FACILITY DESCRIPTIONS AND UPDATED COST ESTIMATES FOR THE MID-VALLEY CANAL

Prepared by the CALFED Storage and Conveyance Refinement Team
April 25, 1997

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

D-004832

INTRODUCTION

The *Facilities Description and Updated Cost Estimates for the Mid-Valley Canal* has been prepared as part of the Storage and Conveyance Component Refinement Task of the CALFED Bay-Delta Program (CALFED or Program). CALFED's mission is to develop a long-term comprehensive plan that will restore the ecological health and improve water management for beneficial uses of the San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta) system.

This report summarizes the principal features, estimated costs, and environmental considerations of a Mid-Valley Canal Project. The general location of the Mid-Valley Canal Project is shown on Figure 1. This project would convey a replacement water supply for a portion of the current groundwater pumping on the east side of the San Joaquin Valley, supplementing existing surface water diversions and groundwater supplies. The canal could convey water to serve portions of Merced, Madera, Fresno, Kings, and Tulare Counties and, by exchange, furnish a water supply to Kern County. Water could also be provided to three existing national wildlife refuges and two state wildlife management areas.

This evaluation and others being performed by CALFED are intended to provide a facilities evaluation and updated cost estimates of representative storage and conveyance components. The objectives of the Mid-Valley Canal Project evaluation are (1) to provide updated cost estimates for the project which represent costs within the range expected if the project were to be constructed today and (2) to enable CALFED to compare this project against other projects that might be considered as part of a long-term CALFED solution strategy.

The cost estimates for the Mid-Valley Canal Project were developed by applying current unit costs to quantities found in the following reports: the December 1980 U.S. Bureau of Reclamation (Reclamation) report, *Mid-Valley Canal Feasibility Design Criteria and Cost*

Estimate; the April 1980 Reclamation report, *Mid-Valley Canal*; the December 1977 Reclamation report, *Project Cost Estimate, Delta-Mendota Canal Capacity Increase*; and the 1990 Reclamation report, *The San Joaquin Valley, California Conveyance Investigation.* These cost estimates were reviewed and adapted for this evaluation. Modification to the previous cost estimates have been made, where appropriate, to reflect current design and safety standards.

A preliminary evaluation of the environmental considerations associated with the Mid-Valley Canal has also been included in this report. Fish, wildlife, plant, and cultural resources that could be affected have been described and potential impacts have been identified. The information for evaluation of environmental considerations was gathered from existing literature and databases.

PROJECT BACKGROUND

Planning efforts to alleviate the problem of groundwater overdraft in the San Joaquin Valley began in the 1960s with the Reclamation's *East Side Division Report, Initial Phase* which recommended direct importation of supplemental water supplies from northern California through an "East Side Canal." A second report, the *Mid-Valley Canal Report* completed in 1980, also recommended imported water supplies to partially relieve the groundwater overdraft of the area through construction of the "Mid-Valley Canal." The canal was strongly supported by local users who recognized that such a facility offered a more immediate and less expensive solution than the East Side Canal. Studies were suspended, however, until 1982 when representatives from Reclamation and the newly formed Mid-Valley Water Agency (MVWA) met to discuss the water supply needs of the MVWA service area. In 1990, a study coordination team comprised of representatives from Reclamation, the California Department of Water Resources (DWR), and the MVWA studied four alternatives for providing the supplemental water to the proposed area: an Enlarged Westside Canal with a Mid-Valley Canal (Alternatives 1A, 1B, 1C); an Eastside

Canal (Alternative 2); an Eastside Canal to the San Joaquin River with a Mid-Valley Canal (Alternative 3); and a reduced Eastside Canal with a Mid-Valley Canal (Alternative 4). Alternative 1B of that study was selected for this CALFED evaluation.

FACILITIES DESCRIPTION

This section provides an overview of the major features included in the proposed Mid-Valley Canal Project. The Mid-Valley Canal Project was formulated on the assumption that there would be sufficient upstream storage and that an isolated cross-Delta conveyance facility would exist prior to commissioning the canal. An isolated through-Delta conveyance facility would reduce the amount of water needed to maintain Delta salinity standards, thereby increasing the amount available for the Mid-Valley Canal and reducing the adverse impact on Delta fisheries resulting from increased diversion from the southern Delta channels.

PROJECT LOCATION

The location of the Mid-Valley Canal is shown on Figure 1. The area encompasses portions of Merced, Madera, Fresno, Kings, and Tulare Counties on the east side of San Joaquin Valley. Principal towns in or near the area include Chowchilla, Madera, Fresno, Selma, Kingsburg, Hanford, Visalia, Exeter, Tulare, Corcoran, and Delano. The area extends from Deadman Creek southward for approximately 107 miles to the Kern County line and from the foothill line of the Sierra Nevada westward for about 45 miles. Figure 2 provides a detailed location map of the Mid-Valley Canal with locations of the major facilities.

D-004835

PROJECT DESCRIPTION

For purposes of this evaluation, the Mid-Valley Canal Project includes enlargement of the main reaches of the Delta-Mendota Canal to accommodate an additional 2,000 cubic-feet-per-second (cfs) of conveyance capacity, construction of a new concrete-lined canal for the Main Mid-Valley and North Branch Canals, and construction of additional pumping plants.

Water would be conveyed from the Clifton Court Forebay to the O'Neil Forebay through a new intake facility and an enlarged Delta-Mendota Canal. At O'Neil Forebay, water would be conveyed to the edge of the north and middle subareas of the San Joaquin Valley through an enlarged Delta-Mendota Canal to an enlarged Mendota Pool. Two new canals, the North and Main Branches of the Mid-Valley Canal, would be constructed to divert water from the Mendota Pool. The North Branch would convey water from the Mendota Pool to the terminus at the Chowchilla River. The Main Branch would convey water south from the Mendota Pool down the center of the east side of the valley and terminate at the White River.

PRINCIPAL FACILITIES

The principal facilities include a new intake facility to the Tracy Pumping Plant from Clifton Court Forebay, two additional pumping units at the Tracy Pumping Plant, 95 miles of enlarged existing canal, 140 miles of new concrete-lined canal, 11 pumping plants, and the rehabilitation of 127 bridges, 19 check structures, 12 siphons, 238 turnouts, 285 drain inlets, 8 overchutes, 33 pipe crossings, 4 wasteways, and 10 culverts. Table 1 provides a summary of the physical characteristics of each of the major features associated with the Mid-Valley Canal Project.

Intake Facilities

As highlighted in Figure 2, the intake facility of the Mid-Valley Canal Project would include construction of a new 4,200-foot intake canal from Clifton Court Forebay complete with a trashrack, fish screens, and a check structure; enlargement of a portion of the existing intake canal; and construction of a 210-inch-diameter, 775 foot-long, reinforced-concrete pipeline under the Southern Pacific Railroad and Byron-Bethany Road.

Water would flow by gravity through the trashrack and fish screens into the new intake canal. From there, the water would enter the existing intake canal--which would be enlarged--to the Tracy Pumping Plant. The existing canal would be enlarged by 2,000 cfs to accommodate a total capacity of 6,500 cfs. Figures 3a and 3b show representative canal cross-sections for the new intake canal and the enlarged portion of the existing intake canal.

Tracy Pumping Plant Addition

The Tracy Pumping Plant addition would be located on the right bank of the Delta-Mendota Intake Channel about 250 feet upstream of the existing pumping plant. The addition would be semi-automatic, controlled and operated from the existing control building, and would consist of two vertical, indoor, centrifugal pumps driven by synchronous electric motors. Each pumping unit would have a capacity of 1,000 cfs at 214 feet total pumping head and would be equipped with a 32,000 horsepower motor.

Discharge Line

A major feature of the Mid-Valley Canal Project would be a 6,700 foot-long, 19-foot-diameter, reinforced-concrete discharge pipe that would parallel the existing Tracy discharge lines. Water pumped at the Tracy Pumping Plant would discharge directly to the Delta-Mendota Canal.

Enlarged Delta-Mendota Canal

Enlarging the 66.5-mile-long Delta-Mendota Canal from the Tracy Pumping Plant discharge line to the O'Neil Forebay (that is from Milepost (MP) 3.5 to 70.0) would include raising water surface elevations from 3 to 5 feet, raising the canal embankments and the concrete lining approximately 5 feet, and rehabilitating numerous canal structures. The capacity would be increased in such a manner to keep the canal in operation during construction. Allowable fluctuation in water surface would be the same as at present and the embankment slope would remain at 1.5:1.

Increasing the capacity of the reach of the Delta-Mendota Canal between O'Neil Forebay and the Mendota Pool (MP 70.0 to 98.62) would include raising the water surface by 3 feet, raising the canal embankments and the concrete lining approximately 3 feet, constructing a new embankment and a new road, and rehabilitating some canal structures. The lower reach of the canal is earth-lined and new embankment would be needed to increase the bottom width to 125 feet. The embankment slopes would remain 2.5:1 for the earth-lined section and 1.5:1 for the concrete-lined section.

Figure 3c shows a representative canal cross-section of an enlarged Delta-Mendota Canal for the concrete-lined section of the canal. Figure 3d shows a representative canal cross-section of an enlarged Delta-Mendota Canal for the earth-lined section of the canal. The concrete-lined

D-004838

section of the enlarged Delta-Mendota Canal would have a top width ranging from 111 feet to 120 feet, a bottom width of 48 feet, and a depth of 21 to 24 feet from the normal operating water surface elevation. The earth-lined section of the enlarged Delta-Mendota Canal would have a top width of 205 feet, a bottom width of 125 feet, and a depth of 16 feet from the normal operating water surface elevation. Capacity of the canal would be enlarged by 2,000 cfs.

The canal structures to be rehabilitated as a result of enlarging both reaches of the Delta-Mendota Canal (MP 3.5 to MP 98.62) include 127 bridges, 19 check structures, 12 siphons, 238 turnouts, 285 drain inlets, 8 overchutes, 33 pipe crossings, 4 wasteways, and 10 canal culverts.

Enlarged Mendota Pool

Enlarging the Mendota Pool would require excavation of 2,300,000 cubic yards of earth to accommodate the 2,000 cfs increased flow from O'Neil Forebay. The excavation would entail deepening, rather than widening the existing Mendota Pool.

Main Branch Mid-Valley and North Branch Canals

After reaching the Mendota Pool, water would be lifted into two canals with 1,500 cfs conveyed approximately 107 miles south by the Main Mid-Valley Canal for use in Fresno, Kings, and Tulare Counties and 500 cfs delivered north by the 33-mile North Branch Canal for use in Madera and Merced Counties.

Structures for the Main Branch Mid-Valley Canal would include three concrete-lined reaches (Reaches 2, 3, and 4) and seven pumping plants. Figure 3e provides a representative canal cross section for Reaches 2, 3 and 4 of the Main Mid-Valley Canal. The canal would generally consist of a trapezoidal section with side slopes of 1.5:1. For this evaluation, the Main Mid-Valley

Canal starts at Reach 2 because Reach 1 has been commonly referred to as an alternative alignment for a new canal to convey water from O'Neil Forebay to the Mendota Pool. This evaluation includes an enlargement of the Delta-Mendota Canal for this reach of a Mid-Valley Canal project. Therefore, Reach 1, or the construction of a new canal from of O'Neil Forebay to the Mendota Pool, is not included in this evaluation.

Reach 2 of the Main Branch Mid-Valley Canal would begin at the Mendota Pool near the inlet of the enlarged Delta-Mendota Canal and would progress in a southeasterly direction for 55 miles to Peoples Weir on the Kings River near U.S. Highway 99. Five pumping plants ranging in capacity from 1,200 cfs to 1,500 cfs would provide the hydraulic head necessary for operating this section of the canal. Reach 2 would have a capacity of 1,500 cfs for much of the length of the canal, decreasing in capacity to 1,200 cfs as it approaches Peoples Weir. Reach 2 would have a top width of 61 to 67 feet, a bottom width of 20 to 22 feet, and a depth of 14 to 15 feet from the normal operating water surface elevation.

Reach 3 of the Main Branch Mid-Valley Canal would begin at Peoples Weir and would continue in a southeasterly direction for approximately 18 miles along the west side of U.S. Highway 99. Two pumping plants ranging in capacity from 700 to 800 cfs would provide the hydraulic head for operating this section of the canal. Reach 3 would then cross to the east side of the highway to a point two miles south of Visalia. With a capacity of 1,200 cfs, Reach 3 would have a top width of 61 feet, a bottom width of 20 feet, and a depth of 14 feet from the normal operating water surface elevation.

Beginning at the U.S. Highway 99 crossing, Reach 4 would continue south for about 33.5 miles, generally paralleling the highway to White River near Earlimart just north of the Kern County line. With a capacity of 700 cfs, Reach 4 would have a top width of 52 feet, a bottom width of 20 feet, and a depth of 11 feet from the normal operating water surface elevation.

The North Branch would extend from the San Joaquin River channel northeast to Deadman Creek just north of Chowchilla, a distance of approximately 33 miles. Four pumping plants ranging in capacity from 240 and 500 cfs would provide the hydraulic head necessary for operating this section of the canal. Water would be conveyed by a 500 cfs capacity, 5-mile-long, dredged channel up the San Joaquin River. An earth intake channel about 2,000 feet long would then divert the water from the deepened Mendota Pool reach to a pumping plant at the head of the concrete-lined canal. The initial canal capacity of 500 cfs would decrease to 240 cfs before siphoning under Berenda Slough. Figure 3f provides a representative canal cross-section of the North Branch. The canal would generally consist of a trapezoidal section with side slopes of 1.5:1. In addition, the North Branch would have a top width ranging from 31 to 39 feet, a bottom width of 10 to 12 feet, and a depth of 7 to 9 feet from normal operating water surface elevation.

