BNL Drinking Water: Step by Step From Source to Finished Product

STEP 1. Of the six drinking-water wells, wells 4, 6 and 7 provide high-in-iron source water, which must be "finished" at BNL's Water Treatment Facility (WTF) before it is distributed around site. At one of these wells, Phil Pizzo is seen performing preventive maintenance on a pump motor. Wells 10, 11 and 12 pump water that is low in iron and does not require treatment; so this water is simply chlorinated and pH-adjusted before entering the water distribution system.
— CN10-144-00

STEP 2. Chlorine is added to water from all the wells to kill microbes and oxidize iron. Joe Tullo is pictured inspecting a liquid sodium hypochlorite storage tank.
— CN10-143-01

STEP 3. Aeration reduces carbon dioxide gas and aids in iron oxidation. At the aeration tank, Phil Pizzo and Greg Stawski are seen sampling the water.
— D2850306

STEP 4. Lime is added to raise the pH and soften the water. Greg Stawski is pictured as he feeds lime into the hopper.
— D2800306

STEP 5. Polymer is added to aid in flocculation (see step 6). Richard Lutz (front) is seen adding polymer into a rapid-mix tank, as Phil Pizzo adjust the flow rate.
— D2810306

In the control room of BNL's Water Treatment Facility (WTF), Bldg. 624 on Upton Road, is Richard Lutz.
— D2820306

Although BNL's "raw" water comes from six in-service, on-site drinking-water wells drilled into the Upper Glacial aquifer (see page 3), the Lab's "finished" drinking water is produced with pride by the staff of BNL's Water Treatment Facility (WTF) of the Energy & Utilities Division.

Producing BNL's finished water are six water-treatment engineers, each having New York State Department of Health (NYSDOH) grade IIA certification. In alphabetical order, they are: Tom Boucher, Jack Kulesa, Richard Lutz, Phil Pizzo, Greg Stawski, and Joe Tullo. They are supervised by Water System Supervisor Tony Ross, who is NYSDOH grade IA certified. WTF operations are overseen by Energy & Utilities' Assistant Division Manager for Operations & Environment Bill Chaloupka.

To make what is called potable water for BNL's daily transient and resident population of approximately 3,000 people , WTF staff employ "federal public water system no. 511891." The centerpiece of this system is the WTF itself, located in and around Bldg. 624 on Upton Road. Able to handle up to 6 million gallons per day, the WTF was built in 1963 to remove iron and manganese from the Lab's source water. Over the years, the facility has undergone a series of upgrades, most recently in 1995-96.

The step-by-step flow of water through the water-treatment process and the on-the-job performance of the WTF's certified staff are shown in the following photos taken by BNL photographer Roger Stoutenburgh.
— Marsha Belford

STEP 6. 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. Pictured at the retention tank, Jack Kulesa (left) is checking for floc.
— CN10-35-00

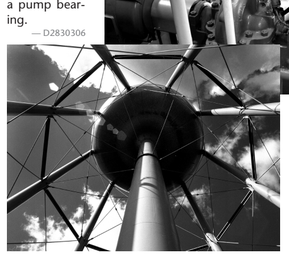
STEP 7. To remove all particles, filtration is performed using a rapid sand filter made up of sand and anthracite coal. Seen inspecting the valves in the filtration valve gallery are: (front to back) Richard Lutz, Phil Pizzo and Greg Stawski.
— D2750306

STEP 8. The wet well stores filtered water before it is pumped into the air-stripping towers. Viewed in the wet-well pump room, Richard Lutz (front) works on a check valve, while Jack Kulesa inspects pump seals.
— CN10-38-00

STEP 9. The air-stripping towers remove volatile organic compounds (VOCs) from water being treated. Pictured inspecting a tower is Joe Tullo.
— D2840306

STEP 10. Pictured at the clear well, where up to 250,000 gallons of "finished" water is stored before its final chlorination and distribution, Richard Lutz and Jack Kulesa take samples.
— CN10-146-00

