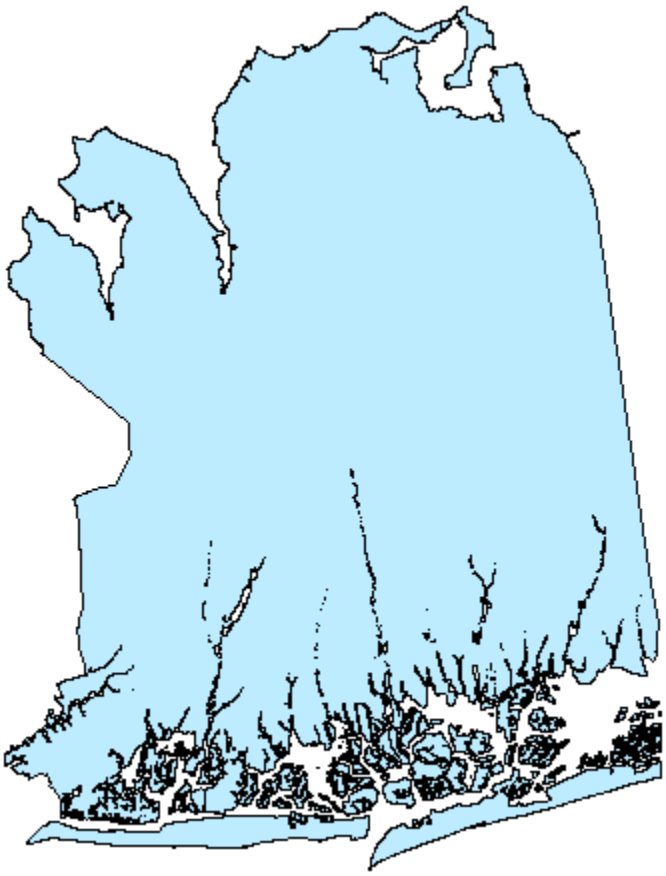
NASSAU COUNTY

GROUNDWATER MONITORING PROGRAM

2000 – 2003

With Historical Information



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A Note to the Reader

The Nassau County Department of Public Works (DPW) is proud to present the information contained in this document. DPW has a long history of involvement in the monitoring of the County's groundwater resource, and is proud to have one of the largest and one of the most sophisticated programs in the entire United States. This document is the first of what will be periodic monitoring data updates that will be compiled every three to four years.

It is important for the reader to understand that the intent of this document is to provide a summary of the extensive amount of data collected by DPW during the monitoring period of 2000 through 2003. Historical data, such as maximums and minimums of various measurements, are also included to give the reader a better perspective on the significance of recent data. Therefore, it must be stressed that this document is not a study type report, but rather a data summary report. In light of this, the discussion and conclusions contained in this document *only* present a broad overall view of trends concerning the condition of the County's groundwater resource.

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Executive Summary

The Nassau County Department of Public Works (DPW) has prepared a groundwater data summary report, entitled "Nassau County – Groundwater Monitoring Program 2000 – 2003." The intent of the report is to describe the County's comprehensive and long standing groundwater program that has been in existence since the 1930s, and present a summary of the extensive amount of data collected through DPW's groundwater monitoring efforts. The information contained in the report will be invaluable to the professional water supply community and interested individuals in gaining an understanding of the overall condition of Nassau County's groundwater resource.

The document summarizes groundwater data collected by DPW during the 2000 – 2003 period, and also presents historical information that gives a basis of comparison for the recent data. Data provided in this document includes groundwater elevations, raw groundwater quality *(the quality of untreated groundwater collected from monitoring wells that are not used as a source of public water supply)*, monthly and annual public water demands as recorded by the numerous water suppliers in Nassau County, and weather related information. This summary report is the first in a series of periodic documents that will be prepared by DPW in future years to continually update the data collected through the County's ongoing groundwater monitoring program.

In addition to describing the groundwater monitoring program and presenting the raw data in tabular summaries and graphical representations, the report briefly describes how the County's groundwater system functions, and how weather patterns, along with public water supply pumping and other variables, can have a profound effect on the groundwater system. The report points out that many variables have an influence on the groundwater system and must be considered collectively when assessing the overall behavior of the system.

