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GROUND WATER

This sheet describes water levels in the unconfined aquifer system of the Salem River study area and includes a water-level map based on water levels from wells and streams measured in October, November and December 1993. Hydrographs of water levels in five water-table observation wells are included, and the hydraulic properties of the aquifer system are discussed.

Water Table

Under natural conditions, water in unconfined aquifers generally flows from high land areas toward points of discharge in low-lying areas, such as wetlands, rivers, streams, and springs. The overall shape of the water table tends to be a subdued replica of the land surface. Where a water-table contour crosses a stream channel, it is shaped like a "v." For a gaining stream (a stream into which ground water flows along most of its length), the "v" points upstream, indicating that nearby ground water is at a higher elevation than the water in the stream channel; therefore, ground water is flowing into the stream. The streams in the study area are principally gaining streams.

Water-Level Map

The water-table-contour map (fig. 2-1) is based on water-level measurements made in 122 wells (table 2-1) and 175 streams (table 2-2) in October, November, and December 1993. The most accurate measurements are those made in wells. The well and stream-site locations are shown in figure 2-1. Construction details for all the wells shown in table 2-1 are from the GWSI data base that is maintained by the USGS. Water levels were measured with respect to land surface at each measuring site; then the elevation of the land surface was used to determine the water-level altitudes with respect to sea level. Where measurements were not made, elevations of streams, lakes, and wetlands (which represent the water table above land surface) estimated from USGS 7-1/2-minute topographic maps provided supplementary water-table-altitude data.

The altitude of the water table in the Salem River study area ranges from near sea level in the western part of the study area to approximately 140 ft above sea level in the eastern part of the study area. The wide range in permeabilities of the geologic materials has a noticeable affect on the water-table gradient (slope of the water table), particularly near discharge areas. In the western half of the study area, the slope of the water table is similar to that of the gently sloping land surface that extends west and southwest to the Delaware River and Delaware Bay. However, in the eastern half of the study area the slope of the water table is steep in many areas, and shows the effect of low- to moderate-permeability geologic materials in combination with a stream drainage system that has cut deeply into the landscape. The water table in the areas of highest elevation along the extreme eastern margin of the study area has a low slope because the water table is in the relatively high-permeability Kirkwood-Cohansey aquifer system. Fourteen water-table altitudes from wells in the low-lying areas near Delaware River and Delaware Bay were at or slightly below sea level. The amount of data needed to determine if the water table is below sea level over a sizable area was beyond the scope of this study. Therefore, it is assumed that these water levels represent effects of localized ground-water withdrawals rather than a regional trend. Contour lines that would show such localized effects are not shown on the 1:100,000 scale water-table-contour map (fig. 2-1). Additionally, the shape of the water table that might be the result of localized variations in the permeability of geologic materials is not generally shown on the water-table-contour map.

Water-Level Monitoring

Water levels in five water-table observation wells in the Salem River study area are monitored on a regular basis (fig. 2-2). Water levels in two of the wells have been monitored for less than 7 years; those in the other three wells have been monitored for at least 27 years. Water levels were measured manually from 1 to 12 times per year. The water-level data are shown in hydrographs in figures 2-3 through 2-5. The vertical and horizontal scales on all the hydrographs are identical to facilitate visual comparison. Construction data for all the wells are listed in table 2-1.

Water levels in the Penns Grove 72 well (33-116) fluctuate from 3.5 to 5.5 ft seasonally (fig. 2-3). Water levels typically are highest during late winter and spring and lowest during fall. Because evapotranspiration in New Jersey is high during summer and low in the late fall through early spring, whereas precipitation is nearly constant throughout the year, the water table naturally declines from spring to fall because much of the water from precipitation is lost from the soil through evapotranspiration rather than percolating down to the water table. From fall to spring, water levels naturally rise because when evapotranspiration is low the soil water derived from precipitation can percolate down to the water table. The typical seasonal fluctuations in water levels in the Aura Orchards well (15-726) and the Shoemaker 1 well (15-811) are 4 to 6 and 2 to 4 ft, respectively (fig. 2-4). Both the Penns Grove 14 (33-348) and the Penns Grove 24 (33-342) wells are screened in the Upper Potomac-Raritan-Magothy aquifer. The water levels in the former well (fig. 2-5) show a typical natural seasonal fluctuation of 3 to 6 ft, whereas those in the latter well show a large seasonal fluctuation of 2 to 9 ft that can be explained by a combination of seasonal withdrawals near the observation well and natural seasonal fluctuations. The hydrographs show some periods of similar trends in water levels among Penns Grove wells 14, 24, and 72. A period of decreasing high and low water levels during water years[2] 1961-66 is evident, as well as a period of relatively high seasonal lows during water years 1967-68.

[2]Water year, typically used in hydrologic analyses, is the 12-month period from October 1 through September 30. It is designated by the calendar year in which it ends. In this report, all data are reported for the calendar year indicated unless otherwise noted.

Hydraulic Properties of Aquifers and Confining Units

Hydraulic properties of the aquifers and confining units in and near the Salem River study area were compiled from documents and results of aquifer and laboratory tests. Many of the test results are from semiconfined or confined portions of aquifers in the study area; these are used because few test results are available from unconfined portions of these aquifers. The parameters typically reported from these analyses are transmissivity, hydraulic conductivity, and storage coefficient. Test locations are shown in figure 2-2, and test results are reported in tables 2-3 and 2-4.

Reported values of the horizontal hydraulic conductivity of aquifers in and near the Salem River study area range from 5 to 250 ft/d. Reported transmissivities (aquifer thickness multiplied by hydraulic conductivity) in and near the study area range from 411 to 19,800 ft^2/d. The values are within the range of typical values for the lithologies of the aquifers in the study area. Storage coefficient is a dimensionless value that represents the volume of water an aquifer will release per unit surface area per unit decrease in water level. Reported storage coefficients for aquifers in and near the study area range from 0.000027 to 0.044. However, the typical storage coefficients for unconfined aquifers (0.01 to 0.30 (Freeze and Cherry, 1979, p. 61)) are considerably different from most of those reported for aquifers in and near the study area. This can be explained by the fact that most of the tests reported here were performed in confined or semiconfined parts of the aquifer. Even the Kirkwood-Cohansey aquifer system, which is considered an unconfined aquifer, appears to behave as a semiconfined aquifer during aquifer tests. This behavior is probably a function of the presence of discontinuous layers of silt and clay in the Cohansey Formation. Values of vertical hydraulic conductivity of the confining units are derived mostly from results of laboratory tests and range from 0.00002 to 0.24 ft/d, the typical range for the lithologies of the confining units in the study area.

