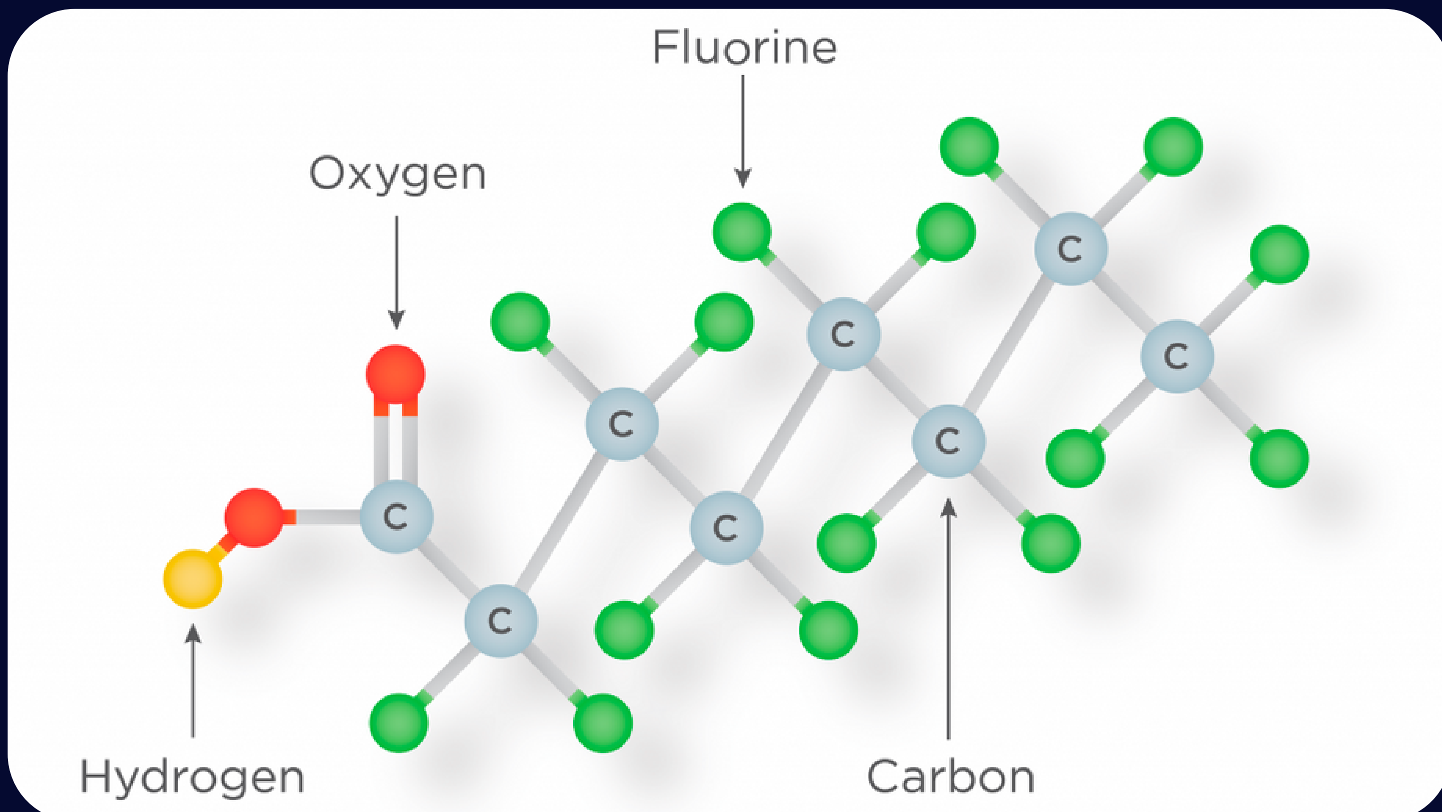

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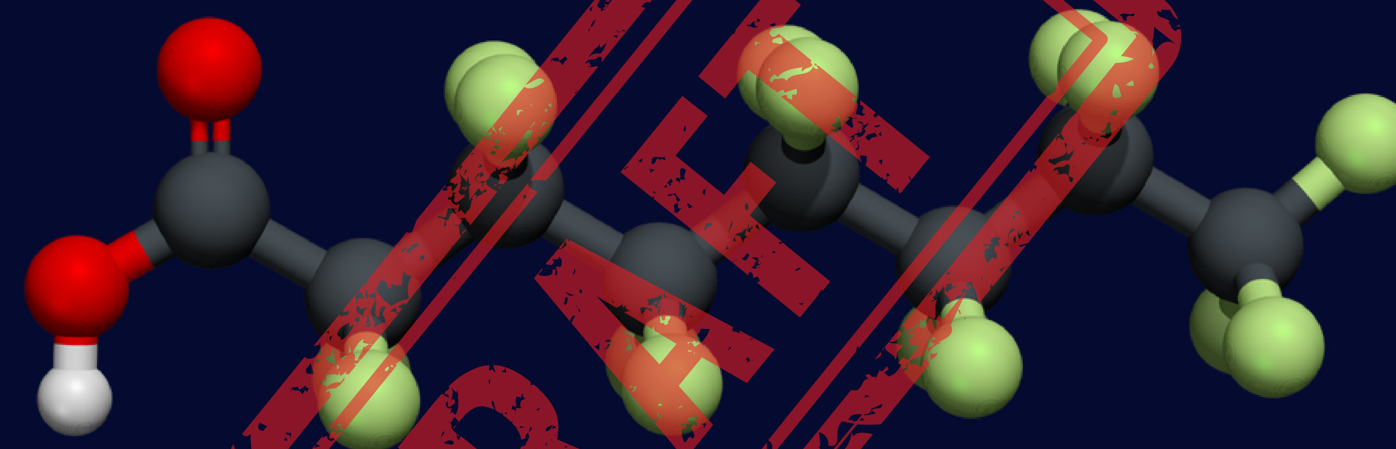

3D model of a PFOA molecule, in its acid form

DRAFT

STATE OF THE AQUIFER

2023 UPDATE

LICAP MEMBERS

Voting Members And The Organizations Or Offices They Represent

Jason Belle
Chairman
Nassua-Suffolk Water Commission Association

Jeffrey Szabo
Vice-Chairman
Suffolk County Water Authority

Paul Granger
Long Island Water Conference

Walter Dawydiak
Suffolk County Commissioner of Health

Angela Pettinelli
Nassau County Commissioner of Health

Dorian Dale
Suffolk County Executive

(Vacant)
Nassau County Executive

Chris Ostuni
Nassau County Legislature Presiding Officer

Michael White
Suffolk County Legislature Presiding Officer

Brian Culhane
Suffolk County Soil and Water Conservation District

Derek Betts
Suffolk County Soil and Water Conservation District

Ex Officio Members And The Offices They Represent

Richard Groh
Suffolk County Legislature Minority Leader

Sarah Meyland
Nassau County Legislature Minority Leader

Brian Schneider
U.S. Geological Survey
Long Island Program Office

Chris Engelhardt
New York State Department of
Environmental Conservation

Vacant Positions

Suffolk County Legislature Presiding Officer

Suffolk County Commissioner of Public Works

Suffolk County Commissioner of Parks,
Recreation and Conservation

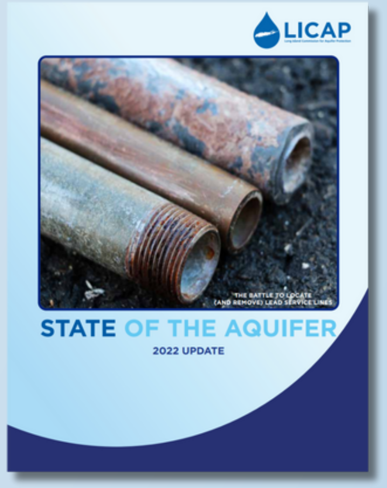
Nassau County Commissioner of Parks

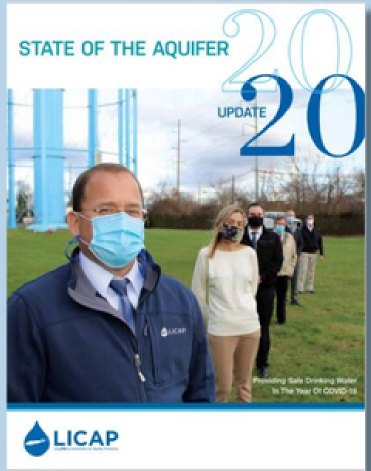
Nassau County Planning Commission

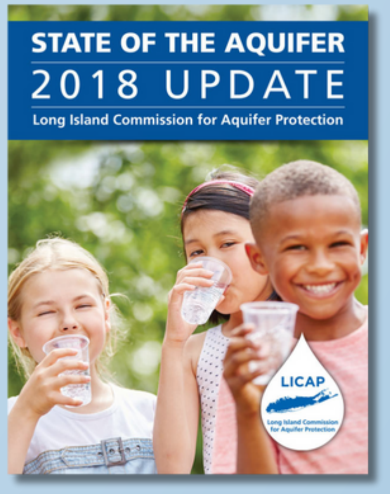
LIGRI (Long Island Groundwater Research Institute)

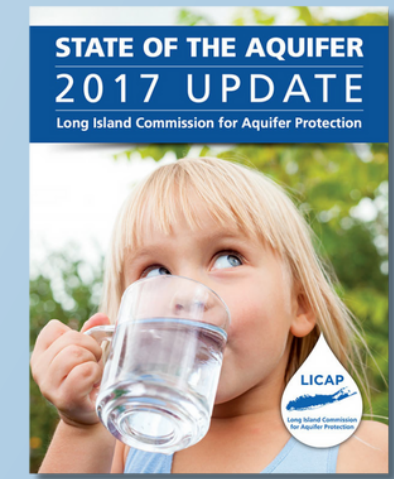
SUNY Stony Brook: School of Marine
and Atmospheric Sciences

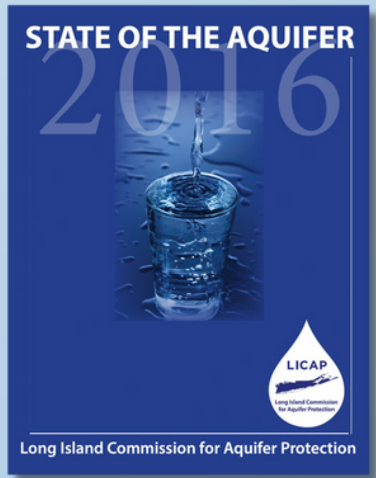
STATE OF THE AQUIFER THROUGH THE YEARS

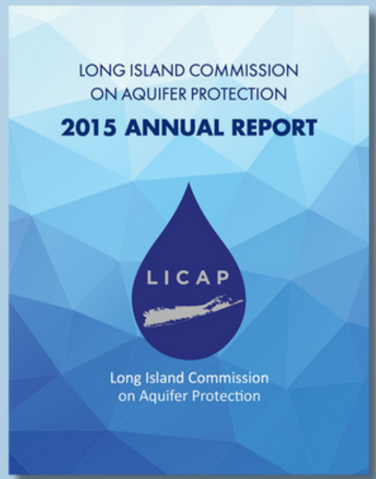












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Previous LICAP State of the Aquifer Reports Available at https://licaponline.com/reports/

Table of Contents

MESSAGE FROM THE CHAIRMAN

The following update to the Long Island Commission for Aquifer Protection's (LICAP) State of the Aquifer report covers many of the topics integral to our understanding of the sole source aquifer that provides 100% of Long Island's drinking water, including groundwater pumpage, hydrologic conditions and groundwater monitoring.

This year's State of the Aquifer Report shifts focus to both legacy and future regulations and also displays a holistic view on the balance between precipitation and groundwater levels. The latest cycle of unregulated contaminant monitoring, "UCMR 5", starting in 2023 and concluding in 2025 as set forth in the 1996 amendments to the Safe Drinking Water Act looks to shed light on another 29 PFAS compounds. The ever nearing Lead and Copper Rule Revisions, will generate a new set of challenges for both regulators and water suppliers.

The fifth Unregulated Contaminant Monitoring Rule (UCMR 5) was published by the EPA on December 27, 2021. UCMR 5 will continue to help peel back the curtain on potential contaminants that affect our aquifer. The PFAS compounds are still in major focus and as such, 29 PFAS compounds are featured in UCMR 5 of the 30 total contaminants to be tested. Long Island water suppliers already have, or will soon start their sampling to meet the schedule set forth by the EPA.

As the Lead and Copper Rule revisions are just around the corner, water suppliers are working feverishly to complete the service line material inventories of their entire systems before the October 16, 2024 deadline.

Many suppliers are taking a multi-prong approach to accrue the necessary data so they may catalog their system in time.

The drought years of 2015 and 2022 provide an opportunity to analyze the continually changing hydrologic conditions and their far reaching effects here on the island. Water conservation continues to play an important role and its impact is highlighted within.

This year's report touches on a wide range of topics, from several contributing voices within LICAP, that affect our aquifer and our industry, and highlights the need to remain focused and aware of current and future obstacles that may harm our aquifer and hinder our ability to provide clean water to our consumers.

JASON BELLE

2023 Chairman,
Long Island Commission for Aquifer Protection

The State of the Aquifer

In 2023 the Lead and Copper initiative continued to evolve on Long Island. Much attention has shifted to the ongoing efforts and updates of water suppliers with regards to the Revised Lead and Copper Rule (LCRR) inventory. In an encouraging development, the state has bolstered these efforts, channeling funds towards the replacement of service lines, a crucial step in ensuring water purity. A notable proposal awaiting the Governor's signature is legislation aimed at mandating the New York State Department of Health (DOH) to present an inventory of both public and private service lines to the general public, a transparency push that may present additional challenges.

The drought year of 2022 has the potential to reveal the impact of recent years' conservation efforts. A look back at the summer pumpage season of 2015, as compared to the tumultuous 2022, provided an opportunity to test the effectiveness of the New York State Department of Environmental Conservation's (DEC) conservation mandate to water suppliers. Using month-by-month pumpage data, one can draw comparisons between the established numbers from the DEC in 2015 and the reported ones in 2022. The conservation front has seen a flurry of initiatives, ranging from integrating rain sensors to the introduction of smart controllers. Effects of these conservation efforts will vary, and a thorough investigation is underway to discern which proved the most fruitful. Additionally, United States Geological Survey (USGS) hydrologic conditions each year spotlight a marked contrast between groundwater and surface water flow from the East End, with 2015 and 2022 offering poignant case studies.

The PFAS challenge has gained momentum. A significant development on the federal level is the EPA's proposed regulation, which carries potential implications for the NYS Drinking Water Quality Council. On a local level, moves are underway to expand water mains, bridging the divide between private wells and public water, ensuring all residents have access to clean water. The State investigations continue, with MacArthur Airport, one of the latest receiving official designation as a class 2 superfund site. The discussions around PFAS have expanded, encompassing the nuances between long-chain and short-chain PFAS. Granular activated carbon treatment, the identified best available treatment technology, brings with it a range of concerns from the quantity of carbon required by water suppliers, associated infrastructure costs, and energy demands.

Finally, the countywide monitoring efforts have taken a structured form. Suffolk County is spearheading with a long-term monitoring plan, while similar efforts are in progress in Nassau. Coordination remains the key, as various entities bring their heads together, fine-tuning monitoring strategies to best protect Long Island's precious aquifer system.

LICAP

Long Island Commission for Aquifer Protection

Mission

To advance a coordinated, regional approach to the protection of Long Island's sole source aquifer through the preparation of a State of the Aquifer report, updated annually, and a Groundwater Resources Management Plan.

Founded

By unanimous votes of the Suffolk County and Nassau County Legislatures in 2013. Reauthorized in 2018 and extended through 2023. Currently pending reauthorization through 2028.

Members

LICAP has 11 voting members. The Suffolk County Water Authority, the Long Island Water Conference, the Nassau-Suffolk Water Commissioners Association and the Nassau and Suffolk Departments of Health are permanent members. Additionally, the Nassau County and Suffolk County Executives each appoint one member, as do the Presiding Officers of the Nassau and Suffolk Legislatures and the Nassau and Suffolk Soil and Water Conservation Districts. There are also ex officio members with no voting power.

Commitee Structure

LICAP maintains four standing subcommittees:
The 2040 Water Resources and Infrastructure Committee identifies long-term risks to the water supply industry created by global climate change. The Water Resource Opportunities Subcommittee identifies and quantifies short-term risks to groundwater resources. The Conservation Subcommittee develops strategies to educate Long Islanders about the importance of conserving our groundwater. The fourth subcommittee works in conjunction with the Long Island Nitrogen Action Plan (LINAP) working group.

Meetings

LICAP is required to meet at least quarterly and hold one public hearing in each county annually.

