CHAPTER IV G

Grassland Resource Conservation District Alternative Plans

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
MID-PACIFIC REGION

CHAPTER IV G

GRASSLAND RESOURCE CONSERVATION DISTRICT

The Grassland Resource Conservation District (GRCD) is comprised of 75,000 acres of land which contains the Grassland Water District (GWD), including 165 hunting clubs; Kesterson National Wildlife Refuge (NWR); Volta Wildlife Management Area (WMA); Los Banos WMA; and privately owned wetlands, as shown in Figure IV G-1. The GRCD includes 60,000 acres of privately-owned hunting clubs, 12,000 acres of land owned by the Federal and state governments, and 3,000 acres of cropland. The GRCD is presided over by the Grassland Resource Conservation Board whose members are elected by the people who reside within the boundaries of GRCD.

This area, commonly referred to as the West Grasslands, represents the largest contiguous block of wetlands remaining in the Central Valley and is a major wintering ground for the migratory waterfowl of the Pacific Flyway. Up to 30 percent of the Pacific Flyway wintering population of duck species use this area.

These wetlands are the remnants of a much larger seasonal wetlands complex that historically extended throughout the Central Valley. The wetlands are characterized as shallow wetlands that maintain standing waters during the rainy season but are depleted of soil moisture during the summer. The Service ranked the habitat provided by the GRCD as the most important wetlands in the San Joaquin Valley.

Management of portions of the GRCD wetland habitat has been assisted since 1972 through the Water Bank Program which provides financial incentive to participating landowners to maintain their land as wetland habitat, as well as providing technical assistance from various State and Federal agencies. Recently, the program has been broadened to encourage increased production of food plants for waterfowl (ESA, 1987). Because of limited funding, an average of 15,000 acres have historically been allowed to participate in the program each year. In addition, severely restricted supplies of uncontaminated water have further reduced the landowner's ability to take advantage of the program since 1985.

Although an overall management plan does not exist, the GRCD management objectives encourage food plant and habitat production, primarily swamp timothy and wild millet. Land uses within GRCD included seasonally flooded inland marshes, permanent pasture, seasonally flooded native pasture, and agricultural crops.

To preserve waterfowl habitat, perpetual easements on about 26,000 acres within the GRCD have been purchased by the Service. These easements authorize the Service to restrict land uses that would diminish waterfowl habitat. The purpose of the easement

acquisition is to assure that wintering habitat will continue to be preserved and managed for migratory waterfowl (GWD, 1987). Participation in the easement program does not guarantee or provide the landowner with a water supply to manage the property for waterfowl habitat.

A. WATER RESOURCES

Within the non-refuge portions of GRCD, 70 to 80 percent of the acreage is managed to provide habitat for wintering waterfowl. The agricultural lands only receive drain water and are managed for permanent pasture and other agricultural crops such as sugar beets, alfalfa, and cotton. Any wetland areas within GWD which are converted to agriculture uses are not eligible to use CVP water available from GWD.

Approximately 70 to 80 percent of the lands in GWD and other non-refuge areas are flooded from mid-September to January 15 to an average depth of 18 inches. Some owners drain their land shortly after the hunting season ends in mid-January. However, recognizing the need to provide later winter habitat, GWD has encouraged the landowners to retain the water beyond the end of the hunting season. As a result, there are an increasing number of owners who do not release the water until mid-March or the first of April. Around May 15 of each year, a few areas with uncontaminated water supplies are flood irrigated with about six to eight inches of water for five to ten days to stimulate the growth of waterfowl food plants. If water is available, some owners also irrigate in June or July.

1. Surface Waters

In 1953, as settlement of a water rights claim by Grasslands area interests, 50,000 acre-feet per year of CVP water was made available for use in GWD. The GWD was formed under the California Water Code in 1953 to provide a legal entity to contract for the 50,000 acre-feet per year and to assume responsibility for the distribution of water and maintenance of facilities within the district. The contract limits delivery of this water to the period between September 15 and November 30.

In 1963, GWD initiated a successful protest of the Reclamation's water right for the Los Banos Creek project and received an additional 3,500 acre-feet of CVP water annually. By subsequent agreements, GWD's water was made available from Reclamation at no cost with the following conditions: 1) that GWD maintain at least 80 percent of the district land in wildlife habitat (GWD, 1987), and 2) that GWD supply to the Service not less than 3500 acre-feet of water during the period from October 1 through November 30 of each year. Consequently, the total amount of firm water available to the private wetlands was again reduced to 50,000 acre-feet annually.

To supplement this supply and to provide water for the balance of the year, the GRCD has used agricultural return flows, operational

