Exhibit

Option Forms for Paragraph 16(b) Actions Considered in Program Alternatives

Draft
Plan Formulation Technical Appendix

SAN JOAQUIN RIVER
RESTORATION PROGRAM

Draft
April 2011

San Joaquin River Restoration
Structural Option Description
Pre-Appraisal Level

Option No.	Structural Option Name		Revision Date
31	Delano-Earlimart ID and Pixley ID Groundwater Bank		1 Feb 2008
Reach Number	**River Mile**	**Program Goal**	**Phase**
N/A	N/A	Water Management	II

Task	Responsible Author	Peer Reviewer
Option Description	John Roldan	
Engineering		

Costs (October 2007):
Cost Level: Pre-appraisal
Total Construction Cost: Not available at this time.
Annual O&M Cost: Unknown
Project life: Unknown

Objective of Option
This option is intended to meet the water management goal by capturing surplus flows on the San Joaquin River (SJR) and Deer Creek, including Recovered Water Account supplies, and storing them in the Pixley Irrigation District (PID) underground for later extraction and conversion to regulated irrigation supply in years when the Delano-Earlimart Irrigation District (DEID) experiences shortages due to the SJR restoration program.

Performance Criteria
1. Estimated dry year recovery capability for DEID = 30,000 acre-feet.
2. Estimated normal year recovery capability for DEID = 12,000 acre-feet.
3. Estimated normal year in-lieu or direct recharge in PID = 30,000 acre-feet.
4. Estimated wet year in-lieu or direct recharge in PID = 50,000 acre-feet.

Design Criteria
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Description
The PID is not a Friant Contractor. The PID depends on groundwater, transfers from Friant Division contractors, surplus wet year water and their somewhat unpredictable Cross Valley Contract supply to meet consumptive irrigation demand. Only 55 percent of the PID's 70,000 acres can receive surface water. Because of this, groundwater elevations beneath the PID are much lower than beneath its neighboring Friant Division districts, such as the DEID.

The groundwater depression beneath PID creates an opportunity to develop a groundwater banking facility with a large storage capacity. DEID and PID are currently conducting a feasibility study to determine the appropriate location and size of the proposed recharge, extraction and conveyance facilities **(Figures 31-1 and 31-2)**.

The project is envisioned as an in-lieu and direct recharge project. When irrigation demand exists within PID, surplus SJR flows, Deer Creek flows and any excess DEID supplies will be delivered to PID growers for in-lieu recharge. At times of little or no PID irrigation demand, these same supplies will be recharged directly in 515 acres of recharge basins. It is estimated that approximately 30,000 acre-feet of surplus supply will be available in normal year types for in-lieu and direct recharge activities. In wet years, it is estimated that PID's existing irrigation demand and potential direct recharge capability will allow approximately 50,000 acre-feet of surplus water to be recharged through both in-lieu and direct recharge activities.

DEID is anticipating recovery of approximately 30,000 acre-feet in dry years and 12,000 acre-feet in normal years with 21 extraction wells providing over 100 cfs of production capacity. The water recovered in normal years will be used to satisfy the irrigation demand of lands within the DEID which are not authorized to take delivery of Central Valley Project supplies due to Reclamation Law, otherwise known as "excess lands."

Construction Considerations

Due to the need to locate the project site within an area of favorable soil for recharge, it will likely be necessary to import suitable levee fill material. Due to the incompatibility of levee and recharge basin soil types, it is imperative that the contractor minimize the spreading and commingling of the levee fill with the soil in the recharge area which could reduce the final infiltration rates of the basins. In addition, due to the need to work in the proximity, and often directly on, adjacent landowners' property, it will be necessary to coordinate with landowners on construction activities, especially large hauling operations that may inconvenience or disrupt their daily operations.

Schedule

Planning:	10/06 to 09/08
Agreements:	06/08 to 06/09
Design:	06/08 to 02/09
Property:	06/08 to 06/09
Construction:	06/09 to 06/11
Operational:	06/11

Real Estate Requirements

- **Fee Purchase** The project will require the purchase of 515 acres for the construction of recharge basins and well fields.
- **Access Rights** While it is unknown at the current time, access rights may be necessary if DEID and/or PID personnel must travel through private landowner property to access project infrastructure. One potential location may be along the Deer Creek, where DEID and PID personnel may need to operate and maintain new control structures within the channel.
- **Permanent and Temporary Easements** Permanent easements will be required for approximately 6 miles of new pipelines to convey the recovered groundwater to the DEID existing distribution system.
- **Flowage Easements** Permits or easements may be required to use the Deer Creek channel as a recharge facility and for conveyance of surplus SJR flows to the recharge basins on a routine, long-term basis.

Coordination with Other Options

Option 47 would enhance this option by providing additional surface water irrigation demand within PID for in-lieu recharge. In addition, Option 44 would provide additional conveyance capacity to deliver surplus SJR supplies from the Friant-Kern Canal (FKC) into the PID and would provide access to surplus Tule River supplies as well.

This option is located in the vicinity of Options 33, 39, and 48, all of which are groundwater recharge and/or banking projects. The interaction of these facilities and impacts on the regional aquifer should be evaluated. All of these options rely on surplus SJR flows for recharge purposes and many utilize surplus flows from Deer Creek which has less surplus flow to offer. Competition for the same water resources will

be an issue that should be evaluated. The close proximity of these options will also cause capacity problems within the Friant-Kern Canal. Option 60, and most likely Option 61, will be needed to increase the capacity of the FKC, and consequently, increase the surplus flows available from the SJR to distribute to these projects.

To ease the competition for surplus SJR water supplies, Options 55 and 56, Trans-Valley Canal and Multi-District Bidirectional Conveyance Project, could make State Water Project and Cross Valley Canal supplies available for recharge. Option 53 could also provide access to State Water Project and Cross Valley Canal supplies through an FKC-CVC Intertie, FKC pump-back facilities and exchange agreements with other Friant Division districts. It should be noted that place of use issues must first be overcome, or strategic multi-district exchange agreements must be developed, to enable State Water Project supplies to be a viable source of water for this project.

This option could also provide a location to store any San Joaquin River water recirculated through Options 58 and 59 during periods of low demand on the FKC. It could also be a component of a regional, multi-agency groundwater banking program.

Operational and Maintenance Requirements

- **Operations**

Recharge: Surplus water from the SJR will be diverted from the FKC into Deer Creek via the wasteway gates at the Deer Creek check structure. The surplus flows will then be diverted out of Deer Creek and into the project recharge basins. SCADA control of the FKC wasteway gates at Deer Creek and the project diversion structure within Deer Creek could facilitate the operation tremendously and reduce staffing needs. It would also allow 24-hour monitoring of basin levels, channel flows, and control structure failures. It should be noted that the FKC wasteway gates are controlled by the Friant Water Authority, and consequently, their SCADA system would require upgrades as well. **Extraction:** The wells will extract groundwater and deliver it through new pipeline connections to existing DEID distribution laterals for ultimate delivery to growers. SCADA controls could be extremely helpful in monitoring pump output, pump performance, and on/off status.

- **Maintenance**

Routine maintenance will be required on all proposed project facilities. New recharge basins and levees will require weed and pest control, occasional silt removal, discing, and grading. Pumps, motors and electrical panels will also require routine maintenance. Most routine maintenance can be performed while the system is in operation, although more extensive maintenance should be performed when the system is down. This will be different for the recharge and extraction components which will be operating at different times of the year.

- **Monitoring Requirements**

A monitoring program with a network of monitoring wells will likely be required to assess the project's impact on the underlying aquifer, impacts to adjacent landowners, and additional hydrogeologic characteristics of the aquifer.

Future Requirements for Design

A feasibility study is currently underway and should be available in early 2008. Environmental documentation will be required and it is likely that additional subsurface investigations will be required as well.

Potential Environmental Impacts

- **Temporary (During Construction)**

The significant earthwork involved in the construction of the recharge basins may impact sensitive species. Permits will likely be required for any construction work in or around the Deer Creek channel.

- **Permanent (Operation-Related)**

Anticipated issues include the conversion of agricultural land to direct recharge reservoirs, permitting associated with the use of Deer Creek as a recharge facility, and the avoidance/mitigation of potential impacts to landowners adjacent to the proposed extraction facilities.

Sub-Options considered but Rejected
None.

Drawings

Figures
31-1 Project Location Map
31-2 Project Facility Map (Draft Figure - Provost & Pritchard Engineering Group Draft Feasibility Study)

Attachments

References

31-1 Friant Water Users Authority, *San Joaquin River Restoration Program Water Management Goal Potential Programs & Projects (Feinstein Report)*, 2007.
31-2 Personal communication with Dennis Mills, Provost & Pritchard Engineering Group, January 2008.

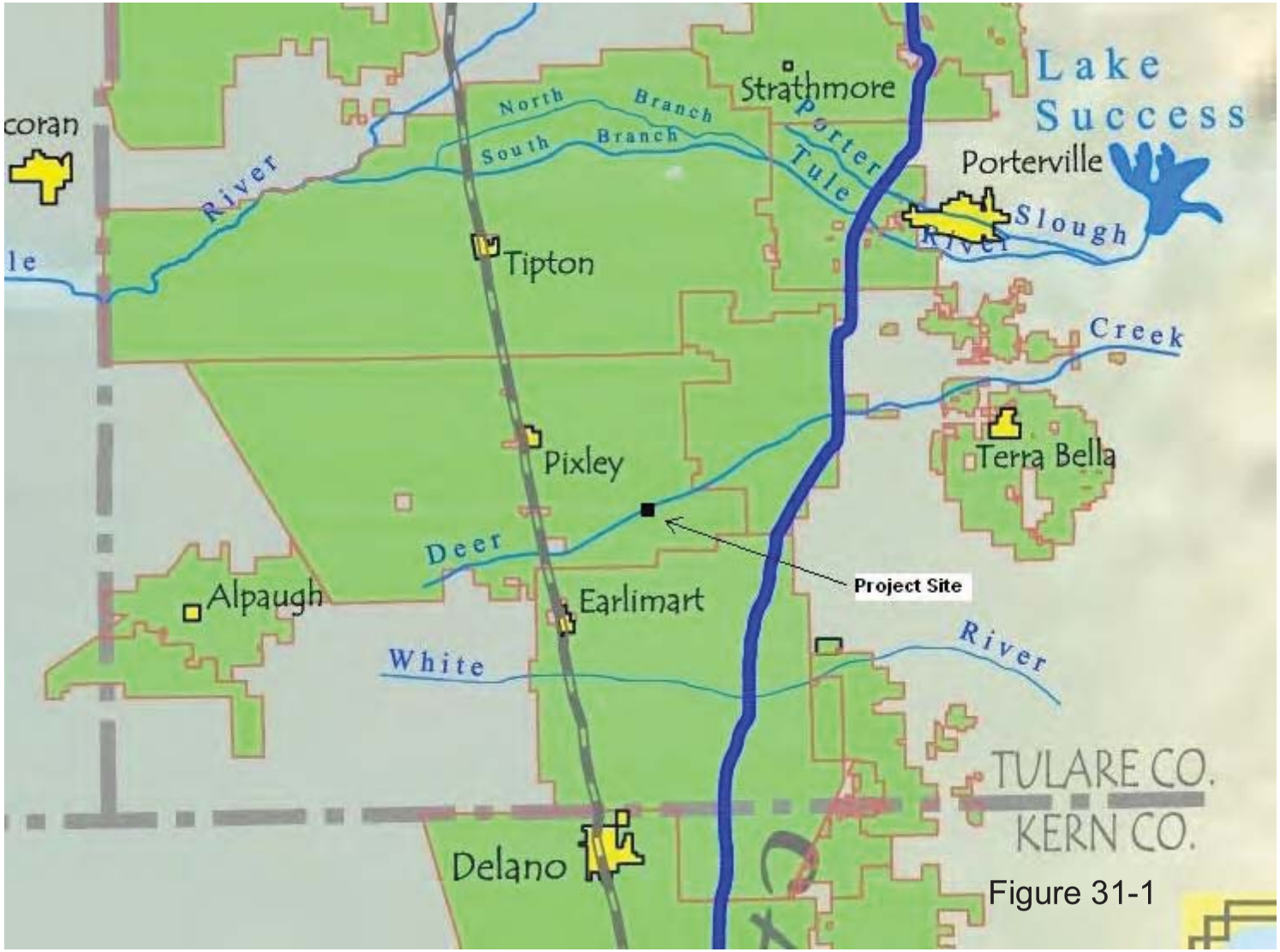
coran
River
le
North Branch
South Branch
Strathmore
Porter
Tule
River
Lake Success
Porterville
Slough
Tipton
Creek
Pixley
Terra Bella
Deer
Project Site
Alpaugh
Earlimart
White
River
TULARE CO.
KERN CO.
Delano

Figure 31-1

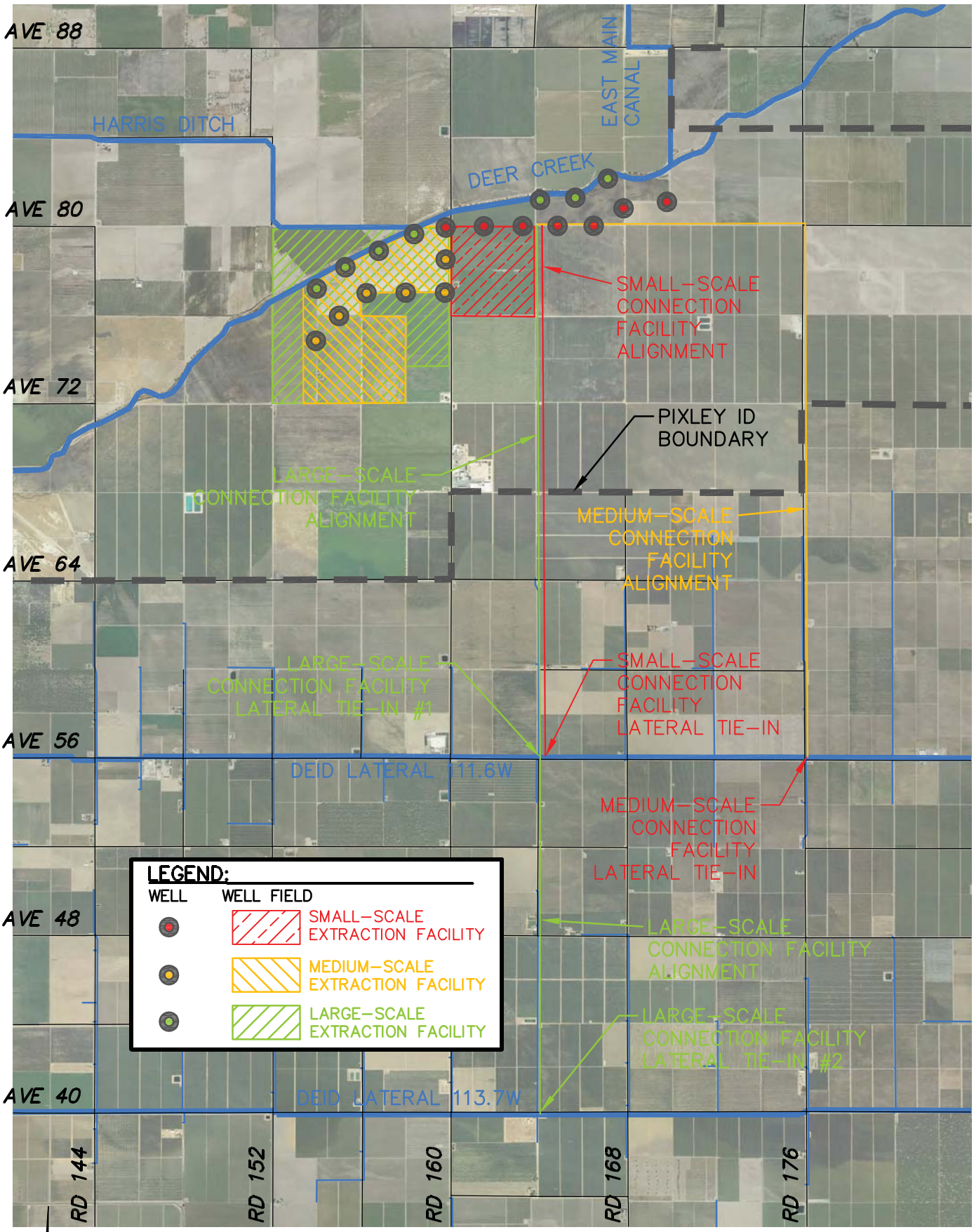

FIGURE 31-2

SCALE IN FEET

0 750 1,500 3,000

N

EST 1968
PROVOST & PRITCHARD INC.
ENGINEERING GROUP
An Employee Owned Company
3500 WEST ORCHARD COURT
VISALIA, CALIFORNIA 93277-7055
559/636-1166 FAX 559/636-1177
www.ppeng.com

DEID-PID JOINT GROUNDWATER BANKING PROGRAM STUDY
PIXLEY IRRIGATION DISTRICT
TULARE COUNTY, CA

PROJECT FACILITY MAP
FIGURE X.X

DESIGN ENGINEER:	Dennis Mills
DRAFTER:	ASC
SCALE:	AS SHOWN
DATE:	1-18-08
JOB NO:	3159 06V1
SHEET	1 OF 1

San Joaquin River Restoration
Structural Option Description
Pre-Appraisal Level

Option No.	Structural Option Name		Revision Date
37	Connect Terra Bella ID Distribution System to Distribution System on Tule River		25 Jan 2008
Reach Number	**River Mile**	**Program Goal**	**Phase**
N/A	N/A	Water Management	I

Task	Responsible Author	Peer Reviewer
Option Description	John Roldan	D. Dorratcague
Engineering		

Costs (October 2007):
Cost Level: Pre-appraisal
Total Construction Cost: Not available at this time.
Annual O&M Cost: Unknown
Project life: Unknown

Objective of Option
Develop replacement water for permanent crops to mitigate San Joaquin River settlement losses. In addition, develop winter replacement water for domestic use when the Friant-Kern Canal is either down for maintenance or is of poor quality due to storm water inflows.

Performance Criteria
1. Provide flexibility in water supply sources to assist in meeting the varying demands of each district under changing hydrologic conditions and water supply availability.
2.
3.
4.

Design Criteria
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Description
The proposed project will connect the distribution system of Terra Bella ID (TBID), a Central Valley Project Friant Division Class 1 contractor, with the distribution system of Vandalia ID (VID), a pre-1914 water right holder on the Tule River.

The TBID service area is very limited in its groundwater resources, and consequently, relies very heavily on its Class 1 contract. TBID's Class 1 allocation is expected to fall short of meeting the irrigation demand of the district more frequently as a result of the San Joaquin River settlement. In addition, TBID delivers domestic supply which has a constant, year-round demand that is challenging to meet during the winter when service is interrupted from the Friant-Kern Canal due to periods of maintenance or when water quality in the FKC is poor due to storm water runoff into the canal.

The VID lies northeast of TBID and has a well field that is recharged naturally and artificially with water retained from the Tule River. These water supplies are of excellent quality. The major irrigation demands within VID occur during the summer and fall months. During the winter and spring, VID has additional

capacity available within its system.

The proposed project consists of the installation of an intertie pipeline between the VID distribution system and TBID's Pump Station 3 consisting of approximately 8,000 feet of 10-inch pipe. This intertie will allow TBID to receive water from VID during the winter and spring to meet its residential and irrigation demand when VID has no irrigation demand and too much runoff for its spreading basins to capture. In exchange, VID will receive Class 1 water from TBID during the fall to augment dwindling Tule River and groundwater supplies. In addition, it is expected that the proposed project will provide TBID and VID with the flexibility to capture and exchange surplus flows on the San Joaquin River and Tule River as conditions allow.

Construction Considerations
Due to the need to work in the proximity, and often directly on, adjacent landowners' property to construct distribution pipelines, it will be necessary to coordinate with landowners on construction activities, especially excavation operations that may inconvenience or disrupt their daily operations.

The pipeline will require a streambed alteration permit in order to cross Deer Creek; however, it is a seasonal stream which should not result in difficult or unusual crossing considerations.

Schedule
Planning: 6/07 – 6/08
Agreement: 7/08 – 12/08
Design: 7/08 – 12/08
Property: 7/08 – 6/09
Construction: 7/09 – 12/09

Real Estate Requirements
- **Fee Purchase** None expected.
- **Access Rights** Temporary landowner access rights may be required during the construction of distribution facilities.
- **Permanent and Temporary Easements** A significant number of permanent easements and encroachment permits are expected due to the potential construction of over a mile of pipeline.
- **Flowage Easements** None expected.

Coordination with Other Options
The TBID's access to Tule River water may make it possible to facilitate Tule/Class 1 exchanges with other Friant Districts. This would likely require a larger pipeline and increased pumping and conveyance capacities to provide assistance to other districts on a regular basis.

Operational and Maintenance Requirements
- **Operations**

Once constructed, this option should fold into the routine daily operations of the TBID. Additional staff should not be required; however, staff could initially require additional training as the operation of the system will become more involved with the addition of another water source.
- **Maintenance**

Maintenance operations should not change significantly due to the implementation of this option. Although the amount of infrastructure to maintain will increase, it is not anticipated to be a substantial burden on either district.
- **Monitoring Requirements**

TBID may require VID to monitor groundwater quality if groundwater is ever to be used to meet TBID's residential demands.

Future Requirements for Design
The design effort should designate the most practical and cost-effective manner in which to connect and improve the distribution systems of each district. The resulting flexibility of the connected systems should

be evaluated to determine the extent of potential water exchanges, in-lieu recharge programs, and banking operations that can reasonably occur, especially in light of the Reclamation Law restrictions on Class 1 water. In addition, overall project costs should be calculated, including any cost savings in the form of lower water treatment costs for TBID, lower energy costs for VID, and lower overall water costs for both districts. The effectiveness of this project in meeting the water management goal must also be determined.

Potential Environmental Impacts

- **Temporary (During Construction)**

Normal construction concerns such as dust control, increased truck traffic, air pollution, mitigation and special construction precautions for species of concern, road closures, etc. may need to be addressed. As mentioned above, a streambed alteration permit will be required for the crossing at Deer Creek.

- **Permanent (Operation-Related)**

Impacts from a long-term exchange of Central Valley Project Friant Division supply and Tule River supply will need to be addressed.

Sub-Options considered but Rejected

None.

Drawings

1 NA
2
3
4

Figures

1 NA
2
3
4
5

Attachments

References

37-1 Keller-Wegley Engineers, *California Department of Health Services Division of Drinking Water and Environmental Management Pre-Application for Funding*, July 2007.

37-2 Telephone Conversation with Sean Geivet, TBID Manager, January 15, 2008.

San Joaquin River Restoration
Structural Option Description
Pre-Appraisal Level

Option No.	Structural Option Name		Revision Date
43	Orange Cove ID In-District GW Recharge/Recovery Program		29 Jan 2008
Reach Number	**River Mile**	**Program Goal**	**Phase**
N/A	N/A	Water Management	I

Task	Responsible Author	Peer Reviewer
Option Description	John Roldan	D. Dorratcague
Engineering		

Costs (October 2007):
Cost Level: Pre-appraisal
Total Construction Cost: Currently not available
Annual O&M Cost: Currently not available
Project life: 20 years – Landowner groundwater pumping facilities

Objective of Option
Meet the water management goal by providing an in-district dry year water supply to mitigate the loss of District contract supplies to restoration flows in the San Joaquin River. This option will more fully utilize the District's existing USBR contract supply within the District boundaries when available.

Performance Criteria
1. Bank up to 15,000 acre-feet of water (5,000 acre-feet annually) within the District through in-lieu recharge.
2. Recover up to 15,000 acre-feet of groundwater annually through landowner extraction facilities.

Design Criteria
1. Existing Class One water supply to be used. No flood water is required.
2. Average pump capacity is 350gpm
3. Average cost per pump plus standby upgrades is $20,000.

Description
The District recently completed a study of the groundwater resources beneath the District and an evaluation of options to provide dry year water supply for its permanent crops (Reference 43-1). Based on the results of the study, the District now intends to conduct a drought preparedness program based on in-lieu groundwater banking with the assistance of its landowners. Due to its location against the foothills of the Sierra Nevada, the District has a very limited groundwater aquifer beneath its boundaries. Landowners in the northern portion of the District have very limited, if any, groundwater to supplement their District allocation of surface water. Landowners in the southern portion of the District, an area of approximately 9,000 acres, are located in a more productive groundwater area (**Figure 43-1**). Current groundwater depths in this portion of the District range from 30 to 70 feet. Aquifer storage under current conditions (back to back wet years) was estimated to be 9,000 acre-feet. Groundwater migration was estimated at 500 feet per year in a southwesterly direction based on a cursory evaluation of driller's logs.

