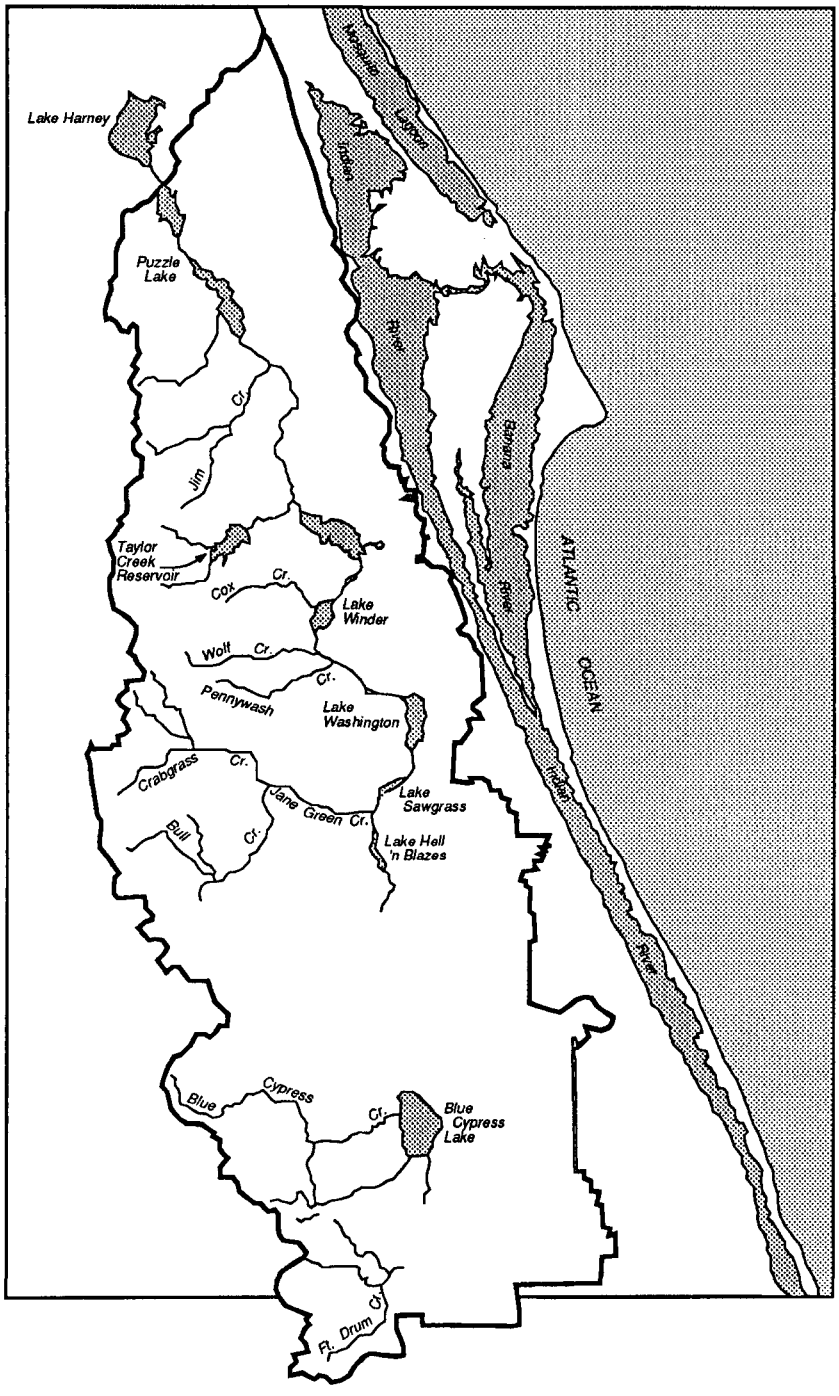
Technical Publication SJ 90-1



Characterization of Agricultural Pump Discharge Quality in the Upper St. Johns River Basin

St. Johns River Water Management District

Technical Publication SJ 90-1

CHARACTERIZATION OF AGRICULTURAL PUMP DISCHARGE QUALITY IN THE UPPER ST. JOHNS RIVER BASIN

by

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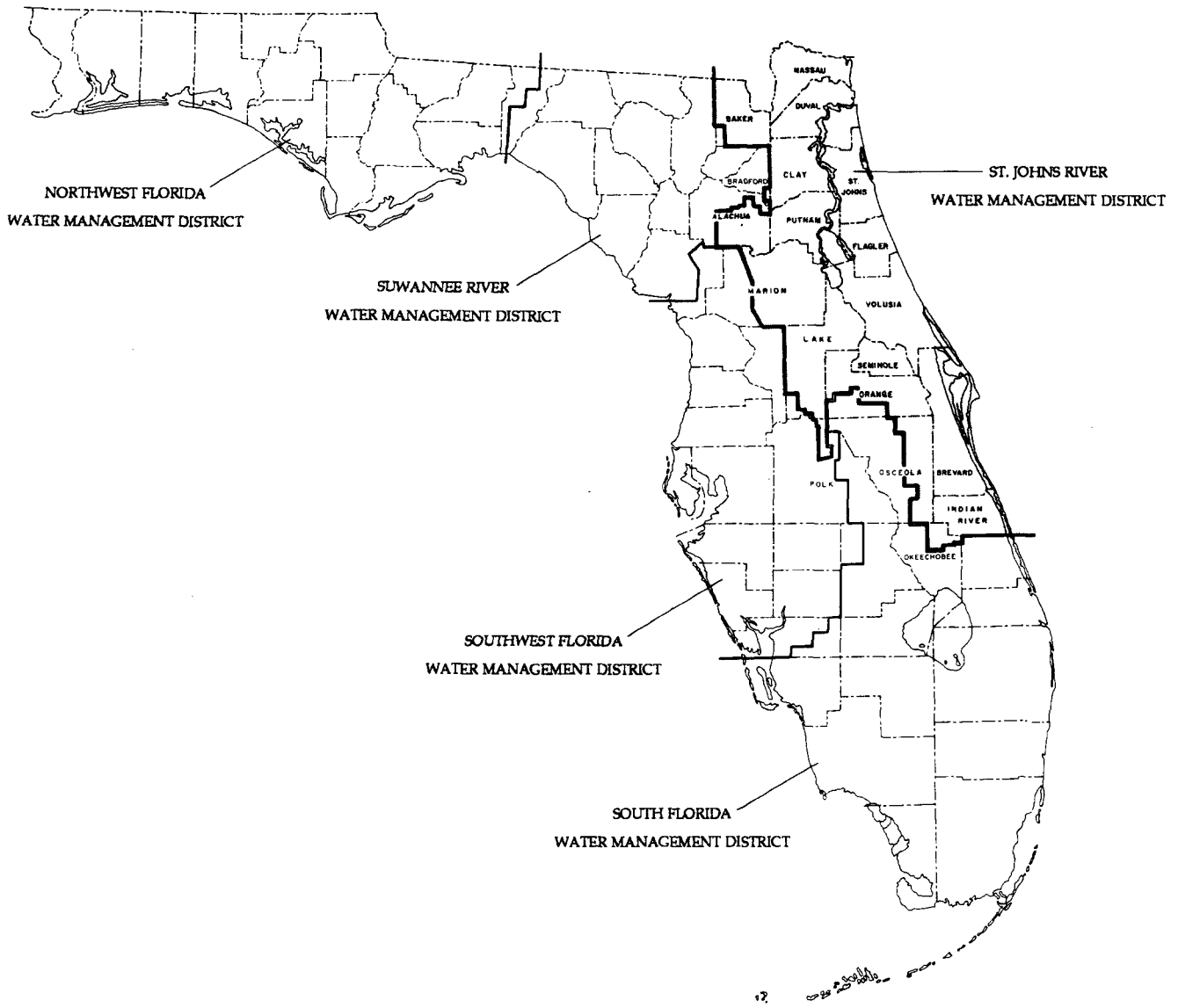
Palatka, Florida

1990



THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

The St. Johns River Water Management District (SJRWMD) was created by the Florida Legislature in 1972 to be one of five water management districts in Florida. It includes all or parts of nineteen counties in northeast Florida. The mission of SJRWMD is to manage water resources to insure their continued availability while maximizing environmental and economic benefits. It accomplishes its mission through regulation; applied research; assistance to federal, state, and local governments; operation and maintenance of water control works; and land acquisition and management. Technical reports are published to disseminate information collected by SJRWMD in pursuit of its mission.

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ABSTRACT

The St. Johns River Water Management District and Florida Institute of Technology collected 58 samples from 9 pumps in the upper St. Johns River basin to characterize the water quality of agricultural discharges. Median dissolved oxygen levels in pump discharges were 2.8 mg/l and violated state water quality standards 89 percent of the time. The median suspended solids concentration was 10.8 mg/l in pump discharges, approximately three times higher than the median of the receiving water body. No violations of the Class I water quality standard for chloride were observed in the pump discharges. Nutrient levels in pump discharges were two to five times higher than levels found in the receiving water body. Nitrate-nitrite nitrogen was most abundant in the pumps of Fellsmere Joint Ventures, with median concentrations from 0.16 to 0.69 mg/l. Fellsmere Joint Ventures' No. 10 pump (Mary A) discharged the highest levels of total phosphorus (median=0.54 mg/l). No violations of pesticide water quality standards were detected in the pump discharge or receiving water body. Regulatory compliance data provided by the pump owners produced results similar to this study.

INTRODUCTION

PURPOSE

Discharges from agricultural pumps have been cited as a source of water quality problems in the upper St. Johns River basin (FDER, 1982). In 1982, the St. Johns River Water Management District (SJRWMD) began sampling pump events to provide information for regulatory and basin management purposes. This report documents pump discharge quality in terms of state water quality standards and background conditions.

BACKGROUND

To convert parts of the upper St. Johns River basin (Figure 1) to agricultural and urban use, landowners typically built a levee around a portion of the floodplain, dug an interior drainage network, and installed pumps to lift excess water over the levee and discharge into the remaining floodplain (Figure 2). In this manner, 222,486 acres of the total floodplain (approximately 62 percent) were isolated (Lowe et al. 1984).

Most of the former floodplain is used for agriculture. In 1980, approximately 70 percent of the basin was rough or improved pasture and 5 percent was row crop or citrus (SJRWMD 1980). Agricultural uses have intensified since then as pasture has been converted to row crops, such as corn and carrots. In some areas, poorly maintained levee or pump systems allowed marsh vegetation to recolonize former pasture.

The reduced ability of the remaining floodplain to assimilate nutrients, combined with increased nutrient loads from former floodplain that has been converted to agricultural use, has intensified water quality problems in the basin (Sullivan 1979). Based on data collected by the Florida Department of Environmental Regulation (FDER) and Game and Fresh Water Fish Commission (FGFWFC), Sullivan (1979) concluded that agricultural pumps caused lower than normal dissolved oxygen levels. CH2M Hill (1979) also documented low dissolved oxygen levels in pump discharges for Deseret Ranch but concluded that the pumps had an insignificant impact on the water quality of the receiving body. These divergent conclusions, based on

Figure 1. Location of upper St. Johns River basin study area within the St. Johns River Water Management District

