2022 BROOKHAVEN NATIONAL LABORATORY Water Quality Consumer Confidence Report

BNL publishes an annual water quality report to provide on-site drinking water consumers with an overview of the Lab's water quality during the previous calendar year. The purpose of this report is to inform you about where your water comes from; what analytical tests are conducted; what they reveal; how the results compare to New York State standards; and to educate you about the importance of preventative measures. Educated consumers are more likely to help protect their drinking water sources.

BNL's drinking water supply and distribution system were in full compliance with all county, state, and federal regulations regarding drinking water quality, monitoring, operations, and reporting in 2021.

BNL's Energy & Utilities (EU) Division is committed to providing over 3,000 employees, facility users, contractors, and guests annually with safe drinking water.

BNL's drinking water is regularly tested using an independent laboratory approved by the New York State Department of Health (NYSDOH). Analytical data are reviewed by the Lab's Environmental Protection Division (EPD) to ensure that testing results comply with all applicable regulatory standards. In addition, EU and EPD work with BNL's Groundwater Protection Group to make sure our potable water supply is not adversely impacted by possible groundwater contamination or remediation operations.

Water Treatment Staff- Supervisor W. Jensen and operators Front L – Front R- W. Jensen, N. Krupski, N. Risi, J. Stanisci, S. Kelvas and R. Kelley.

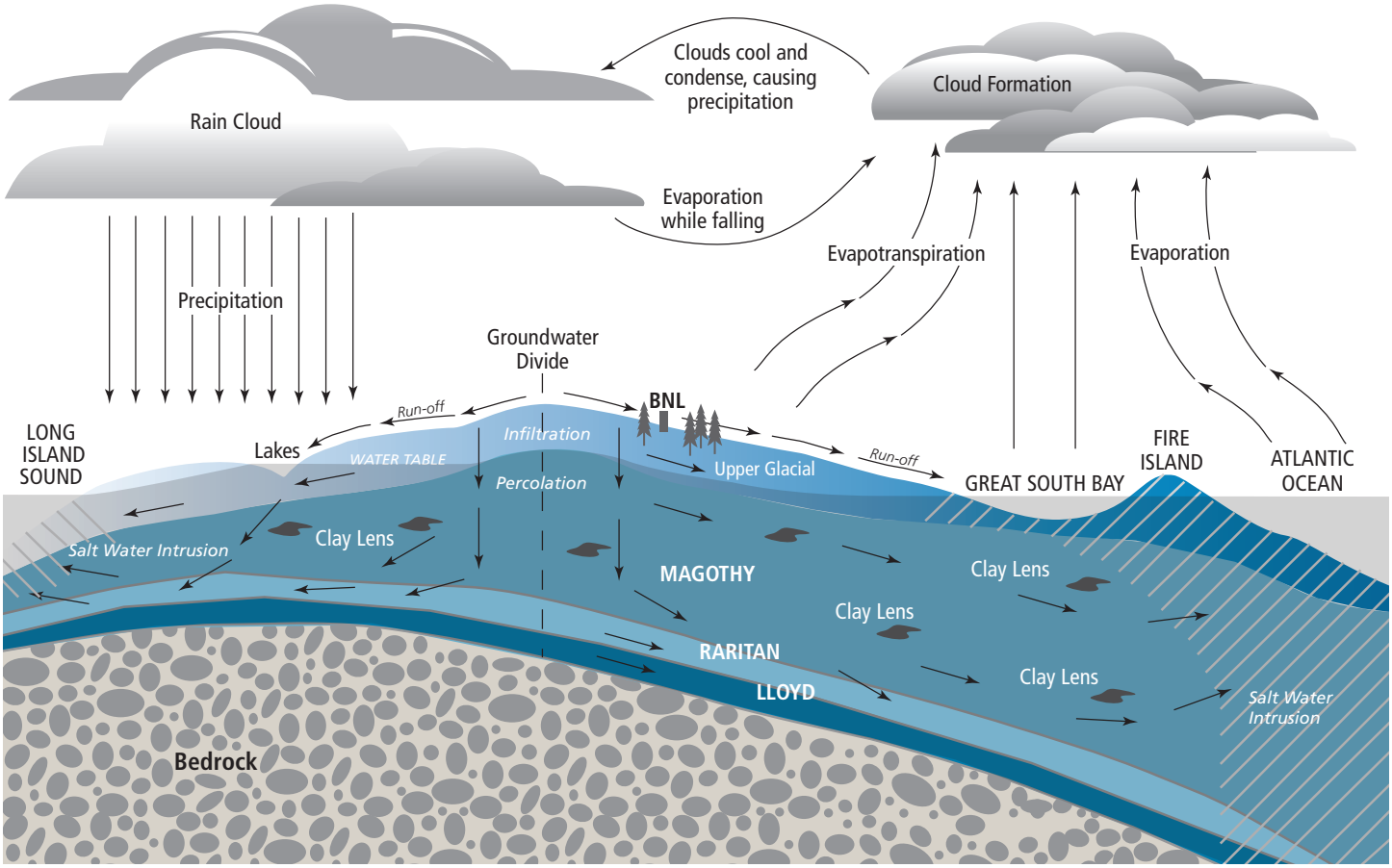
Where Does Our Water Come From?

