2017 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.

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

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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 2016.

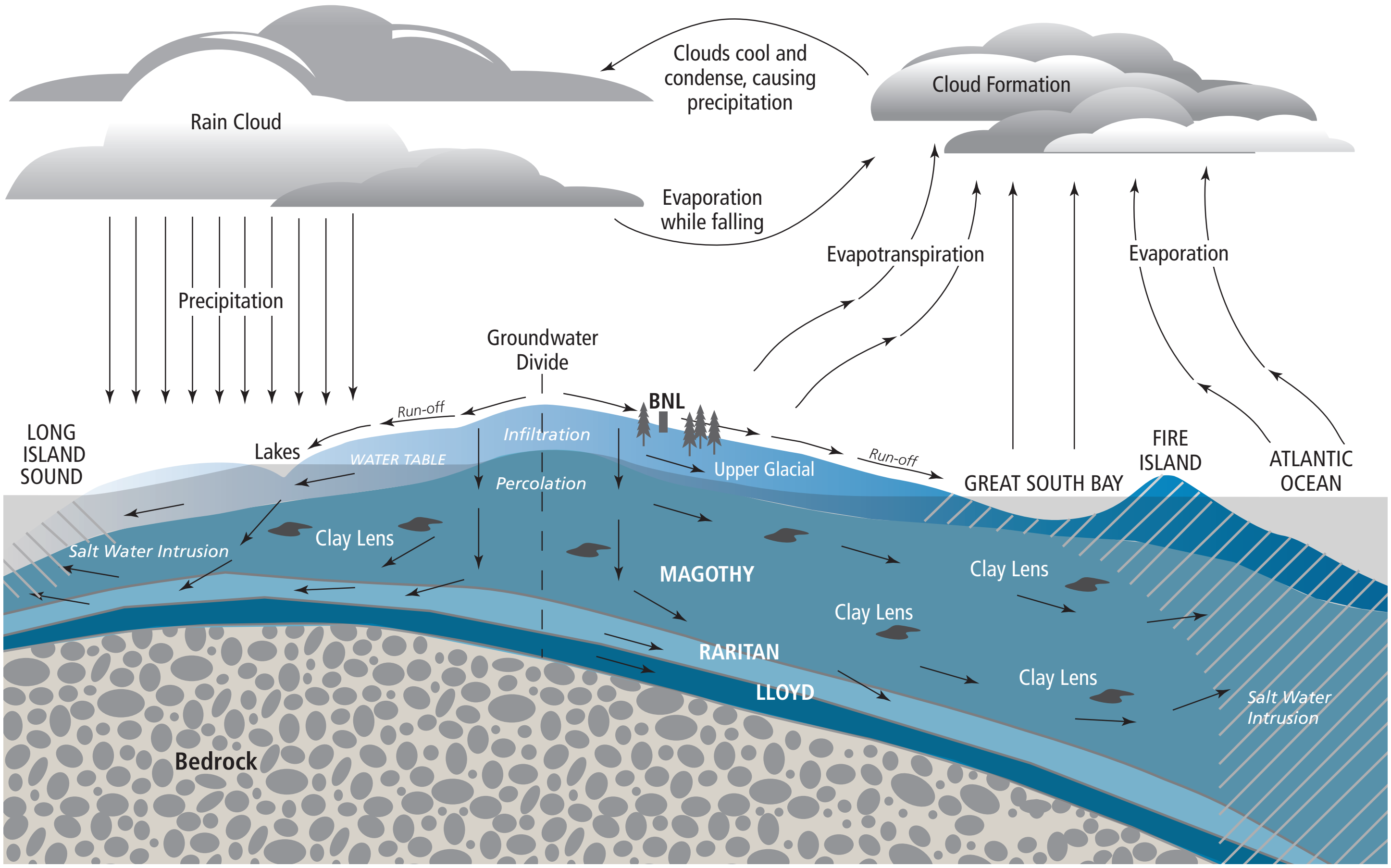
Overseeing the Lab's water supply system, which includes five wells dedicated to pumping drinking water and the on-site Water Treatment Facility, BNL's Energy & Utilities (E&U) Division is committed to providing over 3,000 employees, facility-users, contractors, and guests annually with safe drinking 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, E&U 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.