Interpretation and discussion of the data in general terms is included to give a broad overall evaluation of the condition of the County's groundwater resource. Since the document is intended to be a data summary report, in depth analysis and study of observed trends, as well as projected future trends, are not components of the report. The following are several important facts and observations contained in the document:

- Nassau County maintains a network of approximately 500 monitoring wells that were used for the data summary report. The network is extensive and distributed countywide.

- During the reporting period 2000 – 2003, over 6,000 groundwater levels and over 500 groundwater quality samples were taken.

- Water table elevation maps were produced for each year of the 2000 – 2003 period. Upon comparing the maps, the decline in water table elevation along the "groundwater divide" (along the east-west centerline of the County running roughly beneath the Long Island Expressway) is clearly evident on the 2002 map (mini-drought period). The subsequent recovery in water table elevations corresponding to more normal precipitation can be seen on the 2003 map.

- Monitoring wells located along the groundwater divide show the greatest fluctuations from stresses (weather patterns, development, public supply pumping, and installation of sanitary sewers). Over the 60 plus years of data collected from County monitoring wells, it is evident that the water table near the groundwater divide has declined approximately 8-10 feet in the central and eastern parts of the County and about 10-15 feet in the western part.

From an overall groundwater supply standpoint, this is a negligible decline when compared to the average saturated thickness (approximately 800 feet) of the groundwater system.

- The effect of temperature and precipitation on public water demand is evident from data collected. In Nassau County, the base use demand during the non-irrigation months (November – March) is approximately 142 mgd. During the peak use warmer months (April – October), public water demand consistently exceeds 200 mgd, and has exceeded 300 MGD during unusually hot/dry months on several occasions.

- Annual water demand during both 2001 (203 mgd) and 2002 (200 mgd) significantly exceeded the annual long-term average usage of 185 mgd. The increase is mainly the result of excessive lawn watering and the affects of an increased number of automated irrigation systems.

- A comparison of shallow groundwater quality results for volatile organic chemicals (VOCs) was made for two different time periods; the 2000 – 2003 period covered in this report, and the 1985 – 1987 period when DPW first began raw groundwater quality analysis for VOCs. The improvement in shallow groundwater quality in the Upper Glacial aquifer can be seen when comparing the figures that were prepared for these time periods. Improving raw groundwater quality trends are also evident in the deeper Magothy aquifer that supplies over 90% of the County's drinking water.

- The presence of low concentrations of methyl tertiary butyl ether (MTBE), a gasoline additive that is now banned in New York State, was found in some monitoring wells, and is generally sporadically distributed. The County's sampling results are <u>not</u> indicative of widespread MTBE contamination in Nassau's raw groundwater.

- Initial sampling for pharmaceutical compounds/consumer products indicated that these substances are, for the most part, absent from the County's groundwater. Butylated hydroxytoluene (BHT), a substance commonly used in a wide array of consumer products, was frequently detected at very low concentrations in the monitoring wells that were sampled. Since BHT is a newly analyzed parameter and only a small data set exists, the reliability of the BHT testing data must be ascertained. If the data is determined to be accurate, more study is warranted to determine probable sources and potential impacts that BHT may have on the groundwater supply.

- Perchlorate was detected in a small percentage of the monitoring wells sampled. Concentrations in those wells, which were sporadically distributed, were very low.

There are two main conclusions that may be drawn from the data presented in the County's "Groundwater Monitoring Program 2000 – 2003" report. First, raw groundwater quality is improving largely as the result of the installation of sanitary sewers that serve over 90% of the County's population, plus the many regulatory programs governing the use, storage, and disposal of hazardous substances. Groundwater remediation programs focused at cleaning contaminated sites have also helped to improve overall groundwater quality.

Second, annual public water demand has been increasing in recent years, due to increased warmer weather water usage, primarily from lawn irrigation. Given the increase in usage, there is still no threat of running out of available groundwater for water supply purposes since recharge to the groundwater far exceeds the amount of water withdrawn to satisfy public water demand. Even

though there is no threat of running out of available groundwater, lawn irrigation is an area that still should be targeted to prevent annual water demand from continuing to increase in the future.

In future years, DPW will continue to monitor the groundwater system by collecting water levels and raw groundwater quality samples from the County's extensive groundwater monitoring well network. Additionally, weather data and other information that affects the behavior of the system will continue to be collected and evaluated. The most recent data will be contained in subsequent editions of the summary reports, as well as discussions of any modifications made in the monitoring program to address new groundwater issues of concern.