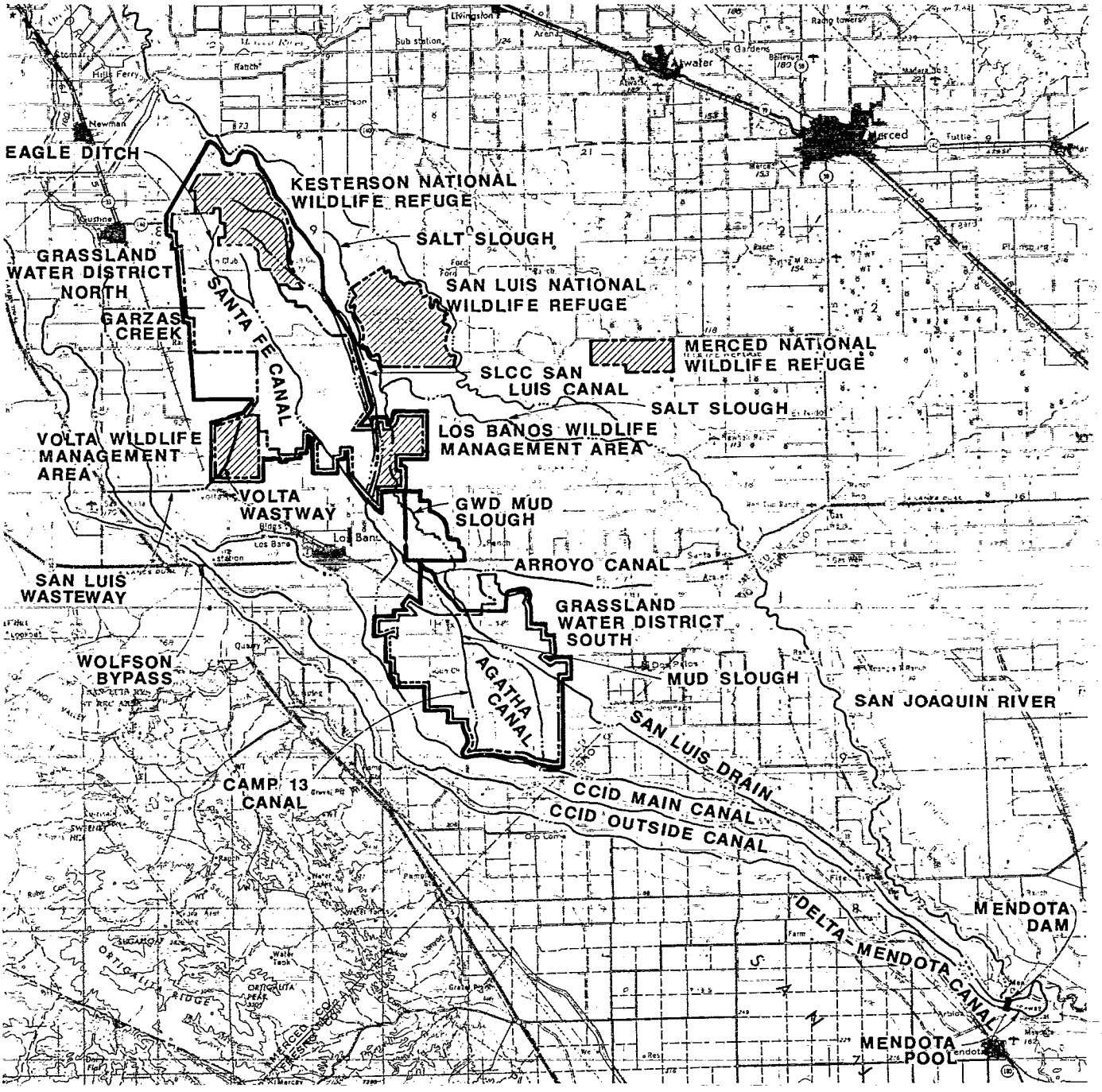


FIGURE IV G-1

GRASSLAND RESOURCE CONSERVATION DISTRICT

EXISTING WATER SUPPLY FACILITIES

C-068228

spill flows from upslope irrigation and water districts, and wells to a very limited extent. Private wetlands within GRCD but outside of boundaries of GWD, are totally dependent upon the receipt of agricultural return flows from neighboring farm lands, water from deep wells, or where feasible, have contracted for the delivery of water from other local water agencies.

The Kesterson Problem. During the spring and summer of 1983, serious waterfowl reproductive problems were observed involving the twelve 100-acre ponds on the Kesterson NWR, which is within the GRCD boundary. Studies revealed that selenium toxicity was a suspected cause of these problems.

The Kesterson ponds served as the terminus for Reclamation's San Luis Drain. The San Luis Drain was designed to remove subsurface irrigation drainage waters from portions of San Joaquin Valley farmlands. An undetermined acreage of these irrigated lands is thought to be the source of the selenium contamination that is causing the toxicity at the Kesterson ponds.

In 1984, shortly after reproductive problems were identified at the refuge, a hazing operation was initiated to discourage waterfowl from using the area. In 1985, the State Water Resources Control Board issued a cleanup and abatement order, which was followed by a cleanup and closure order from the Secretary of the Interior. Although complete implementation of these orders may take up to several years, the value of the Kesterson pond habitat to waterfowl has been lost.

The Kesterson problem has created an uncertain future for other projects in the Valley that involve using subsurface irrigation drainage waters to create waterfowl habitat. In the Grassland area, 148,000 acre-feet of drainage water had been used annually for maintaining waterfowl habitat (USBR, 1986d). However, upon the discovery that much of the subsurface drain waters entering the area contain harmful amounts of selenium and other contaminants, the use of this water has been discontinued. This has caused perhaps as much as two-thirds of the former water supply to no longer be useable for waterfowl habitat.

Beginning in 1986, a series of one year temporary contracts was implemented with Reclamation to provide a supplemental water supply of up to 100,000 acre-feet annually to lands within GWD. However, the cost ($12/acre-foot) precluded use of the water on a widespread basis. More significantly the unavailability of capacity in the DMC has hampered efforts to deliver this water on a continuing basis.

2. Water Conveyance Facilities

The GRCD is divided into the northern and southern areas, as shown in Figure IV G-1. Water supplies to the northern area are delivered by Garzas Creek on the northwest, Volta Wasteway and San Luis Wasteway on the southwest side, the GWD Santa Fe Canal and Eagle

Ditch in the central portion, and the San Luis Canal on the east side. CVP water can be delivered from the DMC through the Mendota Pool or Wolfsen Bypass to the CCID Main Canal which flows into Garzas Creek. Water also can be diverted from the DMC to the Volta Wasteway.