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 2,000 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.

The Lab's five 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 three wells (4, 6, and 7) is processed at BNL's on-site Water Treatment Facility. Water from two other wells (10 and 11) is pumped directly to the distribution system after disinfection and pH adjustments. Last year, BNL pumped approximately 435 million gallons of water.



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 (1-800-426-4791).

Some people may be more vulnerable to disease-causing microorganisms or pathogens in drinking water than others. Immuno-compromised 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 identified one well that is susceptible to radionuclide contamination, specifically tritium. Although tritium has never been detected in this well, the Lab controls water-pumping operations to reduce the potential for impact. In addition to testing the supply-well water, BNL uses a network of groundwater monitoring wells to track potential sources and contamination. If a supply well could not provide water that meets drinking-water standards, it would be immediately removed from service.

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 2017 at *https://www.bnl.gov/about/sustainability/reports.php.*

To help the Lab conserve water, start by being conscious of your personal use, i.e., 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 re-circulating 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 2 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.

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.

Much of Long Island's groundwater is high in iron as a result of naturally occurring iron-containing minerals within the aquifer. 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 Process

BNL's Water Treatment Facility typically treats up to 2 million gallons of "raw" water per day to remove naturally occurring iron and manganese from the groundwater.

Of the five in-service drinking-water wells, wells 4, 6, and 7 provide high-in-iron source water which must be passed through a sand filter 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 Wells 4, 6, and 7 is aerated to reduce carbon dioxide gas and aid in iron oxidation. Lime is added to raise the pH and soften the water 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 Facility to the two water towers on site. Wells 10 and 11 pump water that is low in iron, and do not require treatment for iron. However, they do receive chlorine for disinfection and sodium hydroxide for pH correction prior to being sent to the two water towers system. The water from the two storage towers 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 *http://www.bnl.gov/water/index.php.*

BNL's 2016 Drinking Water Sampling Results

As you can see by the table on Page 6 and 7, our system had no violations. We have learned through our testing that 38 out of 302 contaminants tested have been detected; however, these contaminants were detected below the level allowed by the State. Other parameters tested for, but were less than the minimum detection limit (MDL), include:

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
1,2,4,5 tetramethylbenzene
1,3-dichlorobenzene
1,3-dichloropropane
1,3,5-trimethylbenzene
1,4-dichlorobenzene
1,4-dichlorobutane
1,4-dioxane
1-bromo-2-chloropropane
1-methylnaphthalene
1-naphthol
2,2-dichloropropane
2,3 dichloropropene
2,4,-D
2,4,5,-TP (silvex)
2,6-dichlorobenzamide
2-bromo-1-chloropropane
2-butanone
2-chlorotoluene
2-hydroxyAtrazine
2-eethylnapthalene
3-hydroxycardofuran
4,4 DDD
4,4 DDE
4,4 DDT
4-androstene-3,17-dione
4-chlorotoluene
4-hydroxyphenytoin
4-isopropyltoluene
17 alpha ethynylestradiol
acenaphthene
acenaphthylene
acetaminophen
acetochlor
acrylonitrile
alachlor
alachlor ESA
alachlor OA
aldicarb
aldicarb sulfone
aldicard sulfoxide
aldrin
allethrin
allyl chloride
alpha-BHC
ammonia
anthracene
asbestos
atrazine
azoxystrobin
benfluarlin
benzene
benzo (A) anthracene
benzo (B) fluoranthene
benzo (K) fluoranthene
benzo (A) pyrene
benzo (GHI) perylene
benzophenone
benzyl butyl phthalate
beta-BHC
bisphenol A
bisphenol B
bloc
bromacil
bromobenzene
bromochloromethane
bromoform
bromomethane
butachlor
caffeine
carbamazepine
carbaryl
carbazole
carbofuran
carbon disulfide
carbon tetrachloride
carisoprodol
cesium-137
chlordane
chlorobenzene
chlorodifluoromethane
chloroethane
chlorofenvinphos
chloromethane
chloropyriphos
chloroxylenol
chrysene
cis-1,2-dichloroethene
cis-1,3-dichloropropene
cobalt
cyanide (as free cyanide)
cyfluthrin
cypermethrin
dacthal
dalapon
deisopropylatrazine
delta-BHC
deltamethrin
desethylatrazine
di(2-ethylhexyl) adipate
di(2-ethylhexyl) phthalate
dibenzo (A,H) anthracene
dibromochloropropane
dibromomethane
dibutyl phthalate
dicamba
dichlobenil
dichlorodifluoromethane
dichlorvos
didealkylatrazine
dieldrin
diethyl ether
diethyl phthalate
diethylstilbestrol
diethyltoluamide (DEET)
dimethyl phthalate
dimethyldisulfide
dinoseb
diquat
disulfoton sulfone
diuron
d-Limonene
e. coli
endosulfan I
endosulfan II
endosulfan sulfate
endothall
endrin
EPTC
equilin
estriol
estrone
ethofumesate
ethyl methacrylate
ethyl parathlon
ethylbenzene
etofenprox
etofenprox alpha-CO
fluoranthene
fluorene
gemfibrozil
geranium
glyphosate
heptachlor
heptachlor epoxide
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
hexazinone
ibuprofen
imidacloprid
imidacloprid urea
indeno(1,2,3-cd) pyrene
iodofenphos
iprodione
isobutane
isofenphos
isopropylbenzene
kelthane
lindane
lithium
m,p-xylene
malaoxon
malathion
metalaxyl
methacrylonitrile
methiocarb
methiocarb sulfone
methomyl
methoprene
methoxychlor
methyl isothiocyanate
methyl methacrylate
methyl parathion
methyl sulfide
methyl tert-butyl ether
methylene blue active substances (MBAS)
methylene chloride
metolachlor
metolachlor ESA
metolachlor metabolite
metolachlor OA
metribuzin
molybdenum
monomethyltetrachlo-roterephthalate
n-butane
n-butylbenzene
n-propylbenzene
naled (dibrom)
naphthalene
napropamide
odor
orthophosphate
oxamyl
o-xylene
p-diethylbenzene
pendimethalin
pentachloronitrobenzene
pentachlorophenol
permethrin
phenanthrene
phenytoin (dilantin)
picaridin
picloram
piperonyl butoxide
prallethrin
prometon
prometryne
propachlor
propamocarb hydrochloride
propanal
propiconazole
pyrene
radium-228*
resmethrin
ronstar
sec-butylbenzene
siduron
simazine
strontium-90
styrene
sumithrin
tebuthiuron
tebuthluron
tellurium
terbacil
tert-butylbenzene
testosterone
tetrachloroethene
tetrachloroterephthalic acid
tetrahydrofuran
thorium
tin
titanium
toluene
total coliform bacteria
total polychlorinated biphenals (PCBs)
toxaphene
trans-1,2-dichloroethene
trans-1,3-dichloropropene
triadimefon
trichlorfon
trichloroethene
trichlorofluoromethane
triclosan
trifluralin
tritium
uranium
vanadium
vinclozolin
vinyl cloride

