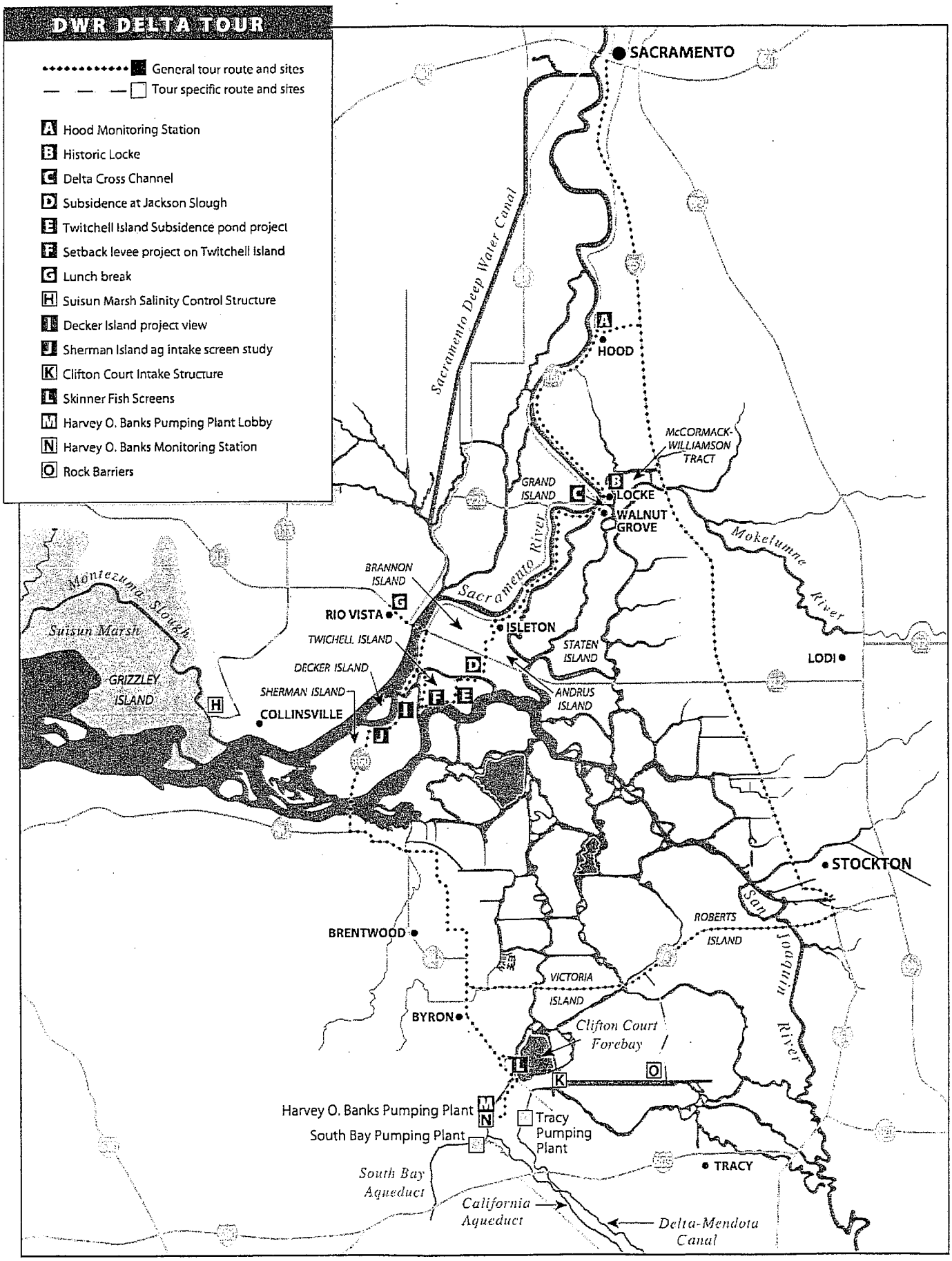
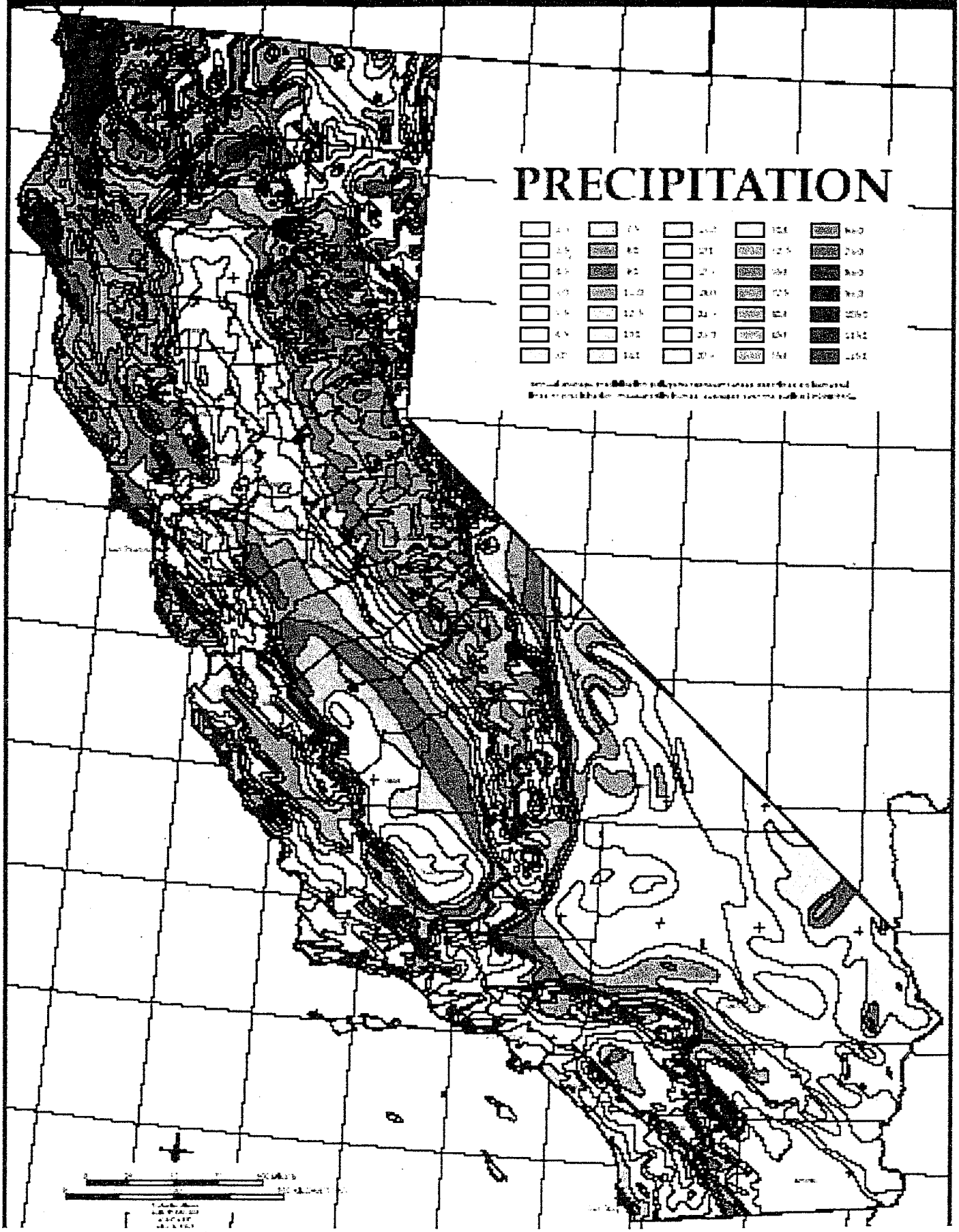

DWR DELTA TOUR
General tour route and sites
Tour specific route and sites
A Hood Monitoring Station
B Historic Locke
C Delta Cross Channel
D Subsidence at Jackson Slough
E Twitchell Island Subsidence pond project
F Setback levee project on Twitchell Island
G Lunch break
H Suisun Marsh Salinity Control Structure
I Decker Island project view
J Sherman Island ag intake screen study
K Clifton Court Intake Structure
L Skinner Fish Screens
M Harvey O. Banks Pumping Plant Lobby
N Harvey O. Banks Monitoring Station
O Rock Barriers
SACRAMENTO
Sacramento Deep Water Canal
HOOD
McCORMACK-WILLIAMSON TRACT
GRAND ISLAND
LOCKE
WALNUT GROVE
Mokelumne River
Sacramento River
BRANNON ISLAND
RIO VISTA
Montezuma Slough
Suisun Marsh
ISLETON
TWICHELL ISLAND
STATEN ISLAND
LODI
DECKER ISLAND
GRIZZLEY ISLAND
SHERMAN ISLAND
ANDRUS ISLAND
COLLINSVILLE
STOCKTON
San Joaquin River
ROBERTS ISLAND
BRENTWOOD
VICTORIA ISLAND
BYRON
Clifton Court Forebay
Harvey O. Banks Pumping Plant
Tracy Pumping Plant
South Bay Pumping Plant
TRACY
South Bay Aqueduct
California Aqueduct
Delta-Mendota Canal

