

**A STORM EVENT PLAN  
FOR OPERATING THE  
GRASSLAND BYPASS PROJECT**

**GRASSLAND AREA FARMERS  
AND  
SAN LUIS & DELTA-MENDOTA  
WATER AUTHORITY**

**AUGUST 25, 1997**

## **A Storm Event Plan for Operating the Grassland Bypass Channel**

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The Grassland Bypass Channel is an earthen ditch that carries agricultural drainage and water from seven irrigation and drainage districts to the San Luis Drain (See Maps Pages 13 and 14), which currently delivers the drainage water to Mud Slough, North. From there, the drainage water flows to the San Joaquin River. The region served by the Grassland Bypass Channel includes 97,000 acres of irrigated farmland on the west side of the San Joaquin Valley (See Map Page 15).

The seven irrigation and drainage districts have formed a Drainage Activity Agreement within the San Luis & Delta-Mendota Water Authority, for the purpose of operating the Grassland Bypass Channel. On behalf of the seven member districts of the Grassland Basin Drainage Activity, also known as the Grassland Area Farmers, a Use Agreement was signed with the U.S. Bureau of Reclamation in November 1995 to enable use of a 28-mile portion of the San Luis Drain for carrying agricultural drainage water. The Drain, which was originally constructed by the Bureau of Reclamation to serve irrigation districts in the San Luis Unit of the Central Valley Project, had been out-of-service for about 10 years.

The Use Agreement is one of three documents that describe the Grassland Bypass Project, which is an innovative program developed by the Grassland Area Farmers in cooperation with environmental and wildlife agencies to improve water quality in channels used to deliver water to wetland areas. Other documents include a Supplement Environmental Assessment and a Consensus Letter to the California Regional Water Quality Control Board for the Central Valley Region.

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The principal goal of the Grassland Bypass Project is to divert agricultural drainage water from channels used to deliver fresh water supplies to wetland areas and wildlife refuges. Before the project was implemented, agricultural drainage water and storm water runoff from the participating districts always flowed to the San Joaquin River through a series of channels, ditches, and sloughs in the Grassland area. The Grassland Bypass Project simply reroutes the drainage water around the wetland areas using several new earthen ditches and a portion of the San Luis Drain.

The Grassland Bypass Channel is an earthen ditch that carries agricultural drainage water from participating districts to the San Luis Drain. The capacity of that channel is approximately 150 cubic feet per second (cfs), which is sufficient to accommodate the volume of drainage water collected in the region. However, the capacity of the Bypass Channel is not sufficient to accommodate the surface runoff that is often generated during major storm events in the San Joaquin Valley.

Several issues regarding major storm events have arisen since the Grassland Bypass Project was implemented:

1. Major storm events will generate surface runoff and storm water flows that exceed the capacity of the Grassland Bypass Channel.
2. Storm water runoff carries sediment that should not be transported in the Grassland Bypass, or deposited in the San Luis Drain.
3. It is not possible during major storm events to separate agricultural drainage water from surface runoff and storm water flows.

4. It will not be possible to divert all of the commingled surface runoff, storm water flows, and agricultural drainage water through the Grassland Bypass Channel during major storm events.

This report addresses these issues and provides the procedures that will be implemented during major storm events to protect the Grassland Bypass Channel and maintain the environmental benefits provided by the Project.

### **Storm Events in the San Joaquin Valley**

The average annual precipitation in the Grassland area is only eight inches, but in many years much of the rainfall is received in storm events that deliver more than one or two inches of precipitation within a few days. These storm events generate substantial surface runoff from agricultural fields and the hills that are west of the Grassland basin. Storm water is carried in creeks that flow from the hills to the Valley floor. Some of the creeks extend to the San Joaquin River, while others have been truncated by human activities that have occurred throughout the history of this region. One such creek is Silver Creek, which ends abruptly at the Southern edge of the Grassland drainage area.

