PREPARED IN COOPERATION WITH THE
NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
and the GLOUCESTER COUNTY PLANNING BOARD

Lacombe, P.J. and Rosman, Robert, 1995, Hydrology of the unconfined aquifer system in the upper Maurice River basin and adjacent areas in Gloucester County, New Jersey, 1986-87

WATER QUALITY

This sheet contains ground- and surface-water-quality data for the Kirkwood-Cohansey flow system in the study area. The water-quality characteristics discussed include major ions, trace metals, and selected other constituents.

Figure 4-1 shows the locations of the water-quality stations, and table 4-1 lists the stations. At each station, Stiff patterns are used to show the ratios of concentrations of the major ions in ground water and surface water during December 1986 and January 1987. Similar Stiff patterns indicate water that has similar concentrations of the major ionic constituents. Surface- water samples from stations 01477120, 01477510, and 01467329 have similar ratios of ionic components, and the samples from stations 01410820 and 01411500 have similar ratios of ionic components. Ground water at most sites has lower ionic concentration than that found in surface water. Four notable exceptions are ground-water samples from wells 15-829, 15-735, 33-463, and 15- 726. Water from well 15-735 may be affected by a local sewer system. Wells 15-829, 33-463, and 15-726 are in agricultural areas where ground-water may be contaminated as a result of the land use.

Trilinear diagrams (figs. 4-2 and 4-3) show the ratios of the major ions in water. Figure 4-2 shows the major ionic components of precipitation, ground water, and surface water during December 1986 and January 1987. This figure shows that as water passes through the hydrologic cycle from precipitation to ground water and then to stream base flow, the concentrations of calcium and carbonate in the water increase.

Surface Water

The trilinear diagrams in figure 4-3 show zones in which the density of data for each of the five surface-water-quality stations in the study area is high. The quality of water is similar at stations 01411500 on the Maurice River and 0140820 on the Great Egg Harbor River. The geology and land use in these two basins are nearly identical. The drainage basins contain outcrops of only the Cohansey Sand and younger deposits and, for the most part, have experienced limited development. These basins consist primarily of undeveloped forested and agricultural land.

The quality of the surface water at stations 01477510 on Oldmans Creek and 01477120 on Raccoon Creek also is similar. Although the headwaters of both streams originate on the Cohansey Sand and the Kirkwood Formation, these streams also flow across geologic units that are older than these two units and, therefore, the geology is more diverse in these drainage basins than in the Maurice and Great Egg Harbor River basins. Land in the Oldmans Creek and Raccoon Creek basins is more intensely utilized for agriculture than is the land in the Maurice and Great Egg Harbor River basins; therefore, the water quality is notably different in these drainage regions.

Surface-water quality at station 01467329 on Big Timber Creek is different from that at the other four stations. Although the geology of the Big Timber Creek basin is similar to that of the Raccoon Creek and Oldmans Creek basins, the land is not used extensively for agriculture, but rather is highly developed with many small industries and extensive residential areas.

The five surface-water-quality stations shown in figure 4-1 have been monitored for numerous physical, chemical, and biological characteristics for about 20 years. The water-quality data are shown in box plots (fig. 4-4). The box plots graphically show the character of the water in the five streams and allow comparison of water quality among streams. Concentrations of both total and dissolved trace elements in water at the Maurice River station are shown. The number in the upper right corner of some of the plots is the applicable New Jersey drinking-water regulation (New Jersey Register, 1989). Water containing constituents in concentrations that exceed these values must be treated before it is considered potable.

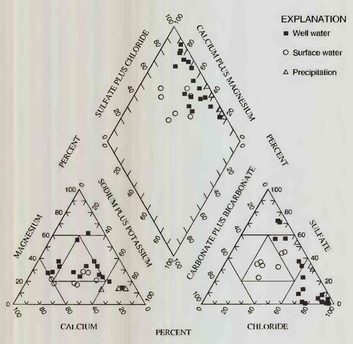


Figure 4-2. Major ionic components of precipitation, ground water, and surface water, December 1986 through January 1987.