Pumping Plants

As mentioned above, 11 new pumping plants would be required on the Main Branch Mid-Valley Canal to provide the hydraulic head necessary for operating the canal. Table 1 provides a summary of the physical features and sizes of each pumping plant. Generally, these pumping plants include three to five units ranging from 240 cfs to 1,500 cfs in capacity, from 1,200 to 10,000 horsepower, and from 13 to 36 feet in total dynamic head.

Electrical Transmission Facilities

Electrical transmission facilities would be needed for the 11 pumping plants on the Main and North Branches. This would involve a new substation addition at the Gurnsey Substation, a metering substation, a transmission line from Pumping Plant Number 1 to Pumping Plant Number 4, a transmission line to Pumping Plant Number 5, a transmission line from the Gurnsey

Substation to Pumping Plants 6 and 7, as well as a transmission line from Pumping Plant Number 1 to Pumping Plant Number 11.

COST ESTIMATE

The cost estimate for the Mid-Valley Canal is based on the December 1980 Reclamation report *Mid-Valley Canal Feasibility Design Criteria and Cost Estimate*, the April 1980 Reclamation report *Mid-Valley Canal*, and the December 1977 Reclamation report *Project Cost Estimate, Delta-Mendota Canal Capacity Increase*. Additional project costs not identified in the reports, including environmental documentation, environmental mitigation, operation and maintenance, power and interest during construction, are not included in this estimate.

COST ESTIMATE METHODOLOGY

The cost estimates developed by Reclamation have been reviewed and adapted for the present cost estimate. Several items in the previous cost estimates have been modified to ensure current design standards and safety factors were incorporated.

General

The cost estimate for the Mid-Valley Canal was determined by applying current unit costs to the quantities provided in the reports identified above. Some of the costs used were determined by escalating unit costs to October 1996 dollars using Reclamation's Construction Cost Trends (CCT) indices. Additional unit costs were developed by Bookman-Edmonston Engineering based on engineering and construction experience.

Table 2 provides a detailed breakdown of the estimated costs of a Mid-Valley Canal. An updated cost estimate for cost items identified in the previous cost estimates has been provided, along with the quantities of the cost item or an indication that the estimated cost has been developed through a lump sum approach. The table also includes the CCT indices for the month and year in which the estimated cost was developed and for October 1996. These cost indices are used to factor the previous cost estimate to October 1996 dollars. In some instances, only a unit cost has been provided with no cost indices. In these cases, the unit cost has been taken from other sources. The far right-hand column of Table 2 provides the cost reference for each cost item.

Pumping Plants

The cost estimate for the 11 pumping plants associated with the Mid-Valley Canal was based on the cost and quantities from the December 1977 Reclamation report *Project Cost Estimate, Delta-Mendota Canal Capacity Increase*. These costs were originally priced in July 1974 dollars and have been updated to October 1996 dollars using the CCT indices described above.

Right-of-Way Costs

Right-of-way costs of $3,000 per acre were used for the Mid-Valley Canal Project. The right-of-way costs were developed by Reclamation's Land Resources Branch (personal communication, February 1997). Reclamation provided land use cost estimates at a subappraisal level for all storage and conveyance components being evaluated by CALFED. A total right-of-way take of 3,616 acres would need to be acquired for this project along the 140 miles of new or expanded canal.

Contingencies and Other Costs

All contingencies and engineering, construction management, and administrative factors were determined by engineering judgment based on similar levels of cost estimation. Contingencies were chosen to be 20 percent, and engineering, construction management, and administration were chosen to be 35 percent. A cost range was developed for the project by subtracting 10 percent from the estimated capital cost for the low end cost and adding 15 percent to the estimated capital cost for the high end.

PRELIMINARY COST FINDINGS

Costs of the Mid-Valley Canal and supporting facilities have been updated to an October 1996 basis as described above. Table 3 summarizes estimated costs of the major items associated with the Mid-Valley Canal. The total cost of the Mid-Valley Canal is estimated to be about $903 million with a resulting calculated range of costs between $813 and $1,040 million.

ENVIRONMENTAL CONSIDERATIONS

[NOTE: The following "Environmental Considerations" should be reevaluated by DWR to ensure consistency with the information presented in the previous sections.]

This portion of the report provides a summary of environmental considerations related to the proposal for constructing the Mid-Valley Canal and enlarging the Delta-Mendota Canal. Fish, wildlife, plant, and cultural resources that could be affected are described, and the impacts are identified. The information presented in this section was gathered from existing literature, with limited original research. No field work was conducted for this analysis.

WILDLIFE

Food and cover for many of the native wildlife species in this area are limited. Except for a few draws and creek channels, the hot and dry climate of the San Joaquin Valley limits vegetation on the valley floor to mostly sagebrush, tumbleweed, and grasses. The impacts from this proposal are primarily associated with the loss of wildlife habitat value resulting from the construction and maintenance of new canals and conveyance facilities.

Construction of the Main Branch would result in the loss of approximately 25 acres of grassland, 280 acres of riparian habitat, 240 acres of marshlands, 1,640 acres of agricultural lands, and 500 acres of irrigated pasture.

Construction of the North Branch would result in the loss of approximately 110 acres of grassland, 660 acres of agricultural lands, and 25 acres of irrigated pasture.

Construction of the Main Branch Intertie would result in the loss of approximately 270 acres of riparian habitat, 240 acres of marshlands, 1,000 acres of agricultural lands, and 200 acres of irrigated pasture.

Enlargement of the Delta-Mendota Canal would result in the loss of approximately 135 acres of agricultural lands. The impact of enlarging the existing canal is expected to be minimal assuming that the existing right-of-way is used.

D-004845

Fish, Amphibians, Reptiles, and Invertebrates

The drainages that would be affected by the proposed conveyance components may continue to support native species such as tule perch, Sacramento sucker, riffle sculpin, and endemic minnows. Nonnative game and non-game species may also be found in drainages and channels.

General Wildlife

Historically, large amounts of land within the Tulare Lake Basin portion of the valley were marshlands. Many of the species that once occurred here have been greatly reduced in number because of habitat deterioration and replacement by farming and urban development. General wildlife that may be found throughout the drainage areas within the San Joaquin Valley include species such as California mule deer, mountain lion, golden eagle, coyote, and bobcat. Bird species found in the drainage areas include valley quail, band-tailed pigeon, dove, osprey, and red-tailed hawk.

Common mammals found in the alkali desert scrub habitats within the lower portions of the San Joaquin Valley include pocket gopher, California ground squirrel, desert cottontail, deer mouse, California vole, Hermann's kangaroo rat, black-tailed hare, striped skunk, badger, and coyote. Reptiles, such as side-blotched lizard, western whiptail, western fence lizard, gopher snake, and western rattlesnake, are commonly observed in alkali desert scrub habitat. Common birds that forage or nest in alkali desert scrub include roadrunner, mourning dove, blue-gray gnatcatcher, common raven, sage sparrow, white-crowned sparrow, house finch, American goldfinch, and lesser goldfinch.

Sensitive and Listed Fish and Wildlife Species

No special-status fish species are known to exist along the alignment of the proposed conveyance.

According to the California Department of Fish and Game's (CDFG) California Natural Diversity Data Base records (Version 8/96), 15 State or federally listed species and 19 species that are either candidates for listing or species designated by CDFG as "species of special concern" have been known to occur in the area affected by the proposed Mid-Valley Canal and Delta-Mendota Canal Enlargement.

Listed wildlife species that could be affected by the Mid-Valley Canal Main Branch component include Fresno kangaroo rat (federal/State endangered), Tipton kangaroo rat (federal/State endangered), San Joaquin kit fox (federal endangered, State threatened), blunt-nosed leopard lizard (federal/State endangered), giant garter snake (federal/State threatened), and vernal pool fairy shrimp (federal threatened).

Listed wildlife species that could be affected by the Mid-Valley Canal Main Branch Intertie component include Fresno kangaroo rat (federal/State endangered), San Joaquin kit fox (federal endangered, State threatened), giant garter snake (federal/State threatened), and vernal pool fairy shrimp (federal threatened).

Listed wildlife species that could be affected by the Mid-Valley Canal North Branch component include Swainson's hawk (State threatened), western yellow-billed cuckoo (State threatened), bank swallow (State threatened), giant garter snake (federal/State threatened), Fresno kangaroo rat (federal/State endangered), San Joaquin kit fox (federal endangered, State threatened), and blunt-nosed leopard lizard (federal/State endangered).

D-004847

Listed wildlife species that could be affected by the enlargement of the Delta-Mendota Canal include California red-legged frog (federal threatened), Aleutian Canada goose (federal threatened), Swainson's hawk (State threatened), western yellow-billed cuckoo (State threatened), bank swallow (State threatened), San Joaquin antelope squirrel (State threatened), giant kangaroo rat (federal/State endangered), Fresno kangaroo rat (federal/State endangered), San Joaquin kit fox (federal endangered, State threatened), and blunt-nosed leopard lizard (federal/State endangered).

Wildlife species that are either candidates for State or federal listing or considered species of special concern by the CDFG that could be affected by the proposed Mid-Valley Canal Main Branch component include California tiger salamander, western spade foot, burrowing owl, western pond turtle, Hopping's blister beetle, and Molestan blister beetle.

Wildlife species that are either candidates for State or federal listing or considered species of special concern by the CDFG that could be affected by the proposed Mid-Valley Canal Main Branch Intertie component include tri-colored blackbird, San Joaquin pocket mouse, western pond turtle, Hopping's blister beetle, white-faced ibis, and Molestan blister beetle.

Wildlife species that are either candidates for State or federal listing or considered species of special concern by the CDFG that could be affected by the proposed Mid-Valley Canal North Branch component include California tiger salamander, burrowing owl, western pond turtle, Hopping's blister beetle, Kern shoulderband, Buena Vista Lake shrew, and Morrison's blister beetle.

Wildlife species that are either candidates for State or federal listing or considered species of special concern by the CDFG that could be affected by the proposed enlargement of the Delta-Mendota Canal include California tiger salamander, western spade foot, prairie falcon, yellow-

D-004848

rail, burrowing owl, tri-colored blackbird, white-faced ibis, northern harrier, California mastiff bat, Sacramento splittail, San Joaquin pocket mouse, western pond turtle, California horned lizard, Molestan blister beetle, and curved foot hygrotus diving beetle.

VEGETATION

Much of the native vegetation in the San Joaquin Valley has been replaced by introduced species or has been disturbed by cultivation or grazing. Major natural vegetation classes found within the valley include grassland, sagebrush shrub, coastal shrub, and some hardwood forest-woodland. Willows, western sycamore, cottonwoods, and alder can be found along some of the area's drainages. Typical native plants that might still occur in the undisturbed areas outside the riparian zones in the Tulare Basin include those of the lower Sonoran Grassland Association and the Alkali Sink Association. However, these plants occur only in isolated areas or relatively small remaining natural areas since most of the land is extensively farmed. Some of the common grasses found here include nutgrasses, fescues, bluegrass, wild oats, California needlegrass, and foxtails. Common wildflowers include California poppy, lupine, Mariposa lily, daisy, popcorn flower, fiddleneck, and larkspur.

Sensitive and Listed Plant Species

Federal or State-listed plant species found in or adjacent to the alignments of the proposed conveyance components and in the area of the existing Delta-Mendota Canal include San Joaquin adobe sunset (proposed federal endangered, State endangered), California jewelflower (federal/State endangered), Hover's eriastrum (federal threatened), palmate-bracted bird's beak (federal/State endangered), San Joaquin woolly threads (federal endangered), Bakersfield small scale (State endangered), Delta button-celery (State threatened), and large-flowered fiddleneck (federal/State endangered).

Candidate plant species for federal listing that may occur along the proposed Mid-Valley Canal and enlarged Delta-Mendota Canal alignment include Mason's lilaeopsis, Mt. Hamilton coreopsis, caper-fruited tropidocarpum, Coulter's goldfields, heart scale, Lost Hills crown scale, San Joaquin saltbush, Ferris's milk-vetch, Mt. Diablo phacelia, diamond-petaled California poppy, recurved larkspur, hispid bird's beak, Sanford's arrowhead, Merced phacelia, spiny-sepaled button-celery, and Mason's neststraw.

Plants listed by the California Native Plant Society as being rare, threatened, or endangered in California and elsewhere that could be affected by the Mid-Valley Canal and Delta-Mendota Enlargement project include big tarweed, slough thistle, Munz's tidy-tips, showy madia, Wright's trichocoronis, brittlescale, lesser saltbush, alkali milk-vetch, California hibiscus, and Mt. Diablo buckwheat.

Several sensitive plant communities may be found along the proposed alignments of the Mid-Valley Canal components or along the existing Delta-Mendota Canal alignment. These communities include valley sink scrub, valley saltbush scrub, valley sacaton grassland, northern claypan vernal pool , alkali meadow, cismontane alkali marsh, coastal and valley freshwater marsh, Great Valley cottonwood riparian forest, Great Valley oak riparian forest, and sycamore alluvial woodland.

Special-status habitats within the proposed project's area include valley sink scrub, valley saltbush scrub, valley sacaton grassland, Great Valley cottonwood and oak riparian forests, and sycamore alluvial woodland. Also, there are four Significant Natural Areas in the islands: Mendota alkali sink, Fresno slough, east branch of Cross Creek, and Cross Creek vernal pools.

