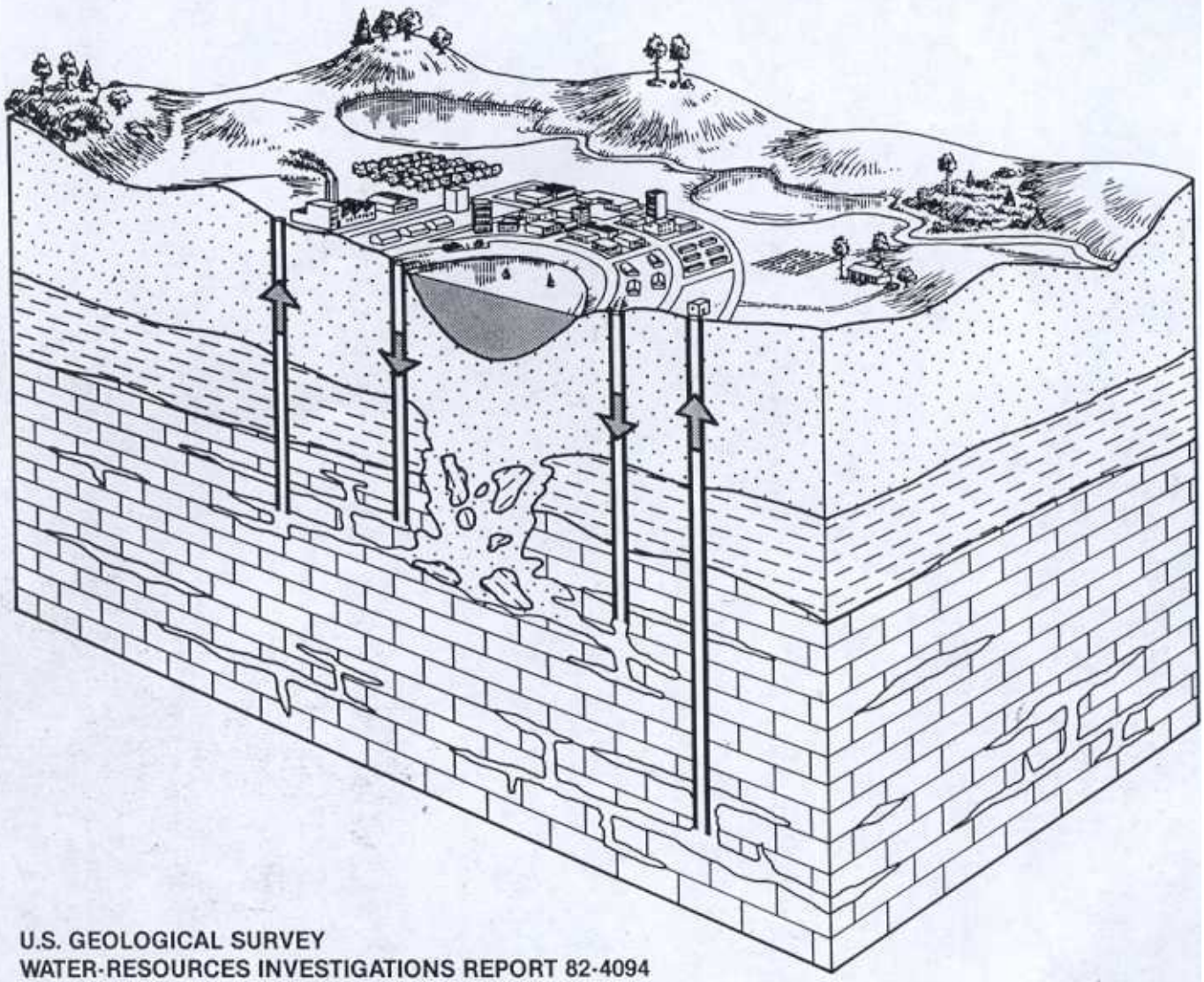
EFFECTS OF RECHARGE FROM DRAINAGE WELLS ON QUALITY OF WATER IN THE FLORIDAN AQUIFER IN THE ORLANDO AREA, CENTRAL FLORIDA



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Prepared in cooperation with the