The Long Island aquifer system is made up of three primary formations. From the surface to approximately 150 feet below is the Upper Glacial aquifer, from 150 to 1,000 feet below is the Magothy aquifer, and from 1,000 to about 1,600 feet below is the Lloyd aquifer. As designated by the U.S. Environmental Protection Agency (EPA), Long Island's aquifer system is one of 78 "sole source" aquifers in the nation recognized under the aquifer protection program authorized by the U.S. Safe Drinking Water Act (SDWA).

The Lab's four in-service drinking-water wells draw up to 1,000 gallons per minute, or about 1.34 million gallons of water per day from the Upper Glacial aquifer to supply drinking water, process cooling water, and fire protection. The water from Well 7 is processed at BNL's on-site Water Treatment Plant. Well 10 and Well 11 are treated with a granular activated carbon (GAC) filter then treated for pH adjustment and disinfection prior to entering the distribution system. Last year, BNL pumped approximately 340 million gallons of water.

For questions about this report, or to speak with someone regarding your drinking water, please contact:

- **Christopher Bruno, P.E.**
  Manager
  Energy & Utilities Division
  (631) 344-8262
- **Jason Remien**
  Manager
  Environmental Protection Division
  (631) 344-3477
- **Suffolk County Department of Health Services**
  (631) 852-5810



Long Island Aquifer System

What's in Our Drinking Water?

Although rivers, lakes, streams, ponds, and reservoirs are all sources of tap and bottled drinking water, most Long Island residents get their water from groundwater wells that are drilled into the underlying aquifer system. As water travels over land surfaces or through the ground, it dissolves naturally occurring minerals and radioactive material. Water can also pick up substances resulting from the presence of animals or from human activities. Contaminants that may be present in source water include: microbiological contaminants; inorganic contaminants; pesticides and herbicides; organic chemical contaminants; and radioactive contaminants.

In order to ensure that tap water is safe to drink, New York State and the EPA prescribe regulations which limit the amount of certain contaminants in water provided by public water systems. In addition, regulations from NYSDOH and the Food and Drug Administration establish limits for contaminants in bottled water, which must provide the same protection for public health.

Source water is treated to remove substances or reduce their concentration before the water is fit for human consumption. Regardless, drinking water, including bottled water, may reasonably be expected to contain at least small amounts of contaminants; however, that does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling EPA's Safe Drinking Water Hotline at (800) 426-4791.

Some people may be more vulnerable to disease-causing microorganisms or pathogens in drinking water than others. Immunocompromised persons such as those with cancer undergoing chemotherapy, who have undergone organ transplants, with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice from their health care provider about their drinking water.

Guidelines from EPA and the Centers for Disease Control on appropriate means to reduce the risk of illness from Cryptosporidium, Giardia, and other microbial pathogens are also available at EPA's Safe Drinking Water Hotline.

BNL's Source Water Assessment

As required under the 1996 Safe Drinking Water Act, NYSDOH performed an assessment of the source water used by the Lab's public water system to evaluate known and possible contamination sources. The assessment includes a susceptibility rating for each well based on the risk posed by the presence of potential sources of contamination within the well's contributing area and the likelihood that the contaminants will travel through the environment to reach the well.

Although the susceptibility rating is an estimate of the potential for source water contamination, it does not mean that the water delivered to consumers is or will become contaminated. If a contaminant is present, it does not necessarily mean that there is a health risk.

Results from the assessment concluded that two on-site wells are rated as having a very high susceptibility to industrial solvents, primarily due to point sources of contamination along transportation routes and from previous spills within the source area. If industrial solvents were to impact water quality at a well, the contamination would be removed by treatment facilities (air-stripping or carbon filtration) before the water is delivered to the consumer. BNL has also determined that four of its supply wells are susceptible to Per- and Polyfluoroalkyl Substances (PFAS) contamination. In August 2020, NYS established drinking water standards of 10 ng/L for PFAS compounds perfluorooctanoic acid (PFOA) and perfluorooctanesulfonate (PFOS). PFOS has been detected in three wells at concentrations above 10 ng/L. To address this contamination, BNL has restricted the operation of several wells and has added GAC filtration systems at two wells to remove PFAS before the water is released into the distribution system. A GAC system on Well 11 was placed back in service in late 2020 and the GAC system for Well 10 went into service in 2021. Well 12 and its associated GAC system will be in service in 2022. NYSDOH had granted a deferral to continue operating the impacted wells. The deferral was completed in 2021. Potable supply wells and water leaving the Water Treatment Plant are now tested for PFAS on a quarterly basis.