Panoche Creek and Silver Creek form a watershed that drains more than 190,000 acres of land located west of Interstate Highway 5 and southwest of the Grassland drainage area (See Map Page 16). Elevations in that watershed range from 560 feet at Highway 5 to more than 5,200 feet at San Benito Peak, in the headwaters of Silver Creek. The elevation of the City of Mendota, located near the terminus of Silver Creek and at the Southern edge of the drainage area is just 160 feet. As a result, storm waters from the Panoche Creek and Silver Creek watershed, which are often very large in volume, move quickly from the watershed to Interstate Highway 5 and the

Grassland drainage area. During some storm events, the instantaneous flow rate in Panoche Creek, which carries water from hills adjacent to the agricultural area can exceed 12,000 cubic feet per second, while the average daily flow rate during such events can exceed 2,000 cubic feet per second. These flows can generate more than 40,000 acre-feet of water during a two-week period that includes a storm event.

Silver Creek is a dry channel for most of the year. However, during storm events, the flow in the Creek can exceed the capacity of its channel, resulting in extensive flooding of agricultural and residential areas. The channel for Silver Creek actually ends at Belmont Avenue (See Map Page 16) and flood waters usually move eastward from that location toward the City of Mendota and northward toward irrigation and drainage districts participating in the Grassland Bypass Project. These flood waters often break through canal banks or flow down county roads, accumulating behind bridges or in areas of low elevation, before spilling into nearby drainage ditches.

The Silver Creek flooding problem affects a large area that includes the districts participating in the Grassland Bypass Project and other water districts and communities. Several public and private entities have studied the Silver Creek problem for many years, without resolution. The cost of flood control structures to contain Silver Creek is prohibitive and there is no guarantee that the silt-laden waters could be successfully contained during very large storm events. As a result, district managers, private landowners, and municipal officials can only attempt to minimize the damage that results when Silver Creek flood waters flow into the region.

The 190,000 acre Panoche and Silver Creek watershed does not include the area from watersheds in Little Panoche Creek and many other westside discharges.

Rainfall received on farm fields generates surface runoff directly, and also contributes to an increase in the volume of subsurface drain water collected in agricultural drainage systems. One inch of rainfall on the 97,000 acres of farmland participating in the Grassland Bypass Project is equivalent to a total water volume of 8,000 acre-feet. The proportion of this water that runs off the surface and the proportion that percolates into the soil is a function of the initial soil moisture, the soil type, and characteristics of the storm event. Most rainfall in the Grassland area occurs when fields are idle for the winter, and there is little opportunity for transpiration from plants. In addition, rainfall that occurs on fields that are saturated from previous rainfall events has a greater likelihood of increasing the volume of water collected in subsurface drainage systems.

## **Operational Considerations**

The primary operational considerations during storm events are the following:

1. The volume of surface runoff and storm water flows can exceed the capacity of the Grassland Bypass Channel that carries agricultural drainage water to the San Luis Drain, and
2. The sediment load in surface runoff and in storm water flow of Silver Creek should not be carried in the Grassland Bypass Channel, or deposited in the San Luis Drain, and
3. The selenium load in commingled agricultural drainage water and storm water runoff may cause exceedance of the selenium concentration objective for wetland water delivery channels, described in the Regional

Board's Basin Plan for the region, if those waters move through wetland channels.

The Grassland Bypass Channel is not large enough to carry all of the surface runoff and storm water flows generated during major storm events. At times, it will be necessary to allow a portion of those waters to flow through larger channels that have often carried surface runoff, storm water flows, and agricultural drainage water, prior to implementation of the Grassland Bypass Project.

The sediment load in surface runoff and storm water flows will reduce the capacity of the Grassland Bypass Channel and the San Luis Drain, while adding to the total mass of sediments already in the San Luis Drain. Such an increase in sediment loads is inconsistent with efforts to manage the existing sediments. The environmental benefits provided by the Grassland Bypass Project can be sustained with greater likelihood if additional sediments are not deposited in the earthen channels or the San Luis Drain.

The Regional Board's Basin Plan for the region includes a 2 part-per-billion selenium concentration objective for wetland water delivery channels. The primary goal of the Grassland Bypass Project is to remove agricultural drainage water from delivery channels used by the Grassland Water District and wildlife refuges. The Grassland Bypass Channel carries agricultural drainage water from participating irrigation and drainage districts to an existing portion of the San Luis Drain. From there, the water flows Northward to Mud Slough (North) and the San Joaquin River.