Water supplies for the southern GRCD area are routed through the CCID Main Canal and CCID Helm Canal. The primary conveyance facilities in the southern division of the GWD are the Camp 13 and Agatha/Geis systems. As noted above, CVP water from the DMC can be diverted into the CCID Main Canal and then to the Agatha Canal and Camp 13 Ditch.

Water supply problems have occurred when the CCID facilities are used to transport agricultural return flows which may not be suitable for refuge management. However, with the aid of funding from the State Resources Agency and the Wildlife Conservation Board, facilities to allow for the separation of flows have been and are being constructed. Additional flow separation projects would further improve management, as discussed below.

The Porter-Blake Bypass has been constructed to divert unusable agricultural drain flows which pass through the Camp 13 and Agatha Canals into Mud Slough. The flows are conveyed in Mud Slough to Salt Slough for continued conveyance to the San Joaquin River. This bypass currently allows freshwater deliveries to be made via the San Luis Canal into northern GRCD area. However, use of the bypass was and is intended to be only a temporary means of dealing with the contamination problem. By agreement with the San Luis Canal Company (SLCC), the operation of this system is scheduled to be discontinued by 1990. At that time, unless an alternate means of separating drainage flows from fresh water supplies is implemented, such as the alternatives discussed in this chapter, portions of the northern GRCD service area may become contaminated.

The GWD also has completed the first two phases of a three-phase project to separate fresh water supplies from drain water for the southern GRCD area. This separation project when completed will allow GWD to alternate the conveyance of fresh water between the Agatha and Camp 13 Canal Systems. When fresh water is flowing in one system, adjacent marshlands can be flooded and irrigated, while agricultural drainage water is bypassed to Mud Slough through the other system. By alternating the type of water carried by each system, all of the southern portion of the GRCD wetlands can receive water of suitable quality. However, drain water would be present in one or the other of the systems at all times, therefore the wetlands cannot be assured of receiving fresh water at the precise time of need.

Another conveyance problem is related to the dewatering of the CCID Main Canal and Reclamation's Mendota Pool for maintenance between mid-November and February. The loss of water delivery capabilities in November constrains management of waterfowl habitat and the

availability of the area for public use. The Mendota Pool is not completely dewatered every year, however, CCID does lower the water level in the CCID canals every winter. Refuge management would be improved if the lowering of the water level was delayed until early December. Negotiations have been completed between GWD and CCID to convey water which may be available at other times during the year when and if CCID has excess capacity in its canal system.

The lands within the GRCD are subject to flooding from several of the natural streams which traverse the area. However, operational modifications on the Los Banos Creek Detention Dam have reduced the frequency and extent of flooding in that watershed. The northernmost portions of the GRCD continue to be impacted by uncontrolled run-off in Garzas Creek (GWD, 1985, 1987).

3. Groundwater

Most of the GRCD is located on land deposits created from overflow of the San Joaquin River. Portions of the GRCD on the eastern side lie within the San Joaquin River floodplain and in channel deposits.

Two water bearing zones are present under the surface and are separated by the Corcoran Clay, an approximately 100-foot thick layer of clay at about a 200-foot depth. Records from wells in the general area of the GRCD show that pump yields range from 675 to 2,100 gallons per minute. Existing well data indicates that dissolved solids concentrations in the groundwater are generally high above the Corcoran Clay. Water below the Corcoran Clay is generally of better quality with total dissolved solids below 2,000 ppm (USFWS, 1978).

Groundwater pumping facilities are present on approximately 15 of the 165 hunting clubs within GWD. Excessive pumping costs and generally poor quality groundwater preclude the use of these wells for anything other than a supplemental supply (GWD, 1987). Some of these wells have not been kept fully operational because of poor yield. Reclamation estimates that the safe yield for the GRCD areas not within the NWRs and WMAs is 71,500 acre-feet. This safe yield assumes that the water would be pumped from below the Corcoran Clay.

4. Offstream Storage

There is a need for additional CVP yield within the San Joaquin Valley to relieve the groundwater overdraft and to provide additional water needed for agricultural, municipal, and fish and wildlife purposes. Surplus water could be pumped from the Sacramento River or the Delta during times when the system is operating at less than maximum capacity, stored at an offstream site until needed, and then delivered during times when canal capacity is available.

Reclamation began investigating various potential offstream storage sites within the San Joaquin Valley in October 1985. In 1987, the California Waterfowl Association requested that the GRCD be included as a potential offstream storage site, whereby wetlands could be enhanced for the benefit of waterfowl and at the same time increase project yield.

An evaluation of GRCD lands for offstream storage on wetland habitat was conducted by Reclamation. The results of this evaluation (USBR, 1987k) indicated that an opportunity for offstream storage within the GRCD does exist. However, the exact amount of return flow varied according to water operations. The report pointed out that more information is needed relative to seepage, evaporation, water quality and impacts on wildlife to determine the viability of an offstream storage program within the GRCD.

In October, 1987, Reclamation entered into a cooperative agreement with the GWD to perform, on a cost-sharing basis, a pilot study to assess the potential for the use of wetlands within the GRCD as an offstream storage site. The primary purpose of this one year study was to obtain additional data on seepage, evaporation, and water quality. Reclamation provided 20,680 acre-feet and local water districts provided 3570 acre-feet of water to GWD during the fall for distribution on approximately 17,000 acres in the northern portion of GWD. The ponded water was released during the spring of 1988 and monitored for quality and quantity. Although weather conditions were extremely dry during the study period and abnormal evaporation rates were experienced, return flow from the ponded area was calculated to be 24 percent of the total applied water. The quality values were determined to be acceptable when blended with other water in the San Joaquin River. Based on the favorable results, a second year of the program was initiated in the fall of 1988.