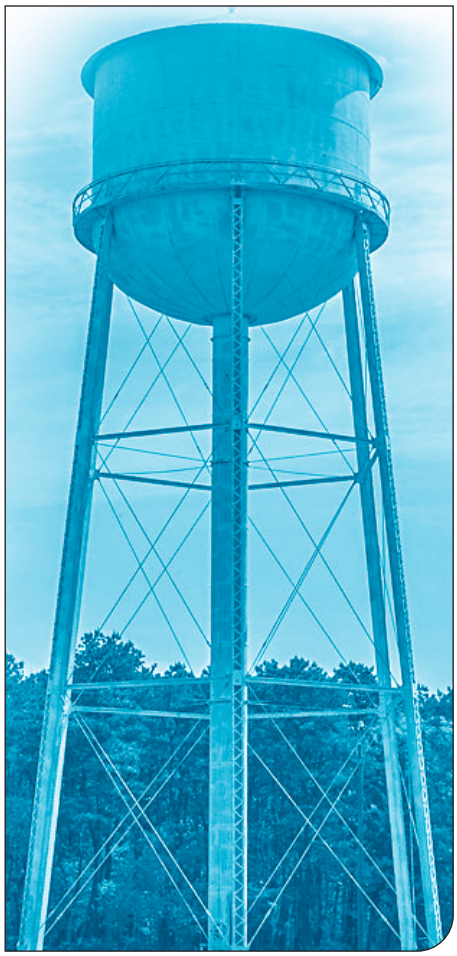
A copy of the complete assessment may be reviewed by contacting Doug Paquette (631) 344-7046 or Jason Remien (631) 344-3477.

Water Conservation Measures

BNL's water conservation program has achieved dramatic reductions in water use since the mid-1990's. The Lab continually evaluates water conservation as part of facility upgrades, such as replacing existing conventional plumbing fixtures with low-flow devices, or new construction. BNL's Water Management Plan describes how the Lab designs and operates buildings and facilities to be sustainable and water efficient. It also outlines our efforts to meet legislative requirements by implementing best management practices and details the steps being implemented to reduce BNL's water consumption. For more information on BNL's water use efficiency and management, please see BNL's Site Sustainability Plan for fiscal year 2022 at *https://www.bnl.gov/about/sustainability/reports.php.*

To help the Lab conserve water, start by being conscious of your personal use, e.g., reduce faucet flow, decrease running water while not in use, and report any drips, leaks, or other plumbing problems promptly to your Facility Project Manager. Regarding process and research use, make sure temperature controls operate properly to minimize flow and specify recirculating water or air-cooled systems for new devices.

While it is important to conserve water, the EPA encourages that you run your tap water for 30 seconds to two minutes and only use cold water for drinking or cooking. Due to the aging infrastructure at BNL, iron and lead may leach into the water from the pipes. Flushing the water will help to remove any contaminants that may have built up while the water was sitting in the pipes.



Water Treatment Process

BNL's Water Treatment Plant can treat up to two million gallons of "raw" water per day to remove naturally occurring iron and manganese from the groundwater.

Of the three in-service drinking water wells, Well 7 provides high-in-iron source water which must be passed through the Water Treatment Plant before being distributed around the site. This water is chlorinated and the pH is adjusted before it enters the distribution system. Chlorine is a disinfection agent and prevents the spread of water borne diseases.

Water from Well 7 is aerated to reduce carbon dioxide gas and aid in iron oxidation. Lime is added to raise the pH to provide for proper corrosion control. A polymer is added to aid in flocculation in the filtration process. Flocculation, or the formation of particle aggregates which settle out of the water as sediment, begins in the retention tank. To help form "floc," water is sent from the retention tank to a slow-mix tank.

Filtration is performed using a rapid sand filter made up of sand and anthracite coal to remove all particles. Filtered water is stored in the "wet well" before it is pumped into air-stripping towers, which remove volatile organic compounds, if present, from the water being treated.

Up to 250,000 gallons of treated water is stored at the clear well before its final chlorination and distribution. Pumps send finished water from the Water Treatment Plant to the two elevated storage tanks.

Wells 10 and 11 pump water that is low in iron, and does not require treatment for iron. Water from Well 10 and 11 pass through a GAC system to remove PFAS before being treated with chlorine for disinfection and sodium hydroxide for pH correction prior to being sent to the two elevated storage tanks. The water from the two storage tanks is delivered on site at 55 to 70 pounds of pressure per square inch via 45 miles of distribution pipe.

