HYDROLOGIC APPRAISAL OF THE PINE BARRENS, SUFFOLK COUNTY, NEW YORK

by Richard K. Krulikas

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 84-4271

Prepared in cooperation with

LONG ISLAND REGIONAL PLANNING BOARD

Syosset, New York

1986

UNITED STATES DEPARTMENT OF THE INTERIOR

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CONVERSION FACTORS AND ABBREVIATIONS

Multiply inch-pound units	by	To obtain SI units
	Length	
foot (ft)	0.3048	meter (m)
	Area	
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
gallon (gal)	0.003785	cubic meter (m^3)
	Flow	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
gallon per minute (gal/min)	0.06308	liter per second (L/s)
gallon per day (gal/d)	0.003785	cubic meter per day (m^3/d)
million gallons per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)

Abbreviation

picocuries per liter (pci/L)

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Abstract

The ground-water resources of the Pine Barrens, in southeastern Suffolk County, were appraised during 1982-83 for their potential for use as a supply of potable water. The study area encompasses approximately 50 square miles. The Precambrian bedrock is overlain by Cretaceous, Pleistocene, and Holocene deposits. The surficial material consists of morainal and outwash deposits overlain by recent beach and marsh deposits.

The ground-water reservoir consists of three aquifers--the Lloyd and the Magothy of Cretaceous age and the upper glacial of Pleistocene age. The water is generally of suitable quality for drinking and most other uses except in several localized spots where point-source contamination has been documented.

Precipitation is the sole source of recharge. Average annual precipitation recorded in the area during 1943-82 was 43 inches, about half of which reaches the ground-water reservoir. Overland runoff is estimated to be 0.5 inches per year, and evapotranspiration 23 inches per year.

Total public water-supply withdrawal in the area in 1982 is estimated to have been 9.09 million gallons per day (Mgal/d). The upper glacial aquifer is the major source of public water; pumpage in 1982 was 7.88 Mgal/d; pumpage from the Magothy was 1.02 Mgal/d, and pumpage from the Lloyd aquifer was 0.19 Mgal/d.

Stream discharge is measured periodically at 17 streamflow-measurement sites on the 11 streams in the Pine Barrens.

INTRODUCTION

More than 2.8 million people on Long Island depend on ground water for drinking water and most other uses. Long Island's aquifers have been designated as "sole source" by the U.S. Environmental Protection Agency. Increasing urbanization and industrialization have altered the quality of water in parts of the aquifers, and some of the water has become impotable. Ground-water planners and managers are, therefore, in search of areas of high-quality potable ground water.

One area proposed as a source of high-quality ground water is a part of Long Island's Pine Barrens in southeastern Suffolk County (fig. 1), which is a relatively undisturbed woodland of pine and oak. Because this is the least populated and least industrialized part of the island, its ground water is probably of high quality. Proper development and management of this natural resource and protection of its quality will require thorough understanding of the geohydrologic environment and its chemical characteristics.

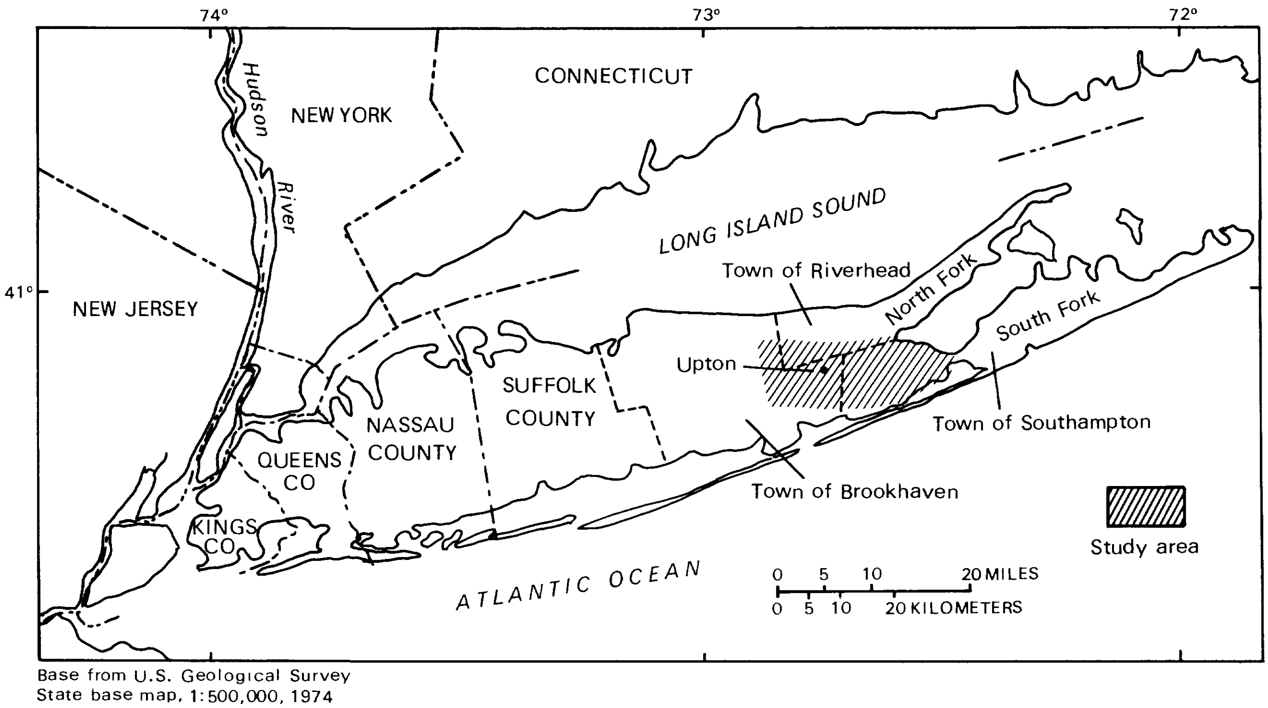


Figure 1.--Major geographic features of Long Island and location of Pine Barrens.

Purpose and Scope

From April 1982 through September 1983, the U.S. Geological Survey investigated the water resources of the Pine Barrens in cooperation with the Long Island Regional Planning Board to (1) describe the geohydrologic units and their relationships; (2) delineate the occurrence and movement of fresh ground water and surface water; and (3) evaluate the chemical quality of several selected properties and constituents of the water in the major aquifers, and (4) identify areas of point-source contamination.

This report summarizes the results of most aspects of the study. Pertinent data on the geology and hydrology of the area are shown on a series of maps, geologic sections, and hydrographs of wells. Certain water-management implications are discussed in the context of these data.

Previous Studies

The geology of the Pine Barrens and the surrounding area were first studied by Fuller (1914); his report describes the Pleistocene units and includes a surficial geologic map. A later description of the subsurface geology (including ground water) is presented in Suter, deLaguna, and Perlmutter (1949). Others who have written on the geology and ground water of the area are Holzmacher, McLendon, and Murrell (1968) and Jensen and Soren (1974).

Several water-table maps of Long Island that include the Pine Barrens have been published, including Nakao and Erlichman (1978) for 1975 and Donaldson and Koszalka (1982a, b, c) for 1979.

Other hydrologic investigations of this area are described by Cohen, Franke, and McClymonds (1969), who studied the effects of the 1962-66 drought; Prince (1976), who depicted the potentiometric surface of the Magothy aquifer; and Donaldson and Koszalka (1982a, b, c), who depicted the water-table altitude and the potentiometric surface of the Lloyd and Magothy aquifers. Some of the streamflow and water-quality data presented herein have been published by the U.S. Geological Survey (1981, 1982, 1983).

Method of Investigation

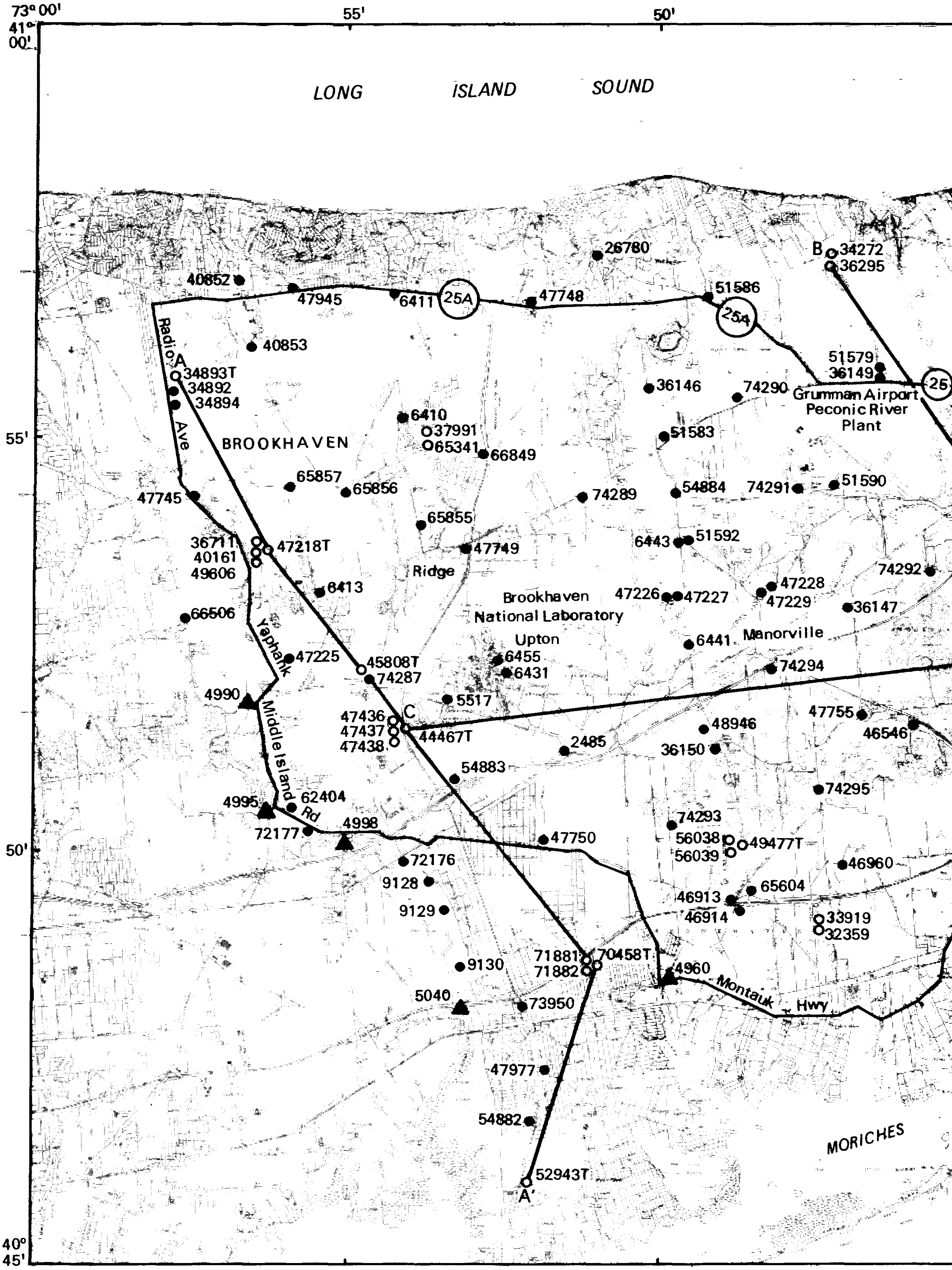
Wells in the Pine Barrens were inventoried to determine which would be most suitable for water-level measurements. An additional 21 wells were drilled to improve the observation-well network. (These additional wells are those having well numbers greater than S74287.) Locations of all hydrologic data sites are shown in figure 2.

Ground-water levels in the upper glacial (water-table) aquifer were measured from April 1982 through September 1983. Water-level data from 112 observation wells measured in September 1983 were used to make a water-table map (fig. 9), and water-level data from five wells screened in the underlying Magothy aquifer were used to make a potentiometric-surface map (fig. 10). All water-level data are given in table 8 (at end of report). All well measurements were adjusted to sea level to uniformly define the water-table and potentiometric-surface altitude.

Ground-water and surface-water samples were analyzed for physical and chemical properties. The analyses were made by the Suffolk County Department of Health Services and the Suffolk County Water Authority.

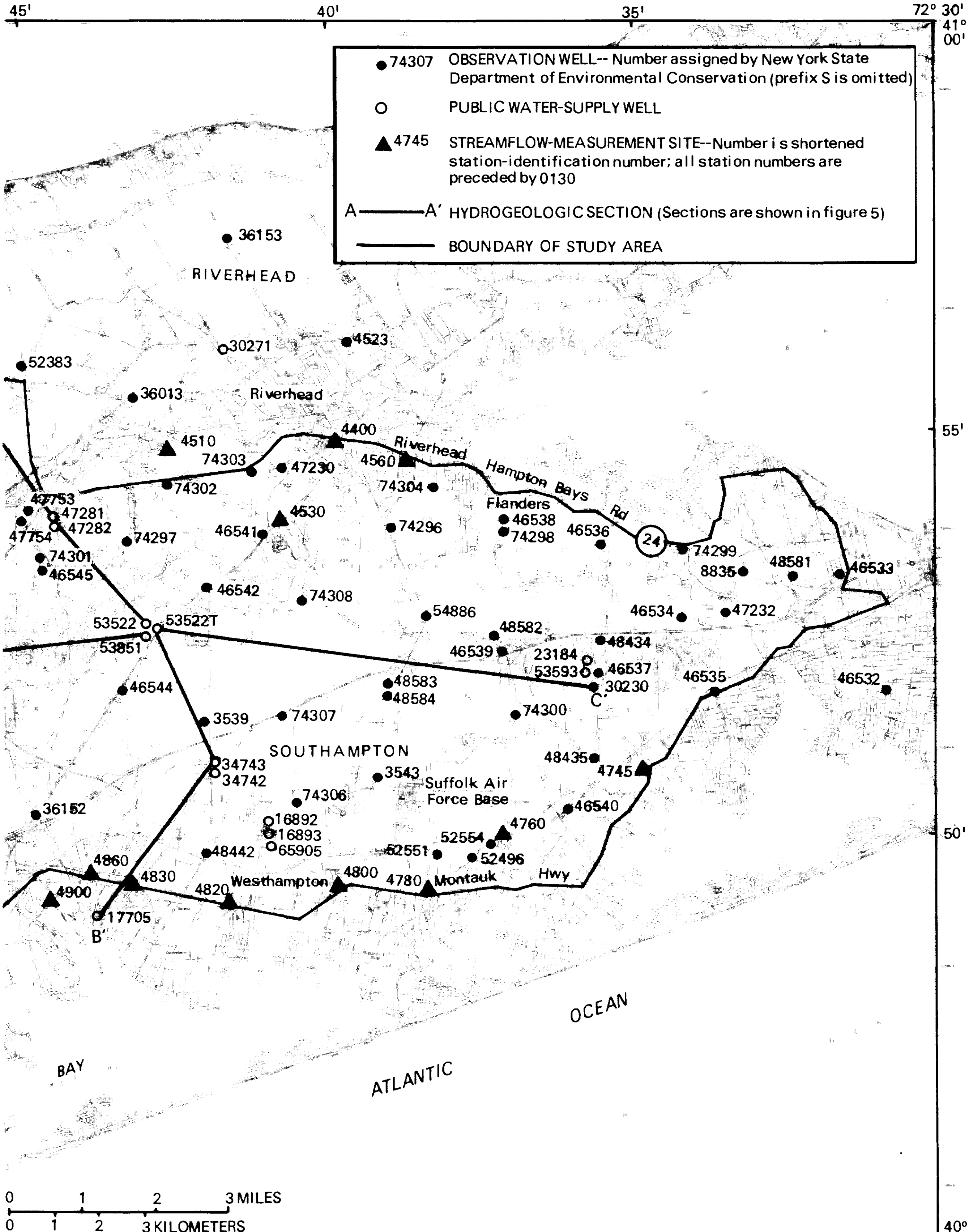
Acknowledgments

The author thanks Vito Minei of the Suffolk County Department of Health Services for supplying all pertinent water-quality data, and the Suffolk County Water Authority and the New York State Department of Conservation for supplying pumpage data.



Base from U.S. Geological Survey Topographic maps, 1:24,000 scale

Figure 2.--Location of wells and streamflow- and position of geologic



measurement sites in Pine Barrens
sections shown in figure 5.

GENERAL SETTING

Location and Extent of Area

The Long Island Pine Barrens encompass approximately 50 mi^2 in southeastern Suffolk County between 72°30' and 72°58' W longitude and 40°48' and 40°57' N latitude. A detailed map of the area is shown in figure 2. The area is bounded on the north by Routes 25 and 25A, on the east by Riverhead-Hampton Bays Road (Route 24), on the south by Montauk Highway (Route 27A) and Yaphank-Middle Island Road, and on the west by Radio Avenue-Yaphank-Middle Island Road. The area encompasses the southeastern part of the Town of Brookhaven, the southwestern part of the Town of Riverhead, and the western part of the Town of Southampton.

Land Use

Land in the Pine Barrens is used for several purposes, principally housing, parks and recreation, and agriculture, with smaller allotments for commerce and industry, transportation, and utilities. Residential use predominates in the western part of the Town of Brookhaven and in the southern part of the Town of Southampton along Montauk Highway, whereas recreational and agricultural use predominate in the eastern part of the Town of Brookhaven and the western part of the Town of Southampton. The recreational lands consist of parks and wildlife sanctuaries; the agricultural lands are mainly sod farms, orchards, shrub and tree nurseries, and fields for crops such as corn, cauliflower, cabbage, and potatoes. Commerce and industry are confined to the major roads. The three biggest single occupants are Brookhaven National Laboratories, the Navy Industrial Aircraft facilities, and Suffolk Air Force Base (fig. 2).

Population

Population of the Pine Barrens area in 1981 is estimated to have been about 23,000 (Long Island Lighting Company, 1981). This figure is based upon the populations of the six main townships in the area--Manorville, 6,820; Riverside-Flanders, 5,400; Westhampton, 1,580; Brookhaven National Laboratory, 400, and Ridge, 8,830 (fig. 2). The figures and estimates do not include the part-time residents and tourists, who substantially increase the total population and water demands during summer. The number of seasonal residents is unknown.

GEOHYDROLOGY

Geologic Setting

The Pine Barrens is underlain by unconsolidated deposits that rest unconformably on the Precambrian(?) basement complex (fig. 3). The formations strike northeast and dip to the southeast. Depth to basement increases southward from approximately 900 ft on the north shore to 1,500 ft below sea level on the barrier islands.

The basement complex is overlain by the Raritan Formation, which consists of the Lloyd Sand Member and an overlying clay member. The Lloyd Sand Member is approximately 300 ft thick, and the clay member is approximately 200 ft thick. The Matawan Group and Magothy Formation, undifferentiated, overlies the Raritan Formation; its thickness ranges from 100 ft at the north shore to more than 900 ft in the southern part of the area. These three units are of Late Cretaceous age and are continuous beneath the study area. The Monmouth Group disconformably overlies the Matawan Group and Magothy Formation, undifferentiated, and is in turn disconformably overlain by the Gardiners Clay. The Monmouth Group is a marine deposit of Cretaceous age that occurs along the barrier islands, primarily in Suffolk County. Its thickness ranges from 0 to 200 ft.

