covered or applied with a soil stabilizer when necessary.
- AQ7. Traffic speeds will be limited to 15 miles per hour on unpaved roads.

Chapter V
Cumulative and Growth-Inducing Impacts

Cumulative Impacts

Cumulative impacts are effects that may be individually minor at a project level, but collectively can result in greater effects when considered in relation to other related past, present, and foreseeable future projects. This discussion focuses on the cumulative impacts associated with the development of conveyance facilities necessary to deliver Level 4 water supplies to the refuge areas. The CVPIA PEIS has addressed the system-wide impacts associated with implementation of the Refuge Water Supply requirements of the CVPIA, including the acquisition of Level 4 water supplies. The expected impacts of acquiring Level 4 supplies will also be subsequently addressed in greater detail in a separate environmental document.

In general, the impact areas are dominated by agricultural uses and are anticipated to remain in agricultural use in the long term. The implementation of any of the action alternatives would result in both beneficial and adverse impacts. As described previously, all adverse impacts can be mitigated to a less than significant level. Adverse impacts were identified within the following resource categories:

- Biological Resources (primarily short-term impacts to habitats, some of which could be used by endangered species)
- Water Quality (primarily short-term impacts from the construction of conveyance facilities across or adjacent to existing stream courses)
- Land Use (primarily short-term impacts associated with installation of facilities through prime agricultural lands)

The installation of conveyance facilities to each of the refuge areas will result in short-term impacts to habitats used by a number of species, including species which are listed as threatened or endangered by the USFWS and CDFG. Generally, limited long-term impacts could also occur where facilities resulted in a permanent encumbrance such as a canal. As described in Chapter 4, the USBR will route all facilities to minimize all impacts to sensitive habitats and will mitigate all impacts where avoidance is not possible. Mitigation measures include revegetation and monitoring at replacement ratios determined reasonable for each type of habitats. In addition to avoidance and mitigation, where avoidance is not feasible, the overall action will result in a number of wildlife and vegetation benefits on NWR. Increased water supplies will allow for the development of additional habitat, which will ensure the maintenance of habitats that cannot currently be maintained during dry periods. Accordingly, potential cumulative negative effects to biological resources are considered minor and the cumulative effects in general would be beneficial.

Adverse contributions to regional water quality are also considered insignificant because of the generally short-term nature of the construction period and the extremely small potential contribution to water quality turbidity and overall quality. Mitigation, including the development of an erosion control and restoration plan, will ensure that there are essentially no adverse impacts to water quality in a cumulative sense.

Impacts to land use are primarily limited to short-term disturbances to agricultural land. Alternatives, which include permanent facilities, such as a canal, would result in permanent impacts. Routing of conveyance facilities to avoid agricultural impacts to the extent possible will lessen impacts. Short-term disturbances will lessen overall productivity for approximately one year. These short-term impacts will not result in any noticeable cumulative effects.

Growth-Inducing Impacts

Growth-inducing impacts are defined in Section 15125(g) of the CEQA Guidelines as "the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment." The proposed alternatives will result in some economic activity during construction in terms of a temporary demand for labor, building materials, and a limited degree of lodging. These short-term economic benefits will not result in significant growth-inducing economic or population growth, or the need to provide additional new housing.

Chapter VI
Environmental Commitment Checklist

Table VI-1
Environmental Commitment Checklist

Impact	Mitigation	Level of Significance After Mitigation
Land Use		
LU-a Alternatives PIX-2B, PIX-4B, or PIX-9 could temporarily impact between 250 and 350 agricultural production acres for one season.	LU-1 Schedule construction to minimize impacts to crop production. LU-2 Minimize workspace required to install facilities. LU-3 Compensate landowners for any loss of crop production or impacts to agricultural operations.	LS
LU-b Alternative PIX-2B could permanently impact residential and other structures.	LU-4 Route conveyance facilities to avoid residences and other structures. LU-5 Compensate landowners for any loss of property.	LS
LU-c Alternatives KER-7, PIX-2B, PIX-4B, and PIX-9 could impact existing residential powerlines.	LU-6 Route conveyance facilities to avoid powerlines.	LS
Biological Resources		
BR-a Alternatives KER-1A/1B, KER-7, PIX-2B, PIX-4B, and PIX-9 could impact special-status plants.	BR-1 Conduct pre-construction surveys prior to final design to identify locations of special-status plants following the procedures outlined in *Guidelines for Assessing the Effects of Proposed Developments on Rare and Endangered Plants and Plant Communities*. Surveys must be timed to coincide with the flowering seasons of the targeted species. Following pre-construction surveys, develop measures to avoid impacts to special-status plants. BR-2 Where avoidance of special-status plants is not practicable, develop and implement measures for mitigating impacts, including relocation or re-establishment of special-status plant populations. Mitigation would involve creating suitable habitat in non-suitable habitat by providing soil, water, and vegetation to replicate conditions needed to establish special-status species populations.	LS
BR-b Alternatives PIX-2B, PIX-4B, and PIX-9 could impact 2.7 acres of riparian habitat.	BR-3 Prior to final design, map and quantify riparian habitat and other important natural plant communities. Develop measures to avoid or minimize impacts to these habitats.	LS

Notes:
LU = Land Use
BR = Biological Resources
LS = Less than Significant

Environmental Commitment Checklist			
Impact		**Mitigation**	**Level of Significance After Mitigation**
BR-b continued	BR-4	Develop and implement mitigation measures for unavoidable impacts to riparian habitat. Where possible, disturbed riparian habitat should be restored onsite following completion of construction activities. Permanently eliminated riparian habitat should be replaced at a 2:1 ratio (i.e., 2 acres of habitat created for each acre eliminated). Mitigation would involve creating riparian habitat in non-riparian habitat by providing soil, water, and vegetation.	
	BR-5	Develop and implement a revegetation plan for temporarily disturbed construction sites. The revegetation plan should incorporate seeding and planting of species that will resist invasion by noxious weeds.	
	BR-6	Develop and implement a monitoring plan to assess the success of mitigation measures for impacts to vegetation and special-status species. Plantings on the revegetation and compensation sites should be monitored during the growing season (March through September) to determine growth rates for 3 years from the date of transplant or planting. A yearly report should be submitted to USFWS, including dates of watering, growth rates, cover rates, and mortality figures. Monitoring could be curtailed after 3 years if success is demonstrated. (Success is achieved when plant cover of the mitigation site is at least 80 percent of the cover at the impact site prior to project disturbance and vegetative composition of the dominant [> 20 percent of the cover] and characteristic species [typical, regularly occurring in the habitat but not dominant] exceeds 80 percent of that which was present at the impact site.) Monitoring of special-status plant mitigation sites could be curtailed after 3 years if overall survival rates of seeded, planted, or transplanted plants exceed 80 percent of projected survival rates.	
	BR-7	Pre-construction surveys should be conducted for raptors prior to the peak March through August nesting period. Construction during the critical nesting period (March through August) will be avoided; or, if nesting pairs and fledglings are identified within 0.25 mile of construction, a monitoring program will be initiated in consultation with the CDFG.	LS

Notes:

BR = Biological Resources

LS = Less than Significant

Environmental Commitment Checklist			
Impact		**Mitigation**	**Level of Significance After Mitigation**
BR-b continued		If Swainson's hawks are present, site surveys will be conducted to identify nesting activity. If nests are located within 0.5 miles of the project site with a direct line of sight to the activity, CDFG will be consulted to establish proper mitigation. As stated above for other raptors, seasonal restrictions (March through August) on project activities may be appropriate.	
BR-c	Alternatives KER-1A/1B, KER-7, PIX-2B, and PIX-9 could impact habitat used by San Joaquin kit fox.	BR-8	Before staging and construction, have a USFWS-approved biologist survey for dens and other kit fox sign such as scat, prey remains, and tracks. The biologist shall follow the USFWS's Standard Recommendations For Avoidance of the San Joaquin Kit Fox (1997). If any evidence of kit fox activity is found, contact the USFWS's Sacramento Fish and Wildlife Office to initiate consultation. A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the habitat types and sign listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. To avoid inadvertent entrapment of animals in holes during construction, all excavated, steep-walled holes or trenches more than 2 feet deep should be covered at the close of each working day by plywood or similar materials or provided with one or more escape ramps constructed of earth fill or wooden planks. All construction pipes, culverts, or similar structures, with a diameter of 4 inches or greater that are stored at a construction site for one or more overnight periods, should be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site.	LS

Notes:
BR = Biological Resources
LS = Less than Significant

Environmental Commitment Checklist		
Impact	**Mitigation**	**Level of Significance After Mitigation**
BR-c continued	On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed daily. Restrict use of rodenticides and herbicides to prevent secondary poisoning. In the event that take cannot be avoided, contact the USFWS for information before starting the action.	
BR-d Alternatives KER-1A/1B, KER-7, PIX-2B, PIX-4B, and PIX-9 could impact habitat used by Tipton kangaroo rat.	BR-9 Before any ground-disturbing activities, have a USFWS-approved biologist survey for the presence of the plant associations considered habitat for the Tipton kangaroo rat. The USFWS-approved biologist must survey for the presence of Tipton kangaroo rat sign such as burrow systems, haystacks, and areas of clipped vegetation. A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers. In the event that take cannot be avoided, contact the USFWS for information before starting the action.	LS

Notes:
BR = Biological Resources
LS = Less than Significant

Environmental Commitment Checklist				
	Impact		**Mitigation**	**Level of Significance After Mitigation**
BR-e	Alternative KER-1A/1B, KER-7, PIX-2B, PIX-4B, and PIX-9 could impact habitat used by blunt-nosed leopard lizard.	BR-10	Before staging and construction, have a USFWS-approved biologist survey for the presence of the habitat types used by this species and signs of leopard lizards such as burrows. The protocol developed by the CDFG shall be used to survey for this species. During the blunt-nosed leopard lizard's hibernation time, surveys are unreliable and cannot be used to determine absence of this species. Notice will be given to the CDFG and the USFWS 30 days before beginning construction to determine whether capture is desired. For projects from 5 to 10 acres in size (or 5 to 10 linear miles), within suitable habitat, should schedule surface disturbance activities during the active season (approximately April 15 to October 15). A USFWS-approved biologist will survey any trenches in the morning and late afternoon to remove lizards that fall into the trench. A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the habitat types and sign listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals (pets) shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed daily. In the event that take cannot be avoided, contact the USFWS for information before starting the action.	LS