As information relative to the 1988-89 off-stream storage program in GRCD becomes available, it will be appropriately incorporated into the Refuge Water Supply Planning Report. If the data from the study continues to be favorable, off-stream storage may become a component of a plan to provide the GRCD with dependable water supplies.

B. FORMULATION AND EVALUATION OF ALTERNATIVE PLANS

The Service, GRCD, and GWD estimate that 180,000 acre-feet of water would be required for full development and optimum management of the GRCD, not including the NWRs and WMAs. For the purposes of assessing the impacts of water delivery alternatives, four levels of water supply have been identified,as presented in Table IV G-1.

TABLE IV G-1

DEPENDABLE WATER SUPPLY NEEDS

ALTERNATIVE SUPPLY LEVELS FOR THE GRASSLAND RCD

Month	Supply Level 1 ac-ft	Supply Level 2 ac-ft	Supply Level 3 ac—ft	Supply Level 4 ac-ft
January	0	3,000	5,200	5,200
February	0	0	6,000	6,000
March	0	0	5,800	5,800
April	0	5,000	9,100	9,100
May	0	12,000	25,700	25,700
June	0	12,000	20,800	20,800
July	0	0	5,800	5,800
August	0	4,000	8,200	8,200
September	10,000	25,000	25,800	25,800
October	30,000	36,000	38,600	38,600
November	10,000	19,000	19,300	19,300
December	0	9,000	9,700	9,700
Total	50,000	125,000	180,000	180,000

Notes:

Supply Level 1: Existing firm water supply
Supply Level 2: Current average annual water deliveries
Supply Level 3: Full use of existing development
Supply Level 4: Optimum mangement

Source: USFWS, 1986g

Each of the water supply levels provide a different rate and volume of water, summarized as follows:

Level 1 - Existing firm water supply

Level 2 - Current average annual water deliveries

Level 3 - Water supply needed for full use of existing development

Level 4 -Water delivery needed for optimum management

1. Delivery Alternative for Level 1 (No Action Alternative) (50,000 acre-feet)

Adequate facilities exist to deliver the current firm water supply to the GRCD. Therefore, no facilities were developed for Level 1.

2. Delivery Alternatives for Level 2 (125,000 acre-feet)

Water from the CVP would be conveyed to the GRCD through existing canals following modifications to separate the fresh water from the agricultural return flows. The Level 2 alternatives would modify existing canals to provide a reliable and good quality water supply. The improved water quality would allow GRCD to increase wildlife habitat such as brood ponds and nesting cover, and increase areas with smartweed and watergrass.

Alternative 2A - Convey Water Under the Zahm-Sansoni-Nelson Plan. The Zahm-Sansoni-Nelson Plan has been revised several times. Under the most recent revision, the San Luis Drain would convey water to the Mendota Pool from CVP facilities, surplus water from the San Joaquin River, and/or surplus water from the Kings River through an intertie in Fresno County (near Bass Avenue). This would allow the GRCD to use flood flows during wet years and reduce capacity problems which occur when CCID cannot use the Wolfson Bypass during flood periods. Water would be diverted from the San Luis Drain near Mallard Road to serve a large portion of the southern GRCD.

The water would flow in the San Luis Drain to the junction of the GWD Santa Fe Canal and the GWD Camp 13 - Mud Slough Bypass. Several new valves and a siphon would be constructed to divert CVP water into the GWD Santa Fe Canal. The CVP water would be mixed with usable agricultural return flows from the SLCC Arroyo Canal which also contains flows from the Agatha Canal Extension. The water would flow through the GWD Santa Fe Canal and be diverted to the SLCC San Luis Canal and Eagle Ditch for delivery to the GRCD and other refuges.

Currently, the GWD Santa Fe Canal conveys a mixture of useable agricultural return water from the SLCC Arroyo Canal and poorer quality return water from Mud Slough. The water quality of the

combined flows is too poor to be used for refuge management. Under this plan, flows from the Camp 13 Canal would be prevented from entering the GWD Santa Fe Canal by a new valve. Instead, the poorer quality water would enter the San Luis Drain, as shown in Figure IV G-2.

This plan would allow GRCD to make use 40 to 120 cfs of useable agricultural return flows available from April to September without using the Porter-Blake Bypass. However, use of the San Luis Drain to convey fresh water would require prior cleaning of toxic sediments, such as selenium.

Alternative 2B - Utilize the Wolfson Bypass. The CCID Wolfson Bypass provides CVP water from the DMC to the CCID Outside Canal, as shown in Figure IV G-2. Water in the CCID Outside Canal can flow to the north or the south. When water is conveyed through the Wolfson Bypass, water in the CCID Outside Canal flows south.

The Wolfson Bypass would be used to transfer CVP water to the CCID Outside Canal. Water would be diverted from the CCID Outside Canal to the CCID Main Canal through an existing cross-tie. From this point, CVP water would be conveyed through the CCID Main Canal to the SLCC San Luis Canal for delivery to the refuges. A lift pump would be constructed on the CCID Main Canal to transfer water through the Helm Extension to the Agatha Canal.

Use of this alternative is limited to times when CCID allows water to flow to the south in the Outside Canal. This plan also may be useful when the Mendota Pool is dewatered.