Section 1
Introduction

The Nassau County Department of Public Works (DPW) has a long history of monitoring the quantity and quality of Nassau County's raw groundwater, which is the sole source of drinking water for all County residents. Over the years, groundwater elevation and quality data collected by DPW has been utilized by numerous organizations in the study of Nassau County's groundwater resource. These entities include the County itself, regulatory agencies, water suppliers, consulting engineers, academia, and concerned citizens. No other governmental agency conducts the level of monitoring of Nassau's groundwater as that which is undertaken by Nassau County DPW.

Although Nassau County government is not a public water supplier and does not pump groundwater for delivery to the consumer, it is nevertheless important to monitor the groundwater resource that serves 1.3 million County residents. Given that Nassau's water supply is dependent upon a "Sole Source Aquifer," as designated by the United States Environmental Protection Agency (EPA), having current and historical water resources information is crucial to properly manage and protect the groundwater resource and ensure an adequate and continuous supply of high quality water at present and into the future. Due to the complexity of the County's groundwater system, monitoring data needs to be collected continually in order to study system behavior and determine trends in water use, changes in raw groundwater quality, groundwater elevations, weather patterns, and similar information used for management purposes.

All of the groundwater data collected by DPW over the years has always been available to others upon request and through the Freedom of Information Law (FOIL), but has not previously been assembled into data summary reports suitable for distribution to interested parties. During the four-year period spanning 2000 – 2003, DPW responded to nearly 800 inquiries and data requests from the professional community and numerous individuals. Although DPW has generated many water resources reports during prior years, this report is the first in a series of periodic documents intended to continually update and summarize groundwater data collected through DPW's comprehensive monitoring efforts. The report is being distributed to the public water suppliers, elected officials, and regulatory agencies, and will also be available to other interested parties.

The intention of this report is to describe the County's comprehensive monitoring program in detail, present groundwater data collected during the 2000 – 2003 period in tabular summary and graphic representation form along with historical trends of various measurements, and provide a general discussion and evaluation of the data. This format is planned for subsequent updates in future years. These periodic reports will present a wealth of information and will form the basis for future comprehensive groundwater studies, groundwater planning, modeling endeavors, and assessment of the overall condition of Nassau County's aquifers from a groundwater quality and quantity perspective.

Nassau County's groundwater monitoring program is conducted entirely in-house. That is, all sample collection, water level measurements, data interpretation, and reporting is undertaken by DPW personnel. In addition, the majority of groundwater quality analysis is performed by DPW's analytical laboratory. The focus of the monitoring effort is to ascertain the overall condition of the groundwater resource and behavior of the aquifer system on a countywide scale through an extensive network of monitoring wells. Although groundwater contamination is known to exist at certain site-specific aquifer segments in Nassau County that require remediation, they are by no means indicative of the condition of the County's aquifers and overall quality of the vast groundwater resource.

DPW's role in monitoring the groundwater resource dates back to the 1930s. At that time, DPW collected and tabulated groundwater levels through a network of shallow monitoring wells and also collected weather related data from several weather stations. Over the years, additional monitoring wells were installed to expand the network with the emphasis still being on monitoring groundwater levels. With the appearance of volatile organic chemicals (VOCs) in the nation's and Long Island's groundwater beginning in the mid to late 1970s, DPW no longer was only interested in groundwater levels, but took on the additional and proactive role of monitoring the County's raw groundwater quality – *the quality of untreated groundwater collected from monitoring wells that are not used as a source of public water supply.* It is emphasized that water quality samples collected from monitoring wells are not representative of untreated or treated water from public supply wells. Further, results of testing from monitoring wells are only indicative of raw groundwater at a particular location, depth, and date on which the sample was collected.

During the mid-1980s, DPW became active in raw groundwater quality monitoring and analysis for both inorganic and organic chemical compounds. Since that time, many additional monitoring wells have been installed by DPW to expand the County's monitoring network to enable groundwater levels to be determined and raw groundwater quality samples to be taken from the deeper Magothy and Lloyd aquifers, as well as the shallow Upper Glacial aquifer. DPW currently monitors a network of 500 monitoring wells for raw groundwater quality, water elevations, and potentiometric heads in the deeper aquifers. DPW also continues to collect precipitation and other weather related data.