STEP 11. The high-service pumps send finished water from the WTF to the two water towers on site. Joe Tullo is seen greasing a pump bearing.
— D2830306



STEP 12. Water from the Lab's two storage towers is delivered on site at 55 to 70 pounds of pressure per square inch via 45 miles of distribution pipe. Viewed from its base is the larger of the Lab's towers, which holds one million gallons of water.
— CN10-44-00

STEP 13. Drinking water is sampled at different intervals in various locations, depending upon the test, and samples are analyzed by an independent, certified lab. Results are reported to the Suffolk County Department of Health Services and to BNL's Environmental Protection Division, which ensures that the Lab's water complies with all applicable regulations. Seen testing BNL water quality is Tom Boucher.
— CN10-41-00

Definition of Terms Used in the Consumer Confidence 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 by your water system.
- action level (AL): The concentration of a contaminant which, if exceeded, then triggers treatment and/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 what is called the maximum contamination level goal (MCLG) as possible.
- maximum contamination 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 concentration of a disinfectant allowed in drinking water. Disinfectants have been proven to be necessary for controlling microbial contamination of water and eliminating water-borne illnesses.
- 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.
- treatment technique: A required process intended to reduce the level of a contaminant in drinking water.
- 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).
- millirem per year (mrem/yr): A measure of radiation absorbed by the body.
- micrograms per liter (µg/l): Equals one part of liquid per billion parts of liquid, or parts per billion (ppb).
- picocuries per liter (pCi/L): A measure of radioactivity in water.
- million fibers per liter (MFL): A measure of asbestos fibers longer than 10 micrometers.

BNL Water Quality Consumer Confidence Report

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the Bulletin

BROOKHAVEN NATIONAL LABORATORY

2009 BNL Water Quality Consumer Confidence Report May 29, 2009

BNL's Drinking Water Complies With All Health, Safety Regulations

Last year, as in the past, Brookhaven Lab's drinking water and the supply system that produces it were in full compliance with all applicable county, state and federal regulations regarding drinking-water quality, monitoring, operations, and reporting.

In fact, the Energy & Utilities (E&U) Division, which is responsible for the Lab's drinking-water supply system, is proud to report that BNL's water has never reached or exceeded what are called primary maximum contaminant levels (MCLs), which safeguard drinking-water consumers' health.

To ensure that tap water is safe to drink, the U.S. Environmental Protection Agency (EPA) and the New York State Department of Health (NYSDOH) have prescribed regulations that limit the amounts of certain contaminants in water provided by public water systems such as BNL's. Each drinking-water contaminant has an allowable MCL. Water for drinking that exceeds MCLs for one or more compounds is in violation of the law.

To provide the same protection to those who drink bottled water, the U.S. Food & Drug Administration has established regulations to limit contaminants in bottled water.

Of the 113 drinking-water contaminants for which BNL tests its drinking water at the well, after treatment at the Water Treatment Facility, or at the consumers' tap, only 15 compounds were detected in the Lab's drinking water in 2008 (see table on page 1, below; tables on pages 2 and 3; and the discussion of those compounds on page 3).

Reducing 'Rusty' Water Around the Site

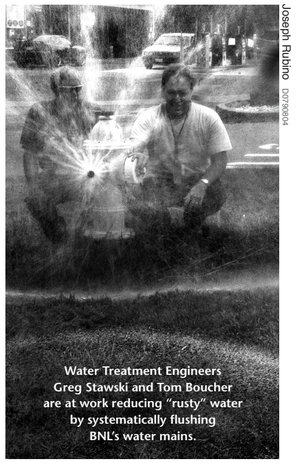
2009 Water-Main Flush Program Started

On April 13, the water treatment engineers of BNL's Water Treatment Facility (WTF) began working their way around the site over a week to flush BNL's water mains. By systematically opening and closing fire hydrants from April 13 to 17, they began BNL's 2009 water-main flushing program.