PFAS: THE EVOLVING LANDSCAPE OF CONTAMINATION, REGULATION, AND REMEDIATION

INTRODUCTION

Since the 1940s, the industrial and consumer product landscapes worldwide have seen extensive use of a group of man-made chemicals known as PFAS (Per- and Polyfluoroalkyl Substances). These compounds have been hailed for their unique ability to resist heat, oil, stains, grease, and water, making them invaluable in a variety of applications. From the slick surface on nonstick pans, water-shedding capacity on raincoats, flame suppressing firefighting foams, to the stain-resistant nature of carpets, the influence of PFAS is undeniable. To date, more than 9,000 types of PFAS have been recognized. Among the vast family of PFAS, certain chemicals, namely perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), have drawn attention from researchers because of their persistent nature. Despite PFOA and PFOS being phased out of production in the United States, their legacy lingers as other countries continue to manufacture and utilize them.

The worrisome aspect of PFAS chemicals lies in their ability to migrate and permeate throughout the environment. Their journey from manufacturing plants to commercial use often leads them to contaminate the soil, water, and even the air. Their resistance to breakdown ensures they remain present, turning them into unwelcome, permanent residents of the environment. This ubiquity has culminated in PFAS traces being detected in the bloodstreams of people and animals globally. These "forever chemicals," as they've been dubbed, are notorious for their ability to accumulate in living organisms. A study by the Centers for Disease Control and Prevention, which drew upon data from the National Health and Nutrition Examination Survey, revealed startling figures: PFAS were detected in the blood of an overwhelming 97% of Americans. Moreover, they have been identified at minimal levels in a range of food products and throughout the natural world. A 2021 study conducted by Johns Hopkins University identified PFAS in 39 of the over 100 bottled waters tested. The Food and Drug Administration, which regulates bottled water in the U.S., has not yet set limits on PFAS in bottled water. Recent studies have also shown rainwater in many parts of the world contain detectable levels of PFAS. The channels of human exposure to PFAS include consuming contaminated water or food, using PFAS-based products, or inhaling air laden with these chemicals. The magnitude of this issue became more evident in 2016 when states like New York, Vermont, and New Hampshire prompted the U.S. Environmental Protection Agency (EPA) to recognize PFAS contamination as a widespread challenge. Responding to this call, the EPA issued a lifetime health advisory, setting the limit for PFOA and PFOS in drinking water at 70 parts per trillion.

PFAS
(CONTINUED)

NEW YORK'S APPROACH TO TACKLING PFAS CONTAMINATION

Aware of the impending crisis, New York State took measures in February 2016, establishing the Water Quality Rapid Response Team (WQRRT). This team, guided by the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (DOH), embarked on an urgent mission to probe water contamination reports and take appropriate actions. Their investigations focused on public water sources and private wells in proximity to sites with suspected PFAS usage. In 2017 New York State also established The Drinking Water Quality Council to provide recommendations to the DOH on emerging contaminants in drinking water. In a bid to fortify these endeavors, the Clean Water Infrastructure Act of 2017 was signed, earmarking an unprecedented $2.5 billion. As part of the Act's framework, an evaluation of inactive solid waste sites began in order to to pinpoint any PFAS-related impacts on drinking water sources. New York also took a pioneering step by becoming the first state to officially designate PFOA as a hazardous substance in January 2016, followed by PFOS in April 2016. This classification not only imposed guidelines on storage and environmental release but also empowered the state to undertake investigations and clean-up actions where necessary. Subsequent evaluations determined if these facilities warranted water sampling. In situations where PFOA or PFOS concentrations were above acceptable levels, remedial measures were initiated. A prominent case occurred in the Hoosick Falls area in 2016, where public drinking waters contaminated by PFOA were addressed. To grasp the full extent of PFAS usage, DEC conducted surveys targeting businesses, airports and fire departments, between June and September 2016. Recognizing the hazards posed by firefighting foam containing PFOS, the state launched a collection program, successfully gathering and safely disposing of over 25,000 gallons of contaminated foam by the summer of 2018. The data accumulated was instrumental in determining facilities that might be potential sources of PFOA and PFOS contamination, especially those near drinking water sources.

PFAS THREAT IMPACTS LONG ISLAND: A LOCALIZED RESPONSE

In July 2016 the NYSDEC designated the Air National Guard Base, and fire training facility at Frances S. Gabreski Airport in Westhampton Beach as a Superfund site. This was due to the historical usage of PFOS-laden firefighting foam. The objective of the State's superfund site program is to investigate sites where hazardous waste might have been disposed of, aiming to assess potential threats to public health and the environment. Typically, the party found responsible for the contamination manages the cleanup. However, if a responsible party cannot be identified or is unwilling or unable to fund an investigation, the state covers the expenses through the 1986 Environmental Quality Bond Act, commonly referred to as the "State Superfund." The NYSDEC's investigations involved analyzing groundwater and soil samples from the base, leading to the validation of the site as a PFOS contamination source for the area. The Suffolk County Department of Health Services (SCDHS) installed wells upgradient of the Suffolk County Water Authority (SCWA) Meetinghouse Road wellfield and sampled private wells downgradient of the Air National Guard Base and detected PFOS and PFOA levels above the health advisory in several wells. Working with the NYSDEC and SCDHS, the SCWA successfully connected over 60 properties to public water.

The Firematics Training Facility in Yaphank, operational since 1959, used Aqueous Film Forming Foam (AFFF) until 2016. The Suffolk County Department of Health Services (SCDHS) tested water from nearby private wells in July 2016 and conducted a groundwater investigation and found elevated levels of PFOS and PFOA. Affected residents were supplied with bottled water, and by January 2017, 16 homes were connected to public water. The sampling scope expanded in February 2017, with more homes receiving bottled water and 32 additional properties being slated for public water connection. In April 2017, the Firematics site was designated a State Superfund site.

In 2017, the SCDHS uncovered levels of PFOS and PFOA exceeding the EPA's health advisory level in private wells around the East Hampton Town Airport in Wainscott. The origin of this contamination was traced back to the firefighting foam used at the airport, prompting the designation of a portion of the airport's land as a Superfund site. Testing areas for these chemicals expanded, affected residents were supplied with bottled water, and there were rebates offered by the Town of East Hampton for the installation of specialized water treatment systems. To address long-term water safety, a water supply district was established, allowing the Suffolk County Water Authority to extend water mains to potentially affected residences. By 2018, approximately 45,000 feet of water main had been added to the hamlet.

On August 26, 2020, the New York State Department of Health published new maximum contaminant levels for emerging contaminants in the NYS register, which include 1,4-dioxane, PFOS and PFOA. Since that time both the New York State Department of Health and EPA have placed an emphasis to review and regulate additional emerging contaminants of concern with a focus on additional perfluorinated compounds.

Notification levels are currently being considered for various other emerging compounds of concern including additional long and short chain PFAS compounds. On October 4, 2022 the New York State Department of Health announced that they were issuing proposed regulations for 23 additional emerging contaminants in drinking water in the State Register. The proposed rulemaking was developed with input and support by the New York State Drinking Water Quality Council (DWQC) in accordance with amendments to Public Health Law signed by the Governor. Action has been delayed so that state action can be potentially reconciled and coordinated with a recent EPA proposal to regulate PFAS compounds at the federal level. On March 14, 2023, EPA announced the proposed National Primary Drinking Water Regulation (NPDWR) for six PFAS including perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO-DA, commonly known as GenX Chemicals), perfluorohexane sulfonic acid (PFHxS), and perfluorobutane sulfonic acid (PFBS). EPA anticipates finalizing the regulation by the end of 2023. Based on state and federal regulatory actions and proposals 1,4 dioxane testing is imperative along with the myriad of prefluorinated compounds that are, or will be, subject to regulatory action. Many water suppliers are performing proactive PFAS testing that employ EPA drinking water methods 533 and 537.1 for testing of 29 perfluorinated compounds.

PFAS
(CONTINUED)

A NEW SUPERFUND SITE AND NEW YORK'S COMMITMENT TO BATTLING PFAS CHALLENGES

In February 2023, MacArthur Airport in Ronkonkoma received a designation as a state Superfund site. The Department of Environmental Conservation (DEC) had been observing the area closely since 2018 when it was first pinpointed as a potential Superfund site. SCDHS initiated a private well survey in an area downgradient of the aiprort in 2017 and identified 4 private wells with detection of PFAS over the PFOS/PFOA MCLs.

In April 2023 Governor Hochul declared an investment exceeding $70 million towards water infrastructure enhancement projects throughout the state. One of the focal points of this investment was the treatment of emerging contaminants that exceed the state's determined Maximum Contaminant Level (MCL). Notably, the Suffolk County Water Authority was granted $16.2 million to spearhead 11 drinking water projects. Additionally, the Manhasset Lakeville Water District in received a $2 million grant for installation of granular activated carbon for the removal of PFOA and PFOS at their Willets well. In May 2023 the Environmental Facilities Corporation Board of Directors approved $51 million in funding for clean water systems and local drinking water projects. Among the several projects approved for funding, Hicksville Water District received $8.9 million through the Water Infrastructure Improvement (WIIA) state grant program for the installation of an advanced oxidation process and granular activated carbon treatment systems at Plant No. 9 for the removal 1,4-dioxane, PFOA and PFOS. Additionally, another $5.6 million WIIA grant was approved for installation of similar systems at Plant No. 5.

A COORDINATED APPROACH TO RESOURCES MANAGEMENT

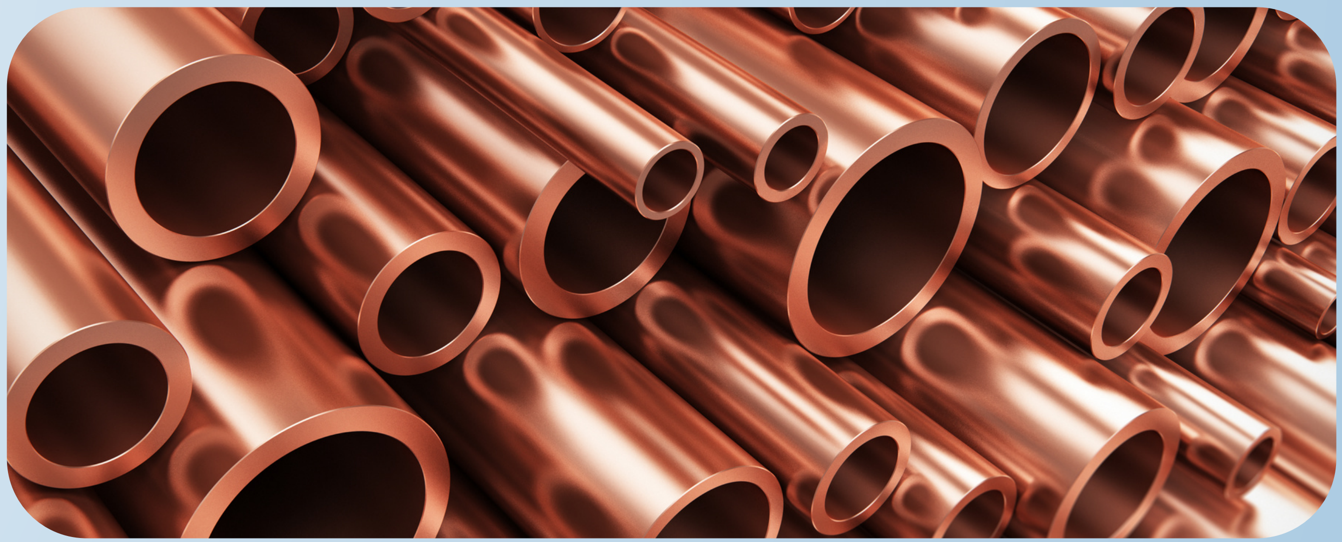
Over the past several years the residents of Manorville, south of the former Navy/Grumman facility have expressed concerns about PFAS contamination in private wells, impacting the safety of their drinking water. Their concern was that the groundwater contamination spread from a 6,000 acre parcel in Calverton where Grumman once fueled and tested U.S. Navy jets, moved through the aquifer and impacted their private wells. Analysis by The Suffolk County Department of Health Services beginning in 2017, revealed the presence of PFOS and PFOA chemicals in 18 of the 112 residential wells south of the Grumman site. Stepping in to address this troubling situation, officials from the Suffolk County Water Authority, Town of Brookhaven, Town of Riverhead, and the Suffolk County Department of Health Services held community meetings to update the residents on the critical projects set to combat this issue. The Town of Riverhead and the SCWA also formed a pact to oversee the extension of water main to the area of Manorville.

Local, State and Federal Grant funds were secured to initiate projects in both the Town of Brookhaven and the Town of Riverhead. Riverhead received over $7.3 million in state and federal funds. SCWA received $6.8 million in grant funding for the Town of Brookhaven side of the project. As part of a policy SCWA also provided 75 feet of water main without any charges to new customers in the Riverhead portion of the project. Additionally, $1.3 million was contributed by Suffolk County to cover funding gaps and help cover the cost of water service.

THE CARBON SOLUTION

Many water suppliers use granular activated carbon (GAC) for treating water with PFOA and PFOS, as carbon is both resilient and versatile. Due to it being very porous and having a high surface area for filtration it has demonstrated a strong ability at removing many PFAS compounds. The carbon is typically derived from coconut shells, coal or wood. While effective, GAC filters pose unique challenges. Their spatial requirements might not be feasible for certain facilities, especially those constrained by nearby development. Additionally, the longevity and effectiveness of these filters can vary based on the quality of the source water. Over the past 35 years the EPA and New York State have continued to set forth more stringent requirements for public drinking water as detailed in the above. These more stringent measures primarily have initiated more rigorous wellhead treatment. The regulatory actions have and will continue to result in far higher wellhead treatment costs as supply wells become impacted. This has directly translated into higher water rates that impacts affordability. Additional infrastructure also significantly increases energy consumption, increases carbon footprint and impacts sustainability. Therefore as new regulatory action is considered the risks must be carefully weighed with respect to public health protection, affordability and sustainability.

LEAD AND COPPER RULE REVISIONS: A REVIEW OF LONG ISLAND'S COMPLIANCE, CHALLENGES, AND FUTURE OUTLOOK



INTRODUCTION

On December 16, 2021, the Environmental Protection Agency (EPA) issued the Lead and Copper Rule Revisions (LCRR). This revision bolstered the existing Lead and Copper Rule (LCR) with the intention to address concerns about lead and copper contamination in drinking water. The primary source of lead in drinking water arises from pipes, posing a potential health hazard to both children and adults. Key changes to the rule involve modified lead sampling and corrosion control, enhanced public education, the commencement of lead testing in educational and childcare settings, mandatory public inventories of lead service lines, and a push for more extensive lead service line replacements.

In order to comply with the LCRR's new stipulations, all water systems are expected to:

- Develop an inventory of all service lines, including utility and customer owned service line materials, and make it publicly available.
- Verify as many service lines of unknown material as possible because unknown materials are treated as lead service lines (LSLs) unless evidence proves otherwise.
- Prepare a lead service line replacement plan if a utility has LSLs.
- Revise sampling protocols and communications for 5th liter sampling
- Revise sampling pool location to align with new sampling tiers.
- Prepare a sampling plan and communications for lead testing in schools and childcare facilities.
- Review corrosion control treatment by evaluating 5th liter LSL samples and make changes as deemed necessary.
- Prepare public notifications and sample notifications.

The primary challenge facing compliance with the LCRR lies in the creation of a comprehensive water service line inventory. Since the revised rule's introduction in December 2021, water suppliers throughout Long Island have been diligently inventorying water service lines through both records reviews and physical inspections.

LEAD AND COPPER RULE REVISIONS (CONTINUED)

NEW YORK STATE'S ROLE AND FUNDING OPPORTUNITIES

The New York Clean Water Infrastructure Act of 2017 initiated the New York State Department of Health's Lead Service Line Replacement Program (LSLRP). Aimed at mitigating the dangers posed by lead in drinking water, this program funds the complete replacement of residential lead service lines from the municipal water mains to residences. Funds will cover costs including engineering, legal and municipal administration fees, construction, and site restoration.

Two funding rounds have so far been distributed amongst municipalities in Long Island. In the first round, the Town of Southold, Town of Hempstead, Town of North Hempstead, and the City of Long Beach each received $611,363. In the second round, the City of Glen Cove and Town of Riverhead each received $627,327.

On the federal level, the Bipartisan Infrastructure Law addresses the existing 6 to 10 million lead service lines across the US. This legislation will deliver resources to remove these lead pipes, in line with a Federal goal of removing 100% of lead service lines. The Bipartisan Infrastructure Law invests $15 billion towards Lead Service Line Replacement through the Drinking Water State Revolving Fund (DWSRF). With this investment, 49% of funds will be provided to communities as grants or principal forgiveness loans and 51% of funds will be available to communities for low-interest loans. In addition, a state match is not required.

LEGISLATIVE DEVELOPMENTS

The New York State Legislature recently passed the Lead Pipe Right to Know Act (A.6115 (Paulin) | S.5512 Rivera) in 2023. This act aims to mandate the disclosure of the lead service line inventory that water utilities are currently developing under the guidelines of the federal Environmental Protection Agency (EPA). Under this legislation, the New York State Department of Health (DOH) is expected to make these service line inventories available to the public and develop interactive maps, helping residents discern their risk associated with lead exposure.