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

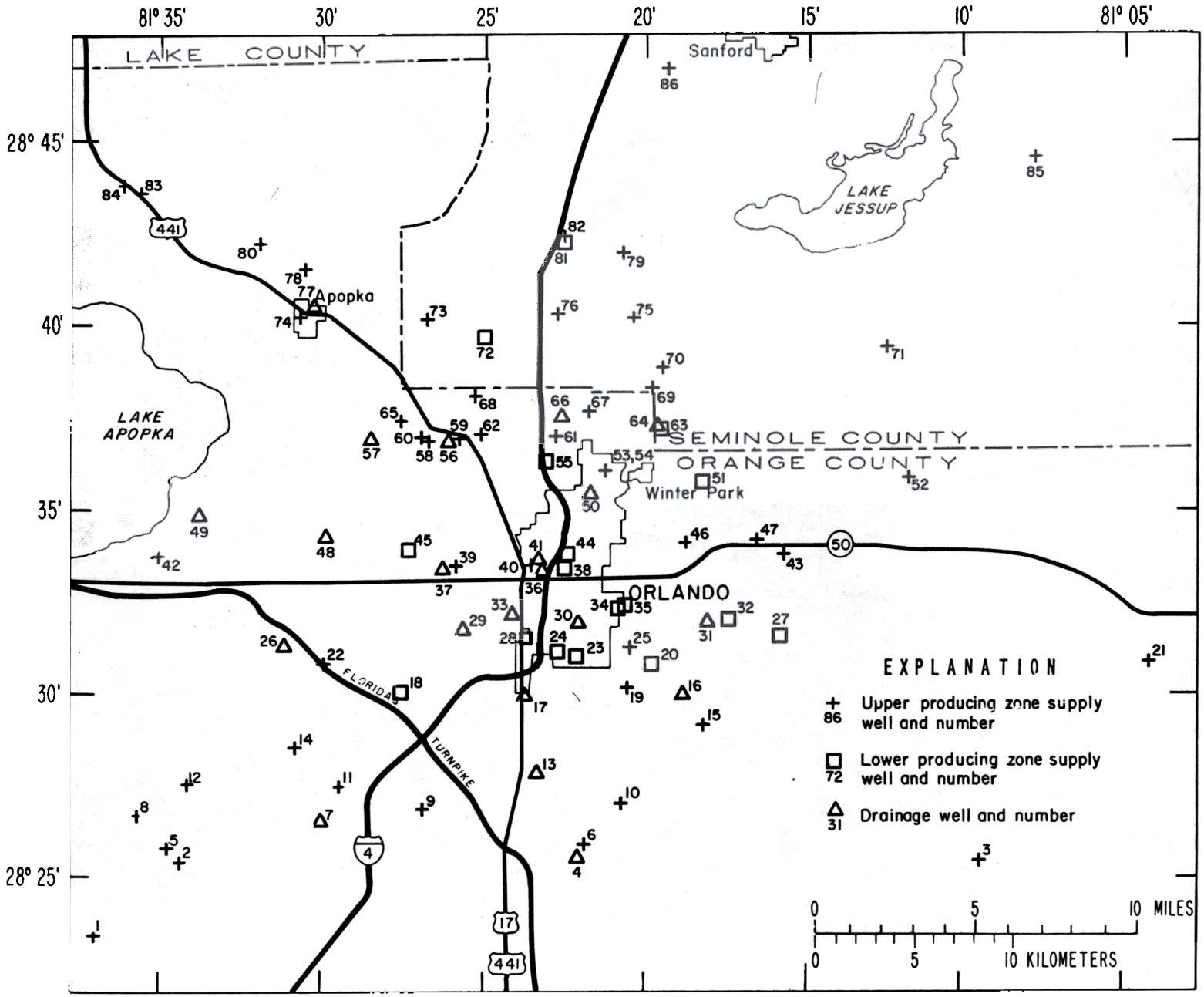


Figure 5.--Locations of drainage wells and supply wells sampled for water quality.