Table 2-1. Well-construction data for, and water levels measured in, wells in unconfined aquifers in the Salem River study area, New Jersey, October and November 1993, except where noted
[Well locations shown in fig. 2-1; --, missing data; altitudes of water levels are rounded to the nearest whole number]

New Jersey well number	Latitude	Longitude	Owner	Local well name	Elevation of land surface (feet above sea level)[1]	Depth of well (feet below land surface)	Screened interval (feet below land surface) Top	Screened interval (feet below land surface) Bottom	Date water level measured	Water level (feet below land surface)	Altitude of water level (feet above sea level)
11-287	392831	0751820	MAYHEW, ROBERT	IRR-1979	110	90.0	40.0	90.0	11-11-93	40.90	69
11-718	392556	0751956	FITHIAN, HERBERT	FITHIAN HAND DUG	91	30	--	--	11-19-93	27.08	64
11-719	392659	0752116	DEHART, ELIZABETH	DEHART IRR	114	74	54	74	11-17-93	48.10	66
11-720	392713	0752112	LEVICK, EVERED	LEVICK HAND DUG	75	31.6	--	--	11-17-93	31.60	43
11-721	392729	0752024	STOW CREEK TWP	SCTWP MW 1	109.75	60	30	60	11-16-93	48.64	61
11-722	392731	0752028	STOW CREEK TWP	SCTWP MW 2	95.30	60	30	60	11-16-93	37.61	58
11-723	392734	0752026	STOW CREEK TWP	SCTWP MW 3	89.30	60	30	60	11-16-93	33.97	55
11-724	392812	0752109	DICKINSON, MELVIN	DICKINSON HAND DUG	28	11.8	--	--	11-19-93	7.45	21
11-725	392908	0751821	DAVIS, F ROLLO	SHILOH-COHANSEY BARN 1	127	67	52	67	11-17-93	47.05	80
11-726	392933	0751827	CRUZANDALE FARMS	UNIT 2 IRR	130	120	60	120	11-17-93	46.73	83
15-35	394022	0750902	HUGHES,WILSON J	2	140	60.0	20.0	60.0	11-12-93	12.18	128
15-353	394649	0752316	PURELAND W CO	LANDTECT 3	6	17.5	7.50	17.5	11-12-93	3.01	3
15-440	394726	0752326	MONSANTO CHEM	37-S1	5	20.0	10.0	20.0	11-10-93	6.02	-1
15-581	394718	0752102	ROLLINS ENVIRONMENTAL SERVICES	MA 5I	2.48	37.0	27.0	37.0	11-09-93	1.33	1
15-604	394750	0752331	MONSANTO CHEM	10S	12.90	13.5	3.50	13.5	11-10-93	4.23	9
15-608	394719	0752357	MONSANTO CHEM	32S	9.40	9.5	1.00	9.50	11-10-93	3.75	6
15-624	394730	0752111	ROLLINS ENVIRONMENTAL SERVICES	MW 101 S	6.28	23.0	13.0	23.0	11-09-93	5.77	1
15-626	394729	0752101	ROLLINS ENVIRONMENTAL SERVICES	MW 102 S	11.78	19.0	9.00	19.0	11-09-93	10.60	1
15-706	394637	0751916	US GEOLOGICAL SURVEY	SHIVELER W TAB	30.56	12	10.5	12.0	11-04-93	3.44	27
15-707	394800	0751936	US GEOLOGICAL SURVEY	GAVENTA W TAB	7.1	6.75	5.75	6.75	11-11-93	4.33	3
15-714	394707	0752058	ROLLINS ENVIRONMENTAL SERVICES	GG	8.46	13.7	10.7	13.7	11-09-93	4.47	4
15-726	394130	0750921	SMITH, JOHN	AURA ORCHARDS	140	62	52	62	10-27-92	13.72	126
15-781	394003	0751108	GANT, THOMAS	GANT 1	140	52	42	52	11-16-93	15.24	125
15-811	394055	0751412	SHOEMAKER, G	SHOEMAKER 1	140	32	27	32	10-27-93	21.04	119
15-1030	394553	0751920	MATLACK TRUCKING INC	MATLACK TRUCKING MW-1A	47	25	5	25	11-05-93	21.62	25
15-1090	394011	0751423	PRINCE, PAUL E	PRINCE HAND DUG	135	20.8	--	--	11-18-93	19.24	116
15-1091	394018	0751158	ELK TWP	ETWP MW 3	140	25	5	25	11-12-93	11.01	129
15-1092	394018	0751203	ELK TWP	ETWP MW 1	140	25	15	25	11-12-93	16.01	124
15-1093	394044	0750937	WAGNER, JOHN H	WAGNER DOM	140	75	65	75	11-15-93	13.91	126
15-1094	394045	0751241	LAKEVIEW TRAILER PARK	LTP MW 3	130	21	1	21	11-11-93	4.54	125
15-1095	394046	0751237	LAKEVIEW TRAILER PARK	LTP MW 2	130	21	1	21	11-11-93	2.14	128
15-1096	394113	0751558	HARRISONVILLE GRANGE	GRANGE HAND DUG	80	13.15	--	--	11-18-93	10.40	70
15-1097	394120	0751114	MULCAHY, RICH	MULCAHY HAND DUG DOM	100	9.0	--	--	11-15-93	4.10	96
15-1098	394200	0750849	STATE OF NJ - DOT & GLASSBORO BORO	NJDOT MW 5	150.95	15.9	5.9	15.9	10-05-93	12.82	138
15-1099	394200	0750859	STATE OF NJ - DOT	NJDOT MW 4	146.68	15	5	15	10-05-93	9.64	137
15-1100	394242	0751718	GLOUCESTER CO IMPROVEMENT AUTHORITY	GCIA MW 11 S	147.54	73	53	73	11-11-93	55.25	92
15-1101	394257	0751657	GLOUCESTER CO IMPROVEMENT AUTHORITY	GCIA MW 117 D	103.58	50	40	50	11-11-93	23.15	80
15-1102	394316	0752110	LEONARDI, PAUL	HAND DUG IRR	70	14	--	--	11-09-93	8.15	62
15-1103	394349	0751908	GRASSO, JOSEPH S	GRASSO FOODS MW 2	88.70	36	--	--	11-10-93	14.51	74
15-1104	394350	0751916	GRASSO, JOSEPH S	GRASSO FOODS MW 3	102.20	40	--	--	11-10-93	21.50	81
33-116	393949	0752919	STATE OF NJ - NJ WATER POLICY	PENNS GROVE 72	8.43	16.0	--	--	11-09-93	7.07	1
33-192	394051	0752148	KELLY BROTHERS	2-1954	60	65.0	45.0	65.0	11-11-93	16.32	44
33-278	393604	0751324	BISHOP AND SON	1	143	72.0	36.0	72.0	11-12-93	16.14	127
33-342	394236	0752724	STATE OF NJ - NJ WATER POLICY	PENNS GROVE 24	17.94	51.0	46.0	51.0	11-12-93	18.87	-1
33-348	394317	0752619	STATE OF NJ - NJ WATER POLICY	PENNS GROVE 14 OBS	25.40	18.0	--	--	11-12-93	7.18	18
33-361	394205	0752700	PENNS GROVE WSC	SCHULTES 4	13	64.0	44.0	54.0	11-10-93	19.28	-6
33-403	394515	0752717	US ARMY CORPS OF ENGINEERS	EHW-13	8.79	43.0	38.0	43.0	11-19-93	2.63	6
33-408	394450	0752410	PEDRICKTOWN SWIM	SWIM 1	15	36.0	26.0	36.0	11-11-93	13.53	1
33-439	394449	0752351	BOND, WILLARD K	1	25	59.0	49.0	59.0	11-08-93	19.63	5
33-449	394614	0752539	US ARMY CORPS OF ENGINEERS	EHW-5	10.16	37.0	32.0	37.0	11-19-93	6.29	4
33-451	394555	0752626	US ARMY CORPS OF ENGINEERS	EHW-9	11.05	27.0	22.0	27.0	11-19-93	7.15	4
33-460	394247	0752714	PENNS GROVE WSC	PGWSC 1A/RF2A	19	61.0	41.0	61.0	11-10-93	19.83	-1
33-677	393840	0751212	UPPER PITTSGROVE TWP	UPPER PITTS SLF MW1	163.8	40	20	40	11-16-93	30.03	134
33-680	393849	0751328	US GEOLOGICAL SURVEY	USGS COLES FARM OBS-1	144.35	32	27	32	11-11-93	17.88	126
33-698	392906	0752620	READE, A TORREY	HAND DUG	10	11.5	--	--	11-19-93	5.50	5
33-699	393204	0752847	PARUSZEWSKI, RAYMOND	PARUSZEWSKI HAND DUG	10	13	--	--	11-19-93	10.99	-1
33-700	393915	0752441	BUZBY, ANDY	BUZBY HAND DRIVEN	22	21.5	16.5	21.5	11-18-93	14.64	7
33-701	393119	0752315	QUINTON TOWNSHIP	QTWP MW 3	55.3	19.0	4.0	19.0	11-10-93	1.78	54
33-702	393122	0752318	QUINTON TOWNSHIP	QTWP MW 4	53.2	14	4	14	11-10-93	2.57	51