While the bills intentions are rooted in public welfare, its directives could potentially be in direct conflict with the forthcoming modifications to the Lead and Copper Rule Revisions (LCRR) by the EPA. Such a conflict would impede the state health department's ability to maintain primacy authority for executing the federal rule. Not securing primacy could jeopardize the flow of federal funding to the state.

There are several concerns that water suppliers have voiced, emphasizing the potential complexities and challenges posed by the proposed legislation:

- The Lead Pipe Right to Know Act mirrors the requirements already set forth by the USEPA's LCRR for lead service line inventory. For New York's Department of Health to gain primacy, it will have to design regulations that align with federal inventory requirements. Implementing two concurrent regulatory stipulations could sow confusion among New York communities, escalating the risk of contravening these requirements.

- The USEPA has signaled its intention to refine the LCRR, publishing the Lead and Copper Rule Improvements (LCRI) later in 2023. Any alterations to inventory requirements could pose a scenario where New York's water supplies grapple with conflicting state and federal mandates.

- The new legislation sets forth a more detailed blueprint for inventory submissions to the NYS Department of Health than the EPA's LCRR. Such directives would encompass over 3,500 water supplies in New York, ranging from tiny villages to metropolitan regions like New York City. This universal approach does not factor in the diverse challenges and resources associated with different water systems. Many water utilities in New York have already initiated their inventory processes. The proposed act could necessitate a reevaluation and possible overhaul of these inventories, incurring added costs and time, without any discernible enhancement in public health.

- Advocates of the act believe it will bolster water systems' ability to access federal funding for removing lead service lines. However, the DOH has not finalized the Intended Use Plan (IUP) related to the EPA's 2022 allocation of BIL funds for such lines. Consequently, access to these funds may be deferred to late 2023 or early 2024. The draft IUP for the 2022 allocation has already enlisted sufficient projects to exhaust the initial three years of funding from the BIL.

- The legislation, in its current form, rigidly encodes intricate scientific and technological principles. As more data and research emerges from the LCRR and LCRI, this static legal structure could hinder both water suppliers and the NYS Department of Health from implementing measures that best safeguard New Yorkers.

While the Lead Pipe Right to Know Act aspires to offer additional transparency, its provisions might inadvertently introduce conflicting demands that could escalate costs for utilities and unnecessarily strain the resources of the NYSDOH.

As of this report's last update, the bill has not been officially signed into law by the Governor.

SURVEY OF LONG ISLAND WATER SUPPLIERS

Several water suppliers across Long Island were surveyed in August 2023 regarding their LCRR compliance progress:

- Water Authority of Great Neck North: The authority began their compliance process two years prior but faced challenges when regulations about excavation changed. At present, they have 75% of the utility side and 45% of the customer side completed.

- Water Authority of Western Nassau County: They are a third way through their inventory using temporary staff to inspect address by address. They are confident in their existing database regarding their part of the service.

- Manhasset- Lakeville WD: This water district has constructed an inventory in GIS and is awaiting field verifications. They have also started a public awareness campaign through their newsletters.

LEAD AND COPPER RULE REVISIONS (CONTINUED)

- Roslyn Water District: Of their 5,800 accounts, about 1,900 need inspections. They are using a predictive model and hope to inspect 50% soon.
- Town of Hempstead Department of Water: Due to the lack of historical installation records, they are collaborating with the building department to find evidence. They will soon request homeowners to perform in-house inspections.
- Bethpage Water District: They have sorted through all tap cards and recorded material types. They have started in-field surveys and are conducting excavations to verify materials.
- Hicksville Water District: They have about 600 services left for field verification. They have also introduced a dedicated web page on Lead and Copper updates.
- Suffolk County Water Authority: They have constructed an inventory in GIS and started a public awareness campaign. They currently have 70% of the utility side and 70% of the customer side completed.

The advent of the LCRR has set in motion a concentrated effort by water suppliers to ensure safer drinking water for all. As suppliers navigate the challenges of compliance and potential legislative issues, collaboration between federal, state, and local entities will be crucial for effective and efficient lead and copper remediation.

HYDROLOGIC CONDITIONS

HYDROLOGIC CONDITONS IN NASSAU AND SUFFOLK COUNTIES

This section of the SOTA provides a snapshot of current hydrologic conditions on Long Island. The analysis was compiled by reviewing published National Oceanographic and Atmospheric Administration (NOAA) precipitation records and U.S. Geological Survey (USGS) groundwater and streamflow records from key stations located in Nassau and Suffolk Counties.

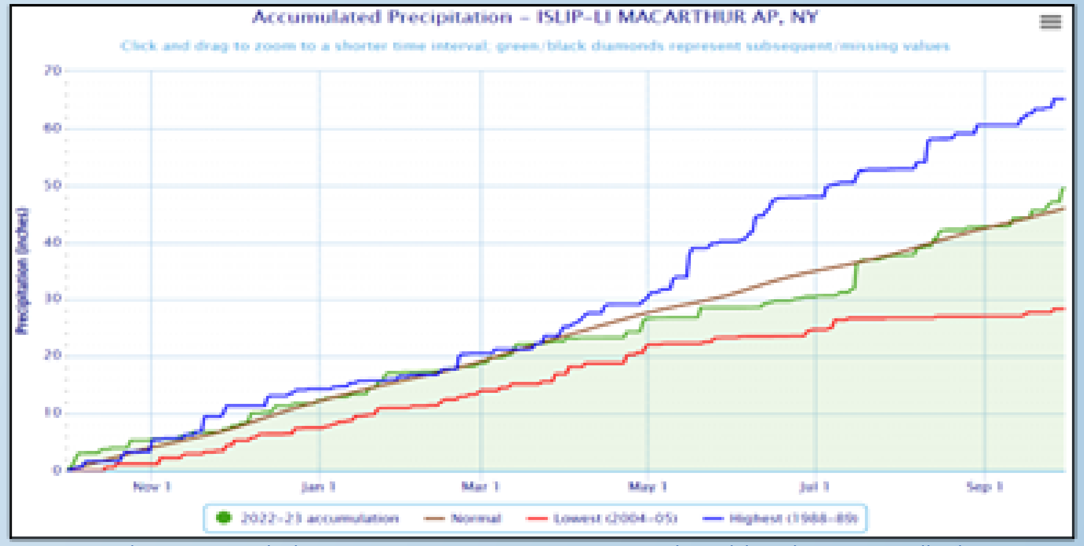
Precipitation is the only natural means by which water enters Long Island's aquifers. Approximately half of all precipitation that falls recharges the aquifers; roughly one million gallons of water per day for each square mile of land. Most recharge on Long Island generally occurs during the non-growing season (October to May); from June through September, aquifer recharge is minimal. The summer months tend to be warmer, leading to higher rates of evaporation. This increased evaporation further reduces the amount of water that would otherwise percolate down into the aquifer.

PRECIPITATION IN RECENT YEARS

Normal, or long-term average precipitation for a given site, is calculated based on weather statistics from the previous three decades (climatic normal). These statistics are updated at the beginning of each new decade. For example, current normal precipitation levels are the average values from calendar years 1991 to 2020. In this manner, changing climatic patterns are accounted for, but do not skew the data excessively for any given decadal period. The current value for normal annual (calendar year) precipitation reported by the National Weather Service (NWS) for Islip-Long Island MacArthur Airport (MacArthur Airport), located in central Suffolk County, NY is 45.99 inches.
For this SOTA update, rather than utilizing calendar years, precipitation records from MacArthur Airport were examined in one-year increments for the period October 1 to September 30 for each year, or the water year. A water year is defined as the 12-month period October 1, for any given year through September 30, of the following year. The water year is designated by the calendar year in which it ends. MacArthur Airport precipitation data was downloaded from the National Centers for Environmental Information (NCEI) website at www.ncei.noaa.gov.

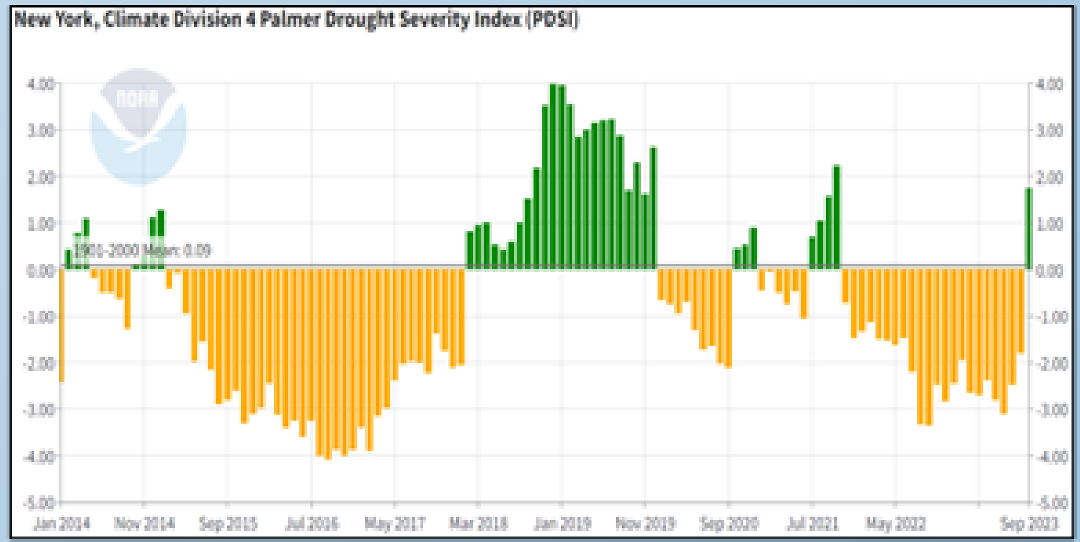
Precipitation at MacArthur Airport for the 2023 water year was 49.58 inches, compared to the two prior water years of 2022 (36.23 inches) and 2021 (51.58 inches). While these values are not directly comparable to the 30-year climatic normal of 45.99 inches calculated for the calendar year, they can be used to indicate general periods of above- or below-normal precipitation. The data presented above indicates that water year 2023 was wetter than normal, water year 2022 was much drier than normal, and water year 2021 was wetter than normal.

The figure below shows an accumulated precipitation graph at MacArthur Airport for water year 2023 (October 1, 2022 to September 30, 2023). This graph shows the annual accumulated precipitation (green) in relation to normal conditions (brown) and the historical years with the highest accumulated precipitation (blue) and lowest accumulated precipitation (red) for the station. The MacArthur Airport station has 60 years of records.



Source: Northeast Regional Climate Center, CLIMOD 2 Data Access, http://climod2.nrcc.cornell.edu

During the 2023 water year, accumulated precipitation at MacArthur Airport was generally at or above normal from the beginning of the calendar year until early April when a precipitation deficit began. The precipitation deficit continued to increase for the remainder of the spring and into early summer, reaching a maximum deficit of almost 5 inches by mid-July. A precipitation event of almost 5 inches occurred in mid-July that erased this deficit, and conditions returned to near normal, and then to above normal by the end of the water year as wetter-than normal conditions prevailed.
The figure below shows the Palmer Drought Severity Index (PDSI) for about the past 10 years (January 2014 to September 2023). This index is commonly used for monitoring drought and uses precipitation and temperature data to estimate moisture supply based on a supply-and-demand model of soil moisture. A PDSI around zero is normal; with positive numbers indicating moist conditions and negative numbers indicating dry conditions. Since 2014, Long Island has been in 2 periods of unusually moist conditions or greater (PDSI +2.0 or above) in 2018-19 and 2021, and 3 periods of moderate drought or greater (PDSI -2.0 or below) in 2015-17, 2020, and 2022-23).



Source: NOAA National Centers for Environmental Information, Climate at a Glance: Divisional Time Series, https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/divisional/time-series

HYDROLOGIC CONDITIONS (CONTINUED)

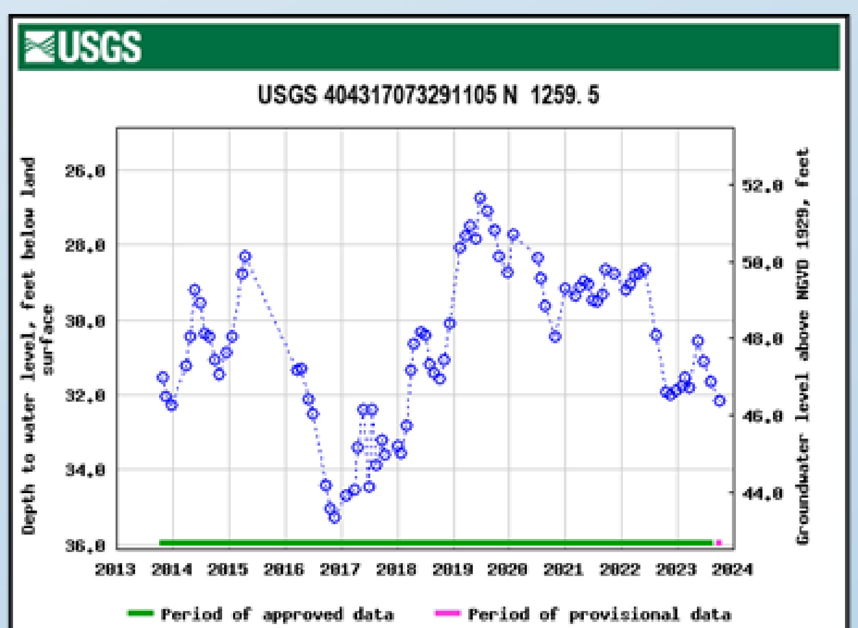
GROUNDWATER LEVELS

Background information pertaining to specific wells and streamflow gauges represented in this section can be obtained from the USGS report entitled "Statistical Analysis of Long-Term Hydrologic Records for Selection of Drought-Monitoring Sites on Long Island, New York," accessible at the following web address: https://pubs.er.usgs.gov/publication/sir20045152.

Aquifer levels on Long Island have fluctuated historically due to human influences such as pumping and sewering, and fluctuate seasonally due to precipitation, recharge, and evapotranspiration. Regardless of these stresses, groundwater levels beneath most of Long Island are usually highest in March, April, and May and lowest in September, October, and November. The following is a snapshot of hydrologic conditions in the aquifer system of Long Island, with the focus being on the 10-year period from October 1, 2013 to September 30, 2023.

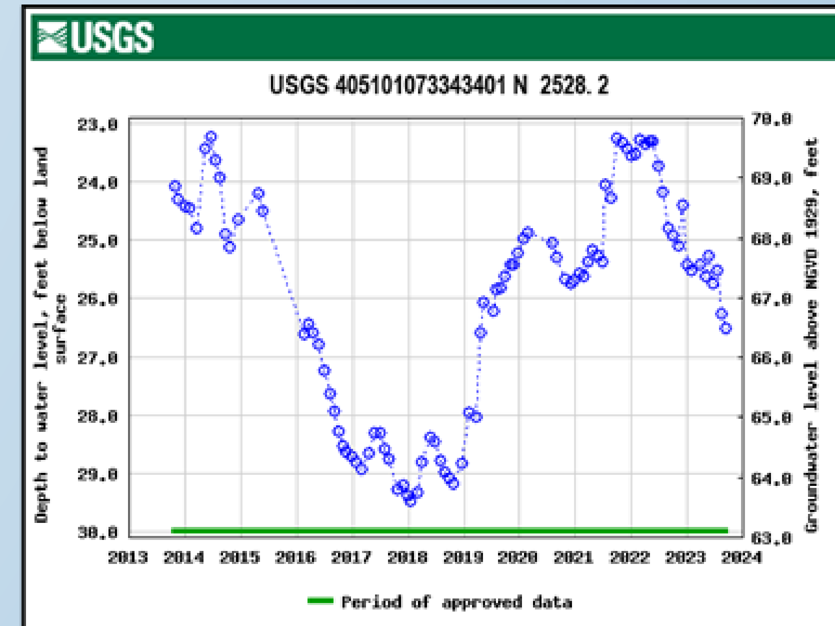
Generally, groundwater levels and streamflows have declined from highs reached in 2019 after a period of well above normal precipitation, to more average levels during 2020 to early 2022, and then to below average levels from late 2022 through 2023 in response to the recent period of below average precipitation. A more detailed look at these trends are shown in the figures on the following pages.

The 10-year hydrograph below shows that water levels at well N1259.5, located in Plainedge in southeastern Nassau County, and screened in the upper glacial aquifer (41 ft deep) increased sharply to above normal levels in 2019 from the lows reached in late 2017. This was in response to higher-than-normal precipitation during 2018 and 2019 after a 3-year period of well below normal precipitation. Water levels returned to more normal levels in 2020 as precipitation totals for 2020 through early 2022 were closer to average. A sharp decline in water levels began later in 2022 as conditions became significantly drier, then recovered somewhat in early 2023, then began to decline sharply for the remainder of the water year.