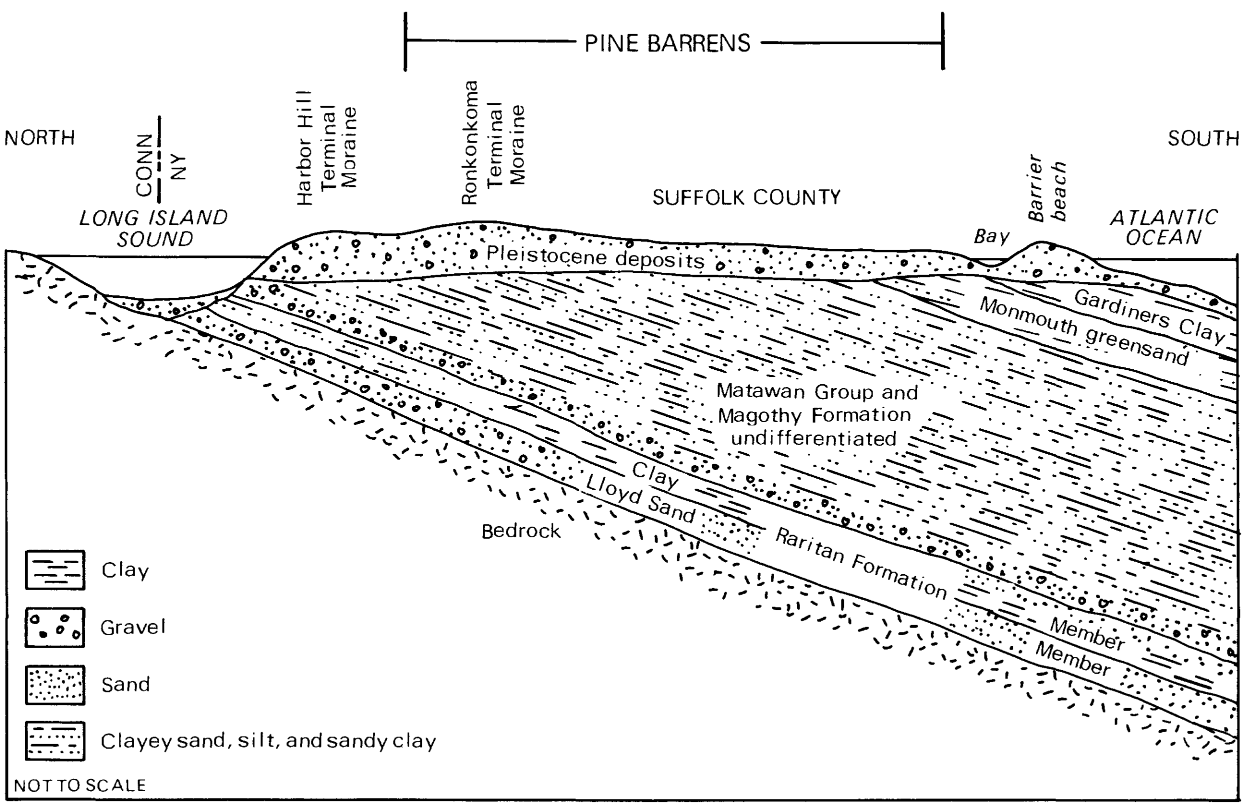
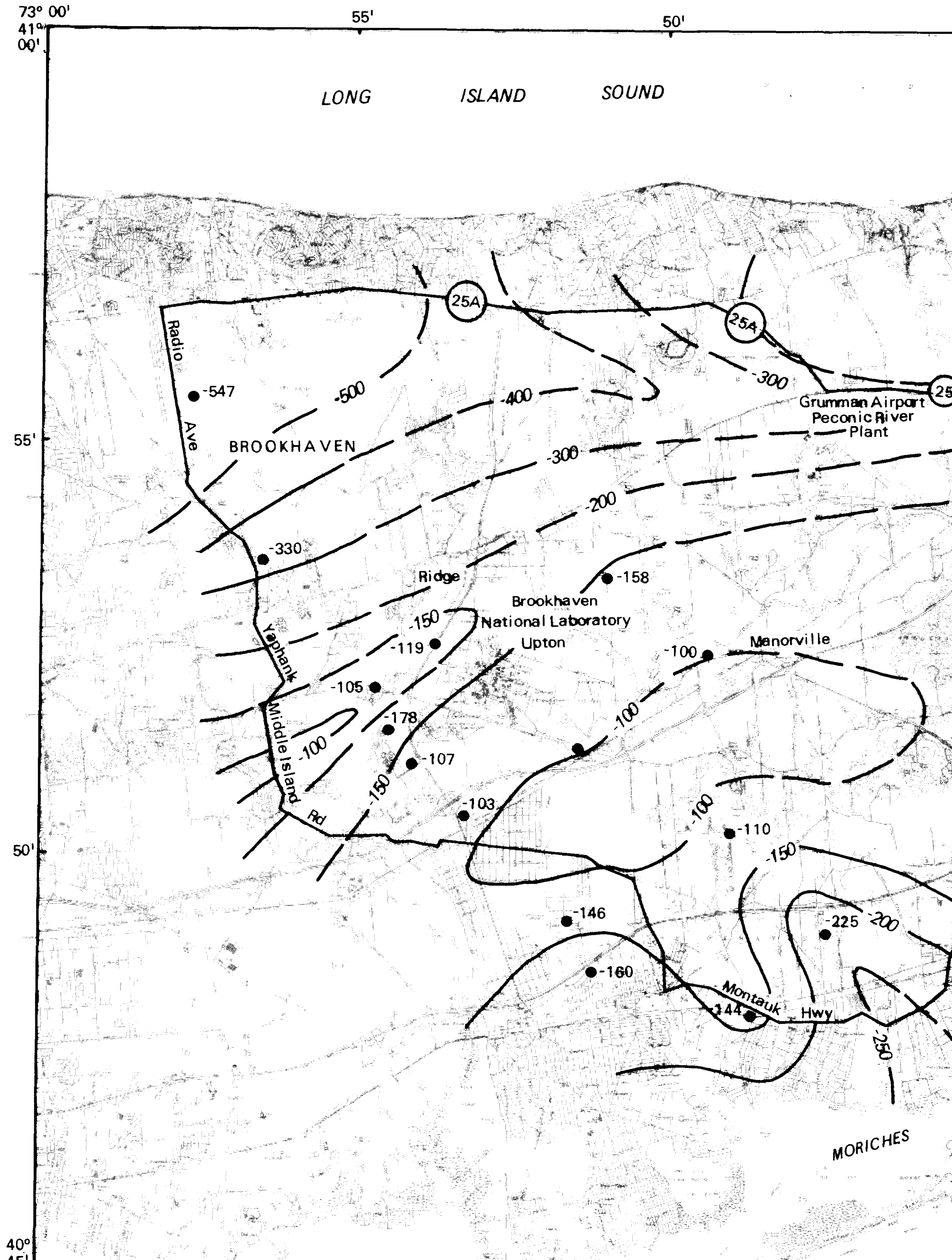


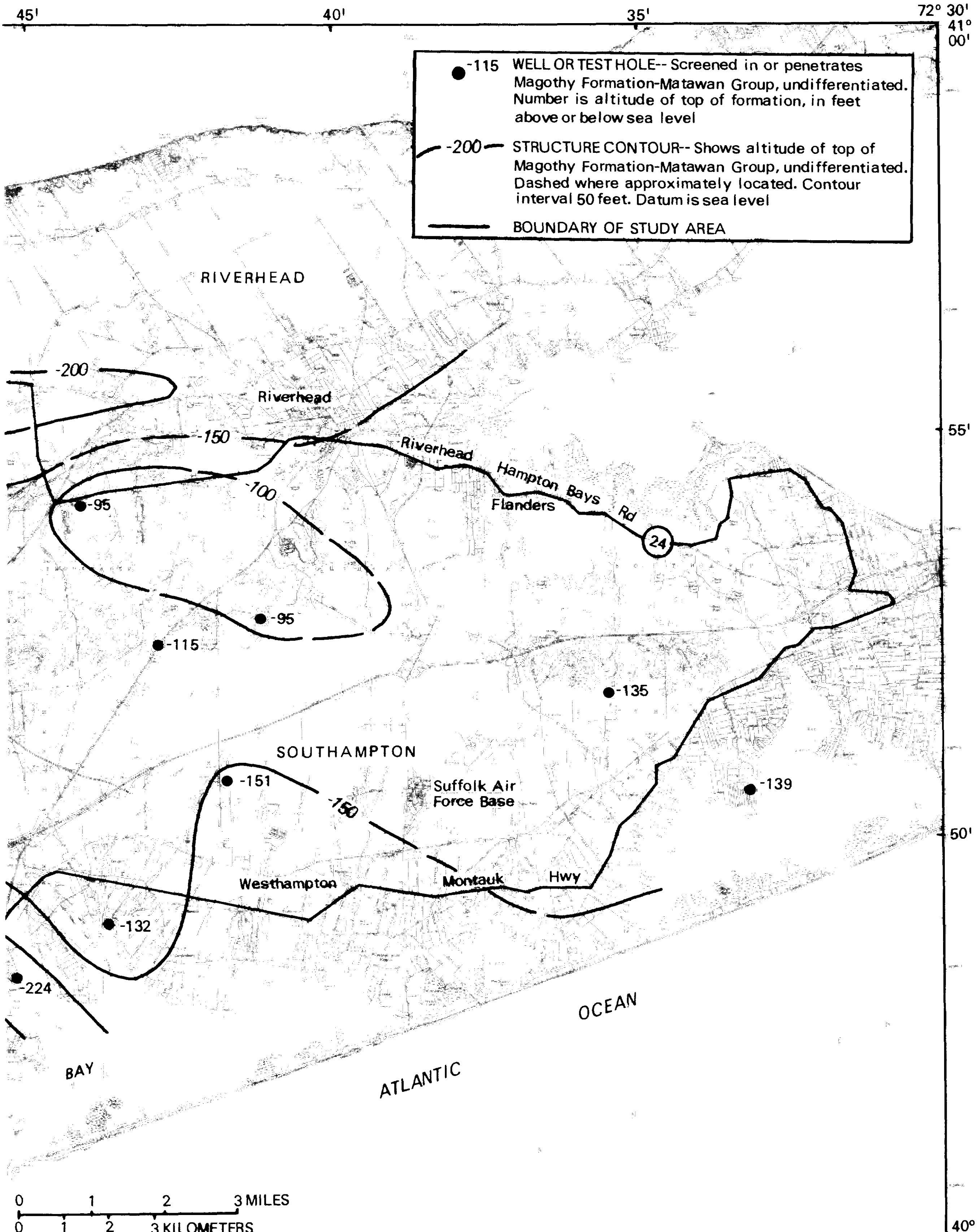
Figure 3.--Generalized geologic section of the Pine Barrens. (Modified from Cohen and others, 1968.)

The altitude of the top of the Matawan Group and Magothy Formation, undifferentiated, is shown in figure 4. Recent test-hole data indicate a buried channel, more than 600 ft below sea level in the northwestern part of the area, that extends north to the limit of the Matawan Group and Magothy Formation, undifferentiated, sequence, as defined by Jensen and Soren (1974). North of this limit it was eroded away by glacial activity, so that subsequent Pleistocene deposits unconformably overlie the Raritan Formation in that area. The channel is bounded on the northeast by a surface high having an altitude of less than 150 ft below sea level.



Base from U.S. Geological Survey
Topographic maps, 1:24,000 scale

Figure 4.--Altitude of top of the



Magothy-Matawan Formation, undifferentiated.

The Pleistocene formations of the area consist of several glacial, periglacial, and interglacial units, including a marine clay known as the Gardiners(?) Clay. The surficial geologic units consist of Pleistocene outwash, moraines, and Holocene deposits; the Holocene material includes shore, beach, salt-marsh deposits, and, at certain locations, artificial fill. The geologic and corresponding hydrogeologic units in the area are summarized in table 1; three sectional stratigraphic diagrams of several deep test wells within the area are given in figure 5.

Table 1.--Geologic and hydrogeologic units in the Pine Barrens.[1]

[Relative position of units is shown in fig. 3]

Hydrogeologic unit	Geologic name	Description and water-bearing character
Upper glacial aquifer	Holocene and upper Pleistocene deposits	Mainly brown and gray sand and gravel of moderate to high hydraulic conductivity; also includes deposits of clayey glacial till and lacustrine clay of low hydraulic conductivity. A major aquifer.
Gardiners Clay	Gardiners Clay	Green and gray clay, silt, clayey and silty sand, and some interbedded clayey and silty gravel: low hydraulic conductivity. Unit tends to confine water in underlying aquifer.
Monmouth greensand	Monmouth Group, undifferentiated	Interbedded marine deposits of dark-gray, olive-green, dark-greenish-gray, and greenish-black glauconitic and lignitic clay, silt, and clayey and silty sand. Unit has low hydraulic conductivity and tends to confine water in underlying aquifer. The northern limit of this formation may lie slightly south of the study area.
Magothy aquifer	Matawan Group and Magothy Formation, undifferentiated	Gray and white fine to coarse sand of moderate hydraulic conductivity. Generally contains sand and gravel beds of low to high hydraulic conductivity in basal 100 to 200 feet. Contains much interstitial clay and silt, and beds and lenses of clay of low hydraulic conductivity. A major aquifer though not highly developed in the study area.
Raritan Clay	Unnamed clay member of the Raritan Formation	Gray, black, and multicolored clay and some silt and fine sand. Unit has low hydraulic conductivity and tends to confine water in underlying aquifer.
Lloyd aquifer	Lloyd Sand Member of the Raritan Formation	White and gray fine-to-coarse sand and gravel of moderate hydraulic conductivity and some clayey beds of low hydraulic conductivity. Not developed as a source of water in the study area.
Bedrock	Undifferentiated crystalline rocks	Mainly metamorphic rocks of low hydraulic conductivity; surface generally weathered; considered to be the bottom of the ground-water reservoir.

[1] Modified from Jensen and Soren (1971).

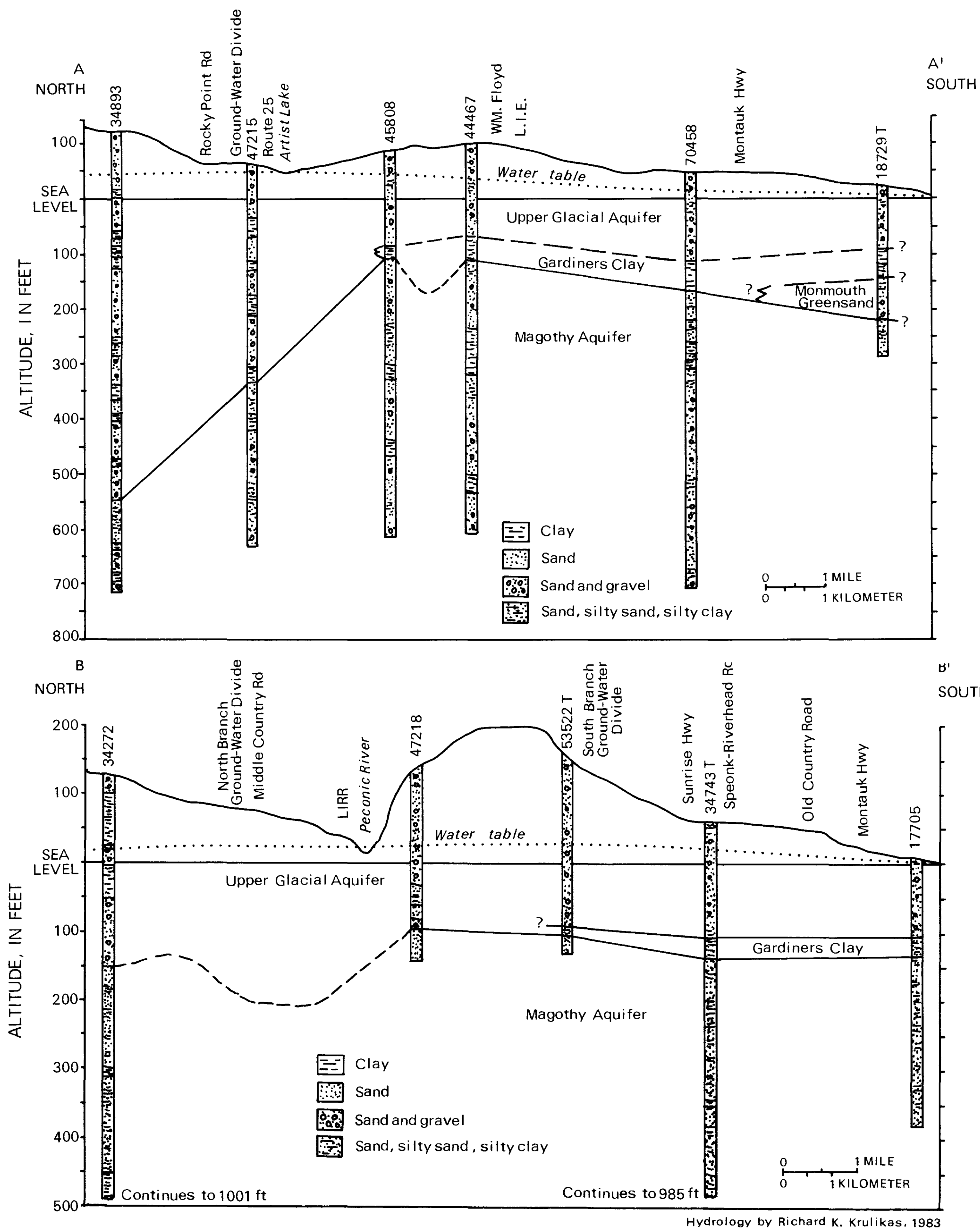


Figure 5.--Geohydrologic sections A-A' and B-B' in the Pine Barrens of Suffolk County. (Locations of sections are shown in fig. 2.)

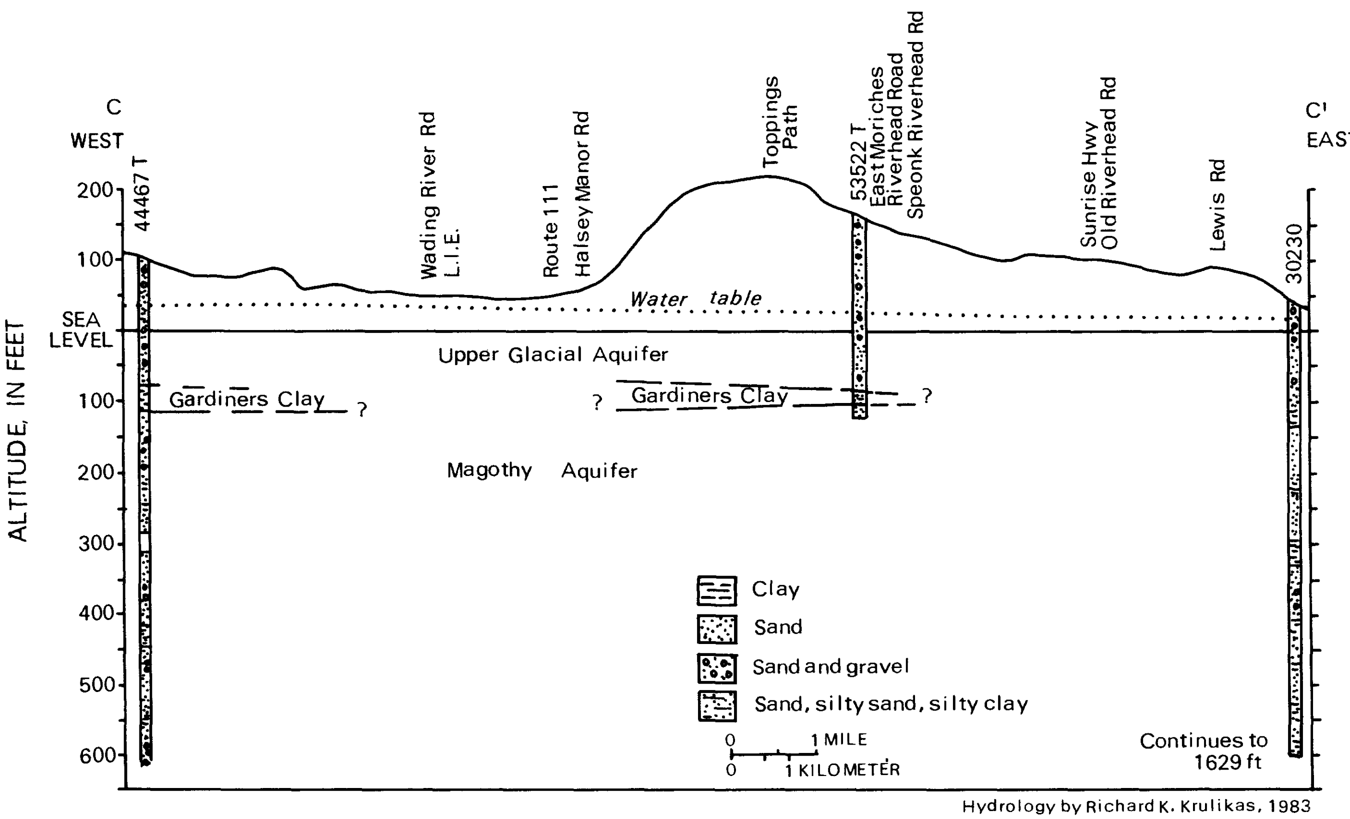


Figure 5.--Geohydrologic sections A-A' and B-B' in the Pine Barrens of Suffolk County. (Locations of sections are shown in fig. 2.)