For more information on the Lab's water treatment process, visit the Water Quality website at *https://www.bnl.gov/water/*.

Plant Upgrades

On May 13, 2021, the Lab put into service the GAC filters at Well 10. This project involved the renovation of the existing Calgon Model 10 filter vessels and installation of new Calgon F400 carbon. The renovation included the replacement of the valves, manifold piping, nozzles, instrumentation, chemical injection systems, electrical controls, and underground leak monitoring system. This system was put online to remove PFOS/PFOA from the raw water pumped from Well 10.

In addition, approximately 5,000 feet of new 12 inch ductile iron water main was installed including 10 new valves and four hydrants on Rochester St. and W. Princeton Ave. This project replaced old asbestos cement pipe and will improve fire protection, reliability, and water quality.

BNL's Water Main Flush Program

In accordance with American Water Works Association recommendations, unidirectional flushing of water mains using fire hydrants within a water distribution system is the most effective and economical way to cleanse and improve water quality.

Iron can get into drinking water from corrosion of cast iron, steel, and galvanized iron pipes that are used throughout the site for water distribution. The Lab's water mains are flushed twice per year to improve the quality of the water delivered to facilities by the Lab's on-site taps, and to help eliminate rusty water.

Visit the Water Quality website at *http://www.bnl.gov/water/* for some tap-water recommendations to be sure your on-site drinking water is the best possible quality.

Water treatment operators in the BNL control room reviewing SCADA trend graphs. L-R- R. Kelley, N. Risi, and S. Kelvas

BNL's 2021 Drinking Water Sampling Results

BNL's drinking water and the supply and distribution system were in full compliance with all applicable county, state, and federal regulations regarding drinking water quality, monitoring, operations, and reporting in 2021. Through water sampling and testing, results show that the compounds listed below were not detected or below the minimum detection limit (MDL). Twenty-nine out of the total 147 contaminants tested were detected and are summarized in the table starting on Page 6.

1,1-dichloroethane
1,1-dichloroethene
1,1-dichloropropene
1,1,1-trichloroethane
1,1,1,2-tetrachloroethane
1,1,2-trichloroethane
1,1,2,2-tetrachloroethane
1,2-dichlorobenzene
1,2-dichloroethane
1,2-dichloropropane
1,2,3-trichlorobenzene
1,2,3-trichloropropane
1,2,4-trichlorobenzene
1,2,4-trimethylbenzene
1,3-dichlorobenzene
1,3-dichloropropane
1,3,5-trimethylbenzene
1,4-dichlorobenzene
2,2-dichloropropane
2,4,-D
2,4,5,-TP (silvex)
2-chlorotoluene
3-hydroxycardofuran
4-chlorotoluene
4-isopropyltoluene
alachlor
aldicarb
aldicarb sulfone
aldicarb sulfoxide
aldrin
ammonia
antimony
arsenic
asbestos
atrazine
benzene
benzo (A) pyrene
beryllium
bromobenzene
bromochloromethane
bromomethane
butachlor
cadmium
carbaryl
carbofuran
carbon tetrachloride
cesium-137
chlordane
chlorobenzene
chlorodifluoromethane
chloroethane
chloromethane
chromium
cis-1,2-dichloroethene color
cis-1,3-dichloropropene
cyanide (as free cyanide)
dalapon
di(2-ethylhexyl) adipate
di(2-ethylhexyl) phthalate
dibromomethane
dicamba
dichlorodifluoromethane
dieldrin
dinoseb
diquat
e. coli
endothall
endrin
ethylbenzene
fluoride
freon-113
glyphosate
haloacetic acid (HAA5)
heptachlor
heptachlor epoxide
hexachlorobenzene
hexachloro-1,3-butadiene
hexachlorocyclopentadiene
isopropylbenzene
lindane
m,p-xylene
manganese
mercury
methomyl
methoxychlor
methyl tert-butyl ether
methylene blue active substances (MBAS)
methylene chloride
metolachlor
metribuzin
n-butylbenzene
n-propylbenzene
nitrite
oxamyl
o-xylene
pentachlorophenol
picloram
propachlor
sec-butylbenzene
selenium
silver
simazine
strontium-90
styrene
tert-butylbenzene
tetrachloroethene
thalium
toluene
total coliform bacteria
total polychlorinated biphenals (PCBs)
total xylenes
toxaphene
trans-1,2-dichloroethene
trans-1,3-dichloropropene
trichloroethene
trichlorofluoromethane
tritium
vinyl cloride

Contaminants on this list include results from BNL compliance and surveillance samples.