The proposed project entails providing an incentive for the southern landowners to take delivery of additional Class One surface water from the District's supply in normal to wet years in lieu of pumping groundwater, thus having a net positive impact on groundwater levels. The incentive will be in the form of a reduction in the cost of the additional Class One water taken by the southern landowners. The cost of the additional Class One water will be reduced to a level consistent with the landowner's cost to pump and use

groundwater. The existing District conveyance facilities are adequate to convey the additional surface water to the southern areas. In dry years, these same landowners would be provided another incentive to relinquish their District allocation of Class One surface water and rely on the recharged groundwater supply beneath their lands to meet their demands. This incentive will be in the form of a payment per acre-foot of District allocation relinquished. The relinquished supply would be made available to other landowners within the District at a premium to pay for the incentives to the participating landowners of the drought preparedness program.

Because on the reliance on landowner facilities to ensure the dry year supply develops when needed, it would be imperative for the District to ensure these facilities are in good working order and capable of meeting the expected production requirements. In addition, many landowners would need to increase the size of their facilities to participate in the program. Significant financial assistance will be required to rehabilitate and expand landowner facilities at the beginning of the program and additional funding will be needed to maintain these facilities on an annual basis.

Construction Considerations

Any retrofit or rehabilitation work performed on landowner facilities must not interfere with the landowner's farm operation. Work must be coordinated with landowners during periods of limited demand. The District would hold the construction contracts with easements from the land owners. The landowners would contract for pump maintenance with approval of the District.

Schedule

Planning: 5/04 – 9/08
Agreements: 7/08 – 9/08
Design: 10/08 – 12/08
Construction: 1/09 – 7/09
Operational: 8/09 (in time to mitigate for Interim Flows)

Real Estate Requirements

- **Fee Purchase:** None required.
- **Access Rights:** Landowner access agreements required to monitor groundwater wells and inspect landowner pumping facilities.
- **Permanent and Temporary Easements:** None required.
- **Flowage Easements:** Not applicable.

Coordination with Other Options

This option requires the District to deliver more of its wet year Class One water supply within the District. Depending on the level of implementation of this option, the District's ability to engage in Options 34 and 45 may be precluded. This option could be combined with other options that utilize water supplies other than the District's Class One supply (e.g. Recaptured SJR water, Recovered Water Account water, Local eastside tributary water, etc.).

Operational and Maintenance Requirements

- **Operations**

Individual contracts must be executed with each participating landowner. The contracts will describe the obligations of the District and the landowner and provide termination conditions should the landowner decide to sell the property or terminate participation in the program. Water delivered to participating landowners in excess of their five-year historical average of deliveries will be credited toward the banking program. The program will leave behind five percent of the water banked, resulting in 95 percent of the banked water being available for the District in dry years. All water delivered under this program for banking and recovery purposes will be delivered though the District's existing infrastructure and in accordance with the District's normal operating procedures.

- **Maintenance**

A routine maintenance plan on the landowners' pumping facilities will be required to ensure that they are

operational when the district calls on its banked water. This maintenance program will be conducted annually during low periods of demand, most likely winter. The District will decide if the cost of the maintenance program will be added into the premium paid by those landowners in need of the water that is relinquished by the participating southern landowners in dry years.

- **Monitoring Requirements**

Groundwater monitoring will be required throughout the duration of the project to monitor the effects of the banking project and the rate of groundwater migration out of the area. This will be performed by the District in conjunction with its normal groundwater well monitoring efforts. The District will decide if the additional cost will be added into the premium paid by those landowners in need of the water that is relinquished by the participating southern landowners in dry years.

Future Requirements for Design

A pilot project within a small portion of the district has been proposed to identify project issues and concerns, including but not limited to, landowner interest, actual landowner and district program costs, required program incentives, contractual issues with landowners, and aquifer response (**Figure 43-2**). An Initial Study in accordance with CEQA will be required for both the pilot project and district-wide project to determine the level of environmental documentation required.

Potential Environmental Impacts

- **Temporary (During Construction)**

No environmental impacts are expected during construction.

- **Permanent (Operation-Related)**

A positive long-term impact to local groundwater levels is expected. Groundwater levels are expected to increase within the District and immediately adjacent to its boundaries due to the increased Class One deliveries.

Sub-Options considered but Rejected

None

Drawings

None

Figures

43-1 Exhibit 1-1 District Service Area and Most Productive Groundwater Area (Reference 43-1)

43-2 Exhibit 4-1 System 9 Service Area within the Most Productive Groundwater Area (Reference 43-1)

Attachments

References

43-1 Provost & Pritchard Engineering Group, Inc. and Orange Cove Irrigation District, *Orange Cove Irrigation District Groundwater Monitoring and Drought Preparedness Program*, July 2006.

Exhibit 1-1: District Service Area and Most Productive Groundwater Area

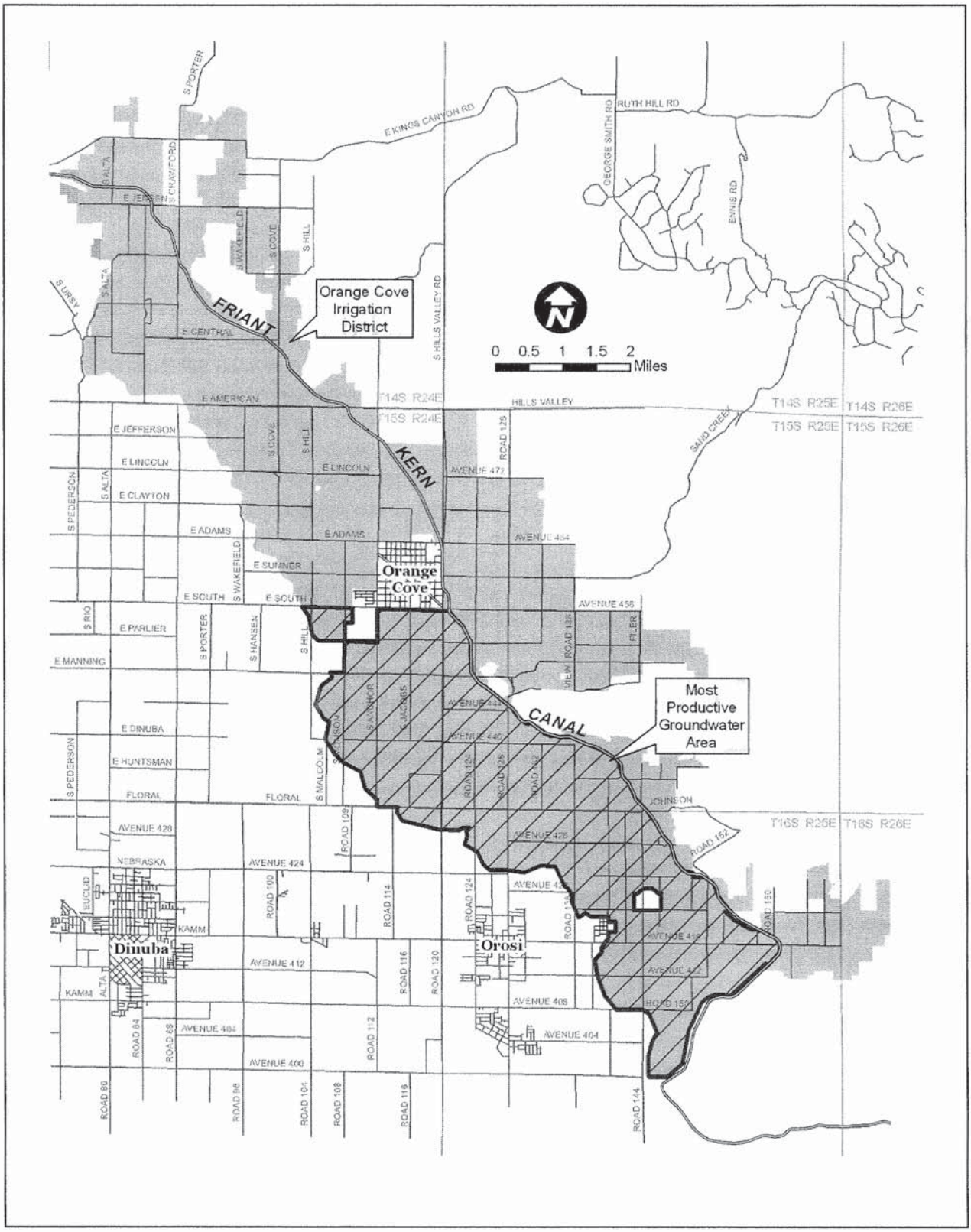


Figure 43-1

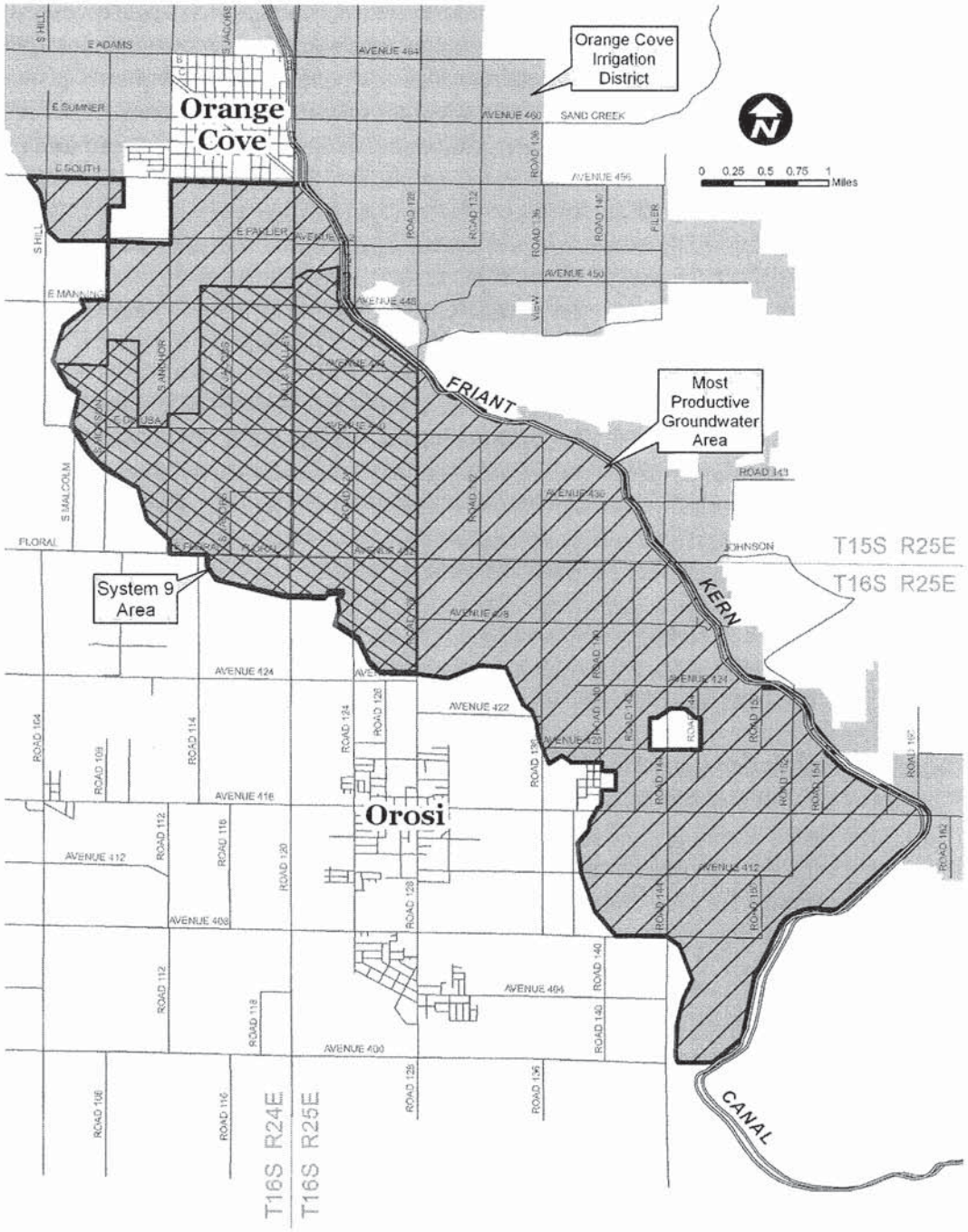


Exhibit 4-1: System 9 Service Area within the Most Productive Groundwater Area

San Joaquin River Restoration
Structural Option Description
Pre-Appraisal Level

Option No.	Structural Option Name		Revision Date
47	Pixley ID Distribution System Expansion		28 Jan 2008
Reach Number	**River Mile**	**Program Goal**	**Phase**
N/A	N/A	Water Management	I

Task	Responsible Author	Peer Reviewer
Option Description	John Roldan	Dennis Dorratcague
Engineering		

Costs (October 2007):
Cost Level: Feasibility Study – March 2006
Total Construction Cost: Not available at this time.
Annual O&M Cost:
Project life:

Objective of Option
The primary goal of the project is to provide additional opportunities for groundwater banking and recharge within the Friant service area to meet the water management goal. Further, the goal of the expansion project is to increase groundwater recharge by delivering water to more of the lands in the District for both in-lieu and direct recharge. The project will also provide operational flexibility and further recharge opportunities by linking the distribution system of the Lower Tule River Irrigation District and the Pixley Irrigation District.

Performance Criteria
1 Maximize delivery of 215 and flood flows and non-CVP water supplies, including Recovered Water Account supplies, when available to meet the water management goals in the Districts.

Design Criteria
1 Pixley ID Canal Capacity Criteria – 1cfs per 60 acres for service areas greater than 6,000 acres.
2 Maximum Recommended Channel Velocities from the Special Committee on Irrigation Research, ASCE, 1926

Description
Pixley Irrigation District (District) is not a Friant Contractor. The District depends on groundwater, transfers from Friant Division contractors, surplus wet year water and their Cross Valley Contract supply (31,102 acre-feet) to meet the consumptive irrigation demand of the lands within the District. Approximately 55 percent of the District's 70,000 acres can receive surface water. There are two large areas of the District that currently have no surface water distribution facilities (**Figure 47-1**). These areas include the area north of Avenue 104 and east of Highway 99 within the District (northeast area) and the area west of Highway 99 and north of Avenue 112 (northwest area). A feasibility study prepared by the District identified potential ways to deliver surface water to areas within the District that currently are not served and the challenges associated with each method of service. The total new service area to be served would exceed 12,500 acres. Delivery of water to these lands is expected to reduce the outflow of groundwater from underneath adjacent Friant contractors.

The options evaluated (alignments and facility types) were developed in conjunction with District staff. Design issues associated with these options were investigated at a reconnaissance level, and feasibility level determinations of sizing and construction quantities were prepared for modifications to the District's existing distribution system as well as for new facilities.

The following options were selected as most feasible and together they constitute the project:

Eastside Improvement and Expansion: Improvements to the Casa Blanca Canal (LTRID #1), the construction of a new Main Canal (flowing north to south) and a new distribution system with two new laterals that would serve approximately 8,030 additional acres. This option could also possibly tie the Casa Blanca Canal into the existing Main Canal. (**Figure 47-2**)

Westside Improvement and Expansion: Improvements to the West Main Canal to improve deliveries up to Lateral #3, and the construction of a new distribution system with one new lateral (Lateral #4) that would serve approximately 4,500 additional acres. (**Figure 47-3**).

The comparative seepage experienced prior to diversion into the District's conveyance system and the quantities and costs of the required cut and fill, road crossings, check structures and concrete were determined for each option.

The District's groundwater database was reviewed to determine if, by providing surface water to the potential service areas, it would address the causes behind some of the deepest groundwater depths in the District. In addition, depth to groundwater contours for the District were generated from January and February 2004 well readings. (**Figure 47-4**) The District's database and 2004 contours showed that the deepest groundwater depths appear to run in a trough (east to west) down the middle of the District, just south of the community of Pixley. From this review it appears that water users within the District are pumping more groundwater than is being recharged, and that groundwater is being recharged from subsurface inflows of groundwater from the north, south, and east of the District. Average water levels in monitored wells versus time, from 1986 to 2004, were summarized in **Figure 47-5**. This figure shows an overall downward trend (on the order of 70 feet in 20 years) that fluctuates with wet/dry year cycles. It appears that if the potential service areas were provided surface water, it would benefit areas suffering from the greatest groundwater depths in the District by offsetting current groundwater pumping. It is expected that this would have the effect of decreasing the dry year dips and increasing the wet year recovery demonstrated in Figure 47-5. Based solely on the benefit of in-lieu recharge and neglecting transportation seepage losses and the direct recharge benefit of the new surface water deliveries, the anticipated benefit to the local groundwater table using the average monthly District water requirements shown in **Figure 47-6** is approximately 50,000 acre-feet per year (4 acre-feet per acre per year X 12,500 acres = 50,000 acre-feet per year).

Construction Considerations

It is anticipated that these options would be constructed using in-house staff. Work would need to be coordinated with routine operation and maintenance activities. It is expected that the new channels could be constructed during the irrigation season; however, modifications to the existing channels would have to be performed during the late fall and winter, preferably before the threat of flood releases on the San Joaquin and Tule Rivers.

Schedule	**Present % Complete**	**Expected Completion**
Planning:	90% Completed	– July 2007
Agreement(s):	0% Completed	– July 2008
Design:	10% Completed	– July 2008
Property (including right-of-way):	0% Completed	– October 2008
Construction:	0% Completed	– July 2009 (with funding)
Operational:	0% Completed - Project could be operational in 36 months	

Real Estate Requirements

- **Fee Purchase** Approximately 195 acres will be required for new canals and terminating basins.
- **Access Rights** None.
- **Permanent and Temporary Easements** Permanent easements will be needed along the alignment of all new main canals and laterals.
- **Flowage Easements** None.

Coordination with Other Options

This option could work in conjunction with options that bring additional supplies into the Friant Division service area or otherwise free up existing supplies that can be transferred to this ground-water bank. For example, Options 60 and 61, capacity correction and enlargement of the Friant-Kern Canal, could make additional surplus water available for direct delivery to the District or through transfers made possible by the availability of additional surplus water to other Friant contractors. Option 53, expansion of capacity of the Cross Valley Canal, could allow Cross Valley contractors, including the District, to take delivery of more Cross Valley supply or even surplus State Water Project supplies through multi-party exchanges. Option 44, Tule River Intertie, could also work in conjunction with this option. The feasibility study indicated that the Tule River Intertie would be connected to the Casa Blanca Canal making it possible to deliver surplus Tule River supplies to the northeast project area. Exchanges such as those described in Option 34, potential conjunctive use partnerships, could also assist the District if its neighboring conjunctive use districts decide to transfer a portion of the additional normal and wet year supplies generated by Option 34 to the District to assist with in-lieu recharge and slow the migration of groundwater across their districts' boundaries and into the District.

Options that also rely on bringing additional supplies into the Friant Division could be precluded, to a small degree, by this option. For instance, those groundwater banks that target the same supplies envisioned for this option will be in direct competition for those supplies.

Operational and Maintenance Requirements

- **Operations**

Once constructed, this option will fold into the routine daily operations of the District. Additional staff and significantly altered operational practices are not expected to be needed. Additional surface water supplies for the new areas will be delivered in much the same manner as all other surface supplies.

- **Maintenance**

Maintenance operations should not change significantly due to the implementation of this option. Although the amount of infrastructure to maintain will increase, it is not anticipated to be a substantial burden on the District.

- **Monitoring Requirements**

A quick review of the locations of the project boundaries and existing wells (Figure 47-4) indicates that a sufficient number of wells already exist within and immediately around the northeast and northwest areas to evaluate the effects of this in-lieu recharge program. If desired, one or two strategically placed monitoring wells could be added to provide a more complete representation of the two areas. The frequency of the readings of the existing wells (spring and fall) should be adequate for the potential new wells.

Future Requirements for Design

To proceed to final design, the consent of the landowners within the proposed service areas will need to be obtained if they are expected to fund all or a portion of the new infrastructure through increased assessments. In addition, sale agreements for the property along the alignment of the new channels will need to be negotiated. A CEQA analysis must be performed as well. The feasibility study indicated that additional analysis and modeling should be performed on the Casa Blanca Canal to determine if the Parshall flume at the head of the canal will require modifications to prevent submergence.

Potential Environmental Impacts

- **Temporary (During Construction)**

Normal construction concerns such as dust control, increased truck traffic and air pollution, mitigation and

special construction precautions for species of concern, road closures, water quality impacts, etc. may need to be addressed.

- **Permanent (Operation-Related)**

The long term environmental impacts are expected to be positive due to the expected increase in groundwater levels within the District and the expected decrease in groundwater migration across irrigation district boundaries.

Sub-Options considered but Rejected

An alternate conveyance method to serve the northeastern area was considered but was determined to be more expensive and less water efficient than the Casa Blanca alternative. In addition, an alternative that would serve an area immediately south of the northwestern area was considered; however, the existing private surface water conveyance system was deemed sufficient at the current time.

Drawings

None

Figures

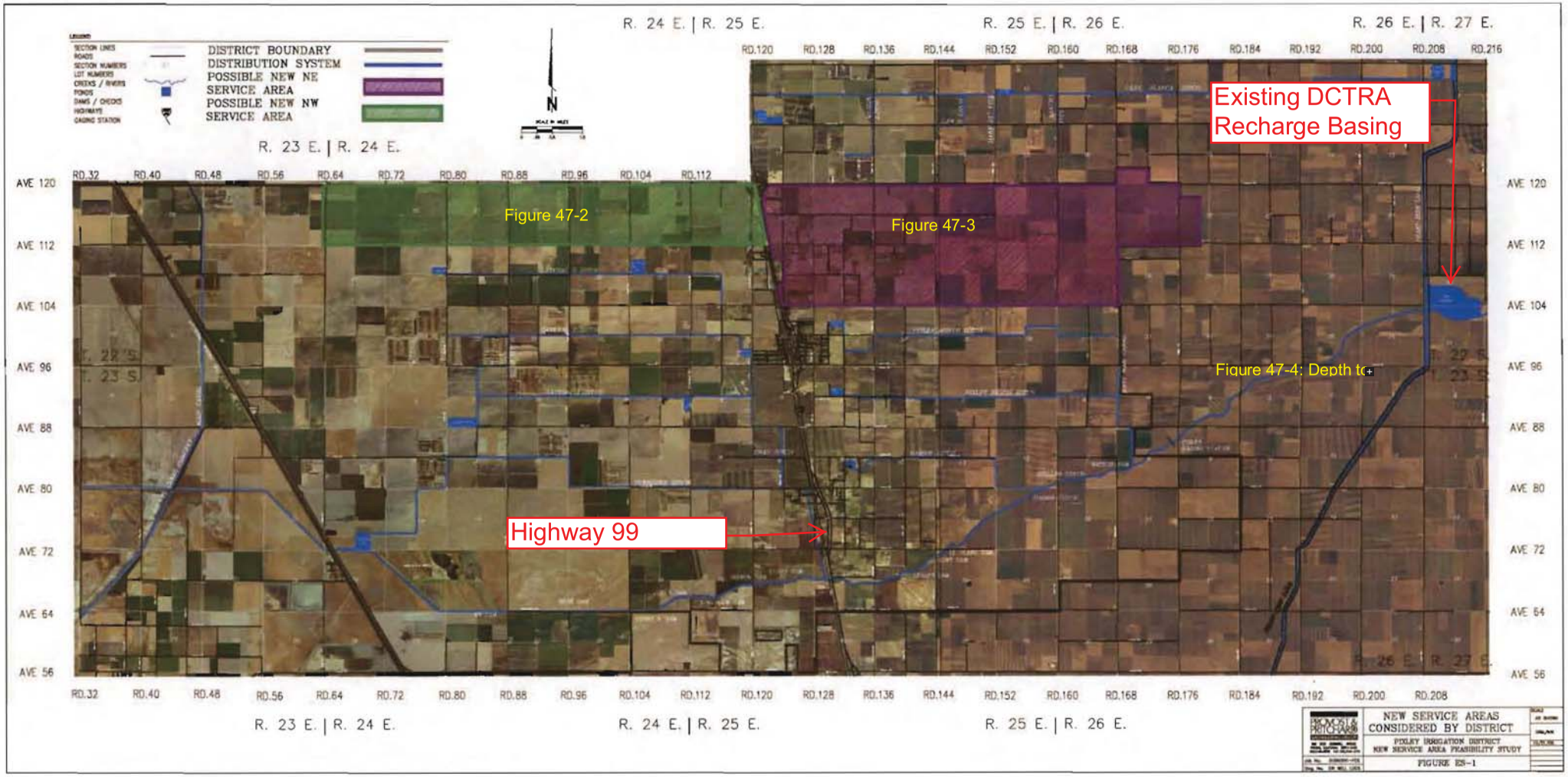
47-1 New Service Areas Considered by District
47-2 Casa Blanca Option – New NE Service Area Served from the Casa Blanca Canal
47-3 Westside Options – New NW Service Area Served from the West Main Canal
47-4 Depth to Water in Wells – Spring 2004
47-5 Pixley Irrigation District Average Depth to Groundwater
47-6 Pixley Irrigation District Average Monthly Water Requirements

Attachments

References

47-1 Provost & Pritchard Engineering Group, *New Service Area Cost and Alternatives Study*, March 2006