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

Performed three times a year, on-site water-main flushing will also take place in July and September. Closer to the weeks selected in those months, the hydrant-flushing schedule will be announced via a Bulletin notice, broadcast e-mail, Web posting, and a flyer distributed to on-site residents.

Much of Long Island's groundwater is high in iron, as a result of naturally occurring iron-containing minerals within the aquifer. Water that enters BNL's distribution system, however, has very low iron for one of two reasons: either because it comes from one of the three drinking-water wells that produces water naturally low in iron; or because, if it comes from one of the three high-iron wells, the water is then treated in a multi-step process to remove iron at the Water Treatment Plant (see photo essay on page 4).



Water Treatment Engineers Greg Stawski and Tom Boucher are at work reducing "rusty" water by systematically flushing BNL's water mains.
Joseph Rubino D2090304

While being delivered around site via 45 miles of underground water mains, however, BNL water can and does pick up insoluble iron.

There are two sources of iron in BNL's water-distribution system: First, between 1941, when Camp Upton was reopened on the site during World War II, and 1963, when the WTF was commissioned, BNL did not treat its drinking water for iron; as a result, some 700 pounds of iron per year—or 7.7 tons over 22 years—was deposited. Second, the site has cast-iron and ductile iron water mains which add insoluble iron into the system as a result of oxidation.

Depending upon where a building is located along the water-distribution system, "rusty" water can be more or less of a problem. Because iron does not pose a health risk to most people at levels usually found in water, the EPA regulates it via secondary, or aesthetic, standards (see pages 2 and 3). — Marsha Belford

Visit the WTF: 6/19

Once you've looked at the pictures and read all about the Water Treatment Facility (WTF), why don't you come to see it for yourself—by going on a lunchtime tour for BNL employees, facility-users and other on-site guests.

Organized by Tour Program coordinator Elaine Lowenstein of the Community Relations Office, the WTF tour will take place on Friday, June 19th, from 12 noon to 1 p.m. Meet in the upper lobby of Berkner Hall by 12 noon sharp!

Bulletin Special Edition

2009 BNL Water Quality Consumer Confidence Report

This special edition of the Brookhaven Bulletin is Brookhaven National Laboratory's eleventh annual Consumer Confidence Report. This report is published yearly for the BNL drinking-water consumer, to present an overview of water quality during the previous calendar year. Because the Lab is the on-site drinking-water supplier, BNL is required by the federal Safe Drinking Water Act (SDWA) of 1976, as amended in 1996, to produce an annual report on the quality of its drinking water.

In addition to reminding consumers of the importance and need to protect drinking-water sources, the report's purpose is to inform drinking-water consumers:

- where our water comes from
- what those tests reveal about the water
- what analytical tests are conducted
- how those results compare to state standards

Among its other responsibilities, BNL's Energy & Utilities (E&U) Division is committed to providing all employees, facility-users, guests, residents, and other visitors with safe drinking water while they are on site. To do so, E&U operates BNL's drinking-water supply system, which is considered by the U.S. Environmental Protection Agency to be a "small community public water system" because it serves between 501 and 3,300 people. BNL's water supply system includes six wells dedicated to pumping drinking water and the Water Treatment Facility in Bldg. 624 (see photo essay on page 4).

To make sure that the Lab's drinking water meets all applicable local, state and federal water-quality standards, E&U has BNL's drinking water regularly tested using an independent laboratory approved by the New York State Department of Health.

To ensure that testing results comply with all applicable regulatory standards, analytical data are reviewed by the Lab's Environmental Protection (EP) Division. In addition, E&U and EP work with BNL's Environmental Restoration Projects to make sure that the Lab's potable-water supply is not adversely impacted by groundwater contamination or remediation operations.