33-703	393124	0752318	QUINTON TOWNSHIP	QTWP MW 5	57.9	13.67	3.67	13.67	11-10-93	6.02	52
33-704	393207	0751844	ALLOWAY SANITARY LANDFILL	ASLF MW 3	96.90	22	--	--	11-10-93	14.61	82
33-705	393213	0751848	ALLOWAY SANITARY LANDFILL	ASLF MW 4	118.40	52	42	52	11-10-93	32.43	86
33-706	393305	0752838	HART, ROBERT N JR	HART HAND DUG	8	11	--	--	11-12-93	9.59	-2
33-707	393326	0752157	ALLOWAY TWP - BD OF ED	REMSTER MW 6	23	27	--	--	11-10-93	3.93	19
33-708	393331	0752155	ALLOWAY TWP - BD OF ED	REMSTER FLD TAG MW 5	33.66	13	3	13	11-10-93	3.59	30
33-709	393351	0753033	ELSINBORO TOWNSHIP - LANDFILL	ELSINBORO MW 4	8.6	23	3	23	11-10-93	5.10	4
33-710	393352	0753029	ELSINBORO TOWNSHIP - LANDFILL	ELSINBORO MW 1	10.74	24.5	4.5	24.5	11-10-93	10.37	0
33-711	393403	0752415	SCHULTZ, TOM	SCHULTZ HAND DUG	10	7.5	--	--	11-19-93	2.07	8
33-712	393408	0751633	TRIANGLE FARMS	TRIANGLE HAND DUG	131	42	--	--	11-12-93	40.24	91
33-713	393414	0752851	SALEM CITY - LANDFILL	SALEM SLF MW 5	3.29	25	5	25	11-09-93	4.34	-1
33-714	393419	0752803	COASTAL MART INC	CM MW3 MARKET & GRIFFITH	12	20.0	5.0	20.0	11-16-93	10.44	2
33-715	393420	0752901	SALEM CITY - LANDFILL	SALEM SLF MW 2	4.57	18.0	8.0	18.0	11-09-93	7.30	-3
33-717	393445	0752731	MANNINGTON MILLS	MM MW 3	5.15	22.0	2.0	22.0	11-08-93	3.51	2
33-718	393448	0752731	MANNINGTON MILLS	MM MW 8	6.34	12.5	2.5	12.5	11-08-93	4.87	1
33-719	393449	0751433	COOPER, JOHNSON	COOPER 1958	140	75	--	--	11-10-93	16.30	124
33-720	393449	0752559	WEIGEL	WEIGEL HAND DUG	18	18	--	--	11-12-93	17.04	1
33-721	393454	0752722	MANNINGTON MILLS	MM MW 11	6.93	13	3	13	11-08-93	5.17	2
33-722	393506	0752749	PIPPIN, SHIRLEY S	PIPPIN HAND DUG 2	11	15.3	--	--	11-18-93	10.89	0
33-723	393510	0752224	SALEM COUNTY UTILITIES AUTHORITY	SCSWF MW 102	24.41	43	33	43	11-10-93	13.15	11
33-724	393518	0752155	SALEM COUNTY UTILITIES AUTHORITY	SCSWF MW 106	26.63	42	32	42	11-10-93	12.70	14
33-725	393551	0752311	WELDON, JAMES	WELDON HAND DUG AT HOUSE	33	27.7	--	--	11-18-93	26.63	6
33-726	393615	0752648	WHITAKER, JEAN	HAND DUG BARN 1	21	25.15	--	--	11-18-93	20.95	0
33-727	393620	0752453	CADWALLADER, ASA	CADWALLADER HAND DUG	24	28	--	--	11-06-93	23.19	1
33-728	393624	0751845	PILESGROVE & WOODSTOWN	PILESGROVE SLF MW 7	104.40	33.04	18.04	33.04	11-12-93	5.63	99
33-729	393639	0751833	PILESGROVE & WOODSTOWN	PILESGROVE SLF MW 6	110.80	24.06	14.06	24.06	11-12-93	5.88	105
33-730	393653	0752242	WILSON, ROBERT	WILSON HAND DUG	40	20	--	--	11-18-93	16.50	24
33-731	393740	0751742	PAULDING, HARRY	PAULDING HAND DUG	110	17	--	--	11-12-93	13.20	97
33-732	393754	0751640	PAULDING BROS	PBROS HAND DUG DOM	110	29	--	--	11-12-93	25.52	84
33-733	393801	0753047	COASTAL MART INC	CM MW1 RT49 & MAHONEY RD	10	17	2	17	11-16-93	10.56	-1
33-734	393815	0753242	PENNSVILLE TWP	PTWP SLF MW 1	5.0	13	3	13	11-17-93	5.30	0
33-735	393819	0753242	PENNSVILLE TWP	PTWP SLF MW 2	6.0	18	8	18	11-17-93	6.97	-1
33-736	393825	0751342	GUENTHER, PAUL	GUENTHER DOM	150	40	27	37	11-12-93	17.60	132
33-737	393825	0752551	FICHERA, FRANK	FICHERA HAND DUG	20	11.5	--	--	11-18-93	11.18	9
33-738	393841	0751220	UPPER PITTSGROVE TWP	UPTWP SLF MW 5	139.9	16	1	16	11-16-93	8.64	131
33-739	393851	0753110	COASTAL MART INC	CM MW1 BROADWAY & FIRST	9	13.6	3.6	13.6	11-16-93	8.06	1
33-740	393854	0751836	COASTAL MART INC	CM MW6 RT 40 & E LAKE	58	20	5	20	11-16-93	8.95	49
33-741	393953	0751815	CARROLL, FRANK	CARROLL HAND DUG	130	14.1	--	--	11-18-93	6.77	123
33-742	394042	0751728	KELLY BROTHERS	KELLY BROS HAND DUG	80	31.5	--	--	11-18-93	30.74	49
33-743	394043	0753037	ATLANTIC CITY ELECTRIC CO	ACEC DEEPWATER MW 1	11.02	24.0	9.0	24.0	11-12-93	8.62	2
33-744	394044	0752449	STORMY ACRES	SA HAND DUG	32	12.4	--	--	12-09-93	9.85	22
33-745	394054	0753028	ATLANTIC CITY ELECTRIC CO	ACEC DEEPWATER MW 3	9.18	18	3	18	11-12-93	6.63	3
33-746	394058	0753036	ATLANTIC CITY ELECTRIC CO	ACEC DEEPWATER MW 2	7.65	18	3	18	11-12-93	5.35	2
33-747	394104	0753035	ATLANTIC CITY ELECTRIC CO	ACEC DEEPWTR FLD TAG MW4	8.5	18	3	18	11-12-93	5.80	3
33-748	394119	0752301	BANFF, JAMES	BANFF HAND DUG DOM	65	16.3	--	--	11-18-93	14.30	51
33-749	394144	0752349	SUN REFINING AND MARKETING CO	NJTP 1N MW9	40	20	5	20	11-15-93	10.00	30
33-750	394255	0752722	PENNS GROVE WATER CO	RF 3A	20	56	36	56	11-10-93	14.35	6
33-751	394424	0752255	OLDMANS TWP	OTWP SLF MW 4	30.28	40	30	40	11-10-93	28.93	1
33-752	394432	0752253	OLDMANS TWP	OTWP SLF MW 2	12.24	18	8	18	11-17-93	4.68	8
33-753	394534	0752526	EXXON CHEMICAL CO - TOMAH PRODUCTS INC	PEDRICKTOWN RD MW 1	10	33	3	33	11-18-93	3.60	6
33-754	394536	0752525	EXXON CHEMICAL CO - TOMAH PRODUCTS INC	PEDRICKTOWN RD MW 3	11	28	3	28	11-18-93	4.63	6
33-755	394537	0752521	EXXON CHEMICAL CO - TOMAH PRODUCTS INC	PEDRICKTOWN RD MW 5	10	23	3	23	11-18-93	3.48	7
33-756	394537	0752523	EXXON CHEMICAL CO - TOMAH PRODUCTS INC	PEDRICKTOWN RD MW 11	12	24	14	24	11-18-93	5.54	6
33-757	394537	0752527	EXXON CHEMICAL CO - TOMAH PRODUCTS INC	PEDRICKTOWN RD MW 2	10	23	3	23	11-18-93	3.59	6
33-758	394538	0752522	EXXON CHEMICAL CO - TOMAH PRODUCTS INC	PEDRICKTOWN RD MW 7	10	25	5	25	11-18-93	3.72	6
33-759	394539	0752521	EXXON CHEMICAL CO - TOMAH PRODUCTS INC	PEDRICKTOWN RD MW 8	8	12	8	12	11-18-93	1.39	7
33-760	394540	0752522	EXXON CHEMICAL CO - TOMAH PRODUCTS INC	PEDRICKTOWN RD MW 6	8	25	5	25	11-18-93	1.63	6
33-761	394539	0752523	EXXON CHEMICAL CO - TOMAH PRODUCTS INC	PEDRICKTOWN RD MW 12 S	10	40	20	40	11-18-93	3.70	6
33-762	394539	0752524	EXXON CHEMICAL CO - TOMAH PRODUCTS INC	PEDRICKTOWN RD MW 10	10	30	20	30	11-18-93	3.69	6
33-763	394539	0752525	EXXON CHEMICAL CO - TOMAH PRODUCTS INC	PEDRICKTOWN RD MW 4 S	10	23	3	23	11-18-93	3.76	6
33-764	394540	0752523	EXXON CHEMICAL CO - TOMAH PRODUCTS INC	PEDRICKTOWN RD MW 13	10	28	3	28	11-18-93	3.73	6
33-765	394546	0752525	GEON	BFG MW 7 A	9	28	18	28	11-10-93	7.40	2
33-766	394601	0752525	GEON	BFG XA/GEON MW 17A	10	13.5	8	13	11-10-93	2.59	7