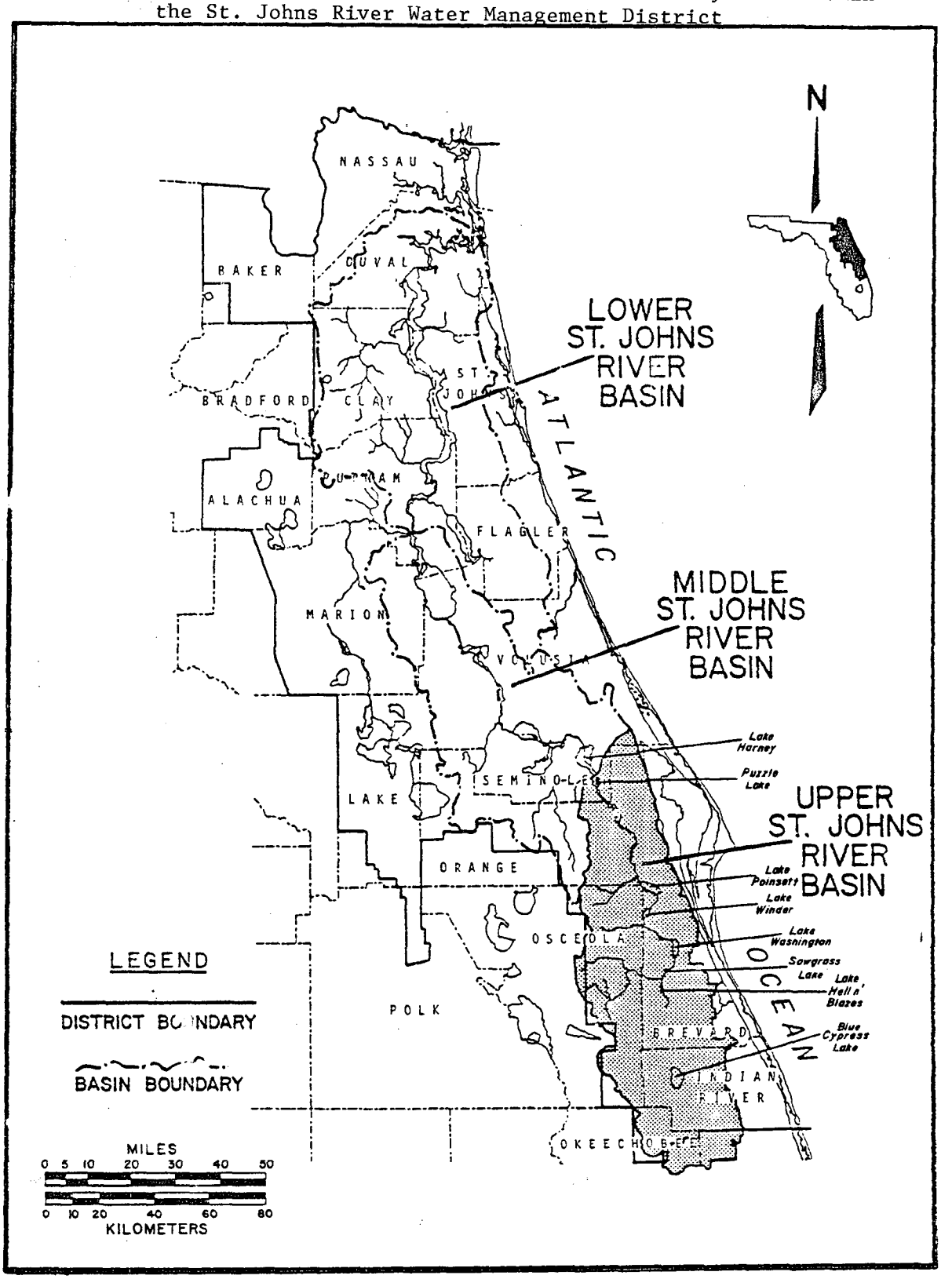
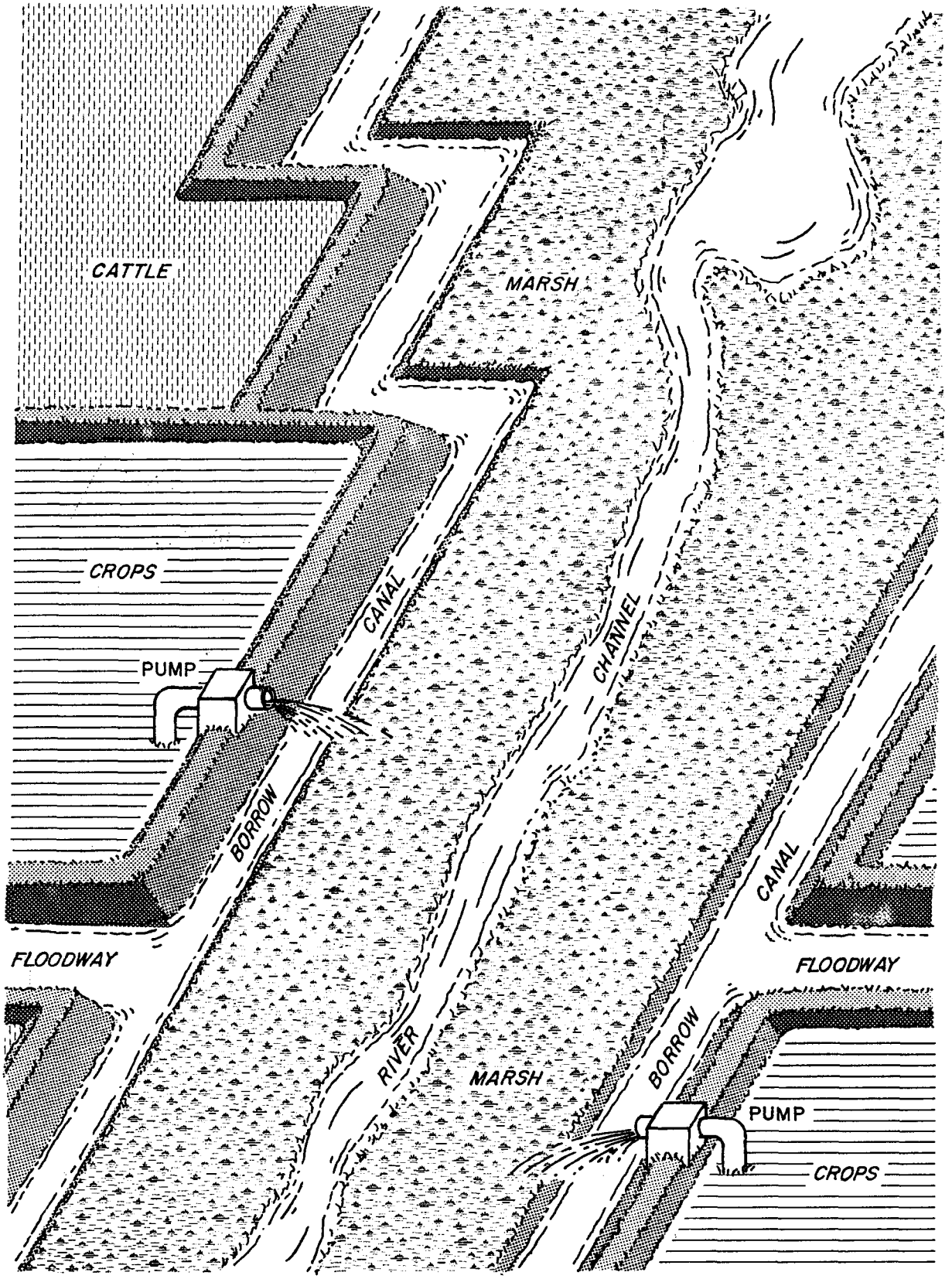


Figure 2. Typical floodplain levee system



limited data, were presented by consultants on opposite sides of a regulatory dispute between the FDER and Deseret Ranches of Florida, Inc. Lowe et al. (1984) concluded that the pumps discharged water of poorer quality than the receiving water body, based on 17 pump events monitored by St. Johns River Water Management District and the Florida Institute of Technology.

METHODS OF INVESTIGATION

The St. Johns River Water Management District's efforts to sample and characterize agricultural pump discharges began in 1982 and continue to the present. Nine pumps were selected for study (Figure 3, Table 1) and a total of 58 pump events were sampled (Table 2, Appendix A). Pump sample collection from April 1985 through January 1987 was funded in part by the Environmental Protection Agency under Section 205(j) of the Clean Water Act. During this period, 24 pump events were sampled, 6 for pesticide analysis only (Table 2). Using funds provided by the grant, pesticides were analyzed for 13 pump events and 71 receiving water body samples.

The collection of water samples from agricultural pumps was complicated and unpredictable. Pumps were located in remote areas with difficult access. Pumps were not operated on a fixed schedule, but in response to storms (basinwide, localized, or merely anticipated) and agricultural activities. An operating pump, available for sample collection, was identified by several means: inspection during a routine sampling run; inspection during a special sampling run when conditions were favorable for pump operation; overflights by enforcement staff; and notification by fishermen, other agency personnel, or pump operators.

Pumps generally discharged to an exterior borrow canal or floodway. Depending on water levels in the basin, discharges continued to flow down the canal, sheetflowed through the marsh, or backflowed up the canal. Of the nine pumps sampled, eight discharged to canals or floodways downstream of another pump or agricultural discharge. Discharges from the remaining pump, Duda & Sons, seemed to flow upstream or sheetflow through the marsh due to backwater conditions created by the Duda/Rockledge canal. Because of the pump discharge flow patterns, it was not possible to document background conditions upstream of the pumps.

It was difficult also to document natural background water quality in the basin. While some minimally affected areas remain in the floodplain marsh and hardwood swamp tributaries, the water quality in the river and lakes probably has changed substantially due to changes in hydrology and land use. Marsh and tributary stations are not representative of overall water quality in the basin, since water quality varies between the different water body types (Lowe et al. 1984). For example, dissolved oxygen levels are generally higher in lakes than in marshes or swamps.

Figure 3. Pump sample stations in the upper St. Johns River basin

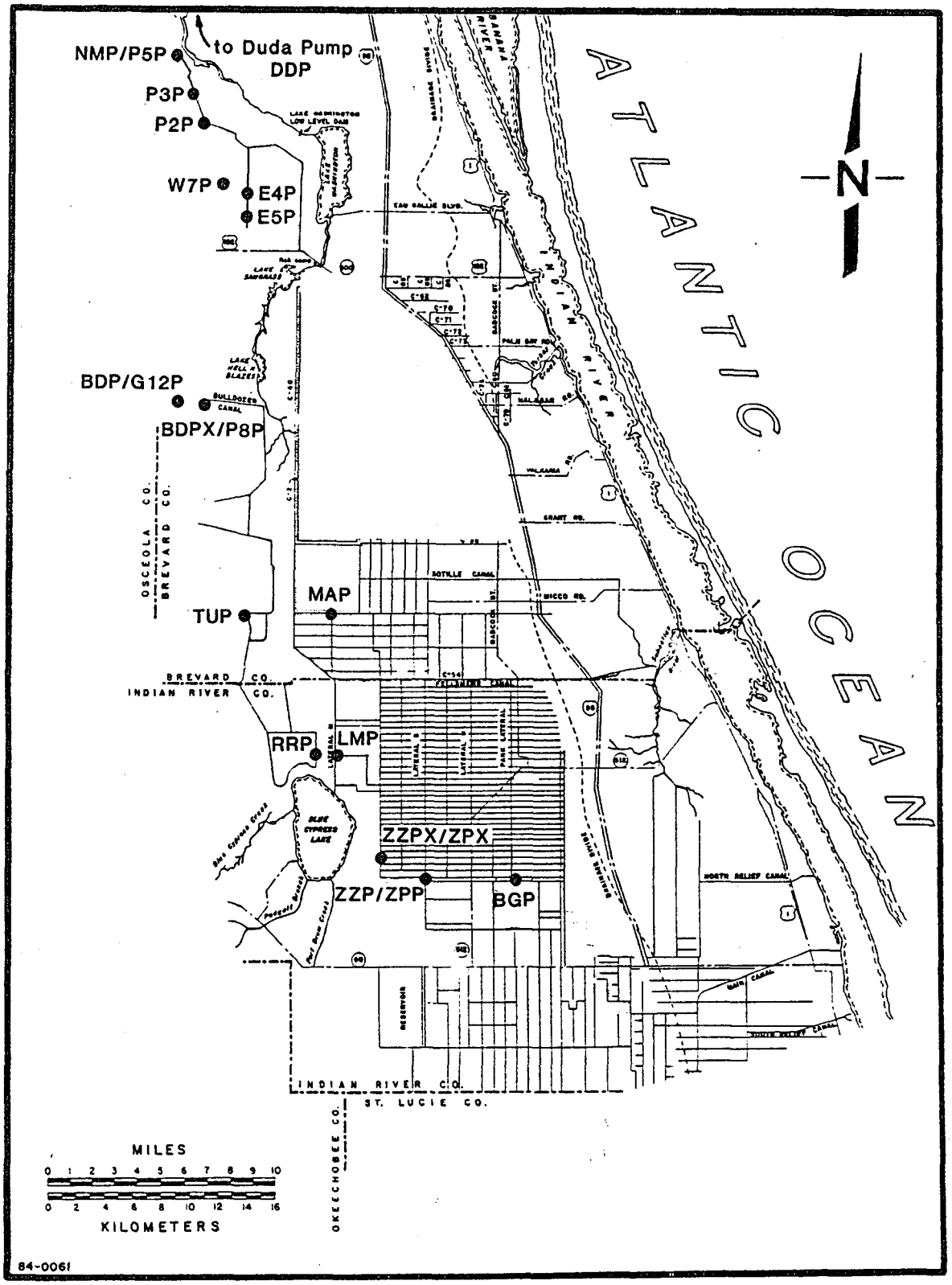


Table 1. Pump sample stations in the upper St. Johns River basin

SJRWMD STATION NAME	OWNER	OWNER DESIGNATION	LAND USE	SOIL TYPE
ZZP	FELLSMERE Joint Ventures	#6	Citrus	Gator, Canova and Terra Ceia Muck, W/Oldsmar, Riviera & Winder Fine Sand
ZZPX	FELLSMERE Joint Ventures	#5	Pasture & Citrus	Same as above
LMP	FELLSMERE Joint Ventures	#4	Row Crop	Gator, Terra Ceia & Canova Muck
MAP	FELLSMERE Joint Ventures	#10	Row Crop & Pasture	Monteverde & Micco Peat
TUP	TUCKER & SON Far Reach Ranch	-	Pasture	Felda, Floridana Sand w/Micco Peat
BDP	DESERET RANCHES Of Florida	OG12	Citrus	Felda, Pineda, Holopaw, Malabar, Eau Gallie & Myakka Sand
BDPX	DESERET RANCHES Of Florida	P8	Pasture	Felda, Winder & Floridana Sand w/Micco and Monteverde Peat
NMP	DESERET RANCHES of Florida	P5	Pasture	Unknown, Presumed Sand
DDP	DUDA AND SONS	-	Pasture	Tomoka & Terra Ceia Muck w/Floridana Sand

Table 2. Summary of pump sample events

Pump Owner	SJRWMD Name	SJRWMD - EPA Section 205 (J*)		FIT	Pesticide Only
FELLSMERE	ZZP	7	(3)	5	
	ZZPX	5	(2)		
	LMP	6	(2)		(1)
	MAP	2	(2)	3	(2)
TUCKER	TUP	4	(3)		
DESERET	BDP	1	(1)	6	(2)
	BDPX	4	(4)	1	
	NMP	3	(1)		
DUDA	DDP	5	(1)		
		37	(18)	15	(6)

*Numbers in parenthesis indicate number of samples analyzed for pesticides.

For comparison, stations from SJRWMD's water quality monitoring network were selected to represent existing conditions in the receiving water body. Selected stations (Figure 4, Table 3) exclude areas immediately downstream of a pump discharge or other local influence and represent a variety of areas and water body types. Comparisons of the quality of agricultural discharges to that of the receiving waters are for illustrative purposes and do not imply that the existing water quality is desirable or representative of natural background quality.

During the study period (1982-1987), the parameters sampled, analytical techniques, and equipment changed (Table 4). The number of parameters analyzed per sample varied due to the short notice before pump sample collection, changes in the district's laboratory capabilities and the periodic availability of EPA grants which expanded parametric analysis. From 1982 to September 1985, stations in the receiving water body were sampled quarterly. Since October 1985, the stations were sampled bimonthly.