Notes: *Radium-228 was tested in 2011 and will be retested in 2020.
Contaminants on this list include results from BNL compliance samples, surveillance samples, and Suffolk County Department of Health Services 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.
- **microbiological:** bacteria and viruses, which may come from sewage, livestock operations, wildlife, etc.
- **inorganic chemicals:** dissolved salts and metals, which can occur naturally or result from storm-water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, farming, etc.
- **pesticides & herbicides:** substances for, respectively, eliminating problem insects and plants, which may come from a variety of sources, such as agricultural operations, storm-water runoff, residential uses, etc.
- **organic chemicals:** 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, storm-water runoff, septic systems, etc.
- **radioactive:** naturally occurring, or from oil and gas production, mining activities, nuclear facilities, etc.
- **synthetic organic chemicals:** man-made compounds used for a variety of industrial and agricultural purposes.
- **volatile organic compounds:** 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 AND UNIT OF MEASUREMENT	DATE OF DETECTION	VIOLATION (YES/NO)	LEVEL DETECTED	DETECTION LOCATION	RANGE OF RESULTS	MCLG	REGULATORY LIMIT (MCL)	LIKELY SOURCE OF CONTAMINATION
DISINFECTANTS								
Chlorine Residual (mg/L)	08/08/16	No	0.7	Bldg. 725	0.3 – 1.5	NS	4	Water additive to control microbes.
DISINFECTION BY-PRODUCTS								
Haloacetic Acids (µg/L)	08/08/16	No	4.09	Bldg. 1005	3 – 4.09	NS	60	By-product of drinking water disinfection needed to kill harmful organisms.
Total Trihalomethanes (µg/L)	08/08/16	No	16.5	WTP	<0.5 – 16.5	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								
Antimony (µg/L)	01/11/16	No	0.032	Bldg. 400	<0.4 – 0.032	6	6	Discharge from petroleum refineries, fire retardants, ceramics, electronics, and solder.
Arsenic (µg/L)	01/11/16	No	0.12	Bldg. 400	<1.4 – 0.12 (a)	NS	10	Erosion of natural deposits.
Barium (mg/L)	09/13/16	No	0.059	Well 11	<0.024 – 0.059	2	2	Erosion of natural deposits.
Beryllium (µg/L)	01/11/16	No	0.0048	Bldg. 400	<0.3 – 0.0048 (a)	4	4	Erosion of natural deposits.
Bromide (mg/L)	09/13/16	No	0.35	Well 11	<0.5 – 0.35 (a)	NS	NS	Naturally occurring.
Cadmium (µg/L)	01/11/16	No	0.036	Bldg. 400	<1.0 – 0.036 (a)	5	5	Naturally occurring; indicative of road-salt contamination.
Chloride (mg/L)	09/13/16	No	75	Well 10, 11	41 – 75	NS	250	Naturally occurring; indicative of road-salt contamination.
Chromium (µg/L)	01/11/16	No	0.031	Bldg. 400	<7.0 – 0.031 (a)	100	100	Erosion of natural deposits.
Color (units)	01/11/16	No	10	Bldg. 400	<5 – 10	NS	15	The presence of metals such as copper, iron, and manganese.
Copper (µg/L)	01/11/16	No	49	Bldg. 400	7 – 49	1300	1300	Corrosion of plumbing.
Fluoride (mg/L)	06/13/16	No	0.13	Well 11	<0.1 – 0.13	NS	2.2	Erosion of natural deposits.
Hexavalent Chromium (µg/L)	09/13/16	No	0.58	Well 10	0.28 – 0.58	NS	NS	Erosion of natural deposits.
Iron (µg/L)	09/13/16	No	120	WTP	50 – 120	NS	300	Corrosion of plumbing.
Lead (µg/L)	01/11/16	No	0.043	Bldg. 400	<1.0 – 0.043 (a)	0	15	Corrosion of plumbing; erosion of natural deposits.
Manganese (µg/L)	09/13/16	No	68	WTP	<10 – 68	NS	300	Naturally occurring.
Magnesium (mg/L)	09/13/16	No	5.9	Well 11	2.8 – 5.9	NS	NS	Naturally occurring.