Hydrology

Precipitation is the sole source of freshwater in the Pine Barrens, and recharge to the ground-water reservoir results from infiltration of precipitation through the soil to the water table. The amount of water that reaches the water table varies throughout the year and is controlled by (1) form, frequency, and intensity of precipitation; (2) slope of the land surface; (3) geology, soil-moisture content, and the amount and kind of vegetal cover; and (4) air temperature.

Precipitation

The climate of the Pine Barrens is characterized by a moderate temperature range and mild winters that are influenced by the Atlantic Ocean and Long Island Sound. Precipitation falls in almost the same total amount in the cool season as during the warm season but is more frequent in spring than in fall. Most precipitation on Long Island is in the form of rain; only 5 to 10 percent falls as snow or sleet. Long-term precipitation in Suffolk County averages 43 in/yr, as determined from 30 years of records collected by the National Weather Service.

The precipitation regime of Long Island during 1951-65 was studied by Miller and Frederick (1969), who calculated the mean annual precipitation for the Pine Barrens area to be between 44 and 46 inches. This compares closely with the 43 in/yr for all of Suffolk County. The annual precipitation recorded at Upton (fig. 1) during 1943-82 had a maximum of 58.63 inches in 1972 and a minimum of 31.82 inches in 1965 (fig. 6A); the long-term average annual precipitation from 1943-82 is 46.32 inches. Mean monthly precipitation at Upton ranges from a low of 3.12 inches in June to a high of 4.60 in December (fig. 6B).

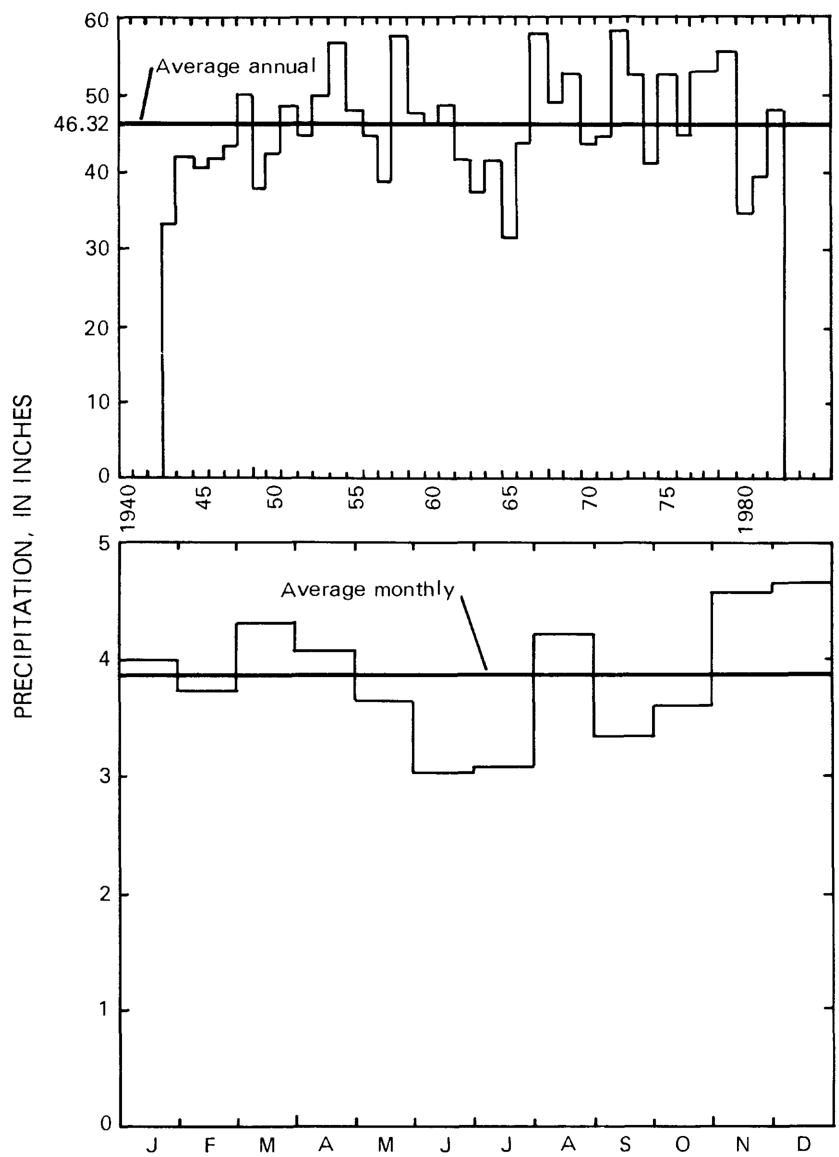


Figure 6.--Average annual and average monthly precipitation at Upton, Suffolk County, 1943-82.

Recharge and Discharge of Ground Water

Ground water in the Pine Barrens is recharged by infiltration of precipitation through the surficial deposits to the water table. The quantity of water that reaches the water table varies throughout the year. Several factors control the amount of recharge; these include variations in precipitation, the stratigraphy and soil characteristics of the area, and the rate of evapotranspiration (the natural loss of water through both evaporation and transpiration by plants).

Evapotranspiration was not measured directly in this study; therefore, all calculations must be considered estimates. An accepted estimate of annual evapotranspiration on Long Island is 23.2 inches, as calculated by Bart and others (1976, p. E24) from the Thornthwaite water-balance calculations for mean weather data. Average values for precipitation, evapotranspiration, and overland runoff can be used in equation 1 to calculate average recharge:

$$\text{Recharge} = \text{precipitation} - (\text{evapotranspiration} + \text{overland runoff}) \quad (1)$$

From an average annual precipitation value of 46.3 inches, an estimated average annual evapotranspiration rate of 23.2 inches, and an average overland runoff value of 0.5 inches, recharge becomes:

$$\text{Recharge} = 46.3 - (23.2 + 0.5) = 22.6 \text{ in/yr}$$

This value of 22.6 in/yr should be considered only as a rough approximation, however, because rates of recharge, precipitation, evapotranspiration, and other factors may vary considerably from place to place and with time.

Ground water is discharged naturally as seepage to streams along both the north and south shores of the study area and also into the Carmans and Peconic River basins (fig. 2). Ground water also discharges directly into the bays along the shore. This is apparent along the south shore, where the potentiometric heads in the Magothy aquifer (well S32359) are greater than or equal to the potentiometric heads in the upper glacial aquifer (well S33919), as shown by the water-level maps in figure 8 (p. 20) and 9 (p. 22).

Flow Subsystems and Recharge Zones

Under natural conditions, the only source of water to the Long Island ground-water system is recharge from precipitation. Approximately half the precipitation that reaches the land surface infiltrates and enters the ground-water system at the water table. Some of this water flows in a shallow flow subsystem and discharges to streams or lakes. Water that enters the system near the shore flows through the upper glacial aquifer and discharges to the sea; water that enters the system further inland flows down to the deeper aquifers. Water near the major ground-water divide (fig. 7, p. 16), flows downward to the Lloyd aquifer.

Overlying the deep flow system on each side of the major ground-water divide is a series of shallow subsystems, each of which converges laterally toward a stream and eventually discharges to the bays and ocean.

The recharge zone for the deep subsystem is an area in which water entering the ground-water system flows down into the deep aquifers (Magothy and Lloyd aquifers). Knowledge of the location and extent of these areas is needed by managers responsible for water development because the deep aquifers are considered potential sources of potable water for Suffolk County. Proper management of development in such areas is essential to prevent human-induced contamination from reaching these deep aquifers and to thereby maintain potable water supplies in the Pine Barrens.

The exact locations of the deep recharge zones in the Pine Barrens are unknown but can be inferred to a degree from the flow patterns within the shallow-flow subsystems. The boundary separating the deep regional flow system from the shallow systems intersects land surface in an east-west-trending line somewhere seaward of the major ground-water divide but north of the start of streamflow (start-of-flow point), as shown in figure 7. A transition zone separates the deep and shallow flow systems, but to locate it accurately would require detailed data on the three-dimensional distribution of heads and seasonal variations in head in the ground-water system. An approximate delineation of this transition zone based on the start-of-flow points of each stream in the area is shown in figure 7. The position and configuration of this transition zone changes as the ground-water system responds to seasonal and induced stresses.

The ground-water-contributing area around the upper reaches of the Peconic River is difficult to delineate because this area has poor drainage and many small ponds and swamps, and thus contributes little base flow to the Peconic River. Discharge in the upper reaches averaged 3 ft^3/s; that in the downstream reaches averages 30 ft^3/s (Warren and others, 1968). It is therefore probable that the main ground-water contributing area is around the downstream reaches of the Peconic River.

Ground-Water Levels

Long Island's major ground-water divide, which traverses the island from west to east, passes through the Pine Barrens and splits near Riverhead into a north branch extending into the north fork and a south branch extending into the south fork (fig. 9, p. 20). Ground water north of the divide moves northward to Long Island Sound, and ground water south of the divide moves southward to Great South Bay and Moriches Bay, either directly or by way of streams. In general, ground water from the area between the two branches of the divide moves eastward to the Peconic River and Peconic Bay. This divide is not stationary but moves north or south as the water-table configuration changes. These changes occur seasonally and also during periods of recharge or drought. Seasonal fluctuations in water levels at the divide are usually less than 5 ft.

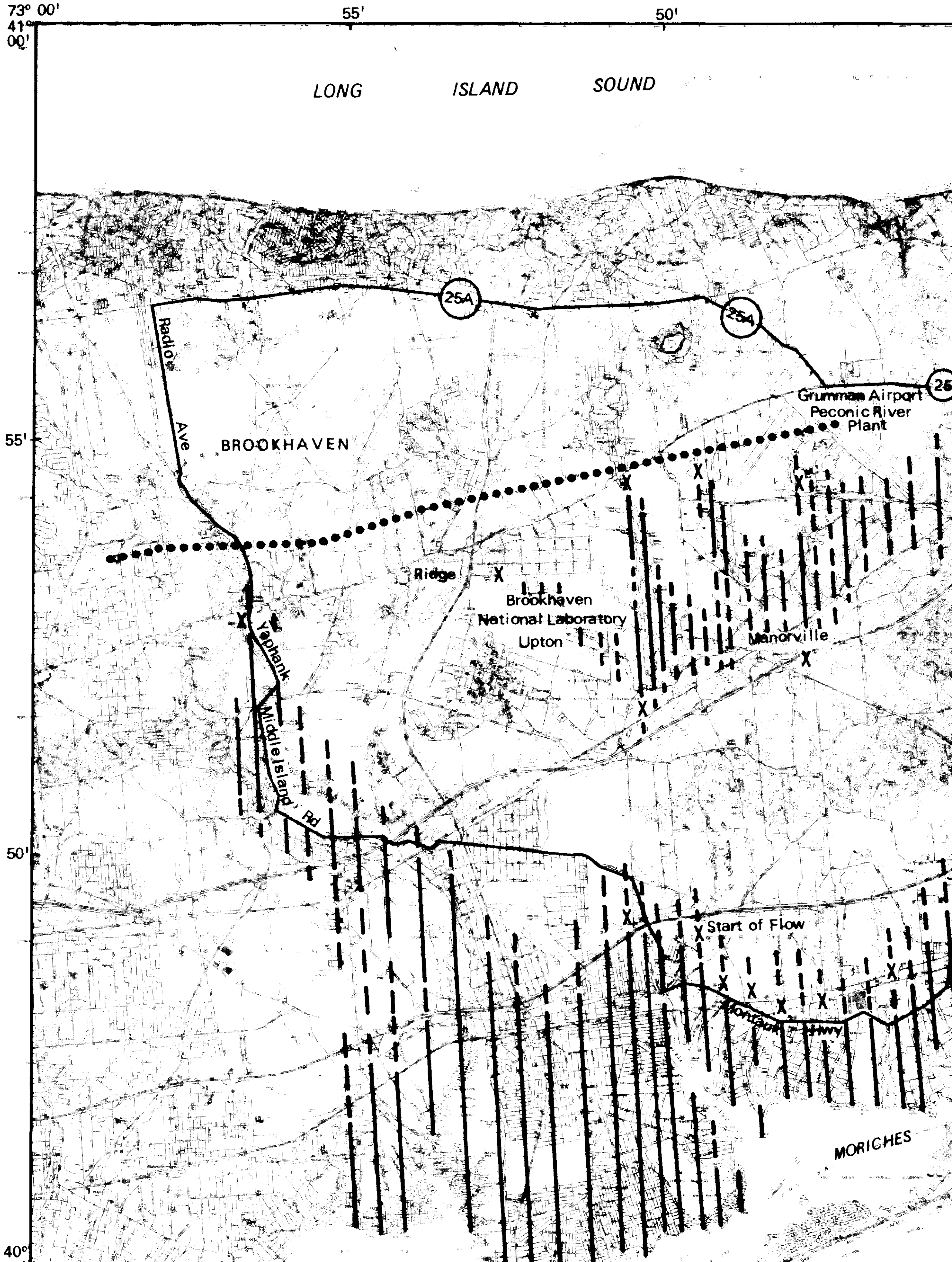


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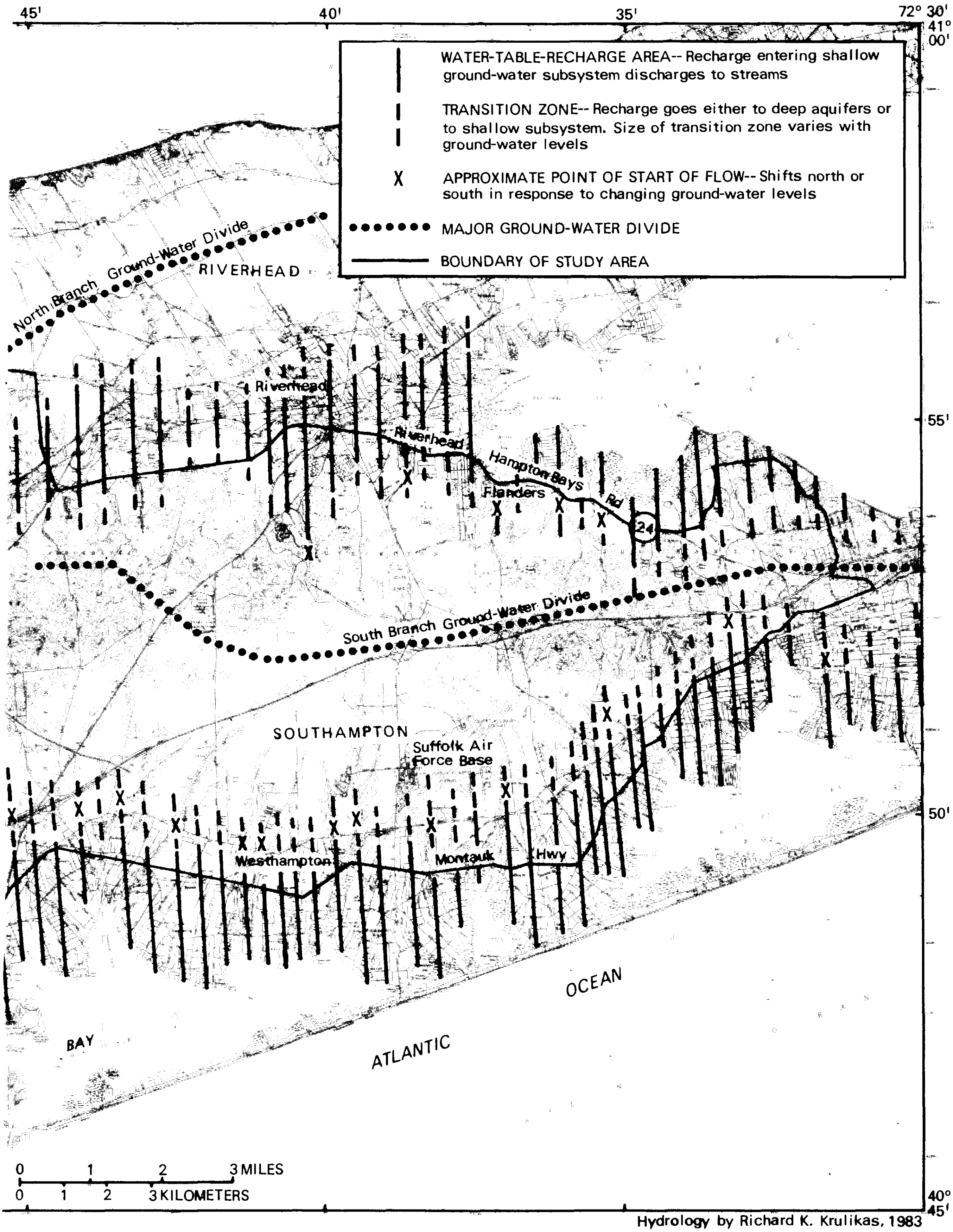
Figure 7.--Approximate areas of shallow and



deep ground-water flow subsystems.

Water table.--Water-level measurements were made in 112 observation wells during June 1983 (see table 8, at end of report) and were used to prepare a water-table map of the Pine Barrens (fig. 9). The water-table altitude reaches a maximum of 55 ft above sea level in the northwest part of the Pine Barrens and decreases to 5 ft in the eastern part. The lower water-table altitude in the east is a result of ground-water discharge into the Peconic River basin and Shinnecock Bay.

The U.S. Geological Survey has monitored water levels in several observation wells in the Pine Barrens since the early 1940's. Figure 8 depicts 1958-82 hydrographs for four of the wells. The water levels coincide in terms of periodicity of water-level fluctuations but differ in magnitude of change.

Magothy aquifer.--Water levels in the Magothy aquifer were measured at five wells in June 1983; these data were used to prepare a potentiometric-surface map of the Magothy aquifer (fig. 10). (The potentiometric surface represents the static head, which is defined by the levels to which water would rise in a tightly cased well screened at a specific depth.) The potentiometric-surface altitude of the Magothy aquifer reaches a maximum of about 47 ft above sea level in the western part of the study area and decreases to zero eastward as it approaches the shore. Where data are lacking, the contours are inferred.