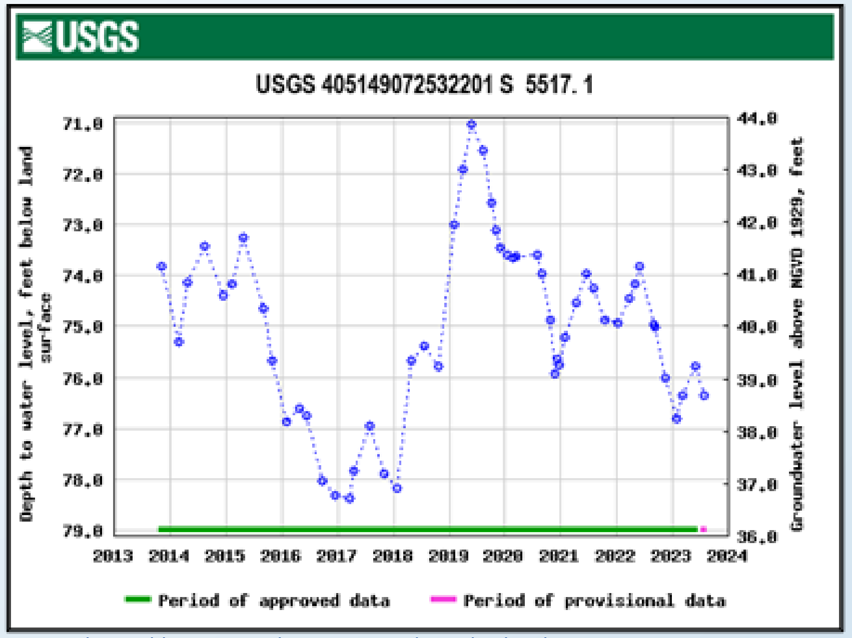
Source: https://nwis.waterdata.usgs.gov/usa/nwis/gwlevels/?site_no=404317073291105

The 10-year hydrograph below shows that water levels at well N2528.2, located in Old Brookville in northeastern Nassau County, and screened in the Magothy aquifer (328 ft deep) increased sharply to more normal levels in 2020 from the lows reached in early 2018. This was in response to higher-than-normal precipitation during 2018 and 2019 after a 3-year period of well below normal precipitation. Water levels sharply increased in 2021, and remained at these levels through early 2022. A sharp decline in water levels began later in 2022 as conditions became significantly drier and local groundwater pumpage increased, and have continued to decline through most of the 2023 water year.



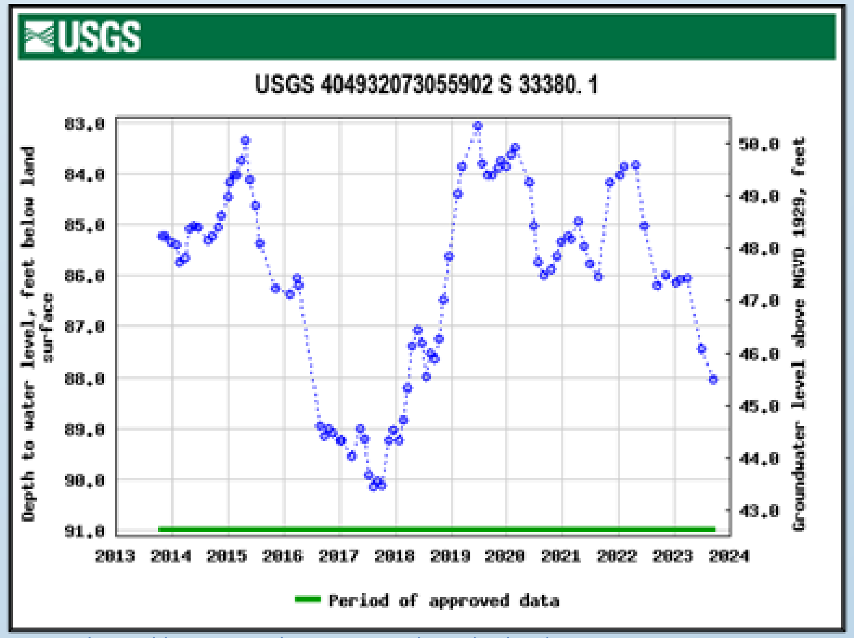
Source: https://nwis.waterdata.usgs.gov/nwis/gwlevels?site_no=405101073343401

Similar to the wells in Nassau County, the 10-year hydrograph below shows that water levels at well S5517.1, located at Brookhaven National Laboratory in east-central Suffolk County, and screened in the upper glacial aquifer (91 ft deep) increased sharply to above normal levels in 2019 from the lows reached in late 2017. This was in response to higher-than-normal precipitation during 2018 and 2019 after a 3-year period of well below normal precipitation. One difference to the wells in Nassau County is the significant decline in water levels in late 2020 that is related to much drier conditions on the east end during that year. Water levels then varied seasonally through early 2022, during a period of relatively average precipitation, but began a sharp decline later in 2022 as conditions became significantly drier, then recovered somewhat in early 2023, then began to decline for the remainder of the water year.



Source: https://nwis.waterdata.usgs.gov/nwis/gwlevels?site_no=405149072532201

Similar to the other hydrographs shown above, the 10-year hydrograph below shows that water levels at well S33380.1, located in Ronkonkoma in central Suffolk County, and screened in the Magothy aquifer (855 ft deep) increased sharply to more normal levels in 2019 from the lows reached in late 2017. This was in response to higher-than-normal precipitation during 2018 and 2019 after a 3-year period of well below normal precipitation. Water levels varied seasonally with changes in precipitation and groundwater pumpage through early 2022. A sharp decline in water levels began later in 2022 as conditions became significantly drier and local groundwater pumpage increased, then leveled off in early 2023, then began to decline sharply for the remainder of the water year.



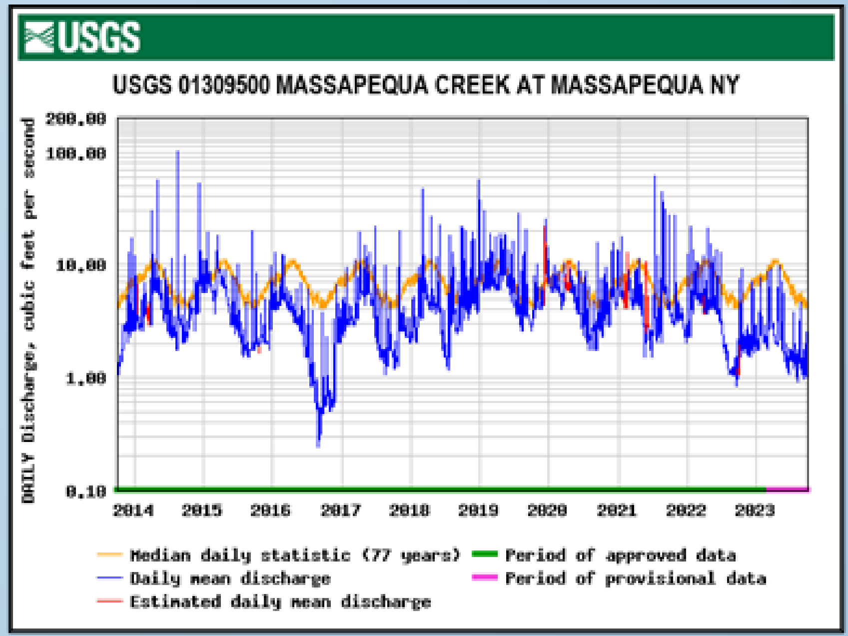
Source: https://nwis.waterdata.usgs.gov/nwis/gwlevels?site_no=404932073055902

STREAMFLOWS

Since all of Long Island's streams are in direct hydraulic contact with the upper glacial aquifer, their flows closely reflect changes in the water-table altitude. As with groundwater levels, streamflow (stream discharge) fluctuates throughout the year, from their highs in the spring to their lows in late summer. For each of the hydrographs shown below, the orange line represents the historical average stream discharge, and the blue line represents the actual recorded discharge. The three streams shown below are reflective of different conditions of development or urbanization, with Massapequa Creek being located in the most highly developed area, Connetquot River located in an area of intermediate development, and the Peconic River located in the most minimally developed area.

Massapequa Creek: Streamflow at most Nassau County streams, including Massapequa Creek, reflect the long-term effects of significant human impacts from sewering and pumping on water levels within the upper glacial and deeper aquifers. Discharges in most streams in Nassau County have decreased markedly since the 1960s and have not recovered due to these impacts.

The 10-year hydrograph below shows that stream discharge at Massapequa Creek prior to 2016 fluctuated around the long-term average, with a few more pronounced periods of above or below average related to changes in precipitation. However, in response to the 3-year period of well-below-normal precipitation during 2015, 2016, and 2017, stream discharge declined significantly over that period reaching a low in late 2016. Since that time, stream discharge increased to above normal in 2019, and then remained near the long-term average until mid-2022, when stream discharge declined sharply to well-below average in response to below-normal precipitation. Stream discharge remained below to well-below average throughout most of the 2023 water year.

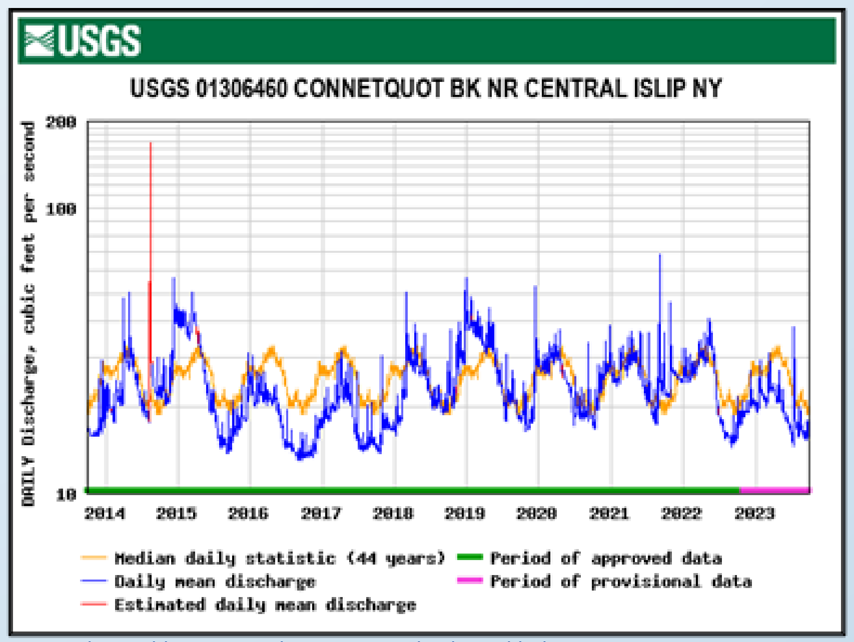


Source: https://nwis.waterdata.usgs.gov/ny/nwis/dv/?site_no=01309500

HYDROLOGIC CONDITIONS
(CONTINUED)

Connetquot River: This stream located in south-central Suffolk County borders areas showing significant human impacts (to its west) and minimal human impacts (to its east). Therefore, it is a good stream to use as a comparison to the more urbanized streams to the west and less human impacted streams to the east.

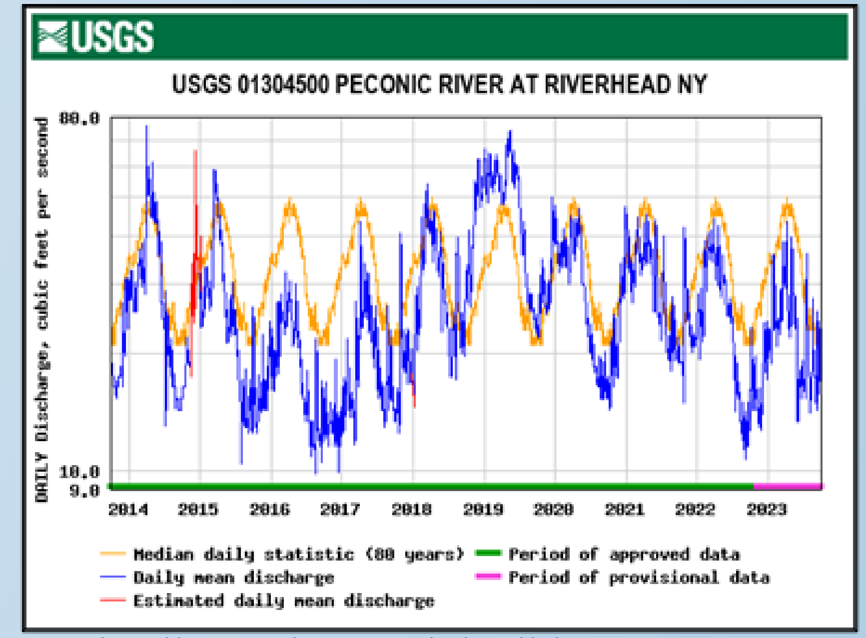
Similar to Massapequa Creek, the 10-year hydrograph below shows that stream discharge at Connetquot Brook prior to 2016 fluctuated around the long-term average, with a few more pronounced periods of above or below average related to changes in precipitation. However, in response to the 3-year period of well-below-normal precipitation during 2015, 2016, and 2017, stream discharge declined significantly over that period reaching a low in late 2016. Since that time, stream discharge increased to above normal in 2019, and then remained near the long-term average until mid-2022, when stream discharge declined sharply to well-below average in response to below-normal precipitation. Stream discharge remained below to well-below average throughout most of the 2023 water year.



Source: https://nwis.waterdata.usgs.gov/ny/nwis/dv/?site_no=01306460

Peconic River: This stream located in eastern Suffolk County is situated in an area with minimal human impact. It is also the one major stream on Long Island that flows from west to east, discharging into the Peconic Bay. Most other streams on Long Island flow north or south, depending on what side of the groundwater divide they are situated in.

Similar to the other two streams, the 10-year hydrograph above shows that stream discharge at Peconic River prior to 2016 fluctuated around the long-term average, with a few more pronounced periods of above or below average related to changes in precipitation. However, in response to the 3-year period of well-below-normal precipitation during 2015, 2016, and 2017, which was somewhat more pronounced in eastern parts of Long Island, stream discharge declined significantly over that period reaching a low in late 2016. Since that time, stream discharge increased to above normal in 2019, and then remained near the long-term average until mid-2022, when stream discharge declined sharply to well-below average in response to below-normal precipitation. Stream discharge remained below to well-below average throughout most of the 2023 water year.



Source: https://nwis.waterdata.usgs.gov/ny/nwis/dv/?site_no=01304500

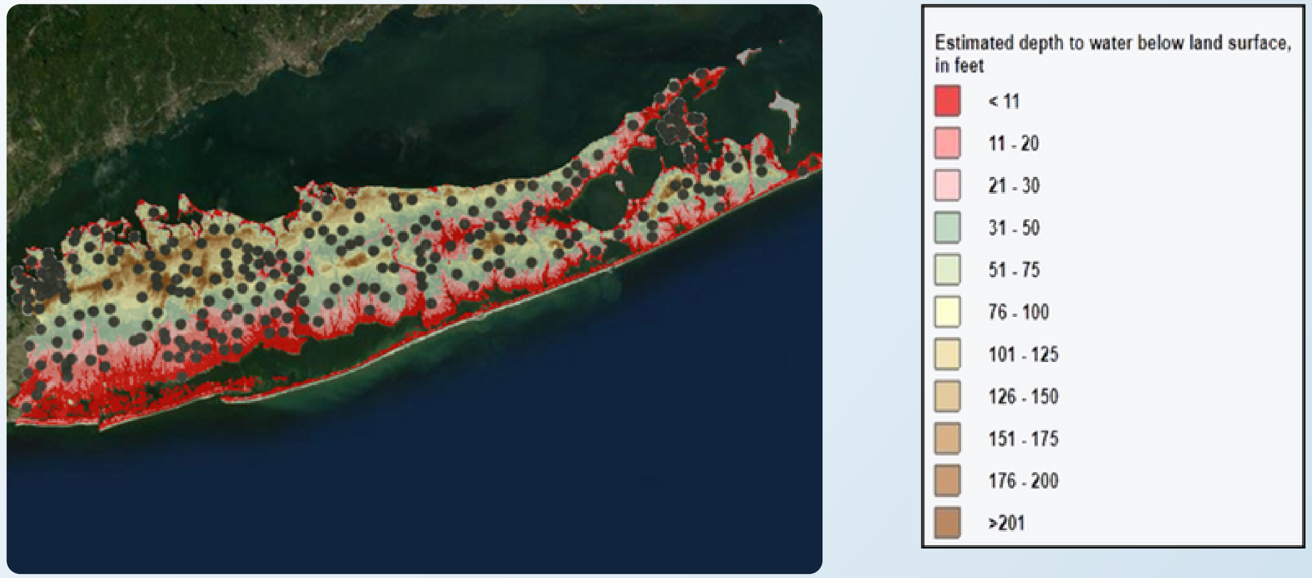
The data displayed in the hydrographs in this section show that Long island has experienced the full spectrum of hydrologic conditions in a very short time frame, from record or near-record lows as recently as 2017 to generally above to well above normal conditions in 2019. The abundance of groundwater and surface-water data collected by the USGS and other agencies over a long period of time ensures that water suppliers, regulatory agencies, and the public are well informed about groundwater and surface-water conditions at any given time. This data is an invaluable aid in making decisions to protect both public health and the health of the environment.