Types of Contaminants

- **disinfectant and disinfection by-products:** formed when disinfectants used in water treatment plants react with bromide and/or natural organic matter (i.e., decaying vegetation) present in the source water. Different disinfectants produce different types or amounts of disinfection by-products. Disinfection by-products for which regulations have been established have been identified in drinking water, including trihalomethanes, haloacetic acids, bromate, and chlorite.
- **inorganics:** dissolved salts and metals, which can occur naturally or result from stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, farming, etc.
- **microbiological:** bacteria and viruses, which may come from sewage, livestock operations, wildlife, etc.
- **organic:** natural and synthetic compounds, including volatile organic compounds (VOCs). These chemicals are by-products of industrial processes, residential uses and petroleum production, and they can also come from gas stations, stormwater runoff, septic systems, etc.
- **perfluorinated:** man-made compounds used in firefighting foams and stain proof coatings.
- **pesticides & herbicides:** substances for, respectively, eliminating problem insects and plants, which may come from a variety of sources, such as agricultural operations, stormwater runoff, residential uses, etc.
- **radioactive:** naturally occurring, or from oil and gas production, mining activities, nuclear facilities, etc.
- **synthetic organic:** man-made compounds used for a variety of industrial and agricultural purposes.
- **volatile organic:** emitted by products including contaminants: paints and lacquer; paint strippers; cleaning supplies; pesticides, building materials and furnishings; office equipment such as copiers and printers; correction fluids and carbonless copy paper; graphics and craft materials including glues and adhesives; permanent markers; and photographic solutions.

CONTAMINANT	UNIT OF MEAS.	DATE OF DETECTION	VIOLATION (YES/NO)	LEVEL DETECTED	RANGE OF RESULTS	MCLG	REGULATORY LIMIT (MCL)	LIKELY SOURCE OF CONTAMINATION
Chlorine Residual, Free	mg/L	4/5/21 & 9/13/21	No	1.3	0.3 – 1.3	NS	4	Water additive to control microbes.
DISINFECTION BY-PRODUCTS								
Total Trihalomethanes	µg/L	8/2/21	No	5.2	0.8 - 5.2	NS	80	By-product of drinking water chlorination needed to kill harmful organisms; formed when source water contains large amounts of organic matter.
INORGANIC CONTAMINANTS								
Barium	mg/L	6/7/21	No	0.06	0.03– 0.06	2	2	Erosion of natural deposits.
Chloride	mg/L	6/7/21	No	87.4	65-87.4	NS	250	Naturally occurring; indicative of road-salt contamination.
Color	units	1/21/21 & 6/7/21	No	5	< 5 - 5	NS	15	Naturally ocurring; presence of metals such as iron and manganese
Hexavalent Chromium	µg/L	9/13/21	No	0.58	<0.02 – 0.58	NS	NS	Erosion of natural deposits.
Iron	µg/L	9/13/21	No	153	<20 – 153	NS	300	Naturally occuring.
Nickel	µg/L	6/7/21	No	1.8	< 0.5 - 1.8	NS	100	Nickel enters groundwater and surface water by dissolution of rocks and soils, from atmospheric fallout, or from biological decays.
Nitrates	mg/L	6/7/21	No	0.47	0.15 - 0.47	10	10	Erosion of natural deposits; runoff from fertilizer use; leaching from septic tanks and sewage.
Odor	units	6/7/21	No	2	0-2	NS	3	Naturally occurring.
Sodium	mg/L	7/12/21	No	56.4	37.4 - 56.4	NS	NS	Naturally occurring; road salt; water softeners.
Sulfates	mg/L	6/7/21	No	11.4	8.5 - 11.4	NS	250	Naturally occurring.
Zinc	mg/L	6/7/21	No	0.05	< 0.02 - 0.05	NS	5	Naturally occurring.