Operators of the Grassland Bypass Channel are actively engaged in achieving both the goals of the Bypass Project and the Regional Board's selenium concentration objective for wetland channels. However, that objective may be exceeded during storm events

in which commingled agricultural drainage water and storm water runoff move through wetland delivery channels. Bypass operators will strive to keep the Bypass Channel open and operating as much as possible, but there will be storm events in which that Channel cannot accommodate the combined flow of agricultural drainage water and storm water runoff. During those events, it may be necessary to allow the commingled waters to flow temporarily into the channels, ditches, and sloughs that have carried drainage water and storm water runoff to the San Joaquin River, prior to implementation of Grassland Bypass Project.

### **Storm Event Procedures**

The Regional Drainage Coordinator and operators of the Grassland Bypass, in consultation with the managers of participating agricultural districts, Grassland Water District, and the Central California Irrigation District, will need to evaluate the likelihood of heavy flow rates occurring when storm events approach the Grassland area. In particular, they will monitor weather conditions and forecasts during all months in which heavy rainfall events are likely to occur. When heavy rains or storm events are predicted for the region, the Regional Drainage Coordinator will consider the current status of irrigation and drainage operations to determine if the Grassland Bypass will be able to accommodate all of the surface runoff, storm water flows, and agricultural drainage water.

Upon reaching a decision, and prior to allowing commingled waters to enter Grassland channels, the Regional Drainage Coordinator will contact the following individuals to inform them of the situation and to notify them regarding operations during the storm event:

1. Personnel at the Central Valley Regional Water Quality Control Board in Sacramento,
2. The Manager of the Grassland Water District,
3. The Manager of the Central California Irrigation District,
4. The Manager of the San Luis Canal Company,
5. Personnel at State and Federal Wildlife Areas that utilize water supply channels in the region,
6. Managers of the irrigation and drainage districts participating in the Grassland Basin Drainage Activity Agreement, and
7. The Manager of the Exchange Contractors Water Authority.

When the anticipated flow of water through sites PE-14 and FC-5 exceed 100 cfs and there is a threat of imminent precipitation, gates providing access to the Camp-13 Ditch and/or the Agatha Canal will be opened so that if there is a rapid increase in flow, those larger channels will be available and operational. The proportional amounts of water flowing to the Grassland Water District and diverted to the Grassland Bypass will be determined in the field, by operators of the Grassland Bypass, in consultation with Grassland Water District personnel, as conditions warrant.

When the combined flow of water through sites PE-14 and FC-5 fall below 100 cfs, and when there is no longer a threat of imminent precipitation, the flow of water to the Grassland Water District will be terminated. This decision will be made by the

Regional Drainage Coordinator, in consultation with Grassland Bypass operators and personnel from Grassland Water District.

The unpredictability of storm events and the resulting flow of water into the Grassland basin make it necessary to implement storm event operations in anticipation of storm events. As a result, there may be times when drainage water is allowed to flow through Grassland channels, although a storm event may not actually occur according to the anticipated schedule. However, preventive action is required to protect the Grassland Bypass Channel and maintain all of the environmental benefits that the Grassland Bypass Project provides.

## **Efforts to Minimize**

### **Water Quality Impacts**

The Grassland Area Farmers will conduct several activities during storm event operation to minimize any potentially negative impacts on water quality. In particular, operators of the Grassland Bypass will maintain communication with Regional Board staff, to keep them informed regarding the dates and times at which agricultural drainage water enters Grassland Water District channels. The operators will collect water quality samples daily in the Camp-13 Ditch, the Agatha Canal, and Salt Slough, whenever agricultural drainage water is flowing in those channels. Results of laboratory analysis will be delivered to the Regional Board. Selenium concentration data will be used to estimate the load of selenium moving through Grassland channels in the commingled storm water runoff and agricultural drainage water.

Irrigation and drainage district managers will modify the operation of drainage system sump pumps, to the extent this action is practical, during storm events in which

agricultural drainage water enters Grasslands channels. The goal of this effort is to reduce the load of selenium from agricultural drainage systems in regional drainage ditches at those times. It may be possible to turn off or cycle the operation of some sump pumps during short-duration storm events, while other sump pumps will need to continue operating during those events.