FRAP

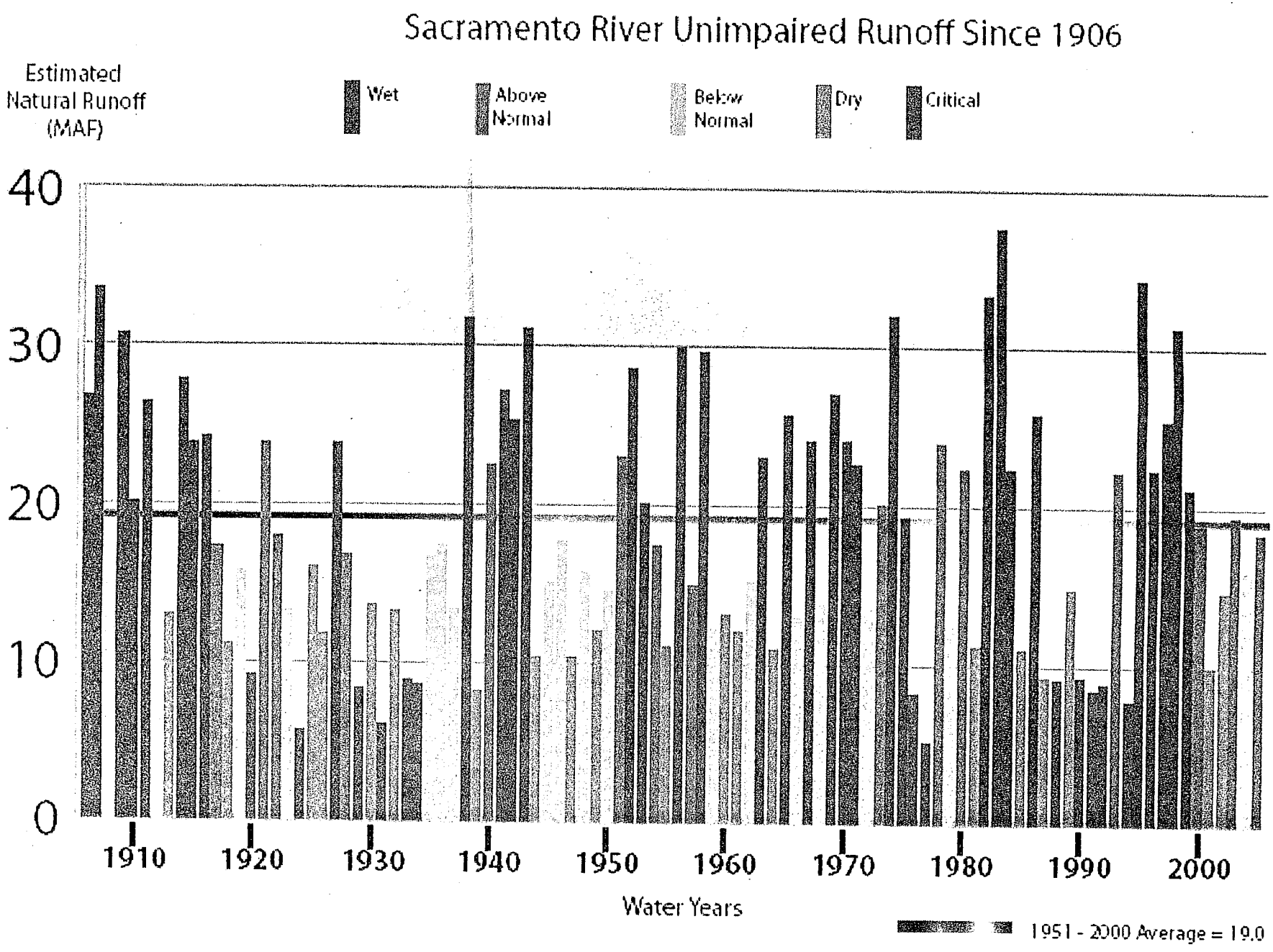
STATE OF CALIFORNIA

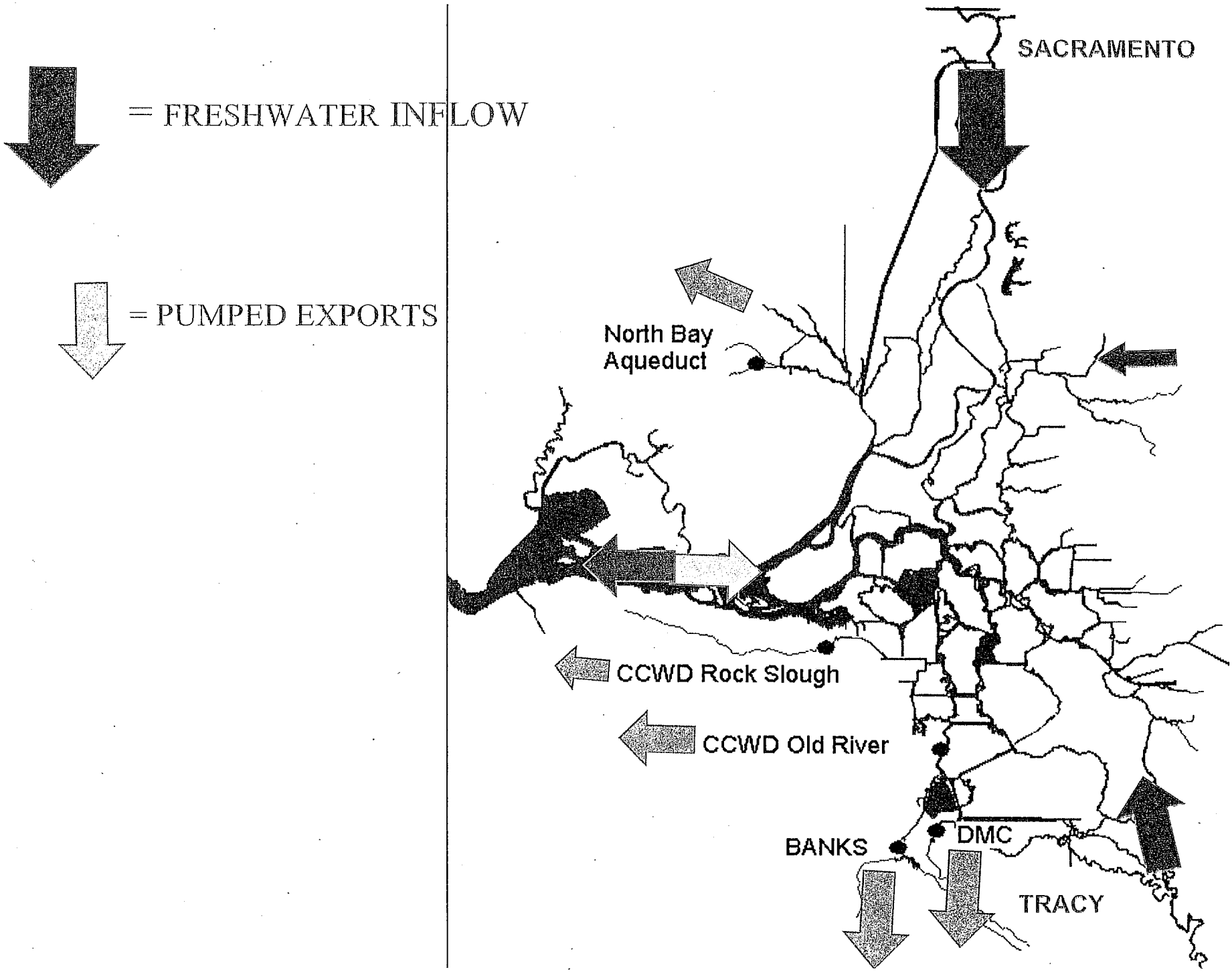


HYDROLOGIC IMBALANCE

Majority of rainfall is in the northern ½ of the state

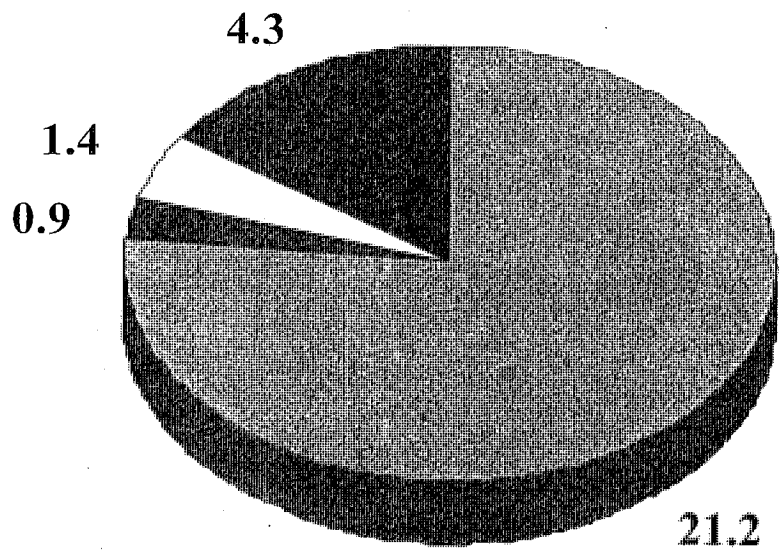
Majority of the population is in the Southern ½ of the state and in the San Francisco Bay Area and the best farm land is in the driest areas of the state


Sacramento River Unimpaired Runoff Since 1906
Estimated Natural Runoff (MAF)
Wet
Above Normal
Below Normal
Dry
Critical
40
30
20
10
0
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
Water Years
1951 - 2000 Average = 19.0


= FRESHWATER INFLOW
= PUMPED EXPORTS
SACRAMENTO
North Bay
Aqueduct
CCWD Rock Slough
CCWD Old River
BANKS
DMC
TRACY

Sacramento-San Joaquin Delta

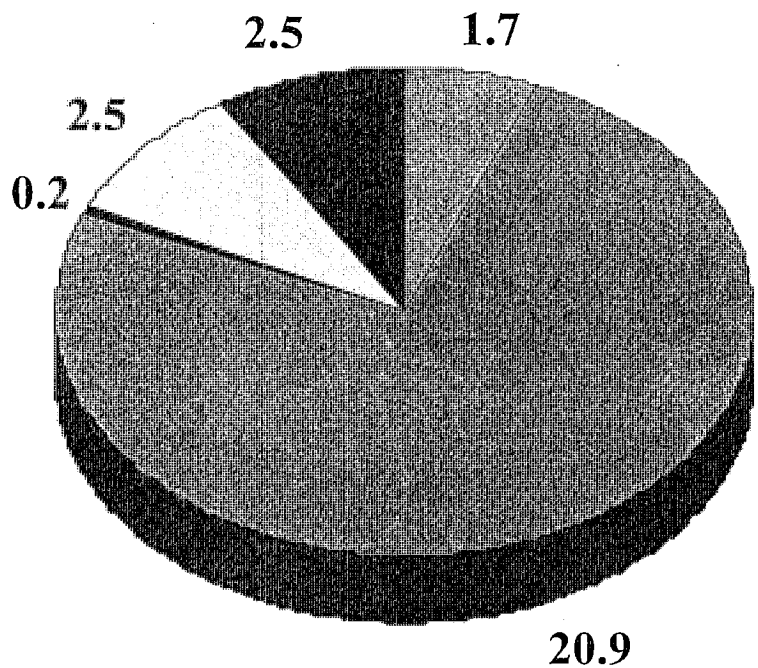
Avg. Annual Inflows (MAF)