Alternative 2C - Implement a Conjunctive Use Plan. Ninety-five wells would be constructed within the non-refuge portion of GRCD to deliver the maximum month water demand. The exact locations of the wells would be determined in a future study. The wells would be developed as part of a conjunctive use program. During dry years, water demands would be supplied by wells, as discussed in Chapter III. During wet years, the wells would probably not be needed if CVP water is provided. Implementation of this alternative also would require implementation of Alternative 2A or 2B.

3. Delivery Alternatives for Level 3 (180,000 acre-feet)

The following alternatives would provide facilities to deliver the increased water supply level from the DMC to the southern portion of the GRCD. Alternative 3A would require implementation of Alternative 2A or 2B. Alternative 3B would require implementation of Alternative 3A or 3B.

Alternative 3A - Construct Turnouts on the Delta-Mendota Canal at Almond Drive and Russell Avenue. Water would be diverted from the DMC at two new turnouts under this plan. The first turnout would be located near Almond Drive. A new 12,600-foot unlined canal would be constructed parallel to Almond Drive from the turnout to

the existing Almond Drive Ditch. Approximately 10,400 feet of the Almond Drive Ditch would be rehabilitated to convey the increased flows. Water would flow through the Almond Drive Ditch to Flyway Ditch and Gadwall Canal which would serve about 2,000 acres of GRCD and eight private hunting clubs.

The new canal along Almond Drive would include siphons under the Outside Canal and the Main Canal. During construction these two canals would probably be dewatered. Another siphon would be constructed under Mercey Spring Road. During construction a detour would be required.

An over-the-lining turnout and pump station would be constructed on the DMC near Russell Avenue. Water would flow directly into an existing ditch that parallels Russell Avenue. The existing ditch would convey water to a point near the CCID Outside Canal. Water would be conveyed in a new 150-foot siphon under the CCID Outside Canal. A new 6000-foot canal would be constructed to convey water to the Main Canal upstream of an existing dam for diversion to the Helm Canal. Portions of the existing ditch along Russell Avenue would be rehabilitated. During construction of the siphon, the CCID Outside Canal would need to be dewatered.

Alternative 3B - Implement a Conjunctive Use Plan. On the non-refuge portion of the GRCD, 126 wells would be constructed to deliver the maximum month water demand. The exact locations of the wells would be determined in a future study. The wells would be developed as part of a conjunctive use program. During dry years, water demands would be supplied by wells, as discussed in Chapter III. During wet years, the wells would probably not be needed if CVP water is provided. Implementation of this alternative also would require implementation of Alternative 3A.

4. Delivery Alternatives for Level 4 (180,000 acre-feet)

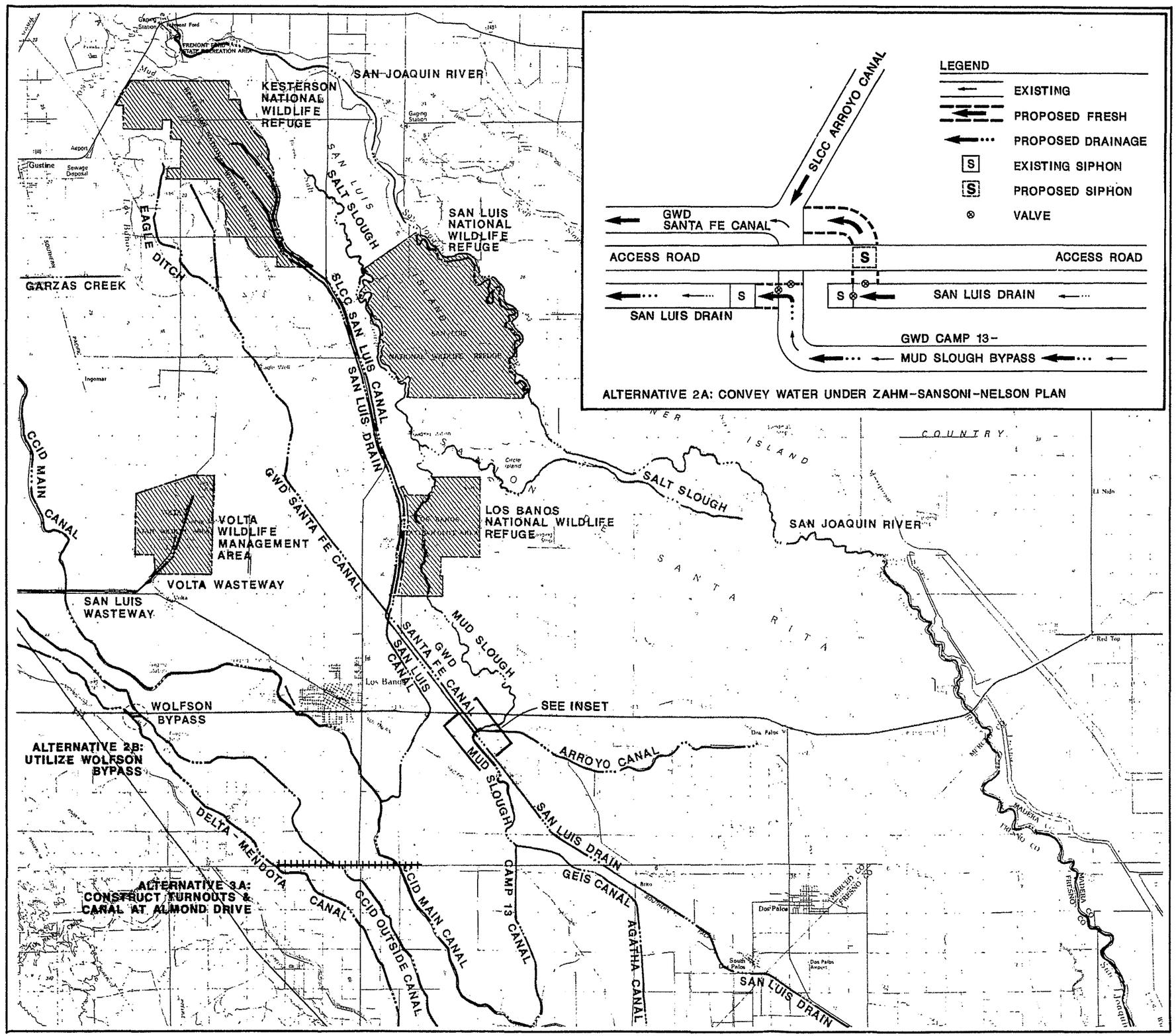
Water Supply Level 4 is equal to Level 3. Therefore, the alternatives for Level 4 would be the same as discussed for Level 3. Alternative 4A would require implementation of Alternative 2A or 2B. Alternative 4B would require implementation of Alternative 4A.