Grab samples were collected by the SJRWMD at 0.5m depth. Pump samples were collected as close to the discharge pipe as possible to minimize dilution effects. High density polyethylene bottles were used for non-pesticide sample collection. Non-pesticide bottles and caps were rinsed with ambient water before sample collection. Samples were stored in iced coolers and transported to the laboratory within 24 hours. Metal and nutrient samples were preserved with nitric and sulfuric acid, respectively, to a pH less than 2. Metals and dissolved nutrient samples were filtered through a .45 micron membrane filter on site, using a Geofilter peristaltic pump and acrylic filter holder.

Pesticide samples were collected in one gallon glass containers provided by Flowers Chemical Laboratories, which performed the analyses (Table 5). Containers were washed by rinsing with the last solvent used, tap water, then glass-distilled water. Glass containers were heated to 400 degrees Centigrade for 15-30 minutes. After drying and cooling, bottles were capped with aluminum foil and teflon-lined caps.

Measurements for dissolved oxygen (D.O.), temperature, pH, and specific conductance were made in situ with a Hydrolab 4041, a YSI Model 33 SCT meter, YSI Model 57 D.O. meter, or Cole-Parmer Digisense pH meter. Instruments were calibrated before and after each daily sampling period. The pH meters were calibrated with two pH buffers. D.O. meters were calibrated in saturated air chambers. Conductivity measurements were calibrated with a 1413 umhos/cm standard. Calibration results were recorded on the Field Calibration Check Sheet and reviewed by the project manager.

SJRWMD samples were identified by a 14-character code which incorporates the three-letter station name, a comment code, the date collected (YYMMDD), and time collected. For a more detailed

Figure 4. Stations selected to represent existing water quality in the receiving water body

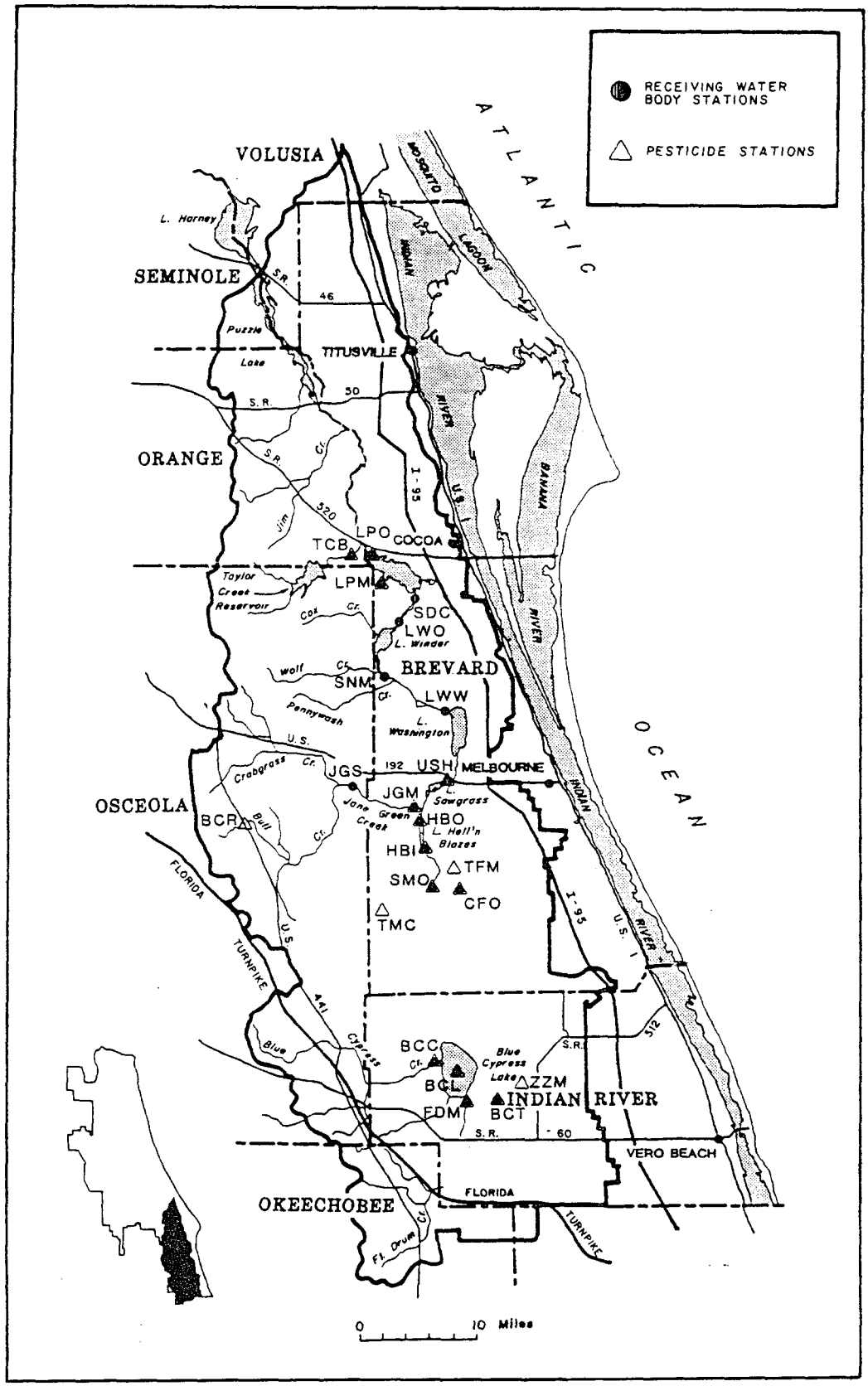


Table 3. Stations selected to represent existing water quality in the receiving water body

STATION LOCATION	NAME		LAT/LONG	WATER BODY TYPE
CENTER OF BLUE CYPRESS LAKE	BCL	*	274336/804512	LAKE
BLUE CYPRESS MARSH	BCT	*	274133/804325	MARSH
FORT DRUM CREEK	FDM	*	274147/804432	MARSH TRIBUTARY
BLUE CYPRESS CREEK	BCC	*	274421/804639	SWAMP TRIBUTARY
SOUTH MORMON OUTSIDE CANAL	SMO	*	275917/804732	CHANNELIZED RIVER
CANAL FORTY	CFO	*	275834/804614	CHANNELIZED RIVER
OUTLET OF LAKE HELL'N BLAZES	HBO	*	280132/804756	LAKE
JANE GREEN SWAMP	JGS		280427/805318	SWAMP TRIBUTARY
JANE GREEN MARSH	JGM	*	280308/804811	MARSH TRIBUTARY
ST. JOHNS RIVER AT US 192	USH	*	280503/804511	RIVER
LAKE WASHINGTON AT WEIR	LWW		280956/804555	LAKE
ST. JOHNS RIVER SOUTH OF NORTH MORMON OUTSIDE CANAL	SNM		281255/805118	RIVER
OUTLET OF LAKE WINDER	LWO		281605/804951	LAKE
ST. JOHNS RIVER SOUTH OF DUDA/ROCKLEDGE CANAL	SDC		281709/804914	RIVER
LAKE POINSETT MARSH	LPM	*	281937/805105	MARSH
TAYLOR CREEK	TCB	*	282106/805544	SWAMP TRIBUTARY
OUTLET OF LAKE POINSETT	LPO	*	282131/805223	LAKE
PESTICIDE SAMPLING STATIONS ARE THOSE DESIGNATED * ABOVE AND:				
ZIGZAG MARSH	ZZM		274149/804030	MARSH
THREE FORKS MARSH	TFM		275950 804713	MARSH
BULL CREEK	BCR		280143/810222	TRIBUTARY
INLET OF LAKE HELL'N BLAZES	HBI		280039/804744	RIVER
TEN MILE CREEK	TMC		275624/804811	TRIBUTARY

Table 4. Techniques for chemical and physical analysis of water samples

PARAMETER	STORET#	SAMPLED BY (*)	METHOD OF ANALYSIS OR FIELD EQUIPMENT USED
WATER TEMPERATURE (deg C)	10	1,2	IN SITU, HYDROLAB 4041(1), Y.S.I. MODEL 57 D.O. METER(1) OR Y.S.I. MODEL 33 SCT METER(2)
SECCHI DEPTH (in)	77	1,2	IN SITU, PLASTIC DISK WITH ALTERNATING BLACK AND WHITE QUADRANTS
TRUE COLOR (CPU)	80	1,2	VISUAL COMPARISON, STD. METHODS 15TH ED., SECTION 204A, P.61(1) OR SPECTROPHOTOMETRIC METHOD, STD. METHODS, 14TH ED., P.66(2)
CONDUCTANCE (micromhos/cm)	94	1,2	DIRECT MEASUREMENT, EPA 120.1-1
DISSOLVED OXYGEN (mg/l)	299	1,2	MEMBRANE ELECTRODE, STD. METHODS, 15TH ED., SECTION 421F(1) OR LEEDS & NORTHRUP 7932 (2)
BOD, 5 DAY (mg/l)	310	1,2	INCUBATION, 5 DAY, EPA 405.1
pH (S.U.)	400	1,2	IN SITU, HYDROLAB 4041 OR COLE-PARMER DIGISENSE pH METER
ALKALINITY, TOTAL (mg/l)	410	1,2	POTENTIOMETRIC TITRATION, EPA 310.1
TOTAL SUSPENDED SOLIDS (mg/l) (RESIDUE, NONFILTERABLE)	530	1,2	GRAVIMETRIC 180 C, EPA 160.2
AMMONIA NITROGEN, DISSOLVED(mg/l)	608	1	AUTOMATED PHENATE METHOD, EPA 350.1
AMMONIA NITROGEN, TOTAL (mg/l)	610	1,2	AUTOMATED PHENATE METHOD, EPA 350.1
TOTAL KJELDAHL NITROGEN, DISSOLVED (mg/l)	623	1	COLORIMETRIC, SEMI-AUTOMATED, EPA 351.2
TOTAL KJELDAHL NITROGEN (mg/l)	625	1,2	COLORIMETRIC, SEMI-AUTOMATED, EPA 351.2

*
1. SJRWMD
2. FIT

Table 4. (Cont.)

PARAMETER	STORET#	SAMPLED BY (*)	METHOD OF ANALYSIS OR FIELD EQUIPMENT USED
NITRATE-NITRITE NITROGEN (mg/l) (NOX)	630	1,2	AUTOMATED CADMIUM REDUCTION, EPA 353.2
TOTAL PHOSPHORUS (mg/l)	665	1,2	COLORIMETRIC, SEMI-AUTOMATED, EPA 365.4
TOTAL PHOSPHORUS, DISSOLVED(mg/l)	666	1	COLORIMETRIC, SEMI-AUTOMATED, EPA 365.4
HARDNESS (mg/l)	900	1,2	EDTA TITRATION, EPA 140.2
CALCIUM, DISSOLVED (microg/l)	915	1,2	ATOMIC ABSORPTION, EPA 215.1
MAGNESIUM, DISSOLVED (microg/l)	925	1,2	ATOMIC ABSORPTION, EPA 242.1-1
SODIUM, DISSOLVED (microg/l)	930	1,2	ATOMIC ABSORPTION, EPA 273.1
POTASSIUM, DISSOLVED (microg/l)	935	1,2	ATOMIC ABSORPTION, EPA 258.1(1) OR FLAME PHOTOMETRIC METHOD, STD. METHODS, 14TH ED.(2)
CHLORIDE (mg/l)	940	1,2	AUTOMATED FERRICYANIDE, EPA 325.2
SULFATE (mg/l)	945	1,2	TURBIDIMETRIC, EPA 375.4
IRON, DISSOLVED (microg/l)	1046	1,2	ATOMIC ABSORPTION, EPA 236.1-1
CHLOROPHYLL A, UNCORRECTED	32210	1,2	SPECTROPHOTOMETRIC METHOD,
CHLOROPHYLL A, CORRECTED	32211		STD. METHODS,
CHLOROPHYLL B, UNCORRECTED	32212		SECTION 1002G, PG 950
CHLOROPHYLL C, UNCORRECTED	32214		(all in microg/l)
PHEOPHYTIN, UNCORRECTED	32218	1	
CHLOROPHYLL/PHEOPHYTIN RATIO	32219		
TOTAL DISSOLVED SOLIDS (mg/l) (RESIDUE, FILTERABLE)	70300	1,2	GRAVIMETRIC 180 C, EPA 160.1
ORTHOPHOSPHATE PHOSPHORUS (mg/l)	70507	1,2	SINGLE REAGENT METHOD, EPA 365.2
TURBIDITY (NTU)	82079	1,2	NEPHELOMETRIC, EPA 180.1

*
1. SJRWMD
2. FIT

Table 5. Pesticide analysis parameters

PARAMETER	STORET NUMBER	CLASS 1 STANDARD (microg/l)	MDL PROPOSED* (microg/l)	MDL ACHIEVED (microg/l)
ALDRIN	39330	0.003	0.003	0.004
CHLORDANE	39350	0.01	0.01	0.01
DDT	39900	0.001	0.001	0.01
DEMETON	39560	0.1	0.1	0.01
ENDOSULFAN 1	34361	0.003	0.003	0.01
ENDRIN	39390	0.004	0.001	0.001
GUTHION	39580	0.01	0.01	0.01
HEPTACHLOR	39410	0.001	0.001	0.003
LINDANE	39340	0.01	0.0005	0.0005
MALATHION	39530	0.1	0.02	0.01
METHOXYCHLOR	39480	0.03	0.01	0.01
MIREX	39755	0.03	0.001	0.001
PARATHION	39600	0.04	0.02	0.01
TOXAPHENE	39400	0.005	0.01	0.1

* METHOD 608 MINIMUM DETECTION LIMITS

description of sample collection techniques, refer to the SJRWMD Water Quality Monitoring Field Manual (Fall and Osburn 1985).