CONTAMINANT AND UNIT OF MEASUREMENT	DATE OF DETECTION	VIOLATION (YES/NO)	LEVEL DETECTED	DETECTION LOCATION	RANGE OF RESULTS	MCLG	REGULATORY LIMIT (MCL)	LIKELY SOURCE OF CONTAMINATION
Mercury (µg/L)	01/11/16	No	0.28	Bldg. 400	<0.2 – 0.28	2	2	Erosion of natural deposits.
INORGANIC CONTAMINANTS								
Nickel (µg/L)	06/13/16	No	5.1	Well 10	<0.79 – 5.1	NS	100	Nickel enters groundwater and surface water by dissolution of rocks and soils, from atmospheric fallout, or from biological decays.
Nitrates (mg/L)	07/11/16	No	0.77	Well 11	<0.05 – 0.77	10	10	Erosion of natural deposits; runoff from fertilizer use; leaching from septic tanks and sewage.
Potassium (mg/L)	09/13/16	No	1.7	Well 10	0.85 – 1.7	NS	NS	Naturally occurring.
Selenium (µg/L)	09/13/16	No	2	Well 11	<2.0 – 2.0	50	50	Erosion of natural deposits.
Silver (µg/L)	01/11/16	No	0.017	Bldg. 400	<10 – 0.017 (a)	NS	100	Naturally occurring; discharge from photographic and radiographic processing, manufacturing of electronic products, jewelry making, and plating and soldering.
Sodium (mg/L)	09/13/16	No	43.2	Well 10	28 – 43.2	NS	NS	Naturally occurring; road salt; water softeners.
Strontium (µg/L)	09/13/16	No	59.2	Well 11	36.9 – 59.2	NS	NS	Naturally occurring.
Sulfates (mg/L)	06/13/16	No	12.7	Well 10	6.64 – 12.7	NS	250	Naturally occurring.
Thallium (µg/L)	01/11/16	No	0.0069	Bldg. 400	<0.3 – 0.0069 (a)	0.5	2	Discharge from electronics, glass, and drug factories.
Zinc (mg/L)	09/13/16	No	0.015	Well 10	<0.02 – 0.015 (a)	NS	5	Naturally occurring.
RADIOACTIVE CONTAMINANTS								
Gross Alpha Activity (pCi/L)	01/07/16	No	1.98	Well 6	<1.41 – 1.98	NS	15	Erosion of natural deposits.
Gross Beta Activity (pCi/L) (b)	04/11/16	No	2.52	Well 10	<0.83 – 2.52	NS	50	Decay of natural deposits and atmospheric fallout.
VOLATILE ORGANIC CONTAMINANTS								
17 Beta Estradiol (µg/L)	09/13/16	No	0.5	Well 10	<0.5 – 0.5	NS	NS	Synthetic Hormone.
Bromochloromethane (µg/L)	07/05/16	No	1.7	Bldg. 488	<0.5 – 1.7	NS	80	By-product of drinking water chlorination needed to kill harmful organisms.
Chloroform (µg/L)	04/04/16	No	1.98	Well 11	<0.5 – 1.98	NS	80	By-product of drinking water chlorination needed to kill harmful organisms.
Dibromochloromethane (µg/L)	07/05/16	No	2.2	Bldg. 488	<0.5 – 2.2	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) *

CONTAMINANT AND UNIT OF MEASUREMENT	DATE OF SAMPLING (MO./YR.)	AL EXCEEDANCE (YES/NO)	90th PERCENTILE RESULT	DETECTION LOCATION	RANGE OF RESULTS	MCLG	REGULATORY LIMIT (AL)	LIKELY SOURCE OF CONTAMINATION
Copper (mg/L)	08/10/15	No	0.09	Bldg. 460	<0.02 – 0.12	1.3	1.3	Corrosion of plumbing.
Lead (µg/L)	09/17/15	No	10.0	Apt. 1A	<1.0 – 800	0	15	Corrosion of plumbing.