HOW CAN I FIND OUT MORE INFORMATION ON LONG ISLAND'S HYDROLOGIC CONDITIONS?

The USGS has a website providing data and resources from their ongoing cooperative groundwater and surface-water hydrologic monitoring program on Long Island that can be accessed at: https://www.usgs.gov/centers/ny-water/science/us-geological-survey-hydrologic-monitoring-long-island-new-york.

The USGS also maintains a depth-to-water map for Nassau and Suffolk Counties. The map is shown on the next page, with the color-coded intervals to its right. Each color represents an interval of depth below land surface, below which groundwater will be encountered. Also shown below (as black dots) are the locations of USGS monitoring wells that were utilized in creating the map.

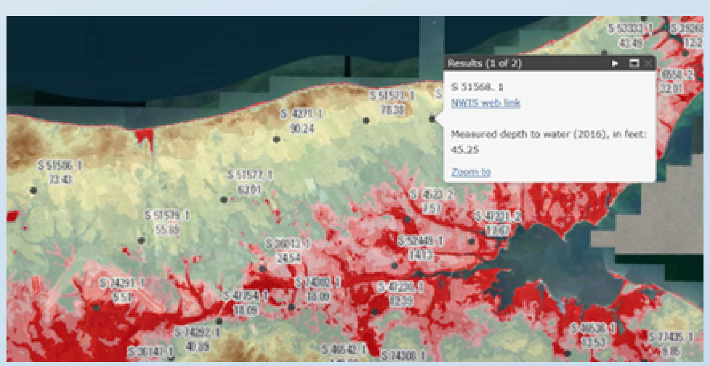
HYDROLOGIC CONDITIONS
(CONTINUED)

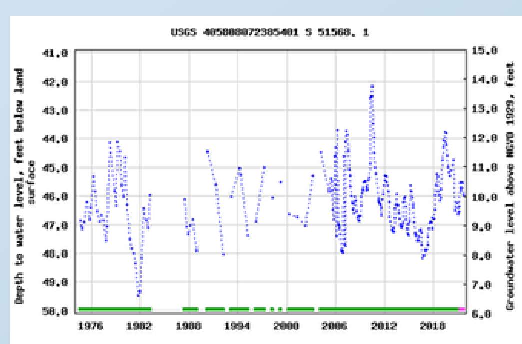


The map is fully interactive and available at the following web address: https://ny.water.usgs.gov/maps/li-dtw.

To use it, click on a monitoring well to get a measured depth to water, or click elsewhere on the map to get an estimated depth to water. The map allows the user to zoom in to a particular area for greater detail.

Below is an example of a close up of the depth to water in eastern Suffolk County. When the user clicks on a particular monitoring well (in this case well number S-15568.1), its information is displayed, including a link to its historical water-level record. Clicking on the "NWIS web link" will display the hydrograph shown to the right of the figure. The user can then specify a particular time period for which data is desired and see a graph of water levels within that time period.





By utilizing this and other publicly-available websites and web tools, anyone can obtain instant information on hydrologic conditions anywhere in Nassau and Suffolk Counties and compare current data with past trends.

GROUNDWATER PUMPAGE

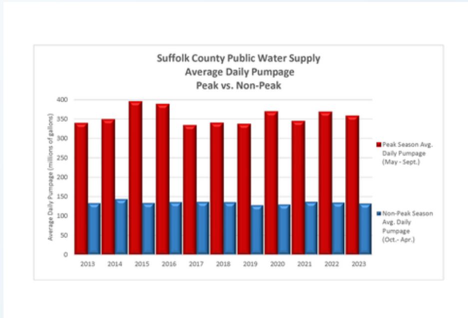
In 2023, the average daily pumpage for Nassau and Suffolk Counties was approximately 174 million gallons per day (mgd) and 227 mgd, respectively, compared to their respective 2013 to 2022 averages of 183 mgd and 228 mgd. The 2023 Nassau County average daily pumpage was approximately 9 mgd below the 2013 to 2022 average while the 2023 Suffolk County average daily pumpage was approximately 1 mgd below the 2013 to 2022 average. Peak season average daily pumpage (May -September) is approximately 100 – 200 mgd more than non-peak season average daily pumpage (October - April). In 2023, the peak season average daily pumpage for Nassau and Suffolk Counties was approximately 242 mgd and 358 mgd, respectively, compared to their respective 2013 to 2022 averages of 251 mgd and 356 mgd.The 2023 Nassau County peak season average daily pumpage was approximately 9 mgd below the 2013 to 2022 average and the Suffolk County peak season average daily pumpage was approximately 2 mgd above the 2013 to 2022 average.

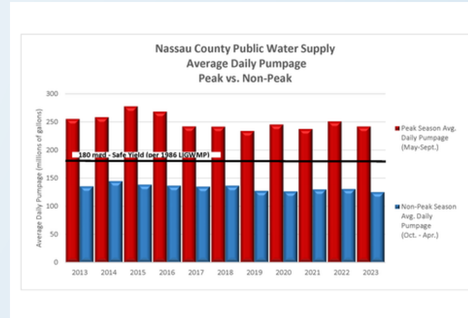
	Suffolk County Public Water Supply Non-Peak Season Avg. Daily Pumpage (mgd)	Suffolk County Public Water Supply Peak Season Avg. Daily Pumpage (mgd)	Suffolk County Public Water Supply Avg. Daily Pumpage (mgd)
Year*	Oct.-April	May-Sept.	All months
2013	133.31	339.08	219.56
2014	143.57	348.74	229.57
2015	133.52	394.83	243.05
2016	135.98	388.23	241.43
2017	136.33	333.51	218.99
2018	135.72	339.83	221.28
2019	127.67	336.75	215.31
2020	129.83	368.96	229.79
2021	136.55	344.25	223.61
2022	134.80	368.26	232.66
2023	132.13	357.70	226.68
Avg.	134.49	356.38	227.45

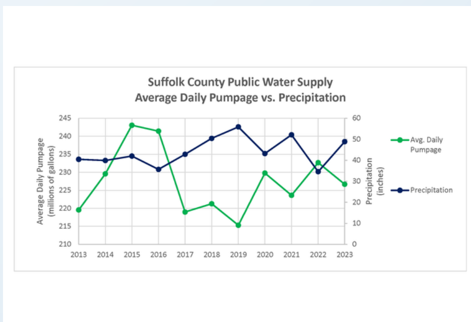
*Yearly pumpage estimates are provided from October – September (i.e. 2013 reporting year contains data from October 2012 through September 2013).

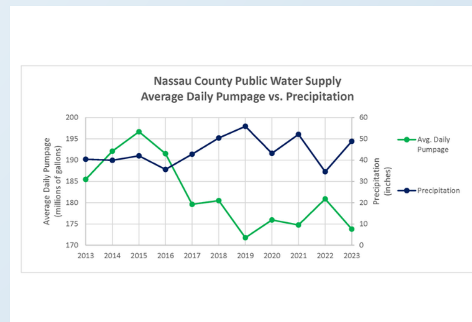
	Nassau County Public Water Supply Non-Peak Season Avg. Daily Pumpage (mgd)	Nassau County Public Water Supply Peak Season Avg. Daily Pumpage (mgd)	Nassau County Public Water Supply Avg. Daily Pumpage (mgd)
Year*	Oct.-April	May-Sept.	All months
2013	135.22	255.12	185.48
2014	144.49	258.11	192.12
2015	138.26	277.61	196.67
2016	136.46	268.21	191.54
2017	134.69	241.89	179.63
2018	136.46	241.47	180.48
2019	127.09	233.66	171.77
2020	126.26	245.11	175.95
2021	129.70	237.18	174.75
2022	130.50**	250.68	180.88**
2023	124.89	241.61	173.82
Avg.	133.09	250.06	182.10

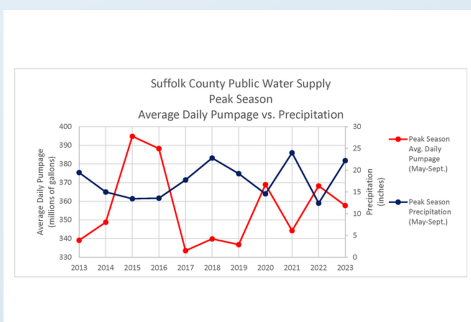
*Yearly pumpage estimates are provided from October – September (i.e. 2013 reporting year contains data from October 2012 through September 2013).
**Updated from last year's SOTA report based on data corrections and newly submitted public water supply pumpage reports.

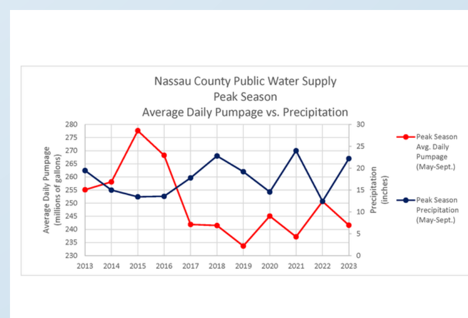


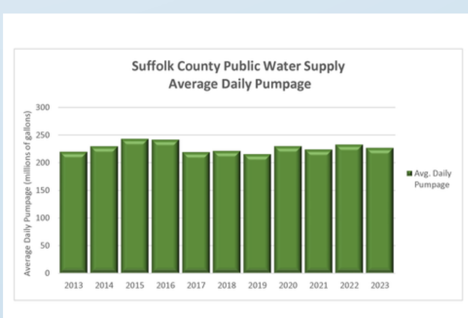


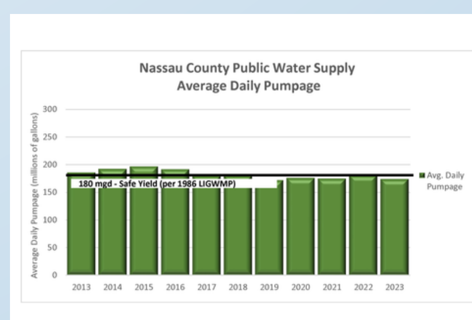


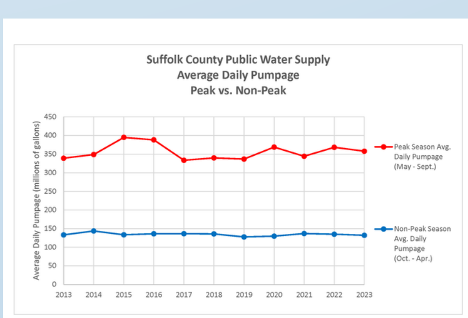


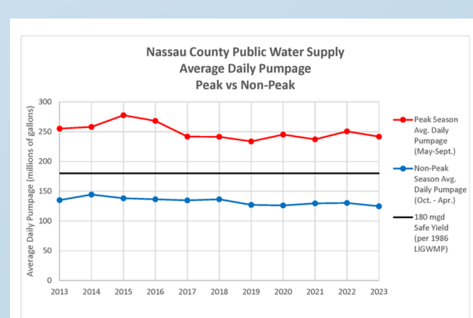












GROUNDWATER MONITORING

GROUNDWATER MONITORING IN SUFFOLK COUNTY

Since the mid-1970s the Suffolk County Department of Health Services (SCDHS) has had the ability to monitor the quality and quantity of its groundwater resources. Essential to this effort is the in-house well drilling and the laboratory analytical capabilities of the SCDHS Public and Environmental Health Laboratory (PEHL). These resources are used effectively to assess impacts from known chemical spills and discharges to the aquifer, and also to trace back groundwater plumes to their suspected points of origin. A monitoring well network to assess long-term changes in our aquifer over time provides invaluable information regarding water quality trends and water table elevation fluctuations. Approximately 850 groundwater samples are collected and analyzed for a variety of contaminants each year. In addition to groundwater studies and monitoring, the in-house laboratory capacities allow the County to monitor public and private drinking water supplies. This ability provides essential public health protection as well as additional water quality information on our aquifer. Suffolk County is also in the process of working with a consultant to develop a Long Term Monitoring Plan to further evaluate the regional effectiveness of recent wastewater initiatives in the County.

MONITORING WELL NETWORK

Since 1976, SCDHS has maintained an in-house well drilling program to conduct groundwater research and reconnaissance and to assess potential impacts to groundwater quality. A network of over 200 permanent monitoring wells is maintained and routinely sampled to evaluate water quality from a variety of land uses across the County. The analytical data gathered by these efforts is utilized to monitor the effectiveness of Sanitary Code requirements and drive additional policies or updates as needed. Expansion of the monitoring well network and replacement of older steel wells is ongoing.

GROUNDWATER INVESTIGATIONS

Groundwater investigations and studies are conducted by SCDHS to identify contamination sources in order to facilitate appropriate cleanups. The efforts involve conducting reviews, hydrogeologic assessments and groundwater investigations at various hazardous waste and other sites that could potentially impact groundwater, surface waters and drinking water supplies. Groundwater monitoring wells are installed and sampled in a variety of investigations, including: illegal dumping sites, Superfund sites, industrial/commercial facilities, composting facilities, and impacts from emerging contaminants. Groundwater flow directions are determined and monitoring wells are installed to delineate contaminant plumes. Since 2016, over 240 groundwater profile wells and monitoring wells were installed by the SCDHS for investigations of PFAS contamination observed in private drinking water wells. These investigations identified PFAS groundwater plumes and potential sources that provided the basis for Superfund designations at numerous sites including: Gabreski Airport, Yaphank Fire Training Center, former BOMARC facility, and East Hampton Airport. Public water was also supplied to affected homeowners in many of these areas. Similar groundwater investigations related to PFAS and/or 1,4-dioxane are underway in Calverton, Manorville, Smithtown and Medford.

PESTICIDE MONITORING IN GROUNDWATER

The NYS Pesticide Reporting Law (1996) mandated a pesticide groundwater monitoring program throughout the state. On Long Island this monitoring is being conducted by the SCDHS. A key part of the program has been the establishment of a county-wide monitoring well network consisting of over 220 wells that are used to monitor the groundwater for a variety of pesticides at sites with varied land uses - including golf courses, greenhouses, row crop farms, vineyards, nurseries and residential turf areas. These data are collected to identify the presence and trends of various pesticides and to assist the NYSDEC with making regulatory decisions about the registration of new or existing pesticides. Special studies are conducted, often in cooperation with pesticide manufacturers, to help determine the leaching potential of new pesticides. For example, methyl isothiocyanate was used by LILCO to treat 16,000 wood utility poles on Long Island to protect them from rotting. SCDHS' investigation determined that the chemical does not appear to impact groundwater. The sample results from the pesticide monitoring network have identified over 100 pesticides in our groundwater since 1997 with agricultural areas being the most heavily impacted. The results provide valuable data for several management and regulatory programs including the NYSDEC Long Island Pesticide Use Management Plan. An annual report on the findings is submitted to the state.

SURFACE WATERS

The SCDHS has maintained a freshwater stream monitoring program since the mid-1960s. Roughly 45 streams are sampled on an annual basis, while twelve of the larger rivers (e.g., Connetquot River, Nissequogue River, Peconic River, etc.) are sampled on a quarterly basis. Additionally, fresh surface water acts as an indicator of the aquifer water quality in the groundwater contributing area of the stream or river. When necessary, surface water samples are also collected as part of work related to groundwater investigations. The extensive data history from fresh surface waters is useful in assessing long-term water quality trends. These efforts also provide a record of the quality of the surface water discharges to receiving bays and estuaries.

USGS COOPERATIVE AGREEMENT

Under a Joint Funding Agreement with the United States Geological Survey (USGS), water table elevations are also monitored that can be utilized in evaluations by County staff, design professionals, and the public. The USGS also can analyze samples for a select set of parameters not currently run by the SCDHS PEHL. These parameters include pharmaceutical and personal care products, pesticide compounds and other contaminants of interest. Recently, the SCDHS is working closely with the USGS on sampling and evaluating potential sources of emerging contaminants including wastewater treatment plants and various land uses such as agriculture.

PUBLIC/PRIVATE WELL WATER

The SCDHS is charged with assuring that public water systems operating in their jurisdiction consistently meet drinking water standards established by the New York State Department of Health (NYSDOH) and the United States Environmental Protection Agency (USEPA). Surveillance sampling of groundwater quality by the County is conducted annually at each of the approximately 1,000 active public water supply wells. The SCDHS collects samples of raw, untreated water directly from the well pumps representative of groundwater from the aquifer. They also collect samples downstream of any treatment systems to ensure that the water going out to consumers from the public water supply is compliant with drinking water standards. In addition, the Office of Water Resources (OWR) samples approximately 800 private wells upon request and as part of comprehensive private well surveys each year. Suffolk County public and private water sampling programs not only help ensure the protection of public health, but also help assess the quality of groundwater in the County.