Table 6.--Statistical summary of data on major dissolved constituents and physical properties for drainage wells and supply wells

[Dissolved concentrations in milligrams per liter, except as indicated. Multiple analyses for a well are averaged. Identical values may be reported for highest and second highest, or for lowest and second lowest, because of rounding of numbers]

Parameter	Group[1/]	Number of wells	Mean	Median	Highest two different values		Lowest two different values	
Specific conductance (µmho/cm at 25°C)	DR	21	323	330	400	395	241	235
	SP	64	287	266	694	565	176	171
Dissolved solids, residue	DR	21	184	190	241	234	130	109
	SP	61	170	160	476	386	100	95
Temperature (°C)	DR	21	23.8	23.5	25.5	25.0	23.0	23.0
	SP	62	24.0	24.0	26.0	25.0	22.5	20.0
Silica (Si)	DR	21	7.4	6.6	17	13	1.3	1.1
	SP	61	11	10	33	22	5.7	5.2
Calcium (Ca)	DR	21	41	45	59	52	29	23
	SP	65	39	36	100	86	25	25
Magnesium (Mg)	DR	26	7.8	7.6	14	13	4.4	4.0
	SP	65	8.3	8.0	15	15	4.7	2.8
Sodium (Na)	DR	21	8.8	8.5	16	15	5.0	4.0
	SP	65	7.6	6.4	34	33	2.9	2.8
Potassium (K)	DR	21	2.1	1.8	6.2	5.1	.9	.7
	SP	65	1.1	1.0	5.4	3.7	.4	.1
Bicarbonate (HCO_3)	DR	21	188	172	460	435	93	71
	SP	59	145	138	301	260	100	91

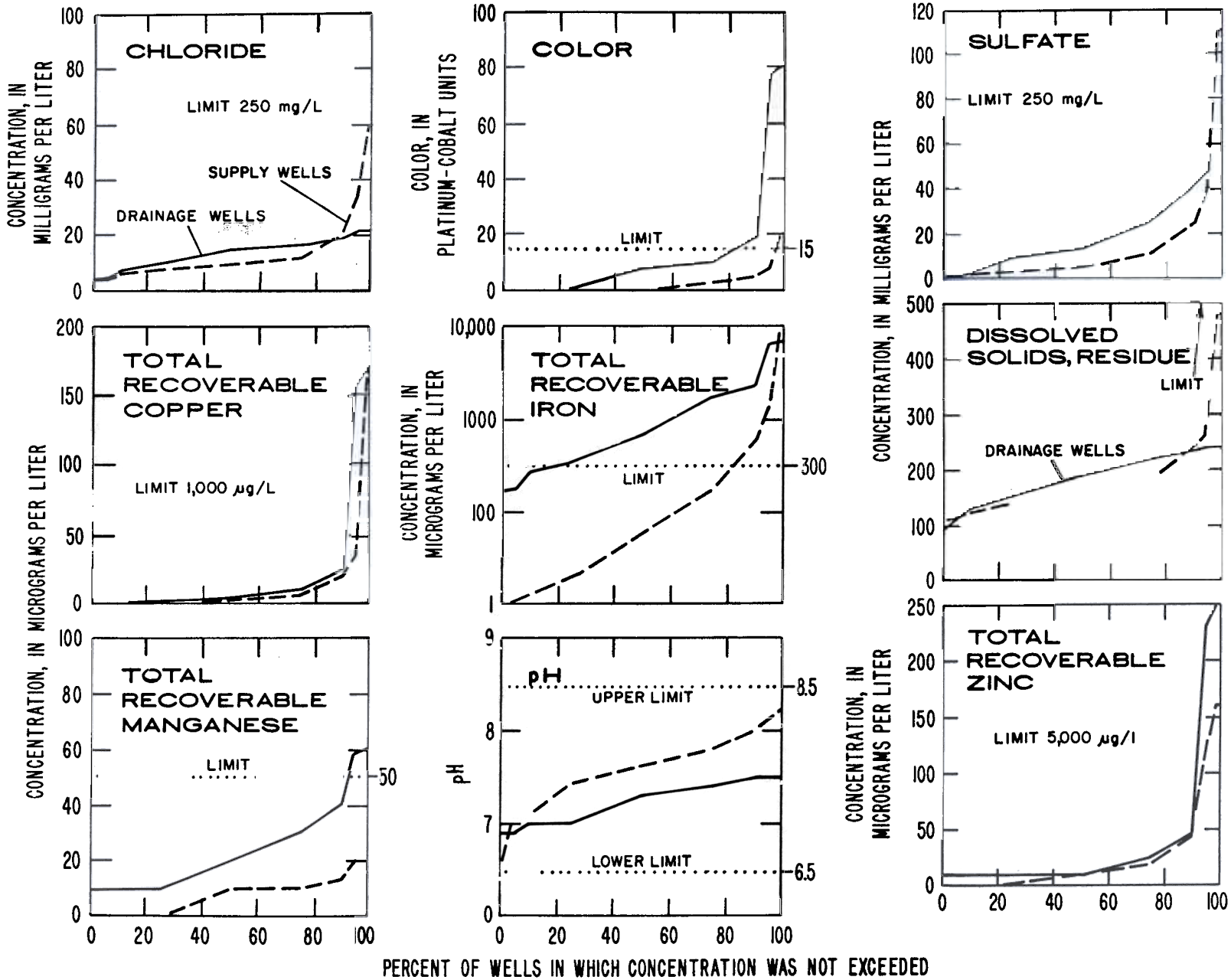
[1/]Group: DR, drainage well; SP, supply well.