Wetlands

Wetland types that could potentially be affected by the proposed Mid-Valley Canal include emergent wet meadows, shallow and deep marshes, forested wet meadows, shrub-scrub wet meadows, and ponds. The proposed conveyance would cross four intermittent streambeds (Cross, Mill, Packwood, and Inside Creeks), 10 lower perennial stream crossings (Fresno, Chowchilla, and Kings Rivers; Elk Bayou; Outside, Deer, and Deep Creeks; and North, Middle, and South Branches of the Tule River), and five slough crossings (Ash, Berenda, Fish, Cole, and Lone Willow Sloughs).

Wetland types that could potentially be affected by the enlargement of the Delta-Mendota Canal include emergent wet meadows, emergent shallow and deep marshes, forested wetlands, and shrub-scrub wetlands. The Delta-Mendota Canal crosses 21 lower perennial streams and 58 intermittent streambeds.

Coastal and valley freshwater marshes, cismontane alkali marsh, and northern claypan vernal pools are special-status habitats that may occur in the areas affected by the proposed Mid-Valley Canal and Delta-Mendota Canal enlargement.

Cultural Resources

Two known prehistoric sites within the area would be affected by the Mid-Valley Canal Main Branch; 14 known prehistoric sites and three historic sites within the area would be affected by the Mid-Valley Canal Main Branch Intertie; and four known prehistoric sites within the area would be affected by the Mid-Valley Canal North Branch. The cultural resources that could be potentially affected by enlarging the existing Delta-Mendota Canal are unknown.

BIBLIOGRAPHY

California Department of Fish and Game, Natural Diversity Data Base, Update Version: 8/96, State of California.

California Department of Water Resources, November 1993, *State Drought Water Bank, Program Environmental Impact Report*, State of California.

U.S. Bureau of Reclamation, December 1977, *Project Cost Estimate, Delta-Mendota Canal Capacity Increase*, Department of the Interior.

U.S. Bureau of Reclamation, April 1980, *Mid-Valley Canal*, Department of the Interior.

U.S. Bureau of Reclamation, December 1980, *Mid-Valley Canal Feasibility Design Criteria and Cost Estimate*, Department of the Interior.

U.S. Bureau of Reclamation, 1990, *The San Joaquin Valley, California Conveyance Investigation*, Department of the Interior.

U.S. Bureau of Reclamation, Land Resources Branch, February 1997, personal communication, Graham McMullen, Department of the Interior.

U.S. Fish and Wildlife Service, September 1995, *Environmental Effects of Yield Increase Options, Technical Appendix #9 to the Final Least-Cost CVP Yield Increase Plan.*

U.S. Fish and Wildlife Service, September 1995, *Environmental Effects of Yield Increase Options, Technical Appendix #9A to the Final Least-Cost CVP Yield Increase Plan.*

U.S. Fish and Wildlife Service, National Wetlands Inventory Program.

U.S. Geological Survey, National Aerial Photography Program.

U.S. Geological Survey, Topographic Maps.

Table 1
SUMMARY OF PHYSICAL CHARACTERISTICS
MID-VALLEY CANAL

Intake Canal to Tracy Pumping Plant	
Length Enlarged (feet)	6,500
Length New (feet)	4,200
Southern Pacific RR/Bethany Road Crossing (feet)	775
Capacity (cfs)	6500
Tracy Pumping Plant Addition	
Number of Units Added	2
Total Combined Capacity (cfs)	2,000
Total Combined Horsepower (hp)	64,000
Total Dynamic Head (feet)	214
Discharge Pipeline	
Type	Reinforced Concrete Pipe
Length (feet)	6,700
Diameter (inches)	228
Capacity (cfs)	2,000
Enlargement of Delta-Mendota Canal	
Tracy Pumping Plant to O'Neil Forebay (MP3.5 to MP70)	
Length (miles)	66.5
Type	Concrete-lined
Capacity Increase (cfs)	2,000
Side Slope	1.5:1
Top Width (feet)	111-120
Bottom Width (feet)	48
Depth (feet)	21-24
O'Neil Forebay to Mendota Pool (MP70 to MP98.63)	
Length (miles)	28.63
Type	Combination concrete-lined/earth-lined
Capacity Increase (cfs)	2,000
Side Slope	2.5:1 (earth)/1.5:1 (concrete)
Top Width (feet)	205 (earth)/111-120 (concrete)
Bottom Width (feet)	125 (earth/48 (concrete)
Depth (feet)	16 (earth)/21-24 (concrete)
Rehabilitated Canal Structures (MP3.5 to MP98.63)	
Bridges (quantity)	127
Check Structures (quantity)	19
Siphons (quantity)	12
Turnouts (quantity)	238
Drain Inlets (quantity)	285
Overchutes (quantity)	8
Pipe Crossings (quantity)	33
Wasteways (quantity)	4
Culverts (quantity)	10

Table 1
SUMMARY OF PHYSICAL CHARACTERISTICS
MID-VALLEY CANAL

Mid-Valley Canal	
Reach 2 (Mandota Pool to People's Weir)	
Length (miles)	54.9
Type	Concrete-lined
Capacity Increase (cfs)	1,500 and 1,200
Side Slope	1.5:1
Top Width (feet)	61.22-66.55
Bottom Width (feet)	20-22
Depth (feet)	13.74-14.85
Reach 3 (People's Weir to 2 miles South of Visalia)	
Length (miles)	17.9
Type	Concrete-lined
Capacity Increase (cfs)	1,200
Side Slope	1.5:1
Top Width (feet)	61.22
Bottom Width (feet)	20
Depth (feet)	13.74
Reach 4 (2 Miles South of Visalia to White River)	
Length (miles)	33.33
Type	Concrete-lined
Capacity Increase (cfs)	700
Side Slope	1.5:1
Top Width (feet)	51.65
Bottom Width (feet)	20
Depth (feet)	10.55
North Reach (Mendota Pool to Deadman Creek)	
Length (miles)	33.4
Type	Concrete-lined
Capacity Increase (cfs)	240-500
Side Slope	1.5:1
Top Width (feet)	31-39
Bottom Width (feet)	10-12
Depth (feet)	7-9

Pumping Plants	Units	Capacity (cfs)	Horsepower	TDH (feet)
No. 1	5	1,500	7,500	25.0
No. 2	5	1,500	8,750	30.0
No. 3	5	1,500	10,000	36.0
No. 4	4	1,200	8,000	36.0
No. 5	4	1,200	7,000	31.0
No. 6	3	800	1,800	13.0
No. 7	4	700	2,800	21.0
No. 8	3	500	2,100	24.0
No. 9	3	500	2,100	24.0
No. 10	3	240	1,200	26.0
No. 11	3	240	1,200	26.0

Table 2
ESTIMATED COSTS
MID-VALLEY CANAL

DESCRIPTION	QUANTITY	UNIT	USBR INDEX	USBR INDEX OCT. 1996	UNIT COST	UNIT COST OCT. 1996	TOTAL COST OCT. 1996	COST REF.
I. INTAKE CANAL, TRACY PUMPING PLANT AND DISCHARGE LINE			APR. 1976		APR. 1976			
Structures and Improvements								
Construct and Remove Coffer Dam	JOB	LS	93	212	$91,000.00	$207,440.00	$207,000	1
Dewatering	JOB	LS	93	212	$57,000.00	$129,935.00	$130,000	1
Concrete	14,700	CY				$600.00	$8,820,000	2
Steel Superstructure, Lighting, Sanitary Facilities,								
Domestic Water System, etc.	JOB	LS	93	212	$818,222.00	$1,865,194.00	$1,865,000	1
Miscellaneous Metal Work	135,500	LB				$5.00	$675,000	2
Allowance for Unlisted Items (10%)							$1,170,000	
SUBTOTAL STRUCTURES AND IMPROVEMENTS							$12,867,000	
Waterways: Intake Canal, Discharge Line								
Excavation	174,200	CY				$2.00	$348,000	2
Backfill	37,480	CY				$4.00	$150,000	2
Compacted Backfill	18,848	CY	93	212	$7.50	$17.10	$322,000	1
Sand Cradle	5,641	CY	93	212	$20.00	$45.59	$257,000	1
Dewatering	JOB	LS	93	212	$1,800.00	$4,000.00	$4,000	1
228"-B225 RCP	1,200	LF	96	196	$1,100.00	$2,245.83	$2,695,000	1
228"-B200 RCP	1,200	LF	96	196	$1,120.00	$2,286.67	$2,744,000	1
228"-B150 RCP	2,400	LF	96	196	$1,145.00	$2,337.71	$5,611,000	1
228"-B100 RCP	800	LF	96	196	$1,195.00	$2,439.79	$1,952,000	1
228"-B50 RCP	1,100	LF	96	196	$1,225.00	$2,501.04	$2,751,000	1
Steel Pipe Liner	140	LF	93	222	$2,400.00	$5,729.03	$802,000	1
Regrade 80 Feet	JOB	LS	96	237	$1,000.00	$2,468.75	$2,000	1
Outlet Structure	JOB	LS	94	213	$77,650.00	$175,951.60	$176,000	1
Fish Collection Facilities	JOB	LS	93	212	$4,616,850.00	$10,524,432.00	$10,524,000	1
Construct SPRR & Bethany Road 775', 210" Diameter Crossing	JOB	LS	93	212	$4,263,000.00	$9,717,806.00	$9,718,000	1
Enlarge Intake Canal	3,965,128	CY				$2.00	$7,930,000	2
Check Structure	JOB	LS	94	213	$410,000.00	$929,043.00	$929,000	1
Allowance for Unlisted Items (10%)							$4,692,000	
SUBTOTAL WATERWAYS							$51,607,000	
Waterway: Pumping Units, Manifold, etc.								
Concrete	2,404	CY				$600.00	$1,442,000	2
Trashracks and Bulkhead Gates	250,000	LB				$5.00	$1,250,000	2
Steel Discharge Pipe and Manifold	368,000	LB				$4.00	$1,472,000	2
Siphon Breaker Valves - 2 Each	7,880	LB				$5.00	$39,000	2
10 Ft. Butterfly Valves with Operators	JOB	LS	93	212	$412,000.00	$939,183.00	$939,000	1
Compression Couplings	11,000	LB				$5.00	$55,000	2
Allowance for Unlisted Item (10%)							$520,000	
SUBTOTAL WATERWAY							$5,717,000	

Table 2
ESTIMATED COSTS
MID-VALLEY CANAL

DESCRIPTION	QUANTITY	UNIT	USBR INDEX	USBR INDEX OCT. 1996	UNIT COST	UNIT COST OCT. 1996	TOTAL COST OCT. 1996	COST REF.
Miscellaneous Accessories								
Accessory Electrical Equipment	JOB	LS	93	216	$1,000,000.00	$2,322,581.00	$2,323,000	1
Miscellaneous Equipment	JOB	LS	93	216	$1,012,000.00	$2,350,452.00	$2,350,000	1
Road and Road Structures	JOB	LS	96	237	$7,500.00	$18,516.00	$19,000	1
SUBTOTAL MISCELLANEOUS ACCESSORIES							$4,692,000	
Pumps and Prime Movers								
Concrete	2,600	CY				$600.00	$1,560,000	2
Vertical Pumping Units	JOB	LS	92	228	$5,720,000.00	$14,175,652.00	$14,176,000	1
SUBTOTAL PUMPS AND PRIME MOVERS							$15,736,000	
Switchyard and Substation								
Station Equipment	JOB	LS	94	190	$745,000.00	$1,505,851.00	$1,506,000	1
Poles and Fixtures	JOB	LS	94	190	$27,000.00	$54,574.00	$55,000	1
Overhead Conductors and Devises	JOB	LS	94	190	$14,800.00	$29,915.00	$30,000	1
SUBTOTAL SWITCHYARD AND SUBSTATION							$1,591,000	
SUBTOTAL INTAKE CANAL, TRACY PUMPING PLANT AND DISCHARGE LINE							$92,210,000	
II. DELTA-MENDOTA CANAL ENLARGEMENT - CONCRETE LINED (M.P. 3.5 TO M.P. 70 SECTION OF CANAL WITH BANKS RAISED TO INCREASE THE CAPACITY 2,000 CFS			OCT. 1977		OCT. 1977			
Roads and Bridges								
Canal Operation and Maintenance Roads	6,632,800	SF	102	237	$0.14	$0.33	$2,189,000	1
County Roads	JOB	LS	102	219	$45,600.00	$97,906.00	$98,000	1
County Bridges	JOB	LS	102	226	$1,556,500.00	$3,448,716.00	$3,449,000	1
Allowance for Unlisted Items (10%)							$287,000	
SUBTOTAL ROADS AND BRIDGES							$6,023,000	
Waterways								
Excavation	1,768,000	CY				$2.00	$3,536,000	2
Backfill	5,303,800	CY				$1.50	$7,956,000	2
Compacted Backfill	4,243,000	CY				$3.00	$12,729,000	2
Overhaul	12,305,000	MY	102	181	$0.25	$0.44	$5,414,000	1
Concrete Lining	75,200	CY				$80.00	$6,016,000	2
Ladder Extension	773	EA	102	212	$100.00	$207.84	$161,000	1
Allowance for Unlisted Items (5%)							$1,791,000	
SUBTOTAL WATERWAYS							$37,603,000	
Waterway Structures								
Check Structures	12	EA	102	213	$64,882.00	$135,489.00	$1,626,000	1
Westley Wasteway	JOB	LS	102	213	$533,209.00	$1,113,466.00	$1,113,000	1
Newman Wasteway	JOB	LS	102	213	$1,467,600.00	$3,064,694.00	$3,065,000	1
Volta Wasteway	JOB	LS	102	213	$1,621,630.00	$3,386,354.00	$3,386,000	1
Mountain House Siphon:								
Earthwork and Concrete	JOB	LS	102	213	$788,250.00	$1,646,051.00	$1,646,000	1