[1] Values of elevation of land surface listed as whole numbers were determined by visual inspection of a 1:24,000 topographic map or by altimeter. Values listed to the tenth or hundredth place were determined from level measurements.

Table 2-2. Elevations of water levels measured at stream sites in the Salem River study area, New Jersey, December 1993
[Elevations of water levels are rounded to the nearest whole number. Site locations are shown in fig. 2-1]

Site number	Latitude	Longitude	Date measured	Elevation of water level (feet above sea level)	Site number	Latitude	Longitude	Date measured	Elevation of water level (feet above sea level)
STM 1	393415	0752223	12-02-93	9	STM 91	393949	0751630	12-07-93	100
STM 2	393601	0752210	12-02-93	14	STM 92	394014	0751616	12-07-93	97
STM 3	393643	0752217	12-02-93	31	STM 93	394036	0751501	12-07-93	67
STM 5	393618	0752025	12-02-93	44	STM 94	394117	0751559	12-07-93	77
STM 6	393500	0752011	12-02-93	21	STM 95	394137	0751638	12-07-93	69
STM 7	393602	0751930	12-02-93	47	STM 96	394155	0751554	12-07-93	96
STM 8	393654	0751928	12-02-93	59	STM 97	394301	0751552	12-07-93	69
STM 9	393649	0751720	12-02-93	82	STM 98	394410	0751522	12-07-93	11
STM 10	393717	0751607	12-02-93	64	STM 99	394414	0751605	12-07-93	27
STM 11	393654	0751518	12-02-93	82	STM100	394447	0751604	12-07-93	22
STM 12	393555	0751548	12-02-93	96	STM101	394342	0751750	12-07-93	54
STM 13	393553	0751757	12-02-93	52	STM102	394259	0751811	12-07-93	86
STM 14	393528	0751747	12-02-93	48	STM103	394356	0751902	12-07-93	51
STM 15	393512	0751821	12-02-93	40	STM104	394439	0751919	12-07-93	36
STM 16	393443	0751836	12-02-93	29	STM106	394351	0752133	12-07-93	18
STM 17	393359	0751903	12-02-93	48	STM107	394304	0752130	12-07-93	10
STM 18	393318	0752138	12-02-93	21	STM108	394355	0752007	12-07-93	74
STM 19	393234	0752118	12-02-93	18	STM109	394314	0752040	12-07-93	69
STM 20	393109	0752147	12-02-93	67	STM110	394321	0751928	12-07-93	80
STM 21	393037	0752105	12-02-93	58	STM111	394229	0752026	12-07-93	12
STM 22	393032	0752221	12-02-93	28	STM112	394231	0751916	12-07-93	35
STM 24	393004	0751932	12-02-93	65	STM113	394229	0751838	12-08-93	59
STM 25	393229	0751850	12-02-93	dry	STM114	394215	0751748	12-07-93	85
STM 26	393200	0751831	12-02-93	79	STM115	394158	0751729	12-07-93	84
STM 27	393324	0751843	12-02-93	49	STM116	394107	0751733	12-08-93	26
STM 28	393437	0751508	12-02-93	110	STM117	394045	0751801	12-08-93	34
STM 29	393335	0752024	12-02-93	15	STM118	394028	0751739	12-08-93	47
STM 30	393722	0751433	12-02-93	106	STM119	393914	0751818	12-08-93	54
STM 31	393609	0751417	12-02-93	113	STM120	393903	0751901	12-08-93	44
STM 32	392942	0751955	12-02-93	54	STM121	393947	0751911	12-08-93	61
STM 33	392921	0751929	12-03-93	55	STM122	394130	0751850	12-08-93	20
STM 34	392827	0751920	12-03-93	54	STM123	394132	0752013	12-08-93	18
STM 35	392823	0752119	12-03-93	16	STM124	394118	0752041	12-08-93	56
STM 36	392750	0752149	12-03-93	2	STM125	394143	0752202	12-08-93	44
STM 37	392738	0752029	12-03-93	43	STM126	394030	0752053	12-08-93	52
STM 38	392715	0752104	12-03-93	38	STM127	394002	0752117	12-08-93	37
STM 39	392702	0752053	12-03-93	59	STM128	393958	0752200	12-08-93	38
STM 40	392637	0752204	12-03-93	dry	STM129	393937	0752224	12-08-93	19
STM 41	392622	0752118	12-03-93	50	STM130	393935	0752044	12-08-93	24
STM 42	392557	0752010	12-03-93	48	STM131	394004	0751945	12-08-93	44
STM 43	392937	0752239	12-03-93	27	STM132	393857	0751958	12-08-93	21