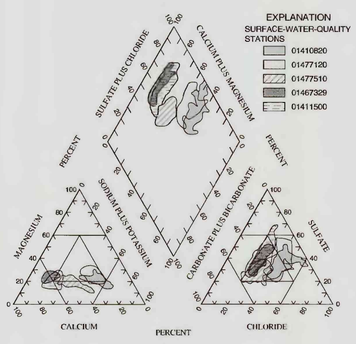
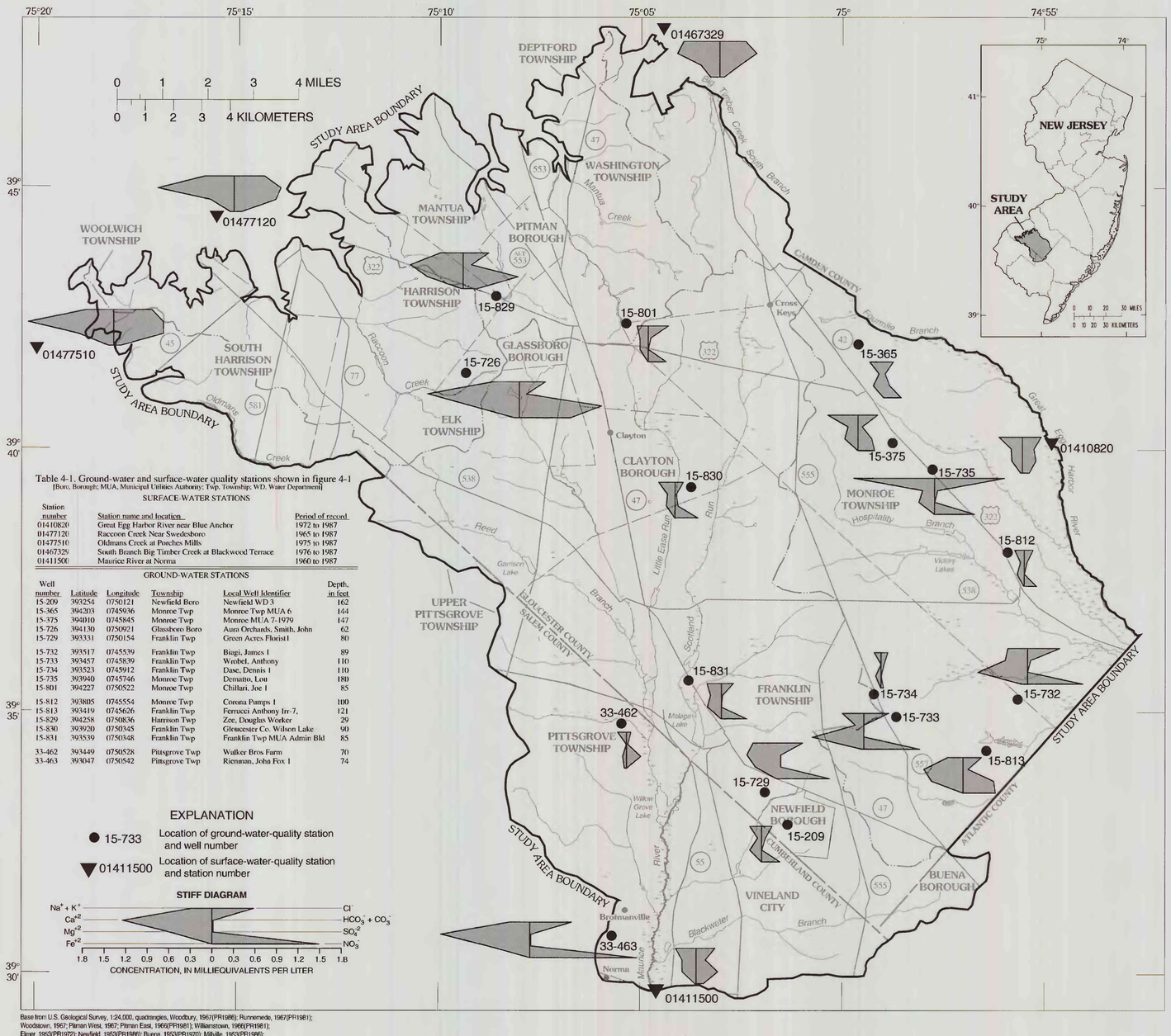