Table 2
ESTIMATED COSTS
MID-VALLEY CANAL

DESCRIPTION	QUANTITY	UNIT	USBR INDEX	USBR INDEX OCT. 1996	UNIT COST	UNIT COST OCT. 1996	TOTAL COST OCT. 1996	COST REF.
21-Ft. Dia. RCP	2,020	LF	102	213	$1,100.00	$2,297.06	$4,640,000	1
Radial Gate and Hoist	20,000	LB				$5.00	$100,000	2
Allowance for Unlisted Items (5%)							$319,000	
S.P.R.R. Siphon								
Earthwork and Concrete	JOB	LS	102	213	$157,610.00	$329,127.00	$329,000	1
18-Ft. Dia. RCP	180	LF.	102	213	$920.00	$1,921.18	$346,000	1
Remove Concrete	1,450	CY	102	213	$150.00	$313.24	$454,000	1
Temporary R.R. Bridge	JOB	LS	102	226	$550,000.00	$1,148,529.00	$1,149,000	1
Allowance for Unlisted Items (5%)							$114,000	
W.P.R.R. Siphon at Sta. L-774+06:								
Earthwork and Concrete	JOB	LS	102	213	$163,830.00	$342,116.00	$342,000	1
18-Ft. Dia. RCP	210	LF	102	213	$920.00	$1,921.18	$403,000	1
Remove Concrete	1,450	CY	102	213	$150.00	$313.24	$454,000	1
Temporary R.R. Bridge	JOB	LS	102	213	$550,000.00	$1,148,529.00	$1,149,000	1
Allowance for Unlisted Items (5%)							$117,000	
W.P.R.R. & Corral Hollow Creek Siphon:								
Earthwork and Concrete	JOB	LS	102	213	$560,900.00	$1,171,291.00	$1,171,000	1
24-Ft. Dia. RCP	820	LF.	102	213	$1,240.00	$2,589.41	$2,123,000	1
Remove Concrete	4,950	CY	102	213	$100.00	$208.82	$1,034,000	1
Temporary R.R. Bridge	JOB	LS	102	213	$550,000.00	$1,148,529.00	$1,149,000	1
Allowance for Unlisted Items (5%)							$274,000	
Hetch Hetchy Siphon:								
Earthwork and Concrete	JOB	LS	102	213	$369,175.00	$770,924.00	$771,000	1
24-Ft. Dia. RCP	430	LF	102	213	$1,240.00	$2,589.41	$1,113,000	1
Remove Concrete	2,810	CY	102	213	$125.00	$261.03	$733,000	1
Allowance for Unlisted Items (5%)							$131,000	
Puerto Creek Siphon:								
Earthwork and Concrete	JOB	LS	102	213	$408,200.00	$852,418.00	$852,000	1
17.5-Ft. Dia. RCP	690	LF	102	213	$860.00	$1,795.88	$1,239,000	1
Remove Concrete	2,950	CY	102	213	$120.00	$250.59	$739,000	1
Allowance for Unlisted Items (5%)							$142,000	
Oristimba Creek Siphon:								
Earthwork and Concrete	JOB	LS	102	213	$453,840.00	$947,725.00	$948,000	1
24-Ft. Dia. RCP	600	LF	102	213	$1,240.00	$2,589.41	$1,709,000	1
Remove Concrete	3,400	CY	102	213	$100.00	$208.82	$710,000	1
Allowance for Unlisted Items (5%)							$168,000	
Garzas Creek Siphon:								
Earthwork and Concrete	JOB	LS	102	213	$410,500.00	$857,221.00	$857,000	1
24-Ft. Dia. RCP	450	LF	102	213	$1,240.00	$2,589.41	$1,165,000	1
Remove Concrete	2,850	CY	102	213	$120.00	$250.59	$714,000	1
Allowance for Unlisted Items (5%)							$137,000	
Pipe Crossings	JOB	LS	102	213	$80,000.00	$167,059.00	$167,000	1
Turnouts	JOB	LS	102	213	$920,000.00	$1,921,176.00	$1,921,000	1

Table 2
ESTIMATED COSTS
MID-VALLEY CANAL

DESCRIPTION	QUANTITY	UNIT	USBR INDEX	USBR INDEX OCT. 1996	UNIT COST	UNIT COST OCT. 1996	TOTAL COST OCT. 1996	COST REF.
Drain Inlets:								
Concrete	238	CY				$600.00	$143,000	2
Pumps	JOB	LS	102	213	$5,817,611.00	$12,148,518.00	$12,149,000	1
Allowance for Unlisted Items (5%)							$615,000	
SUBTOTAL WATERWAY STRUCTURES							$53,626,000	
SUBTOTAL DELTA-MENDOTA CANAL ENLARGEMENT - M.P. 3.5 TO M.P. 70.0							$97,252,000	
III. DELTA-MENDOTA CANAL ENLARGEMENT - CONCRETE LINED (M.P. 70.0 TO M.P. 98.63) SECTION OF CANAL WITH BANKS RAISED AND EARTHLINED (M.P. 98.63 TO M.P. 115.61) SECTION OF CANAL WITH WIDENED AND NEW EMBANKMENT			**OCT. 1977**		**OCT. 1977**			
Land and Rights	JOB	LS	102	213	$136,500.00	$285,004.00	$285,000	1
Roads and Bridges								
Canal Operation and Maintenance Road	4,416,500	SF	102	237	$0.14	$0.33	$1,457,000	1
County Roads	JOB	LS	102	219	$348,700.00	$748,679.00	$749,000	1
Concrete Bridges	JOB	LS	102	226	$3,593,000.00	$7,960,961.00	$7,961,000	1
SUBTOTAL ROADS AND BRIDGES							$10,167,000	
Waterways								
Excavation	5,857,000	CY				$2.00	$11,714,000	2
Backfill	3,489,000	CY				$1.50	$5,234,000	2
Compacted Backfill	3,000,500	CY				$3.00	$9,002,000	2
Overhaul	1,084,500	MY	102	181	$0.25	$0.44	$477,000	1
Concrete Lining	32,500	CY				$80.00	$2,600,000	2
Ladder Extension	540	EA	102	212	$100.00	$207.84	$112,000	1
Allowance for Unlisted Items (5%)							$1,457,000	
SUBTOTAL WATERWAYS							$30,596,000	
Waterway Structures								
Check Structures	7	EA	102	213	$385,184.00	$804,355.00	$804,000	1
Firebaugh Wasteway	JOB	LS	102	213	$1,509,291.00	$3,151,755.00	$3,152,000	1
Canal Undercrossings	JOB	LS	102	213	$2,085,160.00	$4,354,305.00	$4,354,000	1
S.P.R.R. and Highway Siphon:								
Earthwork and Concrete	JOB	LS	102	213	$931,532.00	$1,945,258.00	$1,945,000	1
18-Ft. Dia. RCP	300	LF	102	213	$920.00	$1,921.18	$576,000	1
Radial Gate and Hoist	20,000	LB				$5.00	$100,000	2
Allowance for Unlisted Items (5%)							$131,000	
Miller and Lux Siphon:								
Earthwork and Concrete	JOB	LS	102	213	$334,896.00	$699,342.00	$699,000	1
18-Ft. Dia. RCP	155	LF	102	213	$920.00	$1,921.18	$298,000	1
Radial Gate and Hoist	45,000	LB				$5.00	$225,000	2
Allowance for Unlisted Items (5%)							$61,000	

Table 2
ESTIMATED COSTS
MID-VALLEY CANAL

DESCRIPTION	QUANTITY	UNIT	USBR INDEX	USBR INDEX OCT. 1996	UNIT COST	UNIT COST OCT. 1996	TOTAL COST OCT. 1996	COST REF.
Drain Inlets								
Concrete	198	CY				$600.00	$119,000	2
Pumps	JOB	LS	102	213	$519,095.00	$1,083,993.00	$1,084,000	1
Allowance for Unlisted Items (5%)							$60,000	
SUBTOTAL WATERWAY STRUCTURES							$13,608,000	
SUBTOTAL DELTA MENDOTA CANAL ENLARGEMENT - M.P. 70.0 TO M.P. 116.61							$54,656,000	
IV. **MENDOTA POOL ENLARGEMENT**			**OCT. 1977**		**OCT. 1977**			
Excavation	2,300,000	CY				$2.00	$4,600,000	2
SUBTOTAL MENDOTA POOL ENLARGEMENT							$4,600,000	
V. **MID-VALLEY CANAL - REACH 2 - DESIGN CAPACITY 1,500 CFS FROM MENDOTA POOL TO RASIN CITY AND 1,200 CFS FROM RASIN CITY TO PEOPLES' WEIR**			**JUL. 1974**		**JUL. 1974**			
Land and Rights	1,330	AC				$3,000.00	$3,990,000	2
Relocation of Existing Property								
Farm Bridges, Concrete (24)	33,600	SF.				$100.00	$3,360,000	2
County Road Bridges, Concrete (41)	198,100	SF				$100.00	$19,810,000	2
State Hwy. 41 Bridge, Concrete (1)	2,940	SF				$150.00	$441,000	2
Railroad Bridge (1)	70	LF	95	226	$900.00	$2,141.05	$150,000	1
SUBTOTAL RELOCATION OF EXISTING PROPERTY							$23,761,000	
Structures and Improvements								
Canal Fencing (Wire Mesh)	369,600	LF				$5.00	$1,848,000	2
Canal Fencing (Chain Link)	97,680	LF				$10.00	$977,000	2
Allowance for Unlisted Items (5%)							$141,000	
SUBTOTAL STRUCTURES AND IMPROVEMENTS							$2,966,000	
Waterways								
Excavation	5,700,000	CY				$2.00	$11,400,000	2
Compacted Embankment	1,700,000	CY				$0.80	$1,360,000	2
Preparing Foundation for Concrete Lining	2,000,000	CY				$1.00	$2,000,000	2
Concrete Lining	160,000	CY				$80.00	$12,800,000	2
Road Gravel	59,000	CY				$35.00	$2,065,000	2
Overhaul	240,000	MY	77	181	$0.25	$0.59	$142,000	1
Allowance for Unlisted Items (5%)							$1,488,000	
SUBTOTAL WATERWAYS							$31,255,000	
Canal Structures								
James Bypass Siphon:								
Concrete	5,500	CY				$600.00	$3,300,000	2
Allowance for Unlisted Items (5%)							$165,000	
Turnout to Kings River	JOB	LS	75	213	$162,165.00	$460,549.00	$461,000	1

Table 2
ESTIMATED COSTS
MID-VALLEY CANAL

DESCRIPTION	QUANTITY	UNIT	USBR INDEX	USBR INDEX OCT. 1996	UNIT COST	UNIT COST OCT. 1996	TOTAL COST OCT. 1996	COST REF.
Kings River Siphon and Check:								
Concrete	1,800	CY				$600.00	$1,080,000	2
Radial Gate with Operator	2	EA	75	213	$40,000.00	$113,600.00	$227,000	1
Electrical Works	JOB	LS	77	212	$16,000.00	$44,052.00	$44,000	1
Allowance for Unlisted Items (5%)							$68,000	
Canal Protective Works Culverts and Overchutes:								
Concrete	5,500	CY				$600.00	$3,300,000	2
Allowance for Unlisted Items (5%)							$165,000	
Operating Road - Asphalt Paved	110	MI	75	237	$35,000.00	$110,600.00	$12,166,000	1
SUBTOTAL CANAL STRUCTURES							$20,976,000	
SUBTOTAL MID-VALLEY REACH 2							$82,948,000	
VI. MID-VALLEY CANAL REACH 3 - DESIGN CAPACITY 1,200 CFS FROM PEOPLES' WEIR TO 2 MILES SOUTH OF VISALIA			JUL. 1974		JUL. 1974			
Land and Rights	427	AC				$3,000.00	$1,281,000	2
Relocation of Existing Property								
Farm Bridges, Concrete (15)	31,180	SF				$100.00	$3,118,000	2
County Road Bridges, Concrete (15)	44,975	SF				$100.00	$4,498,000	2
State Highway Bridge (1)	3,066	SF				$150.00	$460,000	2
Railroad Bridge (1)	73	LF	95	226	$900.00	$2,141.05	$156,000	1
Irrigation Crossings	9	EA	75	213	$16,000.00	$45,440.00	$409,000	1
SUBTOTAL RELOCATION OF EXISTING PROPERTY							$8,641,000	
Canal Right of Way Fence								
Weir Mesh Fence	178,000	LF				$5.00	$890,000	2
Chain Link Fence	10,000	LF				$10.00	$100,000	2
SUBTOTAL CANAL RIGHT OF WAY FENCE							$990,000	
Waterways								
Excavation	1,916,053	CY				$2.00	$3,832,000	2
Compacted Embankment	940,700	CY				$0.80	$753,000	2
Overhaul	4,014,235	MY	77	181	$0.25	$0.59	$2,368,000	1
Preparing Foundation for Concrete Lining	812,700	CY				$1.00	$813,000	2
Concrete Lining	67,868	CY				$80.00	$5,429,000	2
Safety Ladders	145	EA	75	213	$200.00	$568.00	$114,000	1
Allowance for Unlisted Items (5%)							$665,000	
SUBTOTAL WATERWAYS							$13,974,000	
Canal Structures								
Inlet Structures								
Concrete	553	CY				$600.00	$332,000	2
Radial Gates	675	SF	75	213	$120.00	$340.80	$230,000	1
Miscellaneous Metal Work	2,100	LB				$5.00	$11,000	2

