QUALITY OF AGRICULTURAL DRAINAGE DISCHARGES TO THE SAN JOAQUIN RIVER FROM AREA EAST OF THE RIVER IN STANISLAUS, MERCED AND MADERA COUNTIES, CALIFORNIA JANUARY 1986 TO SEPTEMBER 1988

California Regional Water Quality Control Board
Central Valley Region
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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

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INTRODUCTION

The Agricultural Unit of the Central Valley Regional Water Quality Control Board (Regional Board) initiated a water quality monitoring program to evaluate the effects of surface and subsurface agricultural drainage water discharges on San Joaquin River water quality. In January 1986, monitoring was initiated on discharges entering the east side of the river from irrigated areas in Stanislaus, Merced and Madera Counties. The purpose of this monitoring program was to compile a data base for selected inorganic constituents found in the agricultural drains that are discharging into the San Joaquin River. This data base will be used in the development and evaluation of an agricultural drainage reduction program in the San Joaquin River.

The majority of the subsurface agricultural drainage pollutant load is discharge to the San Joaquin River via Mud Slough (north) and Salt Slough in Merced County (James et al., 1988a and 1988b). The impact of these discharges, however, is highly modified by numerous surface discharges downstream of these two sloughs. The importance of these downstream discharges is manifested by the finding that the majority of the San Joaquin River in many months of the year is made up entirely of agricultural return flows. Little information is available on the quality and magnitude of the discharges that occur from the east side of the river. The most significant of these occur in Merced and Stanislaus Counties. Additional discharges enter the river upstream of Mud Slough (north) and Salt Slough and effect the rate of dilution or the irrigation supply diverted from the river in these areas. The objective of this study was to characterize the discharges known to enter the San Joaquin River from the east within areas in Stanislaus, Merced and Madera Counties. The goals were:

a) to develop a data base that could be used in assessing beneficial use impacts and appropriate water quality objectives for the San Joaquin River;

b) to identify the need for regulatory actions; and

c) to provide a data base for the flow model being developed for the San Joaquin River.

STUDY AREA

The study area consists of the drainage areas in the irrigated land that discharge into the San Joaquin River from the east. These areas are located in portions of Stanislaus, Merced and Madera Counties (Figure 1). A listing of all monitoring sites is given in Table 1. The site identification numbers and monitoring site descriptions are used throughout this report. Although the discharge monitoring point is at the river, the drainage area may extend to the east of Highway 99. Some of the monitoring (discharge) sites enter into one of the three east side tributaries (Stanislaus, Tuolumne and Merced Rivers); however, these tributaries flow directly to the San Joaquin River. The discharges occur throughout a 133-mile section of the river from the Mendota Dam at the Mendota Pool to the Stanislaus River inflow near Vernalis. The study area has been broken down into three zones for ease of discussion. The northern most zone is bounded on the north by the Stanislaus River, on the south by the Merced River, and on the west by the San Joaquin River (Figure 2). Discharges from this

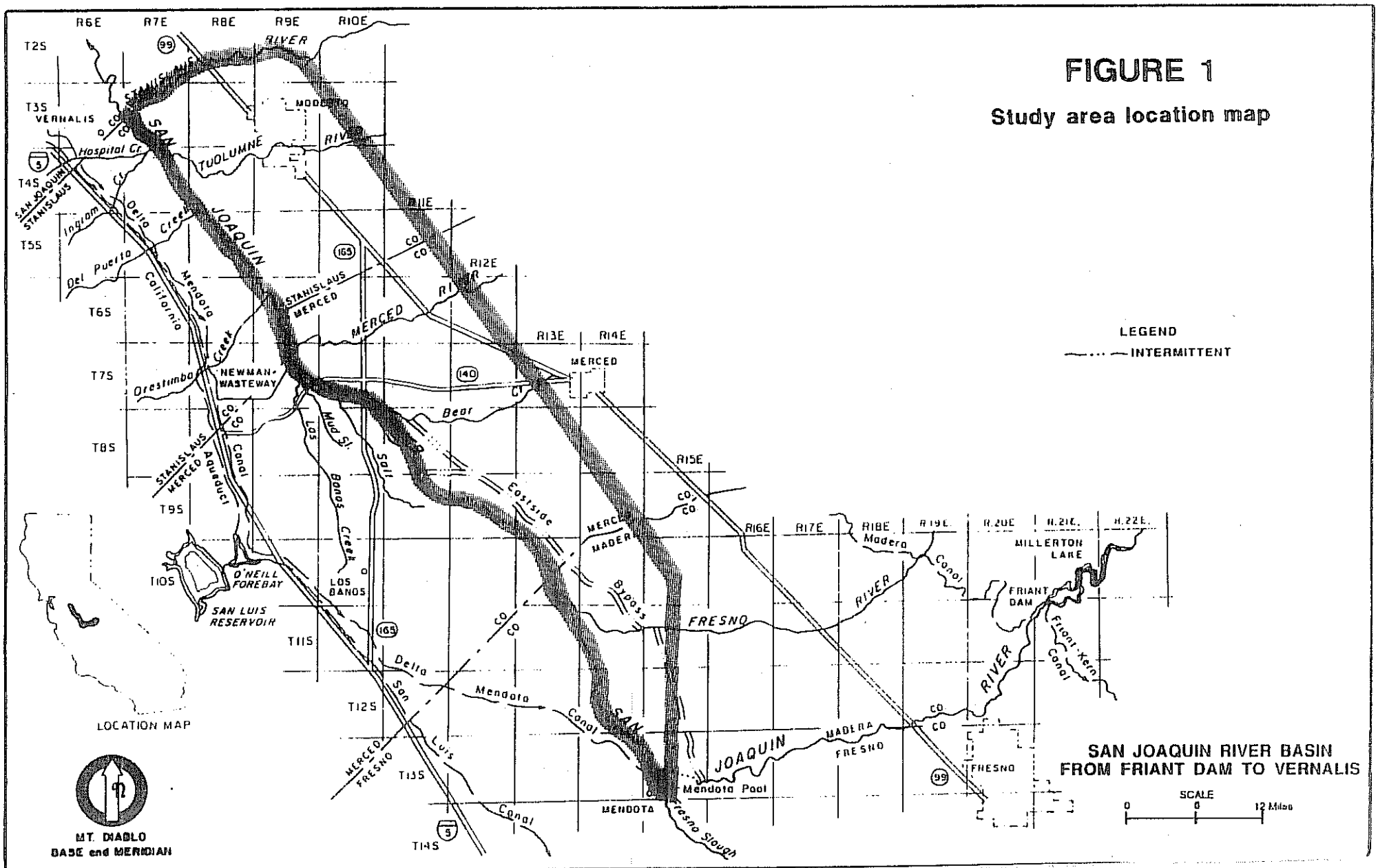


FIGURE 1
Study area location map
LEGEND
INTERMITTENT
SAN JOAQUIN RIVER BASIN
FROM FRIANT DAM TO VERNALIS
SCALE
0
12 Miles
LOCATION MAP
MT. DIABLO
BASE and MERIDIAN
R6E
R7E
R8E
R9E
R10E
R12E
R13E
R14E
R15E
R16E
R17E
R18E
R19E
R20E
R21E
R22E
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
T10S
T11S
T12S
T13S
T14S
VERNALIS
MODESTO
MERCED
NEWMAN-WASTEWAY
LOS BANOS
O'NEILL FOREBAY
SAN LUIS RESERVOIR
MENDOTA
Mendota Pool
FRESNO
MILLERTON LAKE
FRIANT DAM
SAN JOAQUIN RIVER
TUOLUMNE RIVER
MERCED RIVER
FRESNO RIVER
Hospital Cr.
Ingram Cr.
Del Puerto Creek
California Creek
Mendota Creek
Orestimba Creek
Bear Cr.
Mud Sl.
Los Banos Creek
Salt Sl.
Eastside Bypass
Madera Canal
Friant-Kern Canal
Delta Mendota Canal
San Luis Canal
Fresno Slough
STANISLAUS
SAN JOAQUIN
STANISLAUS
MERCED
MERCED AQUEDUCT
MERCED
MADERA
MADERA
FRESNO
FRESNO
MERCED
FRESNO
99
165
140
5

Table 1. Monitoring Sites on Canals and Discharges That Flow into the San Joaquin River from the East.

Map Index	Site Description
Northern Sites	
MER012	Highline Canal Discharge to Merced River
MER013	Stevinson Lateral Discharge to Merced River
MER014	Turlock I.D. Laterals 6 & 7 at Central Ave.
STC101	Harding Drain at Carpenter Road (TID Lat. 5)
STC102	Westport Drain & TID Lat 2 1/2 & 3 to San Joaquin River
STC103	Turlock I.D. Laterals 1 & 2 to San Joaquin River
STC104	Modesto I.D. Lateral 5 at Paradise Road
STC105	Modesto I.D. Lateral 4 at Paradise Road
STC106	Miller Lake Discharge to Stanislaus River
STC107	Modesto I.D. Lateral 6 to Stanislaus River
STC108	Modesto I.D. Main Canal Discharge to Stanislaus River
STC109	Modesto I.D. Lateral 2 Discharge to Dry Creek
STC110	Modesto I.D. Lateral 1 at Mariposa Road
STC111	Modesto I.D. Lateral 1 at Santa Fe Avenue
STC112	Modesto I.D. Main Canal at Albers Road
Central Sites	
MER002	Bear Creek at Diversion
MER003	Owens Creek at Dan McNamara Road
MER004	Duck Slough at Dan McNamara Road
MER005	Turner Island Discharge at Pump #33
MER006	South Slough at Bert Crane Road
MER007	Bear Creek at Bert Crane Road
MER008	Atwater Drain at Highway 140
MER009	Owens Creek at Gurr Road
MER010	Livingston Drain at HWY 140/Washington Ave.
MER011	Stevinson Water District Discharge to Merced River
Southern Sites	
MAD001	Ash Slough at Avenue 21
MAD002	Eastside Bypass at Road 9
MAD003	Berenda Slough at Road 9
MAD004	Mowry Ranch Drain to Mendota Pool
MAD005	Buttonwillow Drain at Avenue 9 1/2
MER001	San Joaquin River near Washington Avenue