Table 6.--Statistical summary of data on major dissolved constituents and physical properties for drainage wells and supply wells--Continued

[Dissolved concentrations in milligrams per liter, except as indicated. Multiple analyses for a well are averaged. Identical values may be reported for highest and second highest, or for lowest and second lowest, because of rounding of numbers]

Parameter	Group[1/]	Number of wells	Mean	Median	Highest two different values		Lowest two different values	
Carbonate (CO_3)	DR	21	0	0	0	0	0	0
	SP	63	0	0	0	0	0	0
Sulfate (SO_4)	DR	21	18	13	47	39	2.2	1.7
	SP	65	10	5.4	109	41	.6	.5
Chloride (Cl)	DR	21	14	15	22	19	7.4	4.9
	SP	65	12	9.6	60	42	4.3	4.0
Fluoride (F)	DR	21	.2	.1	.4	.2	.1	.0
	SP	61	.2	.2	.5	.4	.1	.1
pH (units)	DR	21	7.2	7.3	7.5	7.5	7.0	6.9
	SP	63	7.6	7.6	8.2	8.1	7.0	6.6
Color (Platinum-cobalt units)	DR	20	11	8	80	20	5	0
	SP	61	2	0	20	15	2	0
Turbidity (Nephelometric units)	DR	21	3	2	16	7	1	0
	SP	6	7	1	36	2	1	1
Chemical oxygen demand	DR	20	14	9	60	50	1	0
	SP	52	6	4	40	40	1	0

[1/] Group: DR, drainage well; SP, supply well.



NOTE: LIMITS ARE INTENDED FOR GUIDELINES AND ARE NOT FEDERALLY ENFORCEABLE
(U.S. ENVIRONMENTAL PROTECTION AGENCY, 1977).

Figure 7.--Frequency distribution of constituents specified in suggested National Secondary Drinking Water Regulations.

Table 7.--Statistical summary of nutrient and bacteria data for drainage wells and supply wells

[Dissolved concentrations in milligrams per liter, except as indicated. Identical values may be reported for highest and second highest, or for lowest and second lowest, because of rounding of numbers]

Parameter[1/]	Group[2/]	Number of wells	Mean	Median	Highest two different values		Lowest two different values	
Organic nitrogen (N), D	DR	20	0.30	0.19	1.3	0.62	0.06	0.06
	SP	--	---	---	--	---	---	---
Organic nitrogen (N), T	DR	21	.40	.24	1.5	1.3	.14	.07
	SP	54	.04	.02	.22	.20	.01	.00
Ammonia nitrogen (N), D	DR	20	.39	.27	2.0	.89	.02	.01
	SP	--	---	---	--	---	---	---
Ammonia nitrogen (N), T	DR	21	.42	.30	2.0	.90	.05	.03
	SP	54	.27	.25	1.1	.84	.01	.00
Nitrite (N), D	DR	20	.01	.01	.13	.02	.00	.00
	SP	10	.00	.00	.00	.00	.00	.00
Nitrite (N), T	DR	21	.01	.00	.14	.04	.00	.00
	SP	57	.00	.00	.06	.01	.00	.00
Nitrate (N), D	DR	20	.29	.01	2.4	1.7	.01	.00
	SP	8	.10	.08	.29	.21	.02	.01
Nitrate (N), T	DR	21	.28	.01	2.4	1.5	.00	.00
	SP	57	.18	.00	3.6	.93	.00	.00
Nitrogen (N), D	DR	21	1.0	.83	2.7	2.2	.33	.07
	SP	--	---	---	--	---	---	---