Figure 4-3. Major ionic components of surface water at five surface-water-quality stations.



Base from U.S. Geological Survey, 1:24,000, quadrangles, Woodbury, 1967(PR1986); Runnemede, 1967(PR1981); Woodstown, 1967; Pitman West, 1967; Pitman East, 1966(PR1981); Williamstown, 1966(PR1981); Elmer, 1953(PR1972); Newfield, 1953(PR1986); Buena, 1953(PR1970); Millville, 1953(PR1986); Five Points, 1956(PR1972). PR - Photo Revision

Table 4-1. Ground-water and surface-water quality stations shown in figure 4-1
[Boro, Borough; MUA, Municipal Utilities Authority; Twp, Township; WD, Water Department]

SURFACE-WATER STATIONS

Station number	Station name and location	Period of record
01410820	Great Egg Harbor River near Blue Anchor	1972 to 1987
01477120	Raccoon Creek Near Swedesboro	1965 to 1987
01477510	Oldmans Creek at Porches Mills	1975 to 1987
01467329	South Branch Big Timber Creek at Blackwood Terrace	1976 to 1987
01411500	Maurice River at Norma	1960 to 1987

GROUND-WATER STATIONS

Well number	Latitude	Longitude	Township	Local Well Identifier	Depth, in feet
15-209	393254	0750121	Newfield Boro	Newfield WD 3	162
15-365	394203	0745936	Monroe Twp	Monroe Twp MUA 6	144
15-375	394010	0745845	Monroe Twp	Monroe MUA 7-1979	147
15-726	394130	0750921	Glassboro Boro	Aura Orchards, Smith, John	62
15-729	393331	0750154	Franklin Twp	Green Acres Florist1	80
15-732	393517	0745539	Franklin Twp	Biagi, James 1	89
15-733	393457	0745839	Franklin Twp	Weobel, Anthony	110
15-734	393523	0745912	Franklin Twp	Dase, Dennis 1	110
15-735	393940	0745746	Monroe Twp	Dematto, Lou	180
15-801	394227	0750522	Monroe Twp	Chillari, Joe 1	85
15-812	393805	0745554	Monroe Twp	Corona Pumps 1	100
15-813	393419	0745626	Franklin Twp	Ferrucci Anthony Irr-7,	121
15-829	394258	0750836	Harrison Twp	Zee, Douglas Worker	29
15-830	393920	0750345	Franklin Twp	Gloucester Co. Wilson Lake	90
15-831	393539	0750348	Franklin Twp	Franklin Twp MUA Admin Bld	85
33-462	393449	0750528	Pittsgrove Twp	Walker Bros Farm	70
33-463	393047	0750542	Pittsgrove Twp	Rienman, John Fox 1	74

Figure 4-1. Locations of water-quality stations and Stiff diagrams showing chemical composition of water, December 1986 through January 1987.