STM 44	392837	0752251	12-03-93	16	STM133	393734	0751902	12-08-93	70
STM 45	392649	0752303	12-03-93	15	STM134	393756	0751924	12-08-93	43
STM 46	393149	0752406	12-03-93	6	STM135	393815	0751959	12-08-93	28
STM 47	393053	0752325	12-03-93	16	STM136	393822	0752059	12-08-93	23
STM 48	393003	0752306	12-03-93	13	STM137	393754	0752128	12-08-93	38
STM 49	393103	0752438	12-03-93	3	STM138	393855	0752229	12-08-93	8
STM 50	393158	0752411	12-03-93	9	STM139	393957	0751457	12-07-93	73
STM 51	393313	0752353	12-03-93	13	STM140	394247	0751959	12-07-93	40
STM 52	393421	0752335	12-03-93	12	STM141	393915	0752338	12-08-93	14
STM 53	393546	0752235	12-03-93	3	STM142	393911	0752435	12-08-93	dry
STM 54	393646	0752256	12-03-93	13	STM143	393912	0752525	12-08-93	27
STM 55	393702	0752402	12-03-93	3	STM144	393816	0752330	12-08-93	dry
STM 56	394246	0751447	12-06-93	58	STM145	393804	0752342	12-08-93	40
STM 57	394319	0751418	12-06-93	28	STM146	393732	0752355	12-08-93	18
STM 58	394410	0751330	12-06-93	23	STM147	393750	0752424	12-09-93	10
STM 59	394421	0751425	12-06-93	19	STM148	393829	0752505	12-08-93	15
STM 60	394440	0751342	12-06-93	66	STM149	393939	0752639	12-08-93	11
STM 61	394435	0751253	12-06-93	67	STM150	393825	0752950	12-08-93	9
STM 62	394353	0751201	12-06-93	83	STM151	394111	0752826	12-08-93	7
STM 63	394318	0751155	12-06-93	62	STM152	394250	0752551	12-08-93	19
STM 64	394252	0751141	12-06-93	61	STM153	394233	0752539	12-08-93	30
STM 65	394231	0751205	12-06-93	54	STM154	394206	0752522	12-08-93	16
STM 66	394230	0751011	12-06-93	105	STM155	394207	0752441	12-08-93	20
STM 67	394201	0751017	12-06-93	103	STM156	394224	0752410	12-08-93	22
STM 68	394156	0750907	12-06-93	140	STM157	394326	0752421	12-08-93	21
STM 69	394131	0750856	12-06-93	138	STM159	394310	0752331	12-08-93	36
STM 70	394017	0751136	12-06-93	117	STM160	394245	0752316	12-08-93	42
STM 71	394135	0751224	12-06-93	95	STM162	394216	0752303	12-08-93	40
STM 72	394219	0751325	12-06-93	51	STM163	394141	0752240	12-09-93	32
STM 73	394236	0751345	12-06-93	41	STM164	394121	0752417	12-09-93	15
STM 74	394304	0751337	12-06-93	62	STM165	394033	0752403	12-09-93	18
STM 75	394203	0751349	12-06-93	54	STM166	393951	0752248	12-09-93	17
STM 76	394138	0751323	12-06-93	67	STM167	394236	0752746	12-09-93	dry
STM 77	394105	0751413	12-06-93	118	STM168	394307	0752635	12-09-93	12
STM 78	394101	0751459	12-07-93	78	STM169	394332	0752640	12-09-93	18
STM 79	394033	0751432	12-07-93	89	STM170	394332	0752601	12-09-93	20
STM 80	393944	0751353	12-06-93	89	STM171	394358	0752737	12-09-93	15
STM 81	393910	0751305	12-07-93	113	STM173	394446	0752711	12-09-93	8
STM 82	393951	0751243	12-07-93	111	STM174	394027	0752308	12-09-93	34
STM 83	393852	0751304	12-07-93	118	STM175	394611	0752253	12-09-93	6
STM 84	393739	0751509	12-02-93	86	STM176	394536	0752115	12-09-93	15
STM 85	393839	0751508	12-07-93	95	STM177	394534	0751900	12-09-93	13
STM 86	393820	0751636	12-07-93	67	STM178	394557	0751929	12-09-93	6
STM 87	393803	0751658	12-02-93	60	STM179	394603	0751858	12-09-93	27
STM 88	393736	0751730	12-07-93	58	STM180	394529	0751752	12-09-93	21
STM 89	393832	0751745	12-07-93	47	STM181	394510	0751732	12-09-93	24
STM 90	393916	0751732	12-02-93	79					

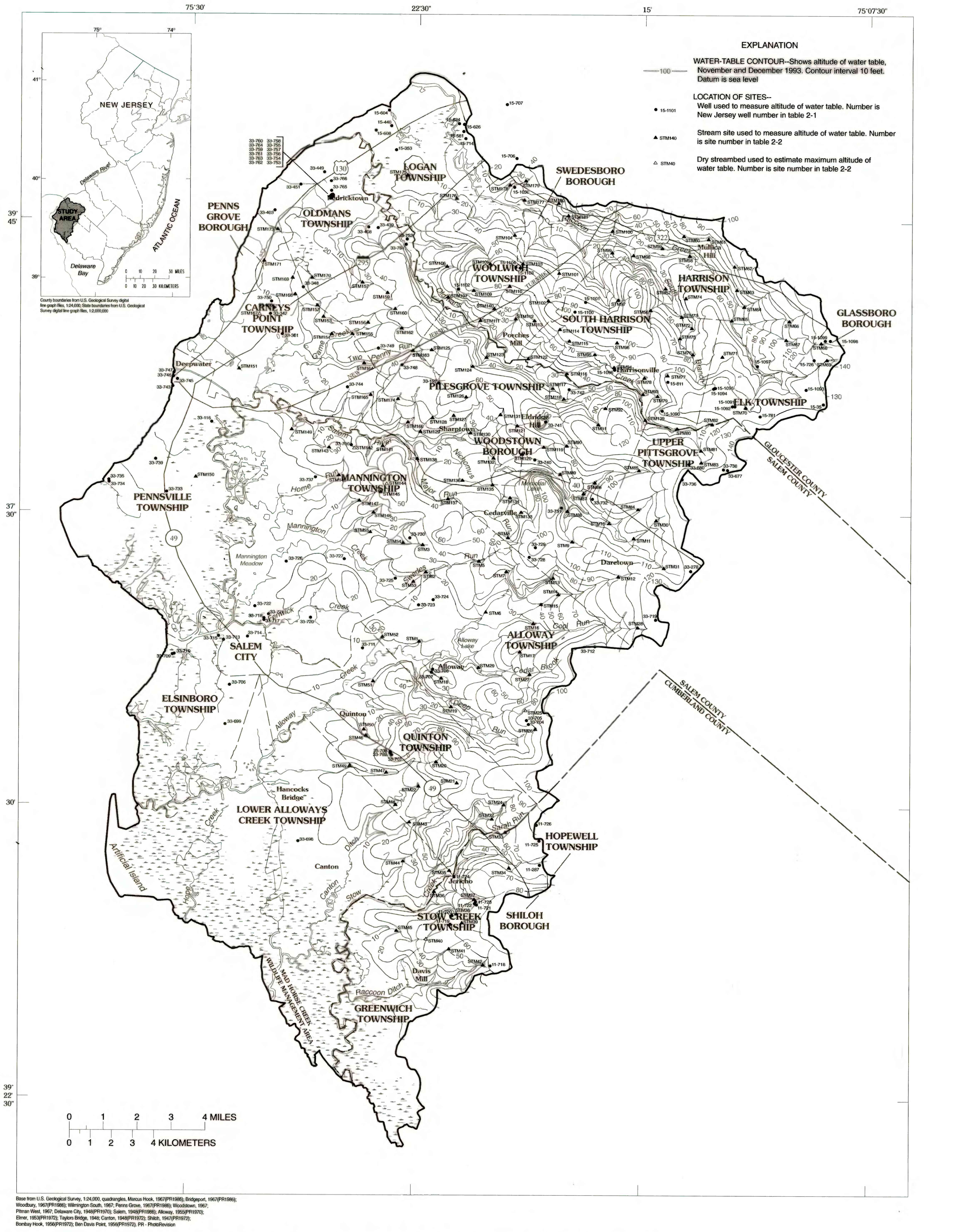

Figure 2-1. Map of the Salem River study area, New Jersey, showing well and stream-site locations and the altitude of the water table in the unconfined aquifer system, October, November and December 1993.