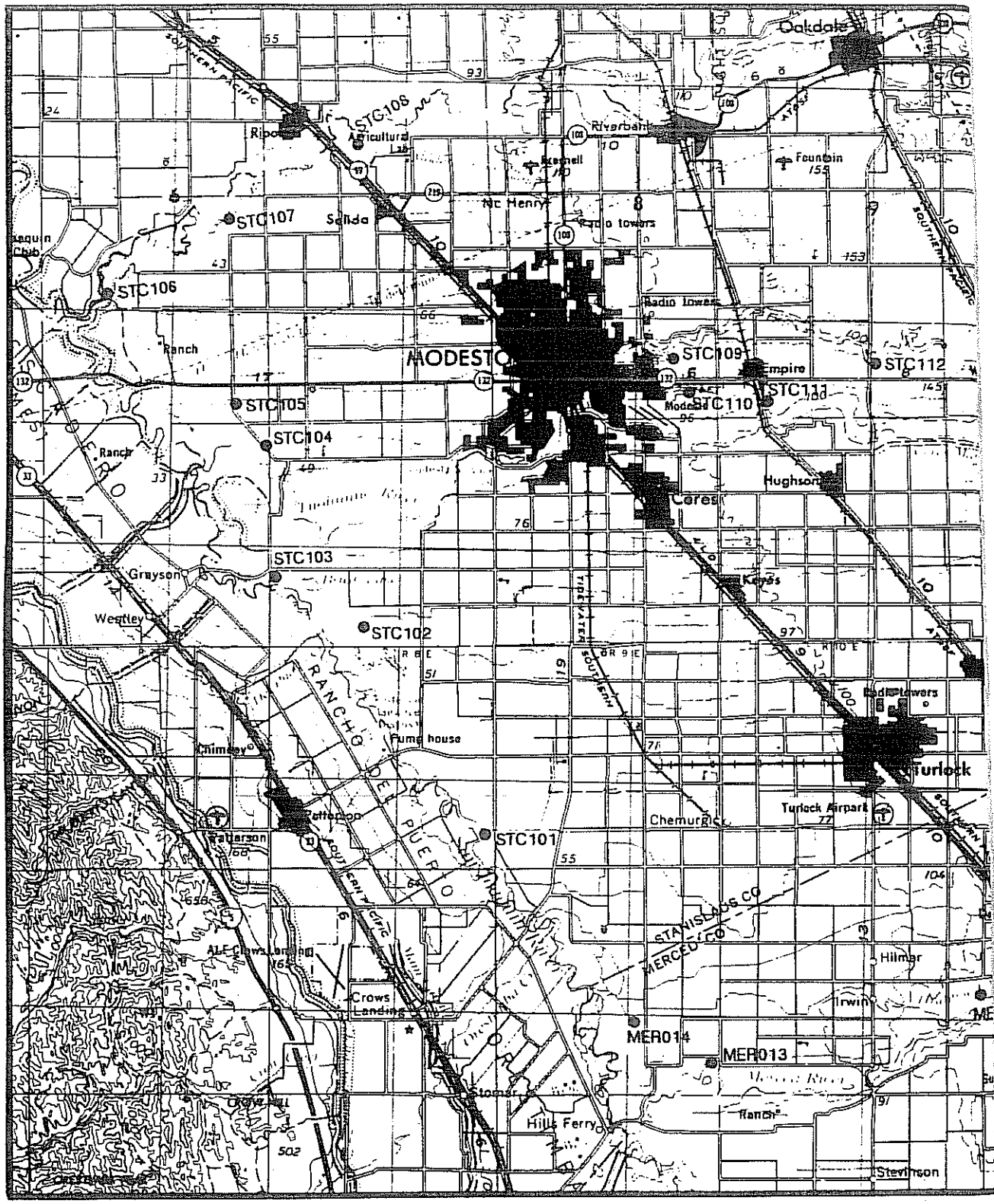


Figure 2. Study Zone 1 (Northern Zone) showing the Location of Monitoring S

northern zone are principally irrigation return flows from Modesto and Turlock Irrigation District Service areas.

The central zone is bounded on the north by the Merced River, on the south by Sandy Mush Road (Merced National Wildlife Refuge) and on the west by the San Joaquin River (Figure 3). Discharges from this central zone are associated largely with irrigation activities that are taking place in the Merced Irrigation District or that immediate vicinity. The southern zone extends from the Merced National Wildlife Refuge to the San Joaquin River at the Mendota Pool (Figure 4). Discharges in this zone are limited and come from a variety of sources. Often flows are associated with one or more areas.

METHODS

The study was initiated in January 1986 and periodic sampling was conducted through Water Year (WY) 88 (end September 1988). The frequency of sample collection for this monitoring program varied but generally grab samples were collected bi-monthly during the irrigation season. Additional samples were taken at selected times during the nonirrigation season. This sampling frequency was supplemented by sampling at selected sites by the local water districts.

All samples were analyzed for total recoverable selenium, boron, chloride, sulfate, total alkalinity and electrical conductivity (EC). Selected sites during 1986 were tested also for total recoverable copper, chromium, lead, mercury, molybdenum, nickel and zinc. Water temperature, pH, EC, flow and sample time were recorded in the field at each site. All samples were collected in polyethylene bottles. All sample bottles were washed and acid rinsed in the laboratory prior to use and rinsed three times with the water to be sampled prior to sample collection. Selenium and other trace element samples were preserved by lowering the pH to less than 2 using ultra-pure nitric acid fixation techniques. All samples were kept on ice until preservation or submittal to the laboratory.

A quality control and quality assurance program was conducted utilizing spike and duplicate samples in the laboratory. In addition, blind replicate samples were collected at 10 percent of the sites and 50 percent of the blind replicates were spiked for laboratory quality assurance. All reported results fall within quality assurance tolerance guidelines.

RESULTS

Concentrations of the measured constituents varied between discharge site, time of the year, and between years. Median mineral and selenium concentrations for the three study zones are listed in Table 2. The median salinity (EC) was different between zones but all three discharge zones showed good quality water. Similarity was also shown for boron with median values for all three study zones showing very low boron concentrations. The highest median boron concentration was noted in the southern study zone (0.25 mg/L) while the northern and central zones showed median values of 0.04 and 0.05 mg/L, respectively. Portions of the southern zone are served by both water from the east side streams and the Delta-Mendota Canal. Those areas being served by Delta-Mendota Canal water showed higher boron concentrations. These sites ranged from 0.3-0.5 mg/L boron while

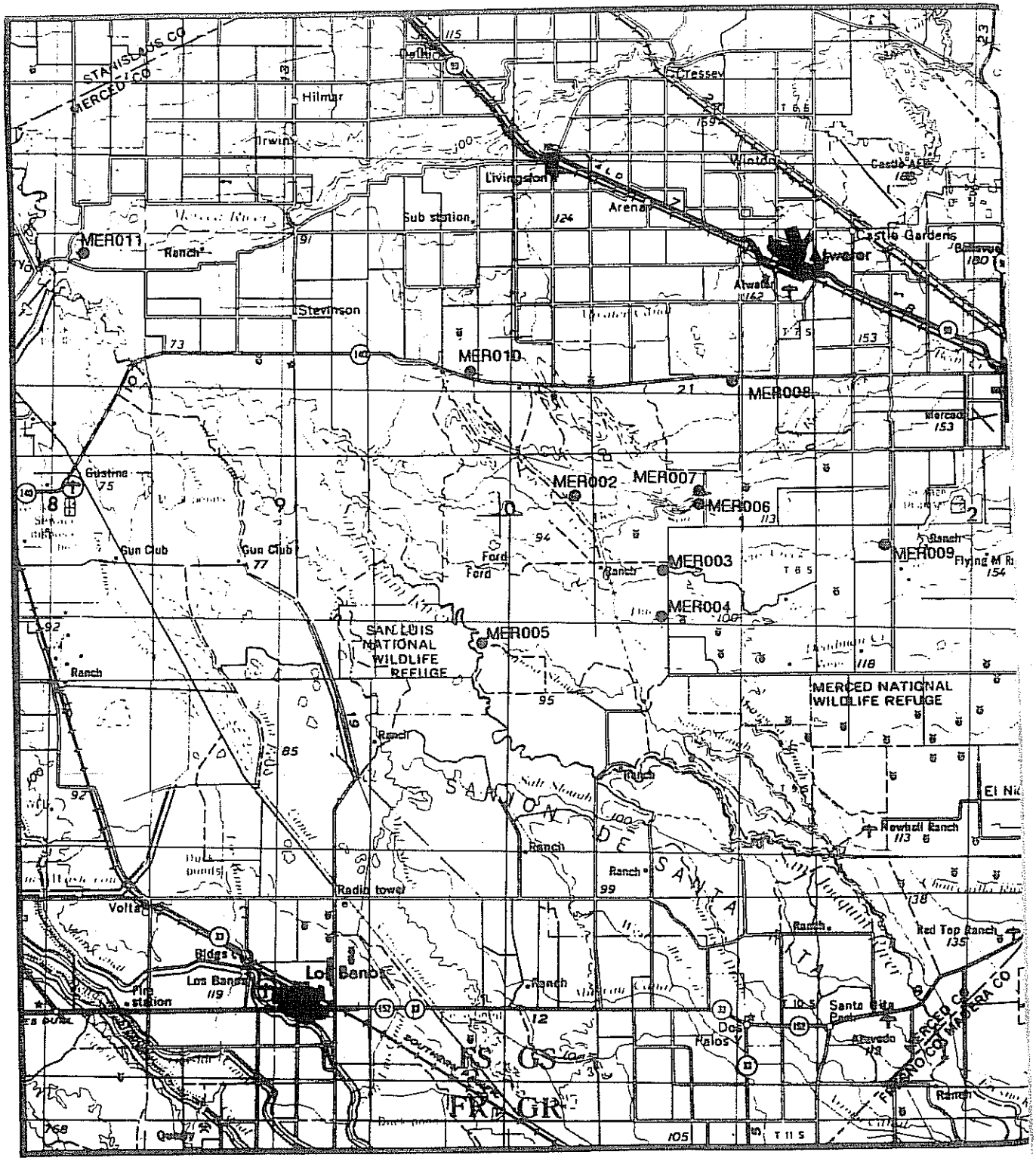
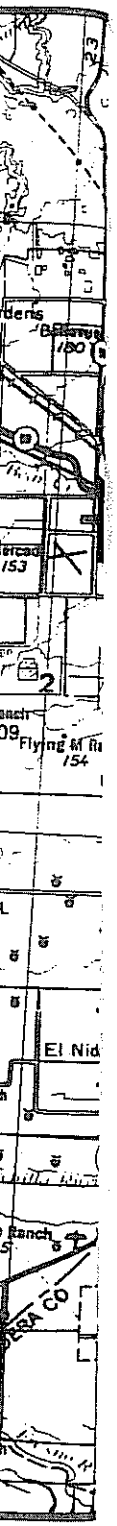