The design of most subsurface drainage systems is not consistent with efforts to turn off sump pumps during storm events. Most drainage systems have one or more main lines that collect drainage water from lateral lines installed at regular intervals across a farm field. The main lines empty into a concrete or metal sump structure, in which a pump is placed to discharge the drainage water into an earthen ditch. Most sump pumps are activated by a float and switch that maintain a desired water level in the sump. When a sump pump is turned off, the water level will rise, because the flow of drainage water from main lines into the sump cannot be stopped or controlled. As a result, the sump will overflow and a pond of saline drainage water will form around the sump.

In addition to the potential ponding problem, it is also possible to damage a subsurface drainage system by turning off a sump pump when the soil profile is saturated. Clay tile lines that have been installed by placing small segments of drain lines end-to-end can float apart when the water level rises in a saturated field. This damage can render a drainage system ineffective.

The proportion of sump pumps that can be turned off during storm events is also limited by the difficulty in gaining access to sumps during heavy rainfall conditions when farm roads are not passable in district vehicles. As described elsewhere in this report, Bypass operators will be striving to keep the Bypass Channel in operation during storm events, until the flow of water approaching the Bypass exceeds its

capacity. This strategy of delaying any release of agricultural drainage water to Grassland channels until the latest feasible moment will result in very wet field conditions by the time that district managers are asked to modify sump pump operations.

There are many deep drains in the Grassland drainage area that collect subsurface drain water from lateral lines or from seepage at the edges of farm fields. The deep drains carry water by gravity to regional drainage ditches. During storm events, these drains also carry storm water flows and surface runoff from roads and farm fields. There are some structures in the deep drains, but they provide limited control of this source of drainage water during storm events.