Sacramento | Delta Precip | Eastside Streams | San Joaquin

Sacramento-San Joaquin Delta

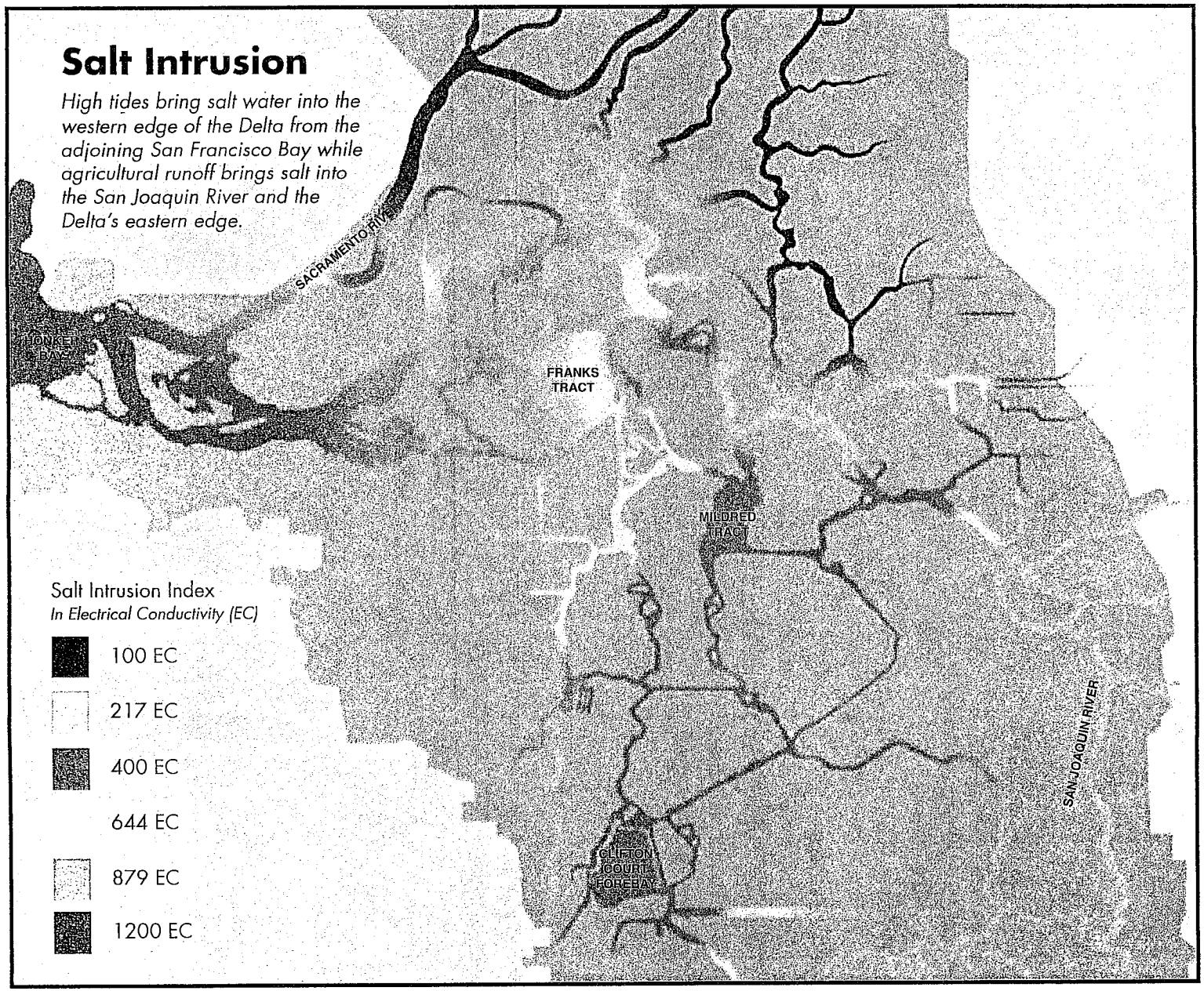
Avg. Annual Outflows & Diversions (MAF)



Consumptive Use | Delta Outflow | CCC & N. Bay
Banks | Tracy

SPECIFIC PARAMETERS OF CONCERN FOR DRINKING WATER

Monitoring Parameter	Significance to Drinking Water Quality
TOC (DBP precursor)	Formation of disinfection byproducts
Bromide (DBP precursor)	Formation of brominated disinfection byproducts
Pathogenic organisms	Waterborne diseases
Chemical contaminants	Regulated drinking water quality constituents
TDS or salinity	Taste and odor problems (salty taste), corrosion of infrastructure and appliances, impacts on wastewater reclamation programs, groundwater conjunctive use programs, and blending projects
Nutrients	Taste and odor problems (algae - geosmin and 2-methylisoborneol), impacts on filtration (algae)
Turbidity	Appearance problems, impacts on filtration & disinfection


Salt Intrusion
High tides bring salt water into the western edge of the Delta from the adjoining San Francisco Bay while agricultural runoff brings salt into the San Joaquin River and the Delta's eastern edge.
SACRAMENTO RIVER
SUISUN BAY
FRANKS TRACT
MILDRED TRACT
CLIFTON COURT FOREBAY
SAN JOAQUIN RIVER
Salt Intrusion Index
In Electrical Conductivity (EC)
100 EC
217 EC
400 EC
644 EC
879 EC
1200 EC

Delta Cross Channel

Location:

On Highway 160 between the towns of Locke (to the north) and Walnut Grove (to the south)

History:

October 1949 the USBR, Corps of Engineers, State Reclamation Board and the Division of Water Resources (not a Department ye t) made the final decision for the Walnut Grove site for the diversion.

Completed in 1951 (shortly after the USBR Tracy Pumping Plant began operation)

Physical Structure:

2 - 60' X 30' gates (steel & concrete) the gate face is actually 38'
Radial arm o peration and they are mounted on a heavily reinforced concrete slab
245' width across the channel

Connecting Channel:

4,200' long
26' deep at maximum water surface level
3,200 CFS designed flow capacity

3 basic reasons for closure:

1) High flows in th e Sacramento River (over 25,000 CFS)
2) Fish Migration
3) Salt Water Intrusion into the Delta

Operational Guidelines

The Delta Cross Channel Gates are operated in accordance with State Water Resources Control Board Decision 1641 as follows:

- From November 1 through January 31. Gates will be closed for a total of up to 45 days for fisheries protection as requested by the US Fish & Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and Department of Fish & Game (DFG). Gates may be closed on very short notice and may be closed on weekends.
- From February 1 through May 20. Gates will be closed .

From May 21 through June 15. Gates will be closed for a total of 14 days for fisheries protection as requested by the USFWS, NMFS, and DFG. Gates may b e closed on very short notice. Whenever possible, gates will be open on the weekends (Saturday and Sunday) and the weekday holiday on Memorial Day weekend, but this cannot be guaranteed.

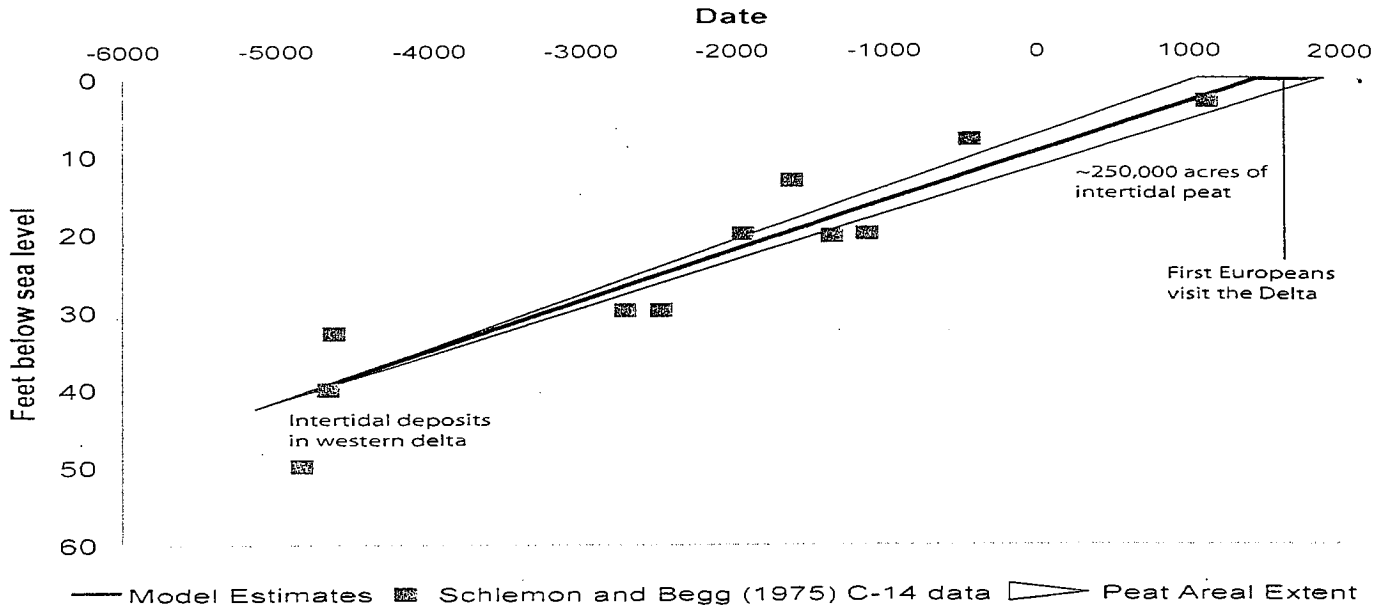
From June 16 through October 31. Gates will generally be open, but t his cannot be guaranteed. Hydrodynamic and fishery experiments have been conducted in late summer and early fall in 2000 and 2001 and are expected to continue thru 2003. These often require intermittent closures.

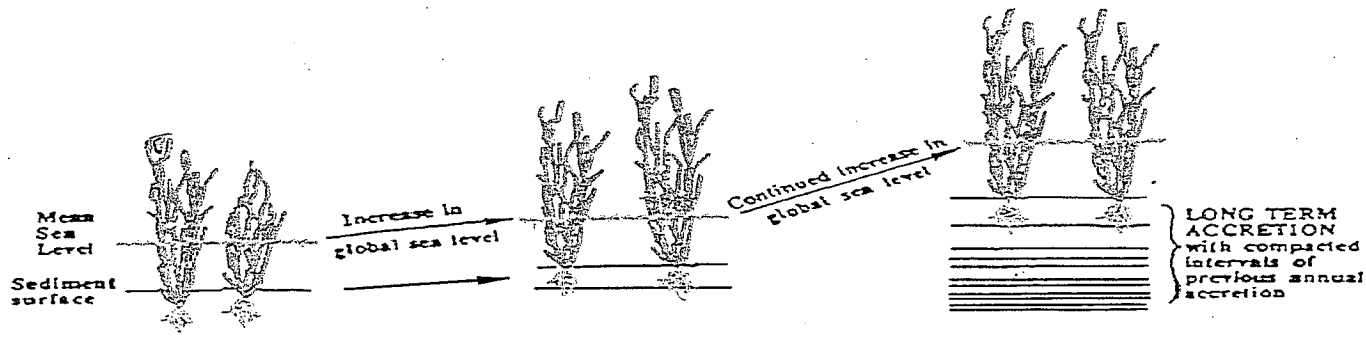
High flows on the Sacramento River, unfore seen fishery protection actions or water quality compliance in the Delta may necessitate a short term closure.