Figure 3. Study Zone 2 (Central Zone) showing the Location of Monitoring Site



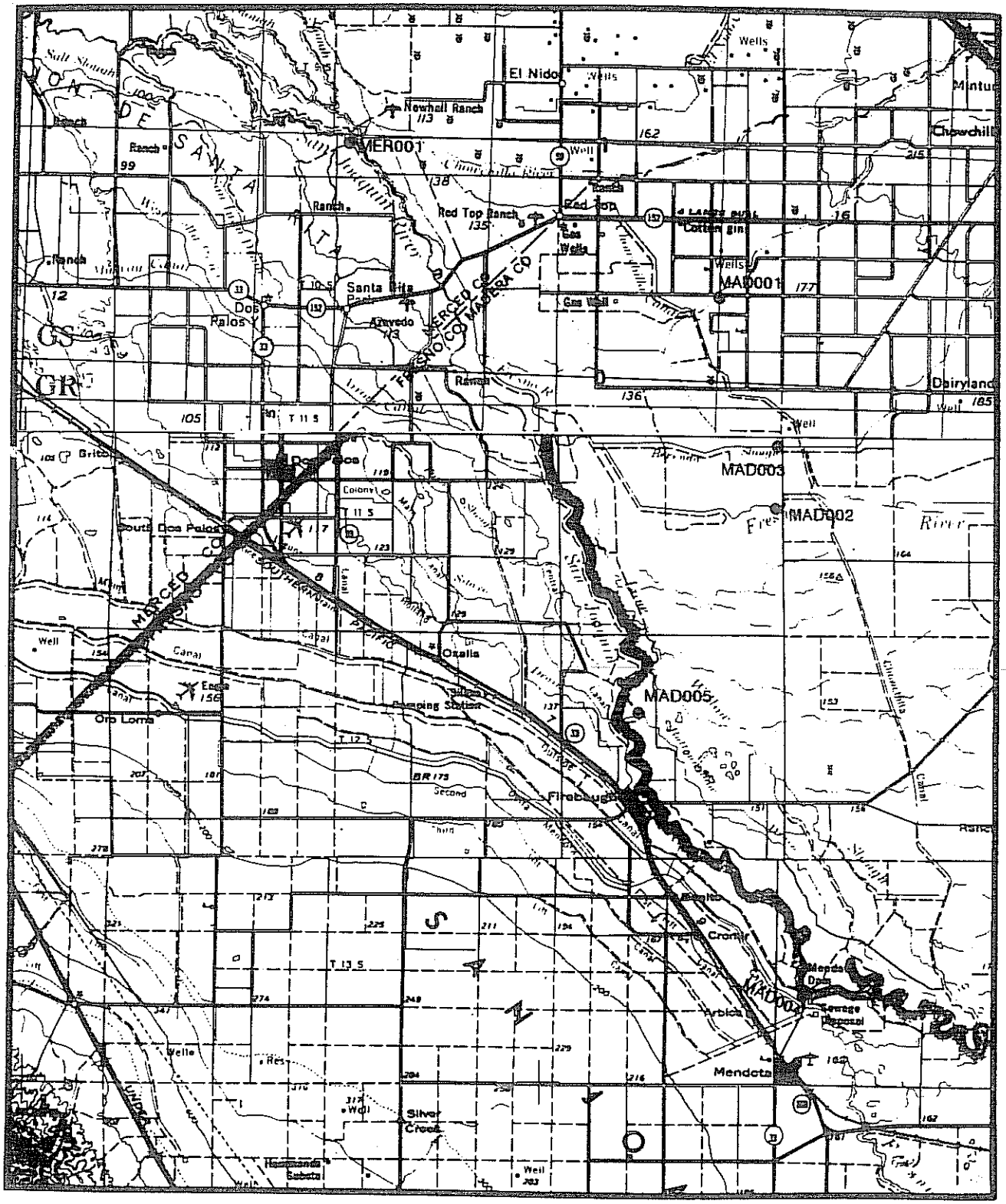


Figure 4. Study Zone 3 (Southern Zone) showing the Location of the Monitoring Sites

Table 2. Summary of Constituent Concentration Ranges from Canals and Discharges That Flow into the San Joaquin River from the East.

Northern Sites

	Temp	pH	EC	Se	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	TALK	HDNS	TDS	Cu	Cr	Ni	Pb	Zn	Hg
			umhos/cm	...ug/L...		.....mg/L.....												.....ug/L.....					
Min	52	5.9	30	<0.2	<5	<0.01	<1	<1	7.3	2.9	9	1.3	<1	12	12	31	68	2	<1	<5	<5	<1	<0.5
Med	72	7.8	260	0.3	<5	0.04	13	7	12	6.4	11	2.3	<1	59	56	61	120	4	6	<5	<5	2	<0.5
Max	82	9.0	1450	1.3	<5	0.30	330	370	22	9.1	25	4.4	26	230	230	94	210	10	140	51	0	42	3.2
Count	98	69	99	96	15	99	99	76	3	3	3	3	19	19	49	3	3	15	15	15	15	15	15

Central Sites

	Temp	pH	EC	Se	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	TALK	HDNS	TDS	Cu	Cr	Ni	Pb	Zn	Hg
			umhos/cm	...ug/L...		.....mg/L.....												.....ug/L.....					
Min	55	6.9	40	<1	<5	<0.01	1	<2	18	9.6	15	2.5	<1	15	12	120	160	2	<1	<5	<5	3	<0.5
Med	74	7.8	310	0.4	<5	0.05	9	14	21	15	20	3.6	0	100	100	140	190	5	4	5	<5	12	<0.5
Max	90	8.9	1580	1.7	<5	0.26	100	51	35	16	45	6.3	8	210	244	190	250	16	12	18	6	60	0.7
Count	69	39	69	69	15	69	69	52	3	3	3	3	13	13	36	3	3	17	17	17	17	17	17

Southern Sites

	Temp	pH	EC	Se	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	TALK	HDNS	TDS	Cu	Cr	Ni	Pb	Zn	Hg
			umhos/cm	...ug/L...		.....mg/L.....												.....ug/L.....					
Min	57	6.5	22	<1	<5	<0.10	<1	<1	3.4	0.8	2.6	1.1	0	16	8	24	32	2	<1	<5	<5	1	<0.5
Med	74	7.6	45	1.0	<5	0.25	69	46	4.0	1.1	3.3	1.2	0	26	70	28	42	6	1	<5	<5	6	<0.5
Max	88	8.5	925	2.7	<5	0.82	150	80	5.3	1.8	3.5	1.4	10	170	180	32	44	11	18	8	<5	24	0.8
Count	34	20	35	33	12	35	35	28	4	4	4	4	9	9	22	4	4	13	13	13	13	13	13

those sites carrying mostly east side stream water showed boron concentrations typically less than 0.1 mg/L.

A similar characteristic was seen with selenium. The three study zones showed median values at or below 1 μg/L. The northern and central study zones showed median total recoverable selenium of 0.3 and 0.4 μg/L, respectively while the median concentration found in the southern zone was 1.0 μg/L. The median value was influenced by selenium values greater than 1.0 being found routinely in drains where the main source of water to that area was the Mendota Pool. At both the Buttonwillow Drain and the San Joaquin River at Washington Avenue sites selenium concentrations ranged from 1.0 to 2.7 μg/L while most other monitoring sites showed concentrations less than 1 μg/L. The elevated selenium at these monitoring sites is associated with the Delta-Mendota supply water which often shows selenium concentrations ranging from 1-3 μg/L (James et al., 1988 and Summers Engineering, 1989).

The limited testing for other trace elements shows that copper, chromium, lead, nickel, mercury, molybdenum and zinc concentrations are low with most showing values at or below the detection limits used in this study. The highest concentration of trace elements was measured in the Westport Drain which carries a variety of water including operational spill water from the Turlock Irrigation District Lateral No. 2 1/2 and 3. The very high values may be the result of an unauthorized discharge but no confirmation sampling was conducted.

Data is presented in Tables 3-5 for the individual monitoring sites within the three study zones. Data is also presented in Appendix A for the sites monitored by the cooperating irrigation districts.

REFERENCES

James, E.W., Westcot, D.W., Grewell, B.J., Belden, K.K., Boyd, T.F., Waters, R.I., and Thomasson, R.R., 1988. Agricultural Drainage Contribution to Water Quality in the Grassland Area of Western Merced County, California. Central Valley Regional Water Quality Control Board Report. 169 pages.

Summers Engineering, Inc., 1989. Grassland Water Task Force; Grassland Area Monitoring Report, February 14, 1989. 100 pages.

Table 3. Water Quality Data From Canals and Discharges That Flow into the San Joaquin River From the Northern Study Zone.