Table Notes:
Table includes results from BNL compliance samples, surveillance samples, and Suffolk County Department of Health Services samples.
* Sampling at the consumer's tap for lead and copper is performed every 3 years; next sampling is scheduled for 2018.
NS = drinking-water standard not specified
WTP = Water Treatment Plant
(a) MDL's may vary throughout the year causing a positive detection below a previous detection limit.
(b) The State considers 50 pCi/L to be the level of concern for beta particles.

Lead and Copper Testing

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 10 consumer taps every 3 years and to notify those occupants of the buildings tested with the results. Results from testing performed in 2015 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 2018.

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 2 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.*

2015 Lead and Copper Sampling Results

Location	Faucet	Lead	Copper
Apt. 1A	kitchen	7.0 µg/L	0.02 mg/L
Apt. 1B	kitchen	4.4 µg/L	0.024 mg/L
Apt. 2B	kitchen	800 µg/L*	0.1 mg/L
Apt. 4B	kitchen	1.7 µg/L	< MDL
Apt. 5B	kitchen	10.0 µg/L	< MDL
Apt. 6A	kitchen	1.3 µg/L	< MDL
Apt. 8C	kitchen	< MDL	< MDL
Apt. 13D	kitchen	< MDL	< MDL
Apt. 22A	kitchen	2.9 µg/L	0.027 mg/L
Apt. 22B	kitchen	2.6 µg/L	0.021 mg/L
Apt. 22C	kitchen	4.4 µg/L	0.013 mg/L
Apt. 22D	kitchen	16 µg/L	0.015 mg/L
Apt. 24A	kitchen	15.0 µg/L	< MDL
Apt. 26A	kitchen	1.3 µg/L	< MDL
Apt. 28A	kitchen	1.2 µg/L	< MDL
Apt. 34A	kitchen	7.1 µg/L	0.061 mg/L
Apt. 34E	kitchen	< MDL	< MDL
Apt. 34F	kitchen	0.88 µg/L	0.01 mg/L
Apt. 36B	kitchen	3.2 µg/L	< MDL
Apt. 42A	kitchen	< MDL	< MDL
Apt. 40M	kitchen	< MDL	< MDL
Bldg. 153	bathroom	< MDL	0.02 mg/L
Bldg. 170	bathroom	< MDL	< MDL
Bldg. 371	bathroom	4.7 µg/L	0.10 mg/L
Bldg. 460	kitchen	2.7 µg/L	0.09 mg/L
Bldg. 535	bathroom	< MDL	0.07 mg/L
Bldg. 703	bathroom	< MDL	0.12 mg/L
Bldg. 728	kitchen	2.4 µg/L	0.032 mg/L
Bldg. 911	bathroom	< MDL	0.04 mg/L

Notes:
Action Level for Lead is 15 µg/L.
Action Level for Copper is 1.3 mg/L.
*Apartment was vacant at the time of testing; a retest in October showed lead at 5.8 µg/L.

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 Safe Drinking Water Act, disinfectants and their by-products are regulated. The Lab had no violations in 2016; annual averages for chlorine residual and by-products are based on results from finished tap water.

Disinfection Residual	2016 Annual Running Average	MRDLG
chlorine*	0.7 mg/L	4 mg/L
Disinfection By-product	**2016 Annual Average**	**MCL**
total trihalomethanes[1]	16.5 µg/L	80 µg/L
haloacetic acids (five)[2]	4.09 µg/L	60 µg/L

Notes:
* BNL range of results for chlorine is 0.3 - 1.5 mg/L; maximum found in Bldg. 725.
[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. Although the Lab is required to test these indicators, there are no MCLs set for these parameters.

Other indicators tested, but not detected, include: ammonia, cyanide, methylene blue active substances, and total coliform.