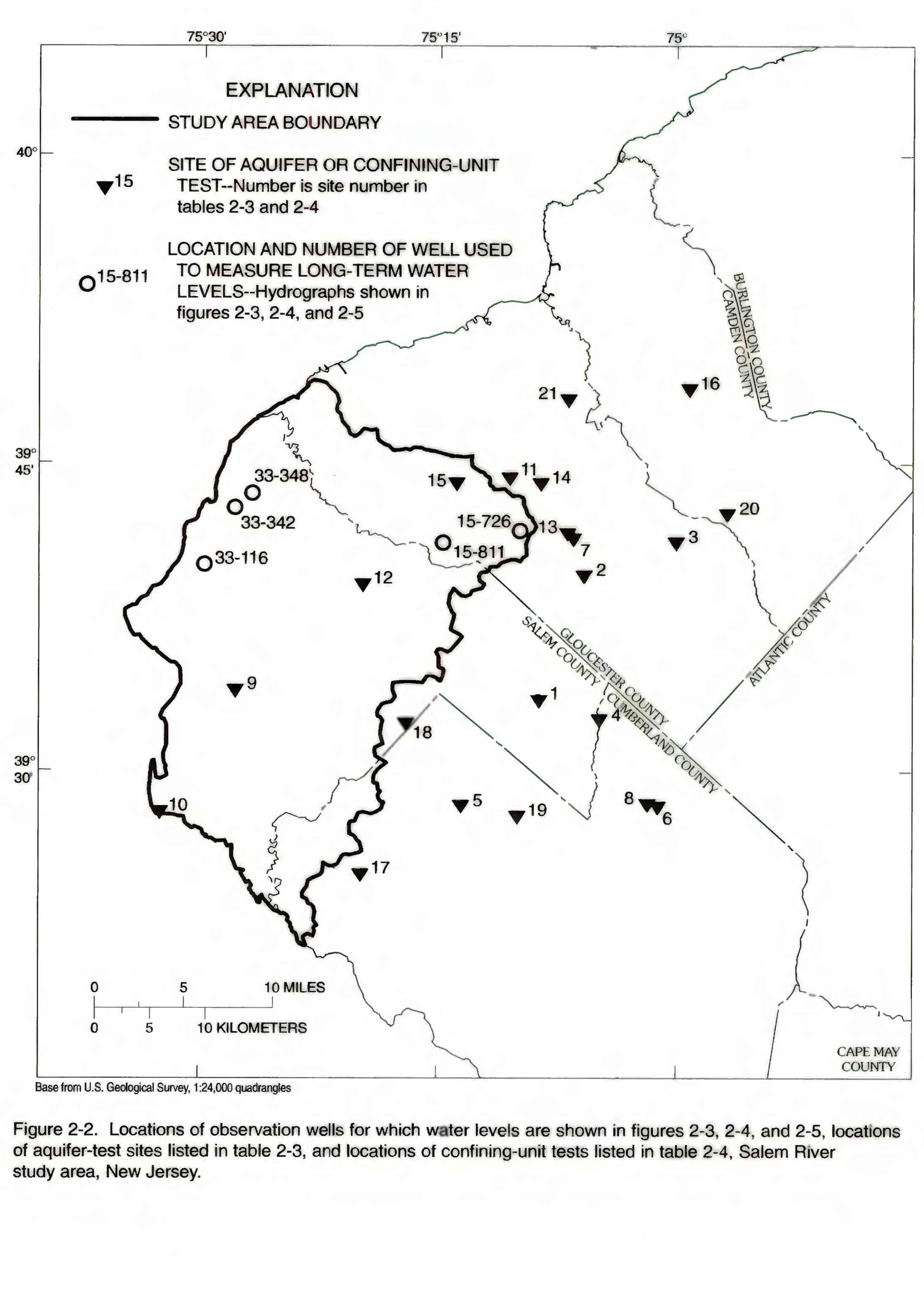

Figure 2-2. Locations of observation wells for which water levels are shown in figures 2-3, 2-4, and 2-5, locations of aquifer-test sites listed in table 2-3, and locations of confining-unit tests listed in table 2-4, Salem River study area, New Jersey.

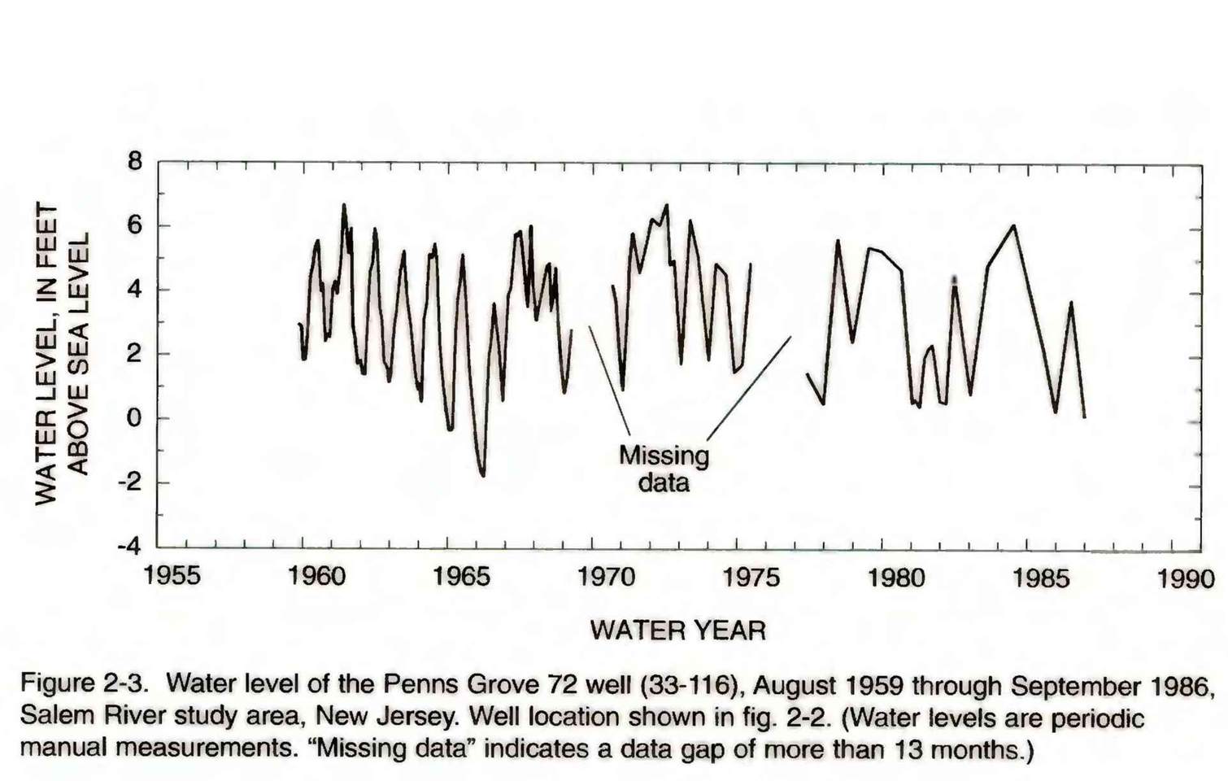

Figure 2-3. Water level of the Penns Grove 72 well (33-116), August 1959 through September 1986, Salem River study area, New Jersey. Well location shown in fig. 2-2. (Water levels are periodic manual measurements. "Missing data" indicates a data gap of more than 13 months.)