Date	Temp	pH	EC	Se	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	Total Alk.	Hard.	TDS	Cu	Cr	Ni	Pb	Zn	Hg
			umhos/cm	...ug/L...		...mg/L...												...ug/L...					
MER012 Highline Canal Discharge to Merced River																							
Lat.37 23'49", Long.120 47'41". In SE 1/4, Sec. 20, T.6S.,R.11E. W side of Merced Ave., 0.6 mi. S of Bloss Ave., 3.1 mi. SE of Hilmar.																12		4	15	5	<5	2	<0.5
08/26/86	78		38	0.2	<5	0.04	1	2															
03/28/87	52	9.0	223	0.3		<0.10	10																
05/15/87	75	7.6	36	0.2		<0.05	2.3									16							
07/28/87	72		47	0.3		0.03	2	<2						<1	15	15							
09/25/87	72	8.3	40	0.5		<0.02	2	<2															
06/14/88	82	8.6	100	0.3		<0.02	5	4															
09/20/88	73	8.4	140	0.2		<0.02	11	3															
MER013 Stevenson Lateral Discharge to Merced River																							
Lat. 37 22'21", Long.120 55'18". In NW 1/4, Sec. 31, T.6S., R.10E. W side of Faith Home Rd. at Turner Rd. intersection, 2.2 mi. S of Bloss Ave., 2.9 mi. NE of Hills Ferry.																80		4	7	10	<5	1	<0.5
08/26/86	79		530	0.3	<5	0.04	77	25															
03/28/87	59	7.8	952	0.5		0.12	110																
05/15/87	75	8.2	574	0.6		<0.05	63									120							
07/28/87	72		680	0.2		0.13	80	28						<1	74	74							
09/25/87	70	7.7	340	0.2		0.04	30	17															
06/15/88	65	7.7	1200	0.2		0.21	180	65															
09/20/88	70	7.6	1120	0.5		0.17	160	56															

Table 3. continued

Date	Temp	pH	EC umhos/cm	Se ...ug/L...	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	Total Alk.	Hard.	TDS	Cu	Cr	Ni	Pb	Zn	Hg
						.....mg/L.....												.....ug/L.....					
MER014 Turlock I.D. Lateral 6 & 7 at Central Avenue																							
Lat. 37 23'52", Long. 120 57'30". In SE 1/4, NE 1/4, Sec. 22, T. S., R. E. W side of laterals' intersection, 1.1 mi. S of American Ave., 6.1 mi. W of Hilmar.																							
08/26/86	80		340	0.3	<5	0.07	29	14							72			4	3	<5	<5	4	<0.5
03/28/87	55	7.6	1180	0.2		0.11	110																
05/15/87	74	7.8	1420	0.2		0.3	270																
07/28/87	73		710	0.4		0.19	100	27							110								
09/25/87	69	7.4	530	0.3		0.08	50	24					8	140	148								
06/15/88	66	7.7	1250	0.6		0.16	150	42															
09/20/88	70	7.8	1450	0.4		0.2	330	50															
STC101 Harding Drain Discharge to San Joaquin River																							
Lat. 37 27'52", Long. 120 01'49". In SE 1/4, Sec. 25, T.5S., R.9E. W side of Carpenter Rd., 2.4 mi. N of Crows Landing Rd., 5.2 mi. E of Patterson.																							
08/27/86	70		550	0.3	<5	0.08	73	17							100			5	2	<5	<5	8	<0.5
03/28/87	57	7.8	466	0.4		<0.10	54																
05/15/87	72	7.6	764	0.2		<0.05	100																
07/28/87	69		990	0.4		0.18	150	29							160								
09/25/87	69	7.2	580	<0.2		0.08	68	21					<1	120	120								
03/30/88	58	7.6	1080	1.1		0.17	160	370					<1	230	230								
06/15/88	72	7.4	1100	0.2		0.15	130	38															
09/21/88	66	7.0	1030	0.8		0.15	150	36															

Table 3. continued

Date	Temp	pH	EC umhos/cm	Se ...ug/L...	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	Total Alk.	Hard.	TDS	Cu	Cr	Ni	Pb	Zn	Hg
						.....mg/L.....												.....ug/L.....					
STC102 Westport Drain & Lateral 2 1/2 & 3 to San Joaquin River																							
Lat. 37 32'30", Long. 120 05'35". In SW 1/4, Sec. 33, T.4S., R.8E.																							
Approx. 0.6 mi. S of Keyes Rd., 6.5 mi. SW of Modesto.																							
08/27/86	68		570	0.7	<5	0.06	38	28							170			3	140	51	<5	2	<0.5
03/28/87	57	7.5	157	0.3		<0.10	6																
05/15/87	74	7.8	489	0.4		<0.05	25																
07/28/87	68		420	0.8		0.1	18	18							140								
09/25/87	68	8.0	340	0.2		0.05	14	17					<1	110	110								
06/15/88	67	7.7	780	0.5		0.09	35	40															
09/21/88	60	6.9	840	0.4		0.11	69	39															
STC103 Turlock I.D. Lateral 1 & 2 to San Joaquin River																							
Lat. 37 34'16", Long. 120 08'05". In NW 1/4, Sec. 30, T.4S., R.7E.																							
S side of Grayson Rd., W of Shiloh Rd. intersection, 2.3 mi. E of Grayson.																							
08/27/86	70		150	0.3	<5	<0.01	10	5							40			2	6	<5	<5	<1	<0.5
03/28/87	59	7.1	47	0.2		<0.10	4																
05/15/87	72	7.8	154	<0.2		<0.05	7.2																
07/28/87	67		190	0.2		<0.02	10	8							60								
09/25/87	69	8.3	210	0.4		0.04	12	9					<1	59	59								
06/15/88	74	7.9	420	0.3		0.07	32	15															
09/21/88	66	7.1	590	0.4		0.08	65	22															

Table 3. continued

Date	Temp	pH	EC umhos/cm	Se ...ug/L...	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	Total Alk.	Hard.	TDS	Cu	Cr	Ni	Pb	Zn	Hg
						.....mg/L.....												.....ug/L.....					
STC104 Modesto I.D. Lateral 5 at Paradise Road to San Joaquin River																							
Lat. 37 36'54", Long. 120 08'31". In SE 1/4, Sec. 1, T.4S., R.7E. E side of Paradise Rd., 1.9 mi. S of Maze Blvd., 4.0 mi. NE of Grayson.																							
07/17/86	75	8.2	110			0.02	10	4	7.3	2.9	9	1.3	2	32	34	31	68						
08/27/86	74		110	0.4	<5	0.01	9	3							32			2	2	<5	<5	<1	<0.5
05/15/87	72	8.2	203	1.3		<0.05	16																
07/28/87	69		150	0.6		0.02	10	7							46								
09/25/87	67	8.0	160	0.2		0.04	13	5					<1	44	44								
06/15/88	71	8.0	190	0.2		0.03	12	6															
09/21/88	60	7.1	87	0.3		<0.02	3	3															
STC105 Modesto I.D. Lateral 4 at Paradise Road to San Joaquin River																							
Lat. 37 37'55", Long. 121 09'28". In NW 1/4, Sec. 35, T.3S., R.7E. E side of Paradise Rd., 0.5 mi. S of Maze Blvd., 4.5 mi. NE of Grayson.																							
07/17/86	72	8.4	300			0.06	22	14	22	9.1	25	2.3	2	110	112	94	210						
08/27/86	72		196	0.4	<5	0.03	12	9							56			4	2	<5	<5	<1	3.2
05/15/87	72	8.2	282	0.2		<0.05	13																
07/28/87	68		250	<0.2		0.07	13	10							84								
09/25/87	66	7.5	380	0.2		0.07	23	16					8	110	118								
06/15/88	70	7.7	400	0.2		0.07	21	17															
09/21/88	63	7.1	81	0.2		<0.02	2	3															

Table 3. continued

Date	Temp	pH	EC umhos/cm	Se ug/L	Mo ug/L	B mg/L	Cl mg/L	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	CO3 mg/L	HCO3 mg/L	Total Alk. mg/L	Hard. mg/L	TDS mg/L	Cu ug/L	Cr ug/L	Ni ug/L	Pb ug/L	Zn ug/L	Hg ug/L
STC106 Miller Lake Discharge to Stanislaus River																							
Lat. 37 40'20", Long. 120 13'10". In SE 1/4, Sec. 17, T.3S., R.7E. W side of levee road, 1.5 mi. S of W end of Beckwith Rd., 6.6 mi. SW of Ripon.																							
07/17/86	74	8.5	160			0.06	5	6	12	6.4	11	4.4	2	70	72	61	120	6	8	10	<5	42	<0.5
08/27/86	74		440	0.2	<5	0.08	4	5							140								
03/28/87	59	8.8	647	0.4		<0.10	35																
05/15/87	75	7.9	414	0.3		<0.05	14																
07/28/87	70		440	0.2		0.1	3	17							160								
09/25/87	66	7.2	350	0.2		0.05	11	15					26	110	136								
06/15/88	70	7.6	540	<0.2		0.08	15	20															
09/21/88	60	7.0	500	0.2		0.07	19	21															
STC107 Modesto I.D Lateral 6 to Stanislaus River																							
Lat. 37 42'28", Long. 121 09'28". In NW 1/4, Sec. 1, T.3S., R.8E. Approx. 0.7 mi. N of Gates Rd./Bacon Rd. intersection, 3.5 mi. SW of Ripon.																							
08/27/86	74		140	0.2	<5	0.04	4	5							44			3	<1	<5	<5	1	<0.5
05/15/87	74	7.5	73	0.6		<0.05	3.5																
07/28/87	69		200	0.3		0.05	5	9							72								
09/25/87	67	6.9	80	0.2		<0.02	2	<2					<1	22	22								
06/15/88	74	8.1	360	<0.2		0.05	10	16															
09/21/88	65	7.1	160	0.2		<0.02	7	4															

Table 3. continued

Date	Temp	pH	EC umhos/cm	Se ...ug/L...	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	Total Alk.	Hard.	TDS	Cu	Cr	Ni	Pb	Zn	Hg
						.....mg/L.....												.....ug/L.....					
STC108 Modesto I.D. Main Canal to Stanislaus River																							
Lat. 37 43'43", Long. 120 05'25". In SE 1/4, Sec. 28, T.2S., R.8E.																							
Approx. 0.2 mi. N of Main Canal/Lateral 8 intersection, 2.5 mi. SE of Ripon.																							
08/27/86	74		70	0.2	<5	0.03	3	2							20			10	12	32	<5	2	<0.5
03/28/87	64	8.9	260	0.2		<0.10	15																
05/15/87	74	6.4	63	0.2		<0.05	5																
07/28/87	70		190	0.5		0.14	5	8							64								
09/25/87	68	7.8	50	<0.2		<0.02	2	<2					<1	20	20								
06/15/88	73	8.0	120	0.2		<0.02	3	5															
STC109 Modesto I.D. Lateral 2 to Dry Creek																							
Lat. 37 38'47", Long. 120 56'38". In NE 1/4, Sec. 26, T.3S., R.9E.																							
Approx. 0.3 mi. E of Riverside Rd., 0.5 mi. N of Yosemite Ave. (HWY 132).																							
08/27/86			34	0.2	<5	<0.01	1	2							16			2	3	<5	<5	1	2.2
05/15/87	76	8.6	83	<0.2		0.05	9.2																
07/29/87	76		93	<0.2		0.02	11	<2							24								
09/25/87	71	7.8	40	0.5		<0.02	<1	<2					<1	16	16								
06/15/88	75	8.1	90	<0.2		<0.02	8	2															