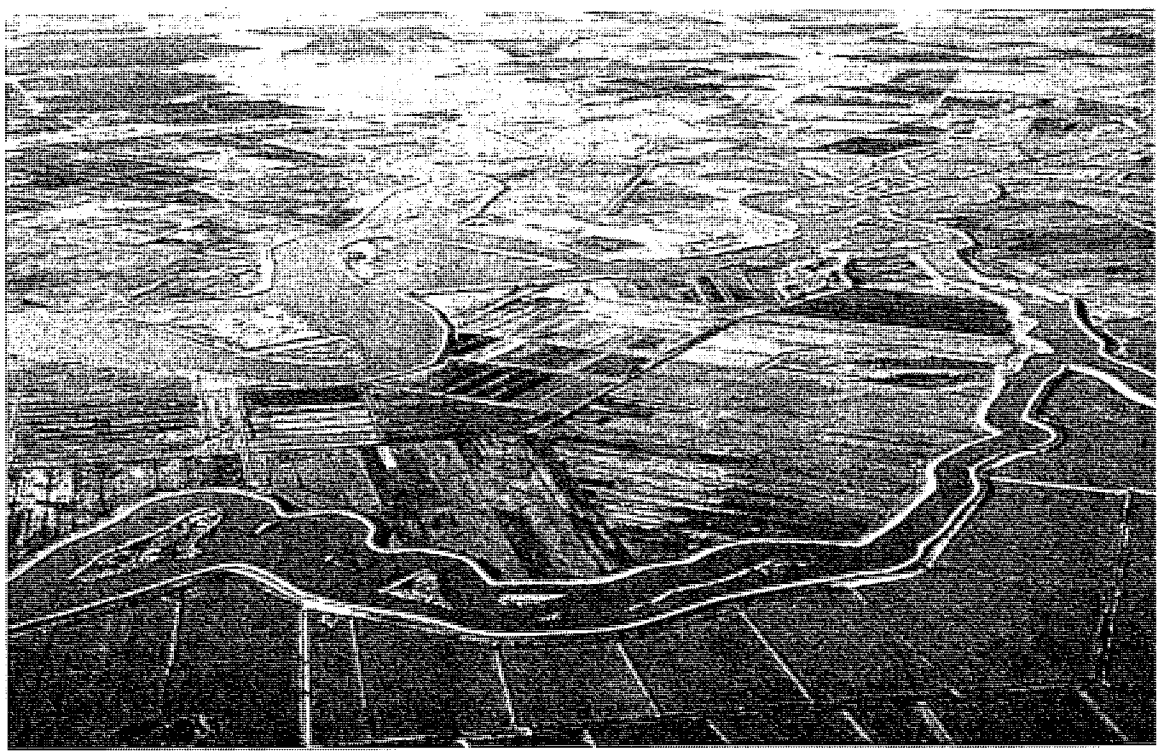
USBR standing operation procedures call for gate closure when flow on the Sacramento River reaches the 20,000 to 25,000 CFS range.

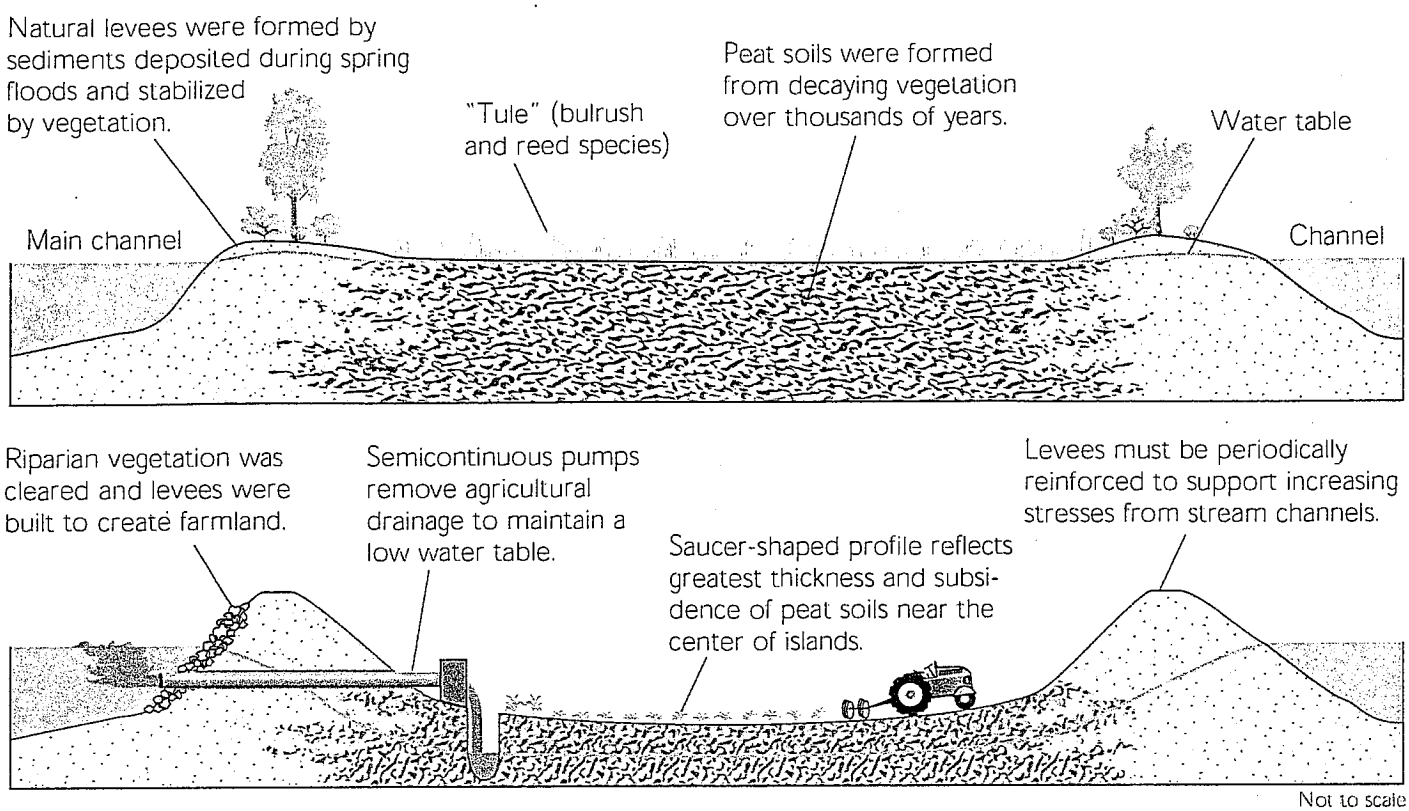
Gate opening and closing times are approximate, since an operator must travel to the site to perform the change. The opening and closing of the gates generally takes 30 minutes to one hour.