In the work performed by Florida Institute of Technology (FIT), one gallon grab samples were collected as close to the pump discharge as possible. Chemical analysis of all samples was performed in accordance with EPA recommended procedures as described in EPA document EPA/600-4-79-020 (Table 4). One sample from each site was analyzed in duplicate and EPA reference samples were routinely analyzed.

Compliance data provided to FDER by Deseret Ranches of Florida, Inc., Rollins Blue Cypress Ranch, Fellsmere Joint Ventures, Inc., and Berry Groves, Inc., were tabulated for comparison. No quality assurance information was provided with the data. Sample analysis was performed for Deseret by Bionomics Analytical Laboratory, for Rollins Ranch by Flowers Chemical Laboratories, and for Berry Groves and Fellsmere Joint Ventures by Flowers, Pioneer Laboratories, or Agri-Business Cooperative. One hundred fifty-two samples were collected from 12 different pumps from 1981 to 1986. According to the permit conditions, compliance samples should be collected at the pump intake. Samples were generally analyzed for pH, specific conductance, dissolved oxygen, five day biochemical oxygen demand, total suspended solids, total dissolved solids, chloride, sulfate, total Kjeldahl nitrogen, nitrate and/or nitrite nitrogen, total phosphorus, and selected pesticides.

RESULTS

COMPARISON OF PUMP DISCHARGE TO RECEIVING WATER BODY AND WATER QUALITY STANDARDS

Dissolved Oxygen and Biochemical Oxygen Demand

Median dissolved oxygen concentration in pump discharges was 2.8 mg/l and ranged from 0.0 to 9.5 mg/l (Table 6). Only 11 percent of the discharges met the minimum state water quality standard of 5 mg/l (Chapter 17-3, Florida Administrative Code). In comparison, median dissolved oxygen in the receiving water body was 3.5 mg/l and ranged from 0 to 11.8 mg/l. Thirty-nine percent of the measurements exceeded 5 mg/l.

Pump discharges contained a slightly higher BOD (median = 2.7 mg/l) than the receiving water body (median = 1.6 mg/l).

Suspended Solids and Turbidity

The median suspended solids concentration of pump discharges, 10.8 mg/l, was four times higher than that of the receiving water body, at 2.7 mg/l. Values exceeding 100 mg/l were observed at Fellsmere's No. 10 and No. 6 pumps (MAP, ZZP; see Table 1, Figure 3 for pump designations). High suspended solid levels in the receiving water body were recorded at marsh sites and reflect the difficulty of collecting water samples in a shallow marsh.

Median turbidity levels in pump discharges were 4.2 NTU and ranged from 1.1 to 73.0 NTU. Violations of state water quality standards were observed twice, at Fellsmere's No. 10 (MAP) and No. 5 (ZZPX) pumps. Turbidity levels in the receiving water body were much lower, with a median concentration of 1.3 mg/l. In 314 measurements, no violations of Chapter 17-3 standards were observed in the receiving water body.

Table 6. Comparison of upper St. Johns River basin pump discharge quality to the receiving water body

	PUMP DISCHARGE		RECEIVING WATER BODY	
PARAMETER	MEDIAN	MIN-MAX, NUMBER	MEDIAN	MIN-MAX, NUMBER
WATER TEMP (Deg C)	26.4	15.0-31.5, 45	24.0	10.0-33.5, 401
SECCHI (in)	18.0	10-36, 17	30.0	3-72, 226
COLOR (CPU)	243.0	68-833, 65	175.0	40-1100, 311
COND.(micromhos/cm)	660.0	75-1550, 43	360.0	60-3150, 345
D.O. (mg/l)	2.8	0.0-9.5, 44	3.5	0.0-11.8, 401
B.O.D. (mg/l)	2.7	0.4-6.7, 56	1.6	0.1-7.6, 310
pH (S.U.)	6.8	5.8-7.5, 40	6.7	5.0-9.6, 314
ALKALINITY (mg/l)	123.0	25.0-237.0, 60	51.0	4.5-153.0, 308
SUSP.SOL.(mg/l)	10.8	1.0-187.0, 62	2.7	0.1-145.0, 311
DISS.NH4 (mg/l)	0.32	0.05-0.89, 11	0.04	0.00-0.47, 77
TOT. NH4 (mg/l)	0.17	0.01-1.84, 52	0.05	0.00-1.10, 150
DISS.TKN (mg/l)	2.42	1.40-5.78, 11	1.48	0.77-4.27, 70
TOT. TKN (mg/l)	2.22	0.90-5.93, 54	1.51	0.59-4.71, 147
NOX (mg/l)	0.08	0.00-2.36, 64	0.02	0.00-1.51, 312
TOT. PHOS (mg/l)	0.15	0.04-1.16, 62	0.08	0.01-0.80, 289
DISS.PHOS (mg/l)	0.15	0.03-0.49, 13	0.06	0.00-0.58, 127
HARDNESS (mg/l)	243.0	27-510, 56	98.0	24-1100, 224
CALCIUM (microg/l)	82.0	34.0-129.0, 30	26.0	5.7-106.0, 129
MAGNESIUM (microg/l)	26.0	7.7-39.0, 8	6.6	1.2-65.0, 129
SODIUM (microg/l)	21.4	2.0-162.0, 30	32.0	6.6-310.0, 128
POTASSIUM (microg/l)	4.4	2.1-9.4, 30	2.2	0.06-7.6, 129
CHLORIDE (mg/l)	92.0	12.0-324.0, 64	70.0	8.0-627.0, 314
SULFATE (mg/l)	45.0	1.0-290.0, 60	15.0	0.0-1000, 310
CHL A (microg/l)	6.9	0.7-198, 52	4.3	0.0-250, 293
CHL A/C (microg/l)	4.3	0.0-178, 26	2.4	0.0-242, 228
T.D.S. (mg/l)	528.0	108-1085, 57	270.0	74-2340, 305
ORTHOPHOS (mg/l)	0.09	0.01-0.84, 63	0.04	0.0-0.56, 314
TURBIDITY (NTU)	4.2	1.1-73.0, 64	1.3	0.1-35.0, 314

Metals and Minerals

For pumps which discharged to Class I waters, no violations of the chloride standard were observed. The highest chloride concentrations (192-199 mg/l) were observed at Fellsmere's No. 10 (MAP) and Deseret's OG12 (BDP) pumps. During the study period, chloride levels in the Class I receiving water body exceeded 250 mg/l on four occasions, each at Station SMO. Since this station is located in a canal upstream of most of the pump discharges and the violations occurred in February 1982, May 1984, and May 1986, the high chloride levels are probably due to bank seepage and evaporation, not agricultural pump discharge. The instantaneous water quality standard for total dissolved solids (less than 1000 mg/l) was violated once at Fellsmere's No. 4 pump (LMP).

Pump discharges were generally more mineralized than the receiving water body. Mean calcium, magnesium, potassium, sulfate, and alkalinity levels in pump discharges were twice those found in the receiving water body (Table 6).

Nutrients

Nutrient levels in pump discharges were generally two to five times higher than levels found in the receiving water body. The pumps typically discharged high levels of inorganic nitrogen, exhibiting median concentrations of 0.08 mg/l for nitrate-nitrite nitrogen and 0.17 mg/l for ammonia nitrogen, compared to 0.02 mg/l and 0.03 mg/l, respectively, in the receiving water body (Table 6). Median total phosphorus and orthophosphate concentrations in the pump discharges were 0.15 mg/l and 0.09 mg/l, respectively, compared to 0.08 mg/l and 0.04 mg/l in the receiving water body.

Pumps discharged nutrients primarily in a dissolved form. An average 67 percent of the total phosphorus, 75 percent of the ammonia, and 94 percent of the total Kjeldahl nitrogen were not removed by filtering.

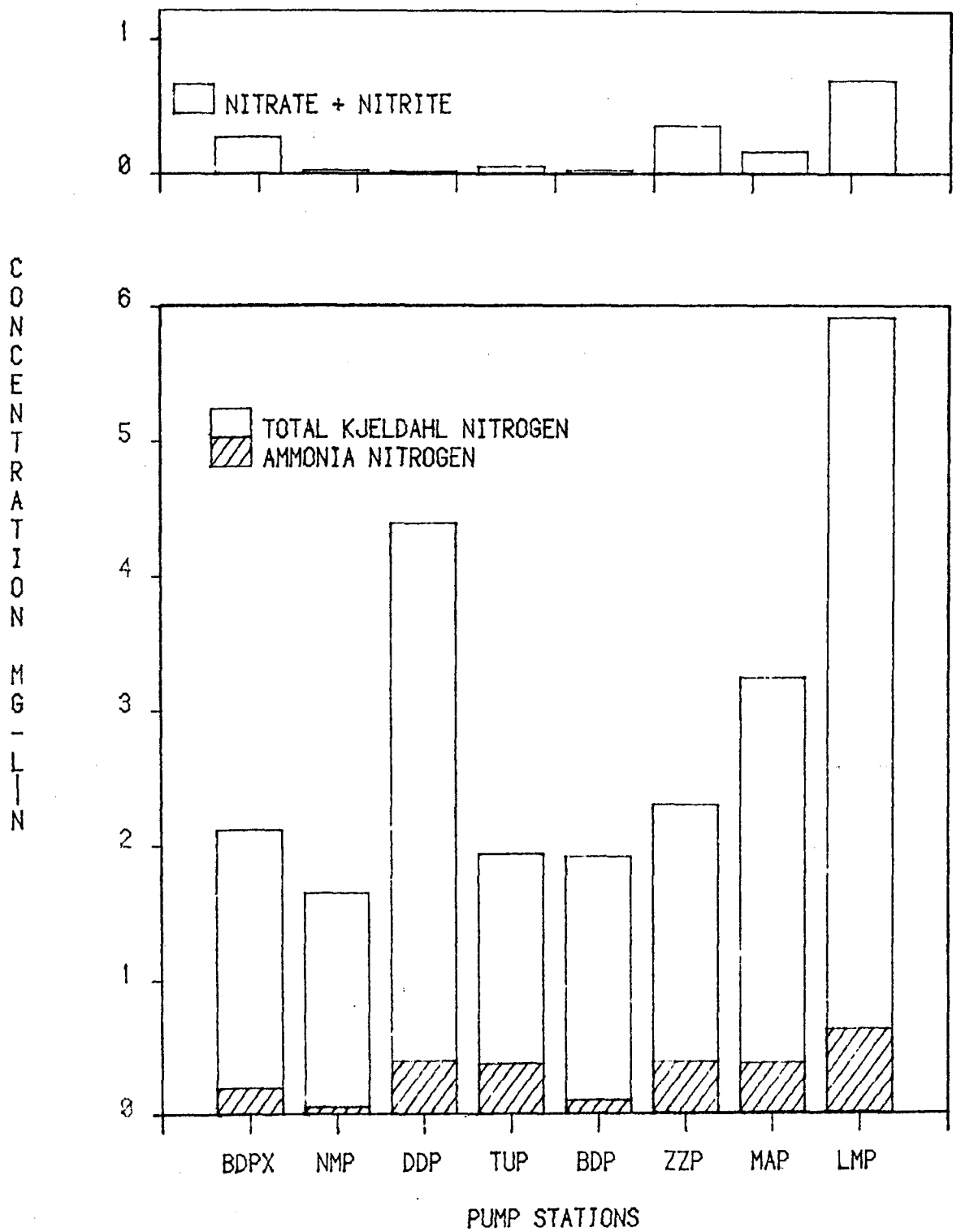
Pesticides

Concentrations of 14 selected pesticides (Table 5) were below minimum detection limits for 13 pump discharge samples and 71 ambient water quality samples.

COMPARISONS BETWEEN PUMPS

Water quality varied considerably among pumps (Appendix B). Fellsmere's pumps, Nos. 5/6, 10, and 4 (ZZP/ZZPX, MAP, and LMP) discharged nitrate-nitrite concentrations much higher than the remaining pumps (Figure 5), ranging from 0.32 to 0.81 mg/l. Median

Figure 5. Comparison of pump discharge quality: ammonia, total Kjeldahl and nitrate plus nitrite nitrogen



ammonia and total Kjeldahl nitrogen concentrations were highest for Fellsmere's pump No. 4 (LMP), at 0.27 mg/l and 5.91 mg/l, respectively. Tucker's Far Reach Ranch pump (TUP) and Fellsmere's No. 10 (MAP) pump discharged the highest levels of total phosphorus, exhibiting median concentrations of 0.35 and 0.54 mg/l, respectively (Figure 6). Deseret pumps Nos. P5 and OG12 (NMP and BDP) consistently exhibited the lowest nutrient levels of the nine pumps sampled.

The predominant form of agriculture within a pump's drainage area is correlated to the water quality of its effluent (Table 7). Pumps which drain pasture and lands of livestock production exhibit higher color and phosphorus concentrations. The relatively more intensive land uses of citrus and row crops exhibit a higher degree of mineralization (higher specific conductance, total dissolved solids, sulfate, chloride, total alkalinity, calcium, and magnesium) more suspended material (total suspended solids and turbidity), and a greater amount of nitrogen in the mineral form (nitrate-nitrite, dissolved ammonia, and dissolved total Kjeldahl nitrogen).

COMPARISON OF PUMP DISCHARGE QUALITY TO REGULATORY COMPLIANCE DATA

Data supplied by the landowners depicted pump discharge quality similar to that documented by SJRWMD and FIT, with the exception of suspended solids (Table 8). Median total suspended solids was 197.5 mg/l at the Berry Groves and Fellsmere Joint Ventures pumps. When these samples were deleted from the compliance data set, the median of total suspended solids for the remaining samples (n=81) was 7.0 mg/l, similar to the median of 10.8 mg/l observed through the SJRWMD sampling program. According to the compliance data, water quality standards for dissolved oxygen were violated 79 percent of the time. No violations of the Class I water quality standards for total dissolved solids were observed. Two samples, out of 92 collected, exceeded the 250 mg/l chloride standard, measuring 255 and 280 mg/l. One violation of the water quality standard for the pesticide Lindane was observed at Rollins Blue Cypress Ranch.