Table 2
ESTIMATED COSTS
MID-VALLEY CANAL

DESCRIPTION	QUANTITY	UNIT	USBR INDEX	USBR INDEX OCT. 1996	UNIT COST	UNIT COST OCT. 1996	TOTAL COST OCT. 1996	COST REF.
Chain Link Fence	144	LF				$10.00	$1,000	2
Allowance for Unlisted Items (5%)							$29,000	
Siphons:								
Concrete	2,211	CY				$600.00	$1,327,000	2
Borrow	18,270	CY				$3.00	$55,000	2
Riprap	2,366	CY				$30.00	$71,000	2
Sand and Gravel Bedding	312	CY				$30.00	$9,000	2
174" Dia. Pipe	410	LF	75	213	$325.00	$923.00	$378,000	1
Jacking Pipe	410	LF	75	213	$810.00	$2,300.40	$943,000	1
Allowance for Unlisted Items (5%)							$139,000	
Canal Protective Works-Culverts and Overchutes:								
Concrete	511	CY				$600.00	$307,000	2
Sand and Gravel Bedding	130	CY				$30.00	$4,000	2
Excavation for Bathtub	23,700	CY				$2.00	$47,000	2
30" D25 Pipe	176	LF				$90.00	$16,000	2
42" D25 Pipe	176	LF				$126.00	$22,000	2
54" D25 Pipe	176	LF				$162.00	$29,000	2
57" D25 Pipe	176	LF				$171.00	$30,000	2
66" D25 Pipe	436	LF				$198.00	$86,000	2
69" D25 Pipe	176	LF				$207.00	$36,000	2
72" D25 Pipe	316	LF				$216.00	$68,000	2
Allowance for Unlisted Items (5%)							$32,000	
Operating Road	36	MI	75	237	$15,000.00	$47,400.00	$1,706,000	1
SUBTOTAL CANAL STRUCTURES							$5,908,000	
SUBTOTAL MID-VALLEY CANAL REACH 3							$30,794,000	
VII. MID-VALLEY CANAL REACH 4 - DESIGN CAPACITY 700 CFS TAGUS RANCH PUMPING PLANT TO WHITE RIVER			**JUL. 1974**		**JUL. 1974**			
Land and Rights	844	AC				$3,000.00	$2,532,000	2
Relocation of Existing Property								
Farm Bridges, Concrete (27)	31,300	SF				$100.00	$3,130,000	2
County Road Bridges, Concrete (37)	75,100	SF				$100.00	$7,510,000	2
State Highway Bridges (3)	7,300	SF				$150.00	$1,095,000	2
Railroad Bridge (1)	58	LF	95	226	$900.00	$2,141.05	$124,000	1
SUBTOTAL RELOCATION OF EXISTING PROPERTY							$11,859,000	
Structures and Improvements								
Canal Fencing (Wire Mesh)	257,664	LF				$5.00	$1,288,000	2
Canal Fencing (Chain Link)	96,096	LF				$10.00	$961,000	2
Allowance for Unlisted Items (5%)							$112,000	
SUBTOTAL STRUCTURES AND IMPROVEMENTS							$2,361,000	

Table 2
ESTIMATED COSTS
MID-VALLEY CANAL

DESCRIPTION	QUANTITY	UNIT	USBR INDEX	USBR INDEX OCT. 1996	UNIT COST	UNIT COST OCT. 1996	TOTAL COST OCT. 1996	COST REF.
Waterways								
Excavation	3,594,000	CY				$2.00	$7,188,000	2
Compacted Embankment	259,000	CY				$0.80	$207,000	2
Preparing Foundation for Concrete Lining	1,124,000	CY				$1.00	$1,124,000	2
Concrete Lining	93,000	CY				$80.00	$7,440,000	2
Allowance for Unlisted Items (5%)							$798,000	
SUBTOTAL WATERWAYS							$16,757,000	
Canal Structures								
Tule River Siphon								
Concrete	2,400	CY				$600.00	$1,440,000	2
Allowance for Unlisted Items (5%)							$72,000	
Outlet to White River:								
Concrete	85					$600.00	$51,000	2
Radial Gates with Hoists	162	SF	75	213	$120.00	$340.80	$55,000	1
Allowance for Unlisted Items (5%)							$5,000	
Check Structures	2	EA	75	213	$40,000.00	$113,600.00	$227,000	1
Culverts and Overchutes:								
Concrete	26,000	CY				$600.00	$15,600,000	2
Allowance for Unlisted Items (5%)							$780,000	
Operating Roads-Asphalt Paved	67	MI	75	237	$35,000.00	$110,600.00	$7,410,000	1
SUBTOTAL CANAL STRUCTURES							$25,640,000	
SUBTOTAL MID-VALLEY CANAL REACH 4							$59,149,000	
VIII. MID-VALLEY PUMPING PLANT NO. 1			OCT. 1974		OCT. 1974			
Structures and Improvements	JOB	LS	82	209	$1,816,000.00	$4,628,585.00	$4,629,000	1
Waterways	JOB	LS	82	209	$1,508,100.00	$3,843,816.00	$3,844,000	1
Accessory Electrical Equipment	JOB	LS	85	216	$330,000.00	$838,588.00	$839,000	1
Miscellaneous Equipment	JOB	LS	85	216	$139,760.00	$355,155.00	$355,000	1
Roads, Railroads, and Bridges	JOB	LS	81	226	$160,000.00	$446,420.00	$446,000	1
Pumps and Prime Movers	JOB	LS	78	228	$1,175,566.00	$3,436,270.00	$3,436,000	1
Switchyard and Substation	JOB	LS	85	216	$153,000.00	$388,800.00	$389,000	1
SUBTOTAL MID-VALLEY PUMPING PLANT NO. 1							$13,938,000	
IX. MID-VALLEY PUMPING PLANT NO. 2			OCT. 1974		OCT. 1974			
Structures and Improvements	JOB	LS	82	209	$1,816,000.00	$4,628,585.00	$4,629,000	1
Waterways	JOB	LS	82	209	$1,243,700.00	$3,169,918.00	$3,170,000	1
Accessory Electrical Equipment	JOB	LS	85	216	$340,000.00	$864,000.00	$864,000	1
Miscellaneous Equipment	JOB	LS	85	216	$163,760.00	$416,143.00	$416,000	1
Roads, Railroads, and Bridges	JOB	LS	81	226	$250,000.00	$697,531.00	$698,000	1
Pumps and Prime Movers	JOB	LS	78	228	$1,205,566.00	$3,523,962.00	$3,524,000	1
Switchyard and Substation	JOB	LS	85	216	$153,000.00	$388,800.00	$389,000	1
SUBTOTAL MID-VALLEY PUMPING PLANT NO. 2							$13,690,000	

Table 2
ESTIMATED COSTS
MID-VALLEY CANAL

DESCRIPTION	QUANTITY	UNIT	USBR INDEX	USBR INDEX OCT. 1996	UNIT COST	UNIT COST OCT. 1996	TOTAL COST OCT. 1996	COST REF.
X. MID-VALLEY PUMPING PLANT NO. 3			OCT. 1974		OCT. 1974			
Structures and Improvements	JOB	LS	82	209	$1,832,600.00	$4,670,895.00	$4,671,000	1
Waterways	JOB	LS	82	209	$1,280,000.00	$3,262,439.00	$3,262,000	1
Accessory Electrical Equipment	JOB	LS	85	216	$380,000.00	$965,647.00	$966,000	1
Miscellaneous Equipment	JOB	LS	85	216	$163,760.00	$416,143.00	$416,000	1
Roads, Railroads, and Bridges	JOB	LS	81	226	$160,000.00	$446,420.00	$446,000	1
Pumps and Prime Movers	JOB	LS	78	228	$1,250,566.00	$3,655,501.00	$3,656,000	1
Switchyard and Substation	JOB	LS	85	216	$259,000.00	$658,165.00	$658,000	1
SUBTOTAL MID-VALLEY PUMPING PLANT NO. 3							$14,075,000	
XI. MID-VALLEY PUMPING PLANT NO.4			OCT. 1974		OCT. 1974			
Structures and Improvements	JOB	LS	82	209	$1,583,400.00	$4,035,739.00	$4,036,000	1
Waterways	JOB	LS	82	209	$1,035,000.00	$2,637,988.00	$2,638,000	1
Accessory Electrical Equipment	JOB	LS	85	216	$320,000.00	$813,176.00	$813,000	1
Miscellaneous Equipment	JOB	LS	85	216	$159,820.00	$406,131.00	$406,000	1
Roads, Railroads, and Bridges	JOB	LS	81	226	$100,000.00	$279,012.00	$279,000	1
Pumps and Prime Movers	JOB	LS	78	228	$1,078,444.00	$3,152,375.00	$3,152,000	1
Switchyard and Substation	JOB	LS	85	216	$159,000.00	$404,047.00	$404,000	1
SUBTOTAL MID-VALLEY PUMPING PLANT NO. 4							$11,728,000	
XII. MID-VALLEY PUMPING PLANT NO. 5			OCT. 1974		OCT. 1974			
Structures and Improvements	JOB	LS	82	209	$1,577,700.00	$4,021,211.00	$4,021,000	1
Waterways	JOB	LS	82	209	$1,133,100.00	$2,888,023.00	$2,888,000	1
Accessory Electrical Equipment	JOB	LS	85	216	$280,000.00	$711,529.00	$712,000	1
Miscellaneous Equipment	JOB	LS	85	216	$159,820.00	$406,131.00	$406,000	1
Roads, Railroads, and Bridges	JOB	LS	81	226	$100,000.00	$279,012.00	$279,000	1
Pumps and Prime Movers	JOB	LS	78	228	$1,027,444.00	$3,003,298.00	$3,003,000	1
Switchyard and Substation	JOB	LS	85	216	$170,600.00	$433,525.00	$434,000	1
SUBTOTAL MID-VALLEY PUMPING PLANT NO. 5							$11,743,000	
XIII. MID-VALLEY PUMPING PLANT NO. 6			OCT. 1974		OCT. 1974			
Structures and Improvements	JOB	LS	82	209	$1,529,200.00	$3,897,595.00	$3,898,000	1
Waterways	JOB	LS	82	209	$904,000.00	$2,304,098.00	$2,304,000	1
Accessory Electrical Equipment	JOB	LS	85	216	$92,500.00	$235,059.00	$235,000	1
Miscellaneous Equipment	JOB	LS	85	216	$159,820.00	$406,131.00	$406,000	1
Roads, Railroads, and Bridges	JOB	LS	81	226	$100,000.00	$279,012.00	$279,000	1
Pumps and Prime Movers	JOB	LS	78	228	$516,563.00	$1,509,953.00	$1,510,000	1
Switchyard and Substation	JOB	LS	85	216	$108,000.00	$274,447.00	$274,000	1
SUBTOTAL MID-VALLEY PUMPING PLANT NO. 6							$8,906,000	
XIV. MID-VALLEY PUMPING PLANT NO. 7			OCT. 1974		OCT. 1974			
Structures and Improvements	JOB	LS	82	209	$1,354,508.00	$3,452,344.00	$3,452,000	1
Waterways	JOB	LS	82	209	$526,032.00	$1,340,740.00	$1,341,000	1
Accessory Electrical Equipment	JOB	LS	85	216	$122,000.00	$310,024.00	$310,000	1

Table 2
ESTIMATED COSTS
MID-VALLEY CANAL

DESCRIPTION	QUANTITY	UNIT	USBR INDEX	USBR INDEX OCT. 1996	UNIT COST	UNIT COST OCT. 1996	TOTAL COST OCT. 1996	COST REF.
Miscellaneous Equipment	JOB	LS	85	216	$105,490.00	$268,069.00	$268,000	1
Roads, Railroads, and Bridges	JOB	LS	81	226	$100,000.00	$279,012.00	$279,000	1
Pumps and Prime Movers	JOB	LS	78	228	$459,108.00	$1,342,008.00	$1,342,000	1
Switchyard and Substation	JOB	LS	85	216	$95,600.00	$242,936.00	$243,000	1
SUBTOTAL MID-VALLEY PUMPING PLANT NO. 7							$7,235,000	
XV. **MID-VALLEY CANAL NORTH BRANCH - FROM MENDOTA POOL TO DEADMAN CREEK, DESIGN CAPACITY 240 CFS TO 500 CFS**			JUL. 1974		JUL. 1974			
Land and Rights	880	AC				$3,000.00	$2,640,000	2
Relocation of Existing Property								
Farm Bridges, Concrete (34)	41,000	SF				$100.00	$4,100,000	2
County Road Bridges, Concrete (7)	13,950	SF				$100.00	$1,395,000	2
State Highway Bridges, Concrete (2)	4,780	SF				$150.00	$717,000	2
Replace Road Pavement and Detours	8	EA	75	219	$6,000.00	$17,520.00	$140,000	1
Irrigation Crossings	2	EA	75	213	$2,000.00	$5,680.00	$11,000	1
SUBTOTAL RELOCATION OF EXISTING PROPERTY							$6,363,000	
Structures and Improvements:								
Canal Fencing (Wire Mesh)	264,000	LF				$5.00	$1,320,000	2
Canal Fencing (Chain Link)	95,040	LF				$10.00	$950,000	2
Allowance for Unlisted Items (5%)							$114,000	
SUBTOTAL STRUCTURES AND IMPROVEMENTS							$2,384,000	
Waterways								
Dredging	500,000	CY				$2.00	$1,000,000	2
Excavation	1,793,000	CY				$2.00	$3,586,000	2
Compacted Embankment	1,023,000	CY				$0.80	$818,000	2
Preparing Foundation for Concrete Lining	789,000	CY				$1.00	$789,000	2
Overhaul	585,000	MY	77	181	$0.25	$0.59	$342,000	1
Concrete Lining	66,000	CY				$80.00	$5,280,000	2
Safety Ladders	65	EA	75	213	$200.00	$616.00	$40,000	1
Allowance for Unlisted Items (5%)							$593,000	
SUBTOTAL WATERWAYS							$12,448,000	
Canal Structures								
Intake Structure								
Concrete	80	CY				$600.00	$48,000	2
Riprap	100	CY				$30.00	$3,000	2
Sand and Gravel Bedding	30	CY				$30.00	$1,000	2
Allowance for Unlisted Items (5%)							$3,000	
Siphons								
Concrete	4,000	CY				$600.00	$2,400,000	2
Gates and Hoists	16,000	LB				$5.00	$80,000	2