Surface Water

One of the 11 streams within the Pine Barrens flows northward into Peconic Bay; the other 10 flow southward into Moriches Bay or Shinnecock Bay (fig. 2). The area also contains several natural lakes and ponds; many are kettleholes that intersect the water table, and some are perched. In addition, several ponds have been created behind small dams on some tributaries.

Stream-discharge measurements are made periodically at 17 sites in the area under base-flow conditions as a measure of ground-water seepage to the streams. The locations of these sites are shown in figure 2; the discharge measurements for fall 1982 and spring 1983 are given in table 9 (at end of report). The U.S. Geological Survey maintains continuous gaging stations on the Peconic and Carmans Rivers. Daily discharges at these sites from 1942 to the present are available at the U.S. Geological Survey's Long Island office in Syosset.

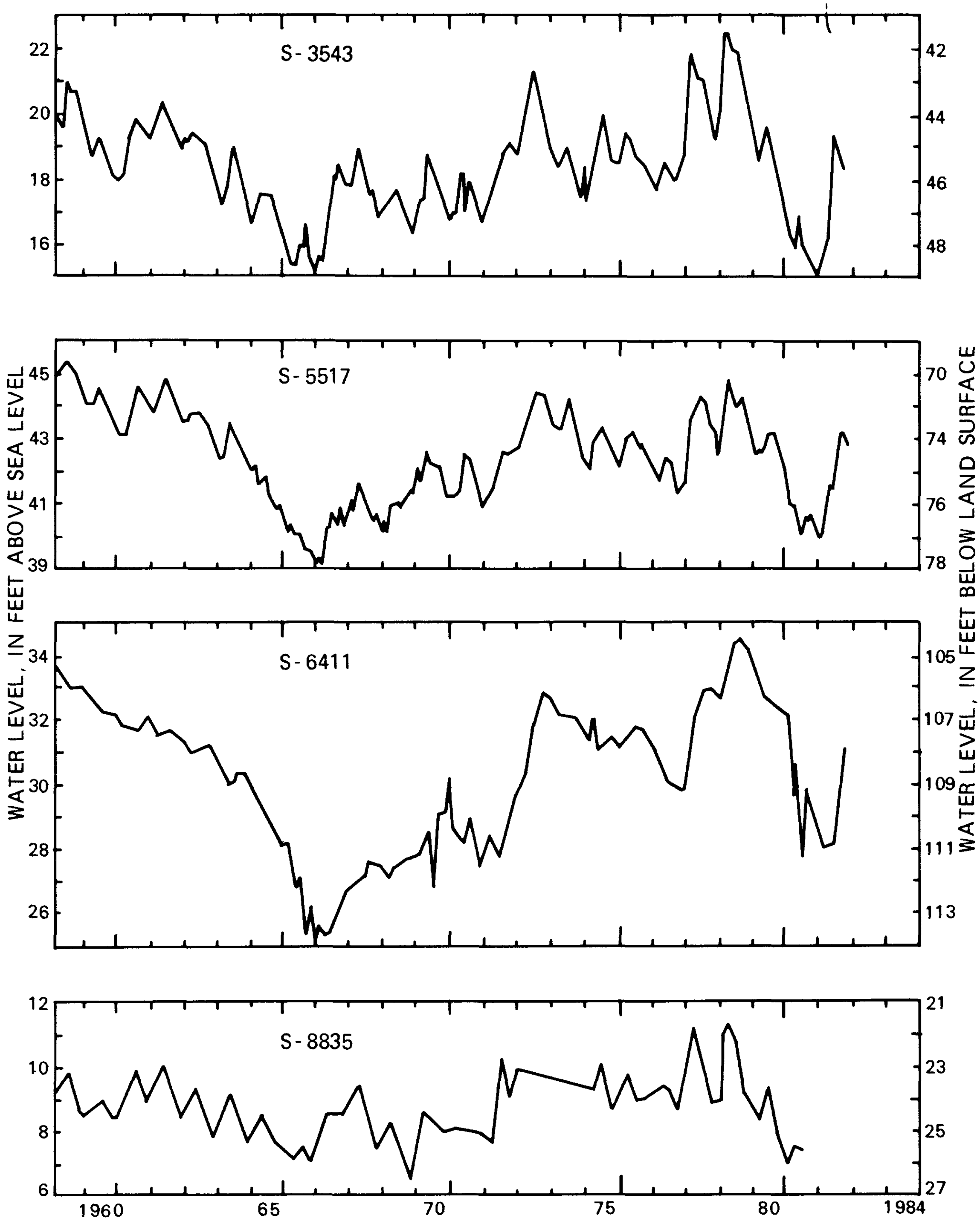
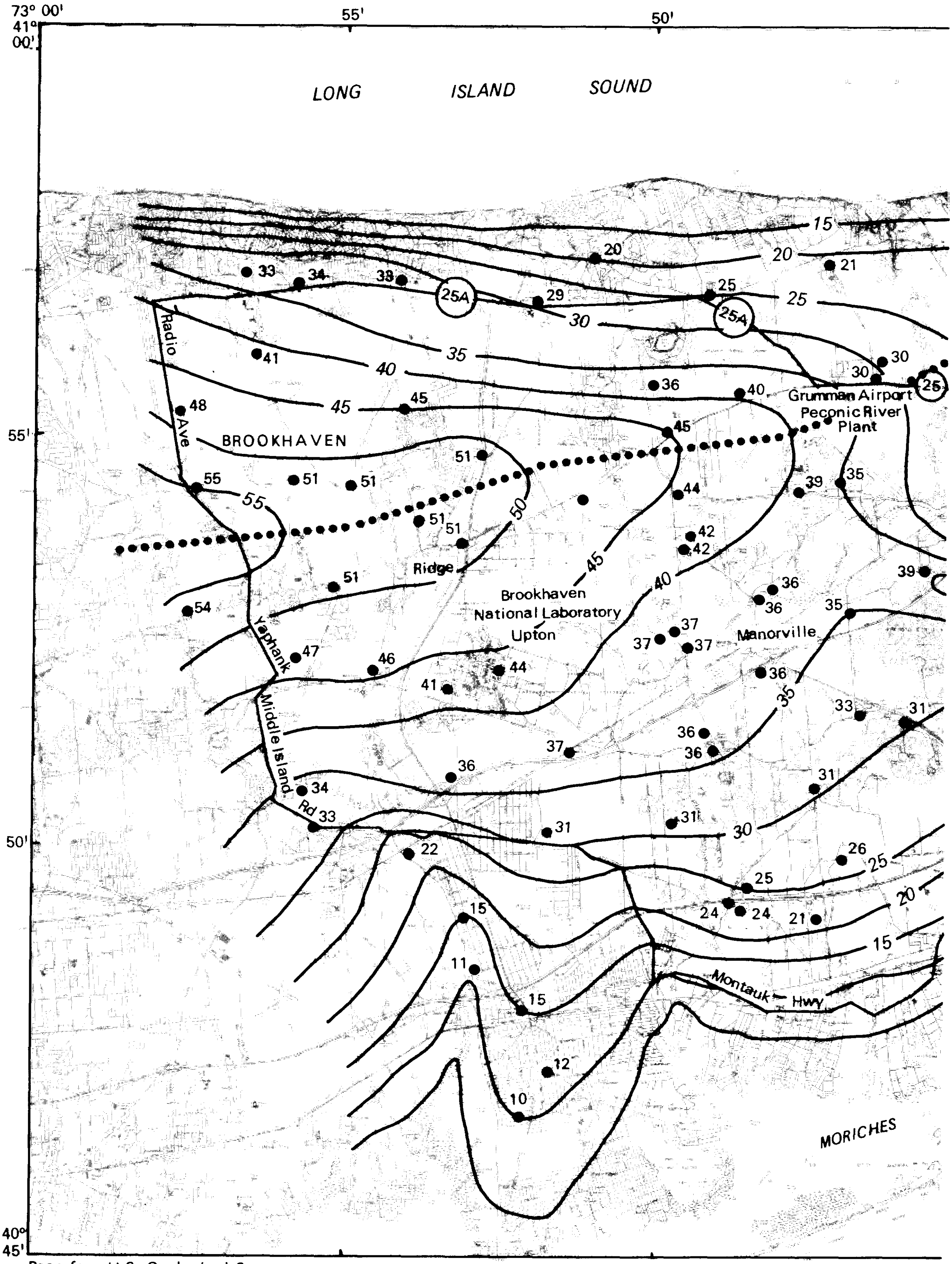
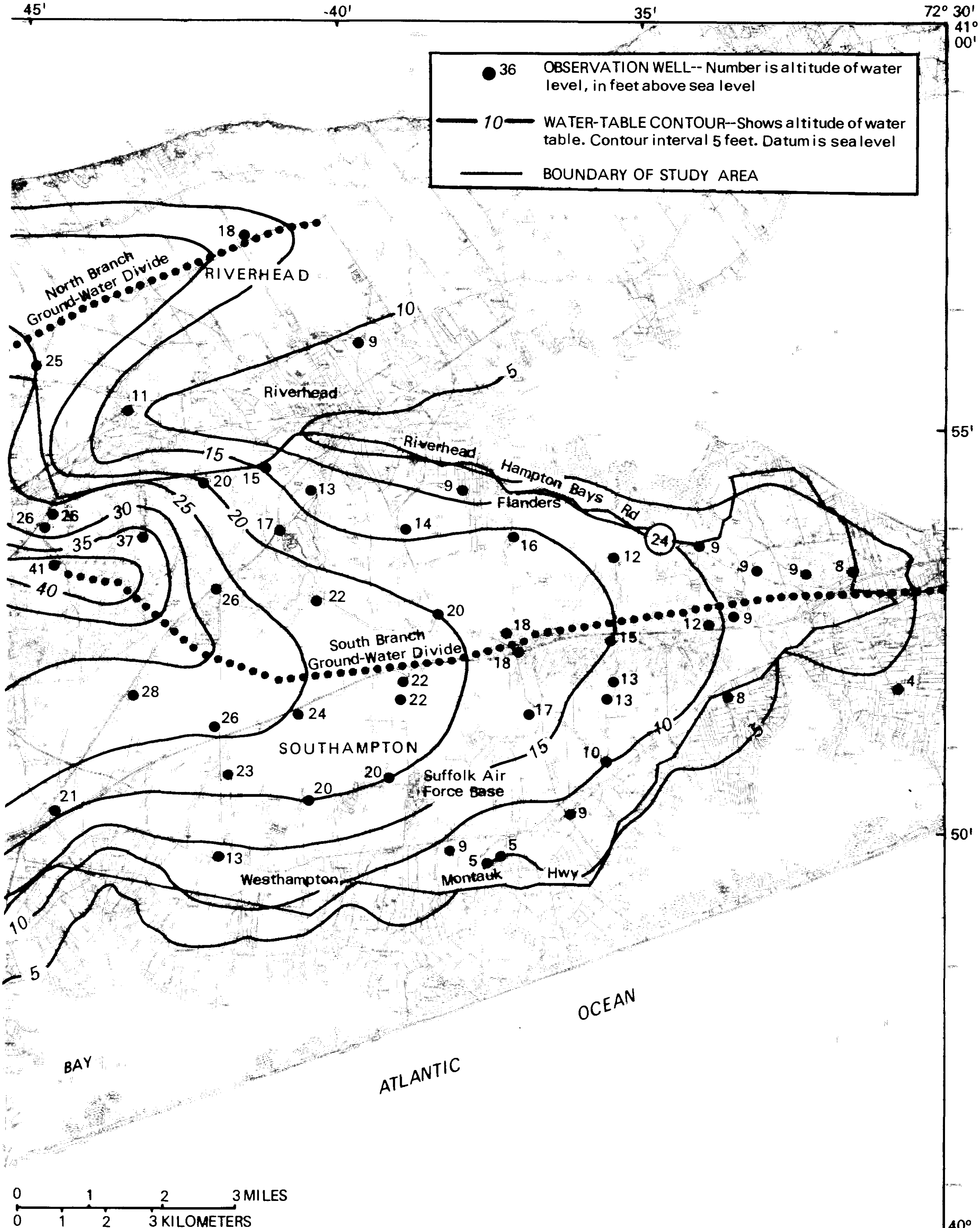


Figure 8.--Long-term (1958-82) hydrographs for wells S3543, S5517, S6411, and S8835. (Locations are shown in fig. 2.)

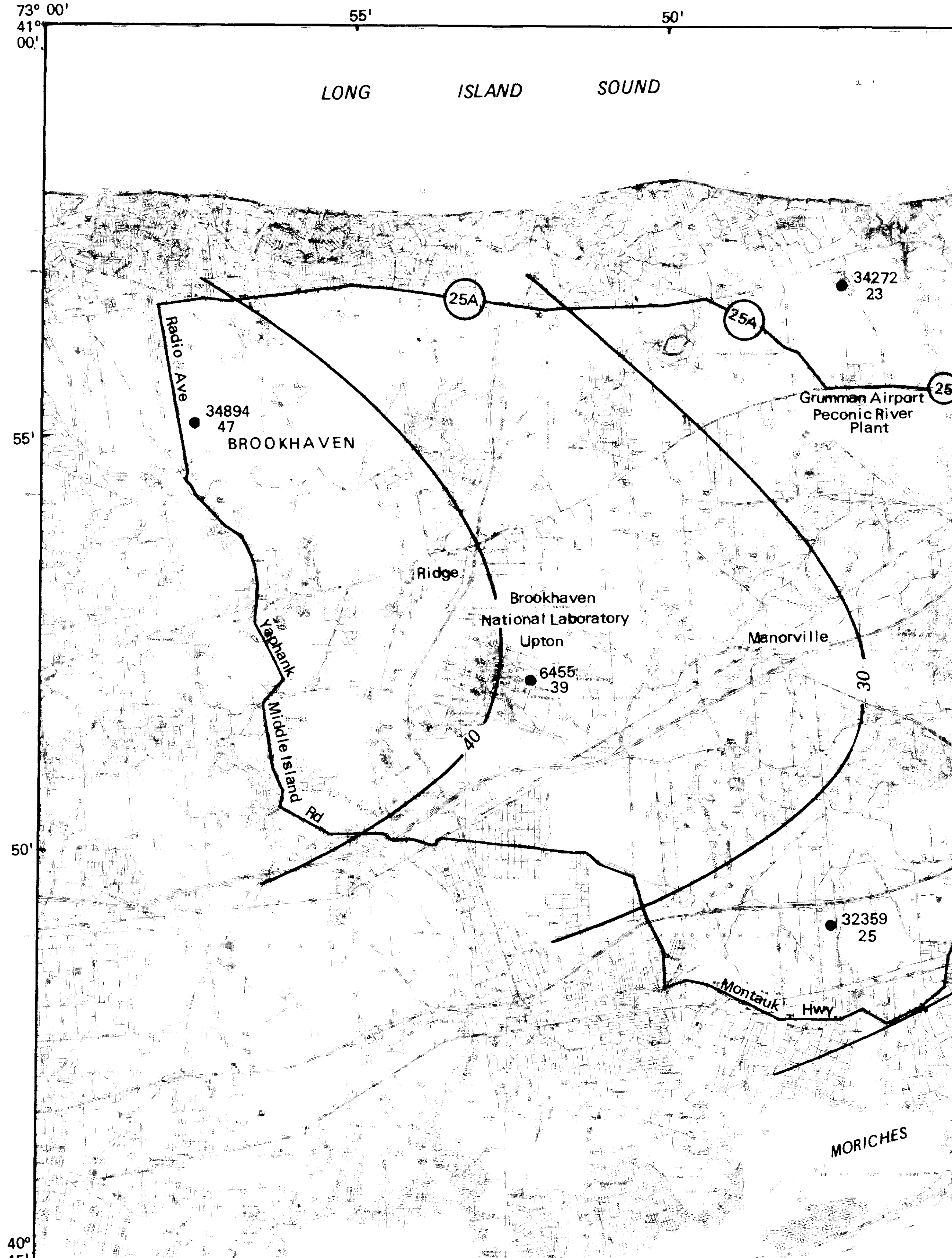


Base from U.S. Geological Survey
Topographic maps, 1:24,000 scale

Figure 9 --Water-table altitude in the

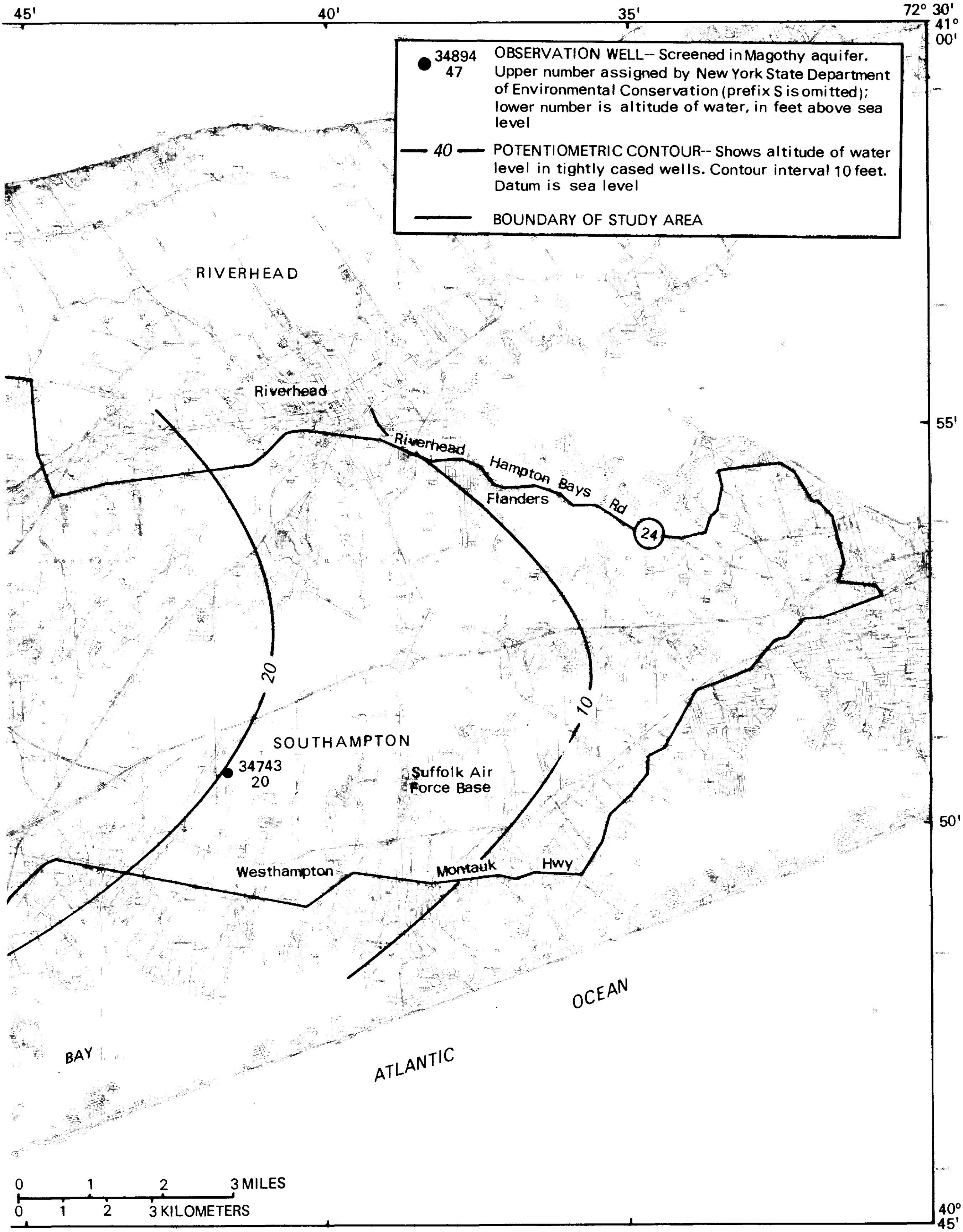


Pine Barrens, September 1983.