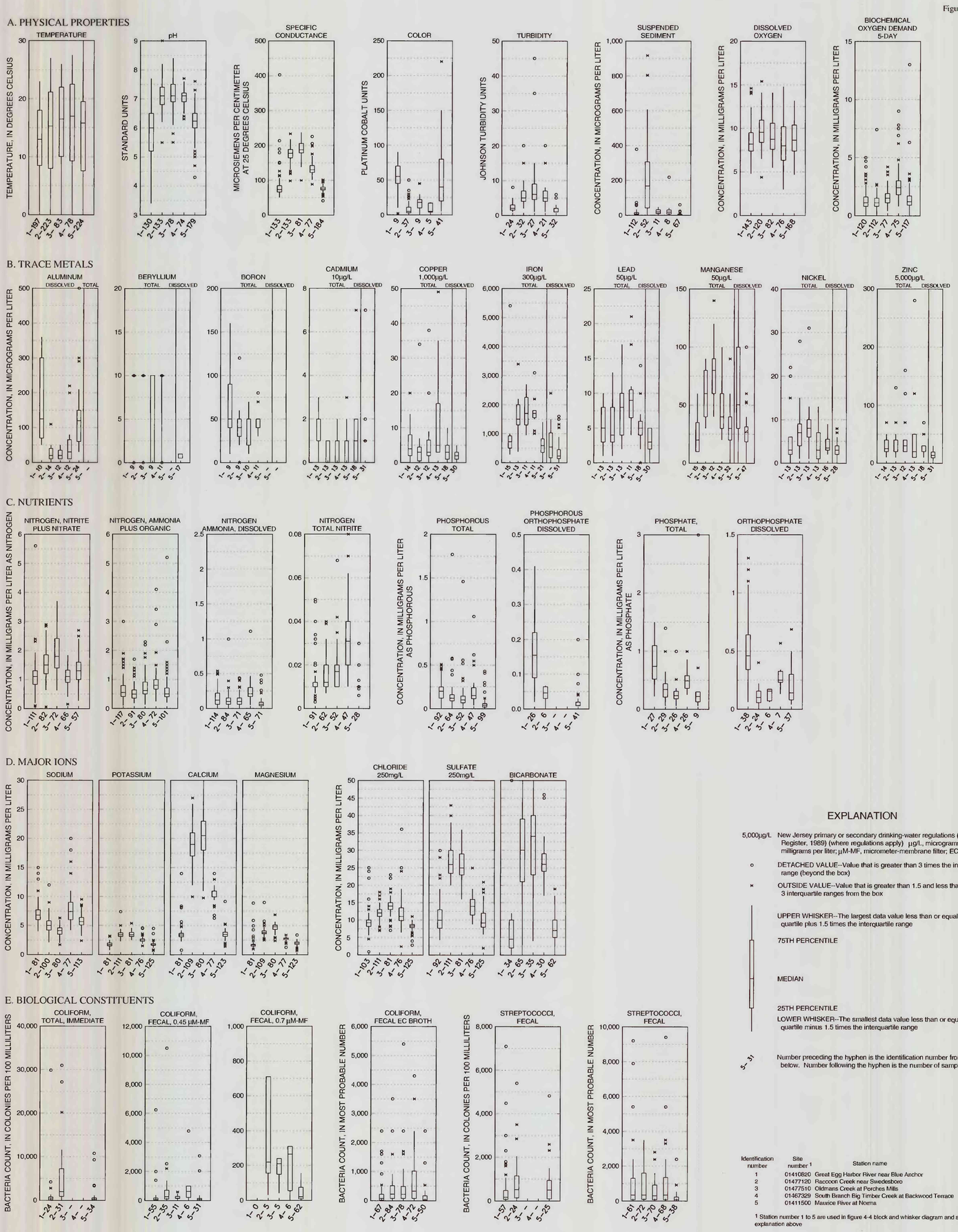


Figure 4-4. Range of concentrations of selected physical properties and chemical and biological constituents at the five surface-water-quality stations.

Ground Water

Table 4-2 presents values of physical properties and concentrations of chemical constituents determined from samples of the ground water in the study area. Water samples from 17 private and public-supply wells were collected from November 1986 through January 1987. Well locations (fig. 4-1) were selected to maximize spatial distribution of data while avoiding areas that were thought to be affected by significant contamination. Ground-water quality was found to be within applicable New Jersey drinking-water regulations (New Jersey Register, 1989).