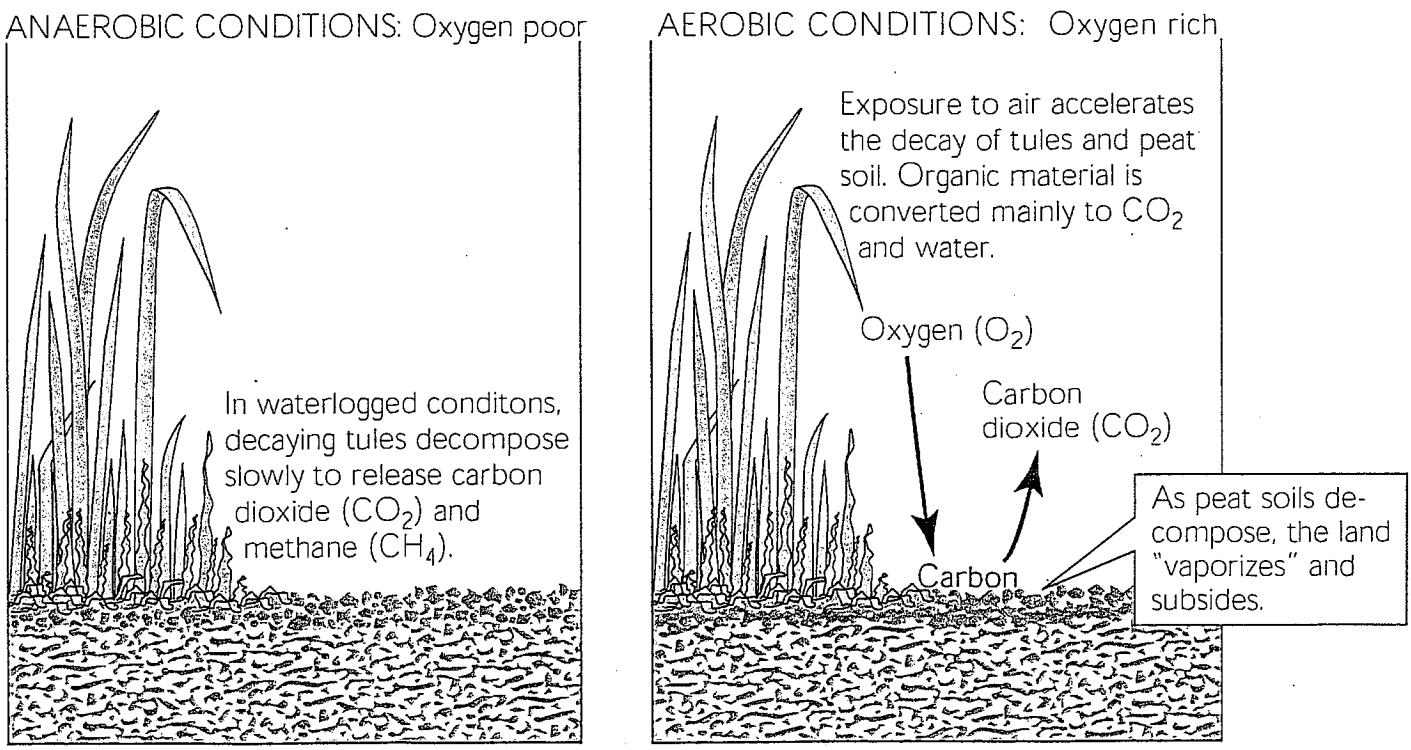
FORMATION OF ORGANIC DEPOSITS





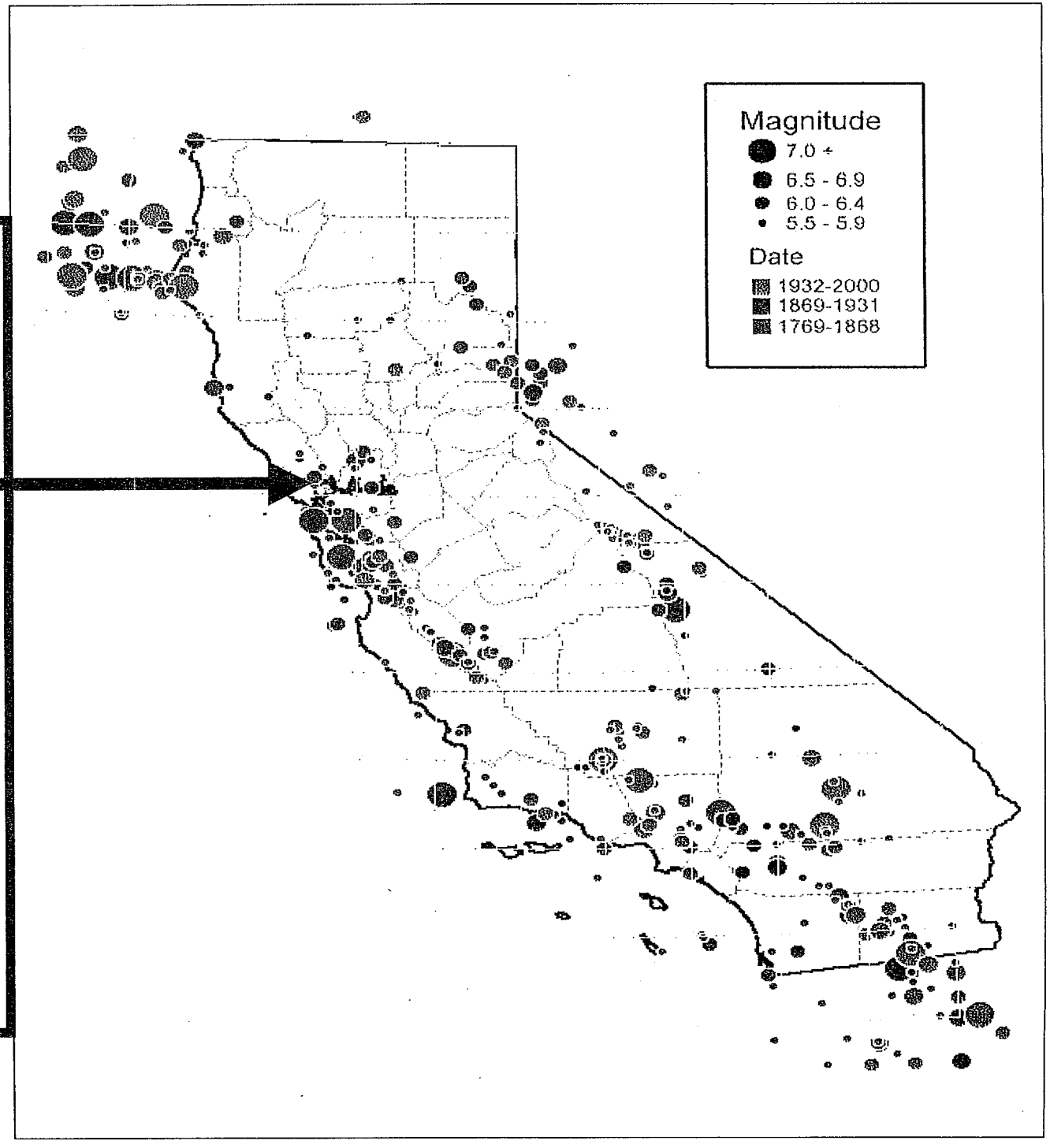


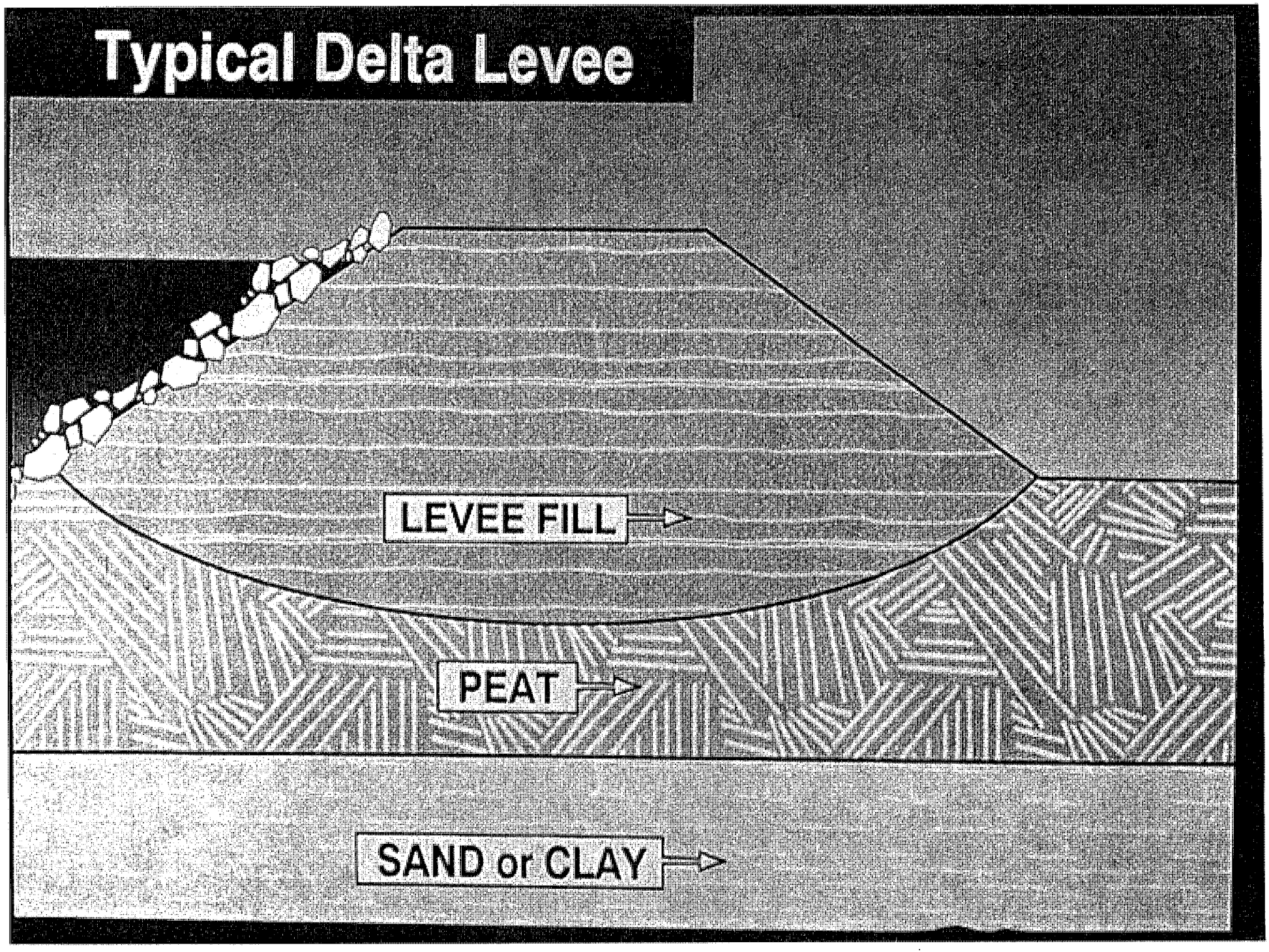

Natural levees were formed by sediments deposited during spring floods and stabilized by vegetation.
"Tule" (bulrush and reed species)
Peat soils were formed from decaying vegetation over thousands of years.
Water table
Main channel
Channel
Riparian vegetation was cleared and levees were built to create farmland.
Semicontinuous pumps remove agricultural drainage to maintain a low water table.
Saucer-shaped profile reflects greatest thickness and subsidence of peat soils near the center of islands.
Levees must be periodically reinforced to support increasing stresses from stream channels.
Not to scale


ANAEROBIC CONDITIONS: Oxygen poor
In waterlogged conditons, decaying tules decompose slowly to release carbon dioxide (CO_2) and methane (CH_4).
AEROBIC CONDITIONS: Oxygen rich
Exposure to air accelerates the decay of tules and peat soil. Organic material is converted mainly to CO_2 and water.
Oxygen (O_2)
Carbon dioxide (CO_2)
Carbon
As peat soils decompose, the land "vaporizes" and subsides.

Seismic Activity in The Delta:

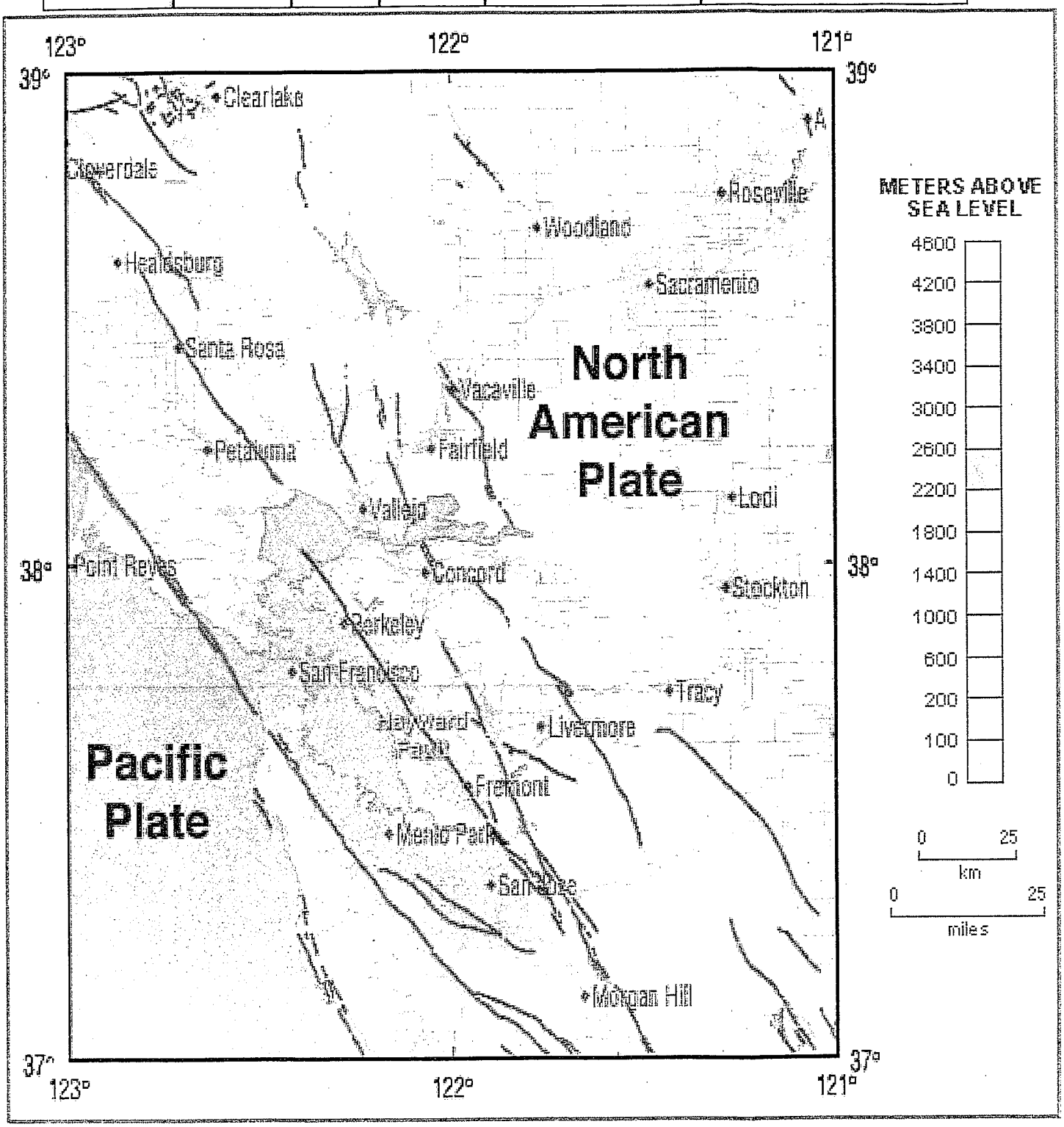
This could have a substantial impact on levee integrity. Liquefaction could cause massive levee failures that would shut the export pumps for months