Alternative 4A - Construct Turnout on the Delta-Mendota Canal at Almond Drive and Russell Avenue. This alternative is identical to Alternative 3A.

Alternative 4B - Implement a Conjunctive Use Plan. This alternative is identical to Alternative 3B.

5. Summary of Alternatives

The beneficial and adverse effects of each alternative to provide additional water were compared with respect to criteria listed in Chapter III.



ALTERNATIVE 2A: CONVEY WATER UNDER ZAHM-SANSONI-NELSON PLAN

LEGEND

REFUGE BOUNDARY

WATER COURSE

SCALE IN FEET

0 3000 6000 12000

FIGURE IV G-2

GRASSLAND RESOURCE CONSERVATION DISTRICT

ALTERNATIVE WATER SUPPLY FACILITIES

JMM

C-068237

C-068237

There were no alternatives for Level 1 because the existing 50,000 acre-feet of water can be delivered in existing facilities.

Alternative 2A would require reconfiguration of the existing canal system. Alternative 2B would use existing facilities. However, Alternative 2A would provide more operational flexibility than Alternative 2B which can only be effective when the CCID Outside Canal is flowing to the south. Whenever CCID operates the Outside Canal in a northerly flow pattern, GRCD would not receive water under Alternative 2B. Both Alternatives 2A and 2B would provide better quality water than water that is delivered through the Mendota Pool. In addition, conveyance losses would be decreased by at least 10 percent if CVP water is not delivered through the Mendota Pool.

Alternatives 3A and 4A would require long-term conveyance agreements as well as extensive improvements to existing canal structures. Alternatives 3A and 4A also would require implementation of Alternative 2A or 2B.

Alternatives 2C, 3B, and 4B would cause an overdraft situation during dry years because the wells would withdraw more water than the safe yield of the GRCD. These alternative also would require implementation of Alternatives 2A or 2B, Alternative 3A, or Alternative 4A to deliver surface water during wet years.

C. COSTS AND ECONOMIC ANALYSIS

Costs of the alternative plans for providing adequate water supplies under the Water Delivery Levels 2, 3, and 4 are presented in Table IV G-2. The construction costs include factors to cover engineering, contingencies, and overhead. Annual operation and maintenance (O&M) costs only include the local cost of delivering water. The annual O&M costs do not include costs to purchase CVP water. During the advanced planning phase, these costs will be refined further.

Construction of the facilities under all of the alternatives would result in additional money being spent in the economy of Merced County during the construction period. The construction could be completed within one summer season by construction workers who reside in the area.

If the total amount of water supplied is equal to Level 1, public use will decline from current average annual values of 109,000 visits per year (Level 2). Therefore, the local economy that relies upon the public use also would decline. If the total amount of water supplied is equal to Levels 3 or 4, the public use and the associated economy would increase.

TABLE IV G-2

SUMMARY OF ESTIMATED COSTS OF ALTERNATIVES

GRASSLAND RESOURCE CONSERVATION DISTRICT

Items	Alternatives				
	2A	2B	2C	3A & 4A	3B & 4B
Additional Water (ac-ft)	75,000	75,000	75,000	130,000	130,000
Construction Costs					
Wells	$ --	$ --	$5,842,500(c)	$ --	$ 7,749,000(h)
Diversion Structures	--	--	--	540,000(e)	--
Pipelines/Canals	675,000(a)	--	--	2,020,000(f)	--
Pump Stations	--	175,000(b)	--	2,300,000(g)	--
Subtotal	$ 675,000	$ 175,000	$5,842,500	$4,860,000	$ 7,749,000
Other Costs	--	--	675,000(d)	675,000(n)	5,535,000(d)
Total (j)	$ 675,000	$ 175,000	$6,517,000	$5,535,000	$13,284,000
Annualized Construction Cost (8.87%, 30 yrs)	$ 64,940	$ 16,840	$ 626,990	$ 532,470	$ 1,277,920
Additional Annual Cost					
Operation & Maintenance(i)	$ --	$ --	$ 198,700	$ --	$ 263,500
Power	--	75,000(j)	300,000(m,n)	40,000(j)	520,000(m,n)
Local Conveyance Cost	825,000(k)	56,300(l)	--	--	--
Subtotal	$ 825,000	$ 131,300	$ 498,700	$ 40,000	$ 783,500
Other Costs	--	--	412,500(d,n)	825,000(o)	432,500(d,n)
Total(j)	$ 825,000	$ 131,300	$ 911,200	$ 865,000	$ 1,216,000
Total Annual Costs	$ 889,940	$ 148,140	$1,538,190	$1,397,470	$ 2,493,920
Cost/Additional Acre-Foot	$ 11.90	$ 2.00	$ 20.50	$ 10.80	$ 19.20