[1/]Parameters: D, dissolved concentrations. Represents material that passes through a 0.45-micrometer filter; T, total concentrations. Represents at least 95 percent of the material in a water-suspended sediment mixture.

[2/]Group: DR, drainage well; SP, supply well.

Table 7.--Statistical summary of nutrient and bacteria data for drainage wells and supply wells--Continued

[Dissolved concentrations in milligrams per liter, except as indicated. Identical values may be reported for highest and second highest, or for lowest and second lowest, because of rounding of numbers]

Parameter[1/]	Group[2/]	Number of wells	Mean	Median	Highest two different values		Lowest two different values	
Nitrogen (N), T	DR	21	1.1	1.0	2.7	2.2	0.39	0.37
	SP	54	.48	.29	3.7	3.6	.08	.05
Orthophosphate (P), D	DR	20	.15	.11	.55	.33	.01	.00
	SP	--	---	---	---	---	---	---
Orthophosphate (P), T	DR	21	.17	.11	.55	.34	.03	.02
	SP	54	.09	.07	.29	.24	.02	.01
Phosphorus (P), D	DR	20	.19	.14	.64	.34	.04	.02
	SP	--	---	---	---	---	---	---
Phosphorus (P), T	DR	21	.25	.23	.66	.64	.11	.04
	SP	54	.09	.07	.30	.24	.02	.01
Total coliform (colonies/ 100 mL)[3/]	DR	21	1,200	150	>10,000	5,600	1	0
	SP	51	6	0	80	60	1	0
Fecal coliform (colonies/ 100 mL)	DR	21	440	10	4,400	1,460	1	0
	SP	51	1	0	5	4	2	0
Fecal streptococci (colonies/ 100 mL)	DR	21	680	16	>10,000	1,650	1	0
	SP	--	---		---	---		
Total organic carbon	DR	21	7.3	6	28	18	2	0
	SP	53	4.5	4	18	16	1	0

[1/] Parameters: D, dissolved concentrations. Represents material that passes through a 0.45-micrometer filter; T, total concentrations. Represents at least 95 percent of the material in a water-suspended sediment mixture.

[2/] Group: DR, drainage well; SP, supply well.

[3/] Immediate M-Endo medium.