Figure 47-1: New Service Areas Considered by District



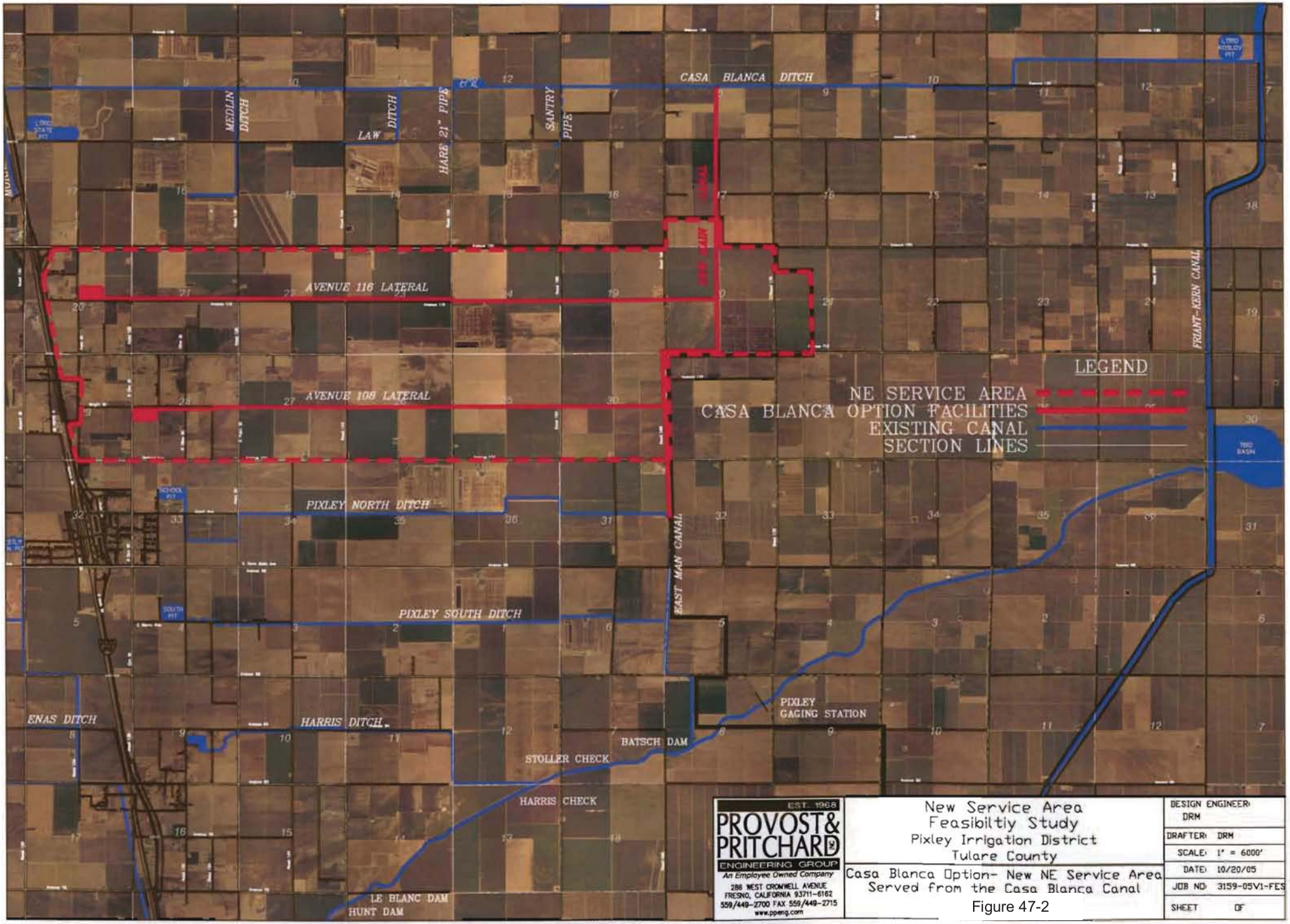
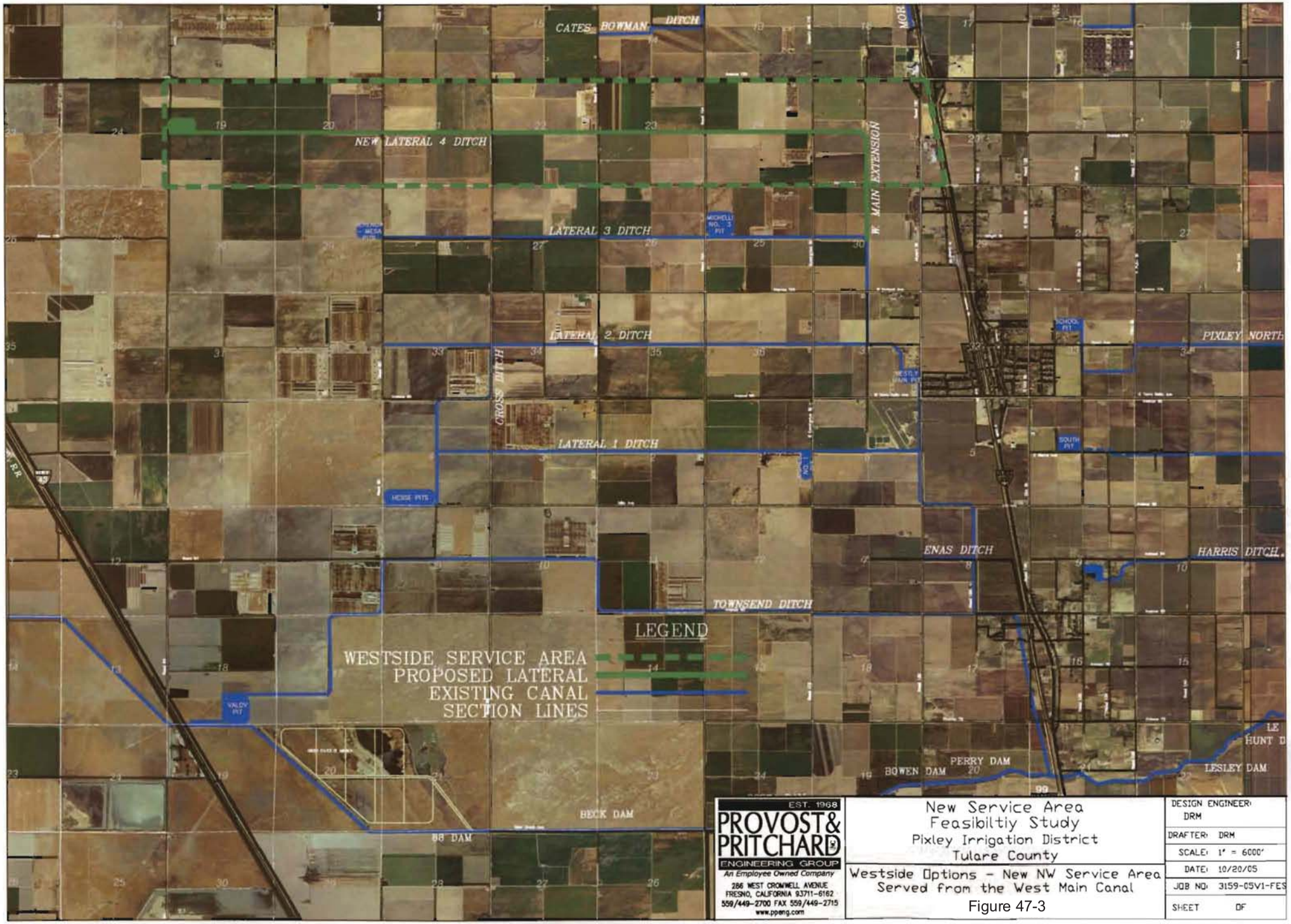

CASA BLANCA DITCH
MEDLIN DITCH
LAW DITCH
HARE 21" PIPE
SANTRY PIPE
AVENUE 116 LATERAL
AVENUE 108 LATERAL
PIXLEY NORTH DITCH
PIXLEY SOUTH DITCH
EAST MAIN CANAL
FRIANT-KERN CANAL
ENAS DITCH
HARRIS DITCH
STOLLER CHECK
HARRIS CHECK
BATSCH DAM
PIXLEY GAGING STATION
LE BLANC DAM
HUNT DAM
LEGEND
NE SERVICE AREA
CASA BLANCA OPTION FACILITIES
EXISTING CANAL
SECTION LINES
EST. 1968
PROVOST& PRITCHARD
ENGINEERING GROUP
An Employee Owned Company
286 WEST CROMWELL AVENUE
FRESNO, CALIFORNIA 93711-6162
559/449-2700 FAX 559/449-2715
www.ppeng.com
New Service Area
Feasibiltiy Study
Pixley Irrigation District
Tulare County
Casa Blanca Option- New NE Service Area
Served from the Casa Blanca Canal
DESIGN ENGINEER: DRM
DRAFTER: DRM
SCALE: 1" = 6000'
DATE: 10/20/05
JOB NO: 3159-05V1-FES
SHEET OF

Figure 47-2



EST. 1968
PROVOST & PRITCHARD
ENGINEERING GROUP
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286 WEST CROMWELL AVENUE
FRESNO, CALIFORNIA 93711-6162
559/449-2700 FAX 559/449-2715
www.ppeng.com

New Service Area
Feasibiltiy Study
Pixley Irrigation District
Tulare County

Westside Options - New NW Service Area
Served from the West Main Canal

Figure 47-3

DESIGN ENGINEER:	DRM
DRAFTER:	DRM
SCALE:	1" = 6000'
DATE:	10/20/05
JOB NO:	3159-05V1-FES
SHEET	OF

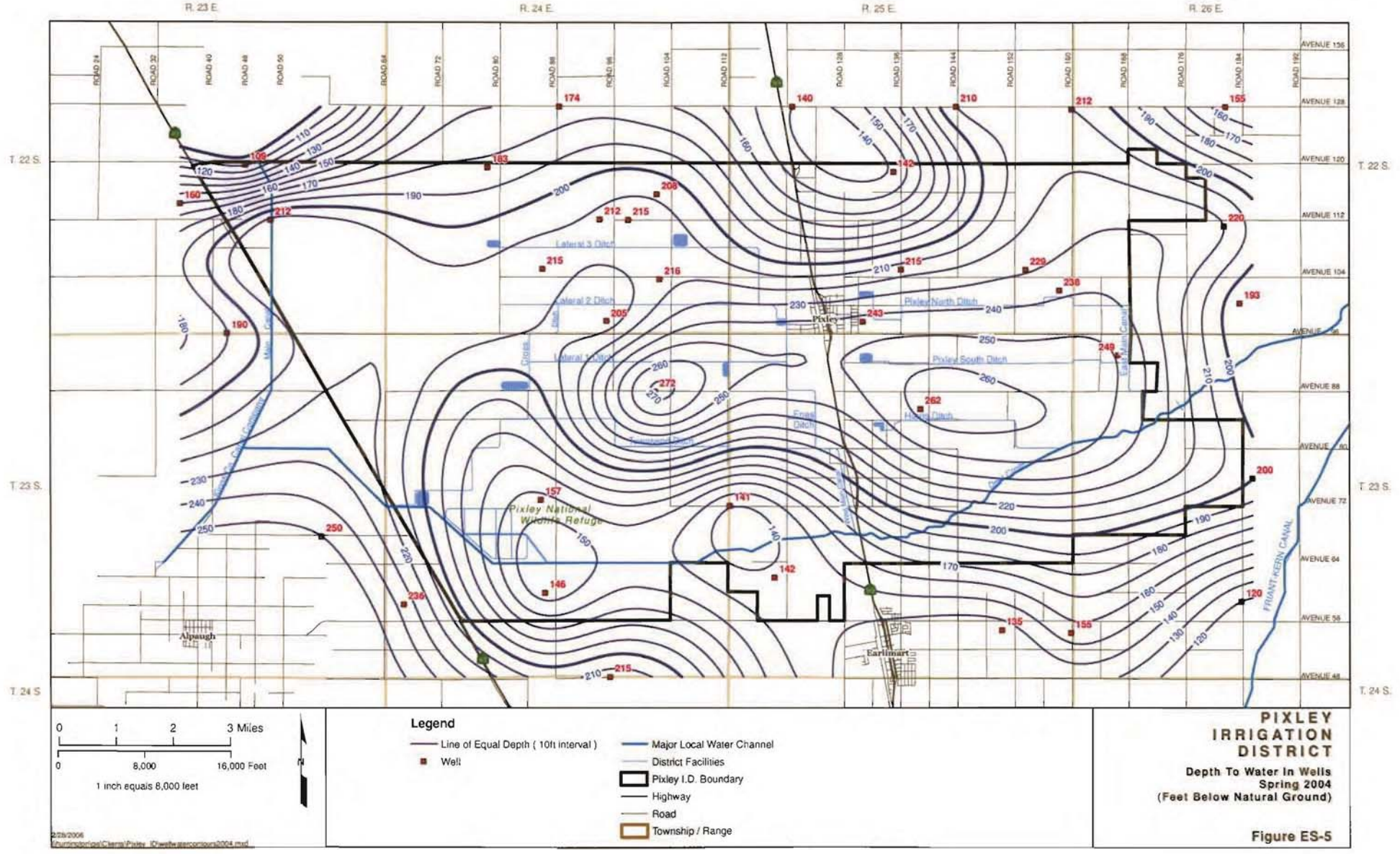


Figure 47-4: Depth to Water in Wells – Spring 2004

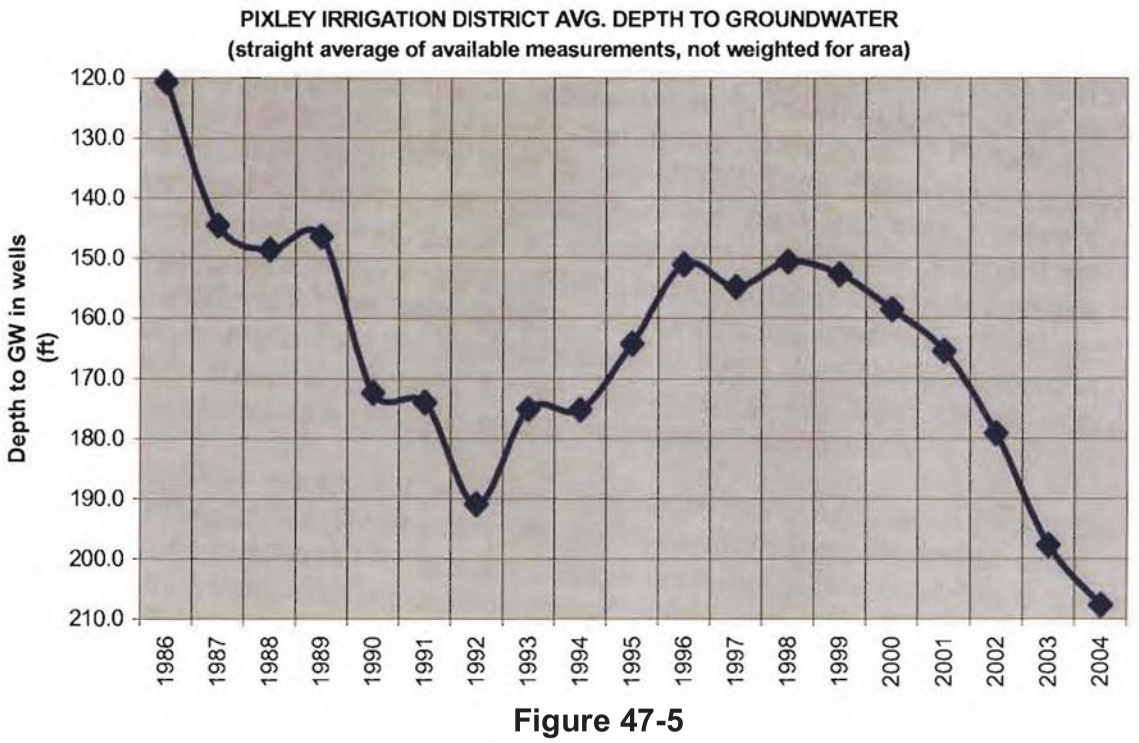


Figure 47-5

Note: Values for 1996 were in January and February. All other values were averages from Fall readings.

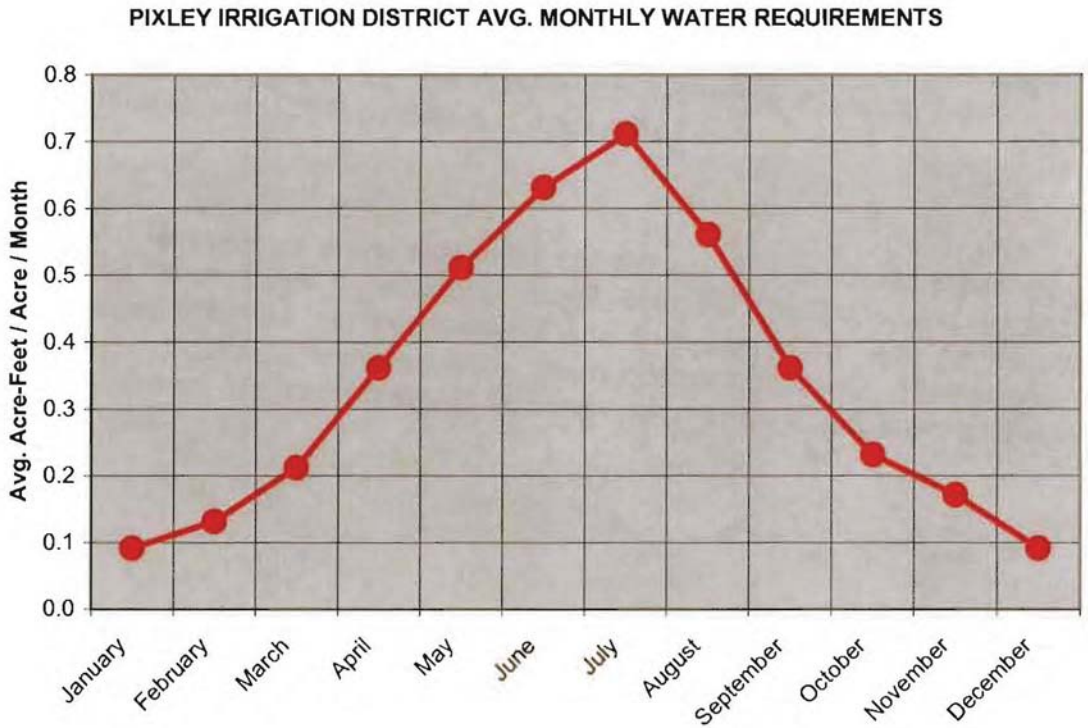

PIXLEY IRRIGATION DISTRICT AVG. MONTHLY WATER REQUIREMENTS
Avg. Acre-Feet / Acre / Month
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
January
February
March
April
May
June
July
August
September
October
November
December

Figure 47-6

San Joaquin River Restoration
Structural Option Description
Pre-Appraisal Level

Option No.	Structural Option Name		Revision Date
69	Shafter-Wasco/Semitropic Interconnection on Kimberlina Road		5 Mar 2008
Reach Number	**River Mile**	**Program Goal**	**Phase**
N/A	N/A	Water Management	II

Task	Responsible Author	Peer Reviewer
Option Description	D. Whitbeck	J. Roldan
Engineering		

Costs (October 2007):
Cost Level: Pre-appraisal
Total Construction Cost: Not available at this time.

Objective of Option
Shafter-Wasco Irrigation District proposes to construct four miles of 60-inch diameter pipeline to connect the district's main lateral to Semitropic Water Storage District's P-384 distribution system. This will increase the capability to exchange water between districts and allow for Recaptured water to be delivered to Shafter-Wasco ID and surplus San Joaquin River water to be delivered to Semitropic for storage.

Performance Criteria
1. Construct conveyance facilities to carry approximately 100 cfs of surface water between the California aqueduct and the Friant-Kern Canal.
2. Increase the districts' capability to obtain multiple surface water supplies and use them in-lieu of groundwater.
3. Provide an exchange mechanism for SWP and CVP supplies.

Design Criteria
1. Reclamation Cost Estimating Guidelines

Description
Shafter-Wasco Irrigation District (Shafter-Wasco) is located immediately adjacent to and east of Semitropic Water Storage District (Semitropic). Shafter-Wasco encompasses 34,140 acres, of which 31,350 are irrigated. The district surrounds the cities of Shafter and Wasco and is crossed by the Central Valley Highway (Highway 43). On the east side, it is bounded by the Calloway Canal. The northern and southern boundaries generally correspond to Highway 46 and Seventh Standard Road, respectively. See **Figure 69-1**.

Shafter-Wasco has a contract with the USBR for Central Valley Project (CVP) water to serve 27,100 acres of district land. The district is entitled to 50,000 acre-feet of Class 1 water and 39,600 acre-feet of Class 2 water, for a total of 89,600 acre-feet of CVP water per year. Water is transported to the district in the Friant-Kern Canal. No major streams cross Shafter-Wasco, but the district his historically made exchanges with North Kern Water Storage District for some Kern River water.

Semitropic is located in Kern County, immediately to the west of Shafter-Wasco and approximately 20 miles northwest of Bakersfield. Semitropic is not a Friant-contracting district and instead receives its entitlement by SWP water delivered in the California Aqueduct. Semitropic has, for several years, attempted to secure a water supply of CVP water, but has been unsuccessful. In some years, Semitropic has been able to purchase Class 215 water available in the Friant-Kern Canal. Semitropic primarily diverts groundwater to balance the demand it cannot fill with SWP water.

Semitropic has recently finished construction of a new eight mile long, 120-inch diameter pipeline to bring water from the California Aqueduct into the district's distribution system. In addition, Semitropic has constructed a new pipeline distribution system, called the P-384 system that creates the possibility of connecting that system with Shafter-Wasco's main (North System) lateral.

This project proposes to construct four miles of 60-inch pipeline to connect Shafter Wasco's distribution system with Semitropic's P-384 distribution system. See **Figure 69-2**. The pipeline would run along Kimberlina Road and will have a capacity of approximately 100 cfs. Construction of two booster pumping plants would also be required for effective operation. The primary goal is to interconnect the two districts, with associated benefits including operational flexibility for water deliveries, increased water supply reliability, increased conjunctive use to enhance groundwater levels, and potential water exchanges between SWP and CVP sources.

Recommendation for Water Management Approach
This project represents an option to exchange water between the California Aqueduct and the Friant-Kern Canal service areas. The distribution system could be used to convey Recaptured water from the California Aqueduct through Semitropic and into Shafter-Wasco to meet irrigation demand, or to carry Recaptured water or surplus San Joaquin River water to Semitropic's groundwater bank. The maximum capacity of the pipeline, however, is only about 100 cfs, which may not be sufficient to impact Friant-Kern supplies on a larger scale. With no direct connection to the Friant-Kern Canal, benefits to other Friant Division contractors would be limited to the exchange potential of Shafter Wasco's CVP contract quantities. This project may represent a way of reducing the dependence of Shafter-Wasco on CVP supplies, which could be beneficial to the water management goals.

Construction Considerations
Construction considerations would be assessed once the pre-design feasibility study has been obtained and reviewed.

Schedule (Completion Dates)
Preliminary Design: Dec-2007 (completed)
Agreements Jun-2008
Property (inc. R/W) Jan-2009
Construction Jan-2010
Operational Jun-2010

Real Estate Requirements
- **Fee Purchase:** None
- **Access Rights:** None
- **Permanent and Temporary Easements:** Permanent easements will be required for access to pipeline and other facilities. Temporary easements may be required for construction.
- **Flowage Easements** None

Coordination with Other Options
This option could be combined to form an alternative in which water would be sent down the San Joaquin River for river restoration, recaptured and pumped back via the California Aqueduct, and either delivered to Shafter-Wasco in-lieu of CVP water or stored in Semitropic for later use by Shafter-Wasco or exchange with other Friant contractors. This option should also be coordinated with other Shafter-Wasco and Semitropic projects including Options 36, 70, 100, 101, 102, and 108. This option could also be a conveyance component of a multi-district groundwater banking program.

Operational and Maintenance Requirements
- **Operations**

Pump stations will likely run on PLC and automatically adjust based on water supply availability in the California Aqueduct, Friant-Kern Canal, and based on farmer demand.

- **Maintenance**

Routine maintenance will be required to ensure that pipelines and facilities are working and in good condition.

- **Monitoring Requirements**

None.

Future Requirements for Design

According to information provided by the Poso Creek Integrated Regional Water Management Group, preliminary design for this project has been completed. Depending on the availability and detail of the completed design, additional work may need to be performed to assess the proposed project. The alternative formulation report needs to be completed to assess whether this project will work in accordance with the water management goal. Flow data, topographic mapping, subsurface investigations, and groundwater levels may be required for design. Rights to divert additional water or to obtain water from the proposed sources need to be verified. Permitting for water quality, dredge and fill, and environmental impacts may need to be acquired.

Potential Environmental Impacts

- **Temporary (During Construction):**

Construction of a new pipeline has potential to impact operation of surrounding farms.