Base from U.S. Geological Survey
Topographic maps, 1:24,000 scale

Figure 10.--Potentiometric surface of Magothy aquifer



in the Pine Barrens, September, 1983.

WATER QUALITY

The chemical quality of water determines the purposes for which the water may be used, such as for drinking, agriculture, or industry. The chemical composition of the water is determined by the type and solubility of material with which the water comes in contact, the duration of contact, the chemical quality of precipitation and the air through which it falls, the water temperature and pressure, and the composition of surface-derived substances such as domestic wastes, fertilizers, and industrial discharges.

Public-Supply Wells

Chemical analyses of water from public-supply wells sampled by the Suffolk County Department of Health Services in 1980 revealed that no wells within the Pine Barrens exceeded the drinking-water standard of 10 mg/L for nitrate-nitrogen nor the 50-μg/L guideline for any single volatile organic compound, as set by the U.S. Public Health Service (U.S. Department of Health, Education, and Welfare, 1962, p. 7).

Observation Wells

The upper glacial aquifer underlying the Pine Barrens has been monitored by the Suffolk County Department of Health Services for several years at 40 observation wells that are part of the observation-well network within Suffolk County (fig. 2). Observation wells are installed by the Suffolk County Department of Health Services to monitor a variety of conditions, including ground-water levels, ambient water quality, presence of cesspool or sewage-treatment-plant effluent, and also for special studies relating to such aspects as streamflow augmentation, landfill leachate, and fuel spills.

A survey of the computer files of the Suffolk County Department of Health Services, which include 1973-83 data on 40 wells, indicated that four of the wells had nitrate-nitrogen concentrations exceeding the 10.0-mg/L limit set by the U.S. Public Health Service (U.S. Department of Health, Education, and Welfare, 1962, p. 7.) (See table 10, at end of report). Water from two wells exceeded the 50-μg/L guideline for volatile organic chemicals. One of the wells, S45724, is a sewage-treatment-plant monitoring well at Smith Road in Ridge (fig. 11); when sampled on October 18, 1980, it contained 330 μg/L of chloroform (trichloromethane). The other well, S51591, south of the Navy Industrial Aircraft Facility in Calverton, was sampled on October 29, 1980, and found to contain 120 μg/L of 1,1,1-trichloromethane.

Private Wells

Data from the Suffolk County Department of Health Services on private wells in the Pine Barrens area from January 1978 through March 1981 revealed 13 wells having nitrate-nitrogen concentrations in excess of 10 mg/L and six wells with volatile organic chemical concentrations in excess of the 50-μg/L guideline for any single constituent. (Locations of these 19 wells are shown in fig. 11.) The locations, dates, and concentrations at which these contaminants were detected are summarized in table 2.

A special sampling survey by Suffolk County Department of Health Services for radioactive contamination in private wells was done at the area southeast of Brookhaven National Laboratory. One sample from a private well had 4,100 pci/L of tritium and 0.55 pci/L of strontium 90.

Table 2.--Nitrate-nitrogen concentrations greater than 10 mg/L, and volatile organic chemical concentrations greater than 50 μg/L in water samples from selected wells in the Pine Barrens, 1978-82.

[Well locations are shown in fig. 11]

A. NITRATE-NITROGEN

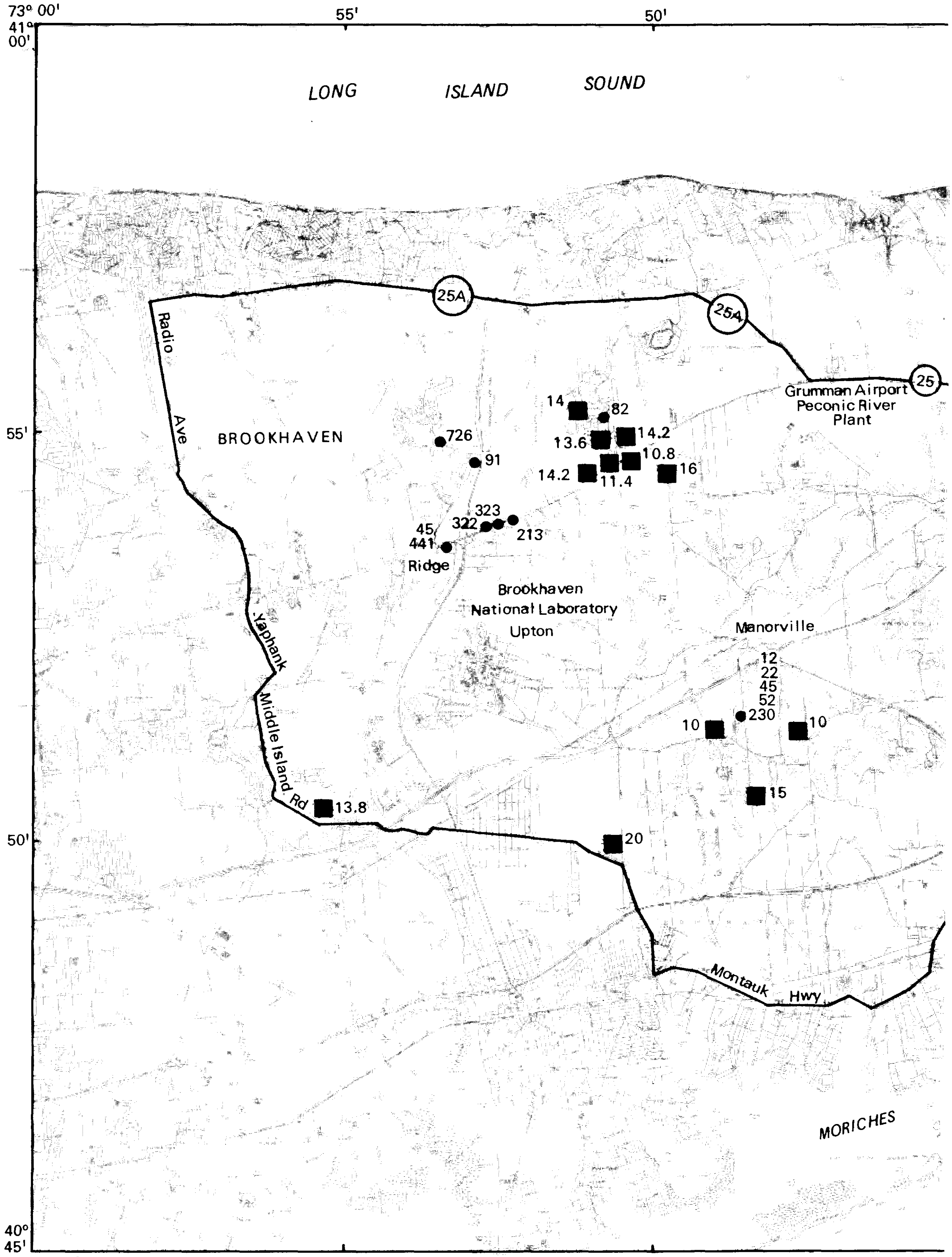
Location	Date	Concentration (mg/L)
1. Main Street, Yaphank	4-28-80	13.8
2. Tarkill Road, Ridge	3- 3-80	13.6
3. Nesaquake Terrace, Ridge	6-27-78	14.2
4. Toppings Path, Calverton	8-21-79	13.6
5. Lakeside Trail, Ridge	3-10-81	14.0
6. Wauwepex Trail, Ridge	6-21-82	11.4
7. Corchaug Trail, Ridge	6-21-82	10.8
8. Ridge Post Office, Ridge	6-21-82	14.2
9. Wading River Road, Manorville	3- 4-81	16.0
10. Silas Charter Road, Manorville	9-14-82	15.0
11. Moriches-Yaphank Road, Manorville	3- 9-82	20.0
12. Orchard Street, Manorville	6-24-82	10.0
13. South Manor School, South St., Manorville	1-13-82	10.0

B. ORGANIC COMPOUNDS

Location	Date	Name	Concentration (μg/L)
Route 25, Ridge	10- 9-79	Carbon tetrachloride	323
	10- 9-79	Trichloroethylene	322
	10- 9-79	1,1,1-Trichloroethane	213
Panamoka Trail, Lake Panamoka	9-10-79	1,1,1-Trichloroethane	82
Ruth Lane, Ridge	7-22-80	O-Xylene	45
		Benzene*	441
Rustic Road, Yaphank	10- 2-79	Benzene	726
Randall Road, Ridge	10-25-82	Chloroform	91
Ryerson Ave., Manorville	10-21-81	Benzene	22
	10-21-81	Toluene	12
	10-21-81	Xylene	230
	10-21-81	Ethylbenzene	52
	10-21-81	1,2,4-Trimethylbenzene	45

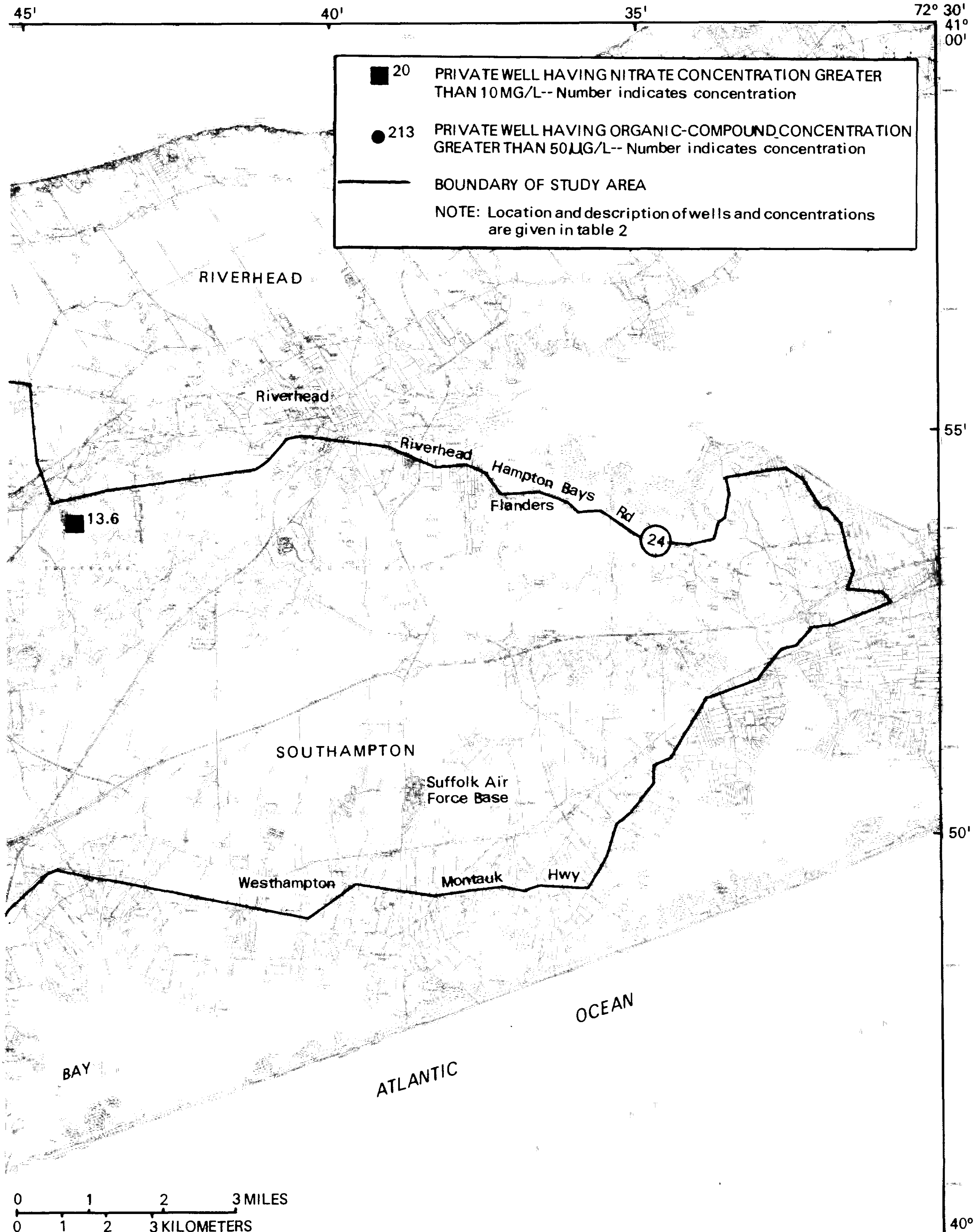
* New York State Department of Health guideline for benzene is 5 μg/L. Guideline for all other volatile organic chemicals listed is 50μg/L.

Data from Suffolk County Department of Health Services.



Base from U.S. Geological Survey
Topographic maps, 1:24,000 scale

Figure 11.--Locations of observation wells and than 10 mg/L and volatile organic



private wells having nitrate concentrations greater
chemical concentrations greater than 50 µg/L.

The residential area adjacent to Lake Panamoka in northern Ridge (fig. 11) is the only location within the Pine Barrens that shows localized nitrate-nitrogen contamination. Four wells in this area had a sample in excess of 10 mg/L NO_3^-. The area surrounding Lake Panamoka is extensively developed, with housing on small lots and with septic tanks close to shallow private drinking-water wells. A private well on Panamoka Trail also had a sample containing 82 μg/L of 1,1,1-trichloroethane, and two other private wells nearby had 1,1,1-trichloroethane concentrations of 27 μg/L and 10 μg/L. These incidents of contamination have been attributed to chemical additives applied to a nearby cesspool that was failing.

The detection of O-xylene (45 μg/L) and benzene (441 μg/L) in the well on Ruth Lane in Ridge (table 2) was attributed to a gasoline leak from a gas station on Route 25 north of this location. Further ground-water testing would be advisable because the Suffolk County Water Authority plans to develop a well field at Sally Lane, east of the contaminated private well (fig. 2).

Three agricultural areas within the Pine Barrens are currently being monitored for aldicarb and carbofuran contamination in private wells. The first is the Mount Sinai area, at the northwest corner of the study area; the second is at Calverton, near the Grumman Airport facility, and the third is in the south-central part of the area bordered by South Road, Wading River Road, Sunrise Highway, and Weeks Avenue (fig. 2).

Surface Water

Synthetic detergents (commonly referred to as methylene blue active substance or MBAS) in the streams and ground water have caused considerable concern in parts of Long Island (Perlmutter and others, 1964, p. 171) because their presence indicates contamination by septic-tank effluent or other wastewater. The U.S. Public Health Service has recommended that concentrations of synthetic detergents in water not exceed 0.5 mg/L. Samples have been taken at 13 streams in the area on a semiannual basis since about 1960; results of the last three samplings are given in table 3. None of the analyses show excessive amounts of synthetic detergents, and none of the streams contained concentrations higher than 0.24 mg/L.

Sewage-Treatment Plants

The Pine Barrens area contains 14 sewage-treatment plants; locations are shown in figure 12. Table 11 (at end of report) lists these plants and indicates the type of treatment, the design and average flow, the type of treatment process, the type of recharge and sludge facility, sludge-disposal quantity, and site locations. Six of these facilities provide denitrification, six provide secondary treatment, and two provide only primary treatment. Two of the plants have measured average flows between 1 and 1.5 Mgal/d; the rest are well below 1 Mgal/d. Twelve plants discharge their treated effluent to the ground through leaching pools or recharge beds, and two discharge it into the Peconic River.

Table 3.--Concentrations of detergents (MBAS) in selected streams in the Pine Barrens, 1982-83.[1]

[All values are in mg/L; locations are shown in fig. 2]

Stream station	Location	MBAS concentration 4-14-82	10-13-82	7- 5-83
Carmans River	Bartlett Road, Yaphank	<0.02	<0.02	0.04
Carmans River	Gage site, Yaphank	< .02	< .02	.15
West Branch Forge River	Montauk Highway, Moriches	< .02	< .02	.06
East Branch Forge River	Montauk Highway, Moriches	< .02	< .02	< .02
Terrell River	Montauk Highway, Moriches	< .02	< .02	< .02
Peconic River	Schultz Road, Manorville	< .02	< .02	.07
Peconic River	Gage site, Riverhead	< .02	< .02	.07
Little Seatuck Creek	Montauk Highway, Eastport	< .02	.24	< .02
Seatuck Creek	Montauk Highway, Eastport	< .02	< .02	< .02
East River	Montauk Highway, Eastport	< .02	< .02	< .02
Beaverdam Creek	Montauk Highway, Westhampton	< .02	< .02	< .02
Aspatuck Creek	Brook Road, Westhampton	< .02	< .02	.13
Quantuck Creek	Meetinghouse Road, Quogue	< .02	.18	< .02

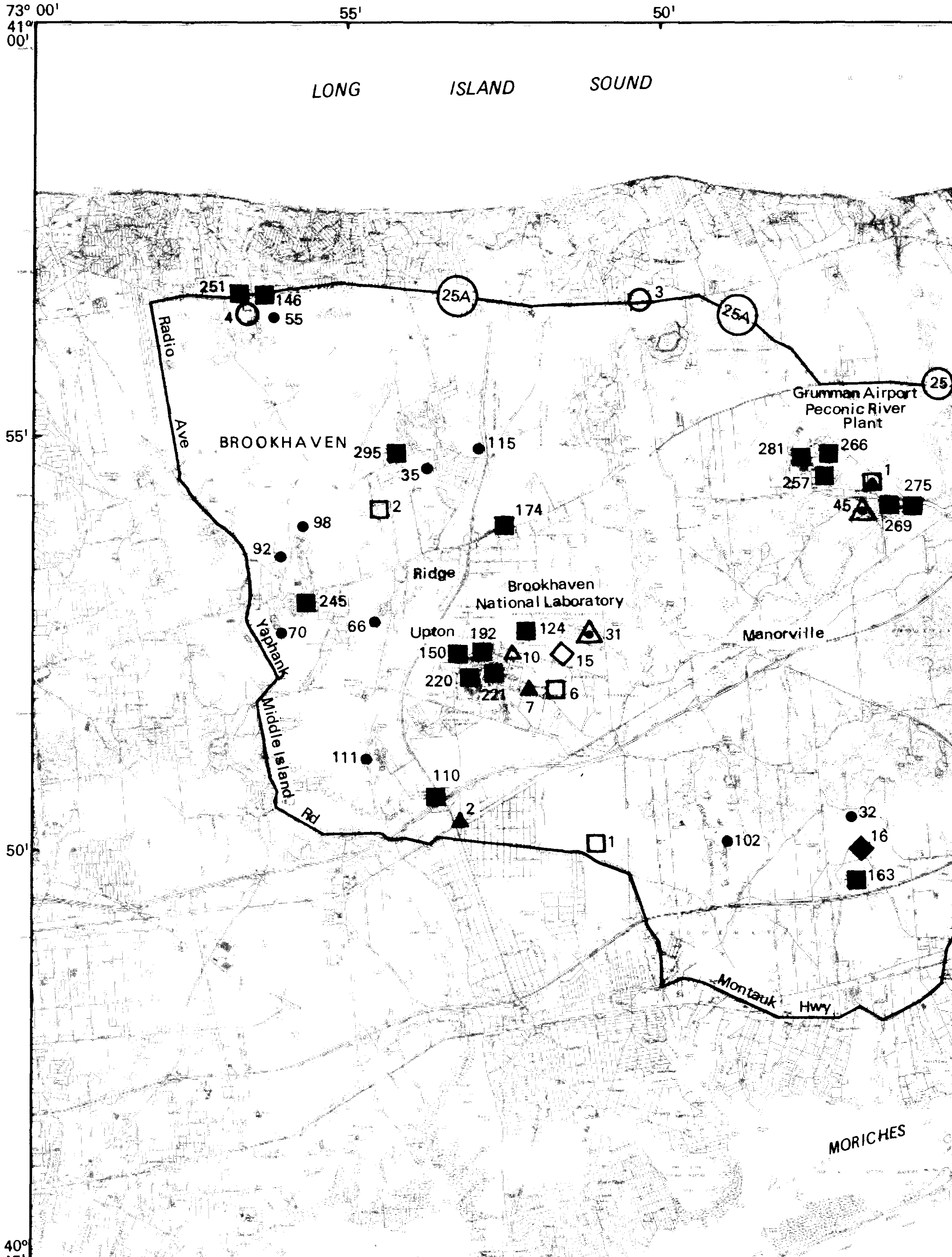
[1] Analyses by Suffolk County Water Authority.