Notes:
BR = Biological Resources
LS = Less than Significant

Environmental Commitment Checklist		
Impact	**Mitigation**	**Level of Significance After Mitigation**
BR-f Alternative KER-7 contains potential vernal pools and swales.	BR-11 If any vernal pools or vernal swales will be impacted (i.e., if construction activities will occur within 250 feet of the edge of a pool or swale), pre-construction surveys should be conducted for fairy shrimp and tadpole shrimp. During final design, avoid by 250 feet all features containing listed shrimp. Surveys should be conducted according to methods outlined in *Interim Guidelines for Surveys for the Endangered Conservancy Fairy Shrimp, Longhorn Fairy Shrimp, Riverside Fairy Shrimp, Vernal Pool Tadpole Shrimp, and the Threatened Vernal Pool Fairy Shrimp*. Stay at least 250 feet from the margin of the pool/swale edge. When conducting activities beyond 250 feet from habitat, be careful to avoid activities that will eventually result in effects to the pool/swale through changes in hydrology, sedimentation, or contamination of the habitat. Adequate fencing will be placed and maintained around any avoided (preserved) vernal pool habitat to prevent impacts from vehicles. If habitat is avoided (preserved) onsite, then a USFWS-approved biologist (monitor) will inspect any construction-related activities at the proposed project site to ensure that no unnecessary take of listed species or destruction of their habitat occurs. The biologist will have the authority to stop all activities that may result in take or destruction until appropriate corrective measures have been completed. The biologist also will be required to report immediately any unauthorized impacts to the USFWS and the CDFG. All onsite construction personnel will receive instruction regarding the presence of listed species and importance of avoiding impacts to these species and their habitat.	LS

Notes:
BR = Biological Resources
LS = Less than Significant

Environmental Commitment Checklist		
Impact	**Mitigation**	**Level of Significance After Mitigation**
BR-f continued	The applicant will ensure that activities that are inconsistent with the maintenance of the suitability of remaining habitat and associated onsite watershed are prohibited. This includes, but is not limited to the following: - Alteration of existing topography or any other alteration or uses for any purposes - Use of fire protection activities not required to protect existing structures at the project site - Use of pesticides or other toxic chemicals, including the exploration for or development of mineral extraction - Placement of any new structures on these parcels - Dumping, burning, and/or burying of rubbish, garbage, or any other wastes or fill materials - Building of any new roads or trails - Killing, removal, alteration, or replacement of any existing native vegetation - Placement of stormwater drains In the event that take cannot be avoided, contact the USFWS for information before starting the action.	
	BR-12 A monitoring plan should be developed and implemented to assess the success of mitigation measures for impacts to special-status wildlife. Success criteria should be clearly defined for all measures implemented to mitigate for project impacts to wildlife. Yearly reports should be submitted to the USFWS and the CDFG. If success criteria are being met after 3 years of monitoring, no additional monitoring is necessary.	

Notes:
BR = Biological Resources

Environmental Commitment Checklist				
	Impact		**Mitigation**	**Level of Significance After Mitigation**
BR-g	Alternatives KER-1A/1B, KER-7, PIX-2B, PIX-4B, and PIX-9 could impact habitat used by Buena Vista Lake shrew.	BR-13	Before any ground-disturbing activities, have a USFWS-approved biologist survey for the presence of the wetland plant associations considered habitat for the Buena Vista Lake shrew. Avoid areas in, or adjacent to, the Kern Lake Preserve. A USFWS-approved worker awareness program shall be conducted for all projects located in areas that provide, or may provide, habitat for this species. Confine surface disturbance to areas that do not exhibit the signs listed above with an adequate buffer (not less than 200 feet). The biologist must stake and flag to exclude construction activities within 200 feet of potential habitat. No work shall be conducted between sunset and sunrise within 0.5 mile of potential habitat. No domestic animals shall be allowed on the project site. On unposted roads, vehicle speeds shall not exceed 25 miles per hour. Trash shall be disposed of in covered containers and removed daily. In the event that take cannot be avoided, contact the USFWS for information before starting the action.	LS
BR-h	KER-7, PIX-2B, PIX-4B, and PIX-9 could impact between 2.4 to 8.2 acres of jurisdictional wetland.	BR-14	Pre-construction delineations should be conducted of wetlands and other waters of the U.S. Request a verification of the delineated boundaries from the USACE. Following verification of the delineation boundaries, measures to avoid impacts to jurisdictional wetlands should be developed.	LS
		BR-15	After final design, impacts to wetlands and other waters should be quantified. Submit to USACE a permit application for discharge of fill material into waters of the U.S., following Section 404 of the Clean Water Act.	

Notes:
BR = Biological Resources
LS = Less than Significant

Environmental Commitment Checklist			
Impact		**Mitigation**	**Level of Significance After Mitigation**
BR-h continued		BR-16 Install and maintain appropriate erosion and sedimentation controls during and following construction as specified in the required Erosion Control Plan (see Hydrology and Water Quality section). BR-17 A streambed alteration agreement with the CDFG should be obtained, following Section 1601 of the Fish and Game Code, before initiating construction within the 100-year floodplain of any stream crossing. BR-18 Develop and implement mitigation plans for impacts to wetlands. Eliminated wetlands should be replaced at a 2:1 ratio. Temporarily impacted wetlands should be restored onsite. Stockpile topsoil removed from wetlands and store in upland landscape positions. Following construction disturbance, restore the land surface contours and backfill the top 6 to 12 inches with stockpiled topsoil. BR-19 Following project completion, monitor the site to assess mitigation success. Success criteria should be clearly defined for all measures implemented to mitigate for project impacts to wetlands. Yearly reports should be submitted to the USFWS and the USACE. If success criteria are being met after 3 years of monitoring, no additional monitoring is necessary.	
Cultural Resources			
CR-a	Alternative KER-7 could impact a prehistoric site.	CR-1 Restrict KER-7 construction activities in the area of CA-KER-2100 to the existing canal alignment and restrict the movement of equipment to the south levee in this area. As the south levee has by far the better road surface, this should not impose a burden on the construction crew.	LS
CR-b	Alternatives PIX-2B, PIX-4B, and PIX-9 could impact adjacent historical residences.	CR-2 Avoid the three historical structures near the PIX-2B, PIX-4B, and PIX-9 alignments. If avoidance of impact to any of these structures is not feasible, then additional historical research should be conducted to determine significance, and a suitable plan for mitigation of adverse effect should be developed, if necessary.	LS

Notes:

BR = Biological Resources

LS = Less than Significant

Environmental Commitment Checklist				
Impact		**Mitigation**		**Level of Significance After Mitigation**
Hydrology and Water Quality				
HWQ-a	Alternatives KER-1A/1B, KER-7, PIX-2B, PIX-4B, and PIX-9 would temporarily impact surface water quality.	HWQ-1	Schedule construction within the banks of all streams during the dry season.	LS
		HWQ-2	Develop and implement an Erosion and Sediment Control and Storm Water Pollution Prevention plan that identifies methods to minimize sedimentation during construction.	
Recreation				
		No mitigation is required.		
Socioeconomics				
		No mitigation is required.		
Energy				
		No mitigation is required.		
Air Quality				
AQ-a	Alignments KER-1A/1B, PIX-2B, PIX-4B, PIX-8, and PIX-9 would temporarily impact air quality.	AQ-1	All active construction areas will be watered daily as necessary.	LS
		AQ-2	Dust producing activities will be suspended when high winds create substantial construction-induced visible dust plumes moving beyond the site in spite of dust control measures.	
		AQ-3	All trucks hauling soil and other loose material will be covered as necessary.	
		AQ-4	Soil stabilizers, such as paving, watering, or the application of gravel, will be applied to all unpaved access roads and staging areas at construction sites.	
		AQ-5	Roads will be swept, as necessary, if visible soil material is carried onto adjacent public streets.	
		AQ-6	Stockpiles will be covered or applied with a soil stabilizer when necessary.	
		AQ-7	Traffic speeds will be limited to 15 miles per hour on unpaved roads.	

Notes:

HWQ = Hydrology and Water Quality
LS = Less than Significant
AQ = Air Quality

Chapter VII
Consultation and Coordination

List of agencies and organizations consulted are as follows:

- CDFG
- USFWS, Ecological Services
- USACE
- Natural Resources Conservation Service
- Central Valley RWQCB

This EA/IS has been prepared to comply with the environmental review and consultation requirements of the NEPA and the CEQA. Compliance with specific environmental review and consultation requirements to implement the proposed action are identified in Table VII-1.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act requires the USBR to consult with the USFWS before undertaking projects that control or modify surface water (water projects). This consultation is intended both to promote the conservation of wildlife resources by preventing loss of or damage to wildlife resources and to provide for the development and improvement of wildlife resources concerning water projects. Federal agencies undertaking water projects are required to include in project reports recommendations made by the USFWS, to give full consideration to these recommendations, and to include in project plans justifiable means and measures for wildlife purposes.

Table VII-1
Review, Permits, and Licenses Required for the Conveyance of Refuge Water Supply

Agency	Act or Regulation	Requirement	Compliance Procedure
USACE	Section 404 Wetlands Permit under the Federal Clean Water Act Executive Order 11990 Protection of Wetlands	Possible dredge and fill permits for pipeline crossings; Notice coordination.	Obtain permitting approval; agencies review NEPA/CEQA document as part of process.
USACE/State Water Resources Control Board	Section 402 National Pollutant Discharge Elimination System/General Construction Activity Stormwater Permit	Project requiring disturbance to greater than one acre.	Obtain permitting approval; agencies review NEPA/CEQA document as part of process.
USACE/RWQCB	Section 401 Water Quality Certification	Work accomplished requiring discharge to surface waters.	Obtain permitting approval; agencies review NEPA/CEQA document as part of process.
USFWS	ESA	Compliance with provisions of the ESA.	ESA Section 7 consultation; agency reviews Draft and Final EA/IS.
CDFG	Streambed Alteration Agreement under Section 1601 of the Fish and Game Code	Alteration to a stream channel.	Obtain agreement approval; agency reviews NEPA/CEQA document as part of process.
CDFG	CESA	Compliance with provisions of CESA.	Agency reviews proponent's submittals; prepares biological opinion.
Advisory Council on Historic Preservation	National Historic Preservation Act, Sec 106; EO 11593, Sec 2 (b)(36 CFR 800)	Compliance with provisions of the ESA and Executive Order.	State Historic Preservation Office review of environmental document/ coordination.