Table 3. continued

Date	Temp	pH	EC umhos/cm	Se ug/L	Mo ug/L	B mg/L	Cl mg/L	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	CO3 mg/L	HCO3 mg/L	Total Alk. mg/L	Hard. mg/L	TDS mg/L	Cu ug/L	Cr ug/L	Ni ug/L	Pb ug/L	Zn ug/L	Hg ug/L
STC110 Modesto I.D. Lateral 1 at Mariposa Road																							
Lat. 37 38'03", Long. 120 55'44". In NW 1/4, Sec. T.3S., R.9E. E side of Mariposa Rd., 0.2 mi. S of Yosemite Ave. (HWY 132).																							
08/27/86	76		70	<0.2	<5	<0.01	2	3							20			4	<1	<5	<5	<1	0.8
05/15/87	78	8.8	95	<0.2		<0.05	6.9																
07/29/87	72		50	0.2		0.02	<1	<2							16								
09/25/87	72	7.5	30	0.2		<0.02	<1	<2					<1	28	28								
06/15/88	72	8.3	320	<0.2		0.03	54	7															
09/21/88	64	6.0	58	0.4		<0.02	2	2															
STC111 Modest I.D. Lateral 1 at Santa Fe Avenue																							
Lat. 37 37'39", Long. 120 53'57". In SW 1/4, Sec. 32, T.3S., R.10E. W side of Santa Fe Ave.,0.6 mi. S of Yosemite Ave. (HWY 132).																							
08/27/86	77		37	0.2	<5	<0.01	1	2							16			2	6	<5	<5	<1	0.7
05/15/87	78	8.6	166	0.5		<0.05	13																
07/29/87	72		36	0.6		0.02	<1	<2							12								
09/25/87	73	7.4	40	<0.2		<0.02	<1	<2					<1	12	12								
06/15/88	75	8.3	310	<0.2		0.04	54	7															

Table 3. continued

Date	Temp	pH	EC	Se	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	Total Alk.	Hard.	TDS	Cu	Cr	Ni	Pb	Zn	Hg
			umhos/cm	...ug/L...		.....mg/L.....												.....ug/L.....					
STC112 Modesto I.D. Main Canal at Albers Road																							
Lat. 37 38'37", Long. 120 51'10". In SW 1/4, Sec. 26, T.3S., R.10E. E side of Albers Rd., 0.4 mi. N of Yosemite Ave. (HWY 132).																							
08/27/86	72		34	0.2	<5	<0.01	1	<1							12			3	6	18	<5	7	<0.5
05/15/87	71	7.5	32	<0.2		<0.05	1.2																
07/29/87	68		31	0.4		0.05	<1	<2							13								
09/25/87	69	7.6	30	<0.2		<0.02	<1	<2					<1	19	19								
06/15/88	71	8.4	47	0.2		<0.02	2	<2															
09/21/88	70	5.9	34	0.4		<0.02	1	2															

Table 4. Water Quality Data From Canals and Discharges That Flow into the San Joaquin River From the Central Study Zone.

Date	Temp	pH	EC umhos/cm	Se ...ug/L...	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	Total Alk.	Hard.	TDS	Cu	Cr	Ni	Pb	Zn	Hg
						...mg/L...												...ug/L...					
MER002 Bear Creek at Diversion near Eastside Canal																							
Lat. 37 15'30", Long. 120 43'00". In NW 1/4, SE 1/4, NW 1/4, Sec. 12, T.8S., R.11E. E bank at diversion structure, 3.6 mi. N of Green House Rd. along W side of Eastside Bypass, approx. 16 mi. W of Merced.																							
01/24/86	58	8.8	310	1.0		<0.01	9	20							120			5	1	<5	<5	4	<0.5
03/25/86	65	8.1	340	<1	<5	0.2	4.2	17	21	16	20	3.6	0	130	130	140	190	6	5	2	<5	20	<0.5
07/11/86	80		110	0.2	<5	0.02	3	6							48			4	1	13	<5	3	<0.5
08/26/86	75		86	0.3	<5	0.04	2	4							32			3	1	<5	6	10	0.5
03/27/87	65	8.0	524	0.2		<0.10	32																
05/15/87	83		125	0.6		<0.05	3.1																
07/29/87	70		110	0.3		0.02	2	4							44								
09/25/87	72	7.1	190	<0.2		<0.02	5	9					<1	66	66								
06/14/88	83	8.5	200	0.4		<0.02	5	8															
09/20/88	70	8.0	140	0.4		<0.02	3	6															
MER003 Owens Creek at Dan McNamara Road																							
Lat. 37 13'30", Long. 120 40'15". In SW 1/4, SW 1/4, NW 1/4, Sec. 21, T.8S., R.12E. E side of Dan McNamara Rd., 0.2 mi. S of Green House Rd., 11 mi. SW of Merced.																							
01/24/86	55	7.6	580	1.0		0.09	44	37							150			6	4	18	<5	20	<0.5
03/25/86	68	8.4	570	<1	<5	0.22	18	28	35	15	45	6.3	8	210	218	190	250	4	3	<5	<5	20	<0.5
07/11/86	77		320	0.9	<5	0.08	10	16							120			11	5	9	<5	25	<0.5
08/26/86	74		270	0.5	<5	0.14	6	19							92			7	7	7	5	22	0.7
03/27/87	68	7.6	655	0.3		0.11	42																
05/15/87	78		257	1.7		<0.05	6.1																
07/29/87	68		320	0.6		0.06	3	14							130								
09/25/87	71	7.0	350	0.4		0.04	13	20					4	120	124								
06/14/88	78	7.8	450	0.5		0.05	12	20															
09/20/88	68	7.8	470	0.7		0.05	16	20															

				330	0.4		0.04	13	20									130						
06/14/88	78	7.8		450	0.5		0.05	12	20						4	120		124						
09/20/88	68	7.8		470	0.7		0.05	16	20															

Table 4. continued

Date	Temp	pH	EC umhos/cm	Se ...ug/L...	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	Total Alk.	Hard.	TDS	Cu	Cr	Ni	Pb	Zn	Hg
						.....mg/L.....												.....ug/L.....					
MER004 Duck Slough at Dan McNamara Road																							
Lat. 37 12'30", Long. 120 40'15". In SW 1/4, NW 1/4, NW 1/4, Sec. 28, T.8S., R.12E. E side of Dan McNamara Rd., 1.5 mi. S of Green House Rd., 11.5 mi. SW of Merced.																							
03/25/86	70	8.1	280	<1	<5	0.26	6.3	22	18	9.6	15	2.5	0	120	120	120	160	5	5	<5	<5	6	<0.5
07/11/86	77		210	0.4	<5	0.06	6	8							92			5	3	6	<5	8	<0.5
08/26/86	82		270	0.4	<5	0.18	6	10							110			5	6	7	<5	10	<0.5
03/27/87	65	8.2	430	0.2		<0.10	12																
05/15/87	82		141	0.9		<0.05	2.7																
07/29/87	66		240	0.7		0.05	3	5							110								
09/25/87	74	7.2	250	0.5		0.03	8	9					<1	100	100								
09/20/88	74	8.2	230	0.9		<0.02	6	8															
MER005 Turner Island Discharge at Pump #33																							
Lat. 37 12'03", Long. 120 45'18". In NW 1/4 north of Sec. 34, no section, T.8S., R.11E. Approx. 4.5 mi W of Turner Island Rd., near SW boundary of San Luis National Wildlife Refuge.																							
08/26/86	80		790	1.2	<5	0.27	95	65							80			4	2	<5	<5	12	0.5
03/27/87	64	8.0	3360	0.9		0.12	710																
05/15/87	82		1270	1.4		0.06	216																
07/29/87	70		1200	1.0		0.28	180	110							140								
09/25/87	73	8.1	1550	1.1		0.27	290	140					10	170	180								
06/14/88	85	8.6	1250	1.1		0.31	190	140															
09/20/88	67	8.1	1270	1.2		0.25	210	110															

Table 4. continued

Date	Temp	pH	EC umhos/cm	Se ug/L	Mo ug/L	B mg/L	Cl mg/L	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	CO3 mg/L	HCO3 mg/L	Total Alk. mg/L	Hard. mg/L	TDS mg/L	Cu ug/L	Cr ug/L	Ni ug/L	Pb ug/L	Zn ug/L	Hg ug/L
MER006 South Slough at Bert Crane Road																							
Lat. 37 15'08", Long. 120 39'04". In NE 1/4, Sec. 9, T.8S., R.12E. W side of Bert Crane Rd., 4.4 mi. S of HWY 140., 12 mi. SW of Merced.																							
08/26/86	78		370	0.7	<5	0.11	8	23							140			11	12	5	<5	27	<0.5
03/27/87	58	8.2	564	0.4		<0.10	16																
05/15/87	79		574	0.7		<0.05	14																
07/29/87	68		510	1.2		0.04	3	29							210								
09/25/87	75	7.1	350	1.1		0.02	9	23					8	140	148								
06/14/88	89	7.8	410	1.4		0.05	9	23															
09/20/88	68	7.7	770	1.0		0.04	17	51															
MER007 Bear Creek at Bert Crane Road																							
Lat. 37 15'20", Long. 120 39'07". In NE 1/4, Sec. 9, T.8S., R.12E. Approx. 300 ft. E of Bert Crane Rd., 4.2 mi S of HWY 140., 11 mi. SW of Merced.																							
08/26/86	76		81	0.3	<5	0.02	2	3							28			3	<1	<5	<5	6	<0.5
03/27/87	65	8.1	265	0.2		<0.10	12																
05/15/87	80		140	0.3		<0.05	2																
07/29/87	71		120	0.3		0.07	2	4							48								
09/25/87	72	7.2	120	0.3		<0.02	2	5					<1	50	50								
03/30/88	57		134	0.3		0.02	13	13					<1	80	80								
06/14/88	82	7.8	180	0.4		<0.02	4	7															
09/20/88	71	8.0	120	0.3		<0.02	3	5															