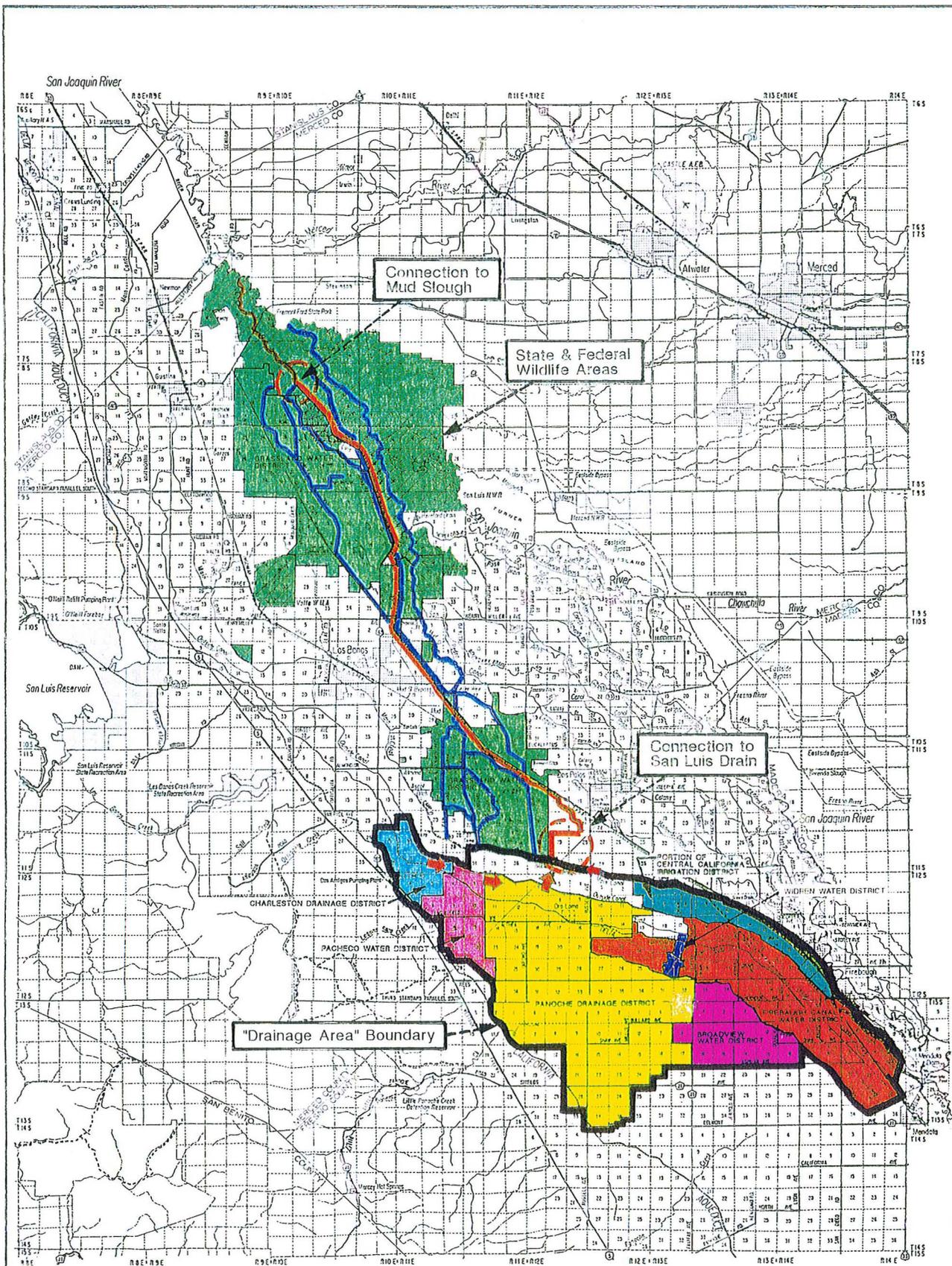
## **Summary**

The Grassland Bypass Channel and the San Luis Drain were designed and constructed explicitly for the purpose of conveying agricultural drainage water. Neither facility can accommodate storm water flows nor surface runoff from major storm events. In fact, the large amount of sediment that is present in the storm water flows and surface runoff must be kept out of these facilities, if their usefulness is to be maintained. Additional sediments are not desirable as they will reduce operational capacity and increase the cost of operating the facility.

The Grassland Bypass Project provides significant environmental benefits to wetland areas and wildlife refuges, as described in the Supplemental Environmental Assessment for the Project and the Use Agreement for the San Luis Drain. The selenium load targets described in those documents for October through December 1996 were achieved as a result of intensive water management efforts in the participating irrigation and drainage districts. These efforts will be continued during

spring and summer months, to minimize the selenium load in agricultural drainage water.

The storm events of early and late January 1997 have revealed several issues that should be addressed by agencies participating in the Grassland Bypass Project and the Regional Water Quality Control Board. These issues involve the dual, but potential conflicting objectives of keeping silt-laden storm water runoff out of the Grassland Bypass Channel and the San Luis Drain, while also achieving the Regional Board's selenium concentration objective for wetland water delivery channels. The Grassland Area Farmers are working with the Regional Board and other interested agencies to develop a long-term plan for achieving these goals, or to determine the optimal balance regarding the amount of sediment entering drainage facilities and the load of selenium entering wetland channels during storm events. To the extent that a reasonable approach to storm events can be identified and maintained, the principal environmental benefits provided by the Grassland Bypass Project will continue to be provided, well into the future.



**LEGEND**

County Line	-----
Great Boundary	-----
River	~~~~~
Creek, Slough, Canal, Ditch (as noted)	~~~~~
Creek	~~~~~
Interstate Highway	=====
State Highway	=====
County Sign Route	=====
Major County Road or City Street	=====
Other Roads	-----
Railroad	-----
City, Town	-----