Table 4-2. Results of ground-water-quality analysis
[µS/cm, microsiemens per centimeter at 25 degrees Celsius; µg/L, micrograms per liter; mg/L, milligrams per liter; <, less than; --, constituent not determined; °C, degrees Celsius; ft, foot; NGVD, National Geodetic Vertical Datum of 1929]

Well number	Sampling date	Temperature of Water °C	Temperature of Air °C	Specific conductance µS/cm	Oxygen, dissolved mg/L	Ph, standard units	Ph, Laboratory standard units	Alkalinity Wh Wat Total Field mg/L $CaCO_3$	Nitrogen, Ammonia, Dissolved mg/L as N	Nitrogen, Nitrite, Dissolved mg/L as N	Nitrogen, Nitrate, Dissolved mg/L as N	Nitrogen, Ammonia + Organic, Dissolved mg/L as N
15-209	11-20-86	13.5	--	62	5.1	4.60	4.80	--	0.011	--	3.60	--
15-365	11-20-86	13.0	--	68	4.2	4.30	4.60	--	.010	--	3.50	--
15-375	11-20-86	13.0	--	100	2.8	4.50	4.80	--	.018	--	--	--
15-726	11-19-86	14.5	--	255	6.5	5.00	5.20	--	.026	--	--	--
15-729	11-19-86	13.0	--	155	6.6	4.30	4.70	--	.016	--	--	--
15-732	12-11-86	12.0	7.5	159	8.5	4.65	5.11	--	<.010	<.010	--	0.80
15-733	12-10-86	12.0	6.5	145	10.3	4.45	4.90	--	<.010	<.010	--	.60
15-734	12-10-86	12.0	6.0	261	8.9	4.96	5.40	--	<.010	<.010	--	<0.20
15-735	12-10-86	15.0	7.5	185	7.9	4.50	4.90	--	<.010	<.010	--	.60
15-801	01-20-87	12.5	11.5	51	8.7	4.90	5.20	4	<.010	<.010	--	.20
15-812	12-10-86	13.5	14.5	41	8.1	4.36	5.20	--	.010	<.010	--	.30
15-813	11-19-86	13.5	--	140	7.4	4.60	4.80	--	.011	--	--	--
15-829	12-11-86	13.5	4.5	174	1.5	4.85	5.20	11	<.010	<.010	--	.30
15-830	01-21-87	14.5	10.0	68	6.2	4.80	4.80	1	<.010	<.010	--	.50
15-831	01-28-86	14.5	7.0	67	3.7	5.00	6.20	4	<.010	<.010	--	1.0
33-462	12-15-86	13.0	--	42	.1	4.50	4.36	--	<.002	--	<.010	--
33-463	12-17-86	13.0	--	262	7.7	4.40	4.40	--	.005	<.010	--	--