- **Permanent (Operation-Related):**

This proposed pipeline system represents a connection between two distinct water supplies, which could have potential surface water and groundwater quality impacts.

Sub-Options considered but Rejected

None

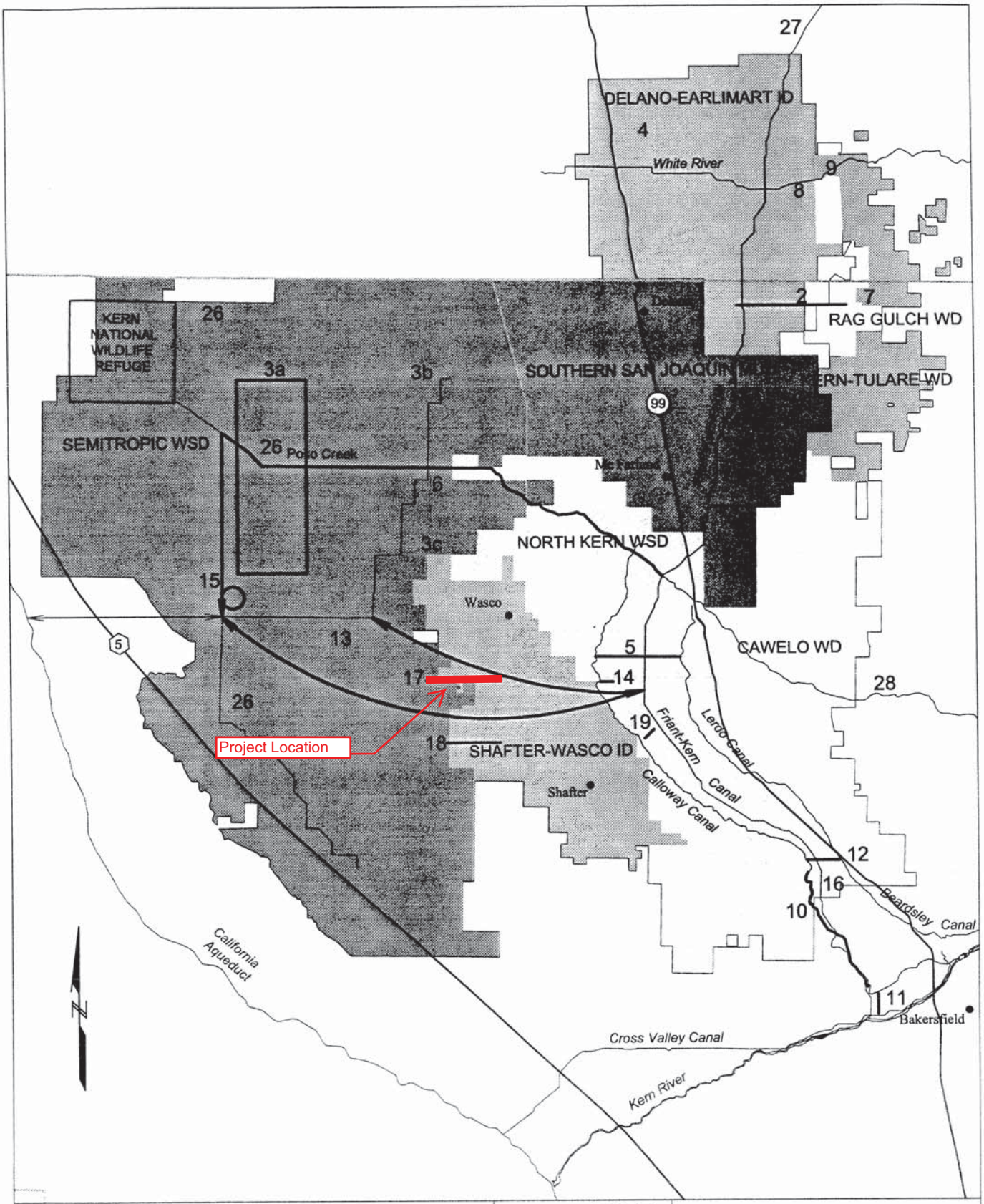
Figures

69-1 Region Map
69-2 Project Location Map

Attachments

References

69-1 GEI Consultants, *Poso Creek Integrated Regional Water Management Plan, Appendix. D. No. 17 Shafter-Wasco / Semitropic Interconnection on Kimberlina Road,* July 2007.



Poso Creek Integrated Regional Water Management Plan	GEI Consultants, Bookman-Edmonston Division	Proposed Project Components
Poso Creek Regional Management Group		June 2007 Appendix D

Figure 69-1: Region Map

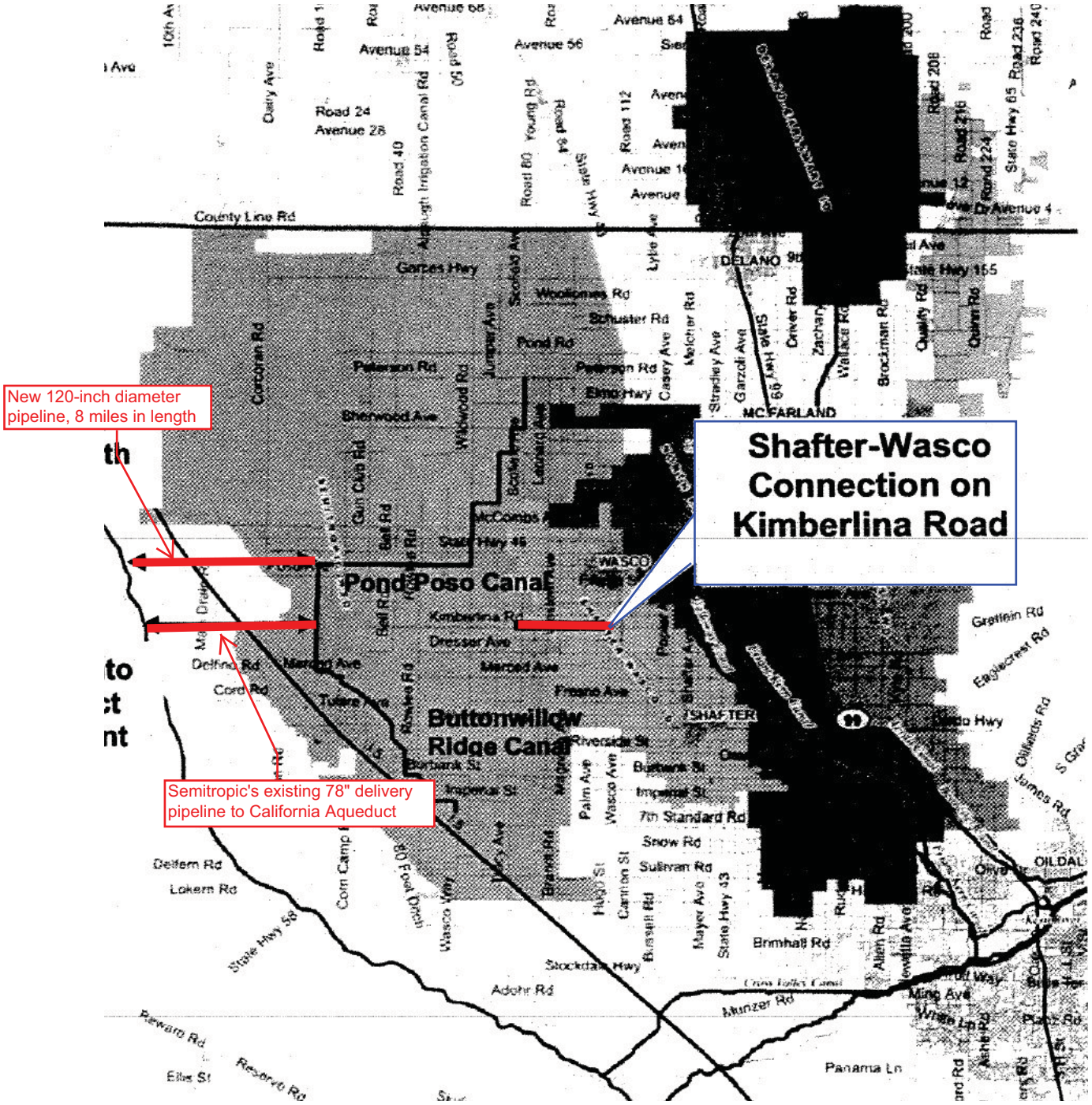


Figure 69-2: Project Location Map

San Joaquin River Restoration
Structural Option Description
Pre-Appraisal Level

Option No.	Structural Option Name		Revision Date
70	Shafter-Wasco/Semitropic Interconnection on Madera Avenue		5 Mar 2008
Reach Number	**River Mile**	**Program Goal**	**Phase**
N/A	N/A	Water Management	II

Task	Responsible Author	Peer Reviewer
Option Description	D. Whitbeck	J. Roldan
Engineering		

Costs (October 2007):
Cost Level: Pre-appraisal
Total Construction Cost: Not available at this time.

Objective of Option
Shafter-Wasco Irrigation District proposes to construct two miles of 36-inch diameter pipeline to upgrade interconnection facilities between the district's 137.2 lateral with Semitropic Water Storage District's B-320 system. This will allow for additional capability to exchange water between districts and allow for Recaptured water to be delivered to Shafter-Wasco ID and surplus San Joaquin River water to be delivered to Semitropic for storage.

Performance Criteria
1. Construct conveyance facilities to carry approximately 50 cfs of surface water between Semitropic and Shafter-Wasco's systems.
2. Increase the districts' capability to obtain multiple surface water supplies and use them in-lieu of groundwater.
3. Provide an exchange mechanism for SWP and CVP supplies.

Design Criteria
1. Reclamation Cost Estimating Guidelines

Description
Shafter-Wasco Irrigation District (Shafter-Wasco) is located immediately adjacent to and east of Semitropic Water Storage District (Semitropic). Shafter-Wasco encompasses 34,140 acres, of which 31,350 are irrigated. The district surrounds the cities of Shafter and Wasco and is crossed by the Central Valley Highway (Highway 43). On the east side, it is bounded by the Calloway Canal. The northern and southern boundaries generally correspond to Highway 46 and Seventh Standard Road, respectively. See Figure 70-1.

Shafter-Wasco has a contract with the USBR for Central Valley Project (CVP) water to serve 27,100 acres of district land. The district is entitled to 50,000 acre-feet of Class 1 water and 39,600 acre-feet of Class 2 water, for a total of 89,600 acre-feet of CVP water per year. Water is transported to the district in the Friant-Kern Canal. No major streams cross Shafter-Wasco, but the district his historically made exchanges with North Kern Water Storage District for some Kern River water.

Semitropic is located in Kern County, immediately to the west of Shafter-Wasco and approximately 20 miles northwest of Bakersfield. Semitropic is not a Friant-contracting district and instead receives its entitlement by SWP water delivered in the California Aqueduct. Semitropic has, for several years, attempted to secure a water supply of CVP water, but has been unsuccessful. In some years, Semitropic has been able to purchase Class 215 water available in the Friant-Kern Canal. Semitropic primarily diverts groundwater to balance the demand it cannot fill with SWP water.

There is an existing 36-inch pipeline intertie between the irrigation distribution systems of Shafter-Wasco and Semitropic. The interconnection is located one-half mile north of Highway 46 and connects Semitropic's Pond-Poso Canal with Shafter-Wasco's Lateral 134.4 system. Since its construction in 1995, this facility has facilitated water banking, exchange, wheeling, and sales arrangements between the two districts by accommodating gravity deliveries from Shafter-Wasco to Semitropic and pumped deliveries (through a pumping plant constructed as a part of the interconnection project) from Semitropic to Shafter-Wasco. In particular, this facility allows Shafter-Wasco to make better use of its contractual supply of CVP water by regulating (though a banking arrangement with Semitropic) "wet-year' and "dry-year" water. Based on the operational success of the interconnection, another interconnection has been proposed by Shafter-Wasco.

This project proposes to construct two miles (10,600 linear feet) of 36-inch reinforced concrete pipeline (RCP) from Shafter Wasco's distribution system to Semitropic's B-230 system. The system would begin at the end of Semitropic's existing Lateral B-230 and end at Shafter-Wasco's Lateral 137.2-7.1N. See Figure 70-2. A booster plant with a bypass line and a bidirectional sonic meter would be included. The plant would be rated for 50 cfs with 60-feet TDH. Two isolation valves will be added, one at both ends of the new pipeline. The primary goal is to increase conveyance capability between the two districts, with associated benefits including operational flexibility for water deliveries, increased water supply reliability, increased conjunctive use to enhance groundwater levels, and potential water exchanges between SWP and CVP sources.

Recommendation for Water Management Approach
This project represents an option to exchange water between the California Aqueduct and the Friant-Kern Canal service areas. The distribution system could be used to convey Recaptured water from the California Aqueduct through Semitropic and into Shafter-Wasco to meet irrigation demand, or to carry Recaptured water or surplus San Joaquin River water to Semitropic's groundwater bank. The maximum capacity of the pipeline, however, is only about 50 cfs (on top of 50 cfs existing), which may not be sufficient to impact Friant-Kern supplies on a larger scale. With no direct connection to the Friant-Kern Canal, benefits to other Friant Division contractors would be limited to the exchange potential of Shafter Wasco's CVP contract quantities. This project may represent a way of reducing the dependence of Shafter-Wasco on CVP supplies, which could be beneficial to the water management goals.

Construction Considerations
Construction considerations would be assessed once the pre-design feasibility study has been obtained and reviewed.

Schedule (Completion Dates)
Preliminary Design: Dec-2007 (completed)
Agreements Jun-2008
Property (inc. R/W) Jan-2009
Construction Jan-2010
Operational Jun-2010

Real Estate Requirements
- **Fee Purchase:** None
- **Access Rights:** None
- **Permanent and Temporary Easements:** Permanent easements will be required for access to pipeline and other facilities. Temporary easements may be required for construction.
- **Flowage Easements** None

Coordination with Other Options
This option could be combined to form an alternative in which water would be sent down the San Joaquin River for river restoration, recaptured and pumped back via the California Aqueduct, and either delivered to Shafter-Wasco in-lieu of CVP water or stored in Semitropic for later use by Shafter-Wasco or exchange with other Friant contractors. This option should also be coordinated with other Shafter-Wasco and

Semitropic projects including Options 36, 69, 100, 101, 102, and 108. This option could also be a conveyance component of a multi-district groundwater banking program.

Operational and Maintenance Requirements

- **Operations**

Pump stations will likely run on PLC and automatically adjust based on water supply availability in the California Aqueduct, Friant-Kern Canal, and based on farmer demand.

- **Maintenance**

Routine maintenance will be required to ensure that pipelines and facilities are working and in good condition.

- **Monitoring Requirements**

None.

Future Requirements for Design

According to information provided by the Poso Creek Integrated Regional Water Management Group, preliminary design for this project has been completed. Depending on the availability and detail of the completed design, additional work may need to be performed to assess the proposed project. The alternative formulation report needs to be completed to assess whether this project will work in accordance with the water management goal. Flow data, topographic mapping, subsurface investigations, and groundwater levels may be required for design. Rights to divert additional water or to obtain water from the proposed sources need to be verified. Permitting for water quality, dredge and fill, and environmental impacts may need to be acquired.

Potential Environmental Impacts

- **Temporary (During Construction):**

Construction of a new pipeline has potential to impact operation of surrounding farms.

- **Permanent (Operation-Related):**

This proposed pipeline system represents a connection between two distinct water supplies, which could have potential surface water and groundwater quality impacts.

Sub-Options considered but Rejected

None

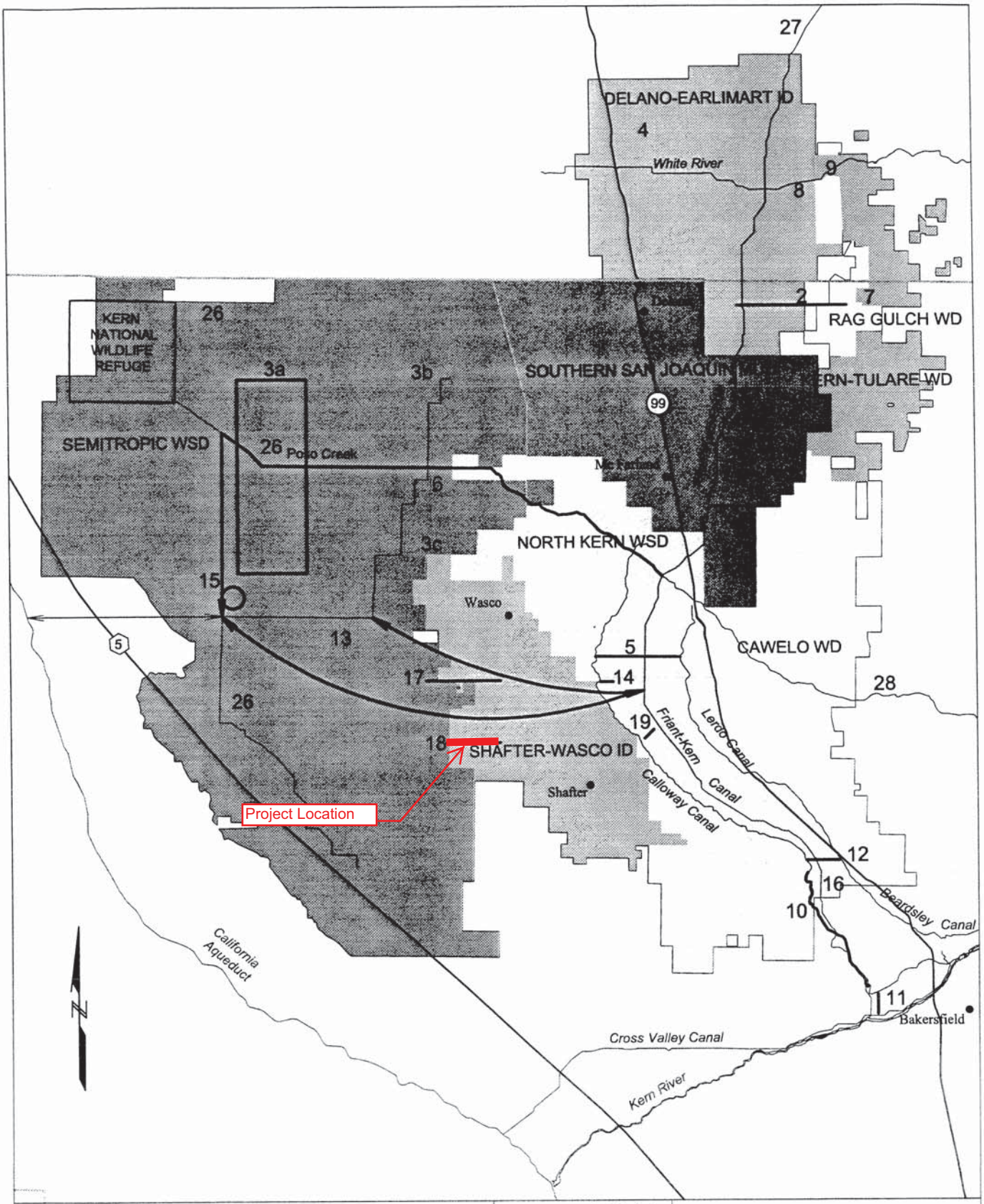
Figures

70-1 Region Map
70-2 Project Location Map

Attachments

References

70-1 GEI Consultants, *Poso Creek Integrated Regional Water Management Plan, Appendix. D. No. 18 Shafter-Wasco / Semitropic Interconnection on Madera Avenue,* July 2007.



Poso Creek Integrated Regional Water Management Plan	GEI Consultants, Bookman-Edmonston Division	Proposed Project Components
Poso Creek Regional Management Group		June 2007 Appendix D

Figure 70-1: Region Map

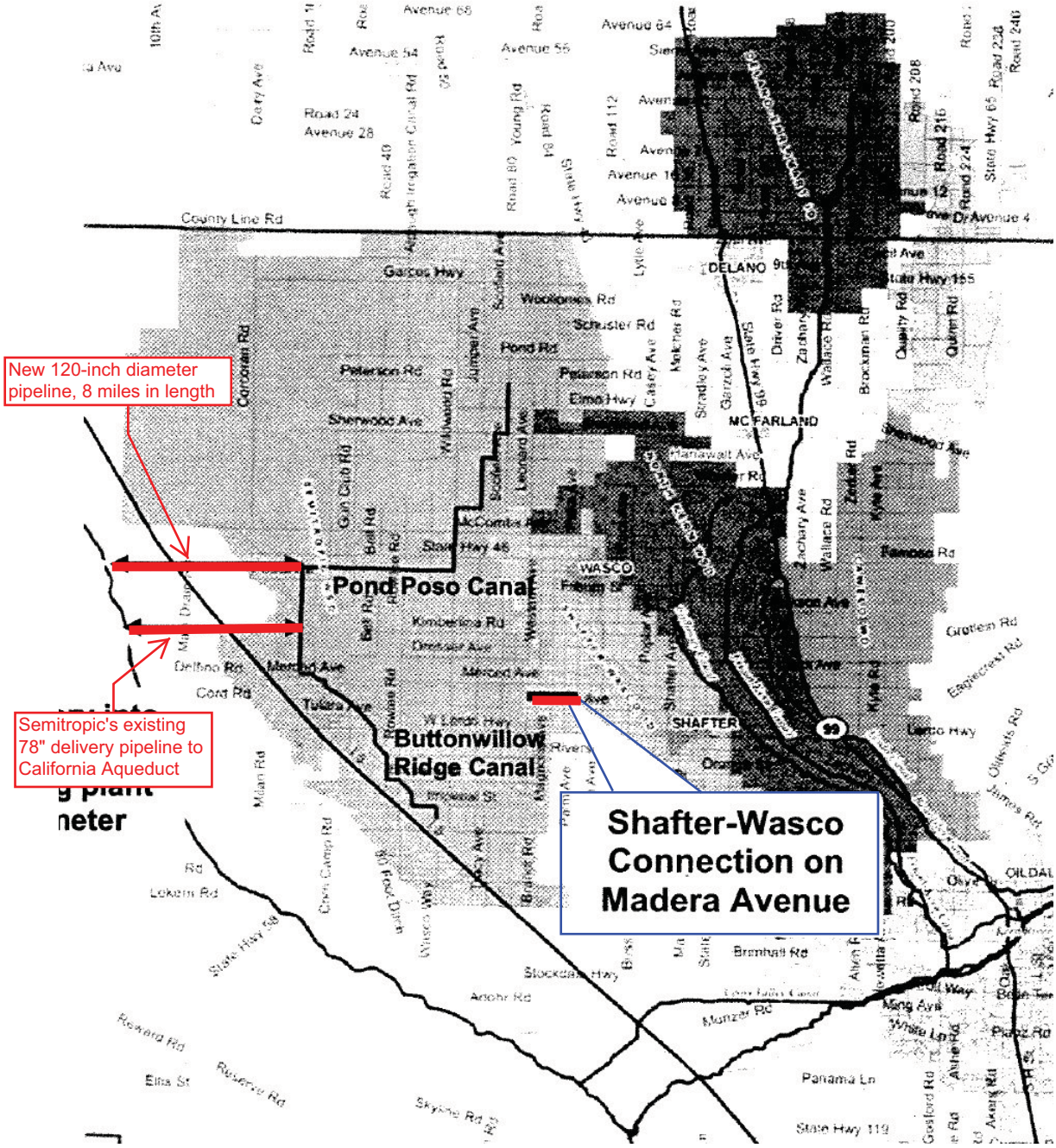


Figure 70-2: Project Location Map

San Joaquin River Restoration
Structural Option Description
Pre-Appraisal Level

Option No.	Structural Option Name		Revision Date
71	Southern San Joaquin Municipal Utility District/Semitropic Interconnection		5 Mar 2008
Reach Number	**River Mile**	**Program Goal**	**Phase**
N/A	N/A	Water Management	II

Task	Responsible Author	Peer Reviewer
Option Description	D. Whitbeck	J. Roldan
Engineering		

Costs (October 2007):
Cost Level: Pre-appraisal
Total Construction Cost: Not available at this time.

Objective of Option
Semitropic Water Storage District proposes to expand its P-1030 in-lieu distribution system by adding 1,280 acres to the distribution network and constructing a 1,000-feet long interconnecting pipeline with Southern San Joaquin Municipal Utility District's delivery system. The goal of the project is to increase reliability of water supply by replacing groundwater pumping with surface water and conserving the groundwater for use during dryer years. The proposed in-lieu recharge area could store Recaptured water or surplus San Joaquin River supplies.

Performance Criteria
1 Construct conveyance facilities to carry 28 cfs of surface water from Southern San Joaquin Municipal Utility District to land within Semitropic previously irrigated with groundwater only.
2 Increase the Southern San Joaquin MUD's ability to store groundwater by adding surface water delivery capability to 1,280 acres within Semitropic.

Design Criteria
1 Reclamation Cost Estimating Guidelines

Description
Semitropic Water Storage District is located in Kern County, approximately 20 miles northwest of Bakersfield, in the western San Joaquin Valley. Semitropic is in the process of implementing a groundwater banking program. The program includes a separate storage and recovery area termed the Stored Water Recovery Unit (SWRU) project. Semitropic uses this groundwater to contract with outside banking partners and store water in the ground beneath Semitropic.