The USBR contacted the USFWS and the CDFG about the need for a formal Section 2(b) Report for the project. The USFWS and the CDFG determined that formal consultation is not required for the project. The USFWS and the CDFG, as project participants, reviewers, and commentors, ensure that the interests of the Fish and Wildlife Coordination Act are fully addressed as part of the project formulation and on-going cooperative efforts. Technical memorandums to the official project files have served the purpose of information tracking. The USBR, USFWS, and CDFG are closely coordinating several ongoing activities associated with the CVPIA.

Endangered Species Act

The ESA (federal and state) protects species that have been listed or proposed for listing as threatened or endangered. The USFWS and the CDFG have been directly involved regarding special-status species for this EA/IS. Past ESA compliance activities have occurred since 1991 and include the following:

- Implementation of biological opinions for specific activities of the CVP
- Consultation on future activities
- Consultation addressing the CVP contract service areas

The USBR and the USFWS are continuing this close coordination for ESA compliance, with more recent activities associated with the CVPIA PEIS. For this EA/IS, endangered species protections include compliance with the ESA, including the 1994 USFWS Biological Opinion for the Delta Smelt and the 1993 Biological Opinion for the winter-run Chinook salmon. The USBR has received concurrence from the USFWS for the USBR's finding that the proposed action are not likely to adversely affect threatened or endangered species.

Other protections require refuge managers to comply with USFWS and NWR policies. These policies require that refuge managers review water and/or habitat management programs to determine any possible impacts on endangered, threatened, or candidate species, annually. This review allows managers to determine if water allocations would result in the adverse impacts to special-status species.

Cultural Resources Coordination

During the preparation of this EA/IS, CVP Environmental Team staff consulted with the USBR regarding the potential impacts on cultural resources resulting from implementation of the proposed action.

Procedures for complying with Section 106 of the National Historic Preservation Act are specified in 36 CFR 800. The analysis presented in this EA/IS serve as an overview and initial study to determine the parameters of potential impact to historical resources. Prior to construction of the selected alternative, the following steps will be needed to satisfy the regulations:

- Identify an area of potential environmental effect for the project.
- Field survey any areas in the area of potential effect that were not examined in the current project, and record and formally evaluate all resources in the area of potential effect.
- Produce a technical report on the findings of the above, including recommendations for mitigation, if necessary.

If no significant cultural resources are located in the area of potential effect and if the USFWS and the State Historic Preservation Officer concurs in this finding, this will complete the Section 106 process. If a significant property is located in the area of potential effect and an adverse impact is determined, consult with the Advisory Council on Historic Preservation, State Historic Preservation Officer, and other interested parties.

Indian Trust Assets

Indian Trust Assets are legal interests in property or rights held in trust by the U.S. for Indian Tribes or individuals. Trust status

originates from rights imparted by treaties, statutes, or executive orders. These rights are reserved for or granted to tribes. A defining characteristic of an asset is that such assets cannot be sold, leased, or otherwise alienated without federal approval.

Indian reservations, rancherias, and allotments are common trust assets. Allotments can occur both within and outside of reservation boundaries and are parcels of land where title is held in trust for specific individuals. Additionally, trust assets include the right to access certain traditional use areas and perform certain traditional activities. No reservations occur within the wetland habitat areas, and therefore, would not be affected by implementation of any of the conveyance alternatives.

Coordination with Water Purveyors

Meetings were held with each of the potential water purveyors to field verify system capacities and obtain direct input on proposed alternatives. This input was incorporated into the alternative selection process to ensure that all reasonable alternatives were evaluated.

Public Involvement Activities

The USBR, in cooperation with the USFWS, held informal public meetings in Tulare and Santa Nella, California. The meetings were held to inform the public about the preparation of the EA/IS and to elicit public comments for preparation of the EA/IS. Written and verbal comments from these meetings were considered in preparation of this EA/IS, as summarized at the end of this chapter. The USBR also conducted an intensive public review prior to the public meetings to elicit comments for the EA/IS analyses from a number of selected federal, state, local agencies, and water districts. These entities were selected based on their interest and participation in the public involvement program for the CVPIA PEIS and refuge water supply specific concerns.

Summary of Public Comments

Public comments received during the scoping meetings held in early June 1995 focused primarily on water quantities, source, use, and quality. Concerns over potential impacts to groundwater were strongest in the San Joaquin Valley due to the areas' historical groundwater concerns and increased use. In general, the public requested a thorough and objective review of all potential impacts to on- and off-refuge uses, in terms of environmental and social issues. Comments ranged from a desire that impacts to all endangered species in the project vicinity be disclosed to concerns over water quality impacts in the Delta. It was also requested that state facilities be used wherever possible to supplement the CVP. A summary of the primary comments is listed in Chapter I under Project Scoping. A complete record of comments raised at the scoping meetings is available from the USBR. Each of these issues is discussed in this EA/IS.

Environmental Justice

Executive Order 12898 requires that each federal agency achieve environmental justice as part of its mission, by identifying and addressing disproportionately high and adverse human health or environmental effects, including social and economic effects of its programs, policies, and activities on minority populations and low-income populations of the U.S. The USBR has determined that none of the conveyance alternatives would disproportionally impact minority or low-income populations. Impacts identified in the Socioeconomic section of Chapter IV are generally anticipated to be beneficial, in addition to being shared across income levels.

Farmlands Policy

Council on Environmental Quality memorandums to heads of Agencies, dated August 30, 1976 and August 11, 1980, and the Farmlands Protection Policy Act of 1981 require agencies for this environmental document to include farmlands assessments designed to

minimize adverse impacts on prime and unique farmlands. As described in the Land Use section of Chapter IV, the proposed project would have no adverse impacts on farmlands. The USBR will work directly with all affected landowners to compensate for any short- or long-term impacts.

Executive Order 11988, Floodplain Management

Executive Order 11988 requires federal agencies to prepare floodplain assessments for proposals located within or affecting floodplains. If any agency proposed to conduct an action within a floodplain, it must consider alternatives to avoid adverse effects and incompatible development. If the only practicable alternative involves siting in a floodplain, the agency must minimize potential harm to or within the floodplain and explain why the action is proposed within the floodplain. No impacts are anticipated to floodplain areas.

Executive Order 11990, Protection of Wetlands

EA 11990 requires federal agencies to prepare wetlands assessments for proposals located within or affecting wetlands. Agencies must avoid undertaking new construction located in wetlands unless no practicable alternative is available and the proposed action includes all practicable measures to minimize harm to wetlands. Impacts to wetland areas are anticipated to be relatively minor and short term in nature. Impacts, which may occur, will be mitigated as identified under the Biological Resources section of Chapter IV.

Clean Water Act

Any person or public agency proposing to locate a structure, excavate, or discharge dredged or fill materials into water of the U.S. must obtain a 404 Permit from the USACE. Under Section 404 of the Clean Water Act, the USACE's jurisdiction over navigable waters has been expanded to include rivers, coastal waters, adjacent wetlands, lakes, intermittent streams, and low lying areas behind dikes along the coast. Improvements requiring work within streams or wetlands regulated by the USACE will require a 404 Permit.

Clean Air Act

The Clean Air Act requires the Environmental Protection Agency to publish national primary standards to protect public health and more stringent national secondary standards to protect public welfare (40 CFR 50). States and local governments are to be responsible for the prevention of air pollution. The proposed project will not adversely affect existing air quality.

Chapter VIII
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Appendix A
Alternatives Screening Process
South San Joaquin Valley Study Area

Technical Appendix
Alternatives Screening Process
South San Joaquin Valley Study Area

This technical appendix provides a detailed discussion of the screening process used in selecting the recommended alternatives for the refuges in the South San Joaquin Valley area. Also, a brief description of the overall project, screening criteria, and a summary of the alternatives is provided.

Background

The initial development of alternatives was based, in part, on the previous studies completed by the U.S. Bureau of Reclamation (USBR) regarding refuge water supply. Four primary investigations were considered in the initial development of alternatives:

- Report on Refuge Water Supply Investigations, Central Valley Hydrologic Basin, California, 1989
- San Joaquin Basin Action Plan/Kesterson Mitigation Action Plan Report, 1989
- Refuge Water Supply Study, Plan Coordination Team Interim Report, 1992
- Refuge Water Supply, Proposed Plan of Study Report, 1993

In addition to the alternatives presented in these investigations, the study team developed additional alternatives for consideration. These alternatives generally involved conjunctive use of groundwater resources to the extent possible and alternative conveyance routing options.

Public involvement meetings were held with interested parties for conveyance of refuge water supplies. A key objective of these meetings was to preview the alternatives being considered for the investigation, receive input and comments on these alternatives, and solicit additional alternatives for consideration. In some instances, additional alternatives were forthcoming from the public involvement meetings. These alternatives were included in subsequent evaluations.

Following the development of the alternatives for each refuge using the process described above, an initial screening process was employed. This initial screening process was used to eliminate from further consideration any alternatives that had fatal flaws, resulting from excessive costs, unreasonable engineering requirements, or unacceptable environmental impacts. Following initial screening of the alternatives, remaining alternatives were developed to the same level of detail and analyzed in the Environmental Assessment/Impact Statement (EA/IS).

A number of agency workshops, discussions with water purveyors, and scoping meetings were held in early June 1995. During these workshops and meetings, the alternatives presented in the EA/IS were determined to be feasible in terms of accomplishing the purpose and need of the proposed action. The process used to determine feasibility and the results of these investigations are presented in the April 1995 Decision Document. Additionally, USBR and the U.S. Fish and Wildlife Service (USFWS) further refined the alternatives selected in the Decision Document in a May 1995 document titled *Refuge Water Supply Conveyance Alternatives Refinement Memorandum* (Memorandum). The EA/IS analyzes alternatives that were determined feasible as presented in the Memorandum. It evaluates the potential environmental impacts of implementing any of the proposed alternatives to each refuge, in addition to discussing the anticipated social and institutional constraints.

Recommended Alternatives

Selection of recommended alternatives for the conveyance of refuge water supplies for each refuge area was based on input from USBR, USFWS, and Department staff, including staff from each of the refuge areas. To guide and document the selection process, it was determined that a number of factors should be identified, which could be used for any of the refuge areas and weighted according to the relative importance. The following six factors were identified (the proportionate weighting factor is indicated in parenthesis) as best capturing the primary issues:

- Water supply reliability (30)
  - Relative ability of an alternative to provide increased water supply reliability, including the benefits of multiple sources or conveyance facilities.
- Water quality (15)
  - Overall water quality expected to be delivered by the alternative, including the potential for degradation due to upstream sources.
- Environmental issues (20)
  - Relative potential impacts to special status species, including both short-term (construction related) and long-term impacts.
- Cost-effectiveness (20)
  - Relative comparison of estimated life-cycle costs for each alternative, including initial capital costs, operations and maintenance costs, wheeling costs, and additional costs for water losses.
- Implementation (10)
  - Relative ease of implementation, including potential impacts on existing agencies, permitting issues, safety, and land use.