Well number	Nitrogen, NO_2+NO_3 Dissolved mg/L as N	Phosphorus, Ortho, Dissolved mg/L as P	Carbon, Organic, Dissolved mg/L as C	Calcium, Dissolved mg/L as Ca	Magnesium, Dissolved mg/L as Mg	Sodium, Dissolved mg/L as Na	Potassium, Dissolved mg/L as K	Chloride, Dissolved mg/L as Cl	Sulfate, Dissolved mg/L as SO_4	Fluoride, Dissolved mg/L as F	Silica, Dissolved mg/L as SiO_2	Arsenic, Dissolved µg/L as As	Barium, Dissolved µg/L as Ba
15-209	--	<0.010	0.4	1.7	2.0	3.3	1.5	5.5	1.3	0.02	7.3	--	120
15-365	--	<.010	.5	1.8	1.8	3.9	1.5	5.2	4.1	.02	12	--	62
15-375	3.30	<.010	.5	3.2	2.2	8.6	2.0	10	9.5	<.10	10	--	82
15-726	9.90	<.010	1.2	26	7.8	3.2	8.6	13	56	.20	7.6	--	84
15-729	10.0	<.010	.5	9.1	3.9	6.5	2.7	12	1.4	<.10	5.9	--	220
15-732	11.0	<.010	.8	6.1	8.3	3.6	4.1	16	.6	<.10	6.1	<1	250
15-733	11.0	<.010	.6	2.8	8.7	5.8	1.5	13	<.2	<.10	6.3	<1	420
15-734	.620	<.010	.5	.50	.80	1.8	.70	4.0	.7	<.10	6.5	<1	37
15-735	8.10	.020	.7	3.1	2.6	23	3.8	35	.2	<.10	6.6	<1	150
15-801	3.70	<.010	.5	2.9	1.2	2.8	1.0	10	<.2	<.10	7.8	<1	47
15-812	2.50	<.010	1.7	1.1	1.1	2.6	.70	4.3	<.2	<.10	6.2	<1	42
15-813	6.40	<.010	.7	11	5.2	2.4	3.0	9.4	21	.10	6.8	--	120
15-829	2.40	.010	1.1	15	6.0	4.7	3.1	13	37	<.10	9.1	<1	67
15-830	4.80	<.010	.5	2.1	1.4	4.6	1.5	4.6	2.3	<.10	9.7	<1	63
15-831	5.20	<.010	.6	3.1	2.2	2.7	3.5	6.3	.5	<.10	6.5	<1	91
33-462	--	<.010	.4	.70	.50	2.3	1.1	2.2	10	.01	18	--	20
33-463	21.0	<.010	.6	25	6.9	4.1	3.2	21	1.2	<.10	7.0	--	190

Well number	Beryllium, Dissolved µg/L as Be	Cadmium, Dissolved µg/L as Cd	Chromium, Dissolved µg/L as Cr	Chromium, Hexavalent, Dis. µg/L as Cr	Cobalt, Dissolved µg/L as Co	Copper, Dissolved µg/L as Cu	Iron, Total Recoverable µg/L as Fe	Iron, Dissolved µg/L as Fe	Lead, Dissolved µg/L as Pb	Manganese, Total Recoverable µg/L as Mn	Manganese, Dissolved µg/L as Mn	Molybdenum, Dissolved µg/L as Mo	Strontium, Dissolved µg/L as Sr
15-209	<0.5	<1	--	--	<3	50	--	20	<10	--	24	<10	16
15-365	<0.5	<1	--	--	<3	20	--	180	<10	--	15	<10	15
15-375	<0.5	1	--	--	<3	20	--	110	<10	--	21	<10	27
15-726	<0.5	1	--	--	<3	<10	--	54	<10	--	55	<10	82
15-729	<0.5	<1	--	--	10	<10	--	27	<10	--	230	<10	35
15-732	<0.5	<1	<10	<1	6	10	80	35	<10	60	64	<10	67
15-733	<0.5	<1	<10	<1	5	20	50	4	<10	20	28	<10	81
15-734	<0.5	<1	<10	<1	<3	<10	30	8	<10	<10	6	<10	9
15-735	<0.5	<1	<10	<1	4	160	40	9	70	20	30	<10	19
15-801	<0.5	<1	<10	<1	<3	50	10	4	<10	<10	6	<10	13
15-812	<0.5	<1	<10	<1	<3	<10	100	82	<10	<10	5	<10	10
15-813	<0.5	<1	--	--	3	10	--	14	<10	--	27	<10	61
15-829	<0.5	<1	<10	<1	<3	<10	250	210	<10	30	34	<10	46
15-830	<0.5	<1	<10	<1	3	210	100	84	<10	<10	11	<10	22
15-831	<0.5	<1	<10	<1	<3	110	150	74	<10	10	15	<10	25
33-462	<0.5	<1	--	--	<3	<10	--	760	<10	--	9	<10	9
33-463	<0.5	<1	--	--	9	<10	--	38	<10	--	61	<10	90