CONTAMINANT	UNIT OF MEAS.	DATE OF DETECTION	VIOLATION (YES/NO)	LEVEL DETECTED	RANGE OF RESULTS	MCLG	REGULATORY LIMIT (MCL)	LIKELY SOURCE OF CONTAMINATION
PERFLUORINATED CONTAMINANTS								
PFBS (Perfluorobutanesulfonic Acid)	µg/L	5/3/21	No	0.003	<0.002 - 0.003	NS	50	Released into the environment from widespread use in commercial and industrial applications.
PFHpA (Perfluoroheptanoic Acid)	µg/L	5/3/21	No	0.002	<0.002 - 0.002	NS	50	Released into the environment from widespread use in commercial and industrial applications.
PFHxS (Perfluorohexanesulfonic Acid)	µg/L	2/24/21	No	0.022	<0.002 - 0.022	NS	50	Released into the environment from widespread use in commercial and industrial applications.
PFOA (Perfluorooctanoic Acid)	ng/L	2/24/21	No	5.5	<2 – 5.5	NS	10	Released into the environment from widespread use in commercial and industrial applications.
PFOS (Perfluorooctanesulfonic Acid)	ng/L	2/24/21	No	45*	< 2 - 45	NS	10	Released into the environment from widespread use in commercial and industrial applications.
PFNA (Perfluorononanoic Acid)	µg/L	2/24/21	No	0.002	<0.002 - 0.002	NS	50	Released into the environment from widespread use in commercial and industrial applications.
RADIOACTIVE CONTAMINANTS								
Gross Alpha Activity	pCi/L	7/12/21	No	2.91	<1.63 - 2.91	NS	15	Decay of natural deposits.
Gross Beta Activity (a)	pCi/L	7/12/21	No	3.59	<1.77 - 3.59	NS	50	Decay of natural deposits and atmospheric fallout.
Radium-228	pCi/L	4/17/20	No	0.77	< 0.53 - 0.77	NS	50	Decay of natural deposits.
SYNTHETIC ORGANIC CONTAMINANTS								
1,4 Dioxane	µg/L	8/2/21	No	0.08	<0.002 - 0.08	NS	1	Released into the environment from widespread use in commercial and industrial applications.
VOLATILE ORGANIC CONTAMINANTS								
Bromodichloromethane	µg/L	1/12/21	No	5.5	<0.5 – 5.5	NS	80**	By-product of drinking water chlorination needed to kill harmful organisms.
Bromoform	µg/L	1/12/21	No	5.1	<0.5 - 5.1	NS	80**	By-product of drinking water chlorination needed to kill harmful organisms.
Chloroform	µg/L	1/12/21	No	6.7	<0.5 – 6.7	NS	80**	By-product of drinking water chlorination needed to kill harmful organisms.
Dibromochloromethane	µg/L	7/12/21	No	6.7	<0.5 – 6.7	NS	80**	By-product of drinking water chlorination needed to kill harmful organisms.

SAMPLING AT THE CONSUMER'S TAP (Tap water samples were collected throughout the Laboratory site) (b)

CONTAMINANT	UNIT OF MEAS.	DATE OF SAMPLING (MO./YR.)	AL EXCEEDANCE (YES/NO)	90th PERCENTILE RESULT	RANGE OF RESULTS	MCLG	REGULATORY LIMIT (AL)	LIKELY SOURCE OF CONTAMINATION
Copper	mg/L	5/12/21	No	0.024	<0.002 - 0.047	1.3	1.3	Corrosion of plumbing.
Lead	µg/L	5/12/21	No	8.6	<1 - 10.4	0	15	Corrosion of plumbing.

Table Notes:
Table includes results from BNL compliance samples and surveillance samples.

* Please see article on page 8 for PFAS deferral information.
** MCL is the sum of the four compounds (Bromodichloromethane, Bromoform, Chloroform, and Dibromochloromethane).
NS = drinking-water standard not specified
(a) The State considers 50 pCi/L to be the level of concern for beta particles.
(b) Sampling at the consumer's tap for lead and copper is performed every year; next sampling is scheduled for 2022. Please see article on Page 10 for health advisory information.

Completion of the Deferral Issued for PFOS

On October 1, 2021, BNL received notification from the NYSDOH that our deferral request requiring the notification below that was sent out in 2021 for Well 10 was closed and that the conditions of the deferral were met.

Why are you receiving this notice/information?

You are receiving this notice because testing of our public water system found the chemical perfluorooctanesulfonic acid (PFOS) in your drinking water above New York State's maximum contaminant level (MCL) of 10 ng/L for PFOS. The MCLs are set well below levels known to cause health effects in animal studies. Therefore, consuming water with PFOS at the level detected does not pose a significant health risk. Your water continues to be acceptable for all uses.

BNL had submitted, and the New York State Department of Health issued a deferral to Brookhaven National Laboratory in December 2020. When a public water system is issued a deferral, the water system agrees to a schedule for corrective action and compliance with the new MCLs. In exchange, the Department agrees to defer enforcement actions, such as assessing fines, if the water district is meeting the established deadlines. We are required to update the Department and the Suffolk County Department of Health Services (SCDHS) each calendar quarter on the status of our projects. If we do not meet the agreed upon deadlines, the Department can resume enforcement.

What are the health effects of PFOS?

The available information on the health effects associated with PFOS, like many chemicals, comes from studies of high-level exposure in animals or humans. Less is known about the chances of health effects occurring from lower levels of exposure, such as those that might occur in drinking water. As a result, finding lower levels of chemicals in drinking water prompts water suppliers and regulators to take precautions that include notifying consumers and steps to reduce exposure.