Figure 6. Comparison of pump discharge quality: orthophosphate and total phosphorus

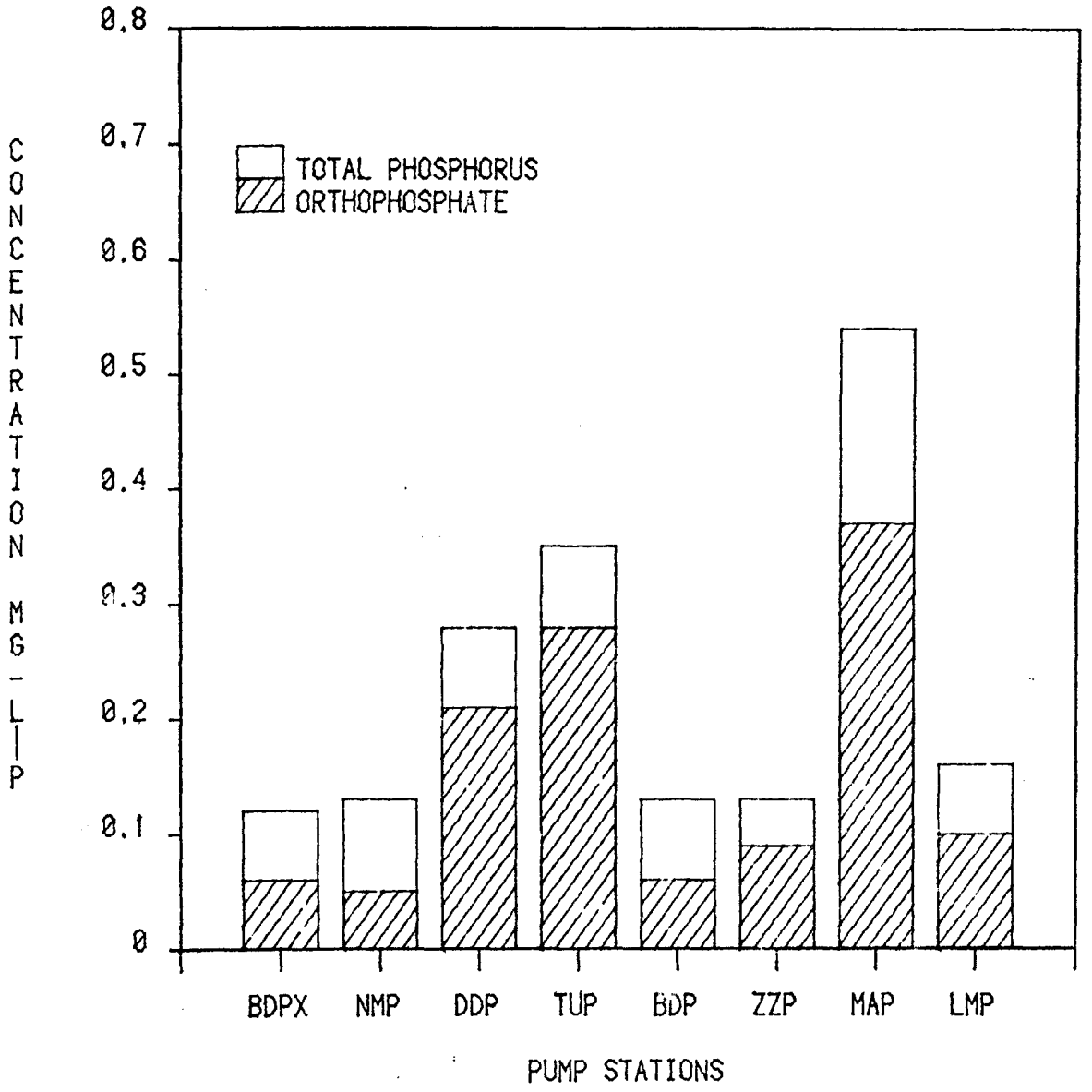


Table 7. Comparison of upper St. Johns River basin pasture and citrus/row crop pumps by median concentration

	PASTURE PUMPS		CIRUS/ROW CROP PUMPS	
PARAMETER	MEDIAN	MIN-MAX, NUMBER	MEDIAN	MIN-MAX, NUMBER
WATER TEMP (Deg C)	26.5	15.0-31.5, 16	26.2	20.5-30.0, 24
COLOR (CPU)	300.0	120.0-550.0, 19	200.0	68.0-833.0, 35
COND. (micromhos/cm)	450.0	75-1550, 15	800.0	77-1450, 24
D.O. (mg/l)	1.1	0.0-8.8, 16	3.8	0.5-9.5, 23
B.O.D. (mg/l)	3.2	1.1-6.1, 17	2.6	0.4-6.7, 30
PH (S.U.)	6.5	5.8-7.35, 13	6.9	6.2-7.5, 23
ALKALINITY (mg/l)	56.0	25.0-169.0, 17	150.0	75.0-237.0, 32
SUSP.SOL. (mg/l)	6.0	1.0-28.0, 18	13.0	1.5-187.0, 33
DISS. NH4 (mg/l)	0.23	0.08-0.63, 4	0.58	0.05-0.89, 7
TOT. NH4 (mg/l)	0.12	0.01-1.84, 14	0.18	0.02-1.50, 28
DISS. TKN (mg/l)	2.03	1.57-2.42, 4	3.20	1.40-5.78, 7
TOT. TKN (mg/l)	2.14	0.95-5.21, 16	2.40	0.90-5.93, 27
NOX (mg/l)	0.03	0.00-0.34, 19	0.25	0.00-2.36, 34
TOT.PHOS.(mg/l)	0.23	0.06-0.75, 18	0.16	0.04-1.16, 33
DISS. PHOS. (mg/l)	0.14	0.12-0.24, 4	0.12	0.03-0.49, 9
HARDNESS (mg/l)	137.0	27.0-446.0, 15	280.0	29.2-510.0, 31
CALCIUM (micg/l)	34.4	30.0-107.0, 5	84.1	36.0-129.0, 19
MAGNESIUM (micg/l)	13.9	6.0-37.0, 4	29.0	13.0-39.0, 5
SODIUM (micg/l)	6.0	8.3-162.9, 5	21.4	2.0-72.0, 19
POTASSIUM (micg/l)	3.5	2.1-9.2, 5	4.5	2.5-9.4, 19
CHLORIDE (mg/l)	64.0	12.0-324.0, 19	98.0	38.0-199.0, 34
SULFATE (mg/l)	23.0	1.0-290.0, 17	61.5	14.0-209.0, 32
CHLOROPHYLL A (micg/ l)	5.5	0.7-35.8, 16	8.2	1.1-197.8, 26
T.D.S. (mg/l)	304.0	108-1085, 17	554.0	284-1042, 30
ORTHOPHOSPHATE (mg/l)	0.17	0.01-0.51, 18	0.09	0.01-0.84, 34
TURBIDITY (NTU)	2.8	1.1-14.0, 18	5.5	1.4-73.0, 35

Table 8. Comparison of pump discharge quality to FDER regulatory compliance data

	SJRWMD/FIT DATA		FDER COMPLIANCE DATA	
	MEDIAN	MIN-MAX, NUMBER	MEDIAN	MIN-MAX, NUMBER
PARAMETER				
COND. (micromhos/cm)	660.0	75-1550, 43	740.0	200-2000, 194
D.O. (mg/l)	2.8	0.0-9.5, 44	3.1	0.0-13.1, 177
B.O.D. (mg/l)	2.7	0.4-6.7, 56	3.0	0.0-37.5, 168
pH (S.U.)	6.8	5.8-7.5, 40	7.2	6.3-8.2, 192
SUSP.SOL. (mg/l)	10.8	1.0-187, 62	39.0	1.0-720, 194
NOX (mg/l)	0.08	0.00-2.36, 64	0.14	0.00-3.20, 194
TOT. TKN (mg/l)	2.22	0.90-5.93, 54	2.12	0.30-12.0, 194
TOT. PHOS.(mg/l)	0.15	0.04-1.16, 62	0.10	0.00-5.10, 194
CHLORIDE (mg/l)	92.0	12.0-324.0, 64	35.0	18.0-485.0, 194
SULFATE (mg/l)	45.0	1.0-290.0, 60	69.0	1.0-922.8, 193
T.D.S. (mg/l)	528.0	108.0-1085, 57	96.0	198.0-1210, 87
TURBIDITY (NTU)	4.2	1.1-73.0, 64	3.1	1.1-22.0, 12

DISCUSSION

Much of the variation in water quality among pump discharges reflects variation in soil type and land use. Drainage and oxidation of highly organic peat and muck soils produces large amounts of nitrogen, while periodic reflooding releases high levels of phosphorus (Steward 1987). Pumps which exhibited the highest nitrate-nitrite and high total Kjeldahl nitrogen concentrations (Fellsmere's pumps, Nos. 5, 6, 10, and 4) drained row crops or citrus on predominantly peat or muck soils. Duda & Sons pump (DDP), which drained pasture on muck soils, had high levels of total Kjeldahl nitrogen, but low levels of nitrate-nitrite. Since lands in pasture undergo less water table variation than those under irrigation and drainage, and less aeration through cultivation, they are less prone to the conversion of organic nitrogen to nitrate and subsequent leaching.

The contribution of inorganic nitrogen by drained organic soils is illustrated by comparing similar land uses on different soils. Median nitrate-nitrite was 0.02 mg/l at Deseret's OG12 pump (citrus on sandy soil) compared to 0.35 mg/l at Fellsmere's No. 6 pump (citrus on muck soil). The pattern of median total nitrogen concentrations for pumps which drain pasture (Duda & Sons > Deseret No. P8 > Tucker > Deseret No. P5) reflects the decreasing amount of peat or muck soils contributing to each pump.

There is evidence to suggest that soil type has an influence on phosphorus concentration in pump effluent. Median total phosphorus levels were 0.54 mg/l and 0.16 mg/l, respectively, for Fellsmere's Nos. 10 and 4 pumps, which both drain row crops with some pasture. Extractable phosphorus levels for Terra Ceia and Gator Muck, which dominate the area drained by pump No. 4, are low (Huckle 1974). However, extractable phosphorus levels are approximately five times higher for Monteverde and Micco peats, which dominate the Mary A Farm (No. 10 pump).

Nutrient loads contributed by Fellsmere's Nos. 10 and 4 pumps and Tucker's Far Reach Ranch pump should be reduced by the Upper St. Johns River Basin Project. Large portions of their contributing floodplain agricultural lands will be restored as wetlands for flood control, wildlife habitat, and water quality improvement (U.S. Corps of Engineers 1985). Approximately 24,300 acres of agricultural lands drained by pumps have been purchased by SJRWMD for this purpose (Table 9). Pumps which drain Lake Miami Ranch, Tucker's Far Reach Ranch, the D. C. Scott property, and Fellsmere's Mary A Farm west of the 'Q' Levee (No. 12 pump) have been or will be eliminated completely.

Table 9. Agricultural lands subject to pump drainage that will be restored to wetlands

LANDOWNER	ACRES	LAND USE
Fellsmere Joint Ventures		
Farm 13	3680	Row crop, pasture, woods
Mary A	6100	Row crop
D. C. Scott	4122	Row crop, pasture
G. A. Tucker and Sons Far Reach Ranch	2089	Pasture
J. A. Sartori		
Willowbrook Farms East	2803	Row crop
Willowbrook Farms West	2705	Pasture
Lake Miami Ranch	2818	Citrus, pasture
	24,317 Acres	

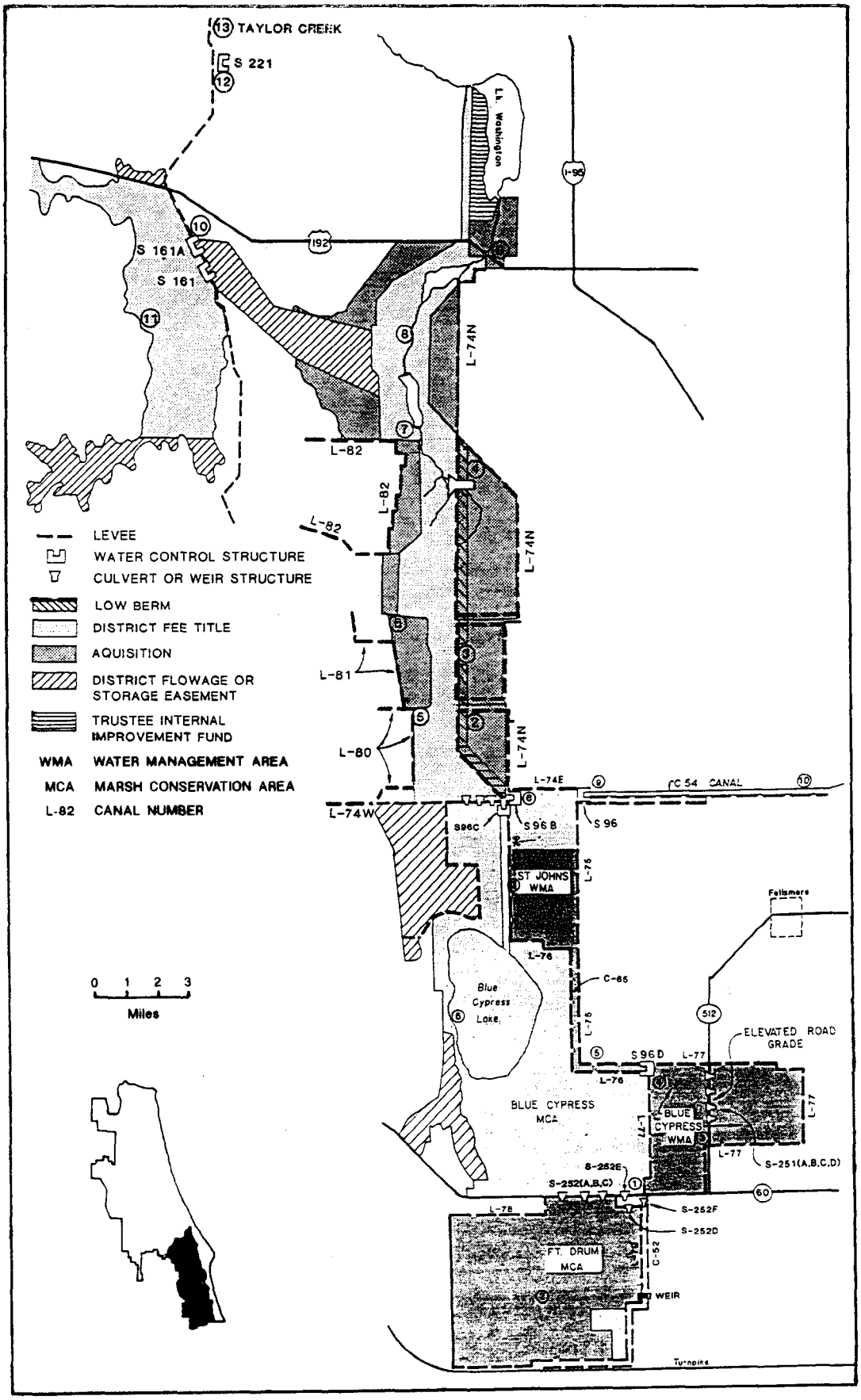
Fellsmere's No. 4 pump has been dismantled and approximately 3,680 acres of row crop and pasture are being reflooded.