Beginning in 1994, Semitropic has developed the Semitropic Groundwater Bank to provide long-term underground storage of surplus water and to enhance groundwater levels. The groundwater bank was implemented in cooperation with California water entities that have contracted for storage space beneath Semitropic. Current banking partners include the Metropolitan Water District of Southern California, Santa Clara Valley Water District, Alameda County Water District, Zone 7 Water Agency, Vidler Water Company, Newhall Land & Farming Company, Castaic Lake Water Agency, and Poso Creek Water Company LLC.

The Semitropic Groundwater Bank has a defined capacity of 1.65 million acre-feet. Water from the State Water Project (SWP) entitlements and other supplies that are not immediately needed to meet the demand of the banking partners is stored within the groundwater bank in what is known as a "Put" operation (i.e. surplus water is put into the groundwater bank for later use). The water is put into the groundwater bank through "in-lieu" recharge. In lieu recharge is a method whereby contracting farmers agree to take

imported surface water in-lieu of operating their farm wells. When needed, typically during dry years, water is recovered from the bank and returned to banking partners in what is known as a "Take"operation.

This project proposes to expand Semitropic's P-1030 distribution system by added 1,280 acres to the distribution network and constructing a 1,000-feet long interconnecting pipeline between Semitropic and Southern San Joaquin Municipal Utility District's (SSJMUD) delivery system. The project is anticipated to provide 28 cfs in-lieu delivery to Semitropic customers. The first phase of the P-1030 system was completed in April 2007. Extra capacity was included in the original system design. A 45" blind flange is located in the southeast corner of the projected, expanded service area and one empty bay was included for a future pump at the P-1030 Pumping Plant.

Anticipated operation of the project is as follows. During wet years, all of the existing groundwater wells would remain off and 4,500 acre-feet would be imported into the service area. The source of water is not identified, but it is implied that a portion of SSJMUD's CVP and/or Recovered Water Account supplies (surplus San Joaquin River supplies), or Semitropic's 215 supplies could be used. During dry years, some minor amounts of water may be imported during limited availability of Article 21 from the State Water Project, but for most of the year agricultural deliveries would be made from on-farm wells.

The goal of the project is to enhance water supply and reliability during drought years, provide an effective water management tool, reduce energy required to pump groundwater pumping for agriculture customers, and increase conjunctive use potential.

Recommendation for Water Management Approach
Semitropic Water District is not a long-term Friant contractor and receives its water from the California Aqueduct under contracts for water with the State Water Project (SWP). This project presents an option to deliver and store Recaptured water and surplus San Joaquin River water at a rate of 28 cfs directly into Semitropic's groundwater bank. Water could then be retrieved during dryer years for delivery back to Friant contractors; however, recovery of this stored water is not addressed in this option.

Construction Considerations
Construction considerations would be assessed once a more detailed feasibility study has been completed.

Schedule (Beginning Dates)
Planning Mar-2008
Agreements Jun-2008
Design Jun-2008
Property (inc. R/W) Jan-2009
Construction Jan-2010
Operational Jun-2010

Real Estate Requirements
- **Fee Purchase** None
- **Access Rights** None
- **Permanent and Temporary Easements** Permanent easements will be required for access to pipeline and other facilities. Temporary easements may be required for construction.
- **Flowage Easements** Flowage easements may be required for spreading grounds.

Coordination with Other Options
This option could be combined to form an alternative which would involve storing surplus San Joaquin River water during wet years in groundwater banks, such as Semitropic's groundwater bank, for extraction during dryer years. Another alternative would be to deliver Recaptured water to Semitropic for storage. Recovery of the stored water would require additional infrastructure or coordination with Semitropic/Shafter-Wasco conveyance options such as 69 and 70. An exchange with Shafter-Wasco's CVP supplies would be required to make the recoverd water available to other Friant Districts. This option

should be coordinated with other Semitropic groundwater storage projects, including options 100, 101, 102, and 108. This option could be a conveyance and storage component of a multi-district groundwater banking program.

Operational and Maintenance Requirements

- **Operations**

Water will be delivered to the proposed in-lieu distribution system as available. Water originating from Southern San Joaquin MUD will likely be controlled by existing structures.

- **Maintenance**

Routine maintenance will be required to ensure that pipelines and facilities are working and in good condition.

- **Monitoring Requirements**

Groundwater levels may need to be monitored.

Future Requirements for Design

A detailed feasibility study needs to be performed to assess the proposed project, including completion of the alternative formulation report to assess whether this project will work in accordance with the water management goal. Flow data, topographic mapping, subsurface investigations, and groundwater levels may be required for design. Rights to divert additional water need to be verified. Permitting for water quality, dredge and fill, and environmental impacts may need to be acquired.

Potential Environmental Impacts

- **Temporary (During Construction):**

None

- **Permanent (Operation-Related):**

None

Sub-Options considered but Rejected

None

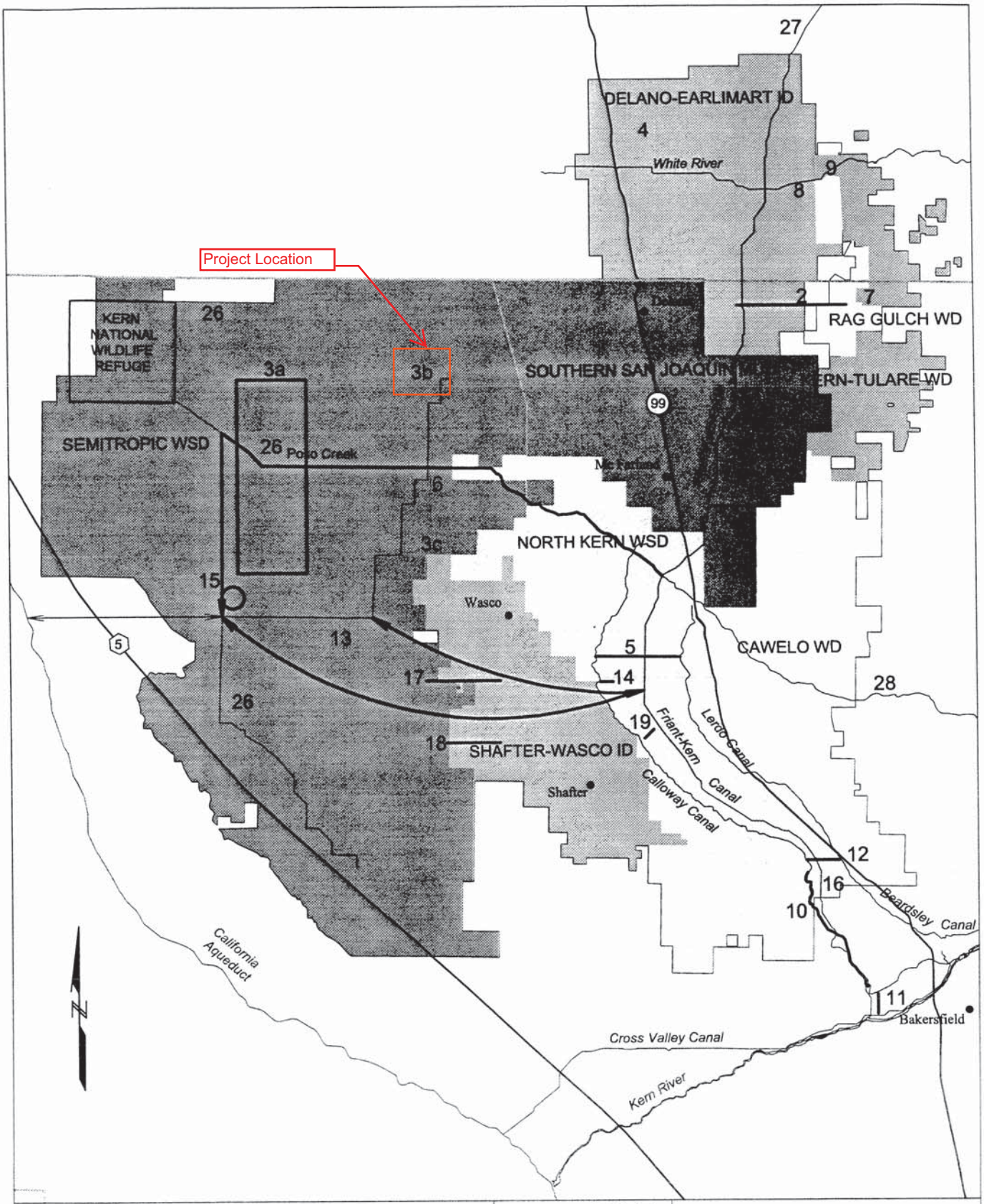
Figures

71-1 Region Map

Attachments

References

71-1 GEI Consultants, *Poso Creek Integrated Regional Water Management Plan, Appendix. D. No. 03b Expand P-1030 In-Lieu Service Area*, July 2007.



Poso Creek Integrated Regional Water Management Plan	GEI Consultants, Bookman-Edmonston Division	Proposed Project Components
Poso Creek Regional Management Group		June 2007 Appendix D

Figure 71-1: Region Map

San Joaquin River Restoration
Structural Option Description
Pre-Appraisal Level

Option No.	Structural Option Name		Revision Date
77	Chowchilla WD Groundwater Recharge Ponds and Recovery Wells		17 Mar 2008
Reach Number	**River Mile**	**Program Goal**	**Phase**
N/A	N/A	Water Management	II

Task	Responsible Author	Peer Reviewer
Option Description	D. Whitbeck	J. Roldan
Engineering		

Costs (October 2007):
Cost Level: Pre-appraisal
Total Construction Cost: Not Available

Objective of Option
The Chowchilla Water District proposes to construct 10 to 20 groundwater recharge ponds and 20 to 40 groundwater recovery wells within the district. The ponds would be used to bank surplus San Joaquin River flows and other stream flows available to the CWD in wet years and the recovery wells to recover the banked water during dryer years. The result would be increased utilization of surplus San Joaquin River flows in accordance with the Water Management Goal.

Performance Criteria
1 Increase the districts ability to bank excess flood waters by constructing recharge ponds.
2 Increase the districts ability to recover groundwater by adding recovery wells.
3 Improve water supply reliability by increasing groundwater levels.

Design Criteria

Description

The Chowchilla Water District (CWD) is located in the San Joaquin Valley about 30 miles north of the City of Fresno. The CWD has a contract with the USBR for 55,000 acre-feet of Class 1 water and 160,000 acre-feet of Class 2 water per year from the San Joaquin River which is delivered from Millerton Lake in the Madera Canal. CWD also has a number of streams that run through the district, including the Chowchilla River, Ash Slough, and Berenda Slough. During wet years, excess flood flows are available in these four water courses, but the CWD is unable to capture the excess flows for use in dryer years because of storage capacity limitations.

CWD expects a decrease in available water supplies due to river restoration on the San Joaquin River. A number of potential projects have been identified for study that may help reduce the impact of a decrease in reliable water supply.

This project proposes to construct 10 to 20 groundwater recharge ponds and 20 to 40 groundwater recovery wells within the district. DWR well logs will be analyzed to determine the potential groundwater recharge sites and recovery well sites. The ponds would be used to absorb excess flood water in wet years and the recovery wells to recover the water during dryer years. The CWD's existing distribution system will be evaluated to determine if it is adequate to serve the proposed groundwater recharge basins. The result would be increased water banking and groundwater levels that will help meet the Water Management Goal.

Recommendation for Water Management Approach
At this preliminary stage of development, the feasibility of this project is uncertain ; however, it appears to have the potential to meet the Water Management Goal by capturing and storing surplus San Joaquin River

flows. The effectiveness of the project and the resulting benefits to CWD and other Friant Districts will need to be determined.

Construction Considerations
Construction considerations would be assessed once a more detailed feasibility study has been completed.

Schedule
Feasibility Study: Jun-2008 to Dec-2008
Agreements and Funding: Jan-2009 to Jan-2010
Engineering and Design: Jan-2009 to Jan-2010
Land Acquisition: Feb-2010 to Dec-2010
Construction: Jan-2011 to Dec-2012
Operational: Jan-2012 (Start up of completed basins)

Real Estate Requirements
- **Fee Purchase** It is expected that a significant amount of land will be acquired for this project; however, the amount is unknown at this time.
- **Access Rights** It is expected that landowner access rights will be required.
- **Permanent and Temporary Easements** Additional permanent easements may be required if the CWD**'s** existing distribution system is inadequate to deliver the additional flows and new infrastructure is required.
- **Flowage Easements** Easements could be required to convey the surplus flows to the groundwater basins.

Coordination with Other Options
This option could be coordinated with other Chowchilla Water District options as a way of banking or storing water to make up for water lost for river restoration on the San Joaquin River. It may also be a component of a regional groundwater banking program.

Operational and Maintenance Requirements
- **Operations:** During wet years, surplus flows will be delivered into the CWD distribution system from the Madera Canal, Chowchilla River, Ash Slough and Berenda Slough, and conveyed to the proposed groundwater recharge basins. During dry years, the stored water will be recovered and conveyed in the CWD distribution system to meet irrigation demand.
- **Maintenance:** Routine earthwork and mechanical maintenance will be required to ensure the basins are recharging and the wells are pumping effectively.
- **Monitoring Requirements:** Groundwater monitoring may be required to determine the effectiveness of the project and impacts to adjacent landowners.

Future Requirements for Design
A detailed feasibility study needs to be performed to assess the proposed project, including completion of the alternative formulation report to assess whether this project will work in accordance with the water management goal. Flow data, topographic mapping, subsurface investigations, and groundwater levels may be required for design. Rights to divert or use excess water may need to be verified. Permitting for water quality, dredge and fill, and environmental impacts may need to be acquired.

Potential Environmental Impacts
- **Temporary (During Construction):** Recharge basin and pipeline construction have the potential to cause dust, noise and traffic impacts, although the rural location of the proposed projects in an agricultural area should limit the severity of these impacts. Potential impacts to species of concern may need to be evaluated.
- **Permanent (Operation-Related):** Groundwater impacts from recharge and recovery operations will need to be determined. The impact of removing farmland from production will also need to be determined.

Sub-Options considered but Rejected
None

Figures
77-1 Service Area Map

Attachments

References
77-1 Chowchilla Water District, *Water Management Projects & Studies,* November 11, 2007.

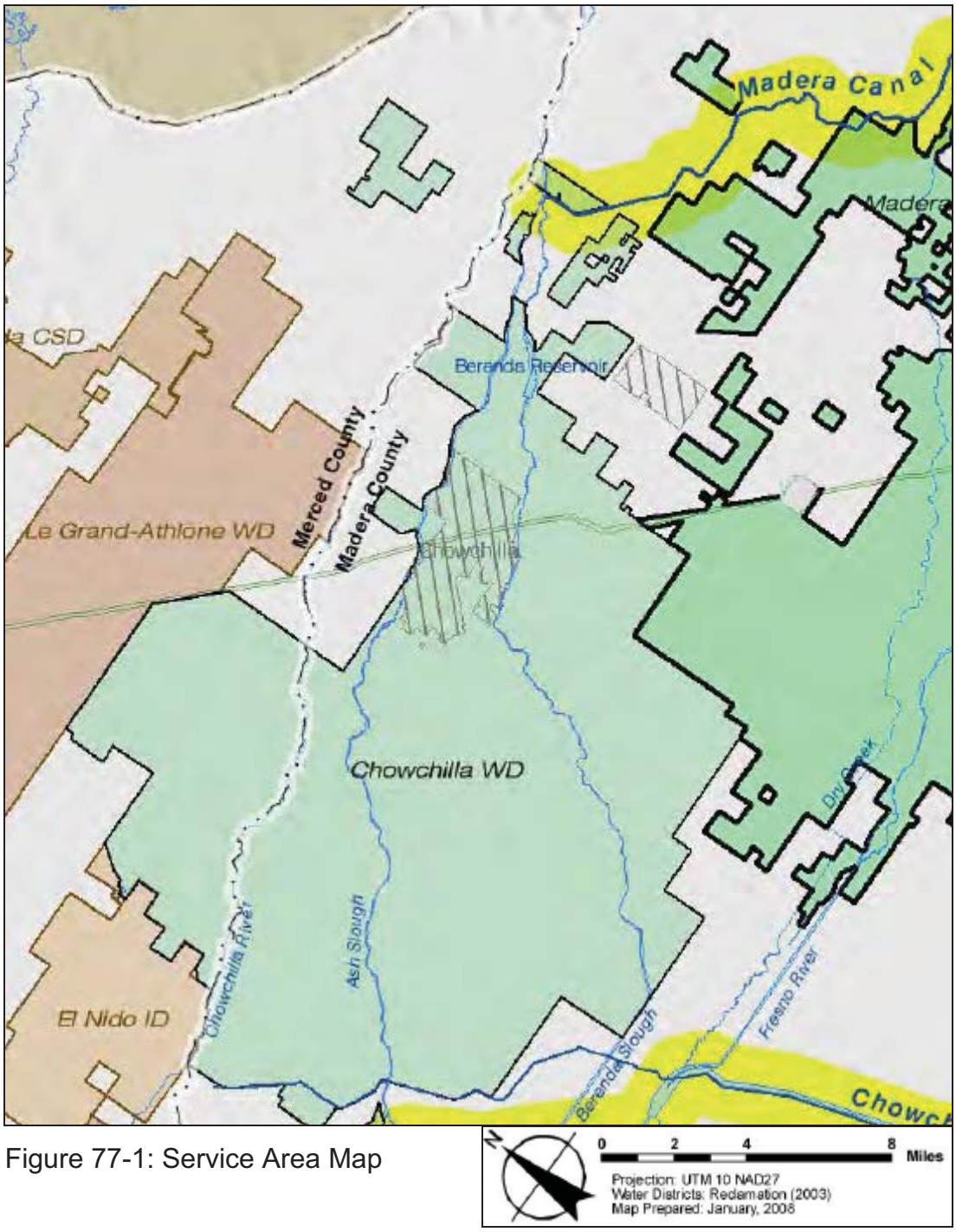


Figure 77-1: Service Area Map

San Joaquin River Restoration
Structural Option Description
Pre-Appraisal Level

Option No.	Structural Option Name		Revision Date
84	City of Fresno Southeast Surface Water Treatment Plant		25 Mar 2008
Reach Number	**River Mile**	**Program Goal**	**Phase**
N/A	N/A	Water Management	II

Task	Responsible Author	Peer Reviewer
Option Description	D. Whitbeck	J. Roldan
Engineering		

Costs (October 2007):
Cost Level: Pre-appraisal
Total Construction Cost: Not available at this time.

Objective of Option
The City of Fresno proposes to construct a 30 MGD surface water treatment plant, and necessary conveyance facilities, in the southeast portion of the City of Fresno. The goal of the project is to augment the City's water supply to help offset the loss of water supply due to restoration of the San Joaquin River by increasing the capture and treatment of surface water supplies available to the City for municipal and industrial use in-lieu of groundwater pumping.

Performance Criteria
1. Offset the loss of CVP supply due to river restoration in the San Joaquin River by construction of a 30 MGD surface water treatment facility to increase water treatment capacity and reduce groundwater demand.
2. Improve water supply reliability by producing drinking water from surface supplies in lieu of groundwater pumping.

Design Criteria
1. Reclamation Cost Estimating Guidelines

Description

The City of Fresno's Water Division manages and operates the City's water system. The City delivers drinking water to about 122,000 urban residential, commercial, and industrial customers in over 110 square miles of the City of Fresno and some County Islands within the City's Sphere of Influence.

Fresno's primary source of water is groundwater. Using nearly 250 wells, the Water Division pumps about 146 MGD (217 cfs) out of the aquifer beneath the City. Rainfall and stream flow replace half of the water pumped each year. The other half comes from entitlements held by the City of Fresno for surface water from Millerton Lake and Pine Flat Reservoirs. Fresno's contract for water from Millerton lake is for 60,000 acre-feet of Class 1 Central Valley Project (CVP) water per year. The contract with Pine Flat Lake is for Class 2 water at a ratio of 21% of the water delivered to the Fresno Irrigation District. During wet years, excess flood waters are released from these reservoirs and are available to the City of Fresno, but the City cannot effectively capture and use the water with its current infrastructure.

This project proposes to construct a 30 MGD surface water treatment plant, and necessary conveyance facilities, in the southeast portion of the City of Fresno. The location of the proposed facility is not known. The goal of the project is to offset water lost to restoration of the San Joaquin River through capture and treatment of surplus surface water supplies available to the City in lieu of groundwater pumping. The city would divert flood waters from the San Joaquin River and treat them in the new plant for delivery to drinking water customers, thus reducing reliance on groundwater supply..

The City of Fresno estimates that water recovery for this project is 30,000 acre-feet during dry years, 30,000 acre-feet during normal years, and 30,000 acre-feet during wet years. It is not known how these numbers were calculated.

Recommendation for Water Management Approach

This project may offer a water management alternative that would allow the City of Fresno to take advantage of surplus San Joaquin River water when available to augment its supplies and reduce the impact of river restoration.

Construction Considerations
Construction considerations would be assessed once a more detailed feasibility study has been completed.

Schedule (Beginning Dates)
Planning: July-2010
Agreements: Jan-2011
Design: Oct-2013
Property: Aug-2010
Construction: June-2014
Operational: June-2015

Real Estate Requirements
- **Fee Purchase** Unknown.
- **Access Rights** Unknown.
- **Permanent and Temporary Easements** Permanent easements will be required for access to conveyance facilities. Temporary easements will be required for construction.
- **Flowage Easements** None.

Coordination with Other Options
This option could be coordinated with other City of Fresno options to mitigate the loss of water to river restoration on the San Joaquin River.

Operational and Maintenance Requirements
- **Operations**

Available surface water supplies will be treated and delivered to customers to directly meet demand..
- **Maintenance**

Routine maintenance will be required to ensure that water treatment facilities are working and in good condition.
- **Monitoring Requirements**

Water quality will need to be monitored to ensure it meets drinking water standards.

Future Requirements for Design
A detailed feasibility study needs to be performed to assess the proposed project, including completion of the alternative formulation report to assess whether this project will work in accordance with the water management goal. Flow data, topographic mapping, subsurface investigations, and groundwater levels may be required for design. Rights to divert flood or other excess water need to be verified. Permitting for water quality, dredge and fill, and environmental impacts may need to be acquired.

Potential Environmental Impacts
- **Temporary (During Construction):**

Construction of facilities may impact surrounding land and associated operations.
- **Permanent (Operation-Related):**

Depending on project site conditions, environmental mitigation measures may be required. This will be addressed through permitting requirements imposed by Corps of Engineers, Regional Water Quality Control Board, and through CEQA/NEPA documentation process.

Figures

84-1 Service Area Map

Attachments

References

84-1 Project description and details supplied to the Friant Water Users Authority by Lon Martin, City of Fresno, December 6, 2007.