For more information and/or copies of the complete analyses of BNL's 2008 drinking-water samples discussed in this report, contact those listed below:

- Bill Chaloupka, E&U Assistant Division Manager for Operations & Environment, Ext. 7136, chaloupka@bnl.gov
- Bob Lee, EP Deputy Division Manager for Environmental Programs, Ext. 3148, blee@bnl.gov
- Suffolk County Department of Health Services, (631) 853-2251

This report is also available at www.bnl.gov/bnlweb/pubaf/bulletin.html and www.bnl.gov/bnlweb/pubaf/water/reports.htm. — Marsha Belford

Latest Results From Lead & Copper Testing At 20 Representative Faucets Around Site

Since 1986 in the U.S., the use of lead in plumbing pipes, fixture, fittings, and solder has been restricted by law, when the federal Safe Drinking Water Act was first amended to require a rule regulating lead and copper at the drinking-water consumer's tap.

Posing certain health risks to most people if consumed in excess, lead and copper enter drinking water mainly as a result of corrosion of plumbing materials. As a result, the federal "lead and copper rule" was issued in 1991 by the U.S. Environmental Protection Agency (EPA) to limit the concentration of these two metals in public water. Then, in October 2007, the rule was revised, requiring water suppliers to reduce water corrosiveness in attempt to protect public water-system consumers from excessive exposure to lead and copper even further.

To know how well they are doing this, water suppliers are required to sample a representative number of consumers' taps, with the frequency of sampling depending upon the size of the system and the system's lead and copper results. BNL, for instance, is required to sample for lead and copper at 20 consumers' taps every three years (see list, below). Sampling was last required and performed in 2006 (see aggregate results, below). Sampling will again take place in 2009, and those results will be reported in 2010.

The lead-and-copper rule revision also requires that BNL notifies occupants of buildings that are part of the lead and copper tap-water sampling program of the test results for their specific faucets. As a result, these results are published in the annual Consumer Confidence Report (CCR), which is distributed to all on-site drinking-water consumers, and which is given to new on-site residents in their Housing Office packets when they check in.

location	faucet	lead 2006 sampling results	copper 2006 sampling results
Apt. 1A	kitchen	28.7 µg/l	0.10 mg/l
Apt. 4C	kitchen	7.6 µg/l	0.03 mg/l
Apt. 5B	kitchen	7.5 µg/l	0.05 mg/l
Apt. 6A	kitchen	4.0 µg/l	0.02 mg/l
Apt. 13D	kitchen	1.0 µg/l	0.02 mg/l
Apt. 24D	kitchen	1.9 µg/l	<MDL
Apt. 26A	kitchen	2.5 µg/l	0.04 mg/l
Apt. 28B	kitchen	<MDL	<MDL
Apt. 34E	kitchen	1.6 µg/l	0.03 mg/l
Apt. 36A	kitchen	2.8 µg/l	0.05 mg/l
Apt. 40G	kitchen	8.8 µg/l	0.03 mg/l
Apt. 42A	kitchen	18.7 µg/l	0.07 mg/l
Bldg. 51	bathrm.	<MDL	<MDL
Bldg. 153	bathrm.	1.3 µg/l	0.02 mg/l
Bldg. 170	bathrm.	<MDL	<MDL
Bldg. 371	bathrm.	11.4 µg/l	0.11 mg/l
Bldg. 460	bathrm.	5.2 µg/l	0.21 mg/l
Bldg. 535	bathrm.	1.2 µg/l	0.32 mg/l
Bldg. 703	bathrm.	1.0 µg/l	0.46 mg/l
Bldg. 911	bathrm.	1.5 µg/l	0.23 mg/l

LEAD AT CONSUMERS' TAP*

MCLG: 0 µg/l
BNL range: <1.0 to 28.7 µg/l
AL at the 90th percentile: 15 µg/l
BNL 90th percentile value: 11.4 µg/l
location of 90th-percentile sample: Bldg. 371 bathroom
location of highest sample: Apt. 1A kitchen
sampling date: 08/04/06 **violation?** No

COPPER AT CONSUMERS' TAP*

MCLG: 1.3 mg/l
BNL range: <0.02 to 0.46 mg/l
AL at the 90th percentile: 1.3 mg/l
BNL 90th percentile value: 0.23 mg/l
location of 90th percentile sample: Bldg. 911 bathroom
location of highest sample: Bldg. 703 bathrm.
sampling date: 08/04/06 **violation?** No

* Discussed in "2008: 15 Parameters Detected in BNL's Drinking Water," on page 3.