The collection systems for all facilities consist of separate sanitary sewers; two are municipal facilities, and the remaining 12 treatment plants are owned and operated privately (table 11). The County is making an effort to acquire facilities 111 and 115 (table 11) but does not plan to acquire any other private facilities in the area. However, sewer-agency contracts for owners of facilities serving condominiums and subdivisions (in this case treatment plants 35, 70, 76, and 98) contain provisions to request County takeover if both the owner and County so desire.

State Pollutant Discharge Elimination System (SPDES) requirements for effluent have been revised; two major modifications are as follows:

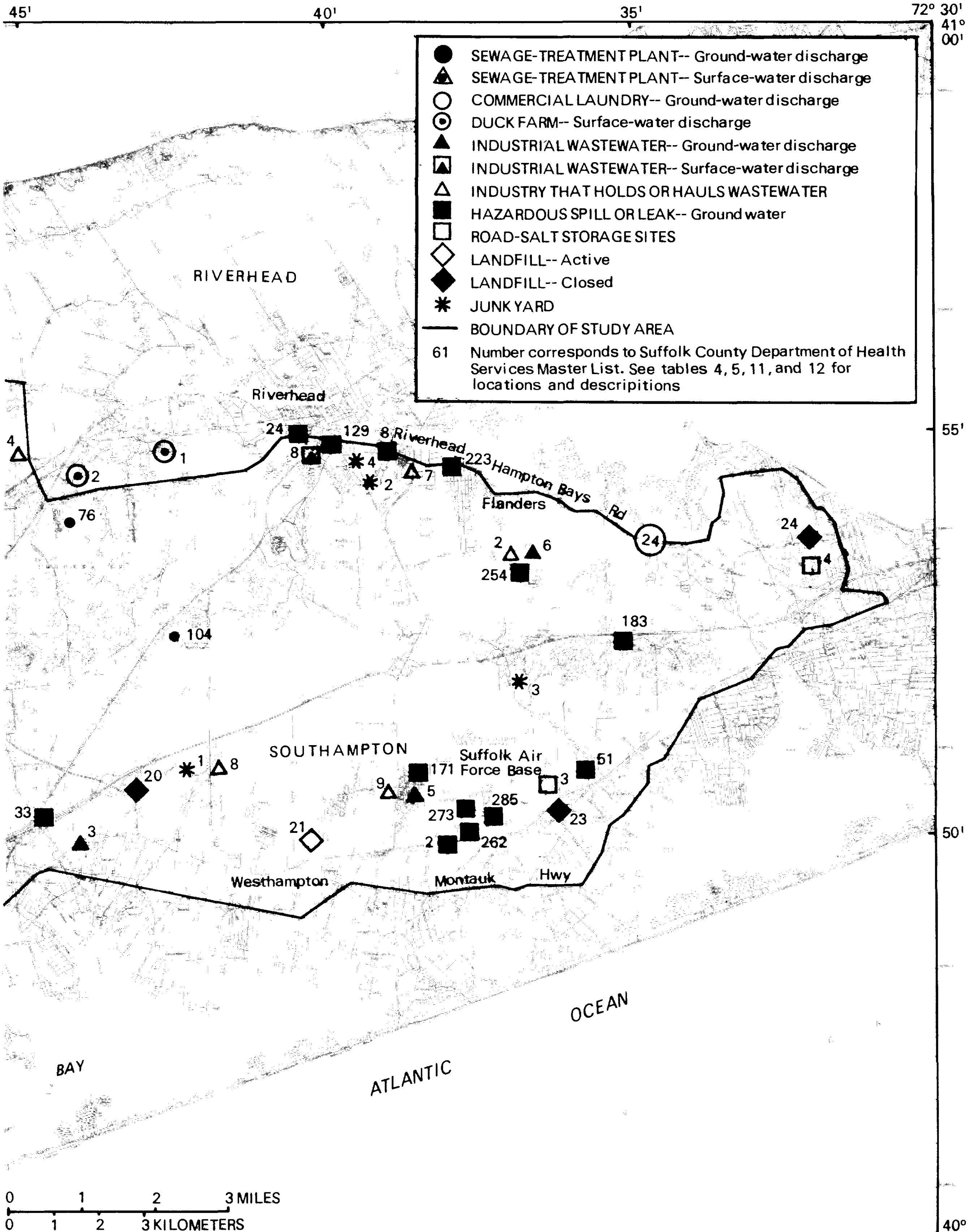
1. Fecal coliform and chlorine limits will be eliminated for facilities that discharge effluent into subsurface leaching pools.

2. After August 31, 1982, all plants that discharge to ground water without denitrification must be upgraded to meet a total nitrogen limit of 10 mg/L.



Base from U.S. Geological Survey
Topographic maps, 1:24,000 scale

Figure 12.--Location of point-source



contamination in Pine Barrens.

Surveillance reports indicate that 10 of the 14 facilities are attaining their effluent requirements for a permit. An assessment survey by the Suffolk County Department of Health Services in 1980 found that, in general, the major causes of the failures to meet effluent limits were inadequate operation and maintenance procedures rather than improper design or construction. As a result of these findings, owners have been advised of the necessary corrective actions and been given a compliance schedule.

Several of the facilities have had long-term operating problems and(or) require upgrading to meet the revised nitrogen standard. Malfunction of process equipment and failing ponding facilities are the two most common serious difficulties.

Samples from 10 of the 14 treatment plants in the area were within the limits of 30 mg/L (daily average) for suspended solids and 10 μg/L for total nitrogen. Samples from the remaining four plants exceeded the limits as a result of mechanical difficulties. The results are based on four samples taken by the Suffolk County Department of Health Services.

Areas of Point-Source Contamination

The Suffolk County Department of Health Services has reported ground-water contamination from point sources in some areas. Locations, chemical type, and approximate volume are given in table 12 (at end of report). Plans for remedial action have not yet been disclosed.

Several other commercial and industrial sources may also contribute chemical pollutants to the area; locations of industrial discharges, commercial laundries, junkyards, road-salt storage sites, duck farms, landfills, and industries that haul or hold wastewater are shown in figure 12 with the locations of documented point sources in the Pine Barrens. Data on the industrial sources and discharges are given in tables 4 and 5.

Table 4.--Industries that hold or haul wastewater in the Pine Barrens.

[Locations are shown in fig. 12]

No.	SPDES No.[1]	Type
2	NY-0136824	Photographic and printing
3	None	Waste oils
4	None	Waste oil and fluid
7	None	Photographic
8	None	Copper chromate and arsenate used
9	None	Pesticide storage
10	None	1) Sulfuric acid 2) Dry radioactive waste 3) Solvents stored and used 4) Waste oils

[1] State Pollutant Discharge Elimination System Permit number. No wastewater discharges allowed.

Table 5.--Industrial wastewater discharges in the Pine Barrens.

[NR, not reported; GW, ground water. Locations are shown in fig. 12; data from Suffolk County Department of Health Services]

No.	SPDES No.[1]	Type of industry	Process water flow (gal/d)	Days of discharge per week	Discharged to:
1	NY-0025453	Aircraft assembly, metal finishing	1,500	5	Surface water via sewage-treatment plant
2	In Process	Pharmaceuticals	1,500	5	GW
3	NY-0098779	Duck vaccines	<100	5	GW
5	None	Pipe manufacturing	NR	5	GW
6	None	Metal etching	<100	5	GW
7	None	PC board etch and degreasing, acid rain manufacturing	NR	NR	GW
		Paint and thinners	NR	NR	GW
		Metal etching and silk screening	NR	NR	GW
		Acid waste and solvents	NR	NR	GW
		Liquid hydrogen, liguid deuterium, wash water	NR	NR	GW
		Steam cleaning and quench water	NR	NR	GW
		Backwash water (high iron)	NR	NR	GW
8	NY-0101567	Photographic rinse water	Unknown	5	Surface water via sewage-treatment plant

[1] State Pollutant Discharge Elimination System Permit number.

WATER USE AND PUMPAGE

Ground water is the only source of water supply for Nassau and Suffolk Counties. A majority of the water in the Pine Barrens is obtained from the upper glacial (water-table) aquifer; the rest is obtained from the Magothy and Lloyd (deep) aquifers. At present, Suffolk County Water Authority supplies the majority of the water in the area; the rest is supplied by several smaller companies.

Total public water-supply withdrawal in the area in 1982 is estimated to have been 9.09 Mgal/d. In 1982, 7.88 Mgal/d was withdrawn from the upper glacial aquifer; 1.02 Mgal/d was withdrawn from the Magothy aquifer, and 0.19 Mgal/d from the Lloyd aquifer.

Ground water is also used for irrigation. Pumpage for farm and golf course irrigation is unknown but is estimated to be less than 0.5 Mgal/d, solely from the upper glacial aquifer.

The upper glacial and Magothy aquifers are capable of producing considerably more water than is currently being withdrawn; use of the Lloyd aquifer is legally restricted. The upper glacial aquifer is the most readily available source, but if it should prove inadequate for a particular need, wells could be drilled to the underlying Magothy in the central part of the Pine Barrens. Withdrawal from the Lloyd aquifer is restricted by New York State legislation to the south-shore barrier islands and to other areas with specific supply problems. Brookhaven National Laboratories is one agency that has permission to pump from the Lloyd aquifer.

Public Water Supply

The Pine Barrens area contains 31 public-supply wells. The Suffolk County Water Authority, which is the major public water supplier within the area, operates 15 wells in six well fields within the Pine Barrens. Well-field locations and pumpage data are given in table 6.

In addition to these sites, the Suffolk County Water Authority plans to develop well fields at four new sites, three of which are Longwood Road, Sally Lane, and Railroad Avenue (fig. 2); the fourth is at Evergreen Avenue within the Westhampton Beach District service area.

Shorewood Water Company, which extends into the study area, operates two wells from its well field at Bridgewater Drive. Calverton Hills Association in Calverton and Ridge Rest Home on Whiskey Road in Ridge both operate their own wells.

Eastern Suffolk Water Corporation services residents along the western border of the study area, but its well field is west of the study-area boundary (fig. 2). Riverside Water District, which is south of Riverhead Town, also has its service area within the Pine Barrens study area but purchases its water supply from the Riverhead Water District, which is outside the study area boundary.

Table 6.--Estimated public-supply withdrawals by Suffolk County Water Authority and private well companies in the Pine Barrens, 1982.

[Locations are shown in fig. 2; data from Suffolk County Water Authority and New York State Department of Environmental Conservation; dashes indicate data unavailable]

Location	Well number and aquifer[1]	Depth (ft)	Design capacity (gal/min)	Total pumpage, by well field, in Mgal		
				Annual	Average daily	Peak daily
Bailey Road	36711 (G)	137	1,700			
	40161 (G)	143	1,700	153	0.42	1.08
	49606 (M)	389	1,200			
William Floyd	47436 (G)	167	1,700			
Parkway	47437 (G)	179	1,700	19.7	.05	.09
	47438 (M)	269	1,400			
Country Club	56038 (G)	158	1,900	64.8	.18	.30
Drive	56039 (G)	163	1,900			
Moriches-River-	53522 (G)	242	300	7.2	.02	.05
head Road	53851 (M)	297	1,400			
Spinny Road	23184 (G)	118	2,000	179.3	.49	.93
	53593 (G)	162	2,000			
Bridgewater	37991 (G)	146	2,100	228.3	.63	--
Drive[2]	65341 (G)	146	2,100			
Calverton	47281 (G)	275	1,080	19.3	.05	--
Hills[2]	47282 (G)	283	1,080			
Ridge Rest Home[2]	-- (G)	230	20	2.5	.007	--
Old Country	16892 (G)	70	1,700			
Road	16893 (G)	76	1,700	144.5	.40	1.11
	65905 (G)	161	1,700			

[1] G, upper glacial aquifer; M, Magothy aquifer.
[2] Private well companies that supply water.

Brookhaven National Laboratory Water Supply

The major user of water in the Pine Barrens is Brookhaven National Laboratory, with an average annual pumpage of 2.4 billion gallons. The 14 wells on the property of Brookhaven National Laboratory are used for a variety of purposes ranging from cooling, which is the major use, to drinking water. Pumpage and other data on these wells are given in table 7.

Table 7.--Estimated public-supply withdrawals by Brookhaven National Laboratory, 1982.

[Locations are shown in fig. 2; data from New York State Department of Environmental Conservation]

Well number	Depth (ft)	Aquifer	Design capacity (gal/min)	Yearly total (Mgal)
S 2476	101	Upper Glacial	500	63.1
S 3197	135	Upper Glacial	500	40.1
S 17836	147	Upper Glacial	1,200	66.1
S 22151	151	Upper Glacial	1,200	223.6
S 22150	150	Upper Glacial	1,200	618.9
S 15949	119	Upper Glacial	825	not in service
S 15950	110	Upper Glacial	950	298.5
S 15951	102	Upper Glacial	1,000	232.0
S 14977	298	Magothy	1,200	172.4
S 18703	145	Upper Glacial	1,300	210.8
S 6434	1,392	Lloyd	450	not in service
S 66944	140	Upper Glacial	1,200	74.8
S 6697	102	Upper Glacial	700	214.5
S 72038	--	--	1,200	161.9

Total yearly pumpage = ±2.4 billion gallons.

SUMMARY AND CONCLUSIONS

Ground water is the sole source of water supply for central and eastern Long Island. Increasing urbanization and industrialization have altered the quality of water in parts of the aquifers to the extent that some of the water has become impotable. One area of Long Island that has been proposed as a source of high-quality ground water is a part of Long Island's Pine Barrens in southeastern Suffolk County. The usefulness of this water source depends upon the amount of precipitation, the rate of recharge, and the chemical quality of the ground water.

The basement of the Pine Barrens area is Precambrian bedrock overlain by Cretaceous, Pleistocene, and Holocene deposits that contain three distinguishable aquifers. The surficial material consists of morainal and outwash deposits overlain by recent beach and marsh deposits.

Precipitation is the only source of recharge to the island's ground-water system. Of the average annual precipitation of 46.3 inches, about 22.6 in/yr reaches the ground-water reservoir. Overland runoff is estimated to be about 0.5 in/yr, and average annual evapotranspiration is estimated to be 23.2 in/yr.

The three aquifers that underlie the Pine Barrens in Suffolk County are capable of producing more than the current 9.09 Mgal/d withdrawal. Both the upper glacial and Magothy aquifers are readily available sources for supplying additional needs. At present, it is unlikely that the Lloyd aquifer would be needed as a source of ground water except in special cases.

Ground water in the Pine Barrens is generally of a quality suitable for drinking and most other uses, except locally where point-source contamination has occurred.

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Tables 8 through 12

Table 8.--Water levels in wells in the Pine Barrens, September 1983.

[All water levels are in feet above sea level]

Local well-identification number[1]	Latitude/Longitude[2]		Owner[3]	Highest water level recorded during study		Lowest water level recorded during study		Sept. 1983 water level	
				Date	Level	Date	Level	Date	Level
S2485	405109	0725130	BNL	5-11-83	38.49	12- 9-82	35.35	9-15-83	37.41
S3539	405121	0724156	USGS	6-29-83	26.08	12-29-82	20.19	9-14-83	25.82
S3543	405037	0723903	USGS	6-29-83	20.14	12- 8-82	17.42	9-14-83	19.54
S4523	405607	0723935	USGS	5-11-83	10.53	12-29-82	8.66	9-15-83	9.05
S5517	405149	0725322	BNL	9-15-83	41.14	12- 9-82	38.34	9-15-83	41.14
S6410	405520	0725405	USGS	6-29-83	45.64	12- 8-82	43.44	9-14-83	45.26
S6411	405650	0725415	USGS	9-14-83	32.55	9- 8-82	30.61	9-14-83	32.55
S6413	405308	0725531	USGS	5-10-83	51.54	10- 6-82	49.27	9-14-83	50.81
S6431	405222	0725333	USGS	5-11-83	46.75	12- 9-82	42.25	9-15-83	44.18
S6441	405210	0724425	USGS	6-29-83	38.23	10- 6-82	36.47	9-14-83	36.99
S6443	405347	0724940	USGS	5-10-83	48.55	12- 8-82	40.84	9-14-83	41.76
S6455*	405223	0725234	BNL	6-15-83	40.39	1-12-83	37.67	9-21-83	39.26
S8835	405310	0723230	USGS	5-11-83	10.62	12- 9-82	7.67	9-15-83	9.45
S9129	404915	0725318	USGS	6-29-83	15.16	11-23-82	14.18	9-14-83	14.86
S9130	404830	0725304	USGS	6-30-83	11.14	1-18-83	10.02	9-14-83	10.93
S26780	405716	0725057	USGS	9-14-83	19.56	1-20-83	18.90	9-14-83	19.56
S30230	405120	0723537	SCWA	6-30-83	13.31	1-19-83	11.22	9-15-83	12.77
S32359*	404908	0724730	SCWA	6-30-83	26.05	12- 8-82	23.30	9-14-83	25.17
S33919	404908	0724730	SCWA	6-30-83	22.45	12- 8-82	19.47	9-14-83	21.48
S34272*	405713	0724713	SCWA	6-29-83	22.64	12-29-82	21.27	9-14-83	22.60
S34742	405038	0724147	SCWA	6-29-83	23.26	1-19-83	19.68	9-14-83	22.55
S34743*	405038	0724147	SCWA	6-29-83	20.24	1-19-83	17.24	9-14-83	19.95
S34892	405517	0725749	SCWA	6-15-83	49.28	3-17-83	45.55	9-14-83	48.48
S34894*	405517	0725749	SCWA	6-29-83	46.81	3-17-83	43.62	9-14-83	46.61
S36013	405505	0724322	SCDHS	5-11-83	12.86	1-19-83	9.28	9-14-83	10.98
S36146	405551	0725016	USGS	6-29-83	36.96	12- 8-82	33.68	9-14-83	36.26
S36147	405259	0724656	USGS	5-10-83	38.07	3-17-83	33.37	9-14-83	35.10
S36149	405542	0724629	USGS	6-29-83	30.76	3-18-83	27.55	9-14-83	30.38
S36150	405117	0724903	USGS	5-10-83	37.73	1-12-83	32.63	9-14-83	35.67
S36152	405010	0724435	USGS	5-10-83	22.06	1-20-83	19.29	9-14-83	21.08
S36153	405715	0724132	SCDHS	1-19-83	19.04	3-18-83	15.01	9-15-83	17.95
S36295	405710	0724713	SCWA	9-14-83	21.27	3-17-83	20.02	9-14-83	21.27
S40852	405655	0725642	USGS	9-14-83	32.88	3-17-83	30.81	9-14-83	32.88
S40853	405608	0725629	USGS	9-14-83	40.91	3-17-83	37.92	9-14-83	40.91
S46532	405147	0723050	USGS	5-11-83	5.81	1-17-83	2.41	9-15-83	3.61
S46533	405302	0723135	USGS	6-30-83	8.34	1-19-83	5.82	9-15-83	7.57
S46534	405231	0723419	USGS	5-11-83	12.75	1-19-83	10.50	9-15-83	12.47
S46535	405144	0723337	USGS	5-11-83	9.71	1-19-83	6.45	9-15-83	8.05
S46536	405324	0723522	USGS	5-11-83	13.95	12- 9-82	10.94	9-15-83	12.05
S46537	405130	0723532	USGS	6-30-83	13.69	1-19-83	11.10	9-15-83	12.90
S46539	405222	0723707	USGS	9-14-83	18.38	1-17-83	15.22	9-14-83	18.38
S46540	405021	0723559	USGS	5-10-83	11.60	12- 9-82	7.65	9-14-83	8.89
S46541	405353	0724038	USGS	5-11-83	18.61	12 -8-82	16.44	9-15-83	17.09
S46542	405302	0724251	USGS	6-29-83	26.54	3-28-83	24.69	9-14-83	26.27
S46544	405120	0724325	USGS	9-14-83	28.14	3-18-83	25.57	9-14-83	28.14
S46545	405330	0724538	USGS	9-14-83	41.89	3-17-83	36.18	9-14-83	41.89
S46546	405131	0724557	USGS	9-14-83	30.86	3-18-83	27.99	9-14-83	30.86
S46913	404919	0724845	SCDHS	5-13-83	25.17	12- 8-82	21.59	9-14-83	23.72
S46914	404918	0724845	SCDHS	5-13-83	24.83	12- 8-82	21.43	9-14-83	24.55
S46966	404952	0724705	SCDHS	6-29-83	26.56	12- 8-82	23.52	9-14-83	25.83
S47225	405218	0725611	SCDHS	5-10-83	48.00	12- 8-82	46.48	9-14-83	47.32
S47226	405240	0724914	SCDHS	6-29-83	40.47	10- 6-82	36.70	9-14-83	37.10
S47227	405240	0724914	SCDHS	5-10-83	38.54	10 -6-82	36.71	9-14-83	37.02
S47228	405306	0724827	SCDHS	5-10-83	37.69	10- 6-82	35.63	9-14-83	35.86
S47229	405306	0724827	SCDHS	5-10-83	36.35	10- 6-82	35.00	9-14-83	35.17
S47230	405417	0724023	SCDHS	5-11-83	13.54	9-15-83	12.89	9-15-83	12.89
S47232	405248	0723327	SCDHS	5-11-83	11.19	12- 9-82	8.21	9-15-83	9.36
S47745	405417	0725727	SCDHS	5-10-83	55.00	10- 8-82	54.27	9-14-83	54.67
S47748	405638	0725147	SCDHS	9-14-83	28.90	10- 8-82	27.53	9-14-83	28.90