Well number	Vanadium, Dissolved µg/L as V	Zinc, Dissolved µg/L as Zn	Aluminum, Dissolved µg/L as Al	Lithium, Dissolved µg/L as Li	Phenols Total µg/L	Solids Residue At 180 °C Dissolved mg/L	Acidity mg/L as H	Bromide, Dissolved mg/L as Br	Mercury Dissolved µg/L as Hg	Elevation of land surface datum ft above NGVD	Depth of well, Total feet	Specific conductance Laboratory µS/cm	Alkalinity Laboratory, mg/L As $CaCO_3$
15-209	<6	46	110	<4	3	--	--	0.14	--	125	162	61	2.0
15-365	<6	83	290	4	2	--	0.2	.14	--	140	144	68	<1.0
15-375	<6	25	220	<4	2	--	--	.025	--	148	147	104	2.0
15-726	<6	23	300	6	1	--	--	.031	--	140	62	267	5.0
15-729	<6	45	440	4	2	--	.2	.041	--	105	80	154	<1.0
15-732	<6	9	100	<4	4	99	--	--	<0.1	110	89	158	2.0
15-733	<6	7	150	<4	4	82	<0.1	--	<0.1	135	110	149	<1.0
15-734	<6	33	20	<4	1	21	--	--	<0.1	138	110	27	2.0
15-735	<6	10	150	<4	2	110	--	--	.2	140	80	189	2.0
15-801	<6	11	30	<4	<1	28	--	--	<0.1	144	85	53	2.0
15-812	<6	<3	<10	7	2	24	<0.1	--	<0.1	123	100	40	2.0
15-813	<6	10	380	4	2	--	--	.044	--	110	120	149	3.0
15-829	<6	5	50	<4	3	100	--	--	<0.1	141	29	184	5.0
15-830	<6	32	300	<4	4	44	--	--	<0.1	120	90	69	<1.0
15-831	<6	28	30	<4	2	32	--	--	.5	104	85	75	--
33-462	<6	10	180	<4	1	--	.1	.020	--	95	70	43	<1.0
33-463	<6	11	710	<4	<1	--	.2	.077	--	105	74	276	<1.0

EXPLANATION

5,000µg/L New Jersey primary or secondary drinking-water regulations (New Jersey Register, 1989) (where regulations apply) µg/L, micrograms per liter; mg/L, milligrams per liter; µM-MF, micrometer-membrane filter; EC, Escherichia coli

○ DETACHED VALUE--Value that is greater than 3 times the interquartile range (beyond the box)

× OUTSIDE VALUE--Value that is greater than 1.5 and less than or equal to 3 interquartile ranges from the box

UPPER WHISKER--The largest data value less than or equal to the upper quartile plus 1.5 times the interquartile range

75TH PERCENTILE

MEDIAN

25TH PERCENTILE

LOWER WHISKER--The smallest data value less than or equal to the lower quartile minus 1.5 times the interquartile range

5- 31 Number preceding the hyphen is the identification number from the list below. Number following the hyphen is the number of samples analyzed.

Identification number	Site number[1]	Station name	Period of record
1	01410820	Great Egg Harbor River near Blue Anchor	1972-87
2	01477120	Raccoon Creek near Swedesboro	1965-87
3	01477510	Oldmans Creek at Porches Mills	1975-87
4	01467329	South Branch Big Timber Creek at Backwood Terrace	1976-87
5	01411500	Maurice River at Norma	1960-87

[1] Station number 1 to 5 are used in figure 4-4 block and whisker diagram and shown in explanation above

HYDROLOGY OF THE UNCONFINED AQUIFER SYSTEM IN THE UPPER MAURICE RIVER BASIN AND ADJACENT AREAS IN GLOUCESTER COUNTY, NEW JERSEY, 1986-87

by
Pierre J. Lacombe and Robert Rosman

1995