Indicator	BNL Sample	MCL
alkalinity†	39.7 mg/L	NS
calcium†	14.4 mg/L	NS
conductivity†	398 µmhos/cm	NS
pH	6 standard units	NS

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

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.

- **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.

- **treatment technique (TT):** A required process intended to reduce the level of a contaminant in drinking water.

- **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.

BNL's 2016 Surveillance/ Investigative Testing for Lead and Copper

In addition to the lead and copper sampling conducted under the EPA's Lead and Copper Rule (LCR), the Laboratory collects routine water samples in the apartment area and on request to determine lead levels and manage risk to residents. Historically, copper has not been a concern due to consistently low sampling results; however, copper is still sampled to ensure acceptable levels are present. Any dwelling constructed prior to 1986 could have lead in the plumbing which can cause elevated levels of lead in the drinking water. BNL has a voluntary program to test for lead and, when necessary, has replaced plumbing or closed apartments for further investigation.

During routine surveillance sampling, two samples are collected, one after running the faucet for 15 minutes (called post purge) and the second after allowing the faucet to remain unused for 6 hours (called first draw). The post purge sample provides data that is representative of the water delivered to the residence during normal use. The first draw sample provides data that represents the first use after a period of extended non-use. Reviewing the results of surveillance testing, two samples had first draw results over the action level for lead, the kitchen in Building 317 and the restroom in Building 935. The kitchen in Building 317 is posted to run the water before use as sampling indicates running the water eliminates almost all the lead. All other water sources within the building were below the action level. The faucets in the restrooms were replaced in Building 935. All other samples in the table were below the action level and significantly decreased when the water was run prior to sampling.

2016 Routine Lead and Copper Surveillance Testing					
		First Draw		Post Purge	
Location	Faucet	Lead (μg/L)	Copper (μg/L)	Lead (μg/L)	Copper (μg/L)
Apt. 1C	kitchen	8.91	23.8	0.65	2.18
Apt. 5A	kitchen	10	47	0.26	1
Apt. 5B	kitchen	2.9	6.9	0.93	1.3
Apt. 5C	kitchen	7	12	0.21	0.65
Apt. 7A	kitchen	0.35	3.7	ND	0.57
Apt. 7B	kitchen	0.78	7.97	ND	1.17
Apt. 7C	kitchen	5.2	38	1.2	6.4
Apt. 7D	kitchen	1.1	33	0.24	0.9
Apt. 24B	kitchen	8.1	12	0.54	3.1
Apt. 24C	kitchen	1.9	14	0.38	1.7
Apt. 36B	kitchen	2.61	10.1	ND	0.55
Apt. 36C	kitchen	5.86	9.17	ND	0.731
Apt. 36D	kitchen	ND	1.51	ND	ND
Apt. 40E	kitchen	4.3	8.3	5.9	12
Apt. 40F	kitchen	6.7	11	6.3	12
Apt. 40H	kitchen	6.3	11	13	23
Apt. 40I	kitchen	5.3	14	3.6	8.5
Apt. 41BO	kitchen	2.1	7.3	0.51	1.2
Apt. 41CN	kitchen	1.2	7.5	0.42	1.6
Apt. 41DM	kitchen	1.4	9.2	0.3	1.2
Apt. 41EL	kitchen	1	4.5	0.45	1.7
Bldg. 153	downstairs kitchen	0.28	17	ND	3.7
Bldg. 153	upstairs kitchen	0.18	59	ND	7.6
Bldg. 170	downstairs kitchen	2.5	11	0.41	8.2
Bldg. 317	ice machine	0.43	2.9	—	—
Bldg. 317	kitchen	21	4.7	0.88	1.1
Bldg. 317	water fountain	0.83	46	0.54	6
Bldg. 373	kitchen (left faucet)	0.75	7.8	0.27	2.9
Bldg. 373	kitchen (right faucet)	1.4	34	0.25	22
Bldg. 935	men's restroom	490	340	2.8	38

Notes:
Action Level for Lead is 15 μg/L.
Action Level for Copper is 1,300 μg/L.