In addition to reducing the acreage drained by pumps in the basin, the project will segregate and detain some agricultural runoff in Water Management Areas (Figure 7). Fellsmere's Nos. 5 and 6 pumps, a relocated No. 4 pump, and Berry Groves pump will discharge to the St. Johns Water Management Area (SJWMA). The long retention times (minimum of 38 days) provided by the SJWMA are expected to reduce suspended solids, BOD, and inorganic nitrogen levels. However, Fellsmere Joint Ventures plans to convert approximately 8,000 acres of improved pasture to citrus, row crop, watercress, and sod. This intensification of land use will occur on predominantly organic soils (Gator, Canova, and Terra Ceia muck) and should increase the net nitrogen load discharged by Fellsmere's pumps. The net effect on the receiving water body will depend on the nutrient removal ability of the SJWMA.

Large agricultural detention reservoirs in the upper St. Johns River basin reduced inorganic nitrogen concentrations by 85 to 89 percent (Fall and Hendrickson 1988), partly through conversion to organic nitrogen. Typically, total nitrogen and phosphorus concentrations were reduced by less than 50 percent. Dissolved oxygen levels increased by about one-third in the St. Johns Water Control District reservoir. Reductions in chloride and total dissolved solids concentrations were not significant, statistically. Therefore, the reservoirs seem to be an appropriate method to reduce nutrient levels, particularly inorganic nitrogen, discharged by agricultural operations. However, the reservoirs are less effective at addressing the mineralization and dissolved oxygen problems which beset the upper St. Johns River basin unless they reduce the volume discharged and, thereby, reduce pollutant loads.

Pesticide samples were analyzed for species listed in Chapter 17-3 F.A.C. (Table 3). It is not known whether these pesticides were applied in the study area. In addition, the sampling intervals were not designed to match the recommended application times for the analyzed pesticides. Although one can conclude that the analyzed pesticides are not persistently present in the receiving water body, further conclusions regarding the source or presence of additional pesticide species are unwarranted.

Figure 7. Upper St. Johns River basin project map



CONCLUSION

Agricultural pumps in the upper St. Johns River basin discharged water of poorer quality than that of the receiving water body. Nutrient, suspended solid, and mineral levels were two to five times higher in pump discharges compared to the receiving water body. Dissolved oxygen levels in pump discharges were generally below state water quality standards and the levels found in the receiving water body. Regulatory compliance data submitted to FDER documented results similar to the SJRWMD monitoring program.

Differences in water quality discharged by individual pumps were due primarily to soil type and land use. Intensive drainage of organic soils, which produced the poorest water quality, should be discouraged or treatment before discharge be required. The Upper St. Johns River Basin Project will eliminate selected pumps and reduce the drainage area of others.

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Appendix A

STATION DESCRIPTIONS AND DATA

NAME: ZZP STATION CODE: 4 LAT: 274156 LONG: 804030 STATION ID: 1
COUNTY: 61 TOPO QUAD: FELLSMERE 4 NW STATION NUMBER: SSJ52010 SOURCE OF DATA: SJRWMD
COMMENTS: ZIGZAG PUMP IN FLOODWAY, DUE WEST OF SR 512
02/08/1982 - 10/01/1986
16 SAMPLES
415 TOTAL MEASUREMENTS

NAME: ZZPX STATION CODE: 4 LAT: 274255 LONG: 804235 STATION ID: 1
COUNTY: 61 TOPO QUAD: FELLSMERE 4 NW STATION NUMBER: SSJ91070 SOURCE OF DATA: SJRWMD
COMMENTS: GRAB SAMPLE AT PUMP ON ZIG/ZAG CANAL
08/28/1984 - 08/28/1984
1 SAMPLES
13 TOTAL MEASUREMENTS

NAME: LMP STATION CODE: 4 LAT: 274637 LONG: 804437 STATION ID: 1
COUNTY: 61 TOPO QUAD: FELLSMERE SW STATION NUMBER: SSJ52090 SOURCE OF DATA: SJRWMD
COMMENTS: FELLSMERE PUMP ON LATERAL M NORTH OF ZIGZAG CANAL
05/03/1982 - 10/18/1985
7 SAMPLES
239 TOTAL MEASUREMENTS

NAME: MAP STATION CODE: 4 LAT: 275159 LONG: 8049 7 STATION ID: 1
COUNTY: 9 TOPO QUAD: KENANSVILLE SE STATION NUMBER: SSJ53010 SOURCE OF DATA: SJRWMD
COMMENTS: MARY A PUMP (FELLSMERE JOINT VENTURE)
07/22/1982 - 08/09/1985
7 SAMPLES
140 TOTAL MEASUREMENTS

NAME: TUP STATION CODE: 4 LAT: 275155 LONG: 8048 5 STATION ID: 1
COUNTY: 9 TOPO QUAD: KENANSVILLE SE STATION NUMBER: SSJ53015 SOURCE OF DATA: SJRWMD
COMMENTS: TUCKER PUMP- NE CORNER OF FAR REACH RANCH
07/30/1984 - 09/24/1985
4 SAMPLES
177 TOTAL MEASUREMENTS

NAME: BDP STATION CODE: 4 LAT: 275950 LONG: 804938 STATION ID: 1
COUNTY: 9 TOPO QUAD: KENANSVILLE NE STATION NUMBER: SSJ53100 SOURCE OF DATA: SJRWMD
COMMENTS: BULLDOZER CANAL PUMP OG11-12, DRAINS CITRUS AREA
05/26/1982 - 01/06/1987
14 SAMPLES
347 TOTAL MEASUREMENTS

NAME: NMP STATION CODE: 4 LAT: 281254 LONG: 805147 STATION ID: 1
COUNTY: 9 TOPO QUAD: DEER PARK NE STATION NUMBER: SSJ55025 SOURCE OF DATA: SJRWMD
COMMENTS: NORTH MORMON OUTSIDE CANAL AT DESERET PUMP #P5
05/05/1982 - 01/06/1987
3 SAMPLES
69 TOTAL MEASUREMENTS

NAME: DDP STATION CODE: 4 LAT: 281615 LONG: 804926 STATION ID: 1
COUNTY: 9 TOPO QUAD: L POINSETT STATION NUMBER: SSJ55185 SOURCE OF DATA: SJRWMD
COMMENTS: DUDA PUMP NORTH OF LAKE WINDER
11/03/1983 - 10/16/1985
6 SAMPLES
201 TOTAL MEASUREMENTS

FIELD DATA SUMMARY

SAMPLE	SAMPLE DEPTH 3/98 FT/MT	STREAM DEPTH 97/198 FT/MT	WATER TEMP 10 DEG C	AIR TEMP 20 DEG C	CLOUD COVER 32 %	WIND DIR 36 DEG	WIND SPEED 35 MPH	SECCHI 77 IN	FLOW 61 CFS	COND 94/95 UMHOS/CM	DO 299/300 MG/L	PH 400 STD UNIT
ZZPA8202081400	0.5 MT	2.2 MT	22.0	23.0	100.	345.0	7.			725.	3.20	7.20
ZZPF8206181600			26.7					30.0		575.	4.60	7.20
ZZPF8206240840			26.4					36.0		750.	2.50	6.90
ZZPF8206251630			28.4					30.0		880.	4.60	6.90
ZZPA8305021611	0.2 MT	0.7 MT	23.2	31.5	50.	180.0	3.			550.	1.10	6.20
ZZPA8306011051	0.5 MT		26.0		30.	270.0	10.			1150.	0.50	7.50
ZZPX8310311616	0.5 MT		23.5					10.0		660.	4.80	6.70
ZZPX8408021235	0.5 MT		26.0	31.0	10.	90.0	6.	24.0		1100.		6.90
ZZPA8408281010	0.5 MT		27.0							600.	2.10	7.22
ZZPX8411061007		0.5 MT	23.5	17.5	0.	350.0	25.	12.0		800.	4.30	7.40
ZZPA8505010935										600.	1.50	
ZZPX8507251320	0.5 MT		28.0	30.0	10.	0.0	0.			600.	4.80	6.90
ZZPA8507251335	0.5 MT		27.0	30.0	10.	0.0	0.				4.30	7.10
ZZPA8610011155	5.0 MT		27.0	31.0	40.	10.0	2.			77.	6.00	6.80
ZZPX8408281025	0.5 MT		28.0							650.	4.10	7.21
LMPA8205031458	0.5 MT	0.5 MT	24.5	26.0	100.	90.0	6.	18.0		1150.	9.50	7.30
LMPA8211011318	0.5 MT	0.8 MT	20.5		100.		2.			1050.	2.20	
LMPA8310311330	0.5 MT	1.0 MT	22.5		100.	45.0	10.	10.0		850.	3.30	6.50
LMPA8408021150	0.5 MT		26.0	31.0	10.	90.0	6.			1450.		6.80
LMPA8507251250	0.5 MT		26.0	30.0	10.	0.0	0.			800.	4.70	6.70
LMPA8509110850	0.5 MT		28.0	30.0	40.	95.0	4.			1000.	1.10	6.50
LMPA8510180907	0.5 MT		27.0	29.0	50.	90.0	5.			800.	3.75	6.70
MAPA8507250941	0.5 MT		25.0	30.0	10.	0.0	0.			800.	5.20	6.90
TUPA8407301630	0.5 MT		29.5	29.0	100.	90.0	10.			650.	3.00	7.35
TUPA8507250833	0.5 MT		25.0	30.0	10.	0.0	0.			600.	1.90	6.80
TUPA8509200947										222.		
TUPA8509241601	0.5 MT		29.0	31.0	40.	360.0	8.			165.	0.05	6.20
BDPF8205270000			26.4					36.0		1150.	3.70	6.80
BDPF8207120000			30.1					18.0		650.	1.40	7.10
BDPX8207120001			31.3					24.0		290.	4.35	6.65
BDPX8507251032	0.5 MT		25.0	30.0	10.	0.0	0.			450.	2.00	7.20
BDPX8509200909										368.		
BDPX8509241410	0.5 MT		29.0	31.0	40.	360.0	8.				0.60	6.60
BDPX8701061025	0.5 MT	1.0 MT	15.0	20.0	20.	25.0	15.			350.	8.80	
NMPA8205051418	0.3 MT	0.3 MT	24.5	24.5	30.	45.0	2.	18.0		900.	4.00	6.20
NMPA8701061515	0.1 MT	1.0 MT	15.0	20.0	20.	25.0	15.			400.	1.00	
DDPA8311031356	0.5 MT		22.5					16.0		1100.	1.10	6.40
DDPA8408011055	0.5 MT		28.0		40.	90.0	6.			1200.	0.20	6.90
DDPA8410011340	0.5 MT	2.0 MT	25.0		100.					1550.	2.00	
DDPA8510031117	0.5 MT		27.0	31.0	40.	185.0	10.	12.0		700.	0.05	6.50
DDPA8510161003	0.5 MT		26.0	32.0	60.					260.	0.10	6.00

LABORATORY DATA SUMMARY (MINERALS AND BIOLOGICAL)