PFOS has caused a wide range of health effects when studied in animals that were exposed to high levels. Additional studies of high-level exposures of PFOS in people provide evidence that some of the health effects seen in animals may also occur in humans. The most consistent findings in animals were effects on the liver and immune system and impaired fetal growth and development. The United States Environmental Protection Agency considers PFOS as having suggestive evidence for causing cancer based on studies of animals exposed to high levels of this chemical over their entire lifetimes.

At the level of PFOS detected in your water, exposure from drinking water and food preparation is well below PFOS exposures associated with health effects.

What is New York State doing about PFOS in public drinking water?

The New York State Department of Health (NYSDOH) has adopted a drinking water regulation that requires all public water systems to test for PFOS. If found above the MCLs, the water supplier must take steps to lower the level to meet the standard. Exceedances of the MCL signal that steps should be taken by the water system to reduce contaminant levels.

WELL 10 MILESTONES	DUE DATE	STATUS	COMPLETION DATE
Perform public notification for MCL exceedance	November 26, 2020	Completed	November 17, 2020
Procure PFOS treatment equipment and parts	December 30, 2020	Completed	December 30, 2020
Submit engineering plans and specifications to SCDHS and receive approval to construct PFOS treatment	December 31, 2020	Completed	December 28, 2020
Construct PFOS treatment system	August 31, 2021	Completed	May 10, 2021
Obtain approval from SCDHS to operate PFOS treatment system and place system in service	October 31, 2021	Completed	May 13, 2021

What is being done to remove these contaminants?

As a precaution, BNL did not use two supply wells (Well 4 and Well 6) and returned to service GAC filters at Well 10 and Well 11. Testing has demonstrated that the filters are effectively removing PFOS and low levels of the other PFAS chemicals that may be present. On May 11, 2021, the SCDHS granted BNL approval to begin operating the GAC system at Supply Well 10, the last active water supply well that had PFOS levels above the new drinking water standard, after necessary upgrades, inspections, and testing were completed. This system went into service on May 13, 2021. The deferral that we received from the NYSDOH was completed and closed on 10/1/2021. Well 10 GAC was placed online and will continue to be sampled in accordance with NYSDOH requirements.

Where can I get more information?

For more information, please contact Chris Bruno at at (631) 344-8262 or Jason Remien at at (631) 344-3477. You can also contact the Suffolk County Department of Health Services at (631) 852-5810.

If you have additional questions about these contaminants and your health, talk to your health care provider who is most familiar with your health history and can provide advice and assistance about understanding how drinking water may affect your personal health.

Chlorine Disinfectant and Its By-Products

Each day, more than 200 million people in the U.S. consume water that has been disinfected to kill unwanted microorganisms found in source water. Worldwide, one of the most commonly used and effective disinfectants is chlorine. A form of chlorine known as sodium hypochlorite is used by BNL for disinfection of its potable water.

Although disinfectants are effective in killing unwanted microorganisms in source water, they can react with naturally occurring organic matter and inorganics to form disinfectant by-products which may pose health risks. Under the SDWA, disinfectants and their by-products are regulated. The Lab had no violations in 2021; annual averages for chlorine residual and by-products are based on results from finished tap water.

Disinfection Residual	2021 Annual Running Average	MRDLG
chlorine*	0.8 mg/L	4 mg/L
Disinfection By-product	**2021 Annual Average**	**MCL**
total trihalomethanes[1]	5.2 µg/L	80 µg/L
haloacetic acids (five)[2]	< 2 µg/L	60 µg/L

Notes:
* BNL range of results for chlorine is 0.3 - 1.3 mg/L; maximum found in Bldg. 49 and Bldg. 930.
[1] Total trihalomethanes is the sum of the concentration of chloroform, bromodichloromethane, dibromochloromethane, and bromoform.
[2] Haloacetic acids (five) is the sum of the concentration of mono-, di-, and trichloroacetic acids, and mono- and dibromoacetic acids.

Other Water Quality Indicators

The following maximum values were measured in samples of well water or finished water at the BNL Water Treatment Plant in 2021. Although the Lab is required to test these indicators, there are no MCLs set for these parameters.

Other indicators tested, but not detected, include cyanide and methylene blue active substances.

Indicator	BNL Sample	MCL
alkalinity†	67.6 mg/L	NS
calcium†	14.2 mg/L	NS
conductivity†	471 µmhos/cm	NS
pH	9.0 standard units	NS

Notes:
NS = drinking-water standard not specified
† = measure of water hardness or dissolved salts

Lead and Copper Testing

Lead and copper sampling at the required locations in May 2021 and December 2021 revealed BNL was in compliance with regulatory requirements.

Due to the exceedance of the lead action level in 2020, lead and copper samples were taken twice in 2021. All samples were below the action level limit for lead and copper.