All apartments that tested over the LCR action level were closed. F&O has replaced underground lead service bends, changed faucets, and service valves in response to lead levels above the action level. Additional samples were taken during the investigative process (see 2016 Investigative Lead and Copper Sample results on Page 11). In the case of Apartment 3C and 3D, replacing the faucets lowered lead values significantly and the apartments were reopened. Apartment 3A and 3B remain closed. The source of lead is likely in the piping behind walls and the apartments will remain closed until repairs can be made and tests results are below the LCR action level.

As both a water provider and owner of the facilities, the Laboratory continues to improve infrastructure whenever possible and will continue to monitor for lead. Any apartment that tests over the action level will be closed and, if occupied, the residents notified and relocated. Federal regulation requires the Laboratory to notify its residents about the risks of lead and reminds all employees that running the water prior to use at work and at home may lower your risk of exposure.

2016 Investigative Lead and Copper Sample Results					
		First Draw		Post Purge	
Location	Faucet	Lead (µg/L)	Copper (µg/L)	Lead (µg/L)	Copper (µg/L)
Apt. 10B*	kitchen (sample 1)	1.79	9.99	ND	4.76
Apt. 10B*	kitchen (sample 2)	3.1	10	ND	3.62
Apt. 2C*	kitchen (sample 1)	20.1	17.2	1.16	2.62
Apt. 2C*	kitchen (sample 2)	21.8	55.5	1.74	5.22
Apt. 3	service line (sample 1)	9.43	300	—	—
Apt. 3	service line (sample 2)	1.65	62.9	—	—
Apt. 3A	kitchen (sample 1)	210	46	0.75	1.1
Apt. 3A	kitchen (sample 2)	5.53	39.8	32.2	62.7
Apt. 3A	kitchen (sample 3)	20.1	39.3	4.63	27.1
Apt. 3B	kitchen (sample 1)	59	39	1.2	1.7
Apt. 3B	kitchen (sample 2)	225	183	1.06	20.5
Apt. 3B	kitchen (sample 3)	67.9	31.9	2.53	19.8
Apt. 3C	kitchen (sample 1)	52	9.2	0.5	0.82
Apt. 3C	kitchen (sample 2)	4.13	7.65	ND	0.66
Apt. 3C	kitchen (sample 3)	2.36	30.6	ND	1.18
Apt. 3D	kitchen (sample 1)	30	39	ND	0.67
Apt. 3D	kitchen (sample 2)	1.74	11.6	ND	0.62
Apt. 3D	kitchen (sample 3)	6.14	28.6	5.8	7.75
Bldg. 360	watermain	ND	0.67	—	—

Notes:
Action Level for Lead is 15 µg/L.
Action Level for Copper is 1,300 µg/L.
* New sampling procedure implemented as recommended by the Suffolk County Department of Health Services.
ND = no detection

2016 Facility Upgrades

In 2016, BNL began construction on a new aeration system at the Water Treatment Facility that removes carbon dioxide more efficiently and effectively than the older existing system. The new system went online in January 2017. Removing the carbon dioxide from the water raises the pH and reduces lime demand, for more effective corrosion control. The new aeration system was installed in the existing retention tank in the filtration building. It consists of a coarse bubble wide-band diffused aeration system that will provide a clog-resistant and maintenance free design suitable for use with drinking water. The previous aeration tank was abandoned and will be scheduled for demolition.

The annual BNL Water Quality Consumer Confidence Report is published by the Environmental Protection Division and the Energy & Utilities Division, with assistance from the Stakeholder and Community Relations Office. It is distributed to approximately 3,300 on-site drinking water consumers served daily by federal public water system No. 5111891 at Brookhaven National Laboratory, Upton, New York 11973, which is managed by Brookhaven Science Associates for the U.S. Department of Energy's Office of Science.

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