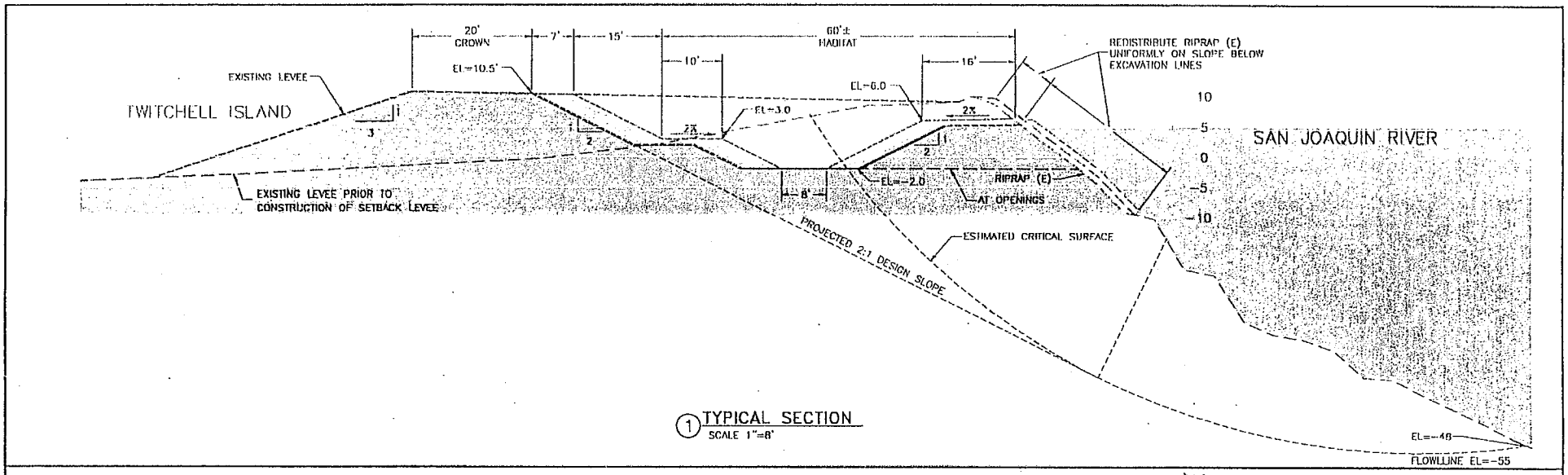

Typical Delta Levee
LEVEE FILL
PEAT
SAND or CLAY

VACAVILLE FAULT

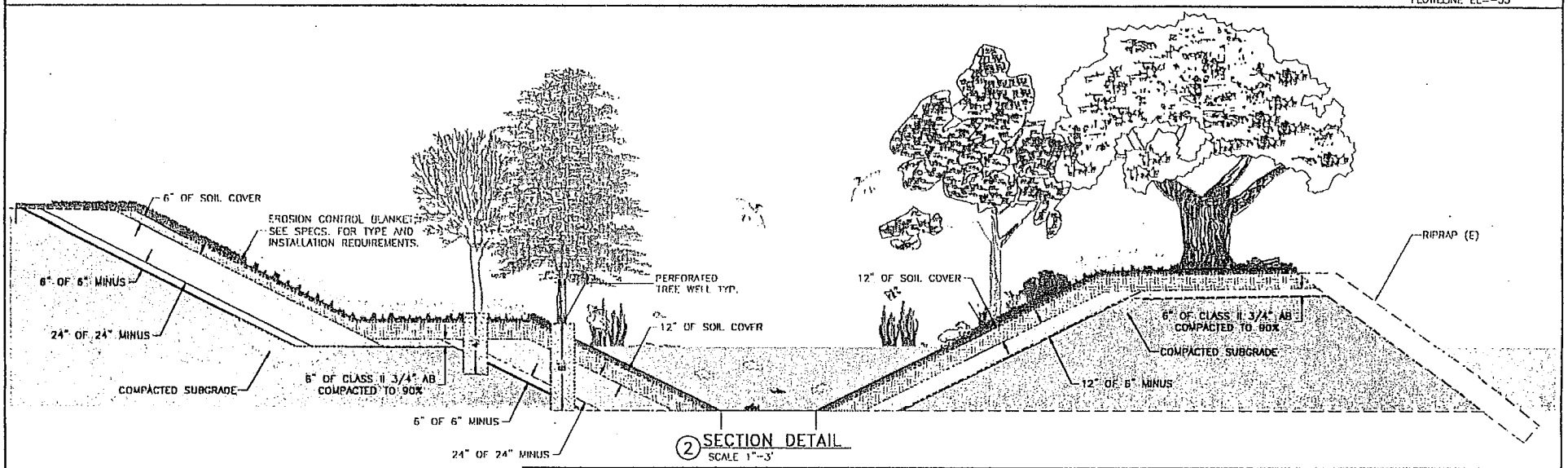
1892, Apr. 19	6.6	38.40	-122.00	Vacaville	1 dead; $225,000 in property damage



Twitchell Island Setback Levee



1 TYPICAL SECTION
SCALE 1"=8'



2 SECTION DETAIL
SCALE 1"=3'

ORIGINAL SCALE IN INCHES FOR REDUCED PLAN
0 1 2 3

KJELDSEN SINNOCK NEUDECK INC.
Consulting Engineers and Land Surveyors
Post Office Box 844
711 N. Pershing Avenue
Stockton, CA 95201-0844
(209) 946-0268

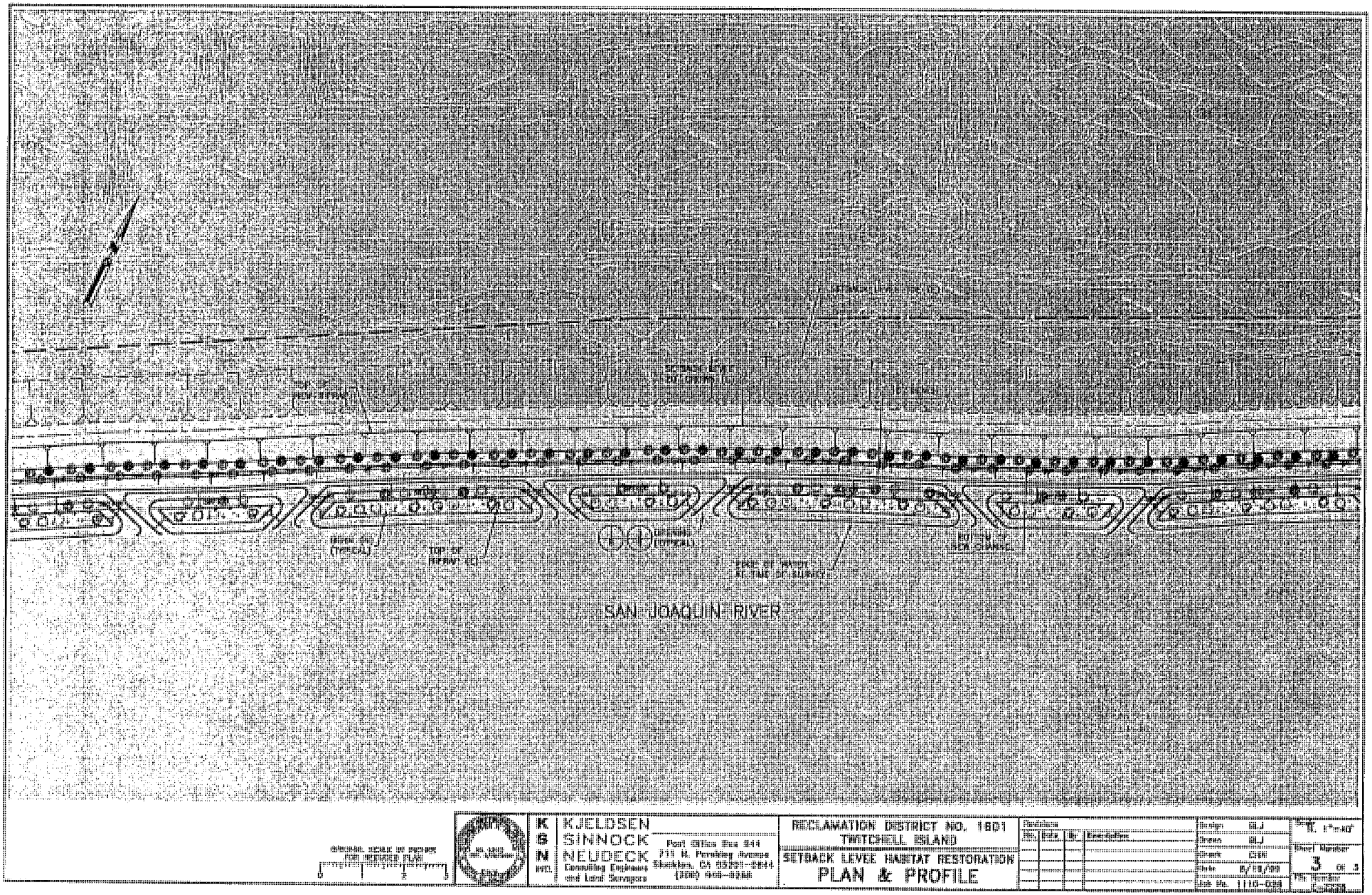
RECLAMATION DISTRICT NO. 1601
TWITCHELL ISLAND
SETBACK LEVEE HABITAT RESTORATION
TYPICAL SECTIONS