Engineering (5)

- Relative engineering aspects of alternatives, including increased system integrity resulting from new facilities and changes in current operations and maintenance functions by refuge management staff.

The weighting factors identified based on determining the relative importance of each factor. It was determined that the reliability of supplies was the most important factor, and therefore, was weighted highest. Environmental issues and cost-effectiveness were ranked next most important and equal amongst themselves. Water quality was determined to be the third most important factor, in part, because the quality of water, which would be conveyed to each of the refuges, is generally good. Implementation and engineering concerns were also felt to be of sufficient importance to warrant including them as separate factors.

Using these six factors and weighting approach, matrices were created to rank each of the alternatives addressed in detail in the EA/IS. Each of the alternatives was compared to one another and given an impact level score of between one and ten for each issues. For example, as shown on Table 1 under water supply reliability, the KER-1A/1B alternative was given a numerical score of 8, compared to KER-7, which was given a score of 6. The weighted impact scores for these two alternatives under water supply reliability were 240 and 180 respectively, because of the weighting factor of 30 given to the water supply reliability factor. The recommended alternative was the alternative that received the highest overall score when summing the six selection factors, as shown in Table 1. The following is a summary of the alternative selection process for Kern and Pixley National Wildlife Refuges (NWR) in the South San Joaquin Valley.

Kern National Wildlife Refuge

Following are the two alternatives under consideration for the Kern NWR:

- KER-1A/1B – Utilize existing Buena Vista Water Storage District (BVWSD) facilities; enlarge Main Drain and utilize existing West Side Canal when Main Drain capacity is exceeded.
- KER-7 – Utilize existing Lost Hills Irrigation District (LHID) facilities and clean Burhan Canal to reduce water losses.

Water Supply Reliability

Tom Charmley raised concerns over clean-out time for Goose Lake Canal, which in turn will limit the timing of water deliveries for KER-1A/1B. However, this alternative is still viewed as more reliable than KER-7 because of unknowns (e.g., ownership) associated with Burhan Canal.

Water Quality

Water received from BVWSD in fall and winter typically is approximately 5 percent agricultural return water. Water quality in the summer is assumed to be good, but has not been tested recently. Kern 1A/1B ranked slightly lower because of the perceived greater potential for agricultural return flows.

TABLE 1
Draft Criteria Evaluation Table – Kern National Wildlife Refuge

		KER-1A/1B			KER-7		
Factors	**Weighting Factor**	**Impact Level**	**Weighted Impact**	**Comments**	**Impact Level**	**Weighted Impact**	**Comments**
Water Supply Reliability	30	8	240	Some concern over clean-out period for Goose Lake Canal, but considered very reliable	6	180	Less reliable due to uncertainty about ownership of Burhan Canal
Water Quality	15	7	105	Water quality considered good, but more likely to be susceptible to agricultural return flows	8	120	Return flows considered to be less of a potential issue
Environmental Issues	20	9	180	Least amount of construction and resultant impact	7	140	Impacts associated with clearing riparian vegetation within Burhan Canal
Cost-Effectiveness	20	9	180	Total costs are close; lower capital cost makes this alternative the least expensive	8	160	Higher capital costs
Implementation	10	9	90	Considered to be relatively equal; edge given to this alternative because of existing positive relationship with BVWSD	8	80	LHID willing to enter into an agreement, but some uncertainty with Burhan Canal and new agreement
Engineering Issues	5	8	40	Limited engineering concerns	7	35	Ranks slightly lower due to pump operation and maintenance concerns
	100		835			715	

Note:
Impact Level – Range from 1 to 10, with 1 being most negative impact

Environmental Issues

KER 1A/1B includes very limited improvements. KER-7 ranked lower because of the need to clean out Burhan Canal, which was a concern of the USFWS during their original field review.

Cost-Effectiveness

The present value capital costs and annualized costs between alternatives were reviewed as shown in Table 2.

TABLE 2
Present Value Capital and Annualized Costs

Alternative	Capital Cost ($ thousands)	Annual Cost ($ thousands)	Cumulative Annual Cost ($ millions)	Total ($ millions)
KER-1A/1B	530	130	1.5	1.9
KER-7	900	150	1.5	2.4

Implementability

There is no real difference between KER-1A/1B and KER-7. Both would generate few implementation concerns and would likely be able to work with BVWSD to develop an acceptable schedule for canal maintenance. Both districts are willing to enter into an agreement.

Engineering Issues

KER-7 ranks slightly lower because of the pump operation and maintenance concerns.

Summary

KER-1A/1B ranked highest; it was ranked higher in each category except water quality, where it was perceived as only slightly lower than KER-7. Table 1 provides a summary of the screening process used in selecting a recommended alternative.

Pixley National Wildlife Refuge

The four alternatives under consideration for the Pixley NWR are as follows:

- PIX-2B – New pipeline from Friant-Kern Canal (FKC) to refuge
- PIX-4B – Shared Delano-Earlimart Irrigation District (DEID) facilities plus new pipeline to refuge
- PIX-8 – Conjunctive use program with new on-refuge ground water wells, in-lieu of recharge with Pixley Irrigation District (PID)
- PIX-9 – New pipeline similar to 2B, upsized to include lands in PID

Water Supply Reliability

Reliability high for PIX-2B as it includes direct pipeline from the FKC, but also considered reliable via PIX-4B. Although no alternatives include the California Aqueduct, it was agreed that the FKC is less susceptible to drought cuts or reductions than aqueduct. PIX-9 determined to be slightly less reliable than PIX-2B due to sharing with PID. PIX-8 is least reliable – and there are concerns over long-term viability. Current recharge is all in the shallow aquifer, no recharge is currently occurring below the Corcoran clay layer. Discussed the potential to store water in lower aquifer due to increased in-lieu recharge and it was not considered a desirable approach.

Water Quality

Groundwater associated with PIX-8 would have lowest water quality. The status of existing data on groundwater quality in the area was discussed, and Tom Charmley is to review records. Current data suggests that water quality is adequate, but the assumption is that it would degrade over time. There are potential significant differences between groundwater and surface water. It is assumed that agricultural return flows accrue to the FKC, as opposed to the TC Canal, which would make it lower quality than TCC. PIX-2B, PIX-4B, and PIX-9 would have same water quality because all systems would be underground, and therefore, they are isolated from potential return flow interface.

Environmental Issues

There is very little differentiation. PIX-2B would have less impact than PIX-4B, due to less pipeline. PIX-8 would have the least impact because no construction would be required other than on-refuge wells. PIX-9 provides potential additional beneficial impact of reducing groundwater overdraft, because PID would draw from FKC.

Cost Effectiveness

The present value capital costs and annualized costs between alternatives were reviewed as shown in Table 3:

TABLE 3
Present Value Capital And Annualized Costs

Alternative	Capital Cost ($ millions)	Annual Cost ($ thousands)	Cumulative Annual Cost ($ millions)	Total ($ millions)
PIX-2B	11.1	13	.1	11.2
PIX-4B	10.0	15	.1	10.1
PIX-8	4.1	85	.9	5.0
PIX-9	17.6	18	.2	17.8

Implementation

PIX- 8 is determined to be lowest based on DEID opposition and perceived opposition from other groups in the area.

Engineering Issues

PIX- 8 would require greatest amount of maintenance/costs because of wells and pumps. PIX-9 would operate in conjunction with PID.

Summary

There is little differentiation in alternatives - PIX-4B selected. Costs of PIX-9 could be reduced depending on PID cost share; if reduced to $10 million total cost, the impact level would be reduced to 5, which would make PIX-2B and PIX-9 close. Table 4 provides a summary of the screening process used in selecting a recommended alternative.

TABLE 4
Draft Criteria Evaluation Table – Pixley National Wildlife Refuge

		PIX-2B			PIX-4B			PIX-8			PIX-9		
Factors	**Weighting Factor**	**Impact Level**	**Weighted Impact**	**Comments**	**Impact Level**	**Weighted Impact**	**Comments**	**Impact Level**	**Weighted Impact**	**Comments**	**Impact Level**	**Weighted Impact**	**Comments**
Water Supply Reliability	30	6	180	Direct pipeline from the Friant-Kern Canal	6	180	Considered as reliable as PIX-2B given wheeling agreement will be negotiated with DEID	3	90	Concern over groundwater management-already in overdraft situation	6	180	Slightly less reliable than PIX-2B due to sharing with PID
Water Quality	15	9	135	Assumed good water quality as source is Friant-Kern Canal - slight chance for agricultural return flows entering the canal	9	135	Same as PIX-2B - all DEID facilities underground	5	75	Assumption that groundwater quality would degrade over time	9	135	Same as PIX-2B
Environmental Issues	20	5	100	Would result in the greatest amount of short-term impacts due to length of pipeline and no groundwater benefits	6	120	Greater impacts than PIX-2B due to more pipeline construction	7	140	Least amount of construction	6	120	Similar to PIX-2B except assumed benefits from providing PID with surface water, resulting in less demand on groundwater
Cost Effectiveness	20	5	100	Second most expensive alternative	5	100	Slightly less expensive than PIX-2B	8	160	Least expensive overall cost (highest operation and maintenance cost, but overshadowed by low capital cost)	2	40	Most expensive, but would improve if cost-shared with PID
Implementation	10	4	40	Similar to PIX-9, however less costly; new facilities would require new right-of-way	6	60	Improvement of existing DEID facilities	2	20	Strongly opposed by DEID and likely by other entities in the area due to overcharge condition	6	60	Supported by PID, but more costly than PIX-2B

TABLE 4
Draft Criteria Evaluation Table – Pixley National Wildlife Refuge

		PIX-2B			PIX-4B			PIX-8			PIX-9		
Factors	**Weighting Factor**	**Impact Level**	**Weighted Impact**	**Comments**	**Impact Level**	**Weighted Impact**	**Comments**	**Impact Level**	**Weighted Impact**	**Comments**	**Impact Level**	**Weighted Impact**	**Comments**
Engineering Issues	5	5	25	Completely independent system	4	20	Would involve DEID facilities	3	15	Greatest requirement for long-term operations and maintenance concerns due to pumps and wells	5	25	Would be operated jointly with PID
Total Score	**100**		**580**			**615**			**500**			**560**	