WASTERWATER MONITORING

Since 2019, SCDHS has participated in a coordinated effort with other agencies to study wastewater as a source of emerging contaminants in Suffolk County. Participating agencies include but are not limited to SCWA, NYSDEC, NYSDOH, United States Geological Survey and Stony Brook University's Center for Clean Water Technology. The group focuses on effluent from STPs, but also from on-site wastewater systems, such as innovative/alternative (I/A) systems and traditional septic systems/cesspools. SCDHS coordinates meetings on a semi-annual basis to share results and guide the ongoing strategy. The objectives are to determine if wastewater is a significant source of emerging contaminants; which site uses are the largest source; and understand the removal efficiencies of different wastewater treatment technologies. The results will be incorporated into the adaptive management strategy of the Subwatersheds Wastewater Plan.

The primary recommendation of the Subwatersheds Wastewater Plan is to institute a long-term (30+ year) program to improve wastewater management in Suffolk County, including a phased transition away from traditional septic systems to the use of innovative/alternative on-site wastewater treatment systems. To monitor the improvements to the environment achieved over time, the County is in the process of developing a Long-Term Monitoring Plan, which will include robust monitoring of groundwater and surface water from a wide range of subwatersheds throughout the County.

GROUNDWATER MONITORING IN NASSAU COUNTY

Since the 1940s, the Nassau County Department of Public Works (NCDPW) has been instrumental in managing a broad network of over 600 monitoring wells strategically located in each of the major aquifers. During the 1980s and 1990s, NCDPW actively sampled and tested these wells, building a comprehensive database of water quality information. Despite the reduction or cessation of this sampling regime in later years due to budgetary and staffing constraints, the network of monitoring wells remains intact. These wells provide vital data for targeted groundwater site investigations or broader regional studies.

The Nassau County Department of Health has been delegated authority by the New York State Department of Health to regulate the infrastructure of public water suppliers that provide drinking water from the County's sole source aquifer; and enforces the requirements of Subpart 5-1 of the New York State Sanitary Code (NYSSC) and Article VI of the Nassau County Public Health Ordinance (NCPHO). The Department and water suppliers work diligently to ensure a safe and reliable drinking water for the County residents.

The County is served by 46 public water suppliers that draw water from approximately 380 public supply wells and then treat, store, and distribute the drinking water to approximately 1.4 million county residents. The Department of Health and water suppliers play an essential role and are steadfast in their commitment to monitoring and maintaining drinking water quality to meet all drinking water standards.

Public water suppliers are required under the NYSSC and the NCPHO to routinely monitor their systems by testing the water from the source (at the well head of the public supply well), following treatment, and within the distribution system for a wide range of bacteriological and chemical parameters. In addition to the monitoring conducted by the public water suppliers, the Department of Health conducts similar surveillance of the public water supply quality and facilities and remains vigilant in the oversight of these invaluable assets.

Each year, approximately 250,000 water quality testing results are reviewed to identify potential contamination threats to ensure compliance with water quality standards. If any sample results are found to exceed a maximum contaminant level or represent a public health threat, the supply well is removed from service or treatment is installed for the continued use of the well.

In response to the evolving understanding of water quality challenges, water suppliers have implemented advanced treatment technologies to ensure that the drinking waters supplied to residents meets or exceeds all regulatory standards. The monitoring efforts detect and assess the presence of emerging contaminants such as 1,4 dioxane and per- and polyfluoroalkyl (PFAS) and promotes proactive measures to safeguard water quality and the public health.

Nassau County's groundwater and drinking water monitoring efforts from all stake holders reflect a commitment to ensuring a safe and sustainable drinking water supply for the County residents.

COLLABORATIONS AND CONTRIBUTIONS

The NCDPW's wells have contributed to a range of projects, including several joint studies with the U.S. Geological Survey (USGS) and private consulting firms, particularly in the context of site remediation efforts. These monitoring wells have become crucial for anyone needing dependable water quality data. The well data is cataloged in the USGS National Water Information System database, accessible at USGS National Water Information System.

CURRENT INITIATIVES AND PARTNERSHIPS

Currently, the NCDPW is engaged in a three-year collaborative agreement with the USGS, set to continue until autumn 2024. This partnership ensures funding for monitoring various hydrological aspects. It includes maintaining 15 continuous-recording observation wells, 50 monthly observation wells, 68 annual-synoptic observation wells, and 15 water supply wells. Additionally, it supports six real-time continuous-recording stream flow stations across five streams, 12 biannual streamflow stations, and saltwater intrusion monitoring, including the early detection of saltwater intrusion at up to five outpost wells. The data from these stations is essential for analyzing long-term aquifer conditions, generating water level and depth maps, and aiding in the creation of groundwater models. Further details on this cooperative effort and the sustainability of Long Island's aquifer system can be found at USGS Groundwater Sustainability.

Furthermore, Nassau County's monitoring well network has been crucial in supporting the New York State Department of Environmental Conservation (NYSDEC) in investigating groundwater issues, such as tracing the refrigerant Freon 22 in Port Washington and Glen Cove. These wells have also been vital in monitoring groundwater at various U.S. Environmental Protection Agency Superfund sites, including the New Cassel Industrial Area and the Old Roosevelt Field. The data has also been instrumental in developing a groundwater model for Farmingdale village and aiding remediation in the Bethpage area.

Overall, Nassau County's monitoring network has proven indispensable to water suppliers, regulatory bodies, and private consultants needing groundwater data for their work.

USGS GROUNDWATER MONITORING IN LONG ISLAND

The USGS has been running a groundwater monitoring network on Long Island since the early 20th century. This network has been pivotal in providing data on water levels, crucial for creating groundwater elevation maps for Long Island's primary aquifer. It also offers essential insights into water quality, including the monitoring of present and past pesticides, their byproducts, and nitrogen and phosphorus levels.

THE WATER BALANCE: EVALUATING LONG ISLAND'S EFFORTS IN SUSTAINABLE USAGE

EVALUATING LONG ISLAND'S EFFORTS IN SUSTAINABLE USAGE (CONTINUED)

INTRODUCTION

In the densely populated and environmentally vulnerable landscape of Long Island, water conservation is not just a necessity but a responsibility for everyone. A New York State Department of Environmental Conservation (NYSDEC) analysis of water supplier annual pumpage data has revealed concerns about the sustainability of our groundwater resources. Water demand on Long Island during warmer months (May – September) is approximately double that of the colder months and safe yield estimates (from the 1986 Long Island Groundwater Management plan) have been exceeded at times. A major contributor to this water demand is lawn irrigation. It is pivotal to realize the potential repercussions of this significant pumpage. During times of peak demand, storage tanks risk severe depletion. This not only jeopardizes regular water pressure for consumers but, in emergencies, can hamper fire protection capabilities. Analogous to a highway congestion, peak water usage sees "too many cars" at once, creating a strain on the system.

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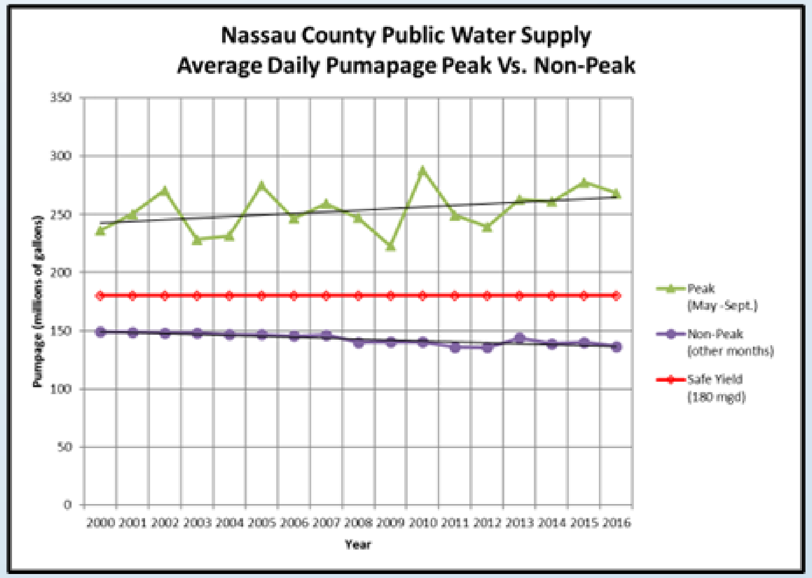
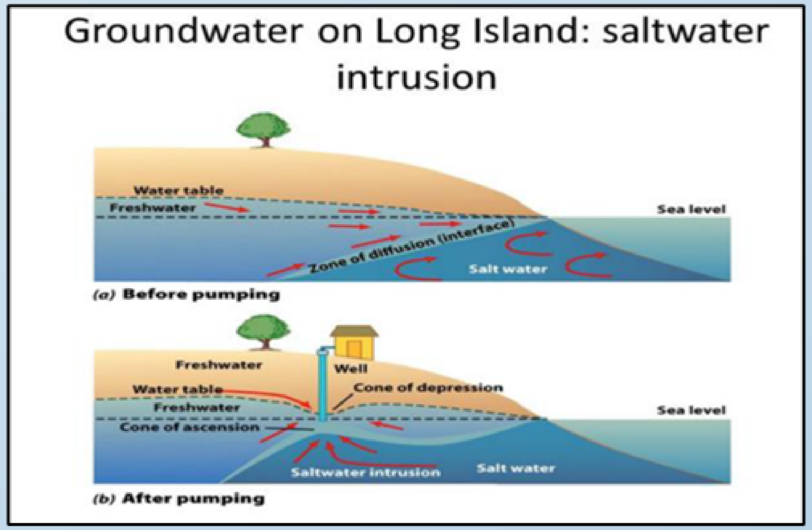


New York State Department of Environmental Conservation. (2017). Presentation slide 66 from the 2017 Long Island Water Conference Drinking Water Symposium, Bethpage, NY.



New York State Department of Environmental Conservation. (2022). Presentation slide 44 from the 2022 Long Island Water Conference Drinking Water Symposium, Bethpage, NY.

As we grapple with challenges such as saltwater intrusion and upconing, contaminant plume migration, and other issues, there is an undeniable need to address peak season (May – September) water demand. This raised awareness was met with action. In accordance with New York State Codes, Rules, and Regulations Title 6 Chapter V Part 601.10, the NYSDEC mandated in 2017 that all Long Island water suppliers submit a Water Conservation Plan and Part 601.5 requires annual reporting of water conservation measures undertaken during that reporting period. The water conservation plans covered all areas of water conservation but focused on a peak season pumpage reduction goal of 15%. The baseline for these conservation measures was the pumpage data from 2012. Many factors are at play in influencing pumpage rates and it's essential to approach such analyses with caution. Since outdoor water usage is dependent on both temperature and precipitation, this report compares the drought years of 2015 and 2022, in trying to assess conservation progress. These years were chosen for comparison because less outdoor water usage is likely to occur during years of increased rainfall, thus possibly skewing results as compared to drier years. Diving into the nuances, conservation is a complex puzzle. Changes in population, service connections, precipitation rates and patterns, ground temperatures, agriculture, and even unexpected factors like a global pandemic, can significantly alter water usage. For instance, during the COVID pandemic, unexpected spikes in pumpage were witnessed, likely due to residents spending more time at their residences. Such anomalies exemplify why comparisons between specific years should be approached with caution and comprehensive understanding.

Water Conservation plans and the conservation measures and implementation schedules included in them, varied by water supplier. Leak detection surveys, high use-customer audits, smart irrigation controller initiatives, water use restrictions, separate customer metering for irrigation systems, and installing service meters that allow customers to access their water consumption data are some of the techniques water suppliers implemented across their systems. Water suppliers can better effectuate water conservation through a teamwork approach, with the cooperation of all stakeholders. Positive effects could be realized if planning commissions and building departments make conservation a priority when approving plans, local governments engage in all levels of public outreach and education and residents reduce their water consumption.

DATA USED FOR THIS ANALYSIS

The analysis below encompasses all water suppliers, and the datasets used includes their respective pumpage change percentages, and population change percentages for the years 2015 and 2022. Precipitation data for these years was also included. To gauge the potential effects of conservation efforts, the following analyses were performed:

1. Examination of the variations in drought intensity and timing, precipitation and pumpage between 2015 and 2022.

This analysis examined how hydrologic conditions varied across Nassau and Suffolk Counties during the two significant droughts that occurred in 2015 and 2022, and determined what impacts each drought had on water usage during peak-season demand for both years. The analysis was performed by analyzing drought intensity and timing for both years using two regional soil dryness indexes – the Palmer Drought Severity Index (PDSI) and the Palmer Z Index (PZI) – that estimate seasonal drought (PDSI) and short-term drought on a monthly scale (PZI), as well as reviewing daily and monthly precipitation data from two key locations – John F. Kennedy International Airport (JFK Airport) in Southwestern Queens County, NY and Islip-Long Island MacArthur Airport (MacArthur Airport) in central Suffolk County, NY.

EVALUATING LONG ISLAND'S EFFORTS IN SUSTAINABLE USAGE (CONTINUED)

2. Analyze the relationship between pumpage and population change.

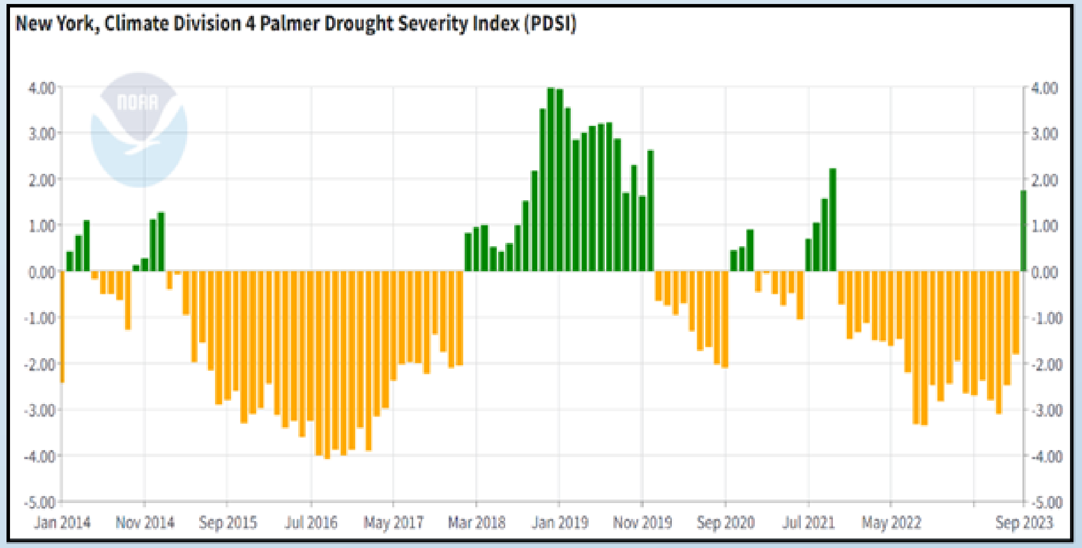
This analysis compared the percentage change in pumpage from 2015 to 2022 and the corresponding percent change in the population served during the same period. This examination aims to shed light on whether population growth or decline had a direct impact on water use.

3. Determine the number of suppliers with a reduction in pumpage in 2022.

To gain insight into the possible influence of water-conservation efforts on usage, this analysis also assessed the number of water suppliers that have managed to reduce their water pumpage in the most recent drought year, 2022, as compared to the 2015 drought.