For over 65 years, Nassau County and the United States Geological Survey (USGS) maintained a cooperative agreement for hydrological data collection and investigation of the County's water resources. The joint agreement provided the funding for the USGS to conduct the necessary field and analytical work related to these tasks. The efforts and expertise provided by the USGS under the cooperative agreement throughout the years were important for augmenting the County's in-house efforts devoted to the groundwater monitoring program.

The cooperative agreement was terminated by the previous County administration in 1999 due to the County's financial difficulties at that time; however, the County's in house efforts remained uninterrupted. Recognizing the significance of the USGS contribution in augmenting the County's groundwater monitoring program, the current administration, under the leadership of County Executive Thomas R. Suozzi, has reestablished the cooperative agreement, which commenced during 2005. Under the new agreement, cooperative data collection is again being undertaken by the USGS to include groundwater measurements, continuous recording of groundwater elevations at select monitoring wells, streamflow and lake level measurements, and saltwater intrusion monitoring. The agreement also provides for information collected under the cooperative program to be incorporated into the regional and national databases maintained by the USGS.

As previously explained, this report focuses on raw groundwater quality collected from monitoring wells. Monitoring of water quality from public supply wells for delivery to the public is a function of both the individual water suppliers and the Nassau County Department of Health. In Nassau County, 48 individual public water suppliers and the Department of Health conduct testing of both untreated and treated water from public supply wells to assure that drinking water satisfies all standards for organic and inorganic chemicals, as well as microbiological and radiological contaminants. These standards, or Maximum Contaminant Levels (MCLs), are specified in the New York State Sanitary Code (Title 10 of the Compilation of Codes, Rules and Regulations of the State of New York, 10 NYCRR) Part 5, Subpart 5-1: Public Water Systems (Statutory Authority: Public Health Law, Section 225).

For drinking water quality information, the reader is referred to the "Annual Water Supply Report" of his/her respective public water supplier. The Annual Water Supply Report is mandated under Section 5-1.72 of the New York State Sanitary Code and complies with the federal Consumer Confidence Report regulations (40 CFR Part 141, Subpart O). This report, which is mailed by each public water supplier to the addresses of metered connections (or billing units) within their supply area every year, provides detailed information on the quality of drinking water provided to the consumer. Alternatively, the reader may contact his/her respective public water supplier or the Nassau County Department of Health for drinking water quality information.

The MCLs previously mentioned are applicable specifically to drinking water that is delivered to the consumer by a public water supplier. Since raw groundwater quality is distinctly different from drinking water quality, there are no direct comparisons made in this document between Nassau County's raw groundwater quality and drinking water MCLs. For the reader's information, a listing of drinking water MCLs specified in the New York State Sanitary Code is included in Table A-2 of the appendix. Additionally, Table A-2 contains a listing of Class GA fresh groundwater standards from Title 6 of the Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Chapter X, Part 703 (Statutory Authority: Environmental Conservation Law, Section 3-0301). The drinking water MCLs and Class GA groundwater standards each have unique applications and do not directly apply to Nassau County's ambient groundwater quality; instead, these standards are useful as an indicator for assessing the condition of the County's raw groundwater resource. Further explanation pertaining to MCLs and Class GA standards is included in Section 5 (5.2.2 Raw Groundwater Quality) of this document. Once again, it must be emphasized that drinking water supplied by a public water supplier is tested and treated (if necessary) to be certain that all drinking water quality criteria is satisfied before the water is delivered to the consumer.

This report is organized into several subsequent sections; Section 2 briefly describes Nassau County's groundwater system, followed by a detailed discussion of the many components of the County's comprehensive groundwater monitoring program in Section 3. Data collected from the monitoring efforts is then presented in Section 4, which is then followed by discussion and evaluation of the data in Section 5. Observations and conclusions are presented in Section 6, and the report concludes with Section 7 that discusses Nassau County's plan for the groundwater monitoring program in the future. Each section begins with several pages of text, is then followed with a series of figures, and then tables, that are referred to in the text of that section.

Although a brief overview of the County's groundwater system is presented in Section 2, this document does assume that the reader possesses a fundamental knowledge of hydrogeology and a general understanding of the behavior of groundwater systems. For more in depth presentations, the reader is referred to the numerous publications that exist in the literature on this subject (refer to the listing of "References" included in this report). One such document that discusses the subject in detail with respect to the Nassau County groundwater system is the "Nassau County 1998 Groundwater Study," which is available from the County upon request.