Lead and copper enters drinking water primarily through plumbing materials. In 1991, the EPA established a "lead and copper rule" to limit the concentration of lead and copper in public water. BNL is required to sample for lead and copper at 20 consumer taps every year and to notify those occupants of the buildings tested with the results. Results from testing performed in 2021 are shown in the table to the right. While lead was detected in some samples, the action limit was not exceeded. Testing will be performed again in 2022. If present, elevated levels of lead can cause serious health problems, especially for pregnant women, infants, and young children. It is possible that lead levels in your building may be higher than at other buildings at the Laboratory as a result of materials used in your building's plumbing. Brookhaven Lab is responsible for providing high quality drinking water. When your water has been sitting in the pipes for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to two minutes before using for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline (1-800-426-4791) or at *http://www.epa.gov/safewater/lead.*

2021 Lead and Copper Sampling Results

		5/12/21		12/1/21	
Location	**Faucet**	**Lead (µg/L)**	**Copper (mg/L)**	**Lead (µg/L)**	**Copper (mg/L)**
Apt. 11A	kitchen	< MDL	0.004	< MDL	0.019
Apt. 13C	kitchen	2.2	0.008	2	0.004
Apt. 1A	kitchen	9.8	0.01	2.9	0.038
Apt. 28D	kitchen	3.3	0.003	6.9	0.008
Apt. 2A	kitchen	3.4	0.01	2.1	0.005
Apt. 30A	kitchen	< MDL	0.012	<MDL	0.01
Apt. 34A	kitchen	2.2	0.006	1.1	0.009
Apt. 36A	kitchen	1.2	0.023	<MDL	0.008
Apt. 4A	kitchen	10.4	0.029	2	0.003
Apt. 5A	kitchen	7.2	0.021	8.8	0.007
Apt. 6C	kitchen	6.2	0.013	<MDL	<MDL
Apt. 7B	kitchen	<MDL	0.003	<MDL	0.009
Apt. 8C	kitchen	< MDL	0.003	< MDL	< MDL
Bldg. 153	bathroom	< MDL	0.021	< MDL	0.021
Bldg. 170	kitchen	3.9	0.008	4.7	0.011
Bldg. 257	bathroom	5.7	0.012	2.1	0.024
Bldg. 258	kitchen	< MDL	0.011	3.2	0.036
Bldg. 371	bathroom	5.4	0.047	< MDL	0.012
Bldg. 388	kitchen	1.5	0.031	5.9	0.018
Bldg. 599	kitchen	8.6	0.011	<MDL	0.007

Notes:
Action Level for Lead is 15 µg/L.
Action Level for Copper is 1.3 mg/L.

Water Treatment Operators servicing a valve on a (GAC) Granular Activated Carbon System manifold. L-R J. Stanisci, N. Krupski.

Definitions Used in this Report

- **90th percentile value:** The reported copper and lead values represent the 90th percentile. A percentile is a value on a scale of 100 that indicates the percent of a distribution that is equal to or below it. The 90th percentile is equal to or greater than 90 percent of the lead and copper values detected in the water system.
- **action level (AL):** The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a drinking water supplier must follow.
- **granular activated carbon (GAC):** A system used to remove volatile organic compounds from ground water.
- **maximum contaminant level (MCL):** The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLG as possible.
- **maximum contaminant level goal (MCLG):** The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
- **maximum residual disinfectant level (MRDL):** The highest level of a disinfectant allowed in drinking water. There is convincing evidence that the addition of disinfectants is necessary for control of microbial contaminants.
- **maximum residual disinfectant level goal (MRDLG):** The concentration of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of using disinfectants to control microbial contamination.
- **micrograms per liter (µg/L):** Equals one part of liquid in one billion parts of liquid or parts per billion (ppb).
- **micromhos per centimeter (µmhos/cm):** A measure of the ability of water to conduct electricity. Conductivity effectively measures the concentration of ions, such as dissolved salts.
- **milligrams per liter (mg/L):** Equals one part of liquid per million parts of liquid, or parts per million (ppm).
- **minimum detection limit (MDL):** The lowest level to which an analytical parameter can be measured with certainty by the analytical lab performing the measurement. While results below the MDL are sometimes measureable, they represent values that have a reduced statistical confidence associated with them (less than 95 percent confidence).
- **picocuries per liter (pCi/L):** Picocuries per liter is a measure of radioactivity in water equal to one trillionth of a curie.
- **nanograms per liter (ng/L):** Equals one part of liquid in one trillion parts of liquid or parts per trillion (ppt).
- **volatile organic contaminants (VOCs):** Organic chemicals that have a high vapor pressure at ordinary room temperature. Their high vapor pressure results from a low boiling point, which causes large numbers of molecules to evaporate or sublimate from the liquid or solid form of the compound and enter the surrounding air. VOCs include both man-made and naturally occurring chemical compounds.

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