COMPARISON OF 2015 AND 2022 DROUGHTS

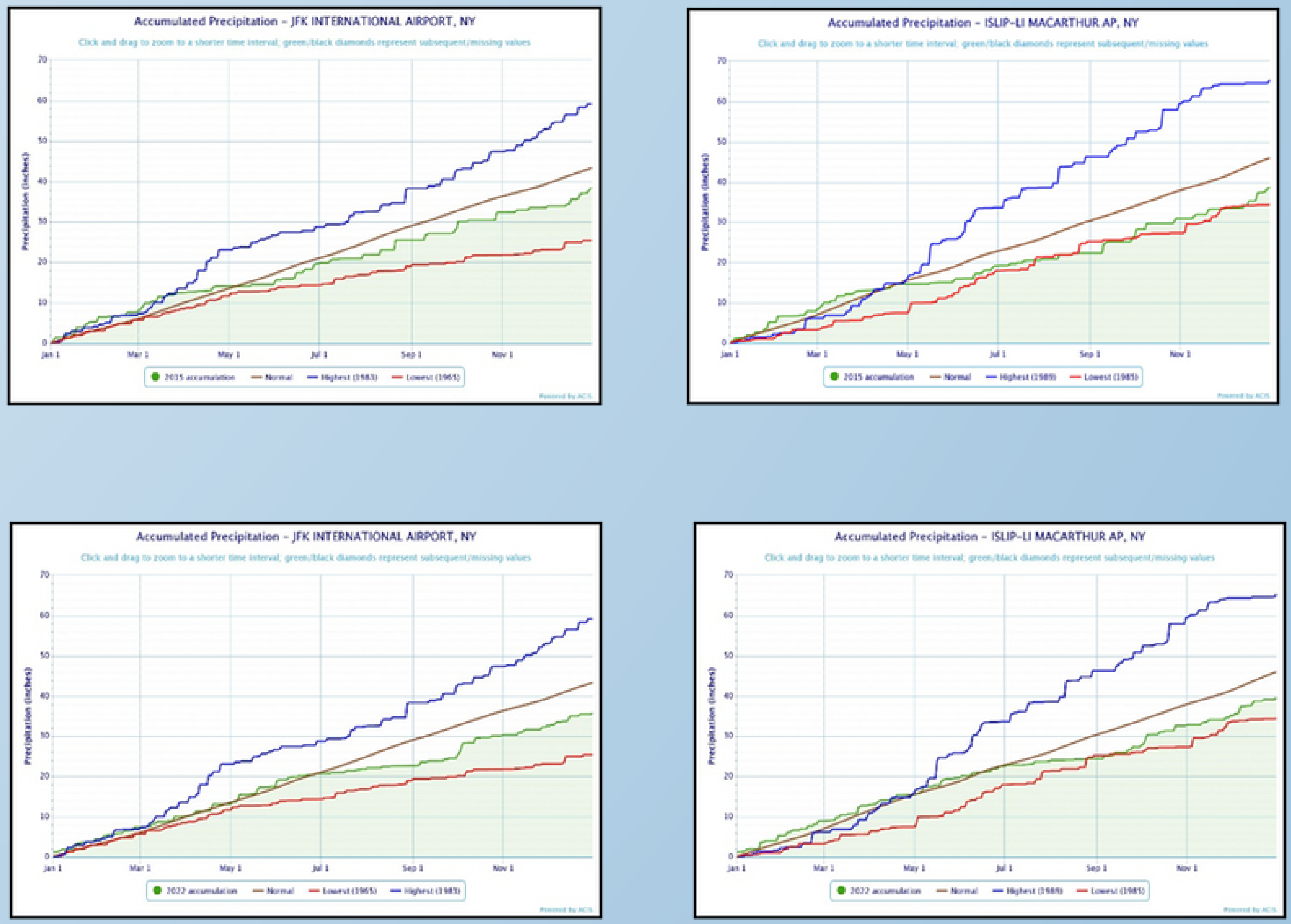
The figure below shows the PDSI for approximately the past 10 years (January 1, 2014 to September 20, 2023) for the coastal region of New York State (Climate Division 4). This index is commonly used for monitoring drought and uses precipitation and temperature data to estimate moisture supply based on a supply-and-demand model of soil moisture. A PDSI around zero is normal; with positive numbers indicating moist conditions and negative numbers indicating dry conditions.



Source: NOAA National Centers for Environmental Information, Climate at a Glance: Divisional Time Series, https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/divisional/time-series

Since 2014, Long Island has been in 2 periods of unusually moist conditions or greater (PDSI +2.0 or above) in 2018-19 and 2021, and 3 periods of moderate drought or greater (PDSI -2.0 or below) in 2015-17, 2020, and 2022-23). The analysis presented below compares the two largest droughts that occurred during this 10-year period. The first drought began in February 2015 and ended in January 2018 (36 months) and reached PDSI "Extreme Drought" levels (-4.0 or less). The second drought began in November 2021 and ended in August 2023 and was less intense than the 2015 to 2018 drought reaching PDSI "Severe Drought" levels (-3.0 to -3.9).

The figure below shows accumulated precipitation graphs at JFK Airport located in southwestern Queens County, NY (left) and MacArthur Airport located in central Suffolk County, NY (right) for calendar years 2015 (top) and 2022 (bottom). The years of 2015 and 2022 were used for comparison because these were the years where water-use demand was the greatest, even though these years may not have reached the greatest PDSI level. These graphs show the accumulated precipitation (green) in relation to normal conditions (brown) and the historical years with the highest accumulated precipitation (blue) and lowest accumulated precipitation (red). The JFK Airport station has 75 years of precipitation record and the MacArthur Airport station 60 years of record.



Source: Northeast Regional Climate Center, CLIMOD 2 Data Access, http:/climod2.nrcc.cornell.edu

EVALUATING LONG ISLAND'S EFFORTS IN SUSTAINABLE USAGE (CONTINUED)

During the 2015 drought, precipitation at both stations was generally at or above normal from the beginning of the calendar year until late April or early May when a pronounced precipitation deficit began. The deficit intensified throughout the spring and summer months at both stations, reaching a maximum of about 9 inches (in.) at the MacArthur Airport station by September and 7 in. at the JFK Airport station by December. Accumulated precipitation remained well-below normal at both stations for the remainder of the year.

In contrast, during the 2022 drought accumulated precipitation at both stations was generally at or above normal from the beginning of the calendar year until July when a pronounced precipitation deficit began. This 2022 deficit began more than 2 months later than it did during the 2015 drought. The deficit intensified at a similar pace at both stations throughout the remainder of the summer months, reaching record low accumulated-precipitation levels by September with a deficit of almost 8 in. at the JFK Airport station (about 1-in. greater of a deficit than in 2015) and 6.5 in. at the MacArthur Airport station (about 2.5-in. less of a deficit than in 2015). Similar to 2015, accumulated precipitation remained well-below normal at both stations for the remainder of the year.

The 2015 drought affected central and eastern areas of Long Island more intensely with a large precipitation deficit occurring concurrently with the summer growing season, thus peak water-use season, while in western Long Island the accumulated deficit was more gradual and did not peak until the growing season had ended. During the 2022 drought, the precipitation deficit at both stations began half-way through the growing season and effected western area of Long Island more intensely. Precipitation deficits were 1-in. greater in 2022 than in 2015 at the JFK Airport station, and about 2.5-in. less in 2022 than in 2015 at the MacArthur Airport station.

VARIATIONS IN PRECIPITATION PATTERNS

The figure below shows a comparison between precipitation amounts and frequency for 2015 (green) and 2022 (blue) at both MacArthur Airport and JFK Airport. The figure includes monthly precipitation totals, days with precipitation of a trace or greater, maximum precipitation on a single day for the month (day of the month shown in parentheses), and a running total of monthly precipitation. This data is being presented to illustrate how patterns of rainfall can be distributed differently throughout the month and can potentially affect overall monthly water use.

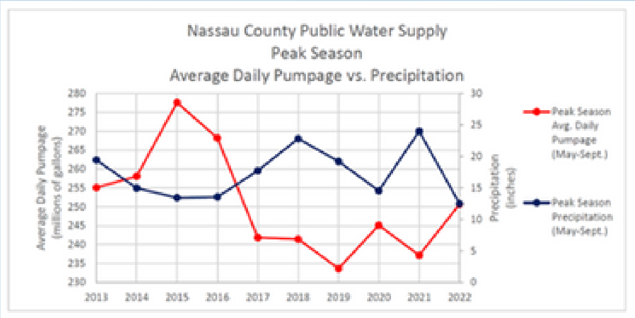
	Calendar Year 2015								Calendar Year 2022							
	Islip				JFK				Islip				JFK			
Month	Monthly Total Precip	Days with Trace or More Precip	Maximum Daily Precip (Day)	Running Precip Total	Monthly Total Precip	Days with Trace or More Precip	Maximum Daily Precip (Day)	Running Precip Total	Monthly Total Precip	Days with Trace or More Precip	Maximum Daily Precip (Day)	Running Precip Total	Monthly Total Precip	Days with Trace or More Precip	Maximum Daily Precip (Day)	Running Precip Total
Jan	5.25	13	1.44 (27)	5.25	5.31	15	1.62 (18)	5.31	5.37	15	1.48 (17)	5.37	4.37	13	1.22 (01)	4.37
Feb	2.69	14	1.41 (02)	7.94	2.35	14	1.18 (02)	7.66	3.61	12	0.81 (25)	8.98	3.08	10	0.78 (25)	7.45
Mar	5.07	21	1.12 (14)	13.01	4.88	20	1.11 (14)	12.54	3.99	15	1.63 (24)	12.97	2.62	17	0.93 (24)	10.07
April	1.66	13	0.61 (20)	14.67	1.61	13	0.87 (20)	14.15	2.49	18	0.73 (18)	15.46	3.10	15	0.96 (18)	13.17
May	0.42	9	0.26 (16)	15.09	0.46	11	0.41 (16)	14.61	4.24	18	1.00 (07)	19.70	4.34	17	1.04 (19)	17.51
June	4.05	16	1.17 (15)	19.14	4.99	20	1.09 (15)	19.60	2.81	15	0.78 (22)	22.51	3.25	12	1.36 (01)	20.76
July	1.74	13	0.48 (18)	20.88	2.31	13	0.97 (30)	21.91	1.27	13	0.57 (21)	23.78	1.10	12	0.38 (18)	21.86
Aug	1.48	8	1.05 (11)	22.36	3.63	8	2.48 (21)	25.54	0.67	8	0.29 (01)	24.45	0.85	12	0.35 (11)	22.71
Sep	4.03	6	2.30 (10)	26.39	2.58	8	1.18 (10)	28.12	2.89	12	0.71 (22)	27.34	1.85	13	0.87 (06)	24.56
Oct	4.57	8	1.64 (02)	30.96	4.20	8	1.81 (02)	32.32	5.35	16	1.18 (24)	32.69	5.61	15	1.38 (04)	30.17
Nov	2.31	9	0.73 (20)	33.27	1.20	9	0.58 (19)	33.52	2.50	10	0.54 (27)	35.19	2.43	11	0.56 (27)	32.60
Dec	5.33	18	1.63 (23)	38.60	4.79	20	1.17 (17)	38.31	4.42	11	1.33 (07)	39.61	3.17	11	0.68 (16)	35.77
Total:	38.60				38.31				39.61				38.60			

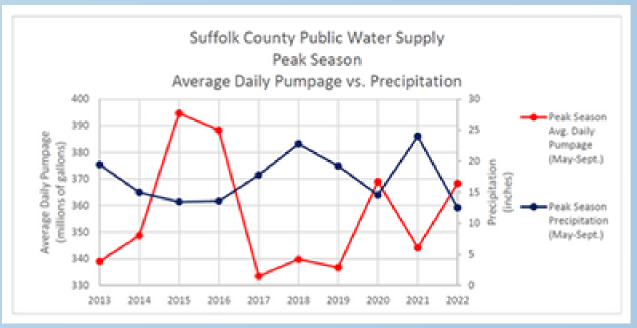
Source: NOAA National Centers for Environmental Information, Climate Data Online Search, Northeast Regional Climate Center, CLIMOD 2 Data Access, http:/climod2.nrcc.cornell.edu

During years of drought, there may be months where precipitation is normal or above normal, and depending on how frequently or intensely this precipitation falls can have a significant impact on monthly water use. For example, MacArthur Airport in September 2015 had 4.03 in. total precipitation spread over a few days (6) during the month, with over half this amount (2.30 in.) falling on a single day (September 10th). In contrast, MacArthur Airport in May 2022 had 4.24 in. total precipitation (similar amount as September 2015) spread over many more days (18) during the month, with a single daily maximum of 1.00 in. on May 7th. This further illustrates how patterns of precipitation in a given month can affect pumpage and consequently complicate attempts to determine the effect of peak-season conservation.

IMPACT OF PRECIPITATION ON WATER PUMPAGE

The figure below shows comparison between the peak season average daily pumpage and peak season precipitation for the period 2013-2022 for Nassau County (left) and Suffolk County, NY (right).



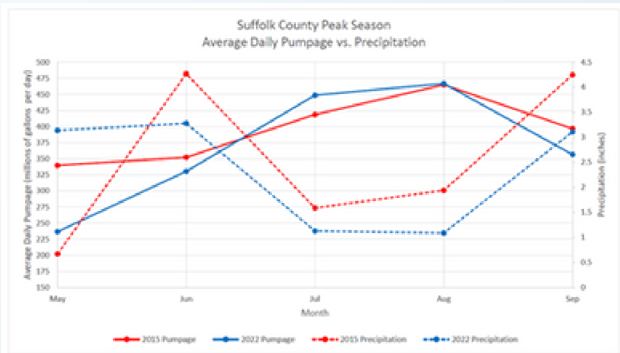


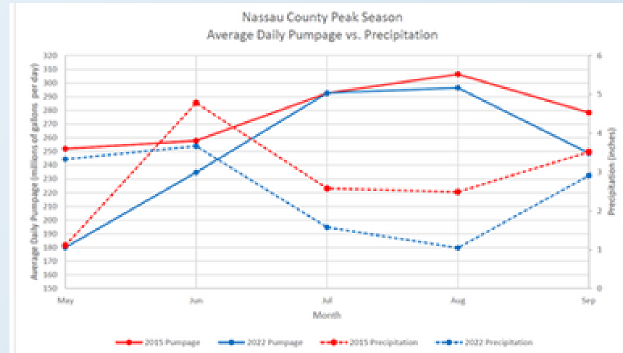
In Nassau County, 2015's peak season, characterized by less than 15 inches of rainfall, coincided with the highest pumpage level in the 2013-2022 period. Conversely, in 2021, when the peak season's rainfall exceeded 20 inches, one of the lowest pumpage levels was recorded in the 2013-2022 period. Similarly, in Suffolk County, 2019 saw the lowest average daily pumpage, correlating with a year when precipitation levels were over 50 inches.

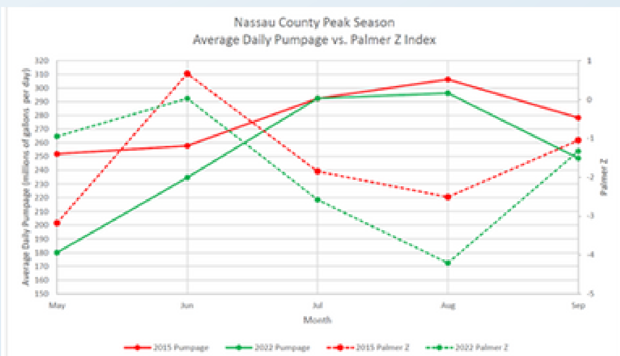
PRECIPITATION AND DROUGHT VERSUS PEAK SEASON WATER USE

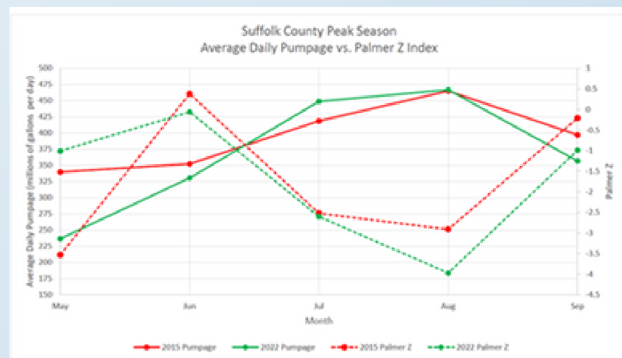
The figures below show: (1) Nassau County's peak season average daily pumpage versus precipitation (top left), (2) Nassau County's average daily pumpage versus the PZI (bottom left), (3) Suffolk County's peak season average daily pumpage versus precipitation (top right), and (4) Suffolk County's peak season average daily pumpage versus the PZI (bottom right). Average daily pumpage is shown as a solid red line for 2015 and a solid blue line for 2022 (top graphs) and as a solid red line for 2015 and a solid green line for 2022 (bottom graphs); precipitation is shown as a dashed red line for 2015 and a dashed blue line for 2022 (top graphs); the PZI is shown as a dashed red line for 2015 and a dashed green line for 2022 (bottom graphs).

EVALUATING LONG ISLAND'S EFFORTS IN SUSTAINABLE USAGE (CONTINUED)









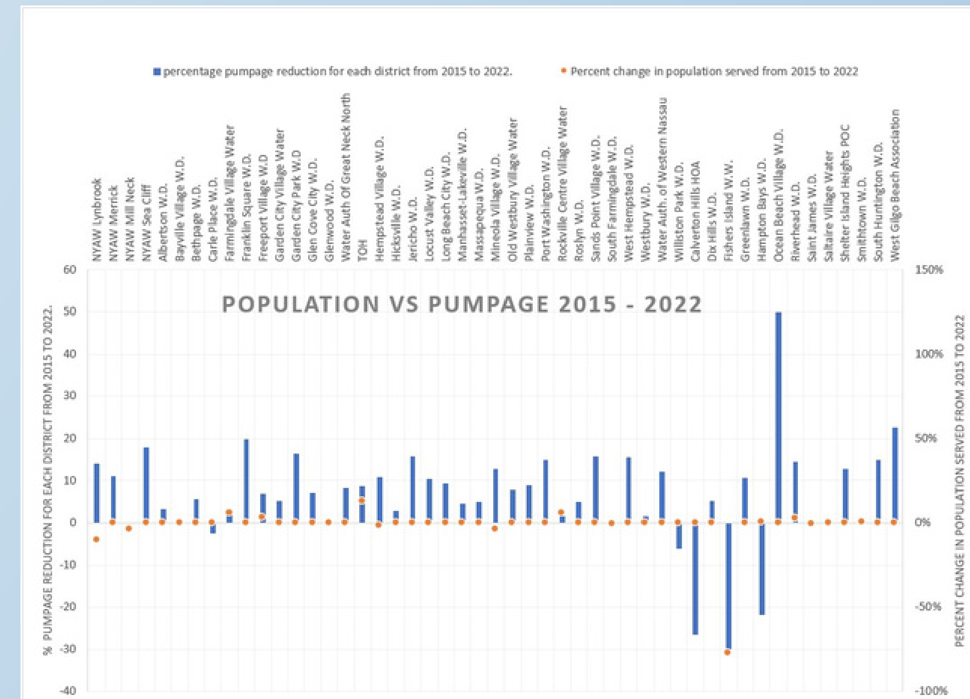
Source: Email Communications NYSDEC

An inverse relationship between average daily peak season pumpage and precipitation in Nassau and Suffolk Counties were observed. As discussed in the section above, the 2015 drought began earlier than the 2022 drought, which is reflected in the pumpage and precipitation in May 2015. However, for both counties total June to September precipitation was less in 2022 than in 2015. The PZI measures short term drought on a monthly scale. A PZI value around zero is normal; with positive numbers indicating moist conditions and negative numbers indicating dry conditions.