09/20/88	71	8.0	120	0.3		<0.02	3	5															

Table 4. continued

Date	Temp	pH	EC umhos/cm	Se ...ug/L...	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	Total Alk.	Hard.	TDS	Cu	Cr	Ni	Pb	Zn	Hg
						.....mg/L.....												.....ug/L.....					
MER008 Atwater Drain at HWY 140																							
Lat. 37 18'07", Long. 120 37'55". In NE 1/4, Sec. 27, T.7S., R.12E. SW corner of HWY 140/Bert Crane Rd., 7.9 mi. W of Merced.																							
08/26/86	90		370	0.2	<5	0.1	17	15							100			16	<1	<5	<5	60	<0.5
03/27/87	68	8.0	668	0.2		0.13	52																
05/15/87	82		285	0.5		<0.05	14																
07/29/87	74		390	0.6		0.09	13	12							140								
09/25/87	78	6.9	330	0.3		0.06	13	14					<1	80	80								
06/14/88	85	7.5	460	0.2		0.12	27	29															
09/20/88	77	7.7	570	0.9		0.15	35	33															
MER009 Owens Creek at Gurr Road																							
Lat. 37 14'07", Long. 120 33'41". In SE 1/4, Sec. 9, T.8S., R.13E. W side of Gurr Rd., 4.2 mi. S of HWY 140, approx. 6 mi. SW of Merced.																							
08/26/86	78		250	0.4	<5	0.09	7	10							92			5	1	<5	<5	12	<0.5
03/27/87	68	7.6	677	0.4		0.13	42																
05/15/87	82		267	0.7		<0.05	9.2																
07/29/87	70		400	0.2		0.14	9	14							160								
09/25/87	72	7.1	320	0.4		0.06	14	15					4	100	104								
06/14/88	83	7.8	460	0.5		0.06	15	20															
09/20/88	70	7.6	600	1.3		0.07	26	26															

Table 4. continued

Date	Temp	pH	EC umhos/cm	Se ug/L	Mo ug/L	B mg/L	Cl mg/L	SO4 mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	CO3 mg/L	HCO3 mg/L	Total Alk. mg/L	Hard. mg/L	TDS mg/L	Cu ug/L	Cr ug/L	Ni ug/L	Pb ug/L	Zn ug/L	Hg ug/L
MER010 Livingston Drain at HWY 140 & Washington Blvd.																							
Lat. 37 18'08", Long. 120 45'33". In SE 1/4, Sec. 21, T.7S., R.12E. NW corner of HWY 140/ Washington Blvd., approx. 14 mi. W of Merced.																							
08/26/86	82		56	<0.2	<5	<0.01	2	3							12			2	<1	<5	<5	5	<0.5
05/15/87	84		210	0.6		<0.05	5																
07/29/87	72		670	0.3		0.07	10	33							244								
09/25/87	84	8.9	40	<0.2		<0.02	1	<2					<1	15	15								
09/20/88	71	7.8	910	0.4		0.08	47	44															
MER011 Stevinson Water District Discharge to Merced River																							
Lat. 37 21'06", Long. 120 56'56". In SE 1/4, Sec. 2, T.7S., R.9E. W side of levee road, 0.3 mi. N of River Rd., approx. 0.5 mi E of Kelly Rd., 1.4 mi. E of Hills Ferry.																							
08/26/86	81		175	0.5	<5	0.07	9	8							56			9	7	8	<5	9	<0.5
03/28/87	58	8.6	1580	0.6		0.18	100																
05/15/87	78	7.2	298	0.8		<0.05	14																
07/28/87	76		250	1.0		0.06	6	12							80								
09/25/87	71	7.1	280	0.3		0.05	13	15					<1	80	80								
06/15/88	73	7.8	350	0.6		0.06	27	14															
09/20/88	67	7.6	380	0.3		0.05	18	20															

Table 5. Water Quality Data from Canals and Discharges That Flow into the San Joaquin River From the Southern Study Zone.

Date	Temp	pH	EC	Se	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	Total Alk.	HDNS	TDS	Cu	Cr	Ni	Pb	Zn	Hg
			umhos/cm	...ug/L..		.....mg/L.....												.....ug/L.....					
MAD001 Ash Slough at Avenue 21																							
Lat. 37 03'20", Long. 120 25'10". In NW 1/4, NW 1/4, NW 1/4, Sec. 23, T.10S., R.14E. 2.2 mi. S of HWY 152 and 1.8 mi. W of Road 9, approx. 10 mi. SW of Chowchilla.																							
03/25/86	58	7.3	51	<1	<5	0.77	2.2	<5	3.6	1	3.1	1.1	0	18	18	24	32	3	2	<5	<5	7	<0.5
07/11/86	82		30	0.4	<5	<0.01	2	<2							10			6	<1	<5	<5	1	<0.5
08/26/86	79		22	0.2	<5	0.01	1	<1							12			7	1	<5	<5	2	0.8
09/25/87	75	7.7	60	0.1		0.02	4	<2					<1	22	22								
MAD002 Eastside Bypass at Road 9																							
Lat. 36 58'30", Long. 120 23'0". In NE 1/4, NE 1/4, SE 1/4, Sec. 13, T.11S., R.14E. 7.5 mi. S of HWY 152, N bank on W side of bridge, 12 mi. SW of Chowchilla.																							
03/25/86	57	7.2	57	<1	<5	0.23	2.5	<5	4.3	1.2	3.5	1.2	0	24	24	32	44	2	1	<5	<5	4	<0.5
MAD003 Berenda Slough at Road 9																							
Lat. 36 59'40", Long. 120 23'0". In NW 1/4, NW 1/4, NE 1/4, Sec7, T.11S., R.15E. 6.5 mi. S of HWY 152, approx. 11 mi. SW of Chowchilla.																							
03/25/86	60	7.2	45	<1	<5	0.82	1.5	<5	3.4	0.8	2.6	1.1	0	16	16	24	39	4	<1	<5	<5	5	<0.5
07/11/86	74		190	0.3	<5	0.04	21	5							60			7	1	<5	<5	7	<0.5
08/26/86	74		34	0.6	<5	0.02	<1	<1							8			6	1	<5	<5	10	0.8
03/27/87	64	7.9	50	0.3		<0.10	6																
07/28/87	81		300	0.2		0.03	25	8							72								
09/25/87	70	7.6	80	<0.2		0.02	5	<2					<1	31	31								

Table 5. (continued)

Date	Temp	pH	EC umhos/cm	Se ...ug/L..	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	Total Alk.	HDNS	TDS	Cu	Cr	Ni	Pb	Zn	Hg
						...mg/L...												...ug/L...					
MAD004 Mowry Ranch Drain to Mendota Pool																							
Lat. 36 46'57", Long. 120 22'02". In SE 1/4, Sec. 19, T.13S., R.15E. 0.9 mi. E of HWY 33/Bass Rd. intersection, approx. 3 mi. N of Mendota.																							
08/26/86	78		530		<5	0.43	57	54							120			11	18	8	<5	24	<0.5
03/27/87	64	6.5	669	0.7		0.18	74																
05/15/87	79		624	1.2		0.05	69																
07/28/87	88		800	0.6		0.39	90	50							140								
09/25/87	69	7	760	0.5		0.28	100	29					10	170	180								
06/14/88	72	7	850	0.4		0.30	120	63															
09/20/88	64	7.1	920	1.0		0.29	150	55															
MAD005 Buttonwillow Drain at Avenue 9 1/2																							
Lat. 36 54'04", Long. 120 27'30". In SE 1/4, Sec. 16, T.12S., R.14E. Approx. 0.5 mi. W of Road 5 1/2, 1.5 mi. NE of Firebaugh,.																							
08/26/86	76		480		<5	0.29	63	54							100			6	4	<5	<5	5	0.6
03/27/87	61	8.2	925	2.7		0.47	58																
05/15/87	74		664	1.5		0.23	87																
07/28/87	80		840	1.2		0.31	130	7							120								
09/25/87	69	7.6	760	1.1		0.20	130	51					4	110	114								
06/14/88	84	7.7	750	1.5		0.35	92	80															
09/20/88	65	7.8	810	1.2		0.27	130	63															

Table 5. (continued)

Date	Temp	pH	EC umhos/cm	Se ...ug/L..	Mo	B	Cl	SO4	Ca	Mg	Na	K	CO3	HCO3	Total Alk.	HDNS	TDS	Cu	Cr	Ni	Pb	Zn	Hg
						.....mg/L.....												.....ug/L.....					
MER001 San Joaquin River near Washington Avenue																							
Lat. 37 06'41", Long. 120 35'21". In NE 1/4, NE 1/4; NW 1/4, Sec. 31, T.9S., R.13E. 6.1 mi W of HWY 59, approx. 5.0 mi N of Hwy 152, 14 mi NE of Los Banos.																							
01/24/86		7.3	670	1.0		0.23	93	78							68			6	1	<5	<5	20	<0.5
03/25/86	60	7.5	68	<1	<5	0.69	1.6	<5	5.3	1.8	3.4	1.4	0	26	26	32	44	3	2	<5	<5	6	<0.5
07/11/86	79		400	1.0	<5	0.30	48	52							72			4	1	<5	<5	5	<0.5
08/26/86	82		440	1.4	<5	0.28	53	48							84			2	1	<5	<5	6	<0.5
03/27/87	62	8.5	743	1.9		0.33	86																
05/15/87	80		664	1.5		0.19	86																
07/28/87	80		760	1.2		0.36	100	65							110								
09/25/87	71	8	650	0.8		0.14	120	43					<1	77	77								
06/14/88	81	8.1	700	1.2		0.25	90	64															
09/20/88	66	8.1	880	1.4		0.25	140	64															

APPENDIX A

Water Quality Monitoring Data For Selected Sites Monitored By Local Cooperating Water Districts

Appendix A-1. Water Quality Data for Merced Irrigation District.