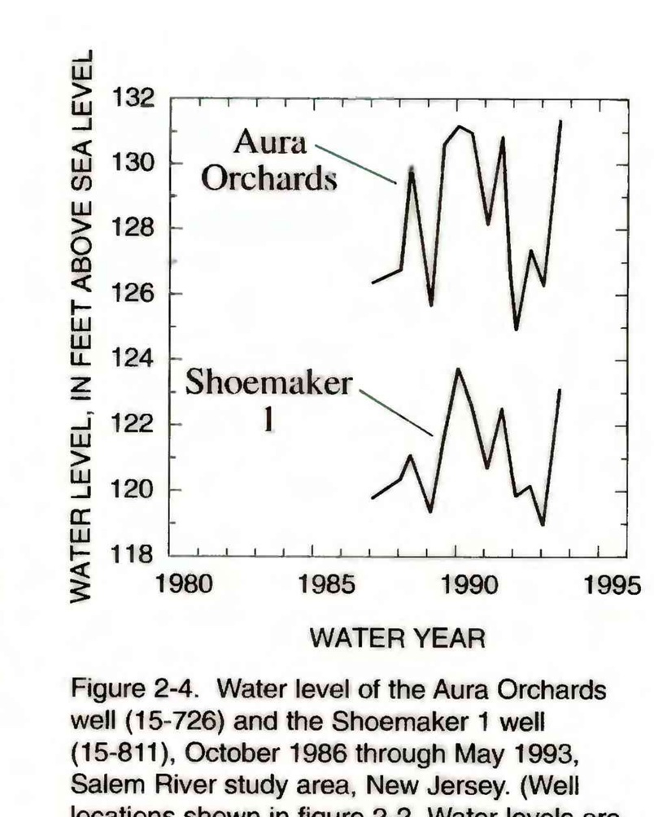

Figure 2-4. Water level of the Aura Orchards well (15-726) and the Shoemaker 1 well (15-811), October 1986 through May 1993, Salem River study area, New Jersey. (Well locations shown in figure 2-2. Water levels are periodic manual measurements.)

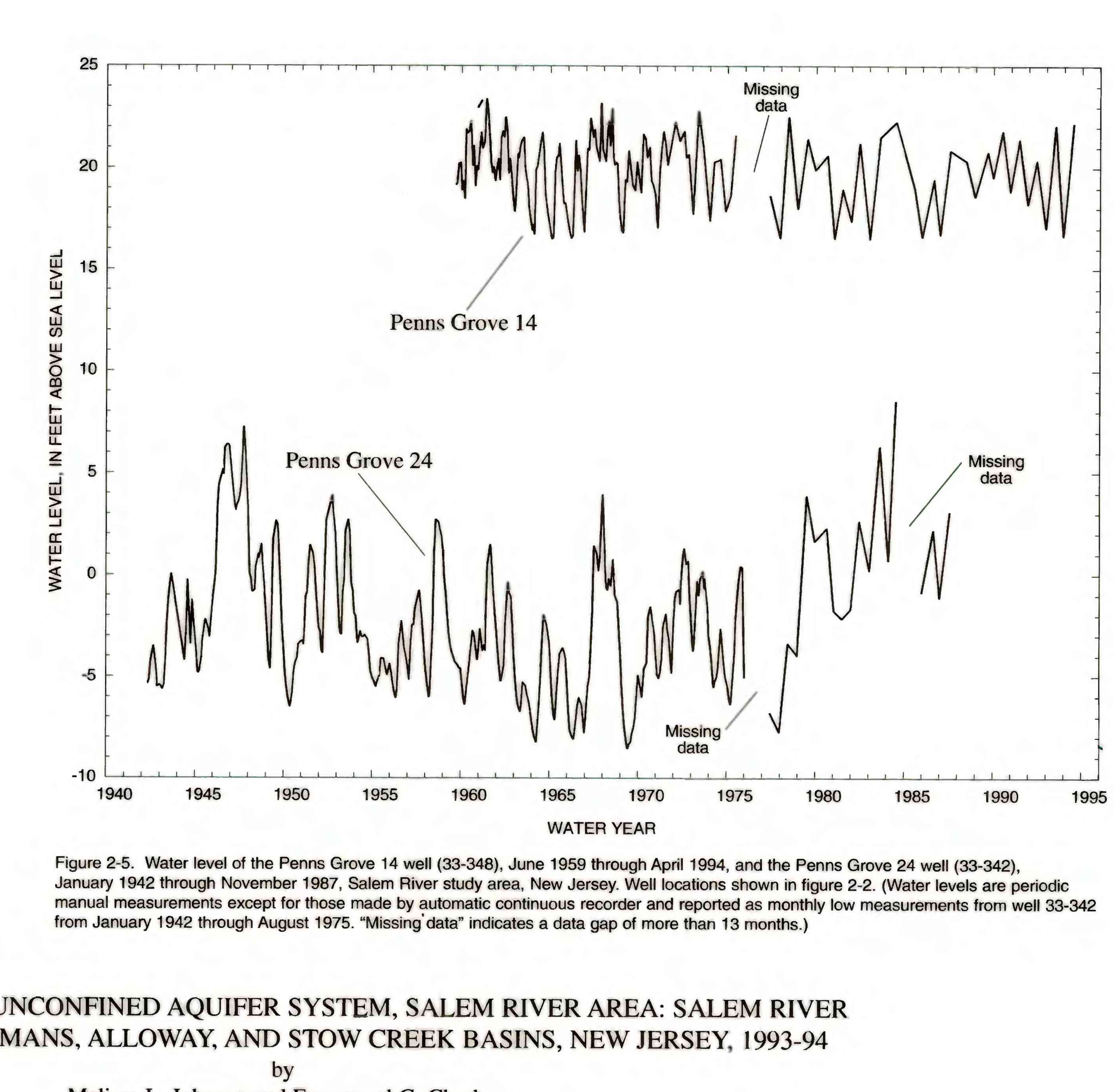

Figure 2-5. Water level of the Penns Grove 14 well (33-348), June 1959 through April 1994, and the Penns Grove 24 well (33-342), January 1942 through November 1987, Salem River study area, New Jersey. Well locations shown in figure 2-2. (Water levels are periodic manual measurements except for those made by automatic continuous recorder and reported as monthly low measurements from well 33-342 from January 1942 through August 1975. "Missing data" indicates a data gap of more than 13 months.)

