U.S. Department of the Interior
U.S. Geological Survey

Water-Table Altitude Near The Brookhaven National Laboratory, Suffolk County, New York, In March 1995

Introduction

The U. S. Geological Survey (USGS) is engaged in a multi-year cooperative study with the Brookhaven National Laboratory Office of Environmental Restoration (BNL-OER) to investigate the hydrogeology of the BNL area in central Suffolk County, N.Y. BNL, a U.S. Department of Energy research facility, is in the western part of the region known locally as the Pine Barrens (see inset map, p. 3). Extensive test-boring programs conducted by BNL will help to define the extent of hydrogeologic units beneath the 5,300-acre BNL site and the surrounding area. As part of the study, the USGS and OER measured water levels in selected wells on the site and in the 300-square-mile surrounding region in March 1995 to delineate the water-table altitude. This fact sheet depicts the water-table configuration in March 1995 and also describes hydrologic conditions at that time and presents a brief overview of the stratigraphy of the study area.

Hydrogeologic Setting

The uppermost hydrogeologic unit on Long Island, the upper glacial aquifer of Pleistocene age, contains the water table in the study area and throughout most of Long Island. The aquifer consists mostly of fine to coarse sand and gravel but locally contains silt or clay units. The upper Pleistocene deposits range from 120 to 230 feet thick in the BNL area. The average hydraulic conductivity of upper glacial material on Long Island is estimated to be about 270 feet per day (Smolensky and others, 1989), but aquifer tests conducted at BNL by Warren and others (1968) indicate the hydraulic conductivity at the site to be lower — about 180 feet per day.

Previous investigators of the BNL region described a greenish sand or sand and clay at the lower part of the aquifer and referred to it as the unidentified unit (de Laguna, 1963; Faust, 1963). A shallow clayey unit beneath the main sewage-treatment facility in the eastern part of the BNL site retards downward flow of ground water and results in locally elevated water levels from ground-water recharge associated with facility operations (Naidu and Royce, 1995).

The Gardiners Clay of Pleistocene age and the Monmouth greensand of Cretaceous age underlie the upper glacial aquifer and confine ground water in the Magothy aquifer along the southern shore of Long Island, but the northern extents of these units in the BNL area have not been defined. In areas where both of these units are absent, the upper glacial aquifer directly overlies the Magothy aquifer. A generalized stratigraphic column of hydrogeologic units is shown in table 1. Detailed discussions of these units are presented by Suter and others (1949), Jensen and Soren (1974), and Smolensky and others (1989). The hydrology of the Pine Barrens area was examined by Krulikas (1986), who provided a water-table map.

Water-Level Measurement

All measured wells are screened in the upper glacial aquifer. Wells were measured by the wetted-steel-tape and electric-tape methods, which are accurate to one-hundredth of a foot.

Hydrologic Conditions

Precipitation at the Upton station during March 1995 (1.53 inches) was below its 1949-95 average for the month of March (4.70 inches). Annual precipitation at this site from 1991 through 1995 was below average (fig. 1A). The precipitation deficit from January 1991 through March 1995 totaled 20 inches below average and resulted in below-average ground-water levels at the BNL site in March 1995.

Water levels in well S5517, on the BNL site, have been measured regularly since 1953 and have ranged from a