Table 2
ESTIMATED COSTS
MID-VALLEY CANAL

DESCRIPTION	QUANTITY	UNIT	USBR INDEX	USBR INDEX OCT. 1996	UNIT COST	UNIT COST OCT. 1996	TOTAL COST OCT. 1996	COST REF.
Jacking 84" Dia. Pipe	4,000	LB				$5.00	$20,000	2
Allowance for Unlisted Items (5%)	330	LF				$1,512.00	$499,000	2
Outlet Structure								
Concrete	60	CY				$600.00	$36,000	2
Riprap	200	CY				$30.00	$6,000	2
Sand and Gravel Bedding	65	CY				$30.00	$2,000	2
Gates and Hoists	4,000	LB				$5.00	$20,000	2
Miscellaneous Metal Work	1,000	LB				$5.00	$5,000	2
Allowance for Unlisted Items (5%)							$3,000	
Culverts and Overchutes								
Concrete	3,900	CY				$600.00	$2,340,000	2
Riprap	1,700	CY				$30.00	$51,000	2
Sand and Gravel Bedding	600	CY				$30.00	$18,000	2
Hauling Spoil	39,000	MY	77	181	$0.25	$0.59	$23,000	1
Gates and Hoists	7,600	LB				$5.00	$38,000	2
Miscellaneous Metal Work	2,000	LB				$5.00	$10,000	2
Removing Existing Structure	JOB	LS	75	213	$2,000.00	$5,680.00	$6,000	1
Allowance for Unlisted Items (5%)							$124,000	
Gravel for Operating Road	80,000	CY				$50.00	$4,000,000	
SUBTOTAL CANAL STRUCTURES							$9,736,000	
SUBTOTAL MID-VALLEY CANAL NORTH BRANCH							$33,721,000	
XVI. MID-VALLEY PUMPING PLANT NO. 8			JAN. 1977		JAN. 1977			
Structures and Improvements	JOB	LS	98	209	$1,250,000.00	$2,665,816.00	$2,666,000	1
Waterways	JOB	LS	98	209	$1,200,000.00	$2,559,184.00	$2,559,000	1
Accessory Electrical Equipment	JOB	LS	98	216	$136,000.00	$299,755.00	$300,000	1
Miscellaneous Equipment	JOB	LS	98	216	$121,900.00	$268,678.00	$269,000	1
Roads, Railroads, and Bridges	JOB	LS	98	226	$120,000.00	$276,735.00	$277,000	1
Pumps and Prime Motors	JOB	LS	98	228	$407,935.00	$949,073.00	$949,000	1
Switchyard and Substation	JOB	LS	98	216	$108,000.00	$238,041.00	$238,000	1
SUBTOTAL MID-VALLEY PUMPING PLANT NO. 8							$7,258,000	
XVII. MID-VALLEY PUMPING PLANT NO. 9			JAN. 1977		JAN. 1977			
Structures and Improvements	JOB	LS	98	209	$1,250,000.00	$2,665,816.00	$2,666,000	1
Waterways	JOB	LS	98	209	$460,000.00	$981,020.00	$981,000	1
Accessory Electrical Equipment	JOB	LS	98	216	$105,000.00	$231,429.00	$231,000	1
Miscellaneous Equipment	JOB	LS	98	216	$121,900.00	$268,678.00	$269,000	1
Roads, Railroads, and Bridges	JOB	LS	98	226	$48,000.00	$110,694.00	$111,000	1
Pumps and Prime Motors	JOB	LS	98	228	$396,935.00	$923,481.00	$923,000	1
Switchyard and Substation	JOB	LS	98	216	$108,000.00	$238,041.00	$238,000	1
SUBTOTAL MID-VALLEY PUMPING PLANT NO. 9							$5,419,000	

Table 2
ESTIMATED COSTS
MID-VALLEY CANAL

DESCRIPTION	QUANTITY	UNIT	USBR INDEX	USBR INDEX OCT. 1996	UNIT COST	UNIT COST OCT. 1996	TOTAL COST OCT. 1996	COST REF.
XVIII MID-VALLEY PUMPING PLANT NO. 10			JAN. 1977		JAN. 1977			
Structures and Improvements	JOB	LS	98	209	$220,000.00	$469,184.00	$469,000	1
Waterways	JOB	LS	98	209	$200,000.00	$426,531.00	$427,000	1
Accessory Electrical Equipment	JOB	LS	98	216	$69,000.00	$152,082.00	$152,000	1
Roads, Railroads, and Bridges	JOB	LS	98	226	$48,000.00	$110,694.00	$111,000	1
Pumps and Prime Motors	JOB	LS	98	228	$170,000.00	$395,510.00	$396,000	1
Switchyard and Substation	JOB	LS	98	216	$95,400.00	$210,270.00	$210,000	1
SUBTOTAL MID-VALLEY PUMPING PLANT NO. 10							$1,765,000	
XIX. MID-VALLEY PUMPING PLANT NO. 11			JAN. 1977		JAN. 1977			
Structures and Improvements	JOB	LS	98	209	$220,000.00	$469,184.00	$469,000	1
Waterways	JOB	LS	98	209	$200,000.00	$426,531.00	$427,000	1
Accessory Electrical Equipment	JOB	LS	98	216	$69,000.00	$152,082.00	$152,000	1
Roads, Railroads, and Bridges	JOB	LS	98	226	$67,200.00	$154,971.00	$155,000	1
Pumps and Prime Motors	JOB	LS	98	228	$170,000.00	$395,510.00	$396,000	1
Switchyard and Substation	JOB	LS	98	216	$95,400.00	$210,270.00	$210,000	1
SUBTOTAL MID-VALLEY PUMPING PLANT NO. 11							$1,809,000	
XX. GURNSEK SUBSTATION ADDITION			JAN. 1975		JAN. 1975			
Land and Rights	JOB	LS	85	212	$1,000.00	$2,494.00	$2,000	1
Station Equipment	JOB	LS	86	228	$44,800.00	$118,772.00	$119,000	1
SUBTOTAL GURNSEK SUBSTATION ADDITION							$121,000	
XXI. METERING SUBSTATION			JAN. 1975		JAN. 1975			
Station Equipment	JOB	LS	85	212	$23,600.00	$58,861.00	$59,000	1
SUBTOTAL METERING SUBSTATION							$59,000	
XXII. PUMPING PLANT NO. 1 TO PUMPING PLANT NO. 4 TRANSMISSION LINE			JAN. 1975		JAN. 1975			
Poles and Fixtures	JOB	LS	86	209	$264,000.00	$641,581.00	$642,000	1
Overhead Conductors and Devices	JOB	LS	86	209	$216,000.00	$524,930.00	$525,000	1
SUBTOTAL PUMPING PLANT NO. 1 TO PUMPING PLANT NO. 4 TRANSMISSION LINE							$1,167,000	
XXIII PUMPING PLANT NO. 5 TRANSMISSION LINE			JAN. 1975		JAN. 1975			
Land and Rights	JOB	LS	85	212	$3,000.00	$7,482.00	$7,000	1
Poles and Fixtures	JOB	LS	86	209	$13,000.00	$31,593.00	$32,000	1
Overhead Conductors and Devices	JOB	LS	86	209	$11,000.00	$26,732.00	$27,000	1
SUBTOTAL PUMPING PLANT NO. 5 TRANSMISSION LINE							$66,000	
XXIV GURNSEY TO PUMPING PLANTS NO. 6 AND NO. 7 TRANSMISSION LINE			JAN. 1975		JAN. 1975			
Land and Rights	JOB	LS	85	212	$110,000.00	$274,352.00	$274,000	1
Clearing Land and Right of Way	JOB	LS	85	212	$43,000.00	$107,247.00	$107,000	1
Poles and Fixtures	JOB	LS	86	209	$297,000.00	$721,779.00	$722,000	1
Conductors and Devices	JOB	LS	86	209	$243,000.00	$590,547.00	$591,000	1
SUBTOTAL GURNSEY TO PUMPING PLANTS NO. 6 AND NO. 7 TRANSMISSION LINE							$1,694,000	

Table 2
ESTIMATED COSTS
MID-VALLEY CANAL

DESCRIPTION	QUANTITY	UNIT	USBR INDEX	USBR INDEX OCT. 1996	UNIT COST	UNIT COST OCT. 1996	TOTAL COST OCT. 1996	COST REF.
XXV. PUMPING PLANT NO. 1 TO PUMPING PLANT NO. 11 TRANSMISSION LINE			JAN. 1975		JAN. 1975			
Poles and Fixtures	JOB	LS	86	212	$363,000.00	$894,837.00	$895,000	1
Overhead Conductors and Devices	JOB	LS	86	209	$297,000.00	$721,779.00	$722,000	1
SUBTOTAL PUMPING PLANT NO. 1 TO PUMPING PLANT NO. 11 TRANSMISSION LINE							$1,617,000	
SUBTOTAL							$557,600,000	
CONTINGENCIES @ 20 %							$111,500,000	
ESTIMATED CONSTRUCTION COST							$669,100,000	
ENG., LEGAL, AND ADM. @ 35 %							$234,200,000	
TOTAL CAPITAL COST							$903,300,000	
ESTIMATED CAPITAL COST RANGE								
LOW (-10 %)							$813,000,000	
HIGH (+ 15 %)							$1,039,000,000	

Footnote:

*LS=lump sum; CY=cubic yard; LB=pound; LF=linear foot; SF=square foot; MY=mile-yard; EA=each; AC=acre; MI=mile;

Cost References:

1. U.S. Bureau of Reclamation, *Mid-Valley Canal Feasibility Design Criteria and Cost Estimate,* December 1980.
2. Costs Developed by Bookman-Edmonston Engineering.
3. U.S. Bureau of Reclamation, Land Resources Branch, Graham McMullen, February 1997.

Table 3
SUMMARY OF ESTIMATED COSTS
MID-VALLEY CANAL

Cost Item	Estimated Costs ($Million)
Intake Canal, Tracy Pumping Plant and Discharge Line	92.2
Delta-Mendota Canal Enlargement--Concrete-Lined (MP 3.5 to 70.0)	97.3
Delta-Mendota Canal Enlargement--Concrete-Lined (MP 7.0 to 98.63)	54.7
Mendota Pool Enlargement	4.6
Mid-Valley Canal--Reach 2	83.0
Mid-Valley Canal--Reach 3	30.8
Mid-Valley Canal--Reach 4	59.2
Mid-Valley Pumping Plant No. 1	14.0
Mid-Valley Pumping Plant No. 2	13.7
Mid-Valley Pumping Plant No. 3	14.1
Mid-Valley Pumping Plant No. 4	11.7
Mid-Valley Pumping Plant No. 5	11.7
Mid-Valley Pumping Plant No. 6	8.9
Mid-Valley Pumping Plant No. 7	7.2
Mid-Valley Canal--North Branch	33.7
Mid-Valley Pumping Plant No. 8	7.3
Mid-Valley Pumping Plant No. 9	5.4
Mid-Valley Pumping Plant No. 10	1.8
Mid-Valley Pumping Plant No. 11	1.8
Gurnsey Substation Addition	0.1
Metering Substation	0.059
Pumping Plant No. 1 to No. 4 Transmission Line	1.1
Pumping Plant No. 5 Transmission Line	0.066
Gurnsey to Pumping Plants No. 6 and No. 7 Transmission Line	1.6
Pumping Plant No. 1 to No. 11 Transmission Line	1.6
SUBTOTAL	557.6
Contingencies (20%)	111.5
ESTIMATED CONSTRUCTION COST	669.1
Engineering, Legal, and Project Administration (35%)	234.2
ESTIMATED TOTAL CAPITAL COST	903.3
Capital Cost Range (minus 10% - plus 15%)	$813 - $1,039