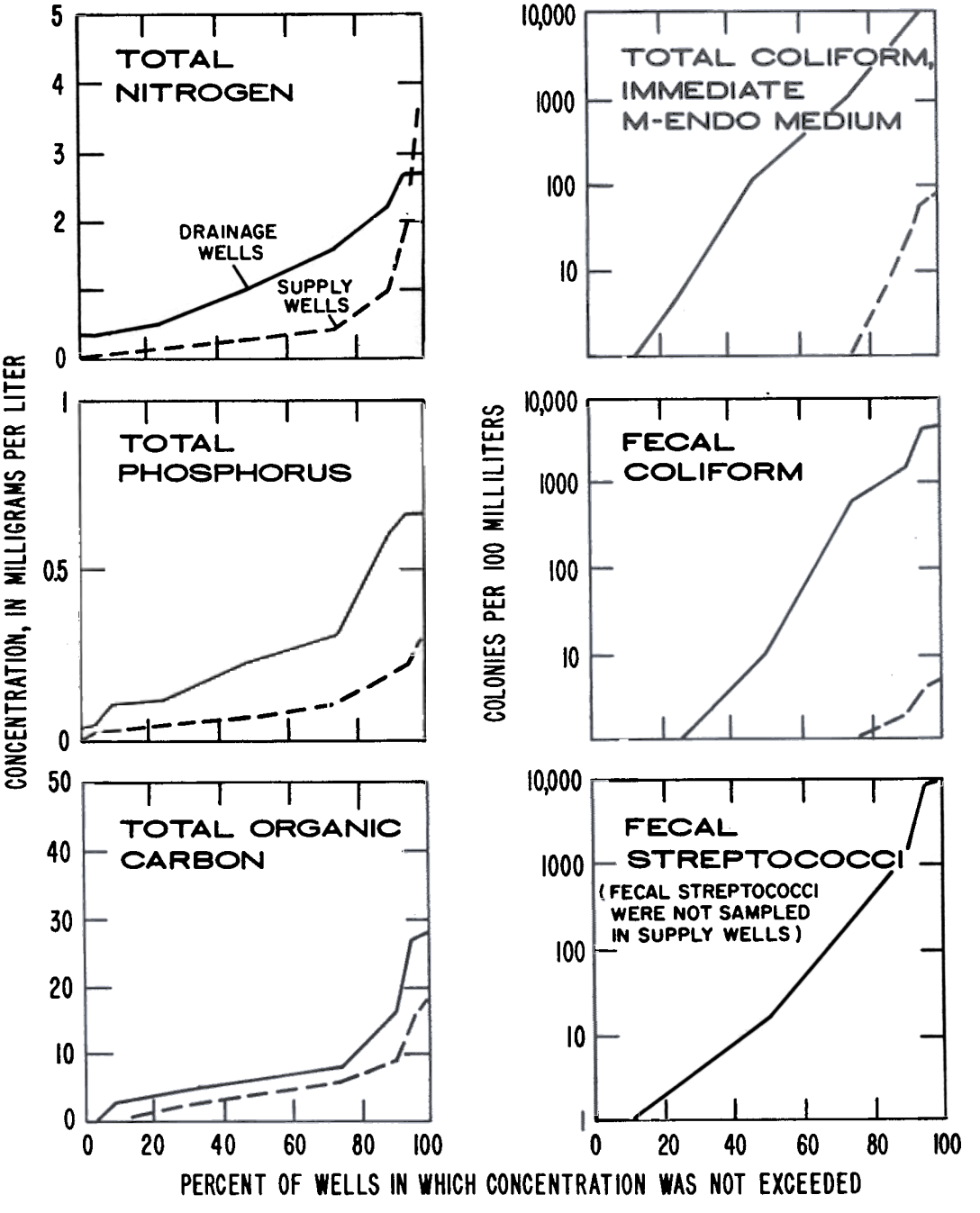


Figure 8.--Frequency distribution of nitrogen, phosphorus, organic carbon, and bacteria in water from drainage wells and supply wells.