A similar inverse relationship exists between the PZI and pumpage during the peak season. In 2022, in both Nassau and Suffolk Counties, the highest pumpage was observed in August of both drought years when the PZI was at or near its lowest levels. However, in 2015 the lowest PZI was observed in May, with the highest pumpage in August. Overall, this data demonstrates that precipitation and drought conditions play a large role in pumpage during the peak season, but there are factors like the timing of drought conditions, how frequently precipitation falls, and other factors that can skew the data.

RELATIONSHIP BETWEEN PUMPAGE AND POPULATION CHANGE:

This final section reviews the relationship between pumpage and population changes, to provide some insight on how changing population might influence overall water usage. The figure and table below shows the percent changes in pumpage and population of the various water suppliers for the years 2015 and 2022. The blue bars in the figure indicate the percent pumpage reduction from 2015 to 2022 for each water district listed at the top of the graphs. The orange dots indicate the percent change in population served for each water supplier over the same time period. For the graphs and table below a reduction in pumpage is indicated by a positive percentage value, while an increase in pumpage is indicated by a negative value. The population served is estimated by each water supplier.



Water District	Percentage change in pumpage from 2015 to 2022*	Percent change in population served from 2015 to 2022
NYAW Lynbrook	14%	-10%
NYAW Merrick	11%	0%
NYAW Mill Neck	N/A**	-4%
NYAW Sea Cliff	18%	0%
Albertson W.D.	3%	0%
Bayville Village W.D.	0%	0%
Bethpage W.D.	6%	0%
Carle Place W.D.	-2%	0%
Farmingdale Village Water	2%	6%
Franklin Square W.D.	20%	0%
Freeport Village W.D	7%	3%

EVALUATING LONG ISLAND'S EFFORTS IN SUSTAINABLE USAGE (CONTINUED)

Water District	Percentage change in pumpage from 2015 to 2022*	Percent change in population served from 2015 to 2022
Garden City Village Water	5%	0%
Garden City Park W.D	16%	0%
Glen Cove City W.D.	7%	0%
Water Auth of Great Neck North	8%	0%
Town of Hempstead	9%	13%
Hempstead Village W.D.	11%	-2%
Hicksville W.D.	3%	0%
Jericho W.D.	16%	0%
Locust Valley W.D.	10%	0%
Long Beach City W.D.	9%	0%
Manhasset-Lakeville W.D.	5%	0%
Massapequa W.D.	5%	0%
Mineola Village W.D.	13%	-4%
Old Westbury Village Water	8%	0%
Oyster Bay W.D.	10%	N/A**
Plainview W.D.	9%	0%
Port Washington W.D.	15%	0%
Rockville Centre Village Water	2%	6%
Roslyn W.D.	5%	0%
Sands Point Village W.D.	16%	0%
South Farmingdale W.D.	0%	0%
West Hempstead W.D.	16%	0%
Westbury W.D.	2%	0%
Water Auth. of Western Nassau	12%	0%
Williston Park W.D.	-6%	0%
Calverton Hills HOA	-27%	0%
Dix Hills W.D.	5%	0%
Fishers Island W.W.	-30%	-77%
Greenlawn W.D.	11%	0%
Hampton Bays W.D.	-22%	1%
Ocean Beach Village W.D.	50%	0%
Riverhead W.D.	14%	3%
Saltaire Village Water	0%	0%
Seaview Association	N/A**	N/A**
Shelter Island Heights POC	13%	0%
South Huntington W.D.	15%	0%
Suffolk County Water Authority	6%	N/A**
West Gilgo Beach Association	23%	0%
West Neck W.D.	3%	N/A**

*Positive values indicate a decrease in pumpage and negative values indicate an increase in pumpage.
**Indicates data not available
Source: Email Communications NYSDEC

Between 2015 and 2022, Long Island water suppliers demonstrated varying trends in water pumpage. Analysis of 54 districts indicates that 40 districts reported reduced pumpage in 2022 as compared to 2015. Notably, Ocean Beach Village W.D. showed a 50% decrease, most likely due to distribution system improvements, new electronics transmitter water meters that detect leaks and are more accurate, and a population decrease presumably due to the pandemic, while Franklin Square W.D. reported a 20% reduction. Conversely, Hampton Bays W.D. and Willison Park W.D. experienced pumpage increases of 22% and 6%, respectively. Hampton Bays W.D. experienced increased demand due to many residents working from home during the pandemic and many seasonal homes transitioning to year-round residences. Among districts reporting reduced pumpage, 10 reported reductions exceeding 15%. Lynbrook saw a 10% population decrease from 2015 to 2022, alongside a 14% pumpage reduction. Town of Hempstead observed a 13% population increase and a 9% pumpage reduction. Fishers Island W.W. experienced a 77% population decrease and a 30% pumpage increase. The Fishers Island W.W. population decrease is due to a different population estimating method with respect to the large transient component of their population. The Fishers Island W.W. pumpage increase is likely due to improvements in water metering. The population served is estimated by each water supplier.

CONCLUSION

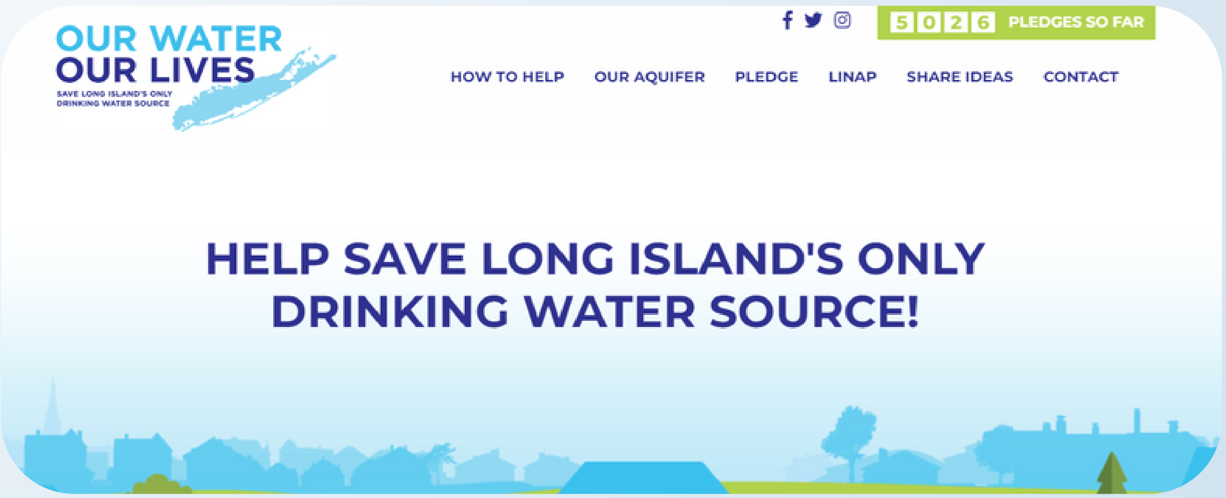
The analysis of water pumpage data for the years 2015 and 2022 provides valuable insights into the state of water conservation efforts within various water supply systems on Long Island. Recognizing that peak season water conservation is a complex issue influenced by multiple factors such as precipitation, infrastructure improvements, and socio-economic considerations, it is important to consider these aspects in evaluating the success of conservation initiatives. In the context of water supply management, an inverse relationship between pumpage and precipitation levels is observed during peak pumping seasons. This relationship underscores the significant influence of weather and precipitation on irrigation and outdoor water usage, complicating the evaluation of peak season water conservation efforts. The analysis of population served vs. pumpage in 2022 versus 2015 indicates that there was not a significant change in population between the two years and therefore the change in water use was not largely influenced by changes in the population. However, the years analyzed were a small subset and may not be reflective of larger gradual changes in population over time. The study shows that out of 54 water suppliers, 40 reported reduced pumpage in 2022 compared to 2015, with several suppliers surpassing a 15% reduction. On the other hand, some water suppliers have seen an increase in pumpage, indicating the need to understand the underlying causes and to potentially focus conservation efforts. Overall while a decrease in peak season water use was observed in 2022 relative to 2015, which can potentially be partially attributed to water conservation efforts, due to the complexities described above, precise quantification of the impact of water conservation efforts on peak season water usage cannot be determined at this time.

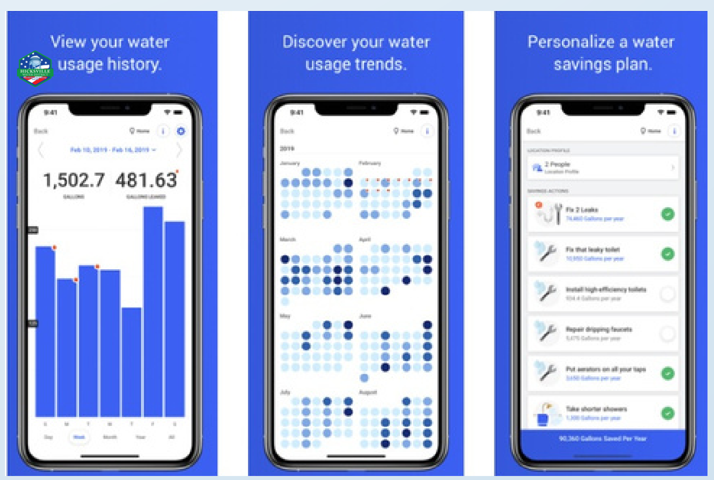
ADDITIONAL REMARKS

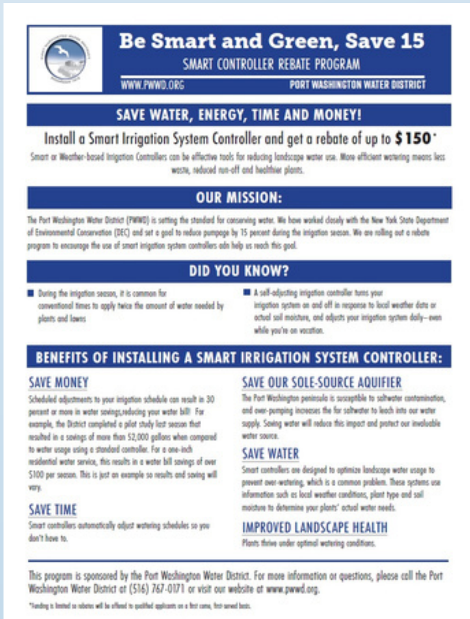
Although exact water conservation induced percent reductions cannot be determined, one thing is clear - Water Conservation initiatives on Long Island should continue. Conservation efforts to reduce peak pumpage are multifaceted and can involve education, outreach and water use restrictions through legislation or tools like smart irrigation controllers, rain sensors, and pressure regulators, which help adjust water usage automatically in response to weather conditions. Tiered billing systems, which charge higher rates for consumption above a certain use threshold, can also be an effective measure towards conservation. Collaboration among water suppliers is vital for sharing successful strategies and tools. Ensuring data accuracy through regular validation and auditing is also key in making informed decisions and avoiding errors that could lead to incorrect conclusions.

Infrastructure improvements are vital to reduce water loss due to leaks and inefficiencies, contributing to a reliable water supply and decreased pumpage. Long-term planning and continuous monitoring, particularly of local climate patterns and drought conditions, are crucial for water suppliers to adapt to changing water availability. This commitment to sustainability, coupled with education and awareness programs like the Our Water Our Lives campaign, will play a crucial role in ensuring the viability of water resources for future generations.

EVERY DROP COUNTS: SAVE WATER FOR A SUSTAINABLE FUTURE







Riverhead STP (photo illustration by H2M Architects & Engineers)

WATER REUSE ROADMAP PREPARED FOR LONG ISLAND

Seatuck Environmental Association, with funding from the Greentree Foundation and technical support by Cameron Engineering, has prepared a Long Island Water Reuse Road Map for Long Island, intended to guide key decision makers in implementing water recycling projects. Water Reuse or recycling involves using highly treated wastewater from a wastewater treatment plant (also known as a sewage treatment plant) for a second purpose rather than discharging it into the ground or a waterbody. Approximately 2.2 billion gallons or 8% of the wastewater generated on a daily basis is reused in the United States, primarily for irrigating agricultural crops and golf courses.

The Road Map identified sources of wastewater (sewage treatment plants) and targets for that wastewater such as golf courses and farms within a two mile radius of the plant. Based on estimated cost, the amount of nitrogen reduced and water saved, and a few other factors, a priority matrix and list was established.

Water Reuse has great potential for Long Island as is illustrated by the existing project involving the Riverhead Sewage Treatment Plant (STP) and Indian Island County Golf Course. This project involves piping wastewater during the warmer months from the STP to irrigate the adjacent golf course, thereby preventing it from being discharged into the Peconic River/Estuary. Engineering consultants for the project estimate the project will prevent 1.2 tons of nitrogen from being discharged into surface waters and keep an estimated 63 million gallons of water in the ground on an annual basis. This project illustrates the dual benefits of water reuse - water quality and quantity - the two sides of the water management coin. The Road Map estimates that if all the Tier 1 projects in the Road Map were implemented approximately 15.5 tons of nitrogen would no longer discharge into ground- or surface waters and nearly 600 million gallons of water would be kept in the ground, on an annual basis.

Public funding is essential to the successful implementation of the Water Reuse Roadmap. In the future Seatuck and partners will strive to secure the public funding necessary to implement the highest priority projects detailed in the Water Reuse Roadmap.

For more information visit the Seatuck Environmental Association's website at: https://seatuck.org/water-reuse/

UCMR 5

REVIEW OF THE FIFTH UNREGULATED CONTAMINANT MONITORING RULE: INSIGHTS & IMPLICATIONS

The 1996 Amendments to the Safe Drinking Water Act required the U.S. Environmental Protection Agency (EPA) to establish criteria for a monitoring program for unregulated contaminants and to publish a list of contaminants to be monitored by public water supply systems. The data generated by the UCMR program has been used to evaluate and prioritize contaminants on the Drinking Water Contaminant Candidate List, a list of contaminants EPA is considering for possible new drinking water standards.

The Safe Drinking Water Act requires EPA to limit monitoring requirements to 30 contaminants in any 5-year cycle. Since many of the contaminants still have analytical methods under development, the success of the methods development efforts will dictate which contaminants will be monitored in the 5-year cycle. UCMR 1 through 4 have been successfully completed.

The fifth Unregulated Contaminant Monitoring Rule (UCMR 5) was published on December 27, 2021 by the EPA. UCMR 5 requires sample collection for 30 chemical contaminants between 2023 and 2025 using analytical methods developed by EPA and consensus organizations. This action provides EPA and other interested parties with scientifically valid data on the national occurrence of these contaminants in drinking water. UCMR 5 will provide new data that will improve EPA's understanding of the frequency that 29 PFAS and lithium are found in the nation's drinking water systems, and at what levels. The monitoring data on PFAS and lithium will help EPA make determinations about future potential regulations and other actions to protect public health under the SDWA. The data will also ensure science-based decision-making, help EPA better understand whether these contaminants in drinking water impact public water systems. It is important to note that treatment systems installed to address specific contaminants like PFOS and PFOA are anticipated to also be effective in addressing other PFAS compounds.

UCMR 5
(CONTINUED)

Recently the EPA released initial UCMR5 2023 testing data that reflects monitoring for 29 different PFAS compounds and lithium at more than 2,000 systems:

- The most frequently observed analyte was lithium. It was detected in 30.5% of systems and above the EPA's health reference level in 22.1% of systems.
- Perfluorooctanesulfonic acid (PFOS) was detected in 6.0% of samples and above the provisional health advisory level in 8.5% of systems.
- Perfluorooctanoic acid (PFOA) was detected in 5.7% of samples and present above the provisional health advisory level in 7.8% of systems.
- Other frequently detected PFAS include perfluoropentanoic acid (PFPeA) perfluorohexanoic acid (PFHxA), perfluorobutanesulfonic acid (PFBS), perfluorobutanoic acid (PFBA), and perfluorohexanesulfonic acid (PFHxS) at 7.6%, 6.8%, 6.8% 6.7% and 4.7% of samples, respectively.

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