What Is in Our Drinking Water?

Although rivers, lakes, streams, ponds, and reservoirs are all sources of tap and bottled drinking water, BNL and the rest of Long Island draw drinking water from groundwater wells that are drilled into the aquifer (see story below).

As water travels over land surfaces or through the ground, it dissolves naturally occurring minerals and radioactive material. In addition, water can pick up substances resulting from human activity or the presence of animals. Contaminants that may be present in water include:

- **microbial contaminants:** bacteria and viruses, which may come from sewage, livestock operations, wildlife, etc.
- **inorganic chemical contaminants:** 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 chemical contaminants:** natural and synthetic compounds, including volatile organic compounds (VOCs). These chemicals are by-products of industrial processes and petroleum production, and they can also come from gas stations, storm-water runoff, septic systems, etc.
- **radioactive contaminants:** can be naturally-occurring, or from oil and gas production, mining activities, nuclear facilities, etc.

Because of the presence of contaminants, source water is often "finished," or treated, to remove substances or reduce their concentration before that water is fit for human consumption (see photo essay on page 4).

Regardless, drinking water — including bottled water — may reasonably be expected to contain at least small amounts of contaminants. The presence of contaminants, however, does not necessarily indicate that the water poses a health risk (see story on page 3).

Some people may be more vulnerable to illness-causing microorganisms or pathogens in drinking water than others. People whose immune systems are compromised may be particularly at risk of infections. Those people include: cancer patients who are undergoing chemotherapy, people who have undergone organ transplants, persons with HIV/AIDS or other immune system disorders, and some elderly people and infants. These people or their care-givers should seek advice from their health-care providers.

Guidelines from the U.S. Environmental Protection Agency (EPA) and the U.S. Centers for Disease Control on ways to reduce the risk of illness by cryptosporidium, giardia and other microbial pathogens are available from the EPA's Safe Drinking-Water Hotline, (800) 426-4791.

More information about drinking-water contaminants can be obtained from the EPA at www.epa.gov/safewater; or from the NYSDOH at www.health.state.ny.us.

2008 Analytical Data

Inorganic Chemicals, Bacteria, Radioactivity

The following maximum values were measured in samples of well water or finished water at the Water Treatment Plant. The ten parameters noted in this table as detected in BNL water are discussed on page 3.

WATER-QUALITY INDICATORS

indicator	*BNL sample*	*MCL*
alkalinity†	28.1 mg/l	NS
ammonia	<MDL	NS
calcium†	10.4 mg/l	NS
chlorides*	48.1 mg/l	250 mg/l
color	<MDL	15 units
conductivity†	297 µmhos/cm	NS
cyanide	<MDL	NS
methylene blue active substances	<MDL	NS
nitrates*	0.72 mg/l	10 mg/l
nitrites	<MDL	1.0 mg/l
odor	<MDL	3 units
pH	5.6 standard units	NS
sulfates*	13.6 mg/l	250 mg/l
total coliform*	1 sample	ND

METALS

metal	*BNL sample*	*MCL*
antimony	<MDL	6.0 µg/l
arsenic	<MDL	50 µg/l
barium	<MDL	2.0 mg/l
beryllium	<MDL	4.0 µg/l
cadmium	<MDL	5.0 µg/l
chromium	<MDL	0.10 mg/l
fluoride	<MDL	2.2 mg/l
iron*	2.68 mg/l	0.3 mg/l
lead	<MDL	15 µg/l
manganese*	0.22 mg/l	0.3 mg/l
mercury	<MDL	2.0 µg/l
nickel	<MDL	0.1 mg/l
selenium	<MDL	50 µg/l
silver	<MDL	100 µg/l
sodium*	25.5 mg/l	NS
thallium	<MDL	2.0 µg/l
zinc*	0.035 mg/l	5.0 mg/l