Appendix B
CEQA Environmental Checklist Form

The attached CEQA Environmental Checklist Form is the standard Initial Study checklist required in accordance with CEQA. This checklist is included for reference, and anticipated impacts from the proposed project and alternatives are identified. Explanations for all answers except "No Impact," which are required, are described in the Affected Environment and Environmental Consequences Section of this EA/IS and are not repeated here to eliminate redundancy

Environmental Checklist Form

1. **Project Title:** *Conveyance of Refuge Water Supply South San Joaquin Valley Study Area*

2. **Lead Agency Name and Address:** *California Department of Fish and Game*
Mr. Paul Forsberg
1812 9th St.
Sacramento, CA 95814
(916) 323-7215

3. **Contact Person and Phone Number:** *(see above)*

4. **Project Location:** *South San Joaquin Valley*

5. **Project Sponsor's Name and Address:**

California Department of Fish and Game
1416 Ninth Street
Sacramento, CA 95814

6. **General Plan Designation:** *Various designations* **7. Zoning:** *Primarily agriculture*

8. **Description of Project:** (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary). *The U.S. Bureau of Reclamation in cooperation with the U.S. Fish and Wildlife Service, and the California Department of Fish and Game propose to construct and/or improve existing facilities to convey water supplies to the Pixley and Kern National Wildlife Refuges within the South San Joaquin Valley area of the Central Valley. These facilities would convey firm, average annual historical water deliveries in addition to an incremental amount of water supplies required for optimal wildlife management from CVP or State Water Project facilities to the boundary of each refuge as specified in Section 3406 (d)(5) of the Central Valley Project Improvement Act. See Project Description under Chapter I: Introduction and Statement of Purpose and Need.*

9. **Surrounding Land Uses and Setting:** (Briefly describe the project's surroundings)

The primary land use in the South San Joaquin Valley is agriculture. The majority of these lands are irrigated for the production of field crops. Typical crops include cotton and other field crops. Vineyards are present within the easternmost portion of the study area. See Chapter II: Background.

10. **Other agencies whose approval is required** (e.g., permits, financing approval, or participation agreement.) *See Chapter VI: Consultation and Coordination.*

Environmental Factors Potentially Affected:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" or as indicated by the checklist on the following pages.

☒ Land Use and Planning	☐ Transportation/Circulation	☐ Public Services
☐ Population and Housing	☒ Biological Resources	☐ Utilities and Service Systems
☒ Geophysical	☐ Energy and Mineral Resources	☐ Aesthetics
☒ Water	☐ Hazards	☐ Cultural Resources
☐ Air Quality	☐ Noise	☐ Recreation
	☐ Mandatory Findings of Significance	

Determination:

(To be completed by the Lead Agency.)

On the basis of this initial evaluation:

I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared. ☐

I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because the mitigation measures described on an attached sheet have been added to the project. A NEGATIVE DECLARATION will be prepared. ☒

I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required. ☐

I find that the proposed project MAY have a significant effect(s) on the environment, but at lease one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets, if the effect is a "potentially significant impact" or "potentially significant unless mitigated." An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed. ☐

I find that although the proposed project could have a significant effect on the environment, there WILL NOT be a significant effect in this case because all potentially significant effects (a) have been analyzed adequately in an earlier EIR pursuant to applicable standards and (b) have been avoided or mitigated pursuant to that earlier EIR, including revisions or mitigation measures that are imposed upon the proposed project.

Signature	Date
Printed Name	For

Evaluation of Environmental Impacts:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cities in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g. the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g. the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect is significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Potentially Significant Unless Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from Section XVII, "Earlier Analyses," may be cross-referenced).

5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). Earlier analyses are discussed in Section XVII at the end of the checklist.

6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g. general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated. See the sample question below. A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

7) This is only a suggested form, and lead agencies are free to use different ones.

Sample Question:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Negative Declaration: Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the proposal result in potential impacts involving:				
Landslides or mudslides? (1,6)	☐	☐	☐	☒

(Attached source list explains that 1 is the general plan, and 6 is a USGS topo map. This answer would probably not need further explanation).

Issues (and Supporting Information Sources):	Potentially Significant Impact	Negative Declaration: Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
I. LAND USE AND PLANNING. Would the proposal:				
a) Conflict with general plan designation or zoning? (source #(s):)	☐	☐	☐	☒
b) Conflict with applicable environmental plans or policies adopted by agencies with jurisdiction over the project? ( )	☐	☐	☐	☒
c) Be incompatible with existing land use in the vicinity? ( )	☐	☐	☐	☒
d) Affect agricultural resources or operations (e.g. impacts to soils or farmlands, or impacts from incompatible land uses)? ( )	☐	☒	☐	☐
e) Disrupt or divide the physical arrangement of an established community (including a low-income or minority community? ( )	☐	☐	☐	☒
II. POPULATION AND HOUSING. Would the proposal:				
a) Cumulatively exceed official regional or local population projections? ( )	☐	☐	☐	☒
b) Induce substantial growth in an area either directly or indirectly (e.g. through projects in an undeveloped area or extension of major infrastructure)? ( )	☐	☐	☐	☒
c) Displace existing housing, especially affordable housing? ( )	☐	☐	☐	☒
III. GEOLOGIC PROBLEMS. Would the proposal result in or expose people to potential impacts involving:				
a) Fault rupture? ( )	☐	☐	☐	☒
b) Seismic ground shaking? ( )	☐	☐	☐	☒
c) Seismic ground failure, including liquefaction? ( )	☐	☐	☐	☒
d) Seiche, Tsunami, or volcanic hazard? ( )	☐	☐	☐	☒
e) Landslides or mudflows? ( )	☐	☐	☐	☒
f) Erosion, changes in topography or unstable soil conditions from excavation, grading, or fill? ( )	☐	☒	☐	☐
g) Subsidence of the land? ( )	☐	☐	☐	☒
h) Expansive soils? ( )	☐	☐	☐	☒
i) Unique geologic or physical features?	☐	☐	☐	☒

Issues (and Supporting Information Sources):	Potentially Significant Impact	Negative Declaration: Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
IV. WATER. Would the proposal result in:				
a) Changes in absorption rates, drainage patterns, or the rate and amount of surface runoff? ( )	☐	☐	☒	☐
b) Exposure of people or property to water related hazards such as flooding? ( )	☐	☐	☐	☒
c) Discharge into surface waters or other alteration of surface water quality (e.g. temperature, dissolved oxygen or turbidity)? ( )	☐	☒	☐	☐
d) Changes in the amount of surface water in any water body? ( )	☐	☐	☒	☐
e) Changes in currents, or the course or direction of water movements? ( )	☐	☐	☒	☐
f) Change in the quantity of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations or through substantial loss of groundwater recharge capability? ( )	☐	☐	☒	☐
g) Altered direction or rate of flow of groundwater? ( )	☐	☐	☒	☐
h) Impacts to groundwater quality? ( )	☐	☐	☒	☐
i) Substantial reduction in the amount of groundwater otherwise available for public water supplies? ( )	☐	☐	☒	☐
V. AIR QUALITY. Would the proposal:				
a) Violate any air quality standard or contribute to an existing or projected air quality violation? ( )	☐	☒	☐	☐
b) Expose sensitive receptors to pollutants? ( )	☐	☐	☐	☒
c) Alter air movement, moisture, or temperature, or cause any change in climate? ( )	☐	☐	☐	☒
d) Create objectionable odors? ( )	☐	☐	☐	☒
VI. TRANSPORTATION/CIRCULATION. Would the proposal result in:				
a) Increased vehicle trips or traffic congestion? ( )	☐	☐	☐	☒
b) Hazards to safety from design features (e.g. sharp curves or dangerous intersections) or incompatible uses (e.g. farm equipment)? ( )	☐	☐	☐	☒

Issues (and Supporting Information Sources):	Potentially Significant Impact	Negative Declaration: Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Inadequate emergency access or access to nearby uses? ( )	☐	☐	☐	☒
d) Insufficient parking capacity on-site or off-site? ( )	☐	☐	☐	☒
e) Hazards or barriers for pedestrians or bicyclists? ( )	☐	☐	☐	☒
f) Conflicts with adopted policies supporting alternative transportation (e.g. bus turnouts, bicycle racks)? ( )	☐	☐	☐	☒
g) Rail, waterborne or air traffic impacts? ( )	☐	☐	☐	☒
VII. BIOLOGICAL RESOURCES. Would the proposal result in impacts to:				
a) Endangered, threatened or rare species or their habitats (including but not limited to plants, fish, insects, animals, and birds? ( )	☐	☒	☐	☐
b) Locally designated species (e.g. heritage trees)? ( )	☐	☐	☐	☒
c) Locally designated natural communities (e.g. oak forest, coastal habitat, etc.)? ( )	☐	☐	☒	☐
d) Wetland habitat (e.g. marsh, riparian and vernal pool)? ( )	☐	☐	☒	☐
e) Wildlife dispersal or migration corridors? ( )	☐	☐	☒	☐
VIII. ENERGY AND MINERAL RESOURCES. Would the proposal:				
a) Conflict with adopted energy conservation plans? ( )	☐	☐	☐	☒
b) Use non-renewable resources in a wasteful and inefficient manner? ( )	☐	☐	☐	☒
c) Result in the loss of availability of a known mineral resource that would be of future value to the region and the residents of the State? ( )	☐	☐	☐	☒
IX. HAZARDS. Would the proposal involve:				
a) A risk of accidental explosion or release of hazardous substances (including, but not limited to: oil, pesticides, chemicals or radiation)? ( )	☐	☐	☒	☐
b) Possible interference with an emergency response plan or emergency evacuation plan? ( )	☐	☐	☐	☒
c) The creation of any health hazard or potential health hazards? ( )	☐	☐	☐	☒