SAMPLE	TURB 82079 NTU	ALK 410 MG/L	HARD 900 MG/L	COLOR 80/81 PT-CO	SULFATE 945 MG/L	CHLORIDE 940/941 MG/L	BOD 310 MG/L	RES DISS 70300 MG/L	RES SUS 530 MG/L	TOC 680 MG/L	CHL A 32210 UG/L	PHEO A 32218 UG/L
ZZPA8202081400	2.2	150.0	260.0	100.	62.0	110.0	2.4	542.	3.0		2.30	1.80
ZZPF8206181600	7.3	109.0	202.0	120.	56.0	100.0	2.1	443.	13.2		1.10	
ZZPF8206240840	3.3	151.0	262.0	284.	72.0	110.0	1.4	547.	5.8		3.60	
ZZPF8206250000	5.6	161.0	306.0	286.	90.0	97.0	2.6	593.	20.8		8.70	
ZZPF8206251630	3.6	119.0	272.0	342.	78.0	112.0	3.0	560.	5.6		1.60	
ZZPF8208160000	4.6	186.0	29.2	498.	68.3	110.0	2.7	546.	2.4		5.90	
ZZPA8305021611	4.4	102.0	176.0	175.	14.0	80.0	6.3	381.	114.0		197.85	30.63
ZZPA8306011051	6.6	118.0	150.0	175.	21.0	75.0	4.0		23.0		33.00	6.89
ZZPX8310311616	19.0	123.0	234.0	200.	25.0	86.0	2.8	438.	78.0		9.97	9.57
ZZPX8408021235	3.6			300.			2.1		8.0			
ZZPA8408281010	4.0			100.		90.0						
ZZPX8411061007	7.1	150.0	320.0	140.	128.0	76.0	1.6	575.	29.5			
ZZPA8505010935	1.5	112.0	188.0	125.	35.0	120.0	1.9	418.	1.5			
ZZPX8507251320	73.0	140.0	280.0	180.	94.0	71.0	3.2	529.	99.0			
ZZPA8507251335	3.7	99.0	210.0	140.	61.0	68.0	1.4	437.	11.0			
ZZPA8610011155	8.1	150.0		150.	38.0	151.0	2.3	473.	2.0		5.47	0.08
ZZPX8408281025	5.5			140.		90.0						
LMPA8205031458	7.3	210.0	450.0	160.	180.0	150.0	5.7	896.	23.0		20.40	3.00
LMPA8211011318	4.6	187.0	372.0	200.	32.0	124.0	2.5	722.	18.0		8.50	4.40
LMPA8310311330	16.2	220.0	54.0	400.	205.0	95.0	3.4	898.	41.1		2.28	3.74
LMPA8408021150	5.6	171.0	510.0	350.	209.0	105.0	3.3	1042.	17.0		32.10	10.10
LMPA8507251250	5.5	102.0	370.0	350.	191.0	82.0	3.0	757.	26.0			
LMPA8509110850	2.0	192.0	500.0	450.	207.0	92.0	2.5	905.	12.0		6.53	4.22
MAPF8207220000	33.0	123.0	192.0	833.	27.4	52.0	6.7	404.	187.0		23.40	
MAPF8208120000	16.0	78.0	126.0	479.	15.8	38.0	6.6	284.	56.0		29.40	
MAPF8209010000	5.3	237.0	352.0	265.	41.3	175.0	3.1	700.	10.0		7.30	
MAPA8507250941	3.7	192.0	345.0	140.	65.0	156.0	2.6	697.	13.0			
MAPA8508091210	3.4	202.0	380.0	225.	65.0	192.0		791.	8.0		32.77	7.78
TUPA8407301630	6.3	150.0	214.0	150.	12.0	80.0	6.1L	406.	17.0		35.80	11.90
TUPA8507250833	3.8	169.0	245.0	120.	19.0	116.0	2.5	492.	28.0			
TUPA8509200947	2.4	50.0	74.0	350.	6.0	35.0	1.4	215.	7.0		2.11	1.28
TUPA8509241601	3.0	55.0	67.0	350.	9.0	22.0	4.3L	180.	11.0		5.18	1.52
BDPF8205260000	1.4	173.0	352.0	75.	76.0	199.0	2.5	681.	4.0		3.40	
BDPF8205270000	1.7	147.0	322.0	68.	95.0	199.0	2.0	632.	6.8		1.90	
BDPF8207120000	15.0	75.0	238.0	432.	20.7	62.0	2.4		12.0		7.90	
BDPX8207120001	14.0	36.0	120.0	472.	9.3	21.0	4.2	242.	10.0		10.90	
BDPF8207200000	7.4	89.0	296.0	244.	58.7	113.0		542.	10.8		5.20	
BDPF8208030000	7.9	183.0	288.0	267.	47.1	110.0	0.4	528.	6.8		13.30	
BDPF8208310000	8.8	135.0	224.0	243.	31.2	83.0	3.3	439.	23.3		19.40	
BDPX8507251032	4.0	140.0	210.0	140.	32.0	61.0	2.7	422.	19.0			
BDPA8508091300	14.0	171.0	310.0	75.	54.0	92.0		571.	33.0		14.71	5.16
BDPX8509200909	3.5	85.0	137.0	300.	29.0	38.0	1.7	284.	8.0		5.81	2.65
BDPX8509241410	2.0	61.0	94.0	450.	23.0	23.0	3.0	217.	3.0		2.30	1.66
BDPX8701061025	3.0	73.0		125.	39.0	32.0	1.1	218.	1.0		3.63	1.18
NMPA8205051418	1.8	67.0	250.0	240.	76.0	120.0	3.6	659.	20.1		24.00	4.40
NMPA8403061400				120.		200.0						

LABORATORY DATA SUMMARY (MINERALS AND BIOLOGICAL)

SAMPLE	TURB 82079 NTU	ALK 410 MG/L	HARD 900 MG/L	COLOR 80/81 PT-CO	SULFATE 945 MG/L	CHLORIDE 940/941 MG/L	BOD 310 MG/L	RES DISS 70300 MG/L	RES SUS 530 MG/L	TOC 680 MG/L	CHL A 32210 UG/L	PHEO A 32218 UG/L
NMPA8701061515	2.5	42.0		150.	45.0	168.0	1.1	414.	3.0		1.22	1.15
DDPA8311031356	6.7	36.0	446.0	300.	290.0	250.0	3.2	1085.	13.8		10.72	4.33
DDPA8407301300	1.7			300.			3.5		1.0			
DDPA8408011055	1.3	61.0	242.0	250.	44.0	255.0	2.6	811.	2.0		10.10	8.30
DDPA8410011340				280.		324.0					2.24	2.83
DDPA8510031117	3.9	52.0	243.0	450.	97.0	169.0	4.0	664.	3.0		10.64	1.34

LABORATORY DATA SUMMARY (NUTRIENTS AND METALS)

SAMPLE	P ORTHO 70507 MG/L	P TOTAL 665 MG/L	TKN 625 MG/L	NH3N 610 MG/L	NOX 630 MG/L	NITRATE 620 MG/L	POT 935 MG/L	MAG 925 MG/L	IRON 1046 UG/L	CALCIUM 915 MG/L	SODIUM 930 MG/L
ZZPA8202081400	0.070	0.120			0.410						
ZZPF8206181600	0.230	0.240	2.300	0.150	0.390		6.60		0.90	62.50	11.20
ZZPF8206240840	0.050	0.080	2.300	0.240	0.580		7.00		1.00	75.30	18.00
ZZPF8206250000	0.100	0.170	1.800	0.070	1.080		7.10		0.80	91.30	19.00
ZZPF8206251630	0.090	0.120	2.400	0.110	0.830		9.40		1.00	73.70	21.40
ZZPF8208160000	0.100	0.140	3.400	0.180	0.320		2.48		1.02	100.10	10.20
ZZPA8305021611	0.055	0.184			0.016						
ZZPA8306011051		0.349									
ZZPX8310311616	0.131				0.320						
ZZPX8408021235	0.088	0.119	5.050	1.500	0.211						
ZZPA8408281010	0.107	0.167	1.990	0.175	0.148						
ZZPX8411061007	0.069	0.071	3.180	0.603	0.583						
ZZPA8505010935	0.046	0.066	1.340	0.058	0.021		4.90	13.00	138.00	67.00	54.00
ZZPX8507251320	0.172	0.467	4.770	0.862	1.060						
ZZPA8507251335	0.114	0.202	1.900	0.891	1.330						
ZZPA8610011155	0.010	0.037	1.500	0.025	0.005						
ZZPX8408281025	0.040	0.102	2.860	0.196	0.285						
LMPA8205031458	0.030	0.140			0.010K		4.40	39.00	200.00	124.00	72.00
LMPA8211011318	0.052	0.126			0.195		4.60	22.00	540.00	78.00	69.00
LMPA8310311330	0.152				0.767		4.70	29.00	1020.00	100.00	59.00
LMPA8408021150	0.084	0.192	5.930	0.270	0.911						
LMPA8507251250	0.220	0.433	5.890	1.440	2.360						
LMPA8509110850	0.122	0.155		0.191	0.607		4.50	32.00	551.00	129.00	59.00
MAPF8207220000	0.620	1.030	4.200	0.350	0.720		4.40		2920.00	60.10	10.20
MAPF8208120000	0.840	1.160	4.400	0.420	0.670		3.85		1590.00	36.00	8.70
MAPF8209010000	0.100	0.190	3.000	0.170	0.060		3.72		520.00	104.90	21.90
MAPA8507250941	0.365	0.537	3.240	0.862	0.164						
MAPA8508091210	0.207	0.283	2.330	0.094	0.008						
TUPA8407301630	0.507	0.715	2.950	0.026	0.005K						
TUPA8507250833	0.123	0.306	2.240	1.840	0.064						
TUPA8509200947	0.328	0.379	1.650	0.053	0.095						
TUPA8509241601	0.413	0.754	2.960	0.312	0.077						
BDPF8205260000	0.010	0.060	0.900	0.050	0.020		3.60		0.10	100.90	24.30
BDPF8205270000	0.010	0.050	1.200	0.040	0.020		4.80		0.20	84.90	26.70
BDPF8207120000	0.230	0.270	2.400	0.180	0.020K		4.93		0.84	64.10	19.00
BDPX8207120001	0.060	0.140	2.700	0.190	0.020K		2.14		0.96	34.40	8.30
BDPF8207200000	0.070	0.110	1.700	0.100	0.050		4.06		0.61	84.10	20.90
BDPF8208030000	0.090	0.140	2.200	0.100	0.080		2.83		0.41	80.10	21.40
BDPF8208310000	0.060	0.290	2.500	0.090	0.040		3.49		0.84	88.90	2.00
BDPX8507251032	0.290	0.473	2.160		0.267						
BDPA8508091300	0.049	0.127	1.920	0.118	0.005K						
BDPX8509200909	0.048	0.071	2.050	0.393	0.148						
BDPX8509241410	0.062	0.119	2.120	0.186	0.317						
BDPX8701061025	0.009	0.059	1.310	0.048	0.343						
NMPA8205051418	0.060	0.180			0.010K		4.40	20.00	300.00	61.00	78.00
NMPA8403061400		0.104			0.007						

L A B O R A T O R Y D A T A S U M M A R Y (NUTRIENTS AND METALS)

S A M P L E	P ORTHO 70507 MG/L	P TOTAL 665 MG/L	TKN 625 MG/L	NH3N 610 MG/L	NOX 630 MG/L	NITRATE 620 MG/L	POT 935 MG/L	MAG 925 MG/L	IRON 1046 UG/L	CALCIUM 915 MG/L	SODIUM 930 MG/L
NMPA8701061515	0.037	0.099	1.650	0.051	0.029						
DDPA8311031356	0.232				0.040		9.20	37.00	1045.00	107.00	162.00
DDPA8407301300	0.213				0.005K						
DDPA8408011055	0.215	0.277	4.390	0.529	0.005						
DDPA8410011340		0.313	5.210								
DDPA8510031117	0.123	0.173	2.790	0.266	0.013		3.50	7.70	415.00	34.00	36.00

Appendix B

STATISTICAL SUMMARY

STATISTICAL SUMMARY FOR FELLSMERE JOINT VENTURES PUMPS #5 & #6
STATION NAME:ZZP & ZZPX

	STORET NUMBER	DATA MEAN	DATA MEDIAN	DATA STD DEV	DATA MINIMUM	DATA MAXIMUM	COUNT
1	10	25.91	26.55	2.03	22.00	28.40	14
2	77	23.67	27.00	10.54	10.00	36.00	6
3	80	203.24	175.00	106.13	100.00	498.00	17
4	94	694.07	655.00	258.38	77.00	1150.00	14
5	299	3.46	4.20	1.65	0.50	6.00	14
6	310	2.65	2.40	1.23	1.40	6.30	15
7	400	7.01	7.00	0.33	6.20	7.50	14
8	410	133.57	131.50	25.55	99.00	186.00	14
9	530	27.79	11.00	37.39	1.50	114.00	15
10	608	0.35	0.36	0.30	0.05	0.63	4
11	610	0.39	0.18	0.45	0.02	1.50	13
12	623	2.48	2.59	0.89	1.40	3.35	4
13	625	2.68	2.30	1.16	1.34	5.05	13
14	630	0.47	0.35	0.41	0.00	1.33	16
15	665	0.16	0.13	0.11	0.04	0.47	16
16	666	0.11	0.11	0.07	0.03	0.19	5
17	900	222.25	234.00	77.40	29.20	320.00	13
18	915	78.32	74.50	14.50	62.50	100.10	6
19	925	13.00	13.00	--	13.00	13.00	1
20	930	22.30	18.50	16.15	10.20	54.00	6
21	935	6.25	6.80	2.34	2.48	9.40	6
22	940	96.62	93.50	21.81	68.00	151.00	16
23	945	60.16	61.50	31.88	14.00	128.00	14
24	1046	23.79	1.00	55.95	0.80	138.00	6
25	32210	26.95	5.68	60.77	1.10	197.85	10
26	32211	54.39	17.37	83.58	4.28	178.55	4
27	32218	9.79	6.89	12.26	0.08	30.63	5
28	32219	1.47	1.56	0.20	1.22	1.68	5
42	70300	498.62	529.00	69.19	381.00	593.00	13
43	70507	0.09	0.09	0.05	0.01	0.23	16
44	82079	9.59	4.60	16.80	1.50	73.00	17