84-2 City of Fresno Water Division. <http://www.fresno.gov/Government/DepartmentDirectory/PublicUtilities/Watermanagement>

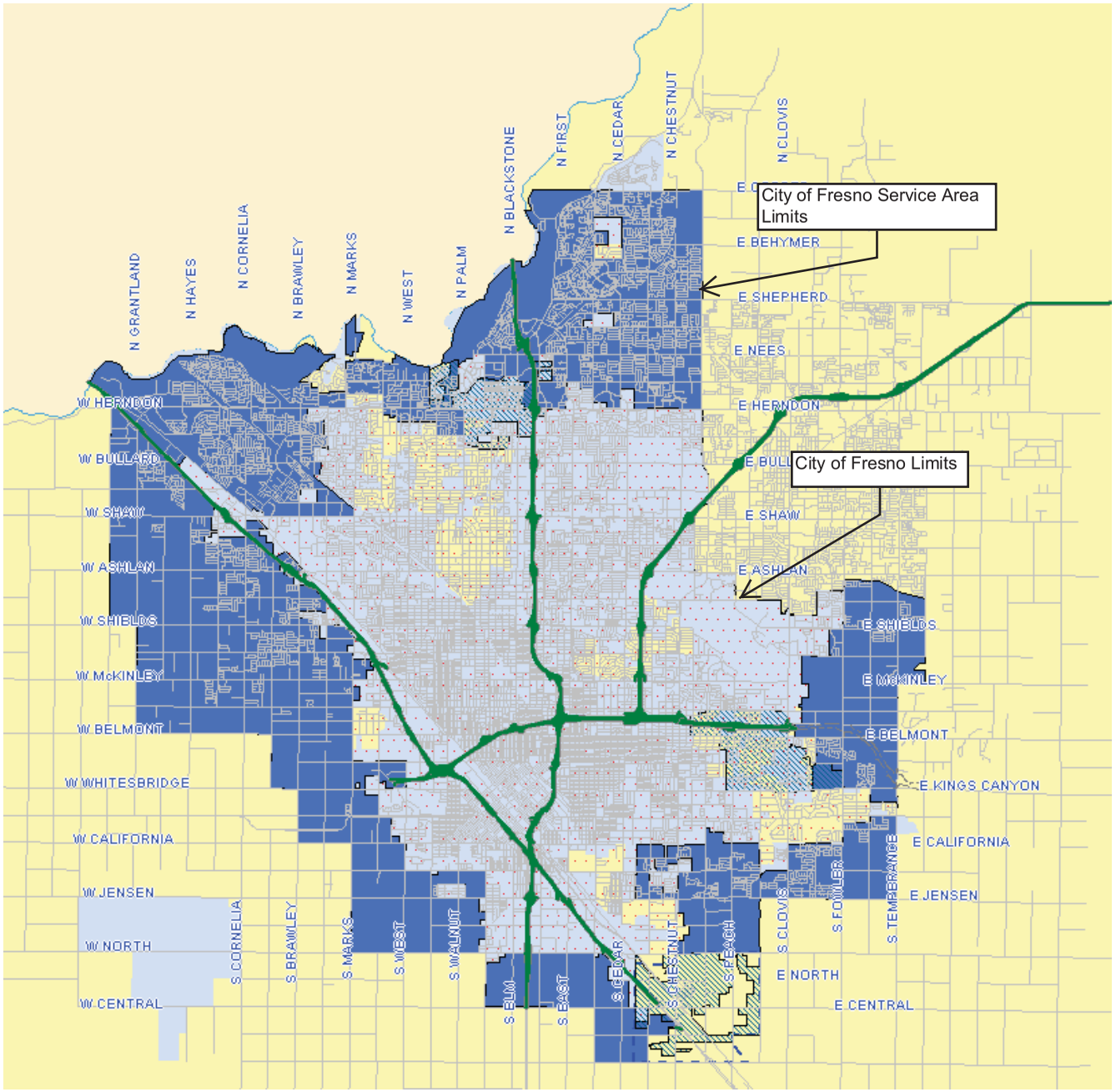


Figure 84-1: Service Area Map

San Joaquin River Restoration
Structural Option Description
Pre-Appraisal Level

Option No.	Structural Option Name		Revision Date
91	Arvin-Edison WSD In-District, In-Lieu Groundwater Bank		24 Mar 2008
Reach Number	**River Mile**	**Program Goal**	**Phase**
N/A	N/A	Water Management	II

Task	Responsible Author	Peer Reviewer
Option Description	D. Whitbeck	J. Roldan
Engineering		

Costs (October 2007):
Cost Level: Pre-appraisal
Total Construction Cost: Not available at this time.

Objective of Option
Arvin-Edison Water Storage District proposes to construct pipelines to 50,000 acres within the district that currently rely entirely on groundwater supplies. Surface water will be delivered, when available, for use in-lieu of groundwater pumping. Delivery of surplus water supplies will provide a groundwater benefit to the district, including higher groundwater levels and reduced pumping costs. This will help meet the water management goal by allowing Arvin-Edison to mitigate a loss of reliable water supply by banking surplus San Joaquin River water beneath their district.

Performance Criteria
1. Construct pipelines to 50,000 acres to provide surface water supply to farmers currently dependent entirely on groundwater resources.
2. Allow the district to capitalize on excess waters in the San Joaquin River through increased in-lieu recharge.
3. Provide the district with an average 2.7 cfs groundwater recovery capacity per well supplied with surface water for in-lieu recharge.
4. Improve groundwater levels and water supply reliability within the district.

Design Criteria
1. Reclamation cost estimating guidelines.

Description
Arvin-Edison Water Storage District (Arvin-Edison) is located in the southern portion of the San Joaquin Valley, southeast of Bakersfield, past the terminus of the Friant-Kern Canal (FKC). The district diverts Central Valley Project (CVP) water from the FKC.

Arvin-Edison has a large area of land, approximately 55,000 acres, that does not have connection to surface water supplies and relies entirely on groundwater. This project proposes to construct pipelines to farmers on 50,000 acres that meet this criterion. The proposed distribution system would include pipelines, pumping/booster plants (both canal-side and in-line), and farm turnouts. When excess surface water is available, water will be delivered to farmers for use in-lieu of pumping groundwater. The result will be, in effect, to increase groundwater levels beneath the district and reduce pumping costs and occurrences of overdraft. These same pipelines could be used to recover stored supplies and deliver water back to district distribution facilities.

A feasibility study concerning in-lieu pumping was performed in 1992 and indicated that production capacity of in-lieu wells averaged 2.7 cfs. The study focused on a 5,000-acre area within the district that contained 37 wells. The results of the 1992 study suggested that production of in-lieu facilities could provide an additional 100 cfs groundwater recovery capacity per 5,000-acre in-lieu recharge area to district

distribution systems. The original cost estimate was $6.4 million, including contingencies, legal, engineering, and administrative cost, to provide in-lieu flow capability to the study area. Without fees, the 1992 cost has been estimated as $5 million.

While the potential capacity for this proposed, 50,000-acre project cannot be accurately predicted given the available data, if the 1992 study were both relevant and reliable to be scaled over the entire proposed area, the result would be an increase of 1,000 cfs in potential groundwater recovery for Arvin-Edison. Since the land area is 10 times the 1992 study, the base cost, without fees, has been estimated as $50 million.

Recommendation for Water Management Approach

Groundwater storage beneath 50,000 acres in Arvin-Edison has potential to help the district mitigate for a loss in reliable water supply in the Friant-Kern Canal by providing a location to store surplus San Joaquin River waters available during wet years that may be recovered and distributed during dryer years. The capacity for groundwater storage in the area is uncertain, but it appears that water may be recovered at a rate of approximately 2.7 cfs through existing wells. This project also has potential for use as a water storage site for Recaptured water and wet-year SWP supplies, which may be recovered and delivered to Friant contractors during dryer years.

Construction Considerations

Construction considerations would be assessed once a more detailed feasibility study has been completed.

Schedule (Beginning Dates)

Agreements: July-2008 to July-2009
Engineering and Design: Aug-2009 to Dec-2009
Construction: Mar 2010 to Mar 2011
Operational: Apr-2011

Real Estate Requirements

- **Fee Purchase** Acreage for booster pumping plants. Quantity unknown.
- **Access Rights** Unknown
- **Permanent and Temporary Easements** Permanent easements will be required for access to pipelines. Temporary easements may be required for construction.
- **Flowage Easements** None

Coordination with Other Options

This option could be coordinated with water management alternatives to store excess flood waters available in the Friant-Kern Canal during wet years for use during dryer years. For example, Options 60 and 61 could enhance this option by providing additional capacity for surplus flows in the Friant-Kern Canal. Arvin-Edison also is located in a unique position to receive State Water Project supplies from the California Aqueduct or the Cross Valley Canal. As a result, Recaptured water could be diverted for storage in Arvin-Edison. This should also be coordinated with other Arvin-Edison projects, including options 57, 89, 90, 92, 93, and 94. This project could also be a component of a multi-district groundwater banking program.

Operational and Maintenance Requirements

- **Operations**

Arvin-Edison will divert available surface water to farmers for use in-lieu of groundwater pumping based on availability of water and anticipated farmer demand. The system will be automated to draw water from available sources and deliver to distribution facilities when needed.

- **Maintenance**

Pipelines will require routine maintenance.

- **Monitoring Requirements**

None

Future Requirements for Design

A feasibility study needs to be performed to assess this option. The alternative formulation report needs to be completed to assess whether this project will work in accordance with the water management goal. Flow data, topographic mapping, subsurface investigations, and groundwater levels may be required for design. Rights to divert additional water or to obtain water from the proposed sources need to be verified. Permitting for water quality, dredge and fill, and environmental impacts may need to be acquired.

Potential Environmental Impacts

- **Temporary (During Construction):** The construction of distribution pipelines may impact landowners.
- **Permanent (Operation-Related):** None

Sub-Options considered but Rejected

None

Figures

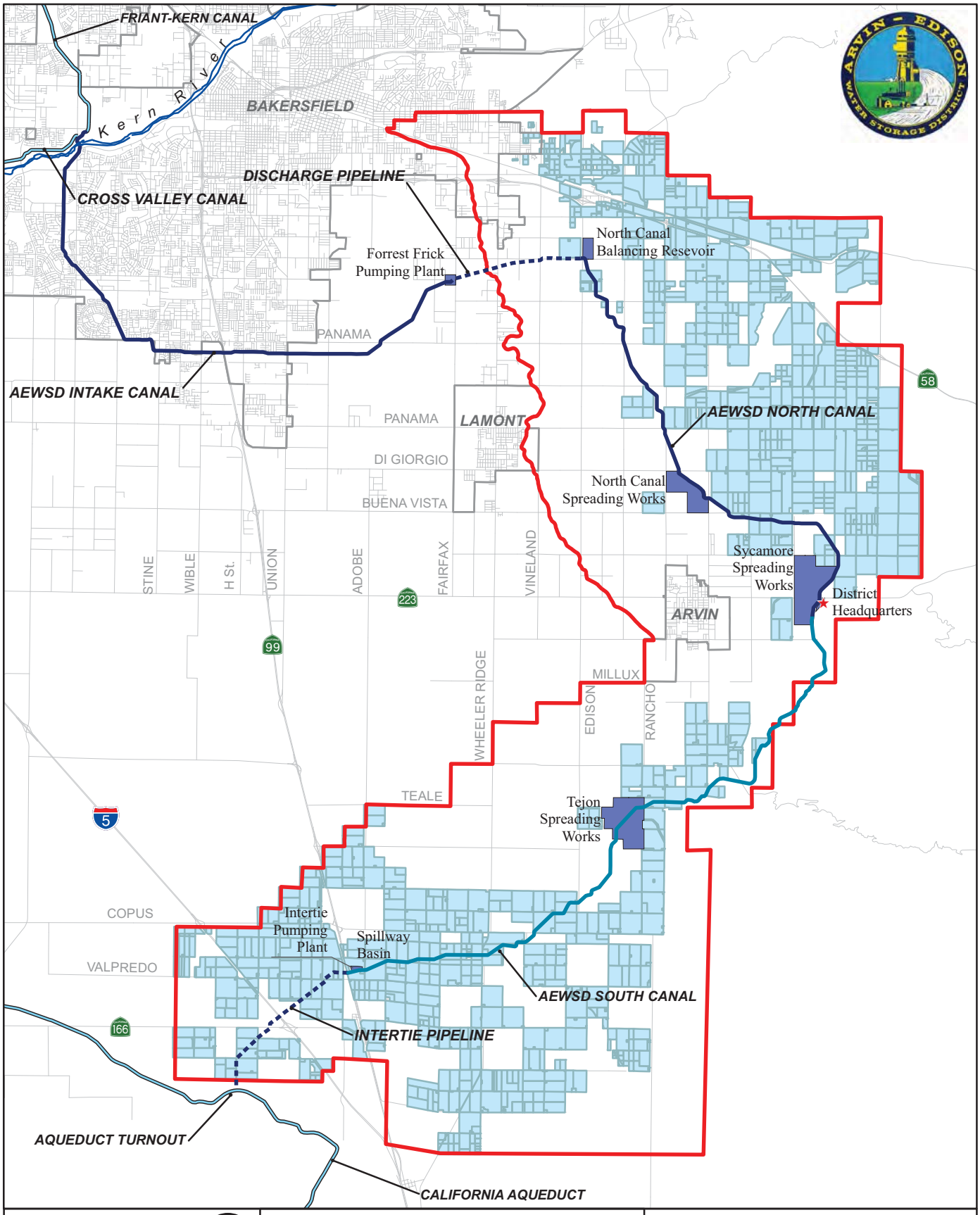
91-1 Facilities Location Map

Attachments

References

91-1 Arvin-Edison Water Storage District, *Response to John Roldan's RFI, San Joaquin River Restoration Water Management Goal Projects, In-Lieu Water Bank Facilities)*, March 7, 2008

91-2 Friant Water Authority, *San Joaquin River Restoration Program, Water Management Goal: Recirculation, Recapture of Restoration Flow and Mitigation of Water Supply Reductions: Potential Programs & Projects* (Feinstein Report)



0 1 2 3 Miles

1 inch equals 3 miles

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Fresno, CA 93711-6162
(559) 449-2700

Legend

- AEWSD Facilities
- AEWSD Boundary
- Surface Water Service Area
- Urban Area

Figure 91-1:

Arvin-Edison W.S.D. Facilities Location Map

4/20/2006
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DRAFT

Arvin-Edison Water Storage District
Response to John Roldan's RFI
San Joaquin River Restoration Water Management Goal Projects
In-Lieu Water Bank Facilities

Option No.: Not Known
Structural Option Name: AEWSD In-Lieu Water Bank Facilities
Revision Date: March 7, 2008
Reach Number: Not Applicable
River Mile: Not Applicable
Program Goal: Water Management
Phase: I and\or II
Task: Not Known
Responsible Author: Not Known
Peer Reviewer: Not Known

Description:

AE has a large area of land (~55,000 acres) relying 100% on groundwater supplies. AE could construct pipelines to landowners in order to deliver surplus water at certain times to offset pumping, and create a groundwater benefit. These same pipelines could be used to connect to farm wells and recover the supplies banked "in-lieu" and delivered them into the distribution facilities. This type of program avoids building new wells and spreading basins but requires distribution pipelines. Semitropic Water Storage District has a working program that would work in a similar fashion.

Under the program concept, existing wells within the in-lieu area would be connected to the AE canal distribution system for coordinated operation with the balance of the system. Groundwater production capability not required to meet the irrigation demands of the in-lieu area could be utilized in the AE surface water service area.

Costs (March 2008):

An in-lieu project feasibility study performed in 1992 indicated a production capacity of potential in-lieu wells averaging 2.7 cfs. This study focused on a 5,000 acre area with 37 wells. A generic distribution system would encompass pipelines, pumping/booster plants (canal-side and in-line) and farm turnouts. 1992 dollars including contingencies, legal, engineering and administrative cost estimated the 5,000 acre area at $6.4 million dollars. AE is capable of serving an area 10 times the study area of 1992. Considering a three (3) percent inflation per year, a project in 2012 (30 years later) could cost nearly $155 million.

Cost Level: Preliminary
Total Construction Cost: $155 million

Annual O&M Cost: Unknown
Project Life: Typical facilities are planned for 50 year lives

Objective of Option:
Utilize wet-period water supplies, firm up dry period water supplies, mitigate groundwater overdraft, if any.

Performance Criteria:
Not Known

Design Criteria:
Design criteria for facilities to be constructed would consist of normal and customary District standards.

Construction Considerations:

Pipelines, pump stations, turnouts, appurtenances.

Schedule:

Project would require external funding or third party partners and thus may take several years to negotiate a deal. Once funding is evident construction, depending on scope could take multiple years to complete.

Real Estate Requirements:

Pipelines and turnouts would require easements. Pump stations would require minimal land purchase.

Coordination with Other Options:

In-lieu Banking Project and Out-of-district banking programs may be pursued either together or separately.

Other A-E projects could be pursued independently of this option, but might gain additional water supply flexibility benefits when combined with this option.

Operational and Maintenance Requirements:

Operation, maintenance, and monitoring requirements would be similar to existing facilities. Costs for these are typically imbedded in the costs per acre-foot of regulated water.

Future Requirements for Design:
Unknown

Potential Environmental Impacts:
Each project would have to be evaluated for potential environmental impacts, both temporary (during construction), and permanent (operation related).

Sub-Options considered but Rejected:
None.

Drawings:
None

Figures:
AE boundary with GWSA and SWSA

Attachments:
None

San Joaquin River Restoration Program

Water Management Goals
Arvin-Edison Water Storage District

This memo is to put forward some ideas, as perceived by Arvin-Edison Water Storage District, as to water management efforts, programs, and policies the District believes are integral to meeting the water management goal of the San Joaquin River Restoration Program. The following ideas are a combination of needed policy/regulation changes as well as water management concepts that may or may not involve construction.

Transfer/Exchange Provisions: The existing USBR transfer provisions are restrictive and a hindrance to effective water management and have been made even more difficult since the passage of CVPIA. Transfers need to be easier to obtain and more readily approved. Special recognition needs to be given to the lack of storage on the Friant system, the existence of un-storable Class II supplies, River Restoration goals, and the need to move water around among various agencies quickly. Perhaps a policy that Class II water can be transferred, period, and without further approval process, is appropriate.

Water Bank Provisions: The District has been operating a water bank since 1966 and the USBR is now considering water banking guidelines. The goal of the Bureau should be to remove existing hindrances to water banking rather than apply restrictive guidelines. Water banking is an especially critical water management tool for the Friant district due to the reasons listed above.

Friant Kern Canal: The canal is undersized and cannot move all the high flow short duration water supplies that are available to the contractors and needs to be expanded.

Carryover Policies: Millerton Lake has a measure of carryover capacity each and every year. It is essential that this reservoir capacity be maximized by the contractors to manage water from one year to the next. Currently the USBR policies are prohibitive and not consistently applied.

East/West Conveyance: The District can improve and enhance its water management capabilities, for itself and others by constructing additional conveyance to Intertie the California Aqueduct to the Friant Kern Canal and or to the District's facilities. This would allow flow to, from, and between the Ca Aqueduct and the F-K canal. This would facilitate deliveries of Westside CVP, SWP, and recirculation water to the District and/or other Friant contractors.

CVC Expansion: The District has embarked on a $15M project to enlarge the CVC by 100 cfs. Agreements to the construction and operation allow

access to other existing and new capacity as well. Funding is not yet secured. The expanded canal is bidirectional.

CVC/F-K Intertie: Along with the CVC expansion the parties are also building a 500 cfs Intertie between the CVC and F-K canal, which will allow for additional programs between Kern County districts and F-K contractors.

AE Intertie: AE has recently completed a $15M, 150 cfs, bi-direction Intertie pipeline between the AE canal and the Ca Aqueduct.

South Canal Improvement Project: A $14.4 M canal expansion program that would facilitate additional utilization of the Intertie pipeline described above.

South Canal Improvement Project – Phase 2: Utilization of the Intertie Pipeline can be further enhanced by construction of a booster plant and other modifications for an additional $5M.

Intake Canal Reverse flow Project – The potential exist to reverse flow the District's 13 mile Intake Canal by adding a combination of check structures and pump-back pumps. This would allow the District to delivery substantial water bank supplies directly into the F-K canal. Estimated cost is $10M.

Water Banking Facilities: AE has recently completed the construction of 500 acres of new spreading basins and approximately 20 new wells at a cost of $16M

In-Lieu Water Bank Facilities: AE has a large area of lands relying 100% on groundwater supplies supplies. The district could construct pipelines to these lands in order to deliver surplus water at certain times to offset pumping, and create a groundwater benefit. These same pipelines could be used to connect to farm wells and recover the supplies banked "in-lieu" and delivered them into the distribution facilities. This type of program avoids building new wells and spreading basins but requires distribution pipelines. Estimated cost is $50M

Out-of-District Banking: AE has a program of banking AE water with RRBWSD under a variety of terms and conditions. Banking programs are expensive, and cost/benefits can be balance with money, water, or a combination of both. AE will be seeking a long term program approval for a "2 for 1" water banking program whereby AE leaves behind 1 AF of water in RRB for gw recharge for each af of water RRB returns to AE. RRB pays all the costs to convey, bank, and return the supplies.

Recirculation/ Contract Modification: AE is ideally suited, and has invested in the infrastructure, so as to be able to access East side or West side supplies. AE

can accept recirculation water directly either for itself or others. AE is also in a position to consider a permanent contract exchange of eastside supplies for Westside supplies thereby making a permanent contribution of F-K water to River Restoration. This type of contract modification would negate the need for one of the recirculation components, namely,conveying water from the SJR to the Ca Aqueduct.

Water Quality Exchange with MWD: AE and MWD have had a banking program partnership in place since 1997 whereby AE banks and returns MWD SWP supplies. The potential exists for MWD to cooperate with AE to regulate large amounts of unregulated F-K supplies via exchange in the Ca Aqueduct. Concerns regarding the change in place of use have prevented much progress to date.

San Joaquin River Restoration
Structural Option Description
Pre-Appraisal Level

Option No.	Structural Option Name		Revision Date
98	Connect FKC Turnout to Cawelo's North System (Non-Friant)		5 Mar 2008
Reach Number	**River Mile**	**Program Goal**	**Phase**
N/A	N/A	Water Management	II

Task	Responsible Author	Peer Reviewer
Option Description	D. Whitbeck	J. Roldan
Engineering		

Costs (October 2007):
Cost Level: Pre-appraisal
Total Construction Cost: Not available at this time.

Objective of Option
The Cawelo Water District, in association with the Integrated Regional Water Management Plan (IRWMP) Management Group, proposes to connect the Friant-Kern Canal with Cawelo's Lateral N-5 by adding a turnout near McFarland, CA, and pumping water through up to 4 miles of 36-inch diameter pipeline into Cawelo. This project would help increase water reliability to Cawelo Water District and help enhance groundwater levels and reduce the occurrences of overdraft. This project would also create an opportunity for Friant Districts to exchange surplus San Joaquin River supplies for State Water Project supplies.

Performance Criteria
Construct a 40 cfs conveyance system to deliver water from the Friant-Kern Canal to Cawelo Water District.

Design Criteria
Reclamation Cost Estimating Guidelines

Description
The Cawelo Water District is located in the southern portion of the San Joaquin valley near the terminus of the Friant-Kern Canal into the Kern River. See Figure 98-1. The district supplies water to over 45,000 acres of permanent crops and was formed in 1965 for the purpose of obtaining water supplies to supplement pumping of groundwater for irrigation. The Cawelo Water District is not a Friant contracting district and currently has a contract to receive SWP water from the California Aqueduct via the Cross Valley Canal.

The district would like to construct a direct tie-in to the Friant-Kern Canal in order to take advantage of short-duration flood flows in the Friant-Kern Canal and to increase availability of surface water supplies. The proposed tie-in would involve construction of a 40 cfs pumping plant and a 36-inch diameter pipeline that will extend 3 to 4 miles from the Friant-Kern Canal to Cawelo's Lateral N-5. See Figure 98-2. In addition, the project will involve installation of a turnout on the Friant-Kern canal, a traveling trash screen in the canal over the outlet grate, a connection to the Cawelo system, and fencing and power to the facilities.

The Cawelo Water District proposes to use Friant-Kern Water as follows. During wet years, the district will deliver 5,000 acre-feet to irrigated lands and 2,000-3,000 acre-feet to spreading ponds. Without the project, this water would be pumped from the ground. During dry years, the district will deliver water from existing sources and exchanges. The district expects that groundwater levels will be higher than previous years and will provide both increased yields and reduced pumping costs to both the district and private landowners.

Recommendation for Water Management Approach
This project has the potential to facilitate an exchange of surplus San Joaquin River supplies for State Water Project supplies. Friant Districts with little groundwater recharge capability may be able to negotiate an exchange of their Recovered Water Account supplies for a portion of Cawelo's State Water Project supplies. Potential incentives for such an exchange may be cost savings and higher quantities of water for Cawelo and a scheduled supply of water for the Friant Districts. In addition, this project may allow Friant Districts and Cawelo to transfer portions of their CVP and SWP contracts to one another to increase operational flexibility and water delivery priority in the CVP and SWP systems.

Construction Considerations
Construction considerations would be assessed once a more detailed feasibility study has been completed.

Schedule
Feasibility Study: Apr-2009 to Sept-2009
Agreements and Funding: July-2009 to Nov-2009
Engineering and Design: Oct-2009 to Mar-2010
Land Acquisition: Oct-2009 to Dec-2010
Construction: Jan-2010 to July-2010
Operational: July-2010

Real Estate Requirements
- **Fee Purchase** Acreage for pump station
- **Access Rights** Land rights must be acquired to access and maintain pipeline.
- **Permanent and Temporary Easements** Permanent easements will be required for access to pipeline. Temporary easements may be required for construction.
- **Flowage Easements** None assuming flows are kept underground.

Coordination with Other Options
This option would coordinate with east-west conveyance options that involve using water from the California Aqueduct as either replacement or supplementary water. SWP supplies brought into the Friant Division may need to be exchanged for Class One supplies in order to convey the water to its final destination.

Operational and Maintenance Requirements
- **Operations**

The pumping station and pipeline would be run by PLC based on anticipated demand in the district.
- **Maintenance**

Routine maintenance will be required to ensure that pipelines and facilities are working and in good condition.
- **Monitoring Requirements**

None.

Future Requirements for Design
A detailed feasibility study needs to be performed to assess the proposed project, including completion of the alternative formulation report to assess whether this project will work in accordance with the water management goal. Flow data, topographic mapping, subsurface investigations, and groundwater levels may be required for design. The right to divert additional water from alternate sources and the ability to transfer contracts needs to be verified. Permitting for water quality, dredge and fill, and environmental impacts may need to be acquired.

Potential Environmental Impacts

- **Temporary (During Construction):**

Construction of a new pipeline will generate dust and potentially impact surrounding farmers.

- **Permanent (Operation-Related):**

The exchange of CVP supplies for SWP supplies will require environmental documentation, as will any transfers of contracts.