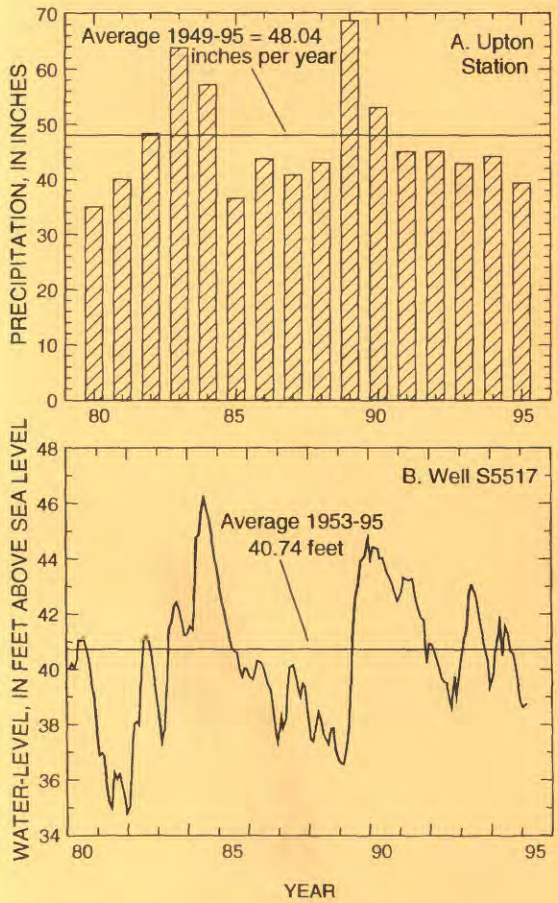
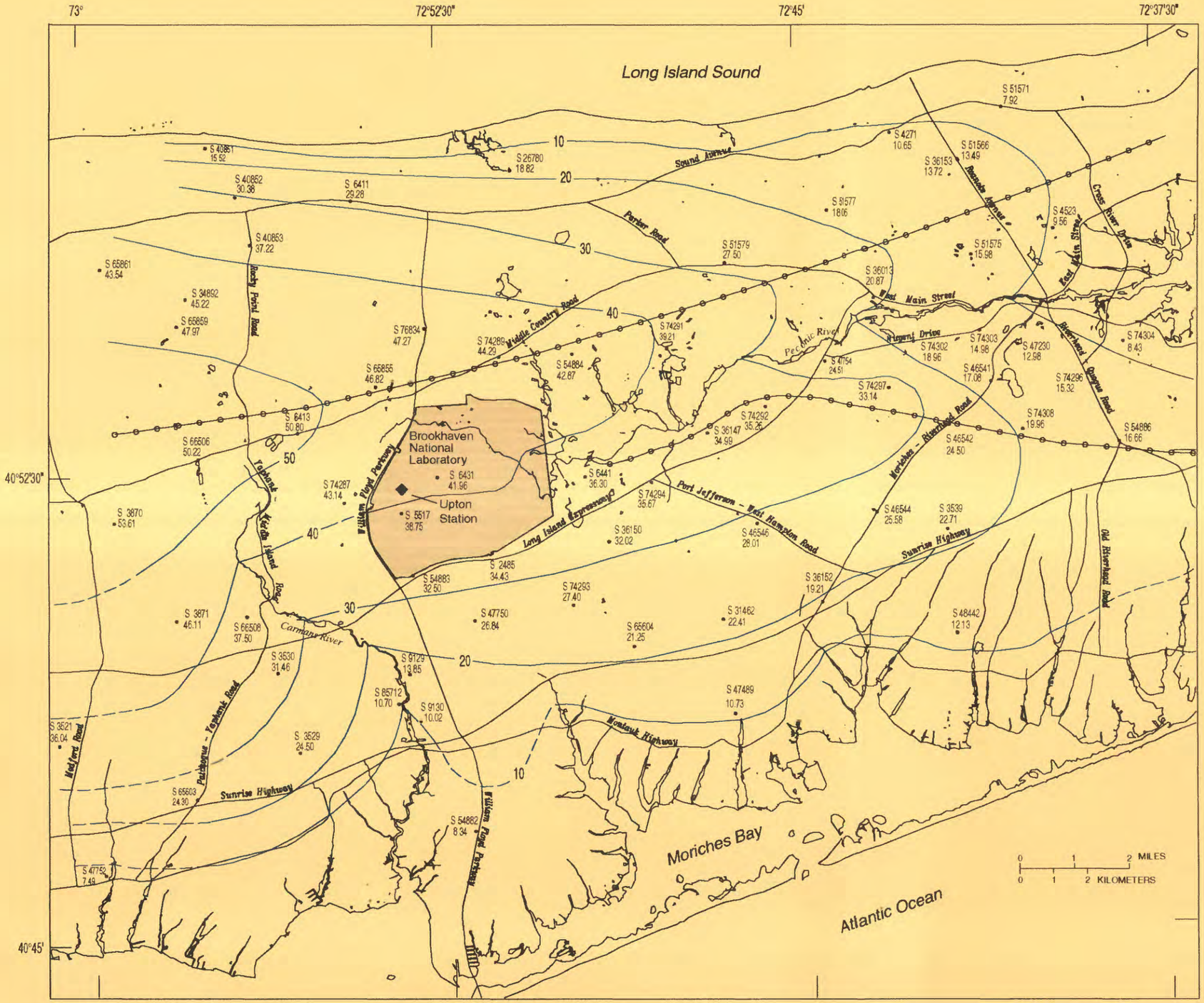
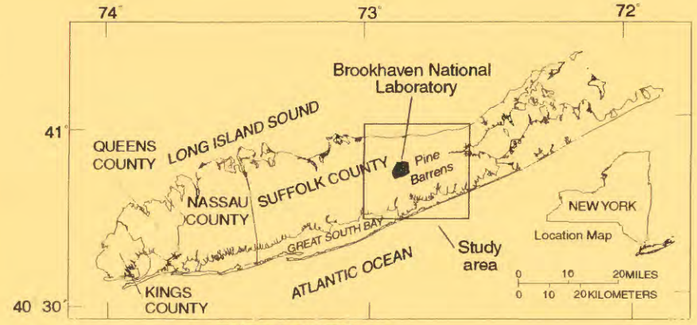