1 S, Suffolk County
2 Should be read 40°51'09" 072°51'30"
3 BNL, Brookhaven National Laboratory; USGS, U.S. Geological Survey; SCWA, Suffolk County Water Authority; SCDHS, Suffolk County Department of Health Services.
* Magothy wells.

Table 8.--Water levels in wells in the Pine Barrens, September 1983 (continued)

[All water levels are in feet above sea level]

Local well-identification number[1]	Latitude/Longitude[2]	Owner[3]	Highest water level recorded during study		Lowest water level recorded during study		Sept. 1983 water level	
			Date	Level	Date	Level	Date	Level
S47749	405338 0725304	SCDHS	5-10-83	52.35	10- 8-82	48.45	9-14-83	50.92
S47750	405004 0725154	SCDHS	6-29-83	31.45	9- 8-82	28.39	9-14-83	30.77
S47753	405407 0724426	SCDHS	5-10-83	27.05	12- 8-82	24.25	9-14-83	25.39
S47754	405407 0724426	SCDHS	5-10-83	27.18	12- 8-82	24.37	9-14-83	25.50
S47755	405136 0724645	SCDHS	6-29-83	33.77	12- 8-82	31.14	9-14-83	33.26
S47945	405648 0725551	SCDHS	9-14-83	34.90	5-10-83	33.00	9-14-83	34.90
S47977	404711 0725150	SCDHS	5-11-83	13.77	1-23-83	10.09	9-14-83	12.16
S48434	405227 0723523	SCDHS	6-30-83	14.93	12- 9-82	13.47	9-15-83	14.92
S48435	405051 0723531	SCDHS	5-11-83	12.48	12- 9-82	9.06	9-15-83	10.30
S48442	404941 0724148	SCDHS	6-29-83	14.69	12- 8-82	11.89	9-14-83	13.39
S48581	405308 0723222	SCDHS	6-30-83	9.88	12- 9-82	7.36	9-15-83	8.73
S48582	405225 0723710	SCDHS	9-15-83	18.44	12- 9-82	15.31	9-15-83	18.44
S48583	405139 0723850	SCDHS	6-29-83	21.82	5-10-83	19.27	9-14-83	21.71
S48584	405139 0723850	SCDHS	6-29-83	21.82	5-10-83	19.29	9-14-83	21.77
S48946	405121 0724906	SCDHS	5-10-83	37.17	12- 8-82	33.48	9-14-83	35.42
S51579	405542 0724630	SCDHS	6-29-83	30.94	12- 9-82	28.19	9-14-83	30.27
S51583	405500 0724952	SCDHS	6-29-83	46.12	12- 8-82	43.09	9-14-83	44.94
S51586	405642 0724919	SCDHS	6-29-83	25.46	10- 8-82	24.01	9-14-83	25.29
S51590	405418 0724706	SCDHS	5-10-83	35.82	12- 8-82	33.64	9-14-83	34.62
S51592	405349 0724941	SCDHS	5-10-83	44.78	12- 8-82	40.80	9-14-83	41.68
S52383	405542 0724453	SCDHS	6-29-83	26.33	12- 9-82	23.04	9-14-83	25.34
S52496	404944 0723731	SCWA	5-10-83	8.00	9-14-83	5.24	9-14-83	5.24
S52551	404944 0723809	SCWA	5-10-83	11.53	12- 8-82	8.52	9-14-83	9.38
S52554	404948 0723726	SCWA	5-10-83	7.48	9-14-83	4.88	9-14-83	4.88
S54882	404642 0725200	USGS	5-11-83	11.79	1-18-83	7.13	9-14-83	9.47
S54883	405051 0725308	USGS	6-29-83	36.74	3-29-83	32.28	9-14-83	36.43
S54884	405418 0724944	USGS	5-10-83	46.62	1-20-83	42.11	9-14-83	43.74
S54886	405243 0723818	USGS	6-29-83	19.94	1-17-83	17.27	9-15-83	19.74
S62404	405033 0725600	USGS	5-10-83	36.19	9-14-83	34.34	9-14-83	34.34
S65604	404936 0724835	USGS	6-29-83	25.98	12- 8-82	22.64	9-14-83	25.10
S65855	405351 0725351	USGS	6-29-83	51.94	3-15-83	47.76	9-14-83	50.90
S65856	405425 0725456	USGS	6-29-83	51.74	3-15-83	47.77	9-14-83	50.97
S65857	405430 0725547	USGS	6-29-83	51.25	3-15-83	47.20	9-14-83	50.57
S66506	405245 0725737	USGS	6-29-83	55.07	3-15-83	50.04	9-14-83	53.97
S66849	405449 0725256	USGS	6-29-83	51.81	3-17-83	47.54	9-14-83	50.78
S72176	404955 0725406	USGS	6-29-83	22.26	11-23-82	21.47	9-14-83	21.83
S72177	405023 0725548	USGS	5-10-83	33.60	11-22-82	32.54	9-14-83	32.81
S73950	404802 0725213	USGS	6-29-83	15.85	11-22-82	13.42	9-14-83	14.49
S74287	405201 0725443	USGS	6-29-83	47.24	9-15-83	46.34	9-15-83	46.34
S74289	405418 0725112	USGS	5-10-83	48.63	9-14-83	46.53	9-14-83	46.53
S74290	405530 0724832	USGS	6-29-83	40.92	9-14-83	40.10	9-14-83	40.10
S74291	405421 0724745	USGS	6-29-83	39.61	9-14-83	39.28	9-14-83	39.28
S74292	405322 0724541	USGS	6-29-83	39.70	5-10-83	38.76	9-14-83	38.88
S74293	405017 0724950	USGS	6-29-83	32.45	5-10-83	31.04	9-14-83	31.43
S74294	405213 0724811	USGS	5-11-83	39.30	9-15-83	36.28	9-15-83	36.28
S74295	405045 0724726	USGS	6-29-83	31.50	5-10-83	29.75	9-14-83	31.00
S74296	405347 0723855	USGS	5-11-83	16.94	9-15-83	14.35	9-15-83	14.35
S74297	405338 0724305	USGS	6-30-83	37.32	5-11-83	35.79	9-15-83	36.80
S74298	405348 0723705	USGS	6-30-83	16.66	9-15-83	15.64	9-15-83	15.64
S74299	405340 0723406	USGS	5-11-83	12.59	9-15-83	8.65	9-15-83	8.65
S74300	405115 0723705	USGS	6-29-83	17.49	5-10-83	16.08	9-14-83	17.02
S74301	405330 0724539	USGS	9-14-83	41.02	5-10-83	38.92	9-14-83	41.02
S74302	405434 0724214	USGS	5-11-83	21.41	9-15-83	20.05	9-15-83	20.05
S74303	405435 0724214	USGS	5-11-83	16.85	9-15-83	14.61	9-15-83	14.61
S74304	405419 0723812	USGS	5-11-83	10.47	9-15-83	8.44	9-15-83	8.44
S74305	405404 0723202	USGS	6-30-83	15.24	9-15-83	14.62	9-15-83	14.62
S74306	405033 0724025	USGS	6-30-83	20.03	9-14-83	19.25	9-14-83	19.25
S74307	405206 0724033	USGS	6-30-83	24.74	5-10-83	21.19	9-15-83	23.77
S74308	405256 0723923	USGS	6-30-83	22.29	5-11-83	21.69	9-15-83	22.21

1 S, Suffolk County
2 Should be read 40°51'09" 072°51'30"
3 BNL, Brookhaven National Laboratory; USGS, U.S. Geological Survey; SCWA, Suffolk County Water Authority; SCDHS, Suffolk County Department of Health Services.
* Magothy wells.

Table 9.--Discharge of selected streams in the Pine Barrens, 1982-83.

[Locations are shown in fig. 2.]

Station number	Station name	Location	Date	Discharge (ft^3/s)
01304400	Peconic River at Manorville, N.Y.	Lat 40°52'38", long 72°49'42", Suffolk County at bridge on Schultz Road, 1 mi (2 km) northwest of Manorville, and 8.5 mi (13.7 km) upstream from gaging station at Riverhead.	7-20-82	1.80
			10-28-82	2.90
			9- 1-83	2.41
01304510	Peconic River at Nugent Drive, at Riverhead, N.Y.	Lat 40°55'03", long 72°40'11", Suffolk County at bridge on Nugent Drive at Riverhead, and 1.4 mi (2.3 km) downstream from gaging station at Riverhead.	7-20-82	26.00
			10-28-82	26.40
			9- 1-83	41.20
01304530	Little River near Riverhead, N.Y.	Lat 40°53'52", long 72°40'30", Suffolk County, at Wildwood Lake outlet, 500 ft (152 m) east of Moriches-Riverhead Road, 1.5 mi (2.4 km) southwest of Riverhead.	7-22-82	4.10
			9- 8-82	4.15
			11-18-82	6.48
			4- 7-83	4.90
			8-30-83	2.97
01304560	White Brook at Riverhead, N.Y.	Lat 40°54'40", long 72°38'37", Suffolk County, at culvert on State Highway 24, 1 mi (2 km) southeast of Riverhead.	7-22-82	0.88
			9- 9-82	0.89
			11-18-82	0.44
			4- 7-83	3.76
			9- 1-83	4.61
01304745	Weesuck Creek at East Quogue, N.Y.	Lat 40°50'52", long 72°34'42", Suffolk County, at culvert on State Highway 27A, 0.5 mi (0.8 km) northeast of East Quogue.	7-26-82	0.93
			9- 9-82	0.88
			12-27-82	0.30
			4- 7-82	1.49
			9- 1-83	1.81
01304760	Quantuck Creek at Quogue, N.Y.	Lat 40°49'57", long 72°37'06", Suffolk County, at culvert on Old Meeting House Road, 1 mi (2 km) northwest of Quogue.	7-26-82	1.40
			9- 8-82	1.12
			12-27-82	1.87
			4- 7-83	2.21
			8-30-83	1.07
01304780	Aspatuck Creek near Westhampton Beach, N.Y.	Lat 40°49'04, long 72°38'13", Suffolk County, at culvert on Brook Road, at Westhampton Beach.	7-26-82	1.70
			9- 8-82	1.24
			12-27-82	0.96
			4- 7-83	3.11
			8-30-83	1.07
01304800	Beaverdam Creek at Westhampton Beach, N.Y.	Lat 40°49'23", long 72°39'42", Suffolk County, at culvert on Old County Road, 100 ft (30 km) northwest of State Highway 27A and 1 mi (2 km) northwest of Westhampton.	7-22-82	2.10
			9- 8-82	1.14
			12-27-82	1.23
			4- 7-83	2.45
			8-30-83	1.58
01304820	Speonk River at Speonk, N.Y.	Lat 40°49'06", long 72°41'29", Suffolk County, at culvert on State Highway 27A, 0.75 mi (1.21 km) east of Speonk.	7-22-82	0.06
			9- 8-82	0.06
			12-27-82	0.75
			4- 7-83	1.66
			8-30-83	0.59

Table 9.--Discharge of selected streams in the Pine Barrens, 1982-83 (continued)

Station number	Station name	Location	Date	Discharge (ft^3/s)
01304830	East River at Eastport, N.Y.	Lat 40°49'24", long 72°43'02", Suffolk County, 15 ft (5 m) upstream from culvert on Long Island Rainroad, 200 ft (60 km) south of State Highway 27A, 0.5 mi (0.8 km) east of Eastport.	7-22-82 9- 8-82 11-10-82 12-27-82 8-30-83	0.76 1.00 0.51 1.13 1.96
01304860	Seatuck Creek at Eastport, N.Y.	Lat 40°39'30", long 72°43'43", Suffolk County, 15 ft (5 m) downstream from culvert on State Highway 27A, at Eastport.	7-22-82 9- 8-82 11-10-82 5- 3-83 8-30-83	2.20 2.40 2.05 8.91 2.26
01304900	Little Seatuck Creek at Eastport, N.Y.	Lat 40°49'12", long 72°44'23", Suffolk County, at culvert on Moriches Blvd., 0.75 mi (1.21 km) southwest of Eastport.	7-22-82 9- 8-82 11-10-82 5- 3-83 8-30-83	0.75 1.00 1.19 7.04 3.32
01304960	Forge River at Moriches, N.Y.	Lat 40°48'22", long 72°50'00", Suffolk County, at culvert on State Highway 27A, at Moriches.	7-22-82 9- 7-82 11-10-82 9-15-83	4.60 2.90 3.17 6.11
01304990	Carmans River at Middle Island, N.Y.	Lat 40°51'47", long 72°56'35", Suffolk County, at culvert on East Bartlett Road, 0.75 mi (1.21 km) south of Middle Island, and 3.0 mi (4.8 km) upstream from gaging station at Yaphank.	7-30-82 9-14-82 11- 8-82 5-11-83 9-14-83	1.70 0.84 0.39 4.84 2.10
01304995	Carmans River near Yaphank, N.Y.	Lat 40°50'29", long 72°56'13", Suffolk County, 25 ft downstream from Mill Road, 1.2 mi (1.9 km) northwest of Yaphank, and 1.9 mi (3.1 km) upstream from gaging station at Yaphank.	7-30-82 9-14-82 11- 8-82 5-11-83 9-14-83	11 13 9.65 16.12 11.90
01304998	Carmans River, below Lower Lake at Yaphank, N.Y.	Lat 40°50'07", long 72°55'01", Suffolk County, at culvert on Yaphank Avenue, at Yaphank, and 0.7 mi (1.1 km) upstream from gaging station at Yaphank.	7-30-82 9-14-82 11- 8-82 9-14-83	15 13 8.8 17
01305040	Carmans River at South Haven, N.Y.	Lat 40°48'09", long 72°53'09", Suffolk County, 50 ft (15 m) upstream from culvert on State Highway 27, at South Haven, and 2.6 mi (4.2 km) downstream from gaging station at Yaphank.	7-30-82 9-14-82 11- 8-82 9-14-83	73 60 62 50

Reference: U.S. Geological Survey.

Table 10.--Concentrations of nitrate-nitrogen in water from selected Suffolk County Department of Health Services observation wells in the Pine Barrens, 1972-82.

[Locations are shown in fig. 2.]

Well no.[1]	Date	Nitrate-nitrogen (mg/L)
45724 STP	12- 6-72	1.40
	3-11-75	3.00
	10-18-77	4.20
	10-15-80	5.20
	4-15-82	10.90
	10- 7-82	6.60
46966	10-28-74	.01
	12-26-74	.03
	4-30-76	.02
	7-20-77	< .02
	6- 5-79	.03
	1-24-80	.02
	5-29-80	.06
	7- 9-80	.04
	9-15-80	.04
	12- 8-80	< .04
	2-17-81	< .02
	5- 4-81	< .02
	7-15-81	< .04
	9-21-81	.02
	11-23-81	< .02
	1- 6-82	< .02
	3-16-82	.02
	5-12-82	< .04
	7-13-82	< .04
	10-15-82	< .20
	11-18-82	.04
47225	8-14-74	3.50
	8-29-74	3.12
	5-27-75	5.40
	5-10-76	5.00
	3- 1-78	4.00
	2- 8-79	4.30
	5-17-79	3.20
	2-22-80	2.60
	3- 5-80	2.30
	7- 8-80	2.90
	9-16-80	2.60
	12-17-80	6.40
	5-13-81	7.40
	6-30-81	7.50
	9-28-81	8.30
47225	10-19-81	9.30
(cont'd)	1-27-82	8.20
	3-29-82	6.30
	5-10-82	6.70
	7-13-82	6.20
	10-15-82	7.20
	11-18-82	6.20
47226	3-30-73	.20
	8- 9-74	< .01
	5-30-75	.01
	5-12-76	< .02
	11-19-76	< .02
	7-30-79	.02
	8-16-79	.06
	10-19-79	< .02
	2- 7-80	.22
	3-21-80	< .02
	5- 4-82	< .04
	7- 8-82	< .04
	9-20-82	< .20
	12- 2-82	< .40
	12-13-82	< .20
47227	3-29-73	.05
	8- 9-74	.41
	5-30-75	< .01
	5-12-76	< .02
	11-19-76	< .02
	7-30-79	.05
	8-16-79	.03
	10- 9-79	< .02
	2- 7-80	.06
	3-21-80	< .02
	5- 4-82	< .40
	7- 8-82	< .40
	9-20-82	< .20
	12- 2-82	< .40
	12-13-82	< .20
47228	8- 9-74	< .01
	5-30-75	< .01
	5-12-76	< .02
	11-19-76	.02

[1] STP = Sewage-treatment plant

Table 10.--Concentrations of nitrate-nitrogen in water from selected Suffolk County Department of Health Services observation wells in the Pine Barrens, 1972-82 (continued)

[Locations are shown in fig. 2.]