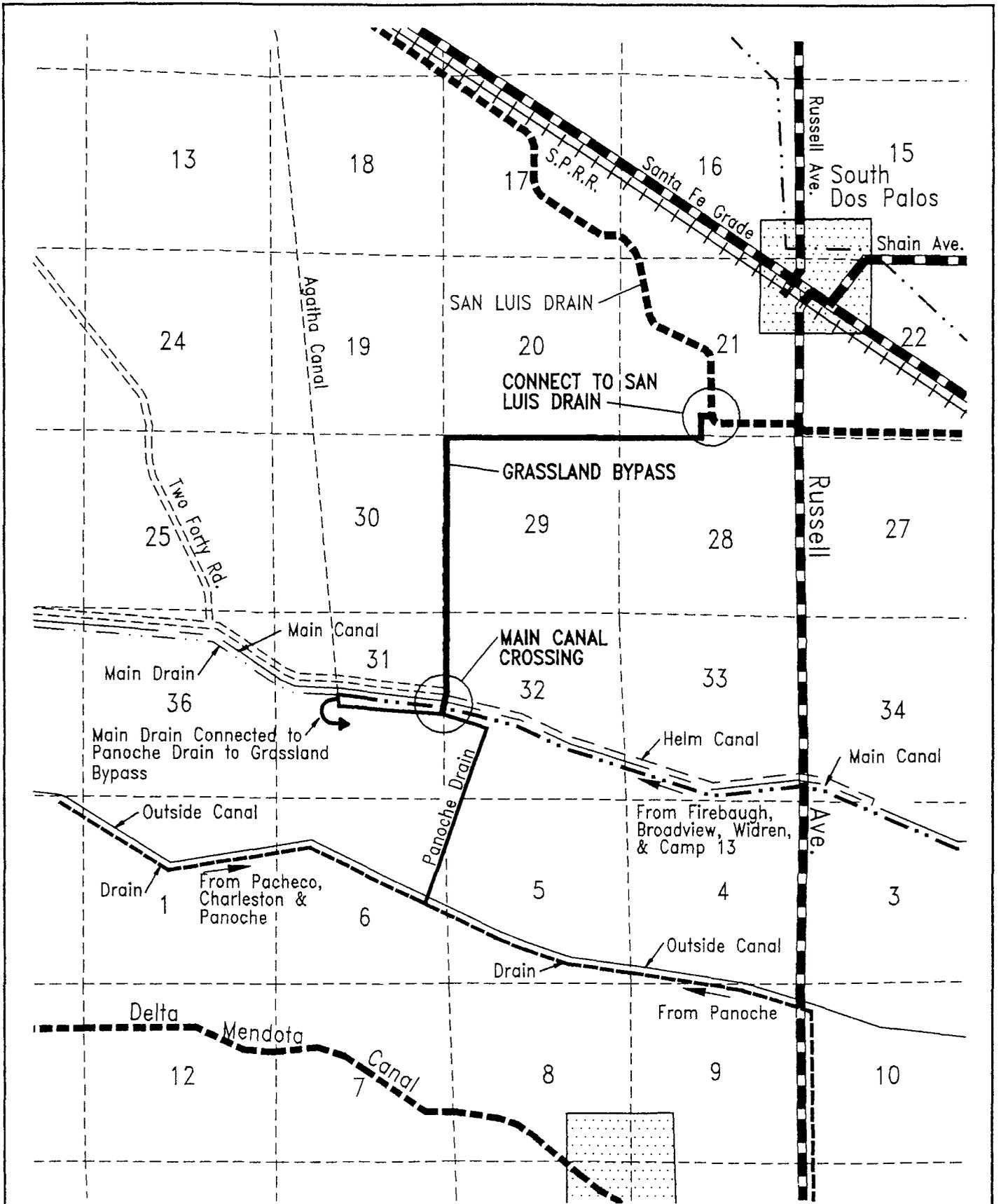
**ABBREVIATIONS**

National Wildlife Refuge	NWR
Waterland Management Area	WMA
Creek	CR
Slough	SL
Stream	ST
Road	R
Drive	D
County	CO
Southern Pacific Railway	SPRR
Atchafalaya and Santa Fe Railway	AT&SFR