Figure 1. Precipitation and water-table altitude at Brookhaven National Laboratory, Suffolk County, N.Y.: A. Annual precipitation at Upton station, 1980-95. B. Water levels in well S5517, January 1980 through March 1995. (Locations are shown in fig. 2.)



Base from New York State Department of Transportation, 1981, 1:24,000

Figure 2. Water-table altitude in central Suffolk County, March 1995



EXPLANATION

- S 3871 / 46.11 — OBSERVATION WELL AND WATER LEVEL -- Well number assigned by New York State Department of Environmental Conservation. Prefix S indicates Suffolk County. Number is water level, in feet above sea level.
- LINE OF EQUAL WATER-TABLE ALTITUDE IN MARCH 1995--Dashed where inferred. Contour interval 10 feet. Datum is sea level.
- PRECIPITATION GAGE
- APPROXIMATE POSITION OF START-OF-FLOW IN STREAM CHANNEL -- inferred from field observations.
- APPROXIMATE POSITION OF GROUND-WATER DIVIDES

Table 1. Selected hydrogeologic units of Long Island

[Modified from de Laguna (1963) and Smolensky and others (1989)]

System	Geologic unit		Hydrogeologic unit
Quaternary	Holocene (Recent) deposits		Upper glacial aquifer
	Upper Pleistocene deposits including "unidentified" unit		
	Gardiners Clay		Gardiners Clay
Cretaceous	Monmouth Group		Monmouth greensand
	Matawan Group-Magothy Formation, undifferentiated		Magothy aquifer
	Raritan Formation	unnamed clay member	Raritan confining unit
		Lloyd Sand Member	Lloyd aquifer
Precambrian	Bedrock		Relatively impermeable bedrock

maximum of 46.93 feet above sea level in 1958 to a minimum of 33.34 feet in 1967. The water level in March 1995 (38.75 feet) was 1.99 feet below the average water level (40.74 feet) for the period of record (1953 to March 1995). The water-level hydrograph for S5517 (fig. 1B) shows that the water level has been lower than that of March 1995 during four periods within the last 15 years.