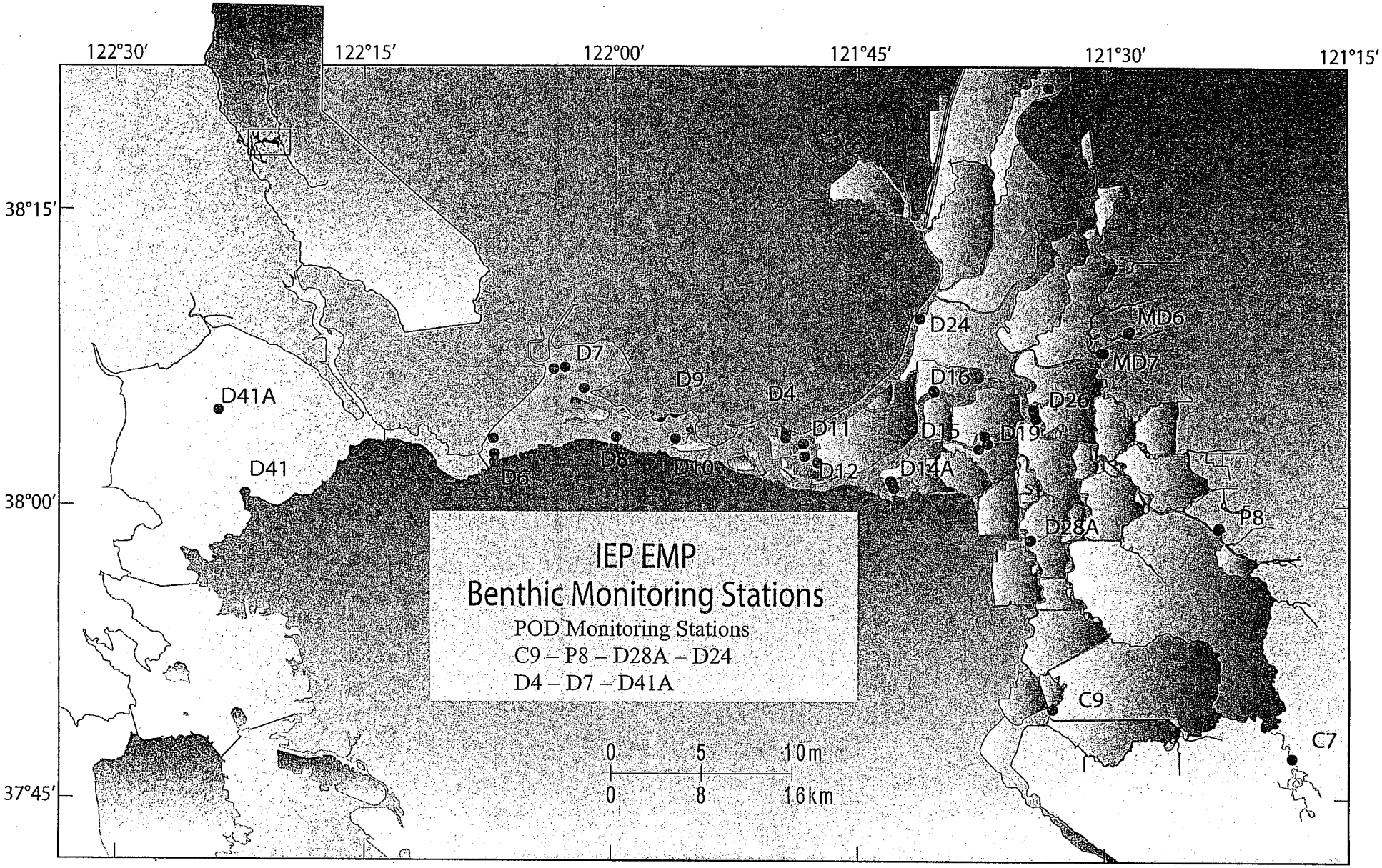
Revisions			
No.	Date	By	Description

Design	BLJ
Drawn	BLJ
Check	CHN
Date	8/19/99
Job No.	1110-028

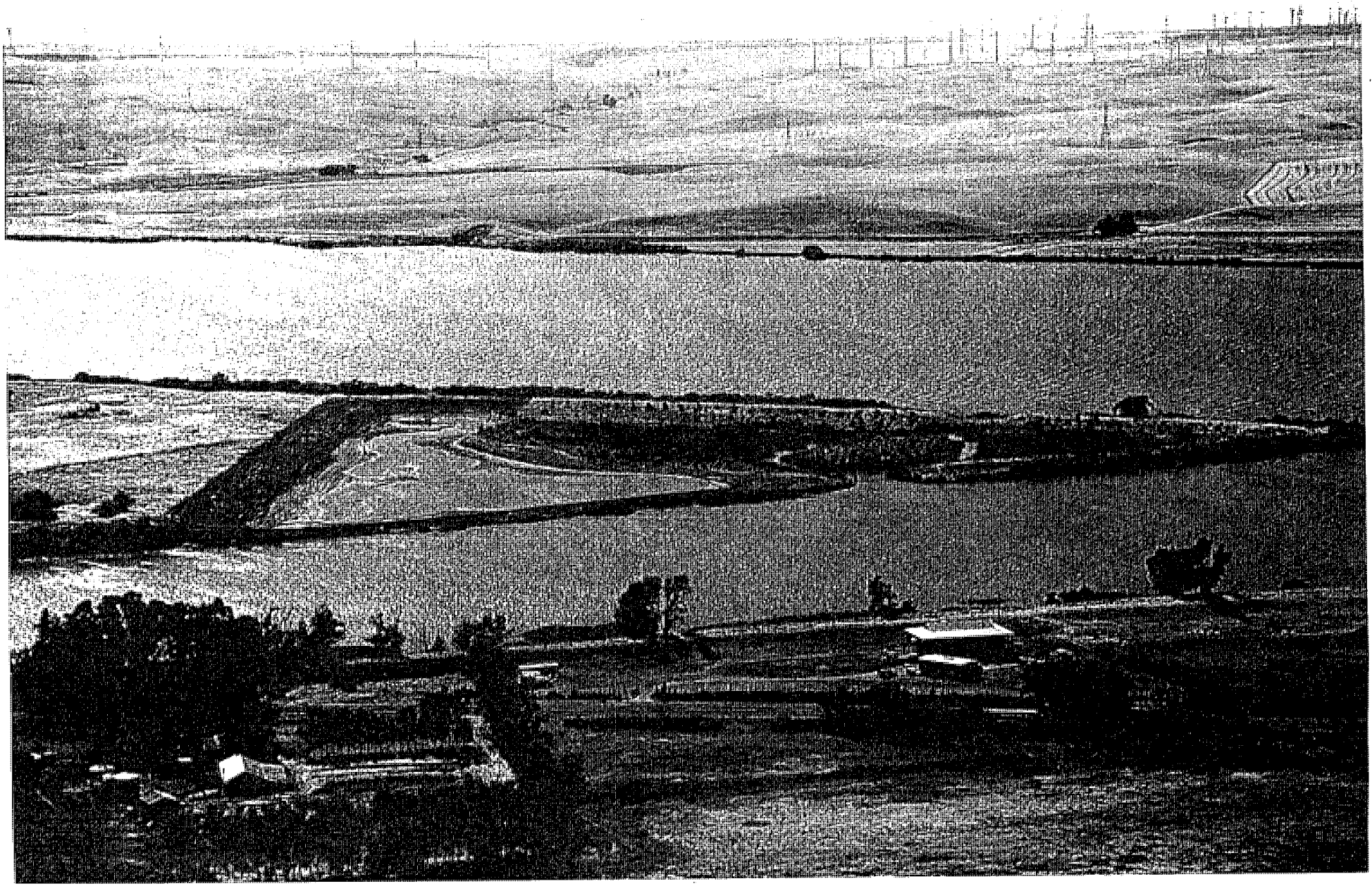
Scale: AS NOTED
Sheet Number: 2 of 3
File Number: E-222B

Twitchell Island Openings




122°30′
122°15′
122°00′
121°45′
121°30′
121°15′
38°15′
38°00′
37°45′
D24
MD6
MD7
D7
D9
D4
D16
D26
D41A
D11
D15
D19
D41
D8
D10
D12
D14A
D6
P8
D28A
C9
C7
IEP EMP
Benthic Monitoring Stations
POD Monitoring Stations
C9 – P8 – D28A – D24
D4 – D7 – D41A
0 5 10m
0 8 16km