Sub-Options considered but Rejected

None

Figures

98-1 Vicinity Map
98-2 Project Location Map

Attachments

References

98-1 GEI Consultants, Poso Creek Integrated Regional Water Management Plan, Appendix. D. *No. 01 Connect Friant-Kern Canal Turnout to Cawelo's North System,* July 2007.

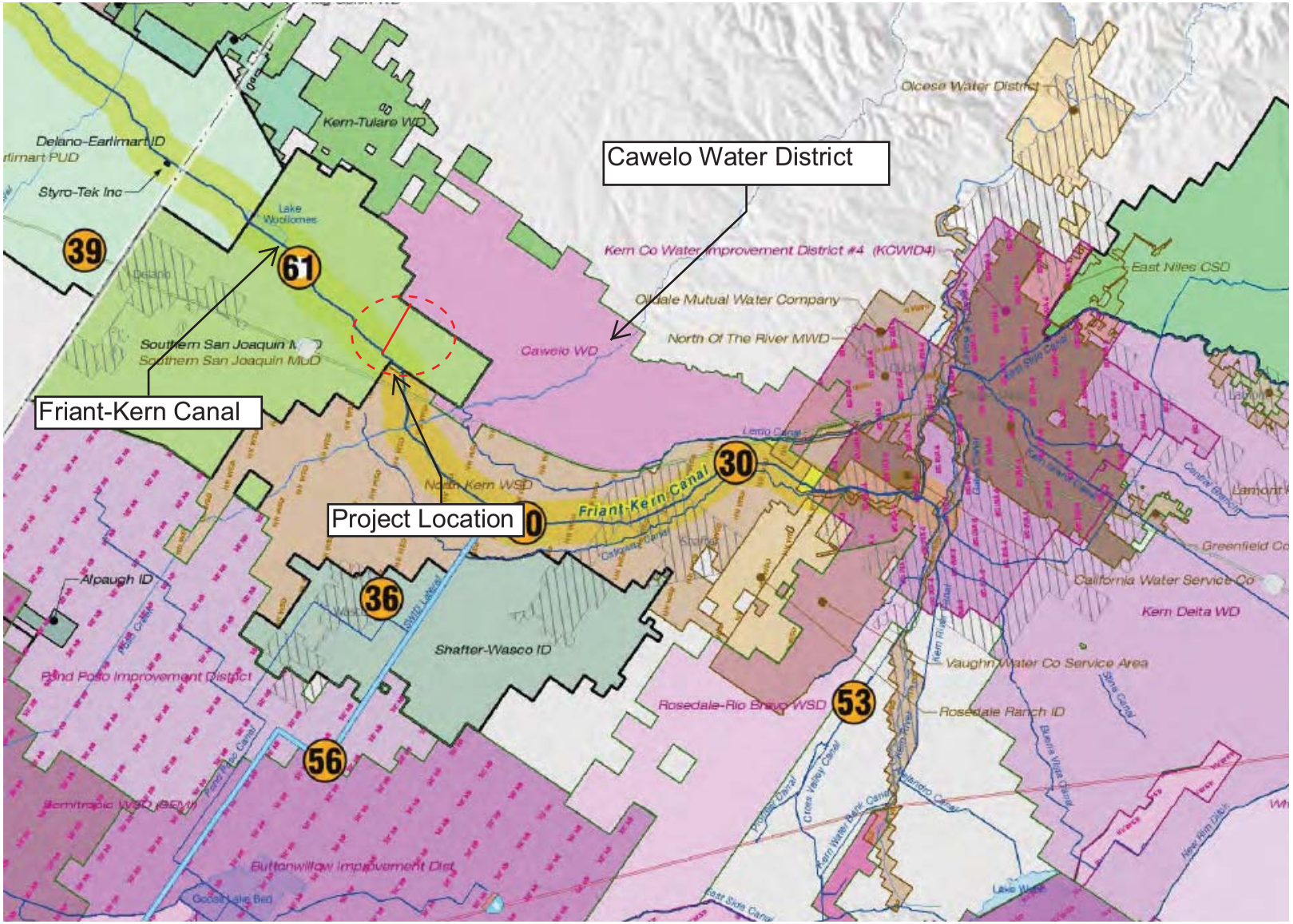


Figure 98-1: Vicinity Map

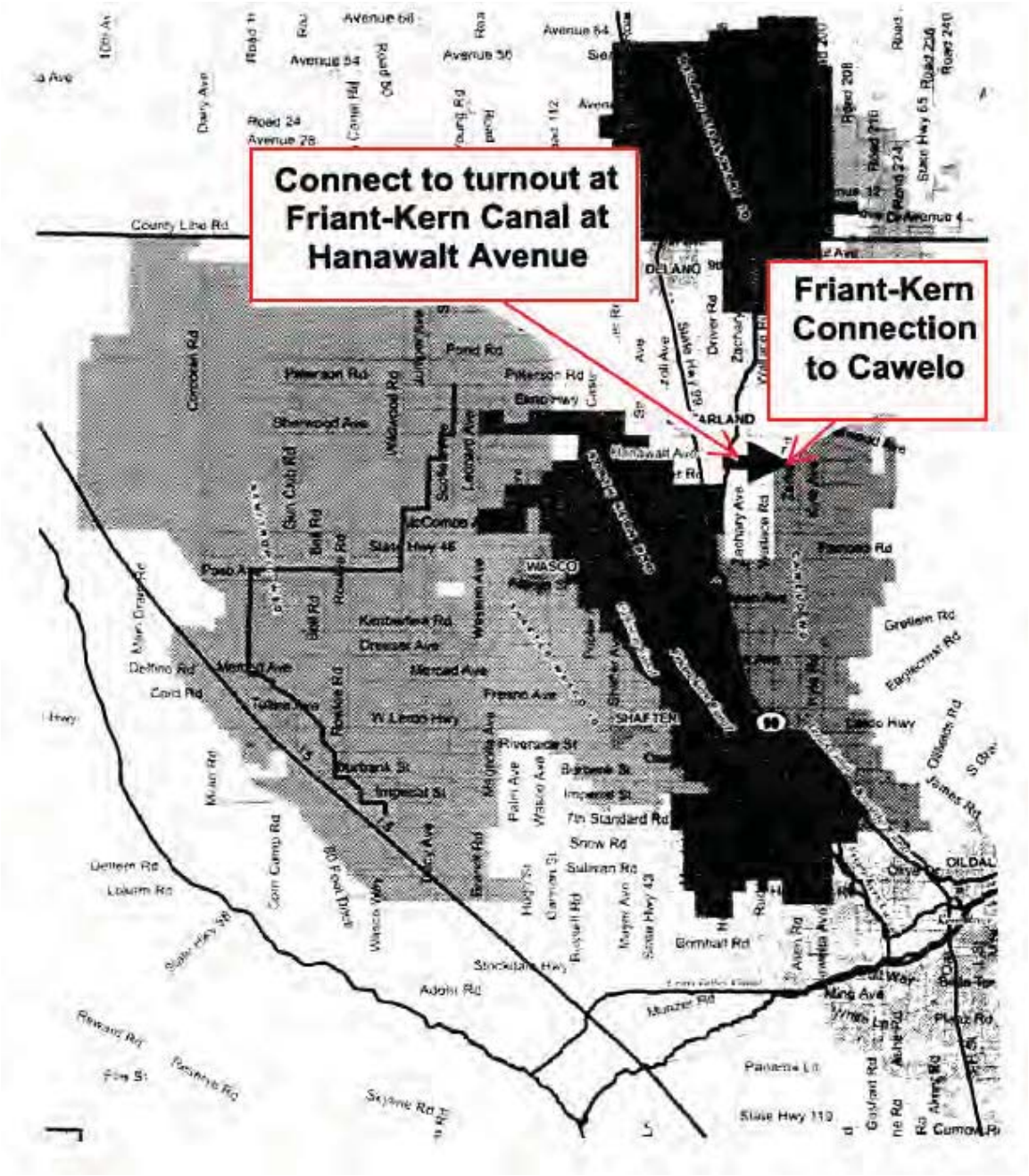


Figure 98-2: Project Location Map

San Joaquin River Restoration
Structural Option Description
Pre-Appraisal Level

Option No.	Structural Option Name		Revision Date
99	Kern-Tulare/Rag Gulch Ninth Avenue Pipeline (Non-Friant)		6 Mar 2008
Reach Number	**River Mile**	**Program Goal**	**Phase**
N/A	N/A	Water Management	II

Task	Responsible Author	Peer Reviewer
Option Description	D. Whitbeck	J. Roldan
Engineering		

Costs (October 2007):
Cost Level: Pre-appraisal
Total Construction Cost: Not available at this time.

Objective of Option
The Kern-Tulare and Rag Gulch Water Districts, in association with the Integrated Regional Water Management Plan (IRWMP) Management Group, proposes to expand the districts' distribution system capability to enable the districts to deliver surface water and reduce groundwater pumping at times when adequate surface water supplies are available. The proposal includes constructing a pipeline from the Friant-Kern Canal to deliver additional water to the districts. The project will serve to raise groundwater levels and provide a water source for dry years, will improve well yields, and will reduce groundwater pumping costs. The project will also reduce energy requirements by increasing the efficiency of the districts' distribution systems and reduce energy demands by pumping less groundwater. Further evaluation will be necessary to determine whether this project meets the objectives of the Water Management Goal.

Performance Criteria
Construct a conveyance system to deliver water at 35 cfs from the Friant-Kern Canal to Kern-Tulare and Rag Gulch Water Districts.

Design Criteria
Reclamation Cost Estimating Guidelines

Description
The Kern-Tulare Water District (KTWD) and Rag Gulch Water District (RGWD) are located in the southern portion of the San Joaquin valley near the terminus of the Friant-Kern Canal into the Kern River. Both districts have significant concerns with regards to future water supplies. See Figure 99-1. The districts have contracts to receive water from both the California Central Valley Project (CVP) and to divert water from the Kern River under contract with the City of Bakersfield. The initial term of the districts' contracts with the City ends on December 31, 2011, and reliable supply from this source is uncertain beyond this date. In addition, restoration of fish on the San Joaquin River is anticipated to reduce the ability of the districts to purchase Friant water supplies.

KTWD has a contract with the Bureau of Reclamation for an annual supply of 40,000 acre-feet from the CVP. RGWD has a contract for an annual supply of 13,300 acre-feet from CVP. Under these contracts, water is delivered through the California Aqueduct to Tupman, CA. Water is then conveyed through the Cross Valley Canal and delivered into the Friant-Kern Canal (FKC). The districts divert water from the FKC despite the fact that they are not Friant long-term contractors. In many years, water diverted through the Cross-Valley Canal never actually reaches the FKC, but is exchanged with Arvin-Edison Water Storage District for FKC supplies.

KTWD also has a contract with the City of Bakersfield, CA, for an average annual supply of 20,000 acre-feet from the Kern River. RGWD also has a contract to divert 3,000 acre-feet from the Kern River via the City of Bakersfield.

The goal of this option is to increase distribution capacity by increasing the ability to divert water from the Friant-Kern Canal. The project consists of constructing the following facilities: a 35 cfs turnout from the FKC, a 1,000 horsepower pumping plant, 4.5 miles of 36-inch diameter pipeline, a 400 horsepower booster plant, and a 36-inch inlet to Cecil Reservoir. See Figure 98-2.

These facilities will increase the delivery to the District's Woollomes/Cecil distribution system from 34,000 gpm (76 cfs) to 50,500 gpm (113 cfs). It is estimated that this will provide an additional 8,300 acre-feet to the existing irrigation demands currently served with groundwater while adequate water supplies are available.

In addition to improving delivery capability, the proposed project will reduce electrical loads within the districts. These reduced electrical loads will be a result of increasing the efficiency of the distribution system by installing premium efficiency motors and, thus, reducing velocities in existing facilities and reducing groundwater pumping. The total annual energy savings is estimated at 4,700,000 kWh, with a resulting savings of approximately $550,000 per year.

Project operation is anticipated to run as follows. During wet years, the districts will deliver an additional 8,200 acre-feet to irrigated lands that, without this project, would have been supplied by groundwater. During dry years, the districts will deliver water from existing available sources. Water levels are anticipated to be higher than they otherwise would have been, resulting in increased well yields and reduced pumping costs.

Recommendation for Water Management Approach
This option will increase the ability to recharge within Rag Gulch WD's proposed banking facility (Option 103). Although Kern Tulare and Rag Gulch are members of the Friant Water Users Authority, they are not Friant Division long-term contractors, and as such this project and Option 103 will likely need to provide storage or exchange benefits to a Friant Division long-term contractor to be a part of the San Joaquin River Restoration Program. The size of the proposed facilities may limit the extent to which Kern-Tulare and Rag Gulch can offer conveyance and storage capacity to other districts; however, this will need to be further evaluated. Groundwater benefits to neighboring Friant districts and exchange potential with Friant Districts will need further evaluation as well.

Construction Considerations
Construction considerations would be assessed once a more detailed feasibility study has been completed.

Schedule
Feasibility Study: Nov-2006 to Dec-2008
Agreements and Funding: Jan-2009 to Feb-2010
Engineering and Design: Mar-2010 to Jun-2010
Land Acquisition: July-2010 to Sept-2010
Construction: Oct-2010 to Mar-2011
Operational: Mar-2011

Real Estate Requirements

- **Fee Purchase** Acreage for pump stations
- **Access Rights** Land rights must be acquired to access and maintain pipeline.
- **Permanent and Temporary Easements** Permanent easements will be required for access to pipeline. Temporary easements may be required for construction.
- **Flowage Easements** None assuming flows are kept underground.
-

Coordination with Other Options

This option could be coordinated with Option 103, Rag Gulch GW Banking Project. If this could be coordinated with an effort to conserve surplus San Joaquin River water for the benefit of a Friant Division long-term contractor, it may help meet the water management goals.

Operational and Maintenance Requirements

- **Operations**

The pumping station and pipeline would be run by PLC based on anticipated demand in the district.

- **Maintenance**

Routine maintenance will be required to ensure that pipelines and facilities are working and in good condition.

- **Monitoring Requirements**

None.

Future Requirements for Design

A detailed feasibility study needs to be performed to assess the proposed project, including completion of the alternative formulation report to assess whether this project will work in accordance with the water management goal. Flow data, topographic mapping, subsurface investigations, and groundwater levels may be required for design. Rights to divert additional water need to be verified. Permitting for water quality, dredge and fill, and environmental impacts may need to be acquired.

Potential Environmental Impacts

- **Temporary (During Construction):**

Construction of a new pipeline will generate dust and potentially impact surrounding farmers.

- **Permanent (Operation-Related):**

None

Sub-Options considered but Rejected

None

Figures

99-1 Vicinity Map
99-2 Project Location Map

Attachments

References

99-1 GEI Consultants, Poso Creek Integrated Regional Water Management Plan, Appendix. D. *No. 02 Ninth Av*enue *Pipeline,* July 2007

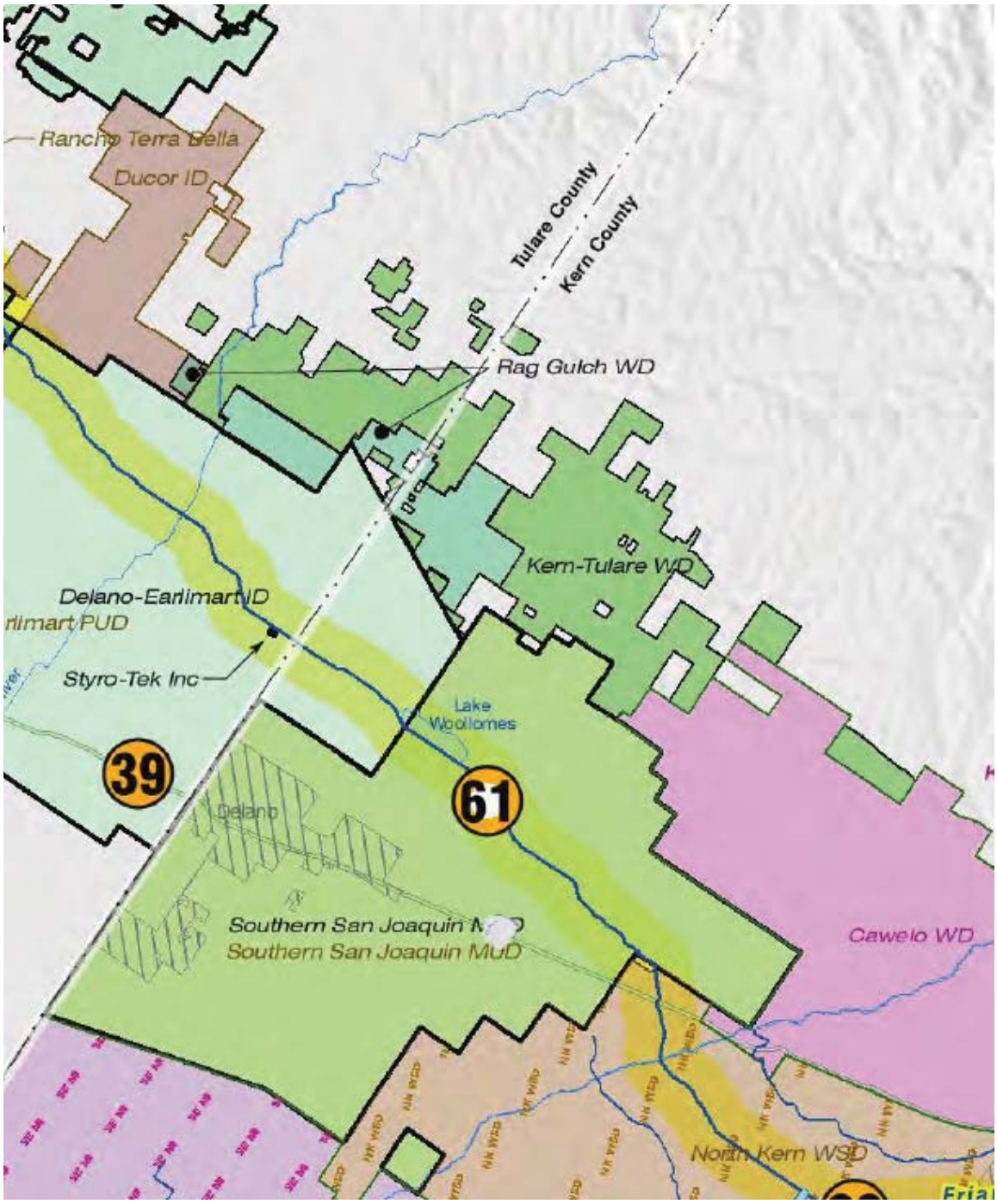


Figure 99-1: Vicinity Map

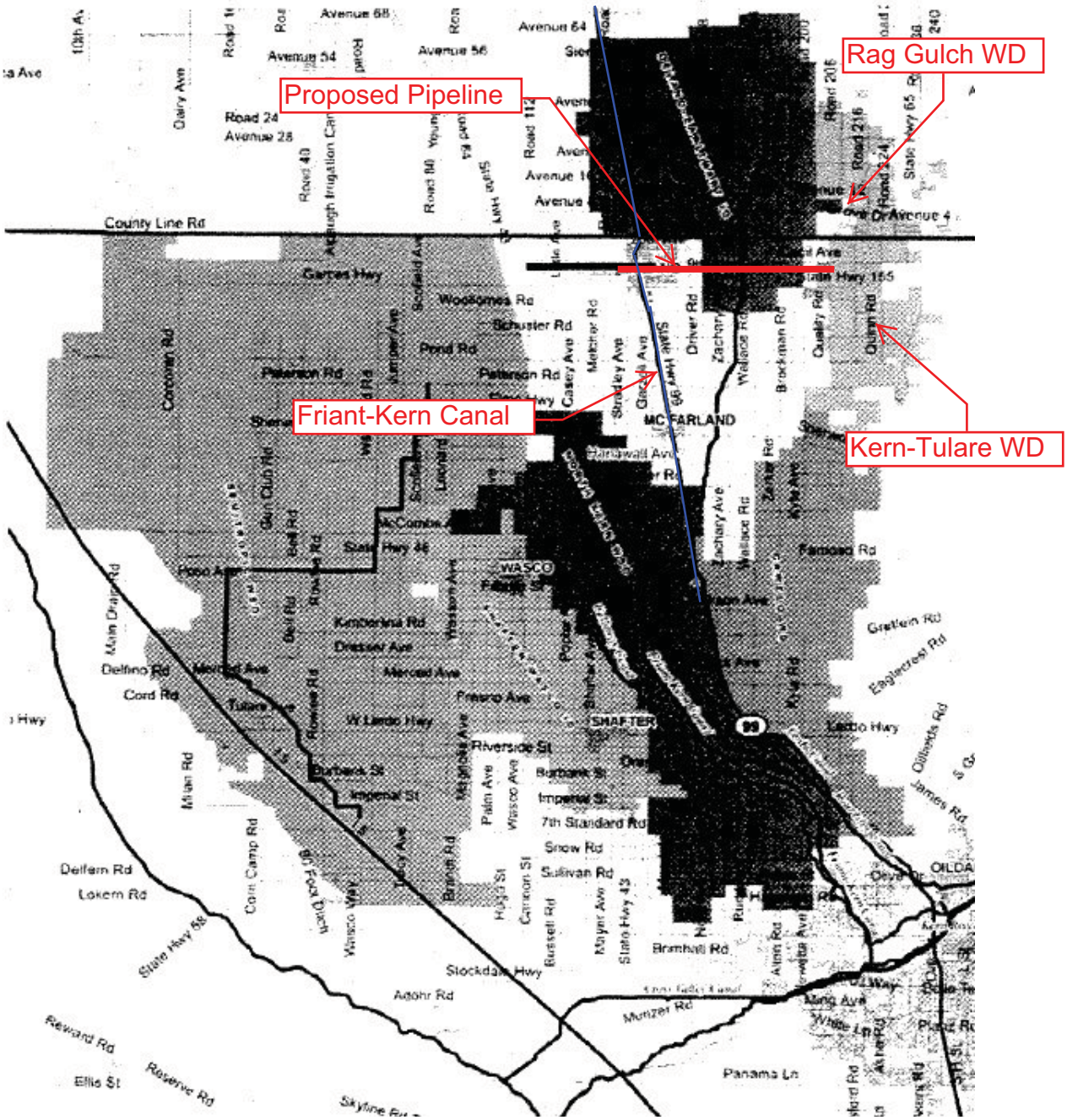


Figure 99-2: Project Location Map

San Joaquin River Restoration
Structural Option Description
Pre-Appraisal Level

Option No.	Structural Option Name		Revision Date
100	Semitropic Stored Water Recovery In-Lieu Service Areas (Non-Friant)		6 Mar 2008
Reach Number	**River Mile**	**Program Goal**	**Phase**
N/A	N/A	Water Management	II

Task	Responsible Author	Peer Reviewer
Option Description	D. Whitbeck	J. Roldan
Engineering		

Costs (October 2007):
Cost Level: Pre-appraisal
Total Construction Cost: Not available at this time.

Objective of Option
Semitropic Water Storage District proposes to increase the capacity of its groundwater bank through the development of the Stored Water Recovery Unit (SWRU). By constructing distribution facilities to carry surface water to 12,000 acres of irrigated land within the SWRU, water can be delivered to farmers that would otherwise have been pumped from the ground. Service would require construction of booster pumping plants and buried pipeline laterals. The goal of the project is to increase water supply reliability by replacing groundwater pumping with surface water and increasing groundwater levels. The availability of storage and conveyance capacity for Recaptured and surplus San Joaquin River supplies will determine whether this option meets the objectives of the Water Management Goal.

Performance Criteria
1 Construct distribution facilities to carry surface water to 12,000 acres of new in-lieu recharge area.
2 Approximately 42,000 acre-feet of in-lieu recharge capacity during wet-year irrigation season.
3 Approximately 420 cfs groundwater recovery capacity.

Design Criteria
1 Reclamation Cost Estimating Guidelines

Description
Semitropic Water Storage District is located in Kern County, approximately 20 miles northwest of Bakersfield, in the western San Joaquin Valley. Semitropic is proposing to increase its groundwater banking program. The proposed program includes a separate storage and recovery area termed the Stored Water Recovery Unit (SWRU) project. Semitropic would use this new groundwater banking facility to contract with outside banking partners to store water in the ground beneath Semitropic.

This project proposes construction of a three-phase distribution system that would carry water from the North-South Canal to 12,000 acres of farms operating wells near the Semitropic Groundwater Bank. Water will be obtained from the California Aqueduct, when available, and pumped into the Pond-Poso Canal. The three phases of the project are anticipated to be constructed in series, with the first to serve areas closest to the Pond-Poso Canal and the last to serve areas furthest away. Construction will also involve a number of pumping plants to ensure that adequate pressure is achieved within the new service area.

Anticipated operation of the project is as follows. During wet years, all of the existing groundwater wells within the 12,000 acre service area would remain off and 42,000 acre-feet would be imported into the service area for in-lieu recharge. During dry years, some minor amounts of water may be imported during limited availability of Article 21, but for most of the year agricultural deliveries would be made from on-farm wells. Groundwater recovery capacity for program participants is expected to be as high as 420 cfs.