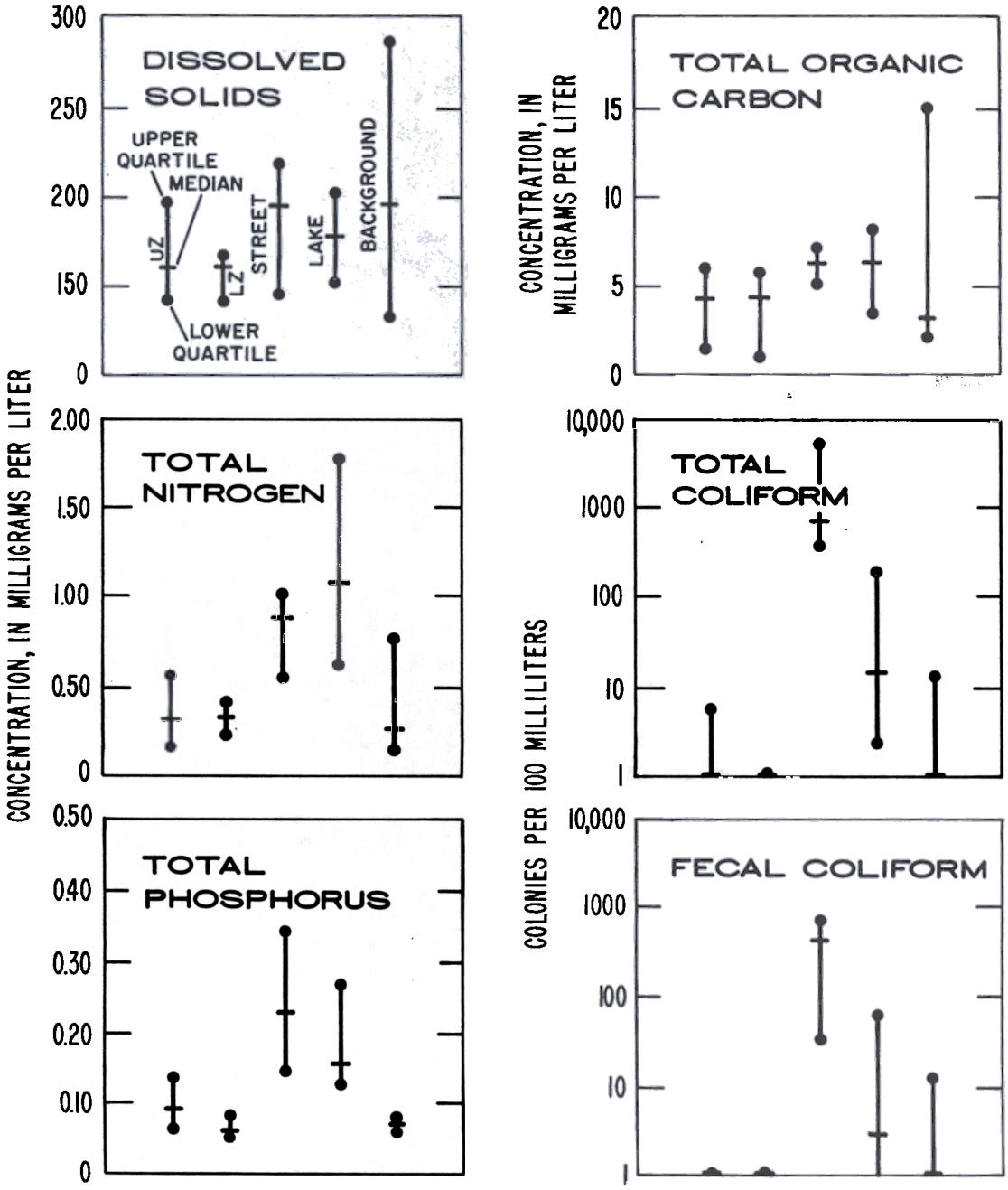
Table 10.--Selected water-quality data for stormwater runoff and drainage wells

[Concentrations in micrograms per liter, except as indicated]

Parameter	Stormwater runoff		Drainage wells
	Range in mean concentrations at sampling sites or median concentration of all samples		Median concentrations of 21 wells
	Miami, Fla.[1/]	Maitland, Fla.[2/]	
Dissolved solids, residue (mg/L)	87 - 105	84 - 104	190
Total nitrogen (N) (mg/L)	.96 - 2.0	2.6 - 8.2	1.0
Total phosphorus (P) (mg/L)	.08 - .30	.4 - 1.1	.23
Total organic carbon (C) (mg/L)	5.8 - 14	22 - 55	6
Aluminum (Al), total recoverable		390	80
Cadmium (Cd), total recoverable	.7 - .9		0
Chromium (Cr), total recoverable	11 - 48		10
Copper (Cu), total recoverable	6.5 - 15	19	4
Iron (Fe), total recoverable	207 - 334	400	660
Lead (Pb), total recoverable	167 - 387	200	3
Zinc (Zn), total recoverable	86 - 128	120	10
Total coliform (colonies/100 mL)	8,000 - 186,000		39
Fecal coliform (colonies/100 mL)	2,400 - 55,000		10

[1/] Data from Mattraw, 1978.

[2/] Samples collected by the U.S. Geological Survey, Orlando.



EXPLANATION: UZ, UPPER-PRODUCING ZONE SUPPLY WELLS; LZ, LOWER-PRODUCING ZONE SUPPLY WELLS; STREET, DRAINAGE WELLS THAT RECEIVE STREET RUNOFF; LAKE, DRAINAGE WELLS THAT RECEIVE LAKE OVERFLOW; BACKGROUND, SUPPLY WELLS IN SURROUNDING AREA WITH NO DRAINAGE WELLS NEARBY.

NOTE: COLIFORM COUNTS BETWEEN 0 AND ARE INCLUDED AT ORDINATE VALUE OF 1.