Sitename	RWQCB ID	Date	Flow ac ft / mo	EC umhos/cm	SS	Cl	B
					.....mg/L.....		
D-3 Owens Creek at Quinley Road		10/08/75	2588	205	126		
D-3 Owens Creek at Quinley Road		03/31/76	778	289	7.2		
D-3 Owens Creek at Quinley Road		04/28/76	1868	479	60		
D-3 Owens Creek at Quinley Road		05/27/76	3156	342	81		
D-3 Owens Creek at Quinley Road		06/22/76	2886	438	72		
D-3 Owens Creek at Quinley Road		07/27/76	2898	391	55		
D-3 Owens Creek at Quinley Road		08/25/76	6726	353	120		
D-3 Owens Creek at Quinley Road		09/22/76	6373	333	182		
D-3 Owens Creek at Quinley Road		05/03/77	452	543	91		
D-3 Owens Creek at Quinley Road		07/13/77	498	510	260		
D-3 Owens Creek at Quinley Road		08/24/77	528	429	122		
D-3 Owens Creek at Quinley Road		04/18/78	2446	452	69		
D-3 Owens Creek at Quinley Road		06/13/78	2224	250	37		
D-3 Owens Creek at Quinley Road		07/11/78	2874	325	23		
D-3 Owens Creek at Quinley Road		08/08/78	4522	315	18		
D-3 Owens Creek at Quinley Road		09/12/78	10320	232	101		
D-3 Owens Creek at Quinley Road		10/10/78	2561	229	26		
D-3 Owens Creek at Quinley Road		01/06/86	595	593	11	40	<0.5
D-3 Owens Creek at Quinley Road		03/21/86	4931	483	62	20	<0.5
D-3 Owens Creek at Quinley Road		06/11/86	3515	294	65	7.8	<0.05
D-3 Owens Creek at Quinley Road		08/06/86	4998	326	191	8	<0.05
D-3 Owens Creek at Quinley Road		10/17/86	7180	273	34	14	<0.05
D-3 Owens Creek at Quinley Road		01/02/87	460	685	15	50	0.14
D-3 Owens Creek at Quinley Road		06/12/87	2295	296		5	<0.5
D-3 Owens Creek at Quinley Road		08/03/87	4225	266		5.6	0.1
D-3 Owens Creek at Quinley Road		09/28/87	4461	293			
D-3 Owens Creek at Quinley Road		10/29/87	611	580			
D-3 Owens Creek at Quinley Road		12/04/87	837	595			
D-3 Owens Creek at Quinley Road		01/13/88	756	563			
D-3 Owens Creek at Quinley Road		02/01/88	407	545			
D-3 Owens Creek at Quinley Road		03/02/88	345	496			
D-3 Owens Creek at Quinley Road		05/16/88	1301	211			
D-3 Owens Creek at Quinley Road		06/10/88	1607	376			
D-3 Owens Creek at Quinley Road		07/07/88	1410	399			
D-3 Owens Creek at Quinley Road		08/17/88	4072	304			
D-3 Owens Creek at Quinley Road		09/08/88	2997	598			
D-3 Owens Creek at Quinley Road		10/06/88	307	522			
D-3 Owens Creek at Quinley Road		10/28/88	482	684			
D-3 Owens Creek at Quinley Road		12/08/88	682	680			
South Slough at Bert Crane Road	MER006	03/21/86		414	43	23	<0.5
South Slough at Bert Crane Road	MER006	06/11/86		441	6	8.9	<0.05
South Slough at Bert Crane Road	MER006	08/06/86		503	21	10	<0.05
South Slough at Bert Crane Road	MER006	06/15/87	105	567		19	<0.5
South Slough at Bert Crane Road	MER006	08/03/87	184	520		7	0.12

Appendix A-1. Water Quality Data for Merced Irrigation District. (continued)

Sitename	RWQCB ID	Date	Flow ac ft / mo	EC umhos/cm	SS	Cl	
					.....mg/L.....		
South Slough at Bert Crane Road	MER006	09/28/87	178	113			
South Slough at Bert Crane Road	MER006	04/21/88	150	601			
South Slough at Bert Crane Road	MER006	05/16/88	49	587			
South Slough at Bert Crane Road	MER006	06/10/88	83	463			
South Slough at Bert Crane Road	MER006	07/07/88	45	518			
South Slough at Bert Crane Road	MER006	08/17/88	178	539			
South Slough at Bert Crane Road	MER006	09/08/88	107	329			
South Slough at Bert Crane Road	MER006	10/06/88	95	760			
South Slough at Bert Crane Road	MER006	10/28/88	141	632			
D-2 Bear Creek at Bert Crane Road	MER007	10/08/75	6222	84	2		
D-2 Bear Creek at Bert Crane Road	MER007	03/31/76	1551	126	206		
D-2 Bear Creek at Bert Crane Road	MER007	04/28/76	5409	203	16		
D-2 Bear Creek at Bert Crane Road	MER007	05/27/76	4907	157	37		
D-2 Bear Creek at Bert Crane Road	MER007	06/22/76	3840	172	71		
D-2 Bear Creek at Bert Crane Road	MER007	07/27/76	4576	176	39		
D-2 Bear Creek at Bert Crane Road	MER007	08/25/76	5161	193	42		
D-2 Bear Creek at Bert Crane Road	MER007	09/22/76	4965	185	111		
D-2 Bear Creek at Bert Crane Road	MER007	05/03/77	891	271	89		
D-2 Bear Creek at Bert Crane Road	MER007	07/13/77	867	310	73		
D-2 Bear Creek at Bert Crane Road	MER007	08/24/77	1146	333	30		
D-2 Bear Creek at Bert Crane Road	MER007	04/18/78	28439	141	12		
D-2 Bear Creek at Bert Crane Road	MER007	06/13/78	4758	82	72		
D-2 Bear Creek at Bert Crane Road	MER007	07/11/78	5544	105	43		
D-2 Bear Creek at Bert Crane Road	MER007	08/08/78	3447	124	65		
D-2 Bear Creek at Bert Crane Road	MER007	09/12/78	6530	88	33		
D-2 Bear Creek at Bert Crane Road	MER007	10/10/78	7672	70	8		
D-2 Bear Creek at Bert Crane Road	MER007	01/06/86	1198	269	18	12	<0.5
D-2 Bear Creek at Bert Crane Road	MER007	03/21/86	20533	181	165	7	<0.5
D-2 Bear Creek at Bert Crane Road	MER007	06/11/86	9330	88	35	2.2	<0.05
D-2 Bear Creek at Bert Crane Road	MER007	08/06/86	11877	110	31	2.8	<0.05
D-2 Bear Creek at Bert Crane Road	MER007	10/17/86	5411	85	41	2.6	<0.05
D-2 Bear Creek at Bert Crane Road	MER007	01/02/87	3076	337	11	13	<0.05
D-2 Bear Creek at Bert Crane Road	MER007	06/15/87	3072	142		4.1	<0.5
D-2 Bear Creek at Bert Crane Road	MER007	08/03/87	4145	173		9.2	0.05
D-2 Bear Creek at Bert Crane Road	MER007	09/28/87	3947	131			
D-2 Bear Creek at Bert Crane Road	MER007	10/29/87	2983	320			
D-2 Bear Creek at Bert Crane Road	MER007	12/04/87	5695	297			
D-2 Bear Creek at Bert Crane Road	MER007	01/13/88	583	202			
D-2 Bear Creek at Bert Crane Road	MER007	02/01/88	228	306			
D-2 Bear Creek at Bert Crane Road	MER007	03/02/88	1319	369			
D-2 Bear Creek at Bert Crane Road	MER007	04/21/88	2924	124			
D-2 Bear Creek at Bert Crane Road	MER007	05/16/88	1879	180			
D-2 Bear Creek at Bert Crane Road	MER007	06/10/88	2126	159			
D-2 Bear Creek at Bert Crane Road	MER007	07/07/88	2963	195			

Appendix A-1. Water Quality Data for Merced Irrigation District. (continued)

Sitename	RWQCB ID	Date	Flow ac ft / mo	EC umhos/cm	SS	Cl	B
					.....mg/L.....		
D-2 Bear Creek at Bert Crane Road	MER007	08/17/88	3917	128			
D-2 Bear Creek at Bert Crane Road	MER007	09/08/88	3261	158			
D-2 Bear Creek at Bert Crane Road	MER007	10/06/88	883	142			
D-2 Bear Creek at Bert Crane Road	MER007	10/28/88	2388	331			
D-2 Bear Creek at Bert Crane Road	MER007	12/08/88	3519	221			
Atwater Drain at HWY 140	MER008	01/06/86	400	523	3.4	39	<0.5
Atwater Drain at HWY 140	MER008	03/21/86	400	654	7.3	60	<0.5
Atwater Drain at HWY 140	MER008	06/11/86	450	146	9.4	8.6	<0.05
Atwater Drain at HWY 140	MER008	08/06/86	800	192	16	14	<0.05
Atwater Drain at HWY 140	MER008	10/17/86	800	145	29	9.2	<0.05
Atwater Drain at HWY 140	MER008	01/02/87	800	597	38	39	0.15
Atwater Drain at HWY 140	MER008	06/15/87	945	160		9.4	<0.5
Atwater Drain at HWY 140	MER008	08/03/87	738	370		12	0.12
Atwater Drain at HWY 140	MER008	09/28/87	1309	254			
Atwater Drain at HWY 140	MER008	10/29/87	284	632			
Atwater Drain at HWY 140	MER008	12/04/87	208	643			
Atwater Drain at HWY 140	MER008	01/13/88	185	622			
Atwater Drain at HWY 140	MER008	02/01/88	185	546			
Atwater Drain at HWY 140	MER008	03/02/88	215	727			
Atwater Drain at HWY 140	MER008	04/21/88	230	301			
Atwater Drain at HWY 140	MER008	05/16/88	414	410			
Atwater Drain at HWY 140	MER008	06/10/88	192	437			
Atwater Drain at HWY 140	MER008	07/07/88	204	549			
Atwater Drain at HWY 140	MER008	08/17/88	1184	446			
Atwater Drain at HWY 140	MER008	09/08/88	1177	412			
Atwater Drain at HWY 140	MER008	10/06/88	238	502			
Atwater Drain at HWY 140	MER008	10/28/88	631	445			
Atwater Drain at HWY 140	MER008	12/08/88	503	239			
Livingston Drain at HWY 140	MER010	06/11/86		50	5.5	<2	<0.05
Livingston Drain at HWY 140	MER010	08/06/86	123	60	7	2.4	<0.05
Livingston Drain at HWY 140	MER010	10/17/86	123	53	7	<2	<0.05
Livingston Drain at HWY 140	MER010	06/15/87	50	194		7.8	<0.5
Livingston Drain at HWY 140	MER010	08/03/87	217	322		8.2	0.07
Livingston Drain at HWY 140	MER010	09/28/87	208	52			
Livingston Drain at HWY 140	MER010	04/21/88	250	360			
Livingston Drain at HWY 140	MER010	05/16/88	192	515			
Livingston Drain at HWY 140	MER010	06/10/88	525	284			
Livingston Drain at HWY 140	MER010	07/07/88	182	762			
Livingston Drain at HWY 140	MER010	08/17/88	491	384			
Livingston Drain at HWY 140	MER010	09/08/88	453	387			
Livingston Drain at HWY 140	MER010	10/06/88	160	817			

Appendix A-2. Water Quality Data For Turlock Irrigation District.

