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THE WATER TABLE ON LONG ISLAND, NEW YORK, IN MARCH 1975

By James H. Nakao and Freddy R. Erlichman

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CONTENTS

PLATE

(in pocket)

FACTORS FOR CONVERTING U.S. CUSTOMARY UNITS

OF MEASURE TO INTERNATIONAL SYSTEM (SI) UNITS

Multiply U.S. customary units	By	To obtain SI units
feet (ft)	0.3048	meters
miles (mi)	1.609	kilometers (km)
Million gallons per day (Mgal/d)	.04381	cubic meters per second (m^3/s)

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ABSTRACT

Water-level measurements in 425 observation wells on Long Island, N.Y., in March 1975 showed that the altitude of the water table ranged from about 20 feet below mean sea level in eastern Queens County to about 120 feet above mean sea level in northwestern Nassau County. March 1975 measurements indicate a slight decline from the levels of March 1974, even though precipitation was near average during the intervening period. Water levels in western Queens County continued to rise from 1974 to 1975, contrary to the islandwide trend, as a result of decreased pumpage. In Suffolk County, two wells recently added to the monitoring network show water-level altitudes of almost 70 feet above mean sea level and have provided the basis for adding a second 60-foot contour that is not shown on the 1974 map. Also, additional data were available in 1975 in Southampton, west of Shinnecock canal, that supported relocation of the 20-foot contour considerably west of the 1974 position.

INTRODUCTION

The ground-water reservoir on Long Island, New York, is the sole source of fresh-water supply for part of the population of Queens County and the entire population of Nassau and Suffolk Counties--a total of more than 3 million people. The ground-water reservoir on Long Island consists basically of three major aquifers--the upper glacial, the Magothy, and the Lloyd. The water table is defined as the upper surface of the ground-water reservoir, or the saturated zone, and, under natural conditions, the water table generally parallels land surface.

On most of Long Island, the water table is in the upper glacial aquifer, which consists mainly of highly permeable sediments. Where the upper glacial aquifer is thin, the water table is in the underlying Magothy aquifer.

Changes in the water table indicate changes in storage that result from both natural phenomena and the activities of man; therefore, changes in the water table through time are of concern to water managers. The major natural phenomenon controlling the amount of water in storage is precipitation. The human activity that has the greatest direct effect on the ground-water reservoir is ground-water withdrawal, or pumping.

It is estimated from data supplied by the New York State Department of Environmental Conservation that, in 1973, the average islandwide withdrawal for all uses from the upper glacial aquifer totaled approximately 160 Mgal/d. The distribution of these withdrawals, however, was not equal throughout the island. Although total withdrawals from the upper glacial aquifer were greatest in Suffolk County, pumpage per unit area was significantly greater in southeast Queens.

Water levels measured in water-table wells are used to develop maps depicting the elevation contours on the water table, and such maps have been published periodically since 1903. Plate 1 (in pocket) shows the water table across Long Island in March 1975. Comparison of this map with earlier ones reveals storage trends. Specific trends between 1974 and 1975 are discussed in the section "Interpretation of Map".

Acknowledgments

Water levels used to plot the contours in plate 1 were obtained through cooperation of the Jamaica Water Supply Company, Nassau County Department of Public Works, and Suffolk County Department of Environmental Control.

METHOD OF WATER-TABLE CONTOUR DERIVATION

Water levels were measured in 423 water-table wells throughout Long Island and were estimated for two others in March 1975. The measurements were made by the U.S. Geological Survey, the Nassau County Department of Public Works, and the Suffolk County Department of Environmental Control. The wetted-tape method was used for all measurements. Well locations were plotted on a map, and the measured water-level altitudes were used to delineate the contours on the water table (pl. 1).

INTERPRETATION OF MAP

The altitude and configuration of the water table on Long Island in March 1975 are shown on the contour map, plate 1. Also indicated on the map are the well locations and the March 1975 water-level altitudes.

The water table on Long Island in March 1975 was characterized by two large, interconnected mounds extending east-west through Nassau and Suffolk Counties. The highest altitudes were almost 90 feet above mean sea level in Nassau County and about 70 feet above mean sea level in Suffolk County. In Kings and Queens Counties, the water-table altitude is low, with a maximum altitude of about 15 feet above mean sea level. Furthermore, a depression in central Queens is more than 20 feet below mean sea level.

The east end of Long Island consists of two peninsulas, locally called the north and south forks. Underlying each is a lens of fresh water rising to an altitude of about 5 ft on the north fork and 20 ft on the south fork. Anomalously high water levels (as much as 66.2 feet above mean sea level) have been recorded on the south fork (pl. 1); this phenomenon is now being studied to determine the areal extent of the mound.

Anomalously high water levels reaching almost 120 feet above mean sea level occur also on Manhasset Neck in northwest Nassau County. This feature was mapped by Swarzenski (1963), who reported (p. 33) that it resulted from a combination of topography and zones of low hydraulic conductivity.

Compared to water levels of 1974 (Koszalka, 1975), water levels, in general, have declined slightly throughout the island. Precipitation on Long Island in 1974 was about equal to the long-term average, in contrast to the above-average amounts in 1972 and 1973. The observed water-level declines, despite average precipitation, are attributed to high water-table conditions at the start of the year.

In Suffolk County, water-level altitudes of almost 70 feet above mean sea level in two wells recently added to the monitoring network, near the Smithtown-Brookhaven town boundary, have provided the basis for adding a second 60-foot contour, not shown on the map of 1974. Also, additional data that became available in 1975 from Southampton, west of the Shinnecock canal, support relocation of the 20-foot contour to a point considerably west of its position on the 1974 map.

The most dramatic change in the configuration of the water table between 1974 and 1975 was in southwest Queens County where, in contrast to the general islandwide decline, water levels continued to rise. In the past, Koszalka (1975), Kimmel (1971), and others have reported altitudes below mean sea level in this area. Koszalka indicated that in 1974, the cone of depression had moved eastward from its 1970 position as a result of above-average precipitation and the gradual cessation of public-supply withdrawals in western Queens. The complete shutdown of the Woodhaven pumping stations in 1974, as well as the near-average precipitation for 1974, caused a further rise of water levels above mean sea level and a continued eastward movement of the edge of the cone of depression in 1975.

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