Figure 11.--Median and interquartile range for dissolved solids, nutrients, and bacteria in selected subgroups of supply wells and drainage wells.

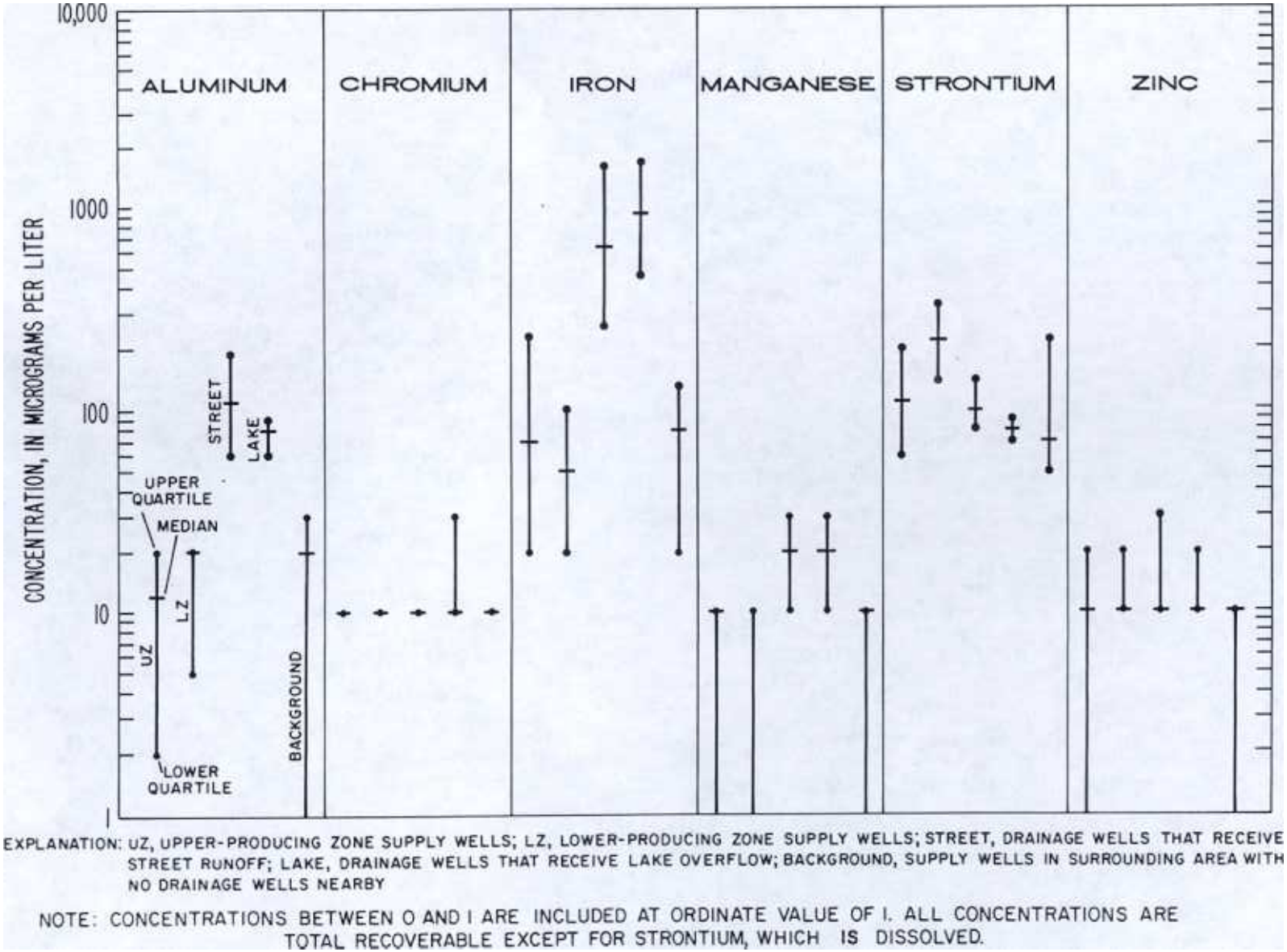


Figure 12. Median and interquartile range for selected metals in selected subgroups of supply wells and drainage wells.