Decker Island with Phase 2



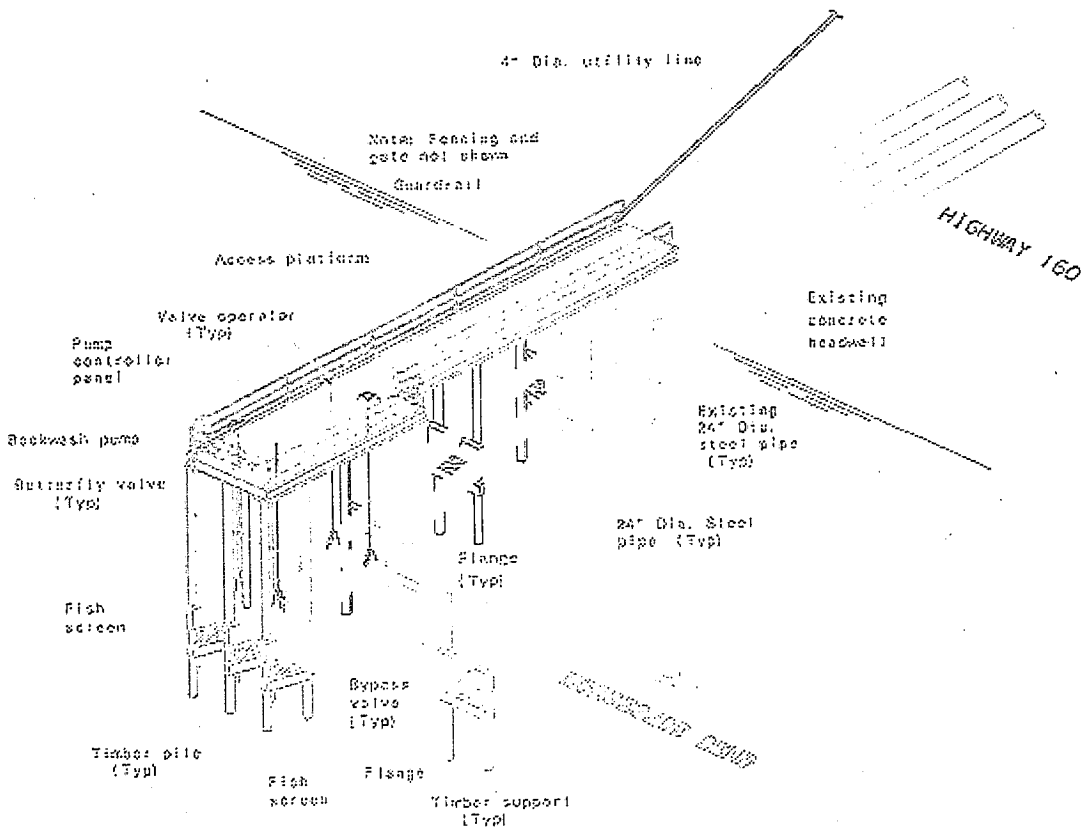
Decker Island Phase 1

Delta Fish Screens

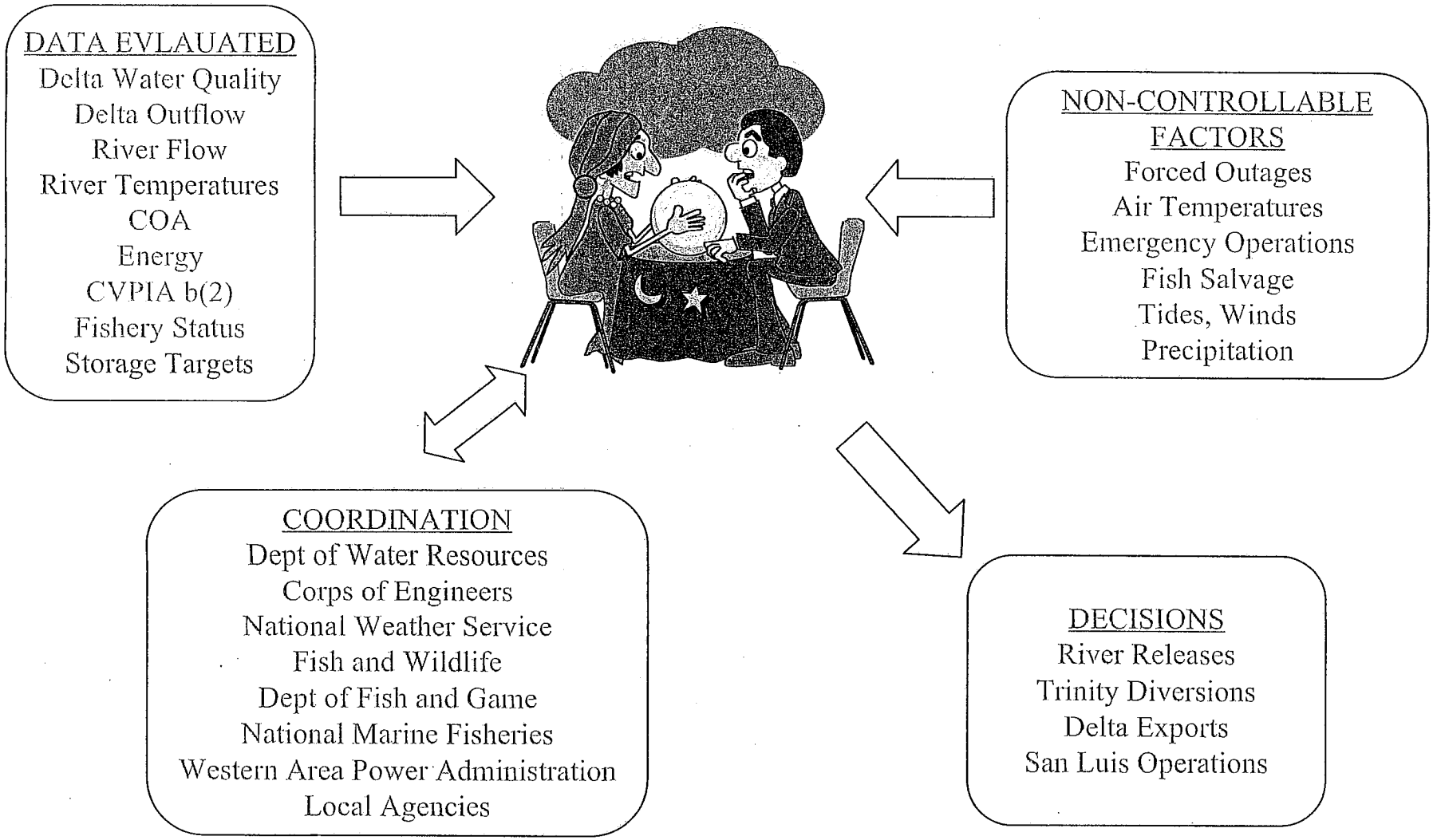
Horseshoe Bend Fish Screen on Sherman Island

This project is the first of five intake facilities in the delta to be screened for fisheries impact mitigation as part of the temporary barriers program. The project is located in Sacramento County approximately 6.5 miles south east of Rio Vista on Sherman Island, adjacent to Horseshoe Bend.

The fish screens are designed to meet operational requirements of the Sherman Island Irrigation District and the revised fish screening criteria issued by the Department of Fish and Game (April 14, 1997) as well as criteria issued by the National Marine Fisheries Service (January 1997) for delta smelt. The maximum total diversion of 30cfs flows through two - 24" diameter siphons with a maximum velocity of 0.2 feet per second at the screens. The screen material is cupro-nickel on a stainless steel structure. The screens will be self-cleaning, by means of a pressurized water backwash system. One unscreened 24" diameter siphon will be used for fish sampling and to provide the client with future increased diversion capacity.



Daily Decision Process

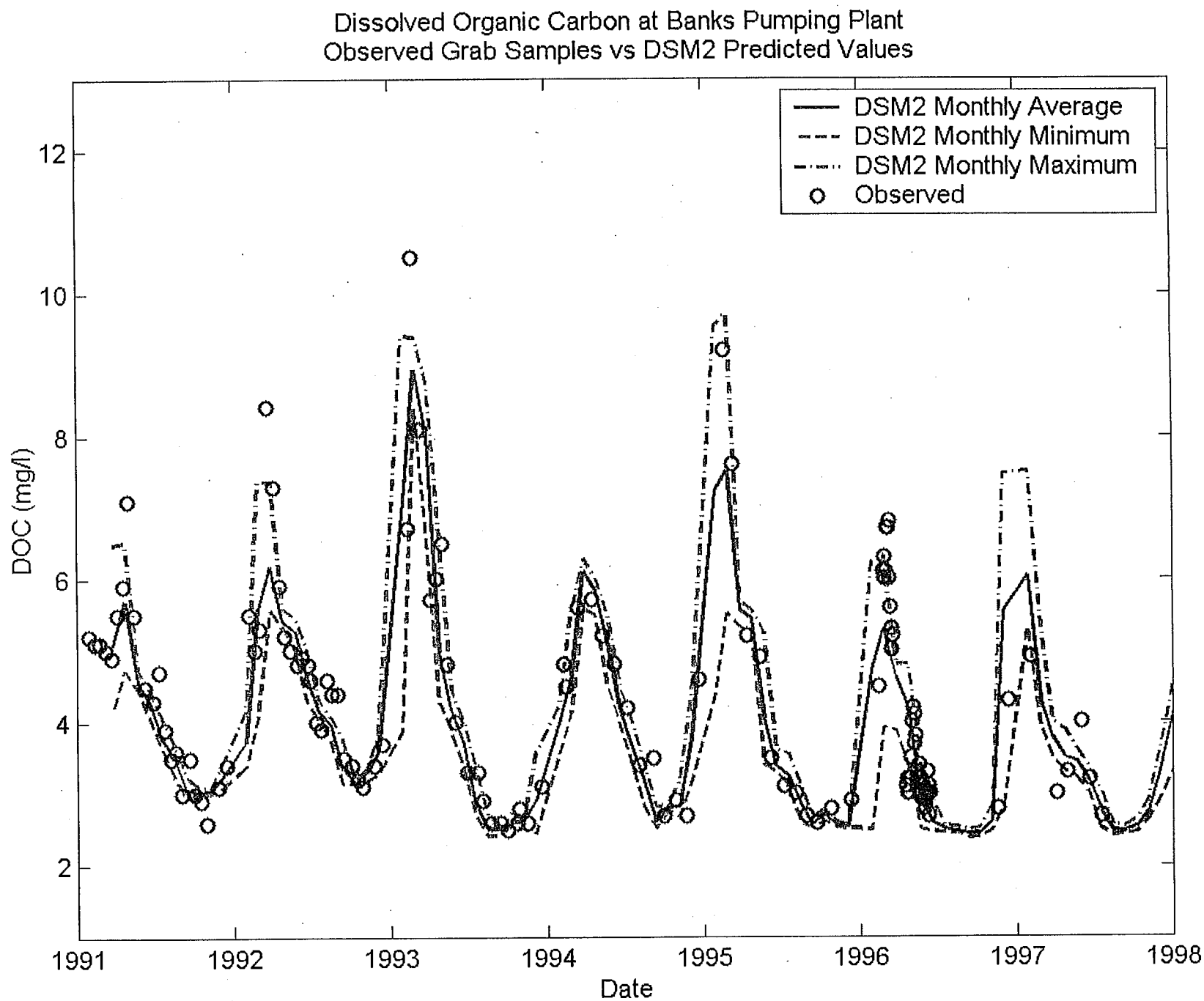


Bay-Delta Standards

DRAFT

Contained in D-1641

CRITERIA	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
FLOW/OPERATIONAL												
• Fish and Wildlife												
SWP/CVP Export Limits					1,500cfs [1]							
Export/Inflow Ratio [2]	65%	35% of Delta Inflow [3]					65% of Delta Inflow					
Minimum Delta Outflow	[4]						3,000 - 8,000 cfs [4]					
Habitat Protection Outflow		7,100 - 29,200 cfs [5]										
Salinity Starting Condition [6]		[6]										
River Flows:												
@ Rio Vista									3,000 - 4,500 cfs [7]			
@ Vernalis - Base		710 - 3,420 cfs [8]				[8]						
- Pulse					[9]					+28TAF		
Delta Cross Channel Gates	[10]	Closed				[11]					Conditional [10]	
WATER QUALITY STANDARDS												
• Municipal and Industrial												
All Export Locations	≤ 250 mg/l Cl											
Contra Costa Canal	150 mg/l Cl for the required number of days [12]											
• Agriculture												
Western/Interior Delta				Max.14-day average EC mmhos/cm [13]								
Southern Delta [14]		1.0 mS			30 day running avg EC 0.7 mS					1.0 mS		
• Fish and Wildlife												
San Joaquin River Salinity [15]				14-day avg;0.44 EC								
Suisun Marsh Salinity [16]	12.5 EC	8.0 EC		11.0 EC						19.0 EC	[17]	15.5 EC


Dissolved Organic Carbon at Banks Pumping Plant
Observed Grab Samples vs DSM2 Predicted Values
DSM2 Monthly Average
DSM2 Monthly Minimum
DSM2 Monthly Maximum
Observed
DOC (mg/l)
12
10
8
6
4
2
1991
1992
1993
1994
1995
1996
1997
1998
Date