Sitename	RWQCB ID	Date	Flow ac ft / mo	EC umhos/cm	SS	Cl	B
					.....mg/L.....		
Lateral 1 to Tuolumne River		04/30/87	0	71		4	<0.5
Lateral 1 to Tuolumne River		05/31/87	1.6	66	9	2.3	<0.5
Lateral 1 to Tuolumne River		07/31/87	2	40	5	1.7	<0.05
Lateral 1 to Tuolumne River		09/30/87	2	29	3	2.6	<0.05
Lateral 1 to Tuolumne River		04/04/88	0	499			
Lateral 1 to Tuolumne River		05/31/88	0	515			
Lateral 1 to Tuolumne River		06/30/88	0	139			
Lateral 1 to Tuolumne River		07/28/88	0	256			
Lateral 1 to Tuolumne River		08/30/88	0	196			
Lateral 1 to Tuolumne River		09/30/88	1.2	408			
Stevinson Canal to Merced River	MER011	04/30/87	809	559		82	0.12
Stevinson Canal to Merced River	MER011	05/31/87	323	336	10	47	<0.5
Stevinson Canal to Merced River	MER011	07/31/87	218	381	5	70	0.07
Stevinson Canal to Merced River	MER011	09/30/87	438	489	6	76.3	0.08
Stevinson Canal to Merced River	MER011	04/04/88	90	779			
Stevinson Canal to Merced River	MER011	05/31/88	89	970			
Stevinson Canal to Merced River	MER011	06/30/88	257	822			
Stevinson Canal to Merced River	MER011	07/28/88	354	1400			
Stevinson Canal to Merced River	MER011	08/30/88	582	648			
Stevinson Canal to Merced River	MER011	09/30/88	567	971			
Highline Canal to Merced River	MER012	04/29/87	685	55		4	0.04
Highline Canal to Merced River	MER012	05/31/87	703	37	18	1.1	<0.5
Highline Canal to Merced River	MER012	07/31/87	653	56	20	3.1	<0.05
Highline Canal to Merced River	MER012	09/30/87	516	100	8	5.7	<0.05
Highline Canal to Merced River	MER012	04/04/88	110	454			
Highline Canal to Merced River	MER012	05/31/88	110	134			
Highline Canal to Merced River	MER012	06/30/88	148	114			
Highline Canal to Merced River	MER012	07/28/88	228	93			
Highline Canal to Merced River	MER012	08/30/88	264	176			
Highline Canal to Merced River	MER012	09/30/88	140	63			
Laterals 6 & 7 at Central Ave.	MER014	04/30/87	1099	1070		170	0.18
Laterals 6 & 7 at Central Ave.	MER014	05/31/87	918	518	13	73.4	<0.5
Laterals 6 & 7 at Central Ave.	MER014	07/31/87	1166	250	7	30	<0.05
Laterals 6 & 7 at Central Ave.	MER014	09/30/87	2669	533	9	65.9	0.06
Laterals 6 & 7 at Central Ave.	MER014	04/04/88	438	1160			
Laterals 6 & 7 at Central Ave.	MER014	05/31/88	965	1170			
Laterals 6 & 7 at Central Ave.	MER014	06/30/88	1223	744			
Laterals 6 & 7 at Central Ave.	MER014	07/28/88	1036	526			
Laterals 6 & 7 at Central Ave.	MER014	08/30/88	1172	1430			
Laterals 6 & 7 at Central Ave.	MER014	09/30/88	1121	803			
Harding Drain at Carpenter Road	STC101	04/30/87	337	667		67	0.09
Harding Drain at Carpenter Road	STC101	05/31/87	4168	441	30	49.3	<0.5
Harding Drain at Carpenter Road	STC101	07/31/87	2433	445	12	61	0.06
Harding Drain at Carpenter Road	STC101	09/30/87	2458	468	11	55.3	0.08

Appendix A-2. Water Quality Data For Turlock Irrigation District. (continued)

Sitename	RWQCB ID	Date	Flow ac ft / mo	EC umhos/cm	SS	Cl	B
					.....mg/L.....		
Harding Drain at Carpenter Road	STC101	04/04/88	528	1020			
Harding Drain at Carpenter Road	STC101	05/31/88	984	1030			
Harding Drain at Carpenter Road	STC101	06/30/88	1176	1020			
Harding Drain at Carpenter Road	STC101	07/28/88	1103	1310			
Harding Drain at Carpenter Road	STC101	08/30/88	1469	1280			
Harding Drain at Carpenter Road	STC101	09/30/88	1260	1230			
Westport Drain & Lat 2 1/2 & 3	STC102	04/30/87	682	662		42	0.04
Westport Drain & Lat 2 1/2 & 3	STC102	05/31/87	734	388	49	25.2	<0.5
Westport Drain & Lat 2 1/2 & 3	STC102	07/31/87	483	588	16	36	<0.05
Westport Drain & Lat 2 1/2 & 3	STC102	09/30/87	386	872	6	44.1	0.11
Westport Drain & Lat 2 1/2 & 3	STC102	04/04/88	104	751			
Westport Drain & Lat 2 1/2 & 3	STC102	05/31/88	125	721			
Westport Drain & Lat 2 1/2 & 3	STC102	06/30/88	89	816			
Westport Drain & Lat 2 1/2 & 3	STC102	07/28/88	95	768			
Westport Drain & Lat 2 1/2 & 3	STC102	08/30/88	138	875			
Westport Drain & Lat 2 1/2 & 3	STC102	09/30/88	90	854			
Lateral 2 to San Joaquin River	STC103	04/30/87	700	154		10	<0.5
Lateral 2 to San Joaquin River	STC103	05/31/87	795	282	18	24.1	<0.5
Lateral 2 to San Joaquin River	STC103	07/31/87	674	152	4	11	<0.05
Lateral 2 to San Joaquin River	STC103	09/30/87	1069	573	4	51.2	0.07
Lateral 2 to San Joaquin River	STC103	04/04/88	253	49			
Lateral 2 to San Joaquin River	STC103	05/31/88	253	215			
Lateral 2 to San Joaquin River	STC103	06/30/88	324	697			
Lateral 2 to San Joaquin River	STC103	07/28/88	340	788			
Lateral 2 to San Joaquin River	STC103	08/30/88	521	1270			
Lateral 2 to San Joaquin River	STC103	09/30/88	503	74			

Appendix A-3. Water Quality Data For Modesto Irrigation District.

Sitename	RWQCB ID	Date	Time	Flow cfs	EC umhos/cm	SS	Cl
						.....mg/L..	
Modesto I.D. at LaGrange Dam		03/05/76			88	0.5	
Modesto I.D. at LaGrange Dam		04/06/76			83	1	
Modesto I.D. at LaGrange Dam		06/25/76			43	9.5	
Modesto I.D. at LaGrange Dam		10/01/76			88	8	
Lateral 1\Airport to Tuolumne River		04/30/87	1125	5			
Lateral 1\Airport to Tuolumne River		06/16/87	1405	9			
Lateral 5 at Paradise Road	STC104	04/30/87	1335	14	208	8	17
Lateral 5 at Paradise Road	STC104	06/16/87	1435	22	100		
Lateral 4 at Paradise Road	STC105	04/30/87	1345	17			
Lateral 4 at Paradise Road	STC105	06/16/87	1455	20			
Miller Lake Discharge	STC106	03/05/76			214	1.6	
Miller Lake Discharge	STC106	04/06/76			343	28	
Miller Lake Discharge	STC106	05/06/76			388	15	
Miller Lake Discharge	STC106	05/28/76			497	23	
Miller Lake Discharge	STC106	06/25/76			522	62	
Miller Lake Discharge	STC106	08/02/76			494	29	
Miller Lake Discharge	STC106	09/01/76			482	38	
Miller Lake Discharge	STC106	10/01/76			347	34	
Miller Lake Discharge	STC106	04/30/87	1430	4	385	18	14
Miller Lake Discharge	STC106	06/16/87	1520	10	320		
Lateral 6 to Stanislaus River	STC107	04/30/87	1500	17			
Lateral 6 to Stanislaus River	STC107	06/16/87	1545	13			
Main Canal to Stanislaus River	STC108	03/05/76			128	0.5	
Main Canal to Stanislaus River	STC108	04/06/76			95	9	
Main Canal to Stanislaus River	STC108	05/06/76			100	3	
Main Canal to Stanislaus River	STC108	05/28/76			193	4	
Main Canal to Stanislaus River	STC108	06/25/76			93	17.5	
Main Canal to Stanislaus River	STC108	08/02/76			181	41	
Main Canal to Stanislaus River	STC108	09/01/76			150	8	
Main Canal to Stanislaus River	STC108	10/01/76			88	10	
Main Canal to Stanislaus River	STC108	04/30/87	1525	4			
Main Canal to Stanislaus River	STC108	06/16/87	1605	8			
Lateral 2 Discharge to Dry Creek	STC109	04/30/87	1050	10			
Lateral 2 Discharge to Dry Creek	STC109	06/16/87	1355	8			
Lateral 1 at Santa Fe Ave.	STC111	04/30/87	1040	0			
Lateral 1 at Santa Fe Ave.	STC111	06/16/87	1340	0.3			
Main Canal at Albers Rd.	STC112	04/30/87	1020	625	35	13	<2
Main Canal at Albers Rd.	STC112	06/16/87	1330	650	30		