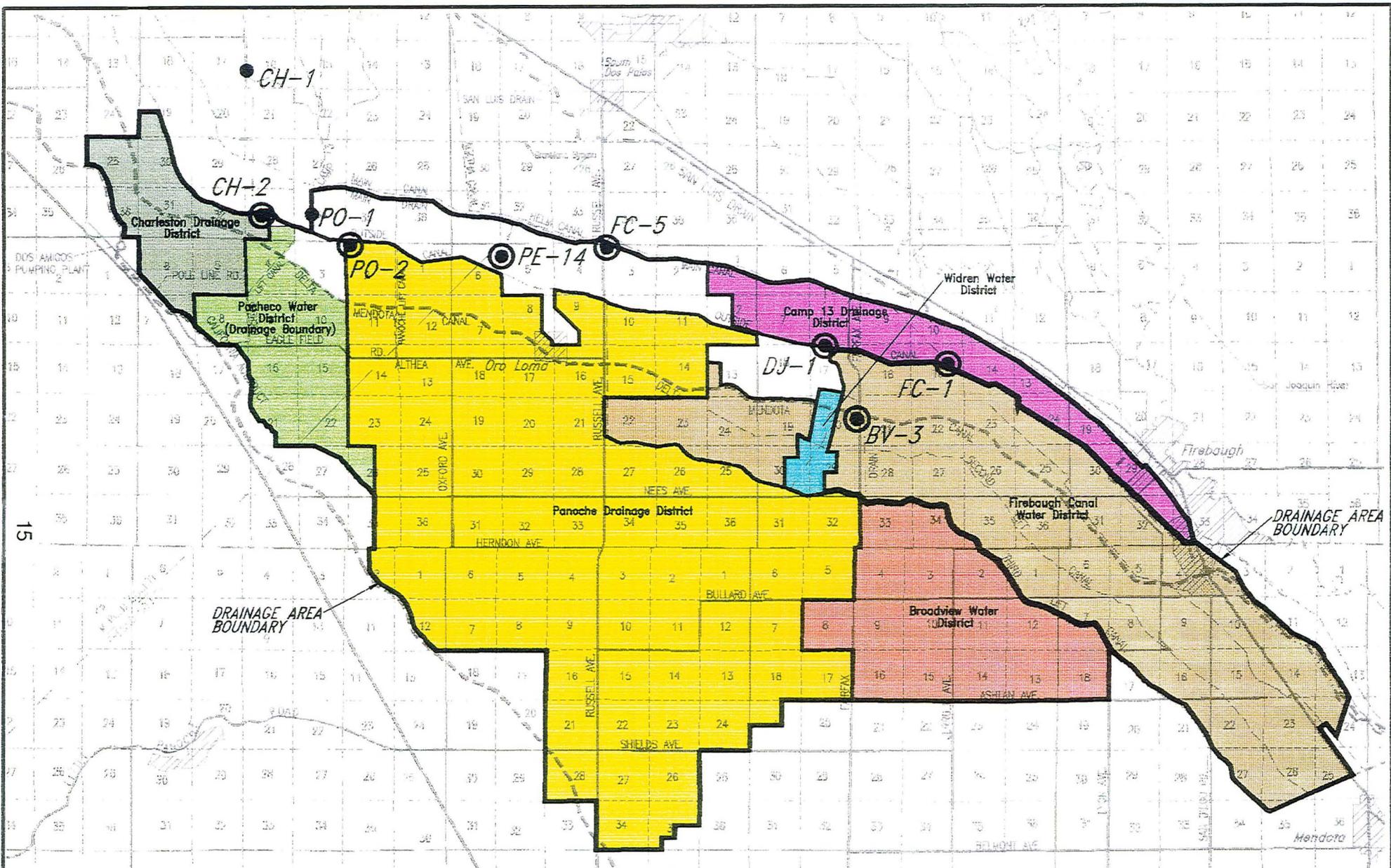
- Proposed Action :**
- Channels that will no longer have unusable drain water.
  - Channels with drain water.
  - Conveyance of drain water in San Luis Drain.
  - Location of project features.

**SUMMERS ENGINEERING, INC.**  
 CONSULTING ENGINEERS  
 HANFORD CALIFORNIA  
 DECEMBER 1999



**LOCATION MAP  
Grassland Bypass Channel**

SUMMERS ENGINEERING, INC.  
Consulting Engineers  
HANFORD CALIFORNIA



**LEGEND**

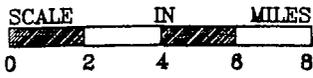
- FC-5  - Current Monitoring Sites
- PO-1  - Historic Monitoring Sites

San Luis & Delta-Mendota Water Authority

**DRAINAGE AREA BOUNDARY**

SUMMERS ENGINEERING, INC.  
 Consulting Engineers  
 HANFORD CALIFORNIA  
 AUGUST 1997

DOS PALOS



DRAINAGE AREA

FIREBAUGH

BELMONT AVE.

MENDOTA

PANOCHÉ / SILVER CREEK WATERSHED

5

SAN

LUIS

CREEK

CANAL

PANOCHÉ

SILVER CREEK

LOCATION MAP  
PANOCHÉ CREEK WATER SHED  
AND  
GRASSLAND DRAINAGE AREA