TABLE IV G-2

SUMMARY OF ESTIMATED COSTS OF ALTERNATIVES

GRASSLAND RESOURCE CONSERVATION DISTRICT

Notes: Alternatives 2A - Convey water under the Zahm-Sansoni-Nelson Plan.
Alternatives 2B - Utilize the Wolfson Bypass.
Alternatives 2C, 3B and 4B - Implement a Conjuctive Use Plan.
Alternatives 3A and 4A - Construct Turnouts on the Delta-Mendota Canal at Almond Drive and Russell Avenue.

(a) 1 siphon, 4 valves, and connecting canal/pipeline, and enlarge existing canals. Cost estimate provided by Reclamation. Does not include cost to remove contaminated deposits from San Luis Drain.

(b) 100 cfs, 5-foot lift pump.

(c) 95 wells, 600 feet deep, 70-foot lift.

(d) Alternative 2C assumes implementation of Alternative 2A, and Alternatives 3B and 4B assume implementation of Alternatives 3A and 4A.

(e) Two 200 cfs turnout.

(f) 18,600 feet of unlined canal, 16,400 feet of rehabilitated canal, 5 siphons, relocated bridge, and 2 crossings.

(g) 1,000 cfs, 15-foot lift pump.

(h) 126 wells, 600 feet deep, 70-foot lift.

(i) Basis for O&M costs are discussed in Appendix F.

(j) Unit Pumping Cost = $1/af.

(k) Unit Conveyance Cost = $11/af ($10/af by SLC and $1/af by GWD)

(l) Unit Conveyance Cost = $0.75/af.

(m) Unit Pumping Cost = $8/af.

(n) Values are multiplied by 0.5 because facilities are assumed to be used only 5 out of 10 years.

(o) Alternatives 3A and 4A assumes implementation of Alternative 2A.

D. WILDLIFE RESOURCES

The annual bird use in the GRCD is approximately 127,210,000 use-days. Approximately 63 and 5 percent of the bird use are by ducks and geese, respectively. Wildlife and fishery resources associated with the GRCD are listed in Table IV G-3. The federally listed, proposed, and candidate threatened and endangered species are the San Joaquin kit fox, Vulpes macrotis mutica; the Valley elderberry longhorn beetle, Desmocerus californicus dimorphus; bald eagle, Haliaeetus leucocephalus; peregrine falcon, Falco peregrines anatum; and Aleutian Canada goose, Branta canadensis leucopareia, as listed in Table IV G-4. The improved habitat would increase the number of wildlife-use days and recreational benefits, as presented in Table IV G-5.

Implementation of the alternative plans may not adversely affect the listed and candidate threatened and endangered species of birds. Detailed field investigations would be completed during the advanced planning phase of the project. Implementation of the plans may result in overall beneficial environmental effects. The No Action Alternative would result in the loss of habitat and associated recreation and wildlife use if supplemental water is not available. Additional regional environmental analyses will be completed as part of the Water Contracting EIS's.

E. SOCIAL ANALYSIS

The social consequences of constructing and operating the facilities under any of the alternatives would be positive due to the potential increase in public use.

F. POWER ANALYSIS

The Pacific Gas and Electric serves the GRCD under the PA-1 rate schedule for agricultural users. A facility must be an authorized function of the CVP to receive project-use power. The authority to deliver CVP project-use power to the GRCD is currently being examined and will be detailed in the Refuge Water Supply Planning Report. A more detailed discussion of project-use power and wheeling agreements is provided in the Power Analysis section of Chapter II.

G. PERMITS

Construction under any of the alternatives would require several permits. Merced County would issue permits for construction along drainage courses and under roads to ensure that the existing drainage facilities would not be adversely affected. CCID would issue permits and approvals for all alternatives. Stream Alteration

Permits would be required from the DFG for Alternatives 2A, 2B, 3A, and 4A. An Army Corps of Engineers permit would be required for construction activities in wetlands or riparian corridors under all alternatives. Approvals would be needed from the Regional Water Quality Control Board and other state agencies before the San Luis Drain could be used to convey CVP water under Alternative 2A.

TABLE IV G-3

FISH AND WILDLIFE RESOURCES

GRASSLAND RESOURCE CONSERVATION DISTRICT

Ducks

Pintail[a]
Gadwall[a]
Ring-necked Duck
Mallard[a]
Shoveler[a]
Canvasback
Green-winged Teal
Cinnamon Teal[a]
Ruddy Duck[a]
Widgeon

Geese and Swans

Ross' Goose
Snow Goose
Cackling Goose
Tundra Swan
White-fronted Goose

Coots

American Coot[a]

Shore and Wading Birds

Pied-billed Grebe
White-faced Ibis
Lesser Sandhill Crane
Common Snipe
Long-billed Curlews
Great Blue Heron
Common Egret
Snowy Egret
American Bittern
Black-crowned Night Herons
American Avocet
Black-necked Stilt[a]
Dowitchers
Great Yellowlegs
Sandpiper
Killdeer[a]
Rail[a]
Sora[a]
Gallinule[a]

Upland Game

Ring-necked Pheasant[a]
Cottontail Rabbits
Black-tailed Jackrabbits
Dove

TABLE IV G-3

FISH AND WILDLIFE RESOURCES

GRASSLAND RESOURCE CONSERVATION DISTRICT
(Continued)