Issues (and Supporting Information Sources):	Potentially Significant Impact	Negative Declaration: Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
d) Exposure of people to existing sources of potential health hazards?( )	☐	☐	☐	☒
e) Increased fire hazard in areas with flammable brush, grass, or trees?( )	☐	☐	☐	☒
X. NOISE. Would the proposal result in:				
a) Increases in existing noise levels? ( )	☐	☐	☒	☐
b) Exposure of people to severe noise levels? ( )	☐	☐	☐	☒
XI. PUBLIC SERVICES. Would the proposal have an effect upon, or result in a need for new or altered government services in any of the following areas				
a) Fire protection? ( )	☐	☐	☐	☒
b) Police protection? ( )	☐	☐	☐	☒
c) Schools? ( )	☐	☐	☐	☒
d) Maintenance of public facilities, including roads? ( )	☐	☐	☐	☒
e) Other governmental services? ( )	☐	☐	☐	☒
XII. UTILITIES AND SERVICE SYSTEM. Would the proposal result in a need for new systems or supplies, or substantial alterations to the following utilities:				
a) Power or natural gas? ( )	☐	☐	☐	☒
b) Communications systems? ( )	☐	☐	☐	☒
c) Local or regional water treatment or distribution facilities? ( )	☐	☐	☐	☒
d) Sewer or septic tanks? ( )	☐	☐	☐	☒
e) Storm water drainage? ( )	☐	☐	☒	☐
f) Solid waste disposal? ( )	☐	☐	☐	☒
g) Local or regional water supplies? ( )	☐	☐	☐	☒
XIII. AESTHETICS. Would the proposal:				
a) Affect a scenic vista or scenic highway? ( )	☐	☐	☐	☒
b) Have a demonstrable negative aesthetic effect? ( )	☐	☐	☐	☒

Issues (and Supporting Information Sources):	Potentially Significant Impact	Negative Declaration: Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Create light or glare? ( )	☐	☐	☐	☒
XIV. CULTURAL RESOURCES. Would the proposal:				
a) Disturb paleontological resources? ( )	☐	☐	☐	☒
b) Disturb archaeological resources? ( )	☐	☐	☒	☐
c) Affect historical resources? ( )	☐	☐	☐	☒
d) Have the potential to cause a physical change which would affect unique ethnic cultural values?	☐	☐	☐	☒
e) Restrict existing religious or sacred uses within the potential impact area? ( )	☐	☐	☐	☒
XV. RECREATION. Would the proposal:				
a) Increase the demand for neighbor hood or regional parks or other recreational facilities? ( )	☐	☐	☐	☒
b) Affect existing recreational opportunities? ( )	☐	☐	☒	☐
XVI. MANDATORY FINDINGS OF SIGNIFICANCE.				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☒	☐
b) Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals?	☐	☐	☐	☒
c) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)	☐	☐	☒	☐
d) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

XVII. EARLIER ANALYSES.

Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, one or more effects have been adequately analyzed in an earlier EIR or negative declaration. Section 15063(C)(3)(D). In this case a discussion should identify the following on attached sheets:

a) **Earlier analyses used.** Identify earlier analyses and state where they are available for review.

b) **Impacts adequately addressed.** Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant tot he applicable legal standards, and state whether such effects were addressed by mitigation measured based on the earlier analysis.

c) **Mitigation measures.** For effects that are "Negative Declarations: Less than Significant with Mitigation Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address sit-specific conditions for the project.

Authority: Public Resources Code Sections 21083 and 21087.
Reference: Public Resources Code Sections 21080(c), 21080.1, 21080.3, 21082.1, 21083, 21083.3, 21093, 21094, 21151; *Sundstrom v. County of Mendocino*, 202 Cal. App. 3d 296 (1988); *Leonoff v. Monterey Board of Supervisors*, 222 Cal. App. 3d 1337 (1990)

Appendix C
Cultural Resources Assessment

CULTURAL RESOURCES ASSESSMENT OF THE PROPOSED WATER SUPPLY IMPROVEMENTS FOR THE PIXLEY AND KERN NATIONAL WILDLIFE REFUGES, KERN AND TULARE COUNTIES, CALIFORNIA

Produced for:

CH2M HILL
2525 Airpark Drive
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Prepared by:

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July 23, 1997
(Job #95-054)

MANAGEMENT SUMMARY

The project involves development of Level 4 water supplies for the involved National Wildlife Refuges by the year 2002. This is authorized by the Central Valley Project Improvement Act (P.L. 102-575). Although most of the lands evaluated in this survey are privately owned, the project is authorized under federal law and administered by the Department of the Interior (Bureau of Reclamation and Fish and Wildlife Service), therefore, it qualifies as a federal undertaking for purposes of Section 106 of the National Historic Preservation Act (16 U.S.C. 470, as amended) and potential impact to cultural resources must be considered. The cultural resources assessment was performed by Peak & Associates, Inc., under contract with CH2M Hill, engineers for the project.

To this end, background research was conducted to assemble a cultural history so that the importance of any identified resources could be evaluated in a regional context. This research included a record search by the Southern San Joaquin Valley Information Center of the California Historical Resources Information System to identify previously recorded sites and previous cultural resources studies in and near the project area. Knowledgeable Native Americans and local historical societies were contacted to elicit Information specific to the project areas. A field examination of the project areas was conducted to identify all cultural resources.

No prehistoric cultural resources were identified within the Pixley NWR project boundaries. The only potential historic resources identified in the survey area were existing occupied residences at the edges of the survey corridor. Since no existing structures will be impacted by the proposed project, the field crew did not record these structures.

The Kern NWR project alignment follows an existing canal, dry at the time of the survey. There were two previously rcorded archeological sites near this alignment. The location of CA-KER-2100 was carefully inspected, but no artifacts could be found on the surface. The location examined was correct, since the sketch map accompanying the site record by Breschini and Haversat was detailed and accurate. We assume that a site, of some sort, is still present at the location.

CA-KER-168 was recorded, minimally, in 1950. There is no description of the appearance of the site other than the notation "Indian village site" on the site record. Again, no site could be identified on the project alignment in this vicinity.

If the preferred alternative (1A/2B) is used for the Kern NWR project, there will be no construction at all near known resources, since the survey area is part of the KER-7 alternative. Should the KER-7 alternative be used, it is recommended that construction activities in the area of CA-KER-2100 be restricted to the existing canal alignment and that the movement of equipment be restricted to the south levee in this area. As the south levee has by far the better road surface, this should not impose a burden on the construction crew. If this is done, impact to CA-KER-2100 can be avoided.

The three old structures near the Pixley NWR project alignment should be avoided. If avoidance of impact to any of these structures is not feasible, then additional historical research should be conducted to determine significance and develop a suitable plan for mitigation of adverse effect, if necessary.

The current project serves as an overview and initial study to determine the parameters of potential impact to historic resources. When a specific alternative is selected, the following steps will be necessary to satisfy the regulations:

- Identify an area of potential environmental effect (APE) for the project. This should include visual as well as physical effects and should include area where equipment and materials will be stored near the construction zone as well as direct construction areas.

- Field survey any areas in the APE that were not examined in the current project and record and formally evaluate all resources in the APE.

- Produce a technical report on the findings of the above, including recommendations for mitigation, if necessary. This report should be submitted to the Bureau of Reclamation for review and distribution to the State Historic Preservation Officer (SHPO) and other interested agencies.

- If no significant cultural resources are located in the APE and the Bureau and SHPO concur in this finding, this completes the Section 106 process. If a significant property is located in the APE the criteria of Effect and Adverse Effect [36 CFR 800.9(a and b)] are applied to determine if the project will have an adverse effect on the property. This should be included in the technical report mentioned above. If a finding of no effect or no adverse effect is made, and the agencies concur, the Section 106 process is completed. In the case of no adverse effect, SHPO provides documentation to the Advisory Council on Historic Preservation (ACHP) who may disagree with the finding. If adverse effect is identified, then a detailed mitigation plan must be prepared in the form of a Memorandum of Agreement signed by the ACHP (at the Council's option), SHPO, Bureau of Reclamation, the project proponent and other interested parties as necessary. Implementation of the terms of the Agreement constitute compliance with Section 106.

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INTRODUCTION

The project involves development of Level 4 water supplies for the involved National Wildlife Refuges (NWR) by the year 2002. This is authorized by the Central Valley Project Improvement Act (P.L. 102-575). Although most of the lands evaluated in this survey are privately owned, the project is authorized under federal law and administered by the Department of the Interior (Bureau of Reclamation and Fish and Wildlife Service), therefore, it qualifies as a federal undertaking for purposes of Section 106 of the National Historic Preservation Act (16 U.S.C. 470, as amended) and potential impact to cultural resources must be considered. The cultural resources assessment was performed by Peak & Associates, Inc., under contract with CH2M Hill, engineers for the project.

The survey covered areas of proposed new construction or major renovation for the facilities delivering water to the refuges. Survey of the actual refuges was not a part of the project. The Kern NWR involved survey of a single alignment less than 2 miles long (Map 1) running west from the Goose Lake Canal. The Pixley NWR, on the other hand, involved almost 25 miles of alignment, for two primary alternate routes, between the NWR and the Friant-Kern Canal (Map 2).

The Kern NWR study area is located in the southern portion of the San Joaquin Valley, northeast of the community of Lost Hills. Elevations range from 200 to 240 feet in this nearly level valley terrain. The Kern River Channel passes near the study area and portions of the former Tulare Lake shore are located nearby. The area was occupied at time of white contact by the Southern Valley Yokuts.

The Pixley NWR study area is located in the central portion of the San Joaquin Valley near the community of Pixley. Elevations in the study area range from 200 to 400 feet. Deer Creek transects the project area in an east/west orientation. The area was occupied at time of white contact by another branch of the Southern Valley Yokuts.

CULTURAL SETTING

Archeology

The Central Valley region was among the first in the state to attract intensive fieldwork, and research has continued to the present day. This has resulted in a substantial accumulation of data, but the emphasis has been in the northern portion of the valley. In the early decades of the 1900s, E.J. Dawson explored numerous sites near Stockton and Lodi, later collaborating with W.E. Schenck (Schenck and Dawson 1929). By 1933, the focus of work was directed to the Cosumnes locality, where survey and excavation were conducted by the Sacramento Junior

Arrows indicate complete survey along a linear project element
"One Acre" indicates survey of about one acre centered upon a feature that will be improved or replaced.