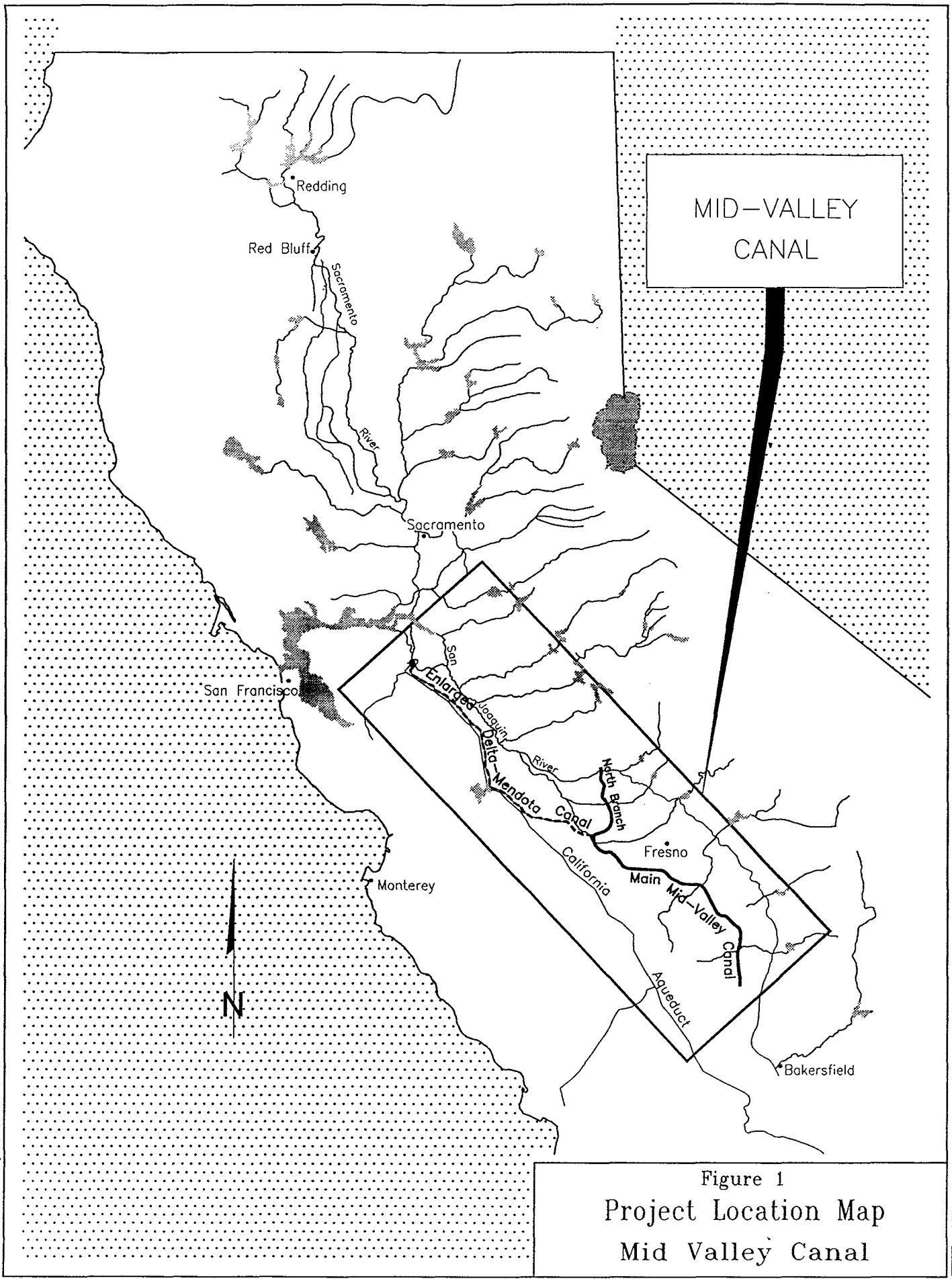


Figure 1

Project Location Map

Mid Valley Canal

S:\UWG\CalFed\B\loc-b3.dwg 3/28/97

CALFED BAY-DELTA PROGRAM

D—004869

D-004870

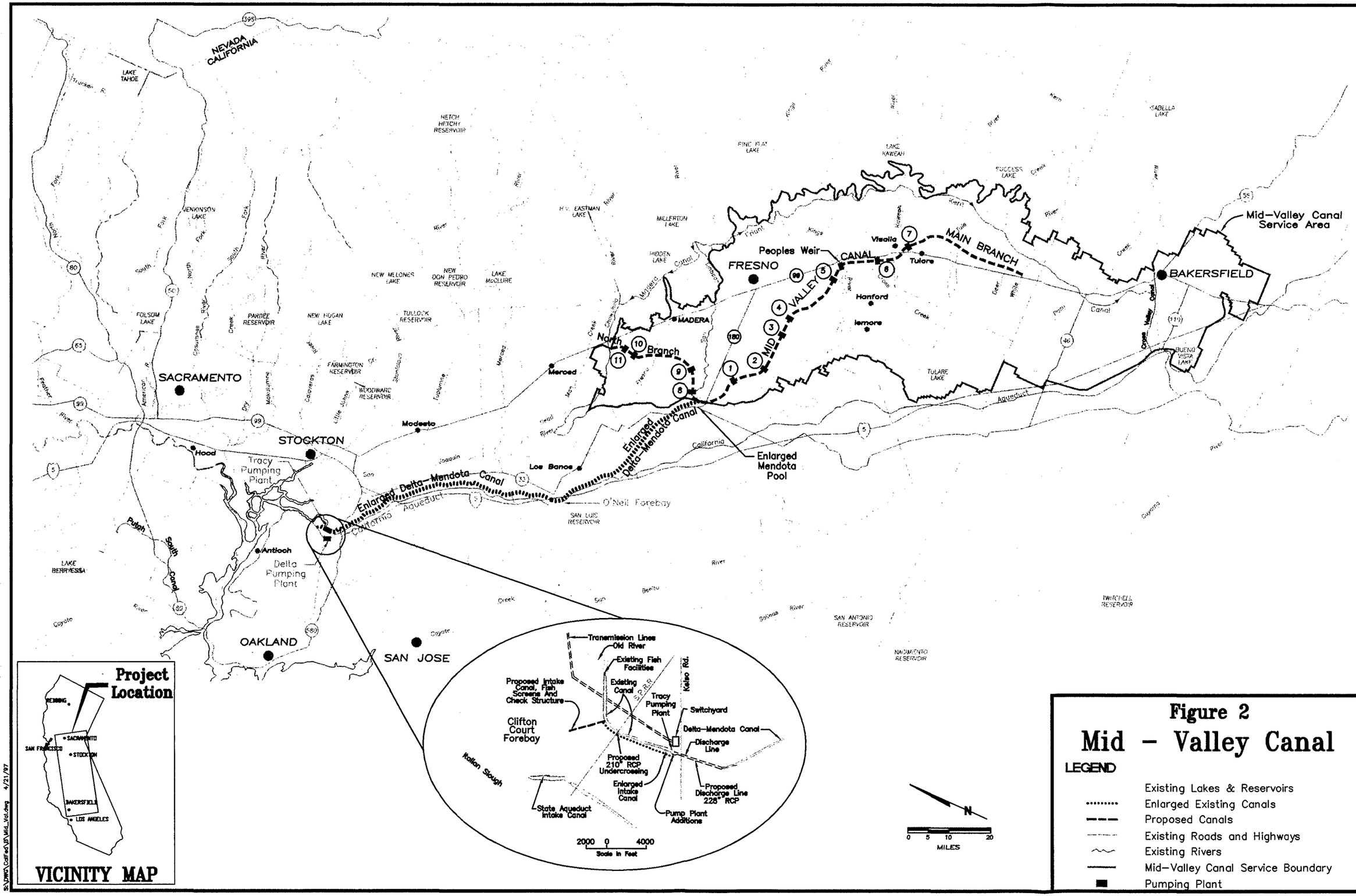


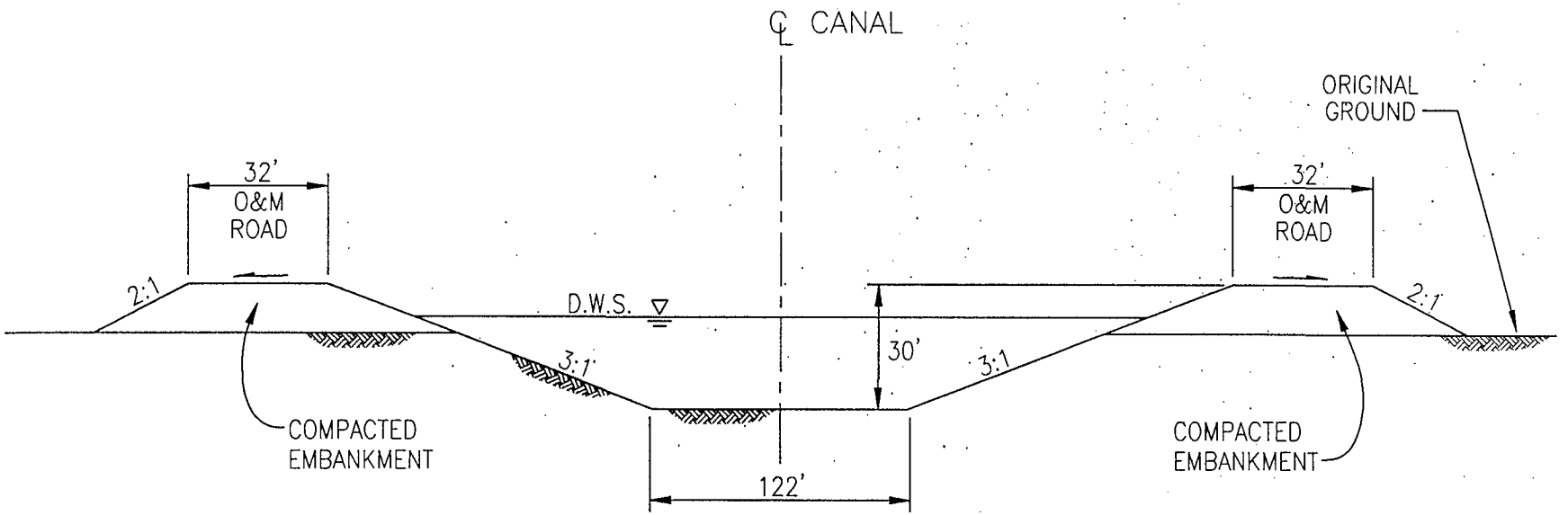
Figure 2
Mid – Valley Canal

LEGEND

- Existing Lakes & Reservoirs
- Enlarged Existing Canals
- Proposed Canals
- Existing Roads and Highways
- Existing Rivers
- Mid—Valley Canal Service Boundary
- Pumping Plant

S:\DWR\CalFed\VA\Mid_Val.dwg 4/21/97

CALFED BAY-DELTA PROGRAM



NEW INTAKE CANAL

(From Clifton Court Forebay To Intersection With Enlarged Existing Canal)

NOT TO SCALE

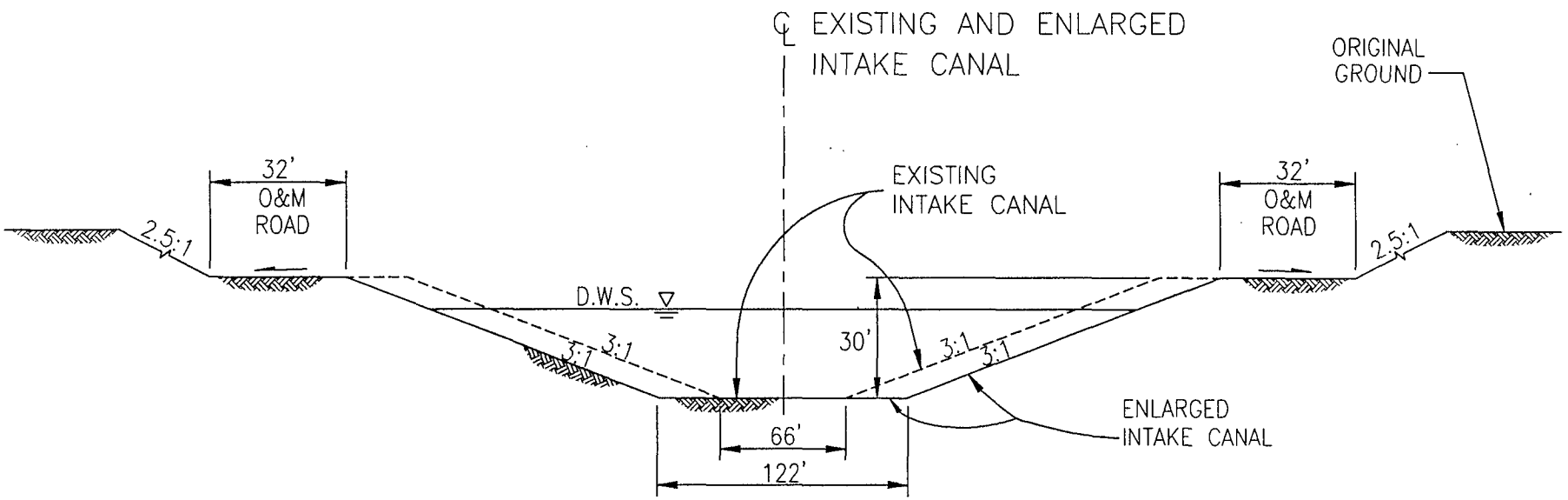
Figure 3a

Mid-Valley Canal

Typical Canal Section

CALFED BAY-DELTA PROGRAM

S:\DWG\CalFed\B\MIDVALX.dwg 4/21/97



ENLARGEMENT OF A PORTION OF
THE EXISTING INTAKE CANAL
(From Intersection To New Canal
To The Tracy Pumping Plant)
NOT TO SCALE