Well no.[1]	Date	Nitrate-nitrogen (mg/L)	Well no.	Date	Nitrate-nitrogen (mg/L)
47228	1-25-79	<0.02	47229	9-27-82	1.40
(cont'd)	6-19-79	.07	(cont'd)	11-29-82	1.10
	8- 8-79	.02			
	8-14-79	< .40	47230	3-28-73	.80
	2- 7-80	< .02		8- 8-74	.07
	3-25-80	< .02		8-14-75	.01
	8-11-80	.04		3-30-76	.02
	9- 3-80	< .04		11- 5-76	.11
	10-29-80	< .02		7-25-77	.03
	1-27-81	< .02		5-10-79	.05
	3-31-81	< .40		4- 7-80	.03
	5-26-81	.05		2-17-81	.10
	11- 5-81	< .04		8-25-81	.15
	1-26-82	.04		11-19-81	.40
	4- 7-82	< .20		5- 6-82	< .04
	5- 4-82	< .04		1-21-82	< .02
	6-17-82	< .04		9-20-82	< .02
	7- 7-82	< .04		12-16-82	< .40
	9-27-82	.04			
	11-29-82	< .20	47232	8- 8-74	< .01
				7- 7-75	< .01
47229	3-27-73	1.00		11-10-76	< .02
	8- 9-74	.50		4-30-79	.07
	5-30-75	1.02		1-10-80	.05
	5-12-76	.43		2-10-81	< .02
	11-19-76	.86		8-11-81	.09
	1-25-78	.74		11-23-81	< .02
	6-19-79	.57		5-11-82	< .40
	8- 8-79	.55		7-14-82	< .40
	2- 7-80	1.10		9-14-82	< .20
	3- 5-80	.60		12-20-82	< .20
	3-25-80	1.20			
	8-11-80	.95	47488 STP	5-22-73	.30
	9- 3-80	.80			
	10-29-80	.83	47745	7- 6-73	4.70
	1-27-81	.90		8-14-74	1.71
	3-31-81	.80		10- 3-74	.91
	5-26-81	1.40		5-19-75	4.10
	11- 5-81	3.20		5-10-76	6.60
	1-26-82	.79		1-26-79	1.70
	4- 7-82	1.20		5-17-79	.93
	5- 4-82	1.20		2-25-80	3.00
	6-17-82	1.10		7- 8-80	3.60
	7- 7-82	.90		9-18-80	1.50

Table 10.--Concentrations of nitrate-nitrogen in water from selected Suffolk County Department of Health Services observation wells in the Pine Barrens, 1972-82 (continued)

[Locations are shown in fig. 2.]

Well no.[1]	Date	Nitrate-nitrogen (mg/L)	Well no.	Date	Nitrate-nitrogen (mg/L)
47745	12-17-80	3.80	47749	3-23-81	2.50
(cont'd)	12-29-80	5.00	(cont'd)	5-11-81	4.20
	3-24-81	11.00		9-24-81	2.10
	5-18-81	9.90		11- 5-81	.49
	6-30-81	5.50		3- 5-82	3.80
	9-28-81	4.30		5- 5-82	3.80
	3-29-82	.71		7-13-82	3.60
	5-10-82	.60		9-30-82	1.80
	7-14-82	.90		11-17-82	1.40
	9-30-82	2.70			
	11-15-82	4.90	47753	7-30-73	.02
				12-26-74	.03
47748	7- 9-73	.15		6- 2-75	.78
	12-26-74	.01		3-19-76	.12
	6- 3-75	.02		5-12-76	.07
	11- 4-76	< .02		7-21-77	.11
	7-13-77	< .02		10-24-77	.07
	1-11-78	.05		6-20-79	.06
	8- 8-79	.05		8-15-79	.07
	1-25-80	.02		1- 8-80	.08
	7-14-80	< .40		1-24-80	.08
	8-12-80	< .40		5-29-80	.11
	9-17-80	< .40		7- 9-80	.10
	12-16-80	.04		9- 3-80	< .40
	5-11-81	.03		10-29-80	.11
	7- 1-81	< .40		12- 8-80	< .10
	9-24-81	< .40		3-23-81	.12
	3-15-82	.02		3-31-81	< .40
	5-25-82	< .04		5- 4-81	.14
	8- 9-82	.05		7- 7-81	< .40
	1-17-83	< .20		9-22-81	.08
				1- 6-82	.06
47749	5- 2-73	2.90		3-16-82	.04
	10- 4-74	3.40		5- 4-82	< .04
	6- 3-75	4.80		7-12-82	< .04
	5-11-76	5.10		9-29-82	< .04
	7-13-77	3.90		11-16-82	.08
	6-20-79	3.00			
	1-25-80	1.90	47754	7-30-73	.04
	6-17-80	3.20		12-26-74	.01
	7-14-80	2.70		6- 2-75	.57
	8-12-80	2.00		3-19-76	.34
	9-17-80	2.00		5-12-76	.52
	12- 6-80	1.90		7-21-77	.05

STP = Sewage-treatment plant

Table 10.--Concentrations of nitrate-nitrogen in water from selected Suffolk County Department of Health Services observation wells in the Pine Barrens, 1972-82 (continued)

[Locations are shown in fig. 2.]

Well no.[1]	Date	Nitrate-nitrogen (mg/L)	Well no.	Date	Nitrate-nitrogen (mg/L)
47754	10-24-77	0.14	48434	10-28-74	0.32
(cont'd)	6-20-79	.02		7- 7-75	.14
	8-15-79	.06		11- 8-76	.25
	1- 8-80	.02		4-30-79	.33
	1-24-80	< .02		1-10-80	.36
	5-29-80	.10		4- 8-80	.43
	7- 9-80	< .02		2-10-81	.17
	9- 3-80	< .40		8-11-81	.15
	10-29-80	< .02		11-19-81	.40
	12- 8-80	< .40		5-13-82	< .40
	3-23-80	< .02		7-21-82	.20
	3-31-81	< .40		9-14-82	.50
	5- 4-81	< .02		12-20-83	.40
	7- 7-81	< .04			
	9-22-81	.03	48435	10-28-74	2.30
	1- 6-82	< .02		7- 7-75	2.90
	3-16-82	.05		11- 8-76	2.30
	5- 4-82	< .04		4-30-79	2.40
	7-12-82	< .04		1-10-80	1.20
	9-29-82	< .04		4- 8-80	2.10
	11-16-82	< .02		2-10-81	2.80
				7-30-81	3.90
47755	6-13-73	.07		9- 3-81	4.20
	10- 3-74	.16		11-19-81	3.80
	6- 3-75	.11		8- 9-82	3.00
	11- 4-76	.20			
	7-26-77	.10	48436	2-15-74	.19
	7-26-77	.09		8-14-75	.01
	6-19-79	.13		11- 5-76	.05
	1-24-80	.08		7-25-77	.23
	5-29-80	.06		3-23-79	.98
	6-16-80	< .40			
	7- 9-80	.06	48442	7- 7-75	.08
	9- 8-80	< .40		11- 5-76	.14
	12- 8-80	< .40		7-25-77	.05
	5- 4-81	.12		5-10-79	.24
	7- 7-81	< .04		4- 9-80	.36
	9-22-81	.08		2-17-81	.25
	3-16-82	.07		8-10-81	.17
	5- 6-82	< .40		11-23-81	.20
	7-13-82	< .04		8- 9-82	< .40
	9-28-82	< .04			
	11-16-82	.05	48583	2-15-74	.20
				7- 7-75	.03

Table 10.--Concentrations of nitrate-nitrogen in water from selected Suffolk County Department of Health Services observation wells in the Pine Barrens, 1972-82 (continued)

[Locations are shown in fig. 2.]

Well no.[1]	Date	Nitrate-nitrogen (mg/L)	Well no.	Date	Nitrate-nitrogen (mg/L)
48583	11- 5-76	<0.20	51579	1- 2-75	1.16
(cont'd)	3-23-79	.03		10-21-75	.70
	11-20-79	.05		11-18-76	1.10
	4- 7-80	< .20		7-26-77	.70
	2-11-81	.40		7-23-79	.65
	8-10-81	.02		2- 5-80	5.70
	11-17-81	.96		2- 8-80	4.10
	5-11-82	1.40		3-24-80	.73
	7-19-82	1.90		8- 6-80	.70
	9- 5-82	1.60		1-13-81	.71
	12-16-82	1.80		1-21-81	.69
				7-28-81	.75
48584	11- 5-76	< .02		10-29-81	.50
	3-23-79	< .02		4-29-82	.80
	5- 7-79	.02		7-20-82	.70
	11-20-79	.05		9-22-82	.70
	4- 7-80	.02		12-15-82	.80
	2-11-81	.04			
	8-10-81	.66	51583	1- 2-75	.14
	11-17-81	.09		4-30-75	.19
	5-11-82	< .40		10-22-75	.26
	7-19-82	< .40		5- 3-76	.11
	9-15-82	< .20		11-18-76	.15
	12-16-82	< .40		1-25-79	.17
				7-30-79	.29
48946	12-16-74	4.22		8-16-79	.36
	5-30-75	4.00		2-13-80	.31
	5-11-76	3.60		3-24-80	.32
	7-19-77	3.10		8-12-80	.40
	7-30-79	5.70		7-29-81	.40
	8-16-79	4.90		5- 5-82	.50
	1-25-80	6.20		7- 7-82	< .40
	2-13-80	6.20		9-21-82	.60
	7- 9-80	8.30		11-30-82	.40
	7- 7-81	9.50			
			51586	1- 2-75	8.45
48946	1- 6-82	8.70		10-21-75	1.30
	5- 5-82	11.60		12- 1-76	1.30
	7- 8-82	11.00		7-27-77	.11
	9-28-82	7.60		8- 8-79	.06
	11-29-82	9.30		1-29-80	8.70
	12-13-82	11.00		2-11-80	3.10
				3-24-80	4.70
49269 STP	8- 7-73	8.60		8-11-80	4.30

Table 10.--Concentrations of nitrate-nitrogen in water from selected Suffolk County Department of Health Services observation wells in the Pine Barrens, 1972-82.

[Locations are shown in fig. 2.]

Well no.[1]	Date	Nitrate-nitrogen (mg/L)	Well no.	Date	Nitrate-nitrogen (mg/L)
51586	1-14-81	4.50	51592	3-25-80	0.03
(cont'd)	7-28-81	11.00	(cont'd)	8-11-80	.62
	11- 2-81	4.30		10-29-80	.47
	5-12-82	.70		7-29-81	.57
	7-20-82	2.10		4- 7-82	< .20
	9-22-82	2.50		5- 5-82	< .40
	12-13-82	1.00		7- 7-82	< .40
				9-28-82	< .40
51591	10- 4-74	.01		12- 1-82	.20
	6- 2-75	.05		12-14-82	< .20
	10-22-75	.11			
	11-19-76	.07	51979 STP	10-10-73	< .20
	7-18-77	< .02		8-11-75	.49
	7-23-79	.09		10-18-77	.94
	2-11-80	.04		5- 5-80	1.10
	3-25-80	.60		10- 7-80	.58
	8-11-80	.05		4-13-82	1.00
	9- 3-80	< .40			
	10-29-80	< .02	51980 STP	8-20-75	.67
	1-13-81	< .02		9- 7-77	2.20
	3-23-81	< .02		10-15-80	.80
	4-11-81	< .02		4-15-82	.06
	5- 5-81	< .40		10- 7-82	1.90
	7- 7-82	< .40			
	9-20-82	< .20	52128	6-10-74	2.95
	12- 2-82	< .40		11-20-79	1.40
				4- 9-80	.86
51592	10- 4-74	.48		2-11-81	1.60
	6-25-75	.48		11-17-81	1.10
	10-22-75	.80			
	12- 1-76	.65	52492	5-13-74	3.48
	1-25-79	.66			
	7-23-79	.57	55662 STP	12- 8-75	.14
	8-16-79	.63		10-18-77	.66
	1-28-80	.63		5- 1-80	2.70
	2-13-80	.60		10- 1-80	.06

STP, Sewage-treatment plant

Table 11.--Sewage-treatment plants in the Pine Barrens.

[Locations are shown in fig. 12; data from Suffolk County Department of Health Services.

Sewage-treatment plant no.[1]	Name of establishment and SPDES[2] Permit no.	Type of treatment[3]	Design flow (Mgal/d)	1980 Average flow (Mgal/d)	Treatment process	Recharge facilities	Sludge facility	Estimated annual sludge discharge (gallons)	Sludge-disposal site
31	Brookhaven National Lab, Upton (NY-0005835)	P	2.3	1.05	Sedimentation and intermittent sand filter	Peconic River	Aerobic digestor and drying beds	5,000	South Carolina landfill
[4]32	Brookhaven Scavenger, Manorville (NY-0079332)	P	.05	1.46	Aerated lagoons	Recharge beds	Sludge drying beds	9 Mgal	Onsite landfill
35	Leisure Village, Ridge (NY-0079359)	S	.165	.106	Contact stabilization	Recharge beds	Aerobic digestor	340,000	Brookhaven Scavenger
45	Grumman Aerospace, Calverton (NY-0025453)	S	.062	.023	Chemical pretreatment, extended aeration	Peconic River	Aerobic digestor	24,000	Riverhead Sewage-Treatment Plant
55	Rocky Point Gardens, Rocky Point (NY-0065382)	S	.03	.021	Extended aeration	Leaching pools	Aerobic digestor	25,000	Brookhaven Scavenger
[4]66	Strathmore Ridge, Yaphank (NY-0079391)	DN	.05	.05	Bio-disc, break-point chlorination	Recharge beds	Aerobic digestor	80,000	Brookhaven Scavenger
70	Artist Lake Condos, Middle Island (NY-0070502)	S	.097	.027	Extended aeration	Leaching pools	Aerobic digestor	32,000	Brookhaven Scavenger

Table 11.--Sewage-treatment plants in the Pine Barrens (continued)

Sewage-treatment plant no.[1]	Name of establishment and SPDES[2] Permit no.	Type of treatment[3]	Design flow (Mgal/d)	1980 Average flow (Mgal/d)	Treatment process	Recharge facilities	Sludge facility	Estimated annual sludge discharge (gallons)	Sludge-disposal site
76	Heatherwood Condos, Calverton (NY-0080616)	S	.05	.04	Extended aeration	Leaching pools	Aerobic digestor	50,000	Brookhaven Scavenger
92	Englishtown Gardens, Middle Island (NY-0080632)	S	.03	.008	Extended aeration	Leaching pools	Aerobic digestor	8,000	Brookhaven Scavenger
98	Coventry Manor, Middle Island (NY-0080667)	DN	.06	.017	Bio-disc, deep bed filter	Recharge beds	Aerobic digestor	75,000	Brookhaven Scavenger
102	Pine Bills Apts., Manorville (NY-0079405)	DN	.181	.053	Extended aeration, deep bed filter	Recharge beds	Aerobic digestor	180,000	Brookhaven Scavenger
104	Suffolk County Community College East Campus (NY-0078131)	DN	.035	.009	Bio-disc, deep bed filter	Recharge beds	Aerobic digestor	10,000	Riverhead Sewage-Treatment Plant
111	Parr Village, Yaphank (NY-0066559)	DN	.45	.011	Extended aeration, deep bed filter	Recharge beds	Aerobic digestor	12,000	Brookhaven Scavenger
115	Ridge Haven Estates, Ridge (NY-0080497)	DN	.171	.025[5]	Extended aeration, deep bed filter	Recharge beds	Aerobic digestor	25,000	Brookhaven Scavenger

1 Number on Suffolk County Department of Health Services master list.
2 SPDES No. - State Pollutant Discharge Elimination System Permit Number.
3 P, Primary; S, Secondary; DN, Denitrification.
4 Municipal facilities (all others are privately owned).
5 This flow is a partial 1981 daily average.

Table 12.--Documented point sources of ground-water contaminants in the Pine Barrens.

[Locations are shown in fig. 12; data from Suffolk County Department of Health Services]

No. [1]	SCDHS File no.	Date reported or discovered	Spill or leak location	Major chemical	Approximate volume (gallons)	Type of operation [2]
2	1974-1	1974	Westhampton Beach (Tank Farm)--2 separate spills, 1967 and 1974.	Jet fuel (JP-4)	80,000 (1967) 10,000 (1974)	OH
8	1976-4	12-21-76	Flanders Road, Flanders	Gasoline	1,200	GS
24	1977-21	12- 9-77	Route 24, Riverhead	Gasoline	2,000	GS
33	1978-12	5- 5-78	County Route 111 and North Sunrise Highway Service Road, Manorville	Gasoline	5,000	GT
51	1978-48	8-30-78	East Quogue Mobile Home Park, Old Country Road, East Quogue	Kerosene	200	OS
110	1979-74	8-29-79	William Floyd Parkway and Long Island Expressway, Yaphank	Gasoline	800 - 1,500	GT
124	1979-107	12-18-79	Thompson Road (in Lab complex, near Bubble Chamber)	Xylene and mineral oil	100	TH
129	1980-6	1-24-80	Traffic Circle, Riverhead (gas layers on ground water)	Gasoline	Unknown	GS
146	1980-51	4-22-80	Route 25A and Hallock Landing Road (gas in ground water)	Gasoline	Unknown	GS
150	1980-56	5- 1-80	Brookhaven National Laboratory, Upton	Diesel fuel	50 - 100	OH
163	1980-116	8-31-80	Sunrise Highway, Center Moriches	Pesticides	Unknown (small)	TT
171	1980-137	9- 9-80	Westhampton	Gasoline	Unknown	GS
174	1980-145	11-14-80	Route 25 and Halfmoon Pond Road, Ridge	Gasoline	Unknown	GS
183	1981-8	1-20-81	Route 27, East Quogue	#2 Fuel oil	300	OT

Table 12.--Documented point sources of ground-water contaminants in the Pine Barrens (continued)

No. [1]	SCDHS File no.	Date reported or discovered	Spill or leak location	Major chemical	Approximate volume (gallons)	Type of operation [2]
192	1980-0197	4-30-80	Upton	Diesel oil	5,200	OH
220	1980-1611	2- 6-81	Upton	#3 Diesel oil	2,000	OH
221	1980-1637	2-11-81	Upton	Alcohol & unknown	300	TH
223	1981-17	1-28-81	Route 24, Flanders	Fuel oil	Unknown, probably >50	OH
245	1981-87	6-26-81	Route 25, Middle Island	Gasoline	500	GH
251	1981-121	8-20-81	Rocky Point Road and Route 25A, Rocky Point	Fuel oil	Unknown	OT
254	1981-157	11- 5-81	Pleasure Drive, Flanders	Ferric chloride waste	2,500	TH
257	1982-20	2-11-82	Calverton	JP-4	100	TH
262	1982-32	5-25-82	Westhampton	Aviation fuel and sodium sulfate	5-gal cans 55-gal drums (unknown quantity)	TH
266	1982-111	8-24-82	Calverton	waste oil	1,000 - 5,000	OS
269	1983-3	1- 7-83	Swan Pond Road, Calverton	JP-4	500	GH
273	1983-7	1-11-83	Westhampton	Paint stripping waste	Unknown	TH
275	1983-96	4- 2-83	Swan Pond Road, Calverton	Wastewater paint rinsing	280	--
281	1983-146	6-16-83	Calverton	JP-5	100 - 500	GH
285	1983-149	6-17-83	Westhampton	2 15,000-gal tanks failed test	Unknown	--
295	1983-165	7- 7-83	Whiskey Road and Ridge Road, Ridge	PCB oil	10 - 15	--

[1] Number on Suffolk County Department of Health Services master list.
[2] OH, oil handling; GS, gasoline storage; GT, gasoline transportation; OS, oil storage; TH, other toxic material handling; TT, other toxic material transportation; OT, oil transportation; GH, gasoline handling.