Water-Table Configuration

The water table is highest in the northern part of the study area and slopes gently toward the shores of Long Island (fig. 2). The ground-water divide for the upper glacial aquifer extends east-west along the island and represents the area where water levels are highest; ground-water near the divide has a large downward vertical-flow component and recharges deep aquifers of the ground-water system. Ground water north of the divide flows northward and discharges to Long Island Sound, and ground water south of the divide flows southward and discharges to south-shore streams, Great South Bay, and the Atlantic Ocean. Carmans River is a major ground-water discharge zone in the southwestern part of the study area (Wexler and Maus, 1988) and significantly affects the configuration of the water-table surface, as illustrated by the upstream bending of water-level contours (fig. 2).

Ground water enters the Peconic River as base flow east of the BNL site. A secondary ground-water divide develops near the start of flow in the Peconic River and extends east-southeastward toward the South Fork of Long Island. Water north of this divide enters the Peconic River as base flow, and water south of the divide flows generally southward. The position of the secondary ground-water divide was estimated from water-table altitude, topography, and the location at which ground water begins to enter the Peconic River, however, its position cannot be delineated precisely because data are sparse.

Acknowledgments

Thanks are extended to William Gunther, manager of OER, for his assistance and cooperation during this project. Appreciation is also given to Victor Cassella of BNL's Department of Applied Science, Oceanographic and Atmospheric Sciences, for providing precipitation data from the Upton station.

——Michael P. Scorca[1], William R. Dorsch[2], and Douglas E.Paquette[3]

References Cited

de Laguna, Wallace, 1963, Geology of Brookhaven National Laboratory and vicinity, Suffolk County, New York: U.S. Geological Survey Bulletin 1156-A, 35 p.

Faust, G.T., 1963, Physical properties and mineralogy of selected samples of the sediments from the vicinity of the Brookhaven National Laboratory, Long Island, New York: U.S. Geological Survey Bulletin 1156-B, 34 p.

Jensen, H.M., and Soren, Julian, 1974, Hydrogeology of Suffolk County, Long Island, New York: U.S. Geological Survey Hydrologic Investigation Atlas HA-501, 2 sheets, scale 1:250,000.

Krulikas, R.K., 1986, Hydrologic appraisal of the Pine Barrens, Suffolk County, New York: U.S. Geological Survey Water Resources Investigations Report 84-4271, 53 p.

Naidu, J.R., and Royce, B.A., eds., 1995, Brookhaven National Laboratory site environmental report for calendar year 1994: Brookhaven National Laboratory Formal Report BNL-52490 [variously paged]

Smolensky, D.A., Buxton, H.T., and Shernoff, P.K., 1989, Hydrologic framework of Long Island, New York: U.S. Geological Survey Hydrologic Investigations Atlas HA-709, 3 sheets, scale 1:250,000.

Suter, Russell, de Laguna, Wallace, and Perlmutter, N.M., 1949, Mapping of geologic formations and aquifers of Long Island, New York: New York State Water Power and Control Commission Bulletin GW-18, 212 p.

Warren, M.A., de Laguna, Wallace, and Lusczynski, N.J., 1968, Hydrology of Brookhaven National Laboratory and vicinity, Suffolk County, New York: U.S. Geological Survey Bulletin 1156-C, 127 p.

Wexler, E.J., and Maus, P.E., 1988, Ground-water flow and solute transport at a municipal landfill site on Long Island, New York — part 2, simulation of ground-water flow: U.S. Geological Survey Water-Resources Investigations Report 86-4106, 44 p.

[1]U. S. Geological Survey

[2]Brookhaven National Laboratory, Office of Environmental Restoration

[3]Brookhaven National Laboratory, Safety and Environmental Protection Division

For more information contact:

Subdistrict Chief
U.S. Geological Survey
2045 Route 112, Bldg. 4
Coram, New York 11727
(516) 736-0783

Additional earth science information can be found by accessing the USGS "Home Page" on the World Wide Web at "*http://www.usgs.gov*", or by calling 1-800-H2O-9000 (1-800-426-9000).

For more information on all USGS reports and products (including maps, images, and computerized data), call 1-800-USA-MAPS.