Although it is not stated, it is assumed that existing recovery wells would be used to return banked groundwater.

The goal of the project is groundwater management and to preserve, enhance, or augment this resource as necessary to mitigate the present level of overdraft in the regional groundwater basin and at the least cost.

Recommendation for Water Management Approach
Semitropic Water District is not a Friant contractor and receives its water from contracts with the State Water Project (SWP). Water is delivered via the California Aqueduct. Additional groundwater storage within Semitropic could help meet the water management goal if an alternative were to be developed that would allow Recaptured water and/or surplus San Joaquin River water to be stored and later delivered to Friant contractors. It is unclear if additional banking capacity for Friant contractors would be available. This would need to be verified by a feasibility study.

Construction Considerations
Construction considerations would be assessed once a more detailed feasibility study has been completed.

Schedule
Planning Mar-2008
Agreements Jun-2008
Design Jun-2008
Property (inc. R/W) Jan-2009
Construction Jan-2010
Operational Jun-2010

Real Estate Requirements
- **Fee Purchase** Land will need to be purchased for pumping plants. Unknown amount at this time.
- **Access Rights** None
- **Permanent and Temporary Easements** Permanent easements will be required for access to pipeline and other facilities. Temporary easements may be required for construction.
- **Flowage Easements** None

Coordination with Other Options
This option could be combined with other options to form an alternative in which water could be sent down the San Joaquin River for river restoration, recaptured and pumped back via the California Aqueduct, and stored in Semitropic for later recovery and conveyance to Friant contractors. In order to get water to the Friant contractors, additional east-west conveyance options would be required. These facilities could also create an opportunity to convey and store surplus San Joaquin River supplies within Semitropic. This option could also be coordinated with other Semitropic projects including Option 101 (Semitropic new in-lieu service area P-565), Option 102 (Semitropic Pond-Poso Spreading Grounds), and Option 108 (Semitropic GW Banking for Parties Outside Poso Creek IRWMP Region).

Operational and Maintenance Requirements
- **Operations**

Pump stations will likely run on PLC and automatically adjust based on water supply in the California Aqueduct and farmer demand.
- **Maintenance**

Routine maintenance will be required to ensure that pipelines and facilities are working and in good condition.
- **Monitoring Requirements**

None.

Future Requirements for Design

A detailed feasibility study needs to be performed to assess the proposed project, including completion of the alternative formulation report to assess whether this project will work in accordance with the water management goal. Flow data, topographic mapping, subsurface investigations, and groundwater levels may be required for design. Rights to divert additional water need to be verified and the storage of CVP and Recaptured supplies in Semitropic should be evaluated against the USBR groundwater banking policy. Permitting for water quality, dredge and fill, and environmental impacts may need to be acquired.

Potential Environmental Impacts

- **Temporary (During Construction):**

None

- **Permanent (Operation-Related):**

The long-term groundwater banking program will likely require appropriate CEQA/NEPA environmental documentation.

Sub-Options considered but Rejected

None

Figures

100-1 Regional Map
100-2 Vicinity Map
100-3 Project Location Map

Attachments

References

100-1 GEI Consultants, Poso Creek Integrated Regional Water Management Plan, Appendix. D. *No. 03a Stored Water Recovery Unit In-Lieu Service Areas*, July 2007

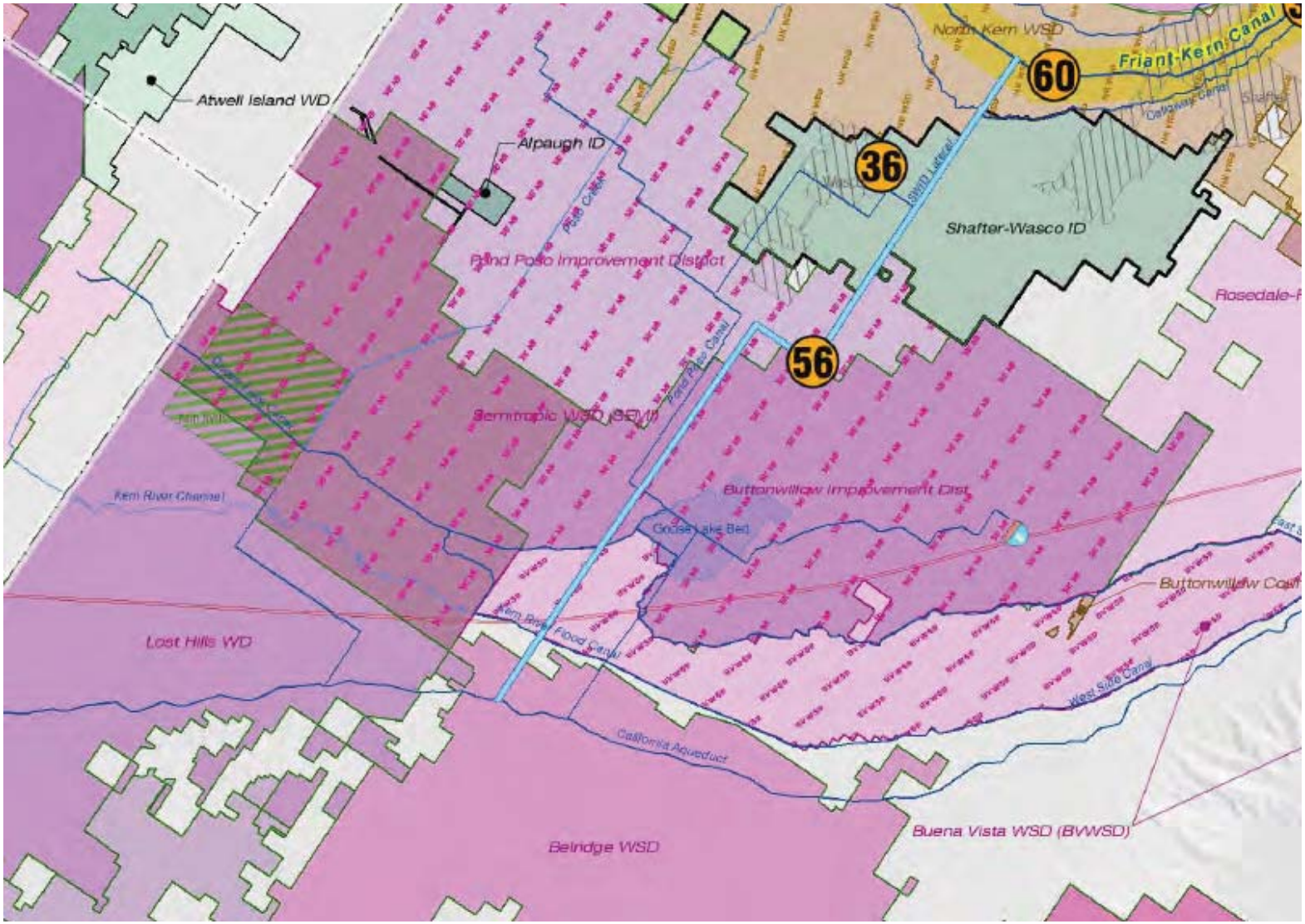


Figure 100-1: Regional Map

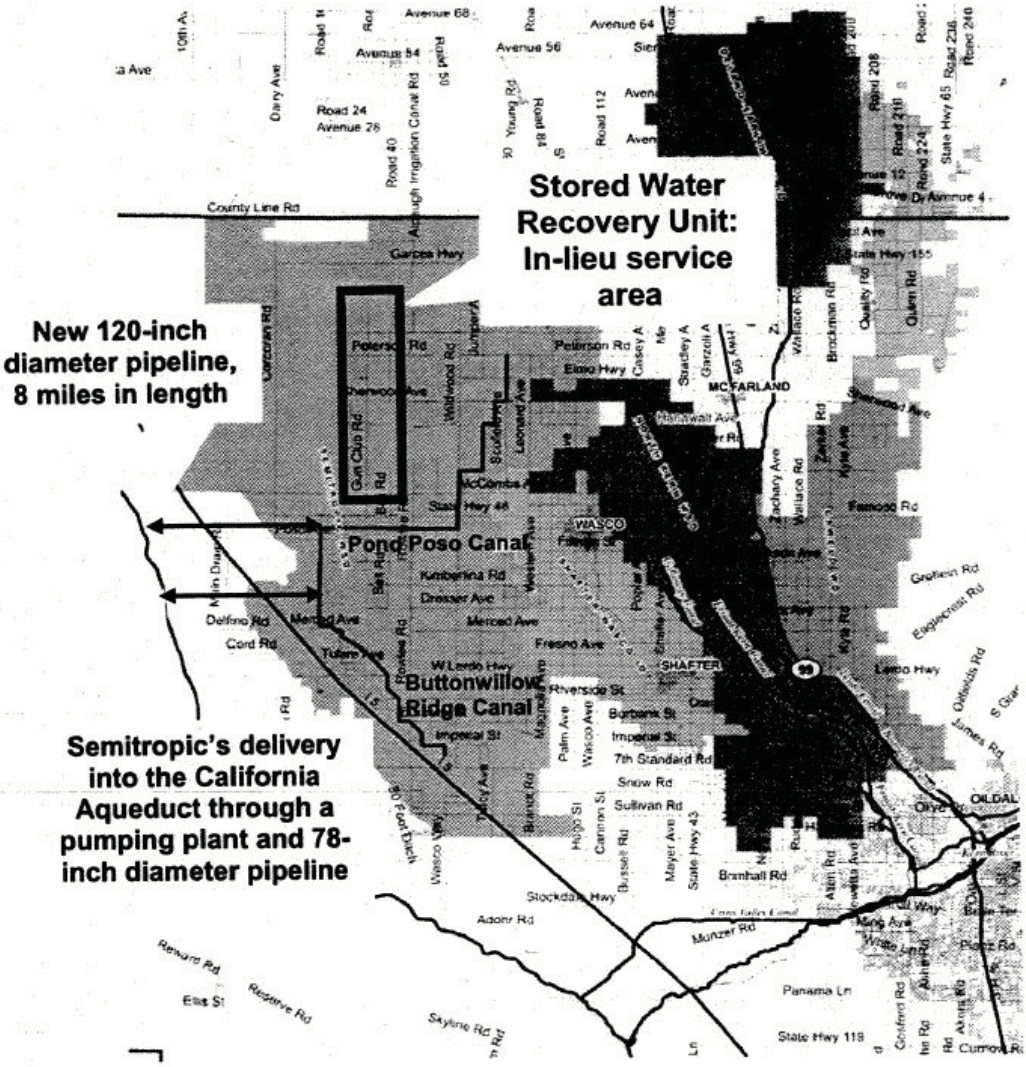


Figure 100-2: Vicinity Map

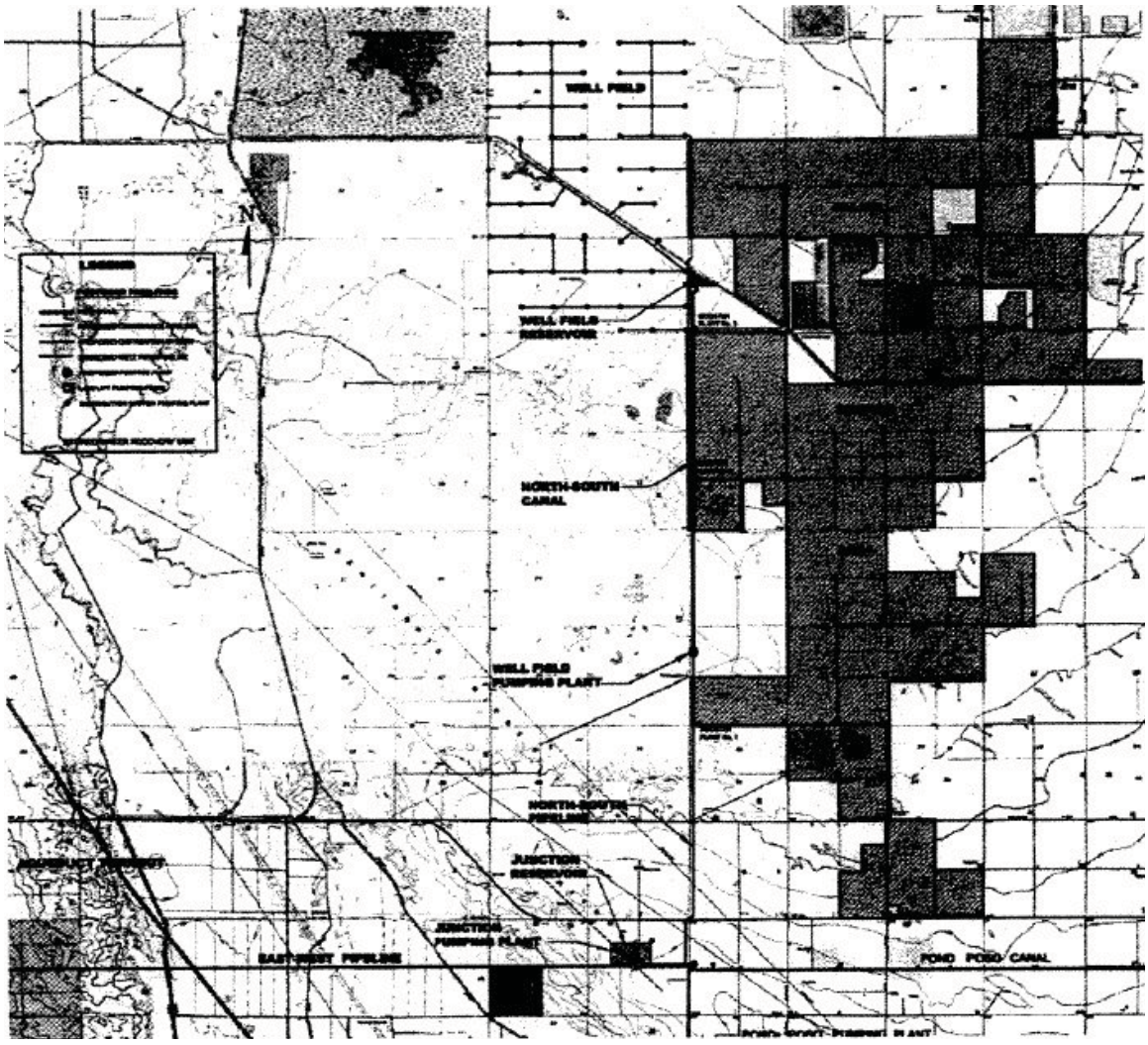


Figure 100-3: Project Location Map

San Joaquin River Restoration
Structural Option Description
Pre-Appraisal Level

Option No.	Structural Option Name		Revision Date
101	Semitropic New In-Lieu Service Area (P-565) (Non-Friant)		7 Mar 2008
Reach Number	**River Mile**	**Program Goal**	**Phase**
N/A	N/A	Water Management	II

Task	Responsible Author	Peer Reviewer
Option Description	D. Whitbeck	J. Roldan
Engineering		

Costs (October 2007):
Cost Level: Pre-appraisal
Total Construction Cost: Not available at this time.

Objective of Option
The Pond-Poso Improvement District of the Semitropic Water Storage District proposes to increase the P-565 distribution system to enhance its existing recharge, banking, and recovery capability with the construction of an additional 3,630 acres of surface water delivery service area for use in-lieu of pumping groundwater. Some of the design or construction may be already underway or completed. The project will add to the district's ability to recharge and bank water for future use by banking partners, and to reduce the amount of overdraft in the groundwater basin. The ability to bank and store Recaptured or surplus San Joaquin River water in this area has the potential to help meet SJRR water management goals.

Performance Criteria
1. Construct a new distribution system to convey surface water to 3,630 acres of farmland for in-lieu recharge.
2. Increase the district's ability to store groundwater.
3. Increase the ability to pump stored groundwater to customers.

Design Criteria
1. Reclamation Cost Estimating Guidelines

Description
The Pond-Poso Improvement District is a part of the Semitropic Water Storage District and participates in the effort to contract with outside banking partners and store groundwater beneath its land. Semitropic Water Storage District is located in Kern County, approximately 20 miles northwest of Bakersfield, in the western San Joaquin Valley. Beginning in 1994, Semitropic has developed the Semitropic Groundwater Bank to provide long-term underground storage of surplus water and to enhance groundwater levels. The groundwater bank was implemented in cooperation with California water entities that have contracted for storage space beneath Semitropic. Current banking partners include the Metropolitan Water District of Southern California, Santa Clara Valley Water District, Alameda County Water District, Zone 7 Water Agency, Vidler Water Company, Nehall Land & Farming Company, Castaic Lake Water Agency, and Poso Creek Water Company LLC.

This project would involve construction of two pump stations, pumps, motors, electrical equipment, 63,389 lineal feet of distribution pipeline, and 15 farm turnouts. The resulting facilities would provide surface water to an additional 3,630 acres of farmland for use in-lieu of pumping groundwater. Capacity of the system would be 75 cfs to farms, but the improvements will also include an additional 50 cfs to relieve capacity in the "Beta" distribution system, which connects into the North Kern Water Storage District canal delivery system. The project will add to the district's ability to recharge/bank water for future use by banking partners, and to reduce the amount of overdraft in the groundwater basin.

Anticipated operation of the project is as follows. During wet years, all of the existing groundwater wells within the service area would remain off and 15,000 acre-feet would be imported into the service area from the California Aqueduct. During dry years, some minor amounts of water may be imported during limited availability of Article 21, but for most of the year agricultural deliveries would be made from on-farm wells. Although it is not stated, it is assumed that existing recovery wells would be used to return banked groundwater to program participants in dry years.

The goal of the project is to enhance water supply reliability during drought years, provide an effective water management tool, reduce groundwater pumping lifts for agricultural water users, and to increase conjunctive use potential.

Recommendation for Water Management Approach
Semitropic Water District is not a Friant contractor and receives its water from contracts with the State Water Project (SWP). Water is delivered via the California Aqueduct. Additional groundwater storage within Semitropic could help meet the water management goal if an alternative were to be developed that would allow Recaptured and surplus San Joaquin River water to be stored here and later delivered to Friant contractors. It appears that groundwater can be stored at a maximum rate of 75 cfs, with an approximate capacity of 15,000 acre-feet per year. The connection to the "Beta" distribution system, which flows into North-Kern Irrigation District, may provide a means of transferring water back to Friant contractors, since North-Kern is located along the Friant-Kern Canal and has proposed interconnections with Friant Districts.

Construction Considerations
Construction considerations would be assessed once a more detailed feasibility study has been completed.

Schedule (Completion Dates)
Planning Mar-2008
Agreements Jun-2008
Design Jun-2008
Property (inc. R/W) Jan-2009
Construction Jan-2010
Operational Jun-2010

Real Estate Requirements
- **Fee Purchase** Land will need to be purchased for pumping plants. Unknown amount at this time.
- **Access Rights** None
- **Permanent and Temporary Easements** Permanent easements will be required for access to pipeline and other facilities. Temporary easements may be required for construction. Unknown quantities.
- **Flowage Easements** None

Coordination with Other Options
This option could be combined with other options to form an alternative in which water could be sent down the San Joaquin River for river restoration, recaptured and pumped back via the California Aqueduct, and stored in Pond-Poso Improvement District or Semitropic Water Storage District for later recovery and conveyance to Friant contractors. East-west conveyance, including the Semitropic to Shafter-Wasco interconnections, would be required to return the banked water to the Friant Division, although the proposed 50 cfs connection to the North-Kern system could facilitate the use of its existing and proposed interconnections with the Friant Division. This option could also be coordinated with other Semitropic, Pond-Poso, or North-Kern projects, including Options 100, 102, 105, 106, 107, and 108.

Operational and Maintenance Requirements
- **Operations**

Pump stations will likely run on PLC and automatically adjust based on water supply in the California Aqueduct and farmer demand.

- **Maintenance**

Routine maintenance will be required to ensure that pipelines and facilities are working and in good condition.

- **Monitoring Requirements**

None.

Future Requirements for Design

Design of pipelines and facilities may have already been completed by the IRWMP, although such information was not provided. If no additional information is available, then a detailed feasibility study needs to be performed to assess the proposed project. Of equal importance is completion of the alternative formulation report to assess whether this project will work in accordance with the water management goal. Flow data, topographic mapping, subsurface investigations, and groundwater levels may be required for design. Rights to divert additional water need to be verified and the storage of CVP and Recaptured supplies in Semitropic should be evaluated against the USBR groundwater banking policy. Permitting for water quality, dredge and fill, and environmental impacts may need to be acquired.

Potential Environmental Impacts

- **Temporary (During Construction):**

None

- **Permanent (Operation-Related):**

The long-term groundwater banking program will likely require appropriate CEQA/NEPA environmental documentation.

Sub-Options considered but Rejected

None

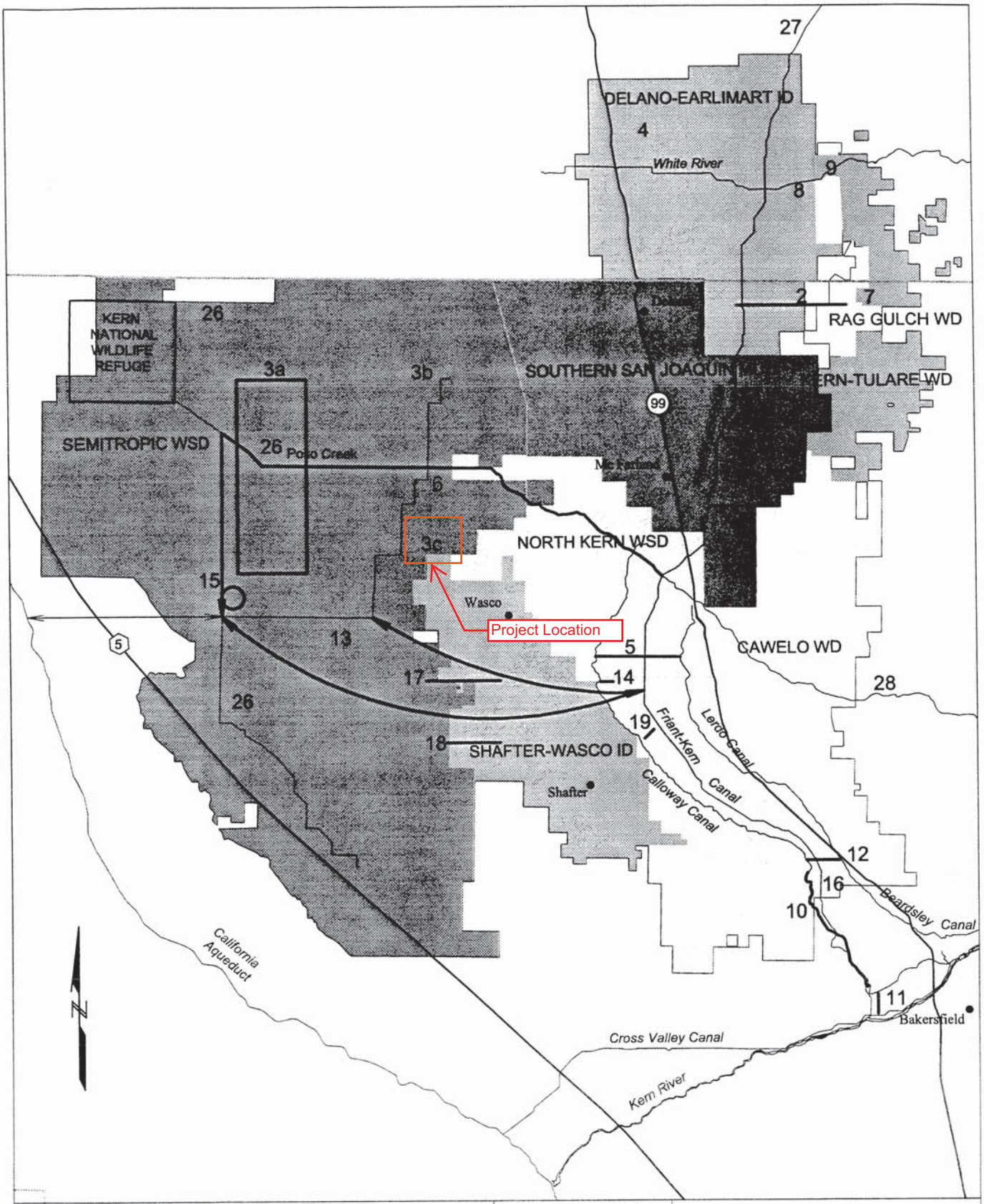
Figures

101-1 Regional Map

Attachments

References

101-1 GEI Consultants, Poso Creek Integrated Regional Water Management Plan, Appendix. D. *No. 03c New In-Lieu Service Area Enhancment of Existing "Beta" System and Interconnection with North Kern Water Storage District*, July 2007



Poso Creek Integrated Regional Water Management Plan	GEI Consultants, Bookman-Edmonston Division	Proposed Project Components
Poso Creek Regional Management Group		June 2007 Appendix D

Figure 101-1: Region Map