Raptorial Birds		
Northern Harrier[a]	Red-tailed Hawk[a]	American Kestrel
Black-shouldered Kite[a]	Cooper's Hawk	Turkey Vulture
Sparrow Hawk[a]	Golden Eagle	
Fish		
Brown Bullhead	Channel Catfish	Striped Bass
Carp	Largemouth Bass	
Furbearers		
Coyotes	Muskrats	Raccoon
Opossum	Striped Skunk	Grey Fox
Beaver	Mink	Badger
Spotted Skunk		

Notes:

(a) Birds nesting on refuge

Source: Environmental Assessment Reports, Los Banos Wildlife Area, and Refuge records

TABLE IV G-4

FEDERAL LISTED, PROPOSED, & CANDIDATE, THREATENED & ENDANGERED SPECIES

GRASSLAND RESOURCE CONSERVATION DISTRICT

Listed Species

Mammals
- San Joaquin kit fox, Vulpes macrotis mutica (E)

Birds
- Aleutian Canada goose, Branta canadensis leucopareia (E)
- Bald Eagle, Haliaeetus leucocephalus (E)
- Peregrine Falcon, Falco peregrines anatum (E)

Invertebrates
- Valley elderberry longhorn beetle, Desmocerus californicus dimorphus (T)

Proposed Species

None

Candidate Species

Birds
- Swainson's hawk, Buteo swainsoni(2)
- Tricolored blackbird, Agelaius tricolor (2)
- White-faced ibis, Plegadis chihi (2)
- Western Snowy Plover, Charadrus alaxandrinus

Reptiles
- Giant garter snake, Thamnophis couchi gigas (2)
- California tiger salamander, Ambystoma tigrinium californiense (2)

Invertebrates
- Molestan blister beetle, Lytta molesta (2)

Plants
- Hispid bird's-beak, Cordylanthus mollis subsp. hispidus (2)
- Delta coyote-thistle, Eryngium racemosum (1)
- Bearded allocarya, Plagiobothrys hystriculus (2)
- Valley spearscale, Atriplex patula subsp. spicata (2)

Source: USFWS, June 4, 1987

(E)—Endangered (T)—Threatened (CH)—Critical Habitat

(1)—Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.

(2)—Category 2: Taxa for which existing information indicated may warrant listing, but for which substantial biological information to support a proposed rule is lacking.

TABLE IV G-5

WILDLIFE RECREATIONAL BENEFITS AND RESOURCE IMPACTS

GRASSLAND RCD

	No Action Alternative	Alternatives				
		2A	2B	2C	3A & 4A	3B & 4B
Habitat Acres						
Permanent Water	200	2,000	2,000	2,000	4,000	4,000
Seasonal Marsh	54,800	51,000	51,000	51,000	46,000	46,000
Smartweed & Watergrass	1,000	3,000	3,000	3,000	6,000	6,000
Bird Use Days						
Ducks	60,000,000	80,000,000	80,000,000	80,000,000	100,000,000	100,000,000
Geese	5,000,000	7,000,000	7,000,000	7,000,000	9,000,000	9,000,000
Waterbirds	30,000,000	40,000,000	40,000,000	40,000,000	50,000,000	50,000,000
Endangered Species	180,000	210,000	210,000	210,000	250,000	250,000
Total	95,180,000	127,210,000	127,210,000	127,210,000	159,250,000	159,250,000
Public Use Days						
Consumptive	60,000	70,000	70,000	70,000	80,000	80,000
Non-consumptive	31,000	39,000	39,000	39,000	56,000	56,000
Total	91,000	109,000	109,000	109,000	136,000	136,000
Total Annual Cost	$ --	$ 889,940	$ 148,140	$ 1,538,190	$ 1,397,470	$ 2,493,920
Incremental Cost/Additional 1000 Bird Use Days	N/A	$ 27.80	$ 4.60	$ 48.00	$ 21.80	$ 38.90
Incremental Cost/Additional Public Use Day	N/A	$ 49.50	$ 8.20	$ 85.50	$ 31.10	$ 55.40

Notes: Alternatives 2A - Convey water under the Zahm-Sansoni-Nelson Plan.
Alternatives 2B - Utilize the Wolfson Bypass.
Alternatives 2C, 3B and 4B - Implement a Conjuctive Use Plan.
Alternatives 3A and 4A - Construct Turnouts on the Delta-Mendota Canal at Almond Drive and Russell Avenue.

E. SOCIAL ANALYSIS

The social consequences of constructing and operating the facilities under any of the alternatives would be positive due to the potential increase in public use.

F. POWER ANALYSIS

The Pacific Gas and Electric serves the GRCD under the PA-1 rate schedule for agricultural users. A facility must be an authorized function of the CVP to receive project-use power. The authority to deliver CVP project-use power to the GRCD is currently being examined and will be detailed in the Refuge Water Supply Planning Report. A more detailed discussion of project-use power and wheeling agreements is provided in the Power Analysis section of Chapter II.

G. PERMITS

Construction under any of the alternatives would require several permits. Merced County would issue permits for construction along drainage courses and under roads to ensure that the existing drainage facilities would not be adversely affected. CCID would issue permits and approvals for all alternatives. Stream Alteration Permits would be required from the DFG for Alternatives 2A, 2B, 3A, and 4A. An Army Corps of Engineers permit would be required for construction activities in wetlands or riparian corridors under all alternatives. Approvals would be needed from the Regional Water Quality and other state agencies before the San Luis Drain could be used to convey CVP water under Alternative 2A.