N

0 5,000 10,000 20,000 FT

SCALE IS APPROXIMATE

KERN NWR

DELIVERY POINT

KER-7
LHID BURHAN CANAL

KER-7
INSTALL
PUMP STATION

KER-7
LHID LATERAL 6-1

KER-1A/1B
BVWSD GOOSE LAKE CANAL

KER-1A/1B
BVWSD MAIN DRAIN

KER-1A/1B
BVWSD WEST SIDE CANAL

KER-1A/1B
BVWSD PIPELINE

CALIFORNIA AQUEDUCT

BVWSD
TURNOUT 1B

INTERSTATE 5

MAP 1
KERN NWR
SURVEY AREAS
U. S. BUREAU OF RECLAMATION
SOUTH SAN JOAQUIN VALLEY, CALIFORNIA

W032003012RDD_116 (SSJ) (7/31/03)

N

0 5,000 10,000 20,000 FT

SCALE IS APPROXIMATE

PIXLEY NWR

PIX-8 INSTALL 6 GROUNDWATER EXTRACTION WELLS

PIX-2B, -4B, -9 PROPOSED PIPELINE DISCHARGE POINT

PIX-4B CONSTRUCT NEW GRAVITY PIPELINE

PIX-2B, 4B, -9 GRAVITY PIPELINE

PIX-9 CONSTRUCT NEW GRAVITY PIPELINE

PIX-2B CONSTRUCT NEW GRAVITY PIPELINE

PIX-4B CONSTRUCT NEW GRAVITY PIPELINE

PIX-4B EXISTING DEID LATERAL 111.6W

HIGHWAY 99

DEER CREEK

ATCHISON-TOPEKA-SANTA FE RAILROAD

SOUTHERN PACIFIC RAILROAD

FRIANT-KERN CANAL

COLONEL ALENWORTH STATE HISTORIC PARK

Arrows indicate complete survey along a linear project element
"One Acre" indicates survey of about one acre centered upon a feature that will be improved or replaced.

MAP 2

PIXLEY NWR

SURVEY AREAS

U. S. BUREAU OF RECLAMATION
SOUTH SAN JOAQUIN VALLEY, CALIFORNIA

W032003012RDD_118 (SSJ) (7/31/03)

College (Lillard and Purves 1936). Excavation data, in particular from the stratified Windmiller site (CA-Sac-107), suggested two temporally distinct cultural traditions. Later work at other mounds by Sacramento Junior College and the University of California, Berkeley, enabled the investigators to identify a third cultural tradition, intermediate between the previously postulated Early and Late Horizons. The three-horizon sequence, based on discrete changes in ornamental artifacts and mortuary practices, as well as on observed differences in soils within sites (Lillard, Heizer and Fenenga 1939), was later refined by Beardsley (1954). An expanded definition of artifacts diagnostic of each time period was developed, and its application extended to parts of the central California coast. Traits held in common allow the application of this system within certain limits of time and space to other areas of prehistoric central California.

In the southern San Joaquin Valley, with the exception of Hewe's excavation at CA-Fre-48 (the Tranquility Site), the foci of early investigations have been the old shorelines of the interior lakes; Tulare, Kern, and Buena Vista. In 1899, Dr. P. M. Jones directed fieldwork in the Buena Vista-Tulare Lake area of Kern County. Jones investigated 150 mounds and conducted trenching of several sites including CA-Ker-53. In 1909, N. C. Nelson investigated prehistoric Site CA-Ker-49, which is located to the west of Buena Vista Lake. Later, four surveys and excavations were conducted in the same locale under the auspices of the University of California. A compilation of these investigations was published in 1926 by Gifford and Schenck.

As a result of this early work, an elaborate culture complex was defined for the late prehistoric period. This complex can be ascribed probably to the Yokuts and their direct ancestors. The material culture of this late temporal period complex included steatite vessels and beads, finely-made projectile points, pottery, shaped stone mortars, *Tivela* disc beads, use of asphaltum, and the presence of metates and manos. Flexed burials were the predominant interment mode. Earlier complexes underlying the late cultural expressions were represented by chipped stone crescents, large projectile points, atlatl spurs, and weights. Mortuary practices, generally thought to be related, include extended rather than flexed burial position, a situation analogous to that of the northern valley (Gifford and Schenck 1926; Lillard, Heizer, and Fenenga 1939; Moratto 1972).

Presence of "Early Man," although not found in direct association with extinct animals, is demonstrated by the frequency of chipped stone crescents and fluted points similar to those of the Clovis-Folsom Complex in the American Southwest. Although fluted points have been found near the shores of Tulare Lake, an area that has also produced surface finds of extinct mammal bone of Pleistocene age, the association is not substantiated by controlled excavations and remains speculative (Riddell and Olsen 1969).

Under the direction of Wedel (1941), the Civil Works Administration, in conjunction with the Smithsonian Institution, initiated the first major excavations using stratigraphic controls. Investigations of CA-Ker-39 and CA-Ker-60 as well as several smaller sites near Buena Vista Lake produced evidence of two distinct cultural entities or occupation periods. Wedel lacked methods for dating these two entities by cross-comparison of the assemblages, he tentatively stated that the early occupation at Buena Vista Lake appeared to be temporally older and less

developed than the Early Horizon (Windmiller Pattern) of the Delta region. He compared this early component to the Oak Grove or Milling Stone culture of the Santa Barbara area (Rogers 1939). He divided the later cultural entity into two distinct phases, both clearly distinguished from the earlier cultural phase by artifact types. Wedel (1941:144-145) estimated that neither of these cultural periods exceeded 1500 B.P. (years Before the Present) Later, other investigators proposed far earlier ages for these occupations, with dates ranging from 2000 to 7000 B.P. (Baumhoff and Olmstead 1963, 1964; Heizer 1964; Meighan 1959).

Later investigations in 1963 and 1964 at CA-Ker-116 near Buena Vista Lake produced materials similar to Wedel's early occupation. These materials occurred in the lower levels of the "upper deposit," while an even deeper cultural deposit yielded materials similar to those of the San Dieguito Complex. Artifacts included a chipped stone crescent, crude point fragments, and an atlatl spur. Radiocarbon age determinations on shell from the lowest cultural levels returned a date of *circa* 8200 B.P. (Fredrickson and Grossman 1966, 1977; Fredrickson 1967). In the early 1970s a site within Kern NWR was excavated, but the only artifacts recovered during the testing were waste flakes from lithic tool manufacture, although burials were also recovered (Summers 1971)

Despite the previously mentioned investigations, the prehistory of the southern San Joaquin remains as yet poorly understood, without a tightly-defined chronological sequence of cultural development.

Ethnology

Ethnographic literature is often uncertain in definition of cultural boundaries for Indian groups. Early displacement by white intrusion resulted in population shifts to avoid conflict with the Spanish, and later with the miners and settlers. The ravages of disease and warfare decimated the native people, further weakening cultural identity. Informants were often uncertain of original territories of the various tribal groupings.

The Southern Valley Yokuts were members of the Penutian language family which held all of the Central Valley, San Francisco Bay Area, and the Pacific Coast from Marin County to near Point Sur. The Yokuts differed from other California Indians in that they had true tribal divisions with group names. Each tribe spoke an individual dialect, although these were similar enough to other Yokuts dialects that they were mutually intelligible (Kroeber 1925).

The tribe controlling the Pixley project area at the time of Euro-American contact was the Wowol, who controlled the southern shores of Tulare Lake. Their principal village, *Sukwutnu*,

was some distance south of the lake, fifteen miles due west of Delano, according to Latta (1949: 27). This village, or perhaps a later location for the same population, has also been reported on Atwell's Island, now the vicinity of the town of Alpaugh, about ten miles north of the Kern NWR and four miles southwest of the Pixley NWR (Arguelles 1983:59). The lower Kern River, incorporating the Kern project area, was the homeland of the Chuxoxi (Wallace 1978: 448). Settlements were oriented along the water ways, with their village sites normally placed adjacent to these features for their nearby water and food resources. House structures varied in size and shape (Latta 1949; Kroeber 1925). Housepit depressions ranged in diameter from between 3 to 18 meters.

Latta (1949:99) reported that a village of 200 to 300 Yokuts might have four or five large houses that were used for ten or twelve years or until a family member died, at which time the Indians burned the house in which the death had occurred. If a sick or aged person died outside the dwelling, the family did not burn the house. When a Northern Yokuts died, his body was cremated or buried in a flexed position. Southern tribes normally buried their dead, although they did cremate shamans, persons who died away from their village and, among the Tachi, persons of great importance.

Trade was well developed, with mutually beneficial interchange of needed or desired goods. Obsidian, rare in the San Joaquin Valley, was obtained by trade with Paiute and Shoshoni groups on the eastern side of the Sierra Nevada, where numerous sources of this material are located, and to some extent from the Napa Valley to the north. Shell beads, obtained by the Yokuts from coastal people, and acorns, rare in the Great Basin, were among many items exported to the east by Yokuts traders (Davis 1961).

The rivers, streams, and sloughs which formed a maze within the valley provided abundant food resources such as fish, shellfish, and turtles. Game, wild fowl, and small mammals were trapped and hunted to provide protein augmentation of the diet. In general, the eastern portion of the San Joaquin Valley provided a lush environment of varied food resources, with the estimated large population centers reflecting this abundance (Cook 1955; Baumhoff 1963).

The Yokuts experienced severe depopulation after contact with the Spanish and subsequent explores. The most devastating impacts of the Spanish colonization effort were not the result of military conflicts, but came from Old World diseases newly introduced to the native people.

History

Most of the Pixley NWR project area lies in an area of checkerboard land grants to the railroad. Portions of the study area were swamp and overflow land that could not be worked for agriculture until reclamation work had taken place. Although the Southern Pacific reached Delano by 1874, the project vicinity remained lightly settled. Early settlers in the sections open

to settlement tried to homestead the land in the 1870s and 1880s, but they never proved up, and a number of claims were cancelled in the 1880s. The area grew slowly, first as primarily ranch land and later, as reclamation/irrigation efforts improved, as agricultural land. A Southern Pacific station was established at Alila, now Earlimart, in 1885. The 1920s topographic maps show a number of small rectangular ponds as well as a system of ditches, apparently part of the irrigation system for the region.

In the Kern NWR project vicinity there is an Indian site shown on the General Land Office plat of 1854 at the edge of the former shore of Tulare Lake. This was evidently occupied at that time by a large group of Indians. This site appears to correspond to the location of "Bubal", a village on the shore of Tulare Lake first visited by Spanish missionaries from Mission San Miguel in 1804. The village was visited repeatedly by the Spanish and Mexicans who ventured into the San Joaquin Valley. A well-marked trail existed from Bubal to the Mission in the 1820s. The Indians of this region were rounded up and sent to a reservation at Fort Tejon in 1859.