Table 2-3. Hydraulic properties of aquifers in and near the Salem River study area, New Jersey
[Site locations shown in fig. 2-2; ft/d, foot per day; ft^2/d; foot squared per day; --, missing data]

Site number	Site location	Date of test	Method of evaluation[1]	Horizontal hydraulic conductivity (ft/d)	Transmissivity (ft^2/d)	Storage coefficient (dimensionless)	Reference
			Kirkwood-Cohansey aquifer system				
1	Paulaitis Farm, Elmer Borough, Salem County	11/59	Theis, Hantush and Jacob	150	4,300	0.0003	Rhodehamel (1973, p. 55)
2	Clayton Borough, Gloucester County	11/9/56	Jacob	130	4,000	.0001	Rhodehamel (1973, p. 55)
2	Clayton Borough, Gloucester County	8/7/57	Jacob	250	7,500	--	Rhodehamel (1973, p. 55)
3	Williamstown, Gloucester County	11/12/51	Jacob	90	8,300	--	Rhodehamel (1973, p. 55)
4	Brotmanville, Salem County	1966	Theis	150	4,300	.044	Rhodehamel (1973, p. 55)
5	Upper Deerfield Township, Cumberland County	11/2/92	Hantush and Jacob	[2]68	[2]10,212	[2].00095	[3]Database file number 40
6	Vineland City, Cumberland County	6/22/88	Hantush and Jacob	99	19,800	.000468	[3]Database file number 6A
7	Glassboro Borough, Gloucester County	7/13/90	Hantush and Jacob	[2]111	[2]5,803	[2].0006	[3]Database file number 57
8	Millville City, Cumberland County	7/21/93	Theis	[4]121	[4]9,657	[4].000641	[3]Database file number 64
8	Millville City, Cumberland County	7/21/93	Hantush and Jacob	[4]109	[4]8,695	[4].000847	[3]Database file number 64
			Wenonah-Mount Laurel aquifer				
9	Salem City, Salem County	3/65	Jacob, Hantush and Jacob, Cooper, and Walton	[2]13	[2]1,200	[2].000035	Rosenau and others (1969, p. 40)
10	Artificial Island, Salem County	1968	Aquifer test	19	940	--	Farlekas and others (1976, p. 70)
11	Mantua Township, Gloucester County	--	Hantush and Jacob	[4]21	[4]1,478	[4].000244	[3]Database file number 18
11	Mantua Township, Gloucester County	5/1/89	Hantush and Jacob	6.7	667	.000142	[3]Database file number 4
11	Mantua Township, Gloucester County	10/6/92	Theis	7.7	538	.000273	[3]Database file number 69
11	Mantua Township, Gloucester County	10/6/92	Hantush and Jacob	9	636	.000263	[3]Database file number 69
11	Mantua Township, Gloucester County	10/6/92	Moench	[4]10.9	[4]760	[4].000187	[3]Database file number 69
11	Mantua Township, Gloucester County	11/2/92	Theis	12.4	866	.000136	[3]Database file number 70
11	Mantua Township, Gloucester County	11/2/92	Hantush and Jacob	[4]10.9	[4]772	[4].000333	[3]Database file number 70
11	Mantua Township, Gloucester County	11/2/92	Moench	10.8	757	.000146	[3]Database file number 70
11	Mantua Township, Gloucester County	11/2/92	Papadopulos-Cooper	12.6	879	.000128	[3]Database file number 70
11	Mantua Township, Gloucester County	10/19/92	Theis	14.3	1,000	.0002	[3]Database file number 71
11	Mantua Township, Gloucester County	10/19/92	Hantush and Jacob	[4]12.0	[4]839	[4].000227	[3]Database file number 71
11	Mantua Township, Gloucester County	10/19/92	Moench	[4]12.5	[4]878	[4].000181	[3]Database file number 71
13	Glassboro Borough, Gloucester County	8/15/90	Theis	[2]16	[2]969	[2].000244	[3]Database file number 58
13	Glassboro Borough, Gloucester County	8/15/90	Papadopulos-Cooper	[2]17	[2]1,007	[2].000118	[3]Database file number 58
14	Pitman Borough, Gloucester County	9/14/93	Hantush and Jacob	[4]7	[4]632	[4].000244	[3]Database file number 72
15	Harrison Township, Gloucester County	10/25/93	Hantush and Jacob	5	411	.000256	[3]Database file number 74
15	Harrison Township, Gloucester County	10/25/93	Moench	6	488	.000044	[3]Database file number 74
12	Woodstown Borough, Salem County	6/8/93	Hantush and Jacob	[4]5.1	[4]512	[4].00151	[3]Database file number 89
			Englishtown aquifer system				
16	Clementon Borough, Camden County	--	Hurr	--	[4]1,720	[5].000027	Farlekas and others (1976, p. 61)
			Upper Potomac-Raritan-Magothy aquifer				
15	Harrison Township, Gloucester County	3/23/93	Hantush and Jacob	87	8,749	.000958	[3]Database file number 73
15	Harrison Township, Gloucester County	3/23/93	Moench	99	9,908	.00044	[3]Database file number 73
15	Harrison Township, Gloucester County	3/23/93	Papadopulos-Cooper	161	16,070	.000057	[3]Database file number 73

[1] Methods of evaluation are explained in Driscoll, 1986.
[2] Average of values from three observation wells.
[3] New Jersey Geological Survey Hydroparameters Database System: unpublished data on file at the New Jersey Geological Survey, New Jersey Department of Environmental Protection, Trenton, N.J.
[4] Average of values from two observation wells.
[5] Assumed storage coefficient for estimating transmissivity.

Table 2-4. Hydraulic properties of confining units in and near the Salem River study area, New Jersey
[Site locations shown in fig. 2-2; ft, feet; ft/d, foot per day; --, missing data]

Site number	Site location	Depth of core (ft)	Vertical hydraulic conductivity[1] (ft/d)	Reference
		Alloway Clay Member of Kirkwood Formation		
17	Sheppards Mill Pond, Cumberland County	105	0.000031	Nemickas (1974, p. 16); Nemickas and Carswell (1976, p. 5)
18	Bostwich Lake, Salem County	90	.00002	Nemickas (1974, p. 16); Nemickas and Carswell (1976, p. 5)
18	Bostwich Lake, Salem County	165	.000036	Nemickas (1974, p. 16); Nemickas and Carswell (1976, p. 5)
19	Vocational School, Cumberland County	210	.000052	Nemickas, (1974, p. 16); Nemickas and Carswell (1976, p. 5)
		Navesink Formation		
20	Winslow Township, Camden County	460-482	[2].087	Farlekas and others (1976, p. 133)
		Hornerstown Sand		
20	Winslow Township, Camden County	430-452	[2].24	Farlekas and others (1976, p. 133)
		Navesink Formation and Hornerstown Sand		
9	Salem City, Salem County	--	[3].056	Rosenau and others (1969, p. 40)
21	Deptford Township, Gloucester County	5-22	[4].0140	[5]Database file number 19
		Marshalltown Formation		
20	Winslow Township, Camden County	610-612	.13	Farlekas and others (1976, p. 133)
		Merchantville Formation		
20	Winslow Township, Camden County	750-792	[6].0002	Farlekas and others (1976, p. 133)

[1] All values determined by laboratory test, except where noted otherwise.
[2] Average of values from three core samples.
[3] Value determined by aquifer test.
[4] Average of values from five core samples.
[5] New Jersey Geological Survey Hydroparameters Database System: unpublished data on file at the New Jersey Geological Survey, New Jersey Department of Environmental Protection, Trenton, N.J.
[6] Average of values from four core samples.

HYDROLOGY OF THE UNCONFINED AQUIFER SYSTEM, SALEM RIVER AREA: SALEM RIVER AND RACCOON, OLDMANS, ALLOWAY, AND STOW CREEK BASINS, NEW JERSEY, 1993-94

by
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1997