STATISTICAL SUMMARY OF FELLSMERE JOINT VENTURES PUMP # 4
STATION NAME: LMP

	STORET NUMBER	DATA MEAN	DATA MEDIAN	DATA STD DEV	DATA MINIMUM	DATA MAXIMUM	COUNT
1	10	24.93	26.00	2.64	20.50	28.00	7
2	77	14.00	14.00	5.66	10.00	18.00	2
3	80	318.33	350.00	114.09	160.00	450.00	6
4	94	1014.29	1000.00	234.01	800.00	1450.00	7
5	299	4.09	3.53	2.93	1.10	9.50	6
6	310	3.40	3.15	1.19	2.50	5.70	6
7	400	6.75	6.70	0.29	6.50	7.30	6
8	410	180.33	189.50	42.09	102.00	220.00	6
9	530	22.85	20.50	10.18	12.00	41.10	6
10	608	0.47	0.47	0.40	0.19	0.75	2
11	610	0.63	0.27	0.70	0.19	1.44	3
12	623	4.87	4.87	1.28	3.97	5.78	2
13	625	5.91	5.91	0.03	5.89	5.93	2
14	630	0.81	0.69	0.83	0.01	2.36	6
15	665	0.21	0.16	0.13	0.13	0.43	5
16	666	0.17	0.12	0.15	0.04	0.33	3
17	900	376.00	411.00	168.85	54.00	510.00	6
18	915	107.75	112.00	23.53	78.00	129.00	4
19	925	30.50	30.50	7.05	22.00	39.00	4
20	930	64.75	64.00	6.75	59.00	72.00	4
21	935	4.55	4.55	0.13	4.40	4.70	4
22	940	108.00	100.00	25.02	82.00	150.00	6
23	945	170.67	198.00	68.84	32.00	209.00	6
24	1046	577.75	545.50	336.86	200.00	1020.00	4
25	32210	13.96	8.50	12.16	2.28	32.10	5
26	32211	10.04	4.01	14.06	0.00	26.10	3
27	32218	5.09	4.22	2.85	3.00	10.10	5
28	32219	1.35	1.34	0.23	1.00	1.60	5
42	70300	870.00	897.00	115.71	722.00	1042.00	6
43	70507	0.11	0.10	0.07	0.03	0.22	6
44	82079	6.87	5.55	4.89	2.00	16.20	6

STATISTICAL SUMMARY OF FELLSMERE JOINT VENTURES PUMP # 10
STATION NAME: MAP

	STORET NUMBER	DATA MEAN	DATA MEDIAN	DATA STD DEV	DATA MINIMUM	DATA MAXIMUM	COUNT
1	10	25.00	25.00	--	25.00	25.00	1
3	80	388.40	265.00	278.17	140.00	833.00	5
4	94	800.00	800.00	--	800.00	800.00	1
5	299	5.20	5.20	--	5.20	5.20	1
6	310	4.75	4.85	2.20	2.60	6.70	4
7	400	6.90	6.90	--	6.90	6.90	1
8	410	166.40	192.00	64.43	78.00	237.00	5
9	530	54.80	13.00	76.52	8.00	187.00	5
10	608	0.89	0.89	--	0.89	0.89	1
11	610	0.38	0.35	0.30	0.09	0.86	5
12	623	3.20	3.20	--	3.20	3.20	1
13	625	3.43	3.24	0.86	2.33	4.40	5
14	630	0.32	0.16	0.34	0.01	0.72	5
15	665	0.64	0.54	0.44	0.19	1.16	5
16	666	0.49	0.49	--	0.49	0.49	1
17	900	279.00	345.00	112.77	126.00	380.00	5
18	915	67.00	60.10	34.96	36.00	104.90	3
20	930	13.60	10.20	7.23	8.70	21.90	3
21	935	3.99	3.85	0.36	3.72	4.40	3
22	940	122.60	156.00	72.14	38.00	192.00	5
23	945	42.90	41.30	22.10	15.80	65.00	5
24	1046	1676.67	1590.00	1202.34	520.00	2920.00	3
25	32210	23.22	26.40	11.30	7.30	32.77	4
26	32211	28.33	28.33	--	28.33	28.33	1
27	32218	7.78	7.78	--	7.78	7.78	1
28	32219	1.55	1.55	--	1.55	1.55	1
42	70300	575.20	697.00	218.57	284.00	791.00	5
43	70507	0.43	0.37	0.30	0.10	0.84	5
44	82079	12.28	5.30	12.69	3.40	33.00	5

STATISTICAL SUMMARY OF TUCKER AND SONS FAR REACH RANCH PUMP
STATION NAME: TUP

	STORET NUMBER	DATA MEAN	DATA MEDIAN	DATA STD DEV	DATA MINIMUM	DATA MAXIMUM	COUNT
1	10	28.37	29.25	2.29	25.00	30.00	4
3	80	311.67	350.00	157.53	120.00	550.00	6
4	94	372.50	382.50	294.58	75.00	650.00	4
5	299	1.42	1.33	1.30	0.05	3.00	4
6	310	3.62	3.80	1.79	1.40	6.10	5
7	400	6.54	6.50	0.68	5.80	7.35	4
8	410	84.17	55.50	59.74	25.00	169.00	6
9	530	11.58	9.00	9.65	1.50	28.00	6
10	608	0.63	0.63	--	0.63	0.63	1
11	610	0.38	0.05	0.72	0.01	1.84	6
12	623	2.42	2.42	--	2.42	2.42	1
13	625	2.02	1.94	0.84	0.95	2.96	6
14	630	0.05	0.05	0.04	0.00	0.09	6
15	665	0.46	0.35	0.22	0.27	0.75	6
16	666	0.15	0.15	--	0.15	0.15	1
17	900	119.50	82.00	88.24	27.00	245.00	6
22	940	49.50	33.50	40.08	12.00	116.00	6
23	945	9.33	9.00	6.02	1.00	19.00	6
25	32210	9.01	2.11	15.08	0.66	35.80	5
26	32211	7.26	1.34	12.12	0.80	28.80	5
27	32218	3.03	1.28	5.00	0.00	11.90	5
28	32219	1.57	1.50	0.25	1.36	2.00	5
42	70300	268.33	212.00	147.55	108.00	492.00	6
43	70507	0.31	0.28	0.14	0.12	0.51	6
44	82079	3.03	2.70	1.87	1.10	6.30	6

STATISTICAL SUMMARY OF DESERET RANCHES OF FLA PUMP #OG12

STATION NAME: BDP

	STORET NUMBER	DATA MEAN	DATA MEDIAN	DATA STD DEV	DATA MINIMUM	DATA MAXIMUM	COUNT
1	10	28.25	28.25	2.62	26.40	30.10	2
2	77	27.00	27.00	12.73	18.00	36.00	2
3	80	200.57	243.00	135.87	68.00	432.00	7
4	94	900.00	900.00	353.55	650.00	1150.00	2
5	299	2.55	2.55	1.63	1.40	3.70	2
6	310	2.13	2.40	1.08	0.40	3.30	5
7	400	6.95	6.95	0.21	6.80	7.10	2
8	410	139.00	147.00	42.41	75.00	183.00	7
9	530	13.81	10.80	10.53	4.00	33.00	7
11	610	0.10	0.10	0.05	0.04	0.18	7
13	625	1.83	1.92	0.61	0.90	2.50	7
14	630	0.03	0.02	0.03	0.00	0.08	7
15	665	0.15	0.13	0.10	0.05	0.29	7
17	900	290.00	296.00	45.40	224.00	352.00	7
18	915	83.83	84.50	12.01	64.10	100.90	6
20	930	19.05	21.15	8.78	2.00	26.70	6
21	935	3.95	3.83	0.81	2.83	4.93	6
22	940	122.57	110.00	54.93	62.00	199.00	7
23	945	54.67	54.00	25.36	20.70	95.00	7
24	1046	0.50	0.51	0.32	0.10	0.84	6
25	32210	9.40	7.90	6.53	1.90	19.40	7
26	32211	11.49	11.49	--	11.49	11.49	1
27	32219	1.48	1.48	--	1.48	1.48	1
40	70300	565.50	556.50	84.56	439.00	681.00	6
41	70507	0.07	0.06	0.07	0.01	0.23	7
42	82079	8.03	7.90	5.31	1.40	15.00	7

STATISTICAL SUMMARY OF DESERET RANCHES OF FLA PUMP #P8
STATION NAME: BDPX

	STORET NUMBER	DATA MEAN	DATA MEDIAN	DATA STD DEV	DATA MINIMUM	DATA MAXIMUM	COUNT
1	10	25.07	27.00	7.20	15.00	31.30	4
2	77	24.00	24.00	--	24.00	24.00	1
3	80	297.40	300.00	164.53	125.00	472.00	5
4	94	363.33	350.00	80.83	290.00	450.00	3
5	299	3.94	3.18	3.59	0.60	8.80	4
6	310	2.54	2.70	1.20	1.10	4.20	5
7	400	6.82	6.65	0.33	6.60	7.20	3
8	410	79.00	73.00	38.62	36.00	140.00	5
9	530	8.20	8.00	7.05	1.00	19.00	5
10	608	0.32	0.32	--	0.32	0.32	1
11	610	0.20	0.19	0.14	0.05	0.39	4
12	623	1.57	1.57	--	1.57	1.57	1
13	625	2.07	2.12	0.50	1.31	2.70	5
14	630	0.22	0.27	0.13	0.02	0.34	5
15	665	0.17	0.12	0.17	0.06	0.47	5
16	666	0.24	0.24	--	0.24	0.24	1
17	900	140.25	128.50	49.75	94.00	210.00	4
18	915	34.40	34.40	--	34.40	34.40	1
20	930	8.30	8.30	--	8.30	8.30	1
21	935	2.14	2.14	--	2.14	2.14	1
22	940	35.00	32.00	16.08	21.00	61.00	5
23	945	26.46	29.00	11.19	9.30	39.00	5
24	1046	0.96	0.96	--	0.96	0.96	1
25	32210	5.66	4.72	3.78	2.30	10.90	4
26	32211	2.85	2.94	1.47	1.34	4.28	3
27	32218	1.83	1.66	0.75	1.18	2.65	3
28	32219	1.41	1.43	0.09	1.31	1.50	3
42	70300	276.60	242.00	85.70	217.00	422.00	5
43	70507	0.09	0.06	0.11	0.01	0.29	5
44	82079	5.30	3.50	4.92	2.00	14.00	5

STATISTICAL SUMMARY OF DESERET RANCHES OF FLA PUMP #P5
STATION NAME: NMP

	STORET NUMBER	DATA MEAN	DATA MEDIAN	DATA STD DEV	DATA MINIMUM	DATA MAXIMUM	COUNT
1	10	19.75	19.75	6.72	15.00	24.50	2
2	77	18.00	18.00	--	18.00	18.00	1
3	80	170.00	150.00	62.45	120.00	240.00	3
4	94	650.00	650.00	353.55	400.00	900.00	2
5	299	2.50	2.50	2.12	1.00	4.00	2
6	310	2.35	2.35	1.77	1.10	3.60	2
7	400	6.20	6.20	--	6.20	6.20	1
8	410	54.50	54.50	17.68	42.00	67.00	2
9	530	11.55	11.55	12.09	3.00	20.10	2
11	610	0.05	0.05	--	0.05	0.05	1
13	625	1.65	1.65	--	1.65	1.65	1
14	630	0.02	0.01	0.01	0.01	0.03	3
15	665	0.13	0.10	0.05	0.10	0.18	3
17	900	250.00	250.00	--	250.00	250.00	1
18	915	61.00	61.00	--	61.00	61.00	1
19	925	20.00	20.00	--	20.00	20.00	1
20	930	78.00	78.00	--	78.00	78.00	1
21	935	4.40	4.40	--	4.40	4.40	1
22	940	162.67	168.00	40.27	120.00	200.00	3
23	945	60.50	60.50	21.92	45.00	76.00	2
24	1046	300.00	300.00	--	300.00	300.00	1
25	32210	12.61	12.61	16.11	1.22	24.00	2
26	32211	0.53	0.53	--	0.53	0.53	1
27	32218	2.77	2.77	2.30	1.15	4.40	2
28	32219	1.36	1.36	0.20	1.22	1.50	2
42	70300	536.50	536.50	173.24	414.00	659.00	2
43	70507	0.05	0.05	0.02	0.04	0.06	2
44	82079	2.15	2.15	0.49	1.80	2.50	2

STATISTICAL SUMMARY FOR DUDA AND SONS PUMP (COCOA RANCH)
STATION NAME: DDP

	STORET NUMBER	DATA MEAN	DATA MEDIAN	DATA STD DEV	DATA MINIMUM	DATA MAXIMUM	COUNT
1	10	25.70	26.00	2.11	22.50	28.00	5
2	77	14.00	14.00	2.83	12.00	16.00	2
3	80	325.00	300.00	86.60	250.00	450.00	4
4	94	962.00	1100.00	495.70	260.00	1550.00	5
5	299	0.69	0.20	0.85	0.05	2.00	5
6	310	3.32	3.35	0.59	2.60	4.00	4
7	400	6.45	6.45	0.37	6.00	6.90	4
8	410	49.67	52.00	12.66	36.00	61.00	3
9	530	4.95	2.50	5.96	1.00	13.80	4
10	608	0.14	0.14	--	0.14	0.14	1
11	610	0.40	0.40	0.19	0.27	0.53	2
12	623	2.21	2.21	--	2.21	2.21	1
13	625	4.13	4.39	1.23	2.79	5.21	3
14	630	0.02	0.01	0.02	0.00	0.04	4
15	665	0.25	0.28	0.07	0.17	0.31	3
16	666	0.13	0.13	--	0.13	0.13	1
17	900	310.33	243.00	117.49	242.00	446.00	3
18	915	70.50	70.50	51.62	34.00	107.00	2
19	925	22.35	22.35	20.72	7.70	37.00	2
20	930	99.00	99.00	89.10	36.00	162.00	2
21	935	6.35	6.35	4.03	3.50	9.20	2
22	940	249.50	252.50	63.41	169.00	324.00	4
23	945	143.67	97.00	129.47	44.00	290.00	3
24	1046	730.00	730.00	445.48	415.00	1045.00	2
25	32210	8.42	10.37	4.13	2.24	10.72	4
26	32211	5.95	6.68	4.06	0.53	9.89	4
27	32218	4.20	3.58	2.99	1.34	8.30	4
28	32219	1.36	1.36	0.22	1.11	1.62	4
42	70300	853.33	811.00	213.67	664.00	1085.00	3
43	70507	0.20	0.21	0.05	0.12	0.23	4
44	82079	3.40	2.80	2.48	1.30	6.70	4