The study area lies in the swampy remnant of Tulare Lake and associated sloughs, therefore, it was conveyed to the state as swamp and overflowed land. Prior to reclamation efforts, the land had little value for agriculture, and consequently, there were few early settlers in the region. Much of the area became part of huge cattle ranches, such as the Miller and Lux. There were some attempts to homestead the land in the 1880s to 1910s, but many of the homesteads were relinquished once or twice, before they were finally taken up in the 1920s to 1940s. One of the main land uses in the 1920s appears to have been the establishment of gun clubs for waterfowl hunting. In the 1940s some exploratory petroleum drilling was done in the future Kern NWR, hoping to repeat successes in the Elk Hills area, but the wells were dry (Arguellas 1983:67).

INFORMATION CENTER RECORD SEARCH

A record search was requested from the Southern San Joaquin Valley Information Center of the California Historical Resources Information System at California State University, Bakersfield. The reply from that agency indicated that there are no cultural resources within or closely adjacent to the Pixley project area. There have been two previous cultural resources inventories that incorporated small portions of the current project area, however, no resources were recorded during these surveys. The Kern NWR project area, on the other hand, has several prehistoric sites recorded in the vicinity, primarily within the wildlife refuge. One of these, CA-KER-2100, was recorded adjacent to the current project alignment and may extend under the levee on the north side of the existing ditch that forms the center line of the proposed project. This site is a diffuse and highly disturbed surface scatter of lithic tools and debitage. Another site, CA-KER-168, is a major village located south of the alignment on the basis of ethnographic writings by Frank Latta in 1950. This location has not been verified by field examination.

A report on file at the Bureau of Reclamation, Sacramento, presents the results of a sampling survey within the boundaries of the Pixley NWR and Kern NWR (Arguelles 1983). Apparently, this report was not filed with the Information Center. This project resulted in recording eight new sites in the Kern NWR and six in the Pixley NWR.

SURVEY EXPECTATIONS

Prehistoric Period Resources

A review of the ethnographic literature concerning the Southern Valley Yokuts indicates that there is one village site located in the general vicinity of the Pixley study area. In general, the most sensitive areas for prehistoric period cultural resources would be those areas with elevation rises (slight rises above the adjacent floodplain) and those areas adjacent to Deer Creek. Away from Deer Creek, there are very likely other prehistoric period cultural resources that involved the collection of plant and animals.

The ethnographic literature indicates that there is likely at least one village site near the Kern NWR project area, located near the former lakeshore of Tulare Lake. A 1930, USGS 1:31,680 series topographic map also shows an "Indian burial ground" in the vicinity. In general, the most sensitive areas for prehistoric period cultural resources would be those areas with elevation rises (slight rises above the adjacent floodplain) and those areas adjacent to water courses or the former lakeshore. Away from the former lakeshore and Kern River Channel, there are very likely other prehistoric period cultural resources that involved the collection of plant and animals. Given the level nature of the terrain in this region, elevation rises of only one foot apparently provided sufficiently higher ground for consideration for prehistoric occupation (Joe Pope, personal communication 1978).

The Information Center record search indicated that numerous prehistoric sites had been recorded within the Kern NWR, including one within the survey area. The same was not true of the Pixley NWR study area, but a relatively small amount of survey had been conducted in this vicinity.

The cultural resource sensitivity for both study areas is moderate to high. If true that a one foot elevational rise was enough for the Indian people to establish villages in the marshlands of the San Joaquin Valley, it will be impossible to detect these rises on a topographic quadrangle. Higher rises may be seen on these maps and the more pronounced elevation increases are considered to be even more highly sensitive since they would have provided an ideal location for habitation. Major villages, smaller associated villages, and camps are likely to have been located within the refuge boundaries and in the surrounding areas. Most archeological sites in the region contain numerous human burials and these should be expected to be found within villages of all sizes.

Historic Period Resources

No historic period resources are expected to be identified in the survey area. These portions of Tulare and Kern Counties developed late and were devoted to agricultural production. If significant structures were associated with the turn-of-the-century agricultural development, they would probably still be standing. No structures will be impacted by the proposed project.

Historic site types that might be present in the study area include residential structures, farm or ranch outbuildings, fences, ditches, canals, water diversion or impound features, wells, and railroad construction or maintenance camps. The overall sensitivity for the presence of historic sites could be rated as low.

The Kern NWR study area lies in the swampy remnant of Tulare Lake and associated sloughs. One of the main land uses in the 1920s appears to have been the establishment of gun clubs for waterfowl hunting. Historic site types could include early trails, campsites, roads, fences, farm complexes, levees, canals, and other water control features, and structures for the gun clubs.

FIELD ASSESSMENT

The field examination of the project areas was conducted on November 15-17, 1995, by Robert Gerry and James Oglesby of Peak & Associates, Inc. The project alignment was examined by walking parallel transects on either side of the centerline of the proposed alignment. The survey area was, typically, 100 feet on either side of the centerline. Larger areas were examined at the connections with the main canals on both projects, to allow for a wider construction zone that could be necessary to construct the junction, and at the crossing of US 99 on the Pixley project, to allow for an expanded construction zone for drilling under the expressway.

Much of the Pixley NWR survey area follows existing roads, dirt and paved, through agricultural land. Grading of the roads and plowing of the adjacent fields insured that virtually all of the ground surface within the survey corridor had been extensively disturbed. Visibility near the road shoulders was generally good. Visibility in the rest of the survey area depended on the type of crop being grown, but was generally adequate.

No prehistoric cultural resources were identified within the Pixley NWR project boundaries. The only potential historic resources identified in the survey area were existing occupied residences at the edges of the survey corridor. Since no existing structures will be impacted by the proposed project, the field crew did not record these structures. Three of these structures appear on the 1929 USGS maps of the area. These are: T23S, R25E north boundary of Section 30 about 1,600 feet west of the northeast section corner; Section 24, center of south

boundary of section; and T23S, R26E, southeast corner of Section 19. The latter is closest to the project alignment and is a modest, but well maintained, example of a rural Craftsman bungalow.

The Kern NWR project alignment follows an existing canal, dry at the time of the survey, excavated some four or five feet below ground level with large levees on both sides. This degree of disturbance virtually precludes the survival of cultural resources within the immediate construction area. Ground visibility north of the canal was generally good, but south of the canal there was very dense ground cover where the land has not been tilled in recent years.

The location of CA-KER-2100 was carefully inspected, but no artifacts could be found on the surface. The location examined was correct, since the sketch map accompanying the site record by Breschini and Haversat was detailed and accurate. The site record, from 1986, notes that artifacts were only observed on eroded surfaces at widely scattered locations. The site consisted largely of obsidian, chert and basalt debitage (waste flakes from lithic tool manufacture). Only two completed tools were observed in a site area defined as 105 by 80 meters in extent. It is not uncommon for a diffuse lithic scatter of this type to "disappear" due to differing light conditions and angles (the previous survey was in April) and soil erosion over time. We assume that a site, of some sort, is still present at the location.

CA-KER-168 was recorded, minimally, in 1950. There is no description of the appearance of the site other than the notation "Indian village site" on the site record. It is not clear from the record if Latta ever was physically on the site. The location is given only as "at the old Broder well or tule pump." The location is apparently near the south side of the project alignment, where ground visibility is very poor. On the other hand, the extensive disturbance of this area over the 45 years since the site was recorded argues against preservation of the site in this area, even if it extended this far north in the first place. There is some possibility that the agricultural use of the area could have obscured evidence of the site, however, there was no soil discoloration in the area that would indicate a midden associated with a long-term residential site.

The only structure in the survey corridor is a small pump house.

CONCLUSIONS

If the preferred alternative (1A/2B) is used for the Kern NWR project, there will be no construction at all near known resources, since the survey area is part of the KER-7 alternative. Should the KER-7 alternative be used, it is recommended that construction activities in the area of CA-KER-2100 be restricted to the existing canal alignment and that the movement of equipment be restricted to the south levee in this area. As the south levee has by far the better road surface, this should not impose a burden on the construction crew. If this is done, impact to CA-KER-2100 can be avoided. The area involved is approximately 140 meters in length extending east from the southwest corner of the wildlife refuge. If this recommendation is not

feasible, then a program of exploratory subsurface testing should be conducted to define the boundaries and research significance of the site. Since the site is within the refuge, this would require the consent of the Department of the Interior and an excavation permit under the Archaeological Resources Protection Act would be required.

The three old structures near the Pixley NWR project alignment should be avoided. If avoidance of impact to any of these structures is not feasible, then additional historical research should be conducted to determine significance and develop a suitable plan for mitigation of adverse effect, if necessary.

There is no indication that another subsurface cultural deposit in either project area is likely. However, the possibility cannot be totally eliminated based on surface inspection alone. We recommend that if artifacts or unusual amounts of stone, bone, or shell are uncovered during construction activities, a qualified archeologist should be consulted for on-the-spot evaluation. Excavation should cease in the area of the find until the evaluation is completed. If bone is uncovered that could be human, state law requires that the County Corner must be contacted. If the coroner determines that the bone is likely to be Native American in origin, then the Native American Heritage Commission must also be contacted.

RECOMMENDED FUTURE ACTIONS

The current project serves as an overview and initial study to determine the parameters of potential impact to historic resources. When a specific alternative is selected, the following steps will be necessary to satisfy the regulations:

- Identify an area of potential environmental effect (APE) for the project. This should include visual as well as physical effects and should include area where equipment and materials will be stored near the construction zone as well as direct construction areas.

- Field survey any areas in the APE that were not examined in the current project and record and formally evaluate all resources in the APE.

- Produce a technical report on the findings of the above, including recommendations for mitigation, if necessary. This report should be submitted to the Bureau of Reclamation for review and distribution to the State Historic Preservation Officer (SHPO) and other interested agencies.

- If no significant cultural resources are located in the APE and the Bureau and SHPO concur in this finding, this completes the Section 106 process. If a significant property is located in the APE the criteria of Effect and Adverse Effect

[36 CFR 800.9(a and b)] are applied to determine if the project will have an adverse effect on the property. This should be included in the technical report mentioned above. If a finding of no effect or no adverse effect is made, and the agencies concur, the Section 106 process is completed. In the case of no adverse effect, SHPO provides documentation to the Advisory Council on Historic Preservation (ACHP) who may disagree with the finding. If adverse effect is identified, then a detailed mitigation plan must be prepared in the form of a Memorandum of Agreement signed by the ACHP (at the Council's option), SHPO, Bureau of Reclamation, the project proponent and other interested parties as necessary. Implementation of the terms of the Agreement constitute compliance with Section 106.

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