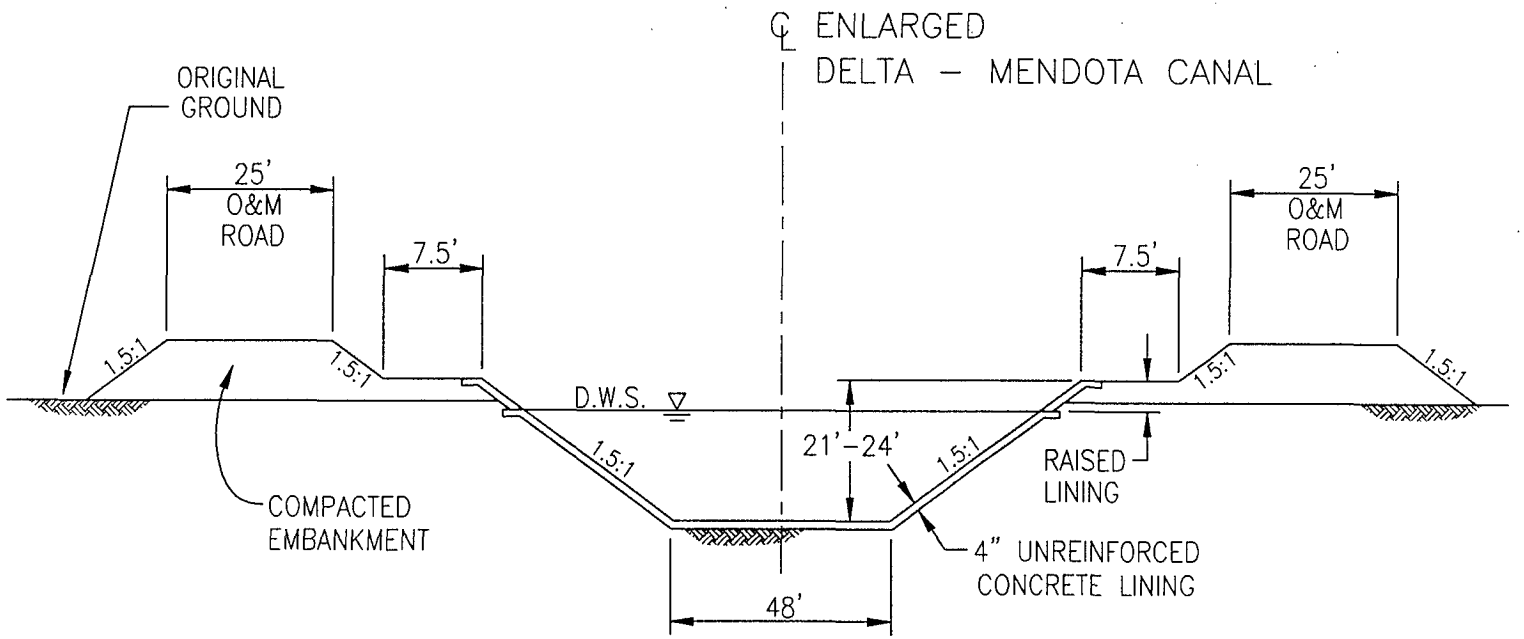
Figure 3b
Mid-Valley Canal
Typical Canal Section

CALFED BAY-DELTA PROGRAM

D-004873

D-004872

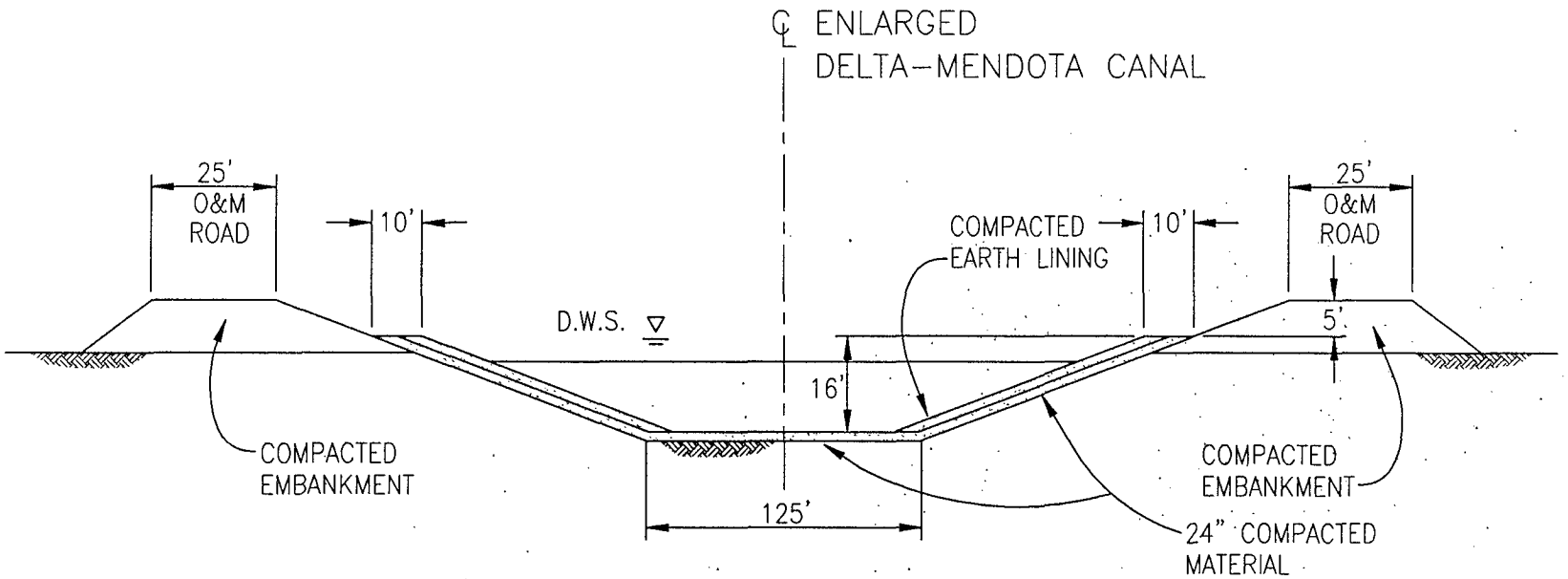
S:\DWG\CalFed\B\MIDVALX.dwg 4/21/97



ENLARGED DELTA–MENDOTA CANAL
CONCRETE LINED SECTIONS
NOT TO SCALE

Figure 3c
Mid–Valley Canal
Typical Canal Section

CALFED BAY–DELTA PROGRAM



ENLARGED DELTA–MENDOTA CANAL

EARTH LINED SECTIONS

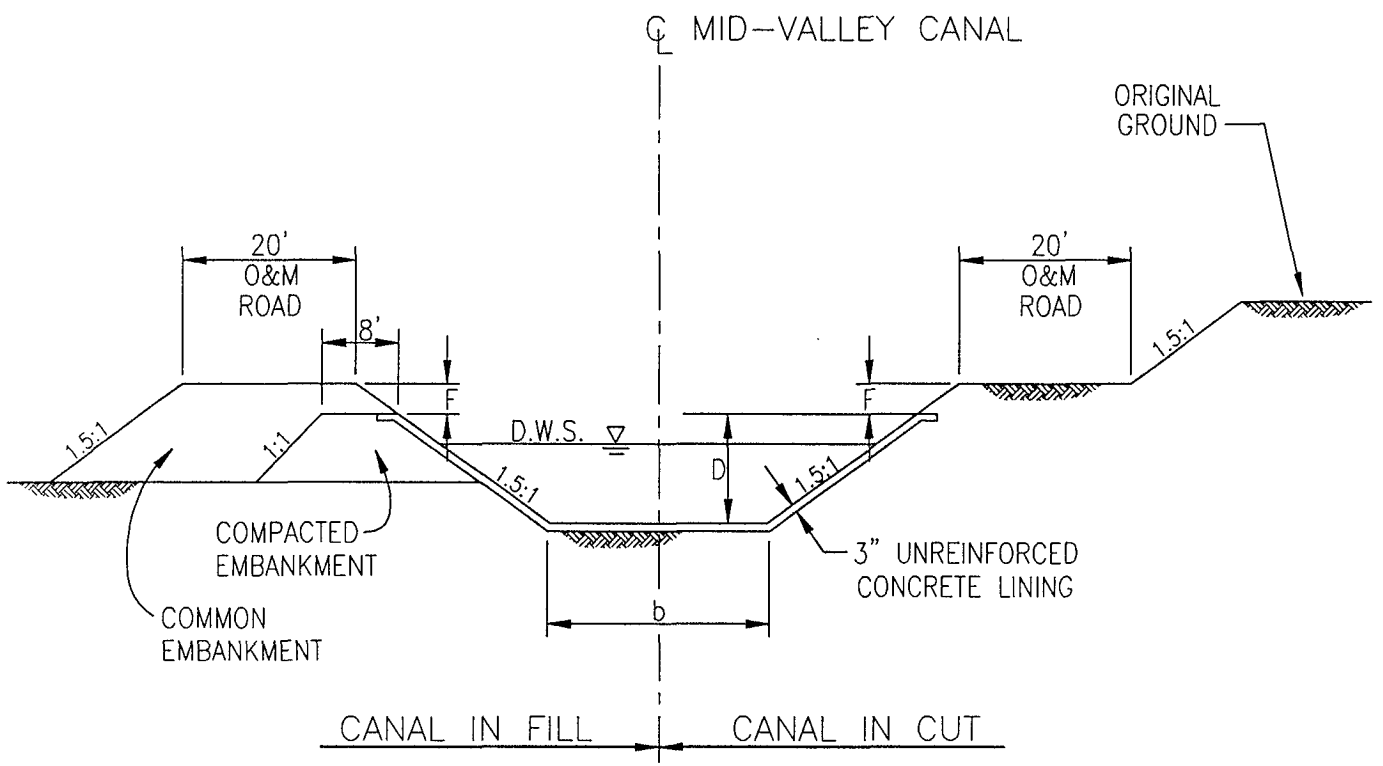
NOT TO SCALE

Figure 3d

Mid–Valley Canal

Typical Canal Section

CALFED BAY-DELTA PROGRAM



MID-VALLEY CANAL MAIN BRANCH
REACHES 2,3,4

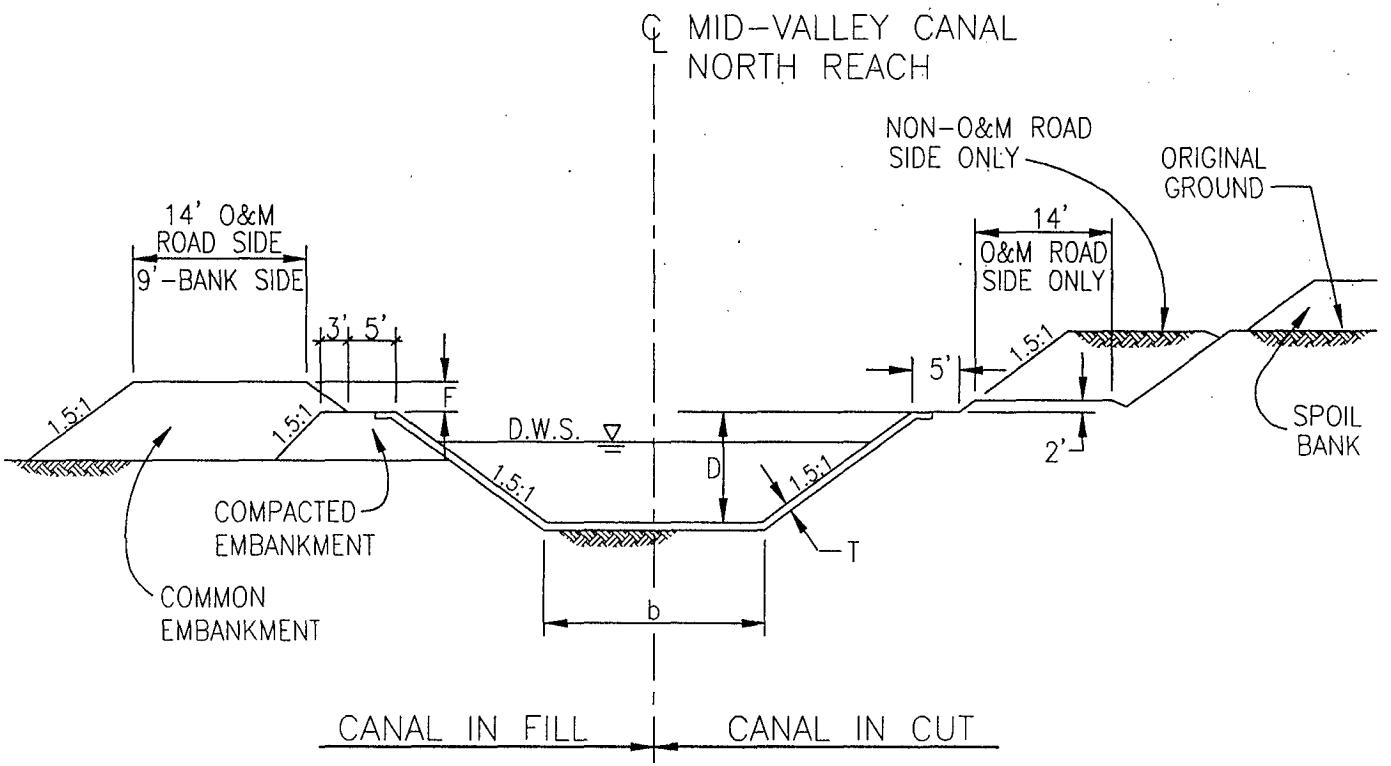
NOT TO SCALE

REACH	Q	b	D	F
2	1500 cfs	22'	14.85'	3.9'
	1200 cfs	20'	13.74'	3.7'
3	1200 cfs	20'	13.74'	2.0'
4	700 cfs	20'	10.55'	1.9'

Figure 3e

Mid-Valley Canal

Typical Canal Section



MID-VALLEY CANAL
NORTH BRANCH
NOT TO SCALE

Q	b	D	F	T
500 cfs	12'	9'	–	3"
500 cfs	12'	9'	3.5'	3"
240 cfs	10'	7'	3.5'	2"

Figure 3f
Mid-Valley Canal
Typical Canal Section

CALFED BAY-DELTA PROGRAM