OTHER

parameter	*BNL sample*	*MCL*
asbestos	<MDL	7 MFL

RADIOACTIVITY

parameter	*BNL well max.*	*MCL*
gross alpha	<MDL	15 pCi/l
gross beta*	2.85 pCi/l	4 mrem/yr
tritium	<MDL	20,000 pCi/l
radium-228*	1.78	5pCi/l
strontium-90	<MDL	8 pCi/l

<MDL: less than the minimum detection limit.
NS: drinking-water standard not specified.
ND: not detected.
† measure of water hardness or dissolved salts.
* Discussed in "2008: 15 Parameters Detected in BNL's Drinking Water," page 3.

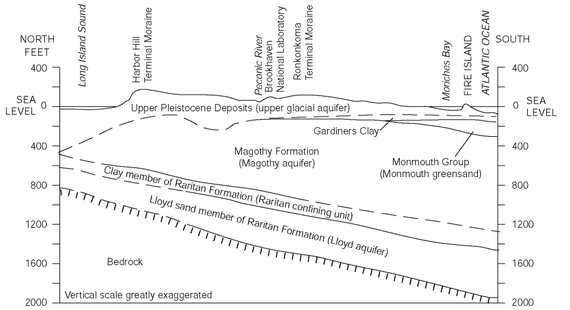
Long Island's 'Sole Source' Aquifer Is Brookhaven Lab's Water Source

All of the water supplied by BNL comes from beneath the ground and, hence, is referred to as groundwater. That water is stored beneath the ground in a sandy, geological formation known as an aquifer. Water in the aquifer originates as precipitation that percolates down through the soil, and this groundwater may be source water for natural springs or man-made wells.

The Long Island aquifer system is made up of three primary formations (see diagram below): From the surface to about 150 feet down is the Upper Glacial aquifer, from 150 to 1,000 feet is the Magothy, and from 1,000 to about 2,000 feet is the Lloyd. Drilled into the Upper Glacial, the Lab's six drinking-water wells draw up to 1,000 gallons per minute, or about 1.15 million gallons of water a day for use as drinking water, process cooling water, or fire protection. Last year, in total, BNL pumped some 420,800,000 gallons.

Long Island's aquifer system is one of 72 "sole source" aquifers in the nation recognized under the aquifer-protection program authorized by the U.S. Safe Drinking Water Act. Long Island's regional aquifer was so named on June 21, 1978, following a 1975 petition to the EPA by the Environmental Defense Fund.

— Marsha Belford



BNL's Source Water Assessed

As required by the 1996 amendments to the Safe Drinking Water Act, an assessment of the source water used by BNL's public water system was done by the New York State Department of Health (NYSDOH), as noted below. Based upon available hydrogeological, land use, and water-quality susceptibility information, the assessment of Brookhaven Lab's source water provides the Laboratory with additional information for use in protecting the source of BNL's drinking water.

As part of the assessment, known and possible contamination sources were evaluated. The assessment includes a susceptibility rating for each well, which is 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, then it does not necessarily mean that there is a health risk. For a discussion of contaminants detected in 2008, see "2008: 15 Parameters Detected in BNL's Drinking Water" on page 3.

BNL's drinking water is pumped from six on-site wells (see story above and photo essay on page 4). According to the NYSDOH source-water assessment, two wells are rated as having a very high susceptibility to industrial solvents. This is 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 the well, then this contamination would be removed by treatment facilities (air stripping or reinstalled carbon filtration) before the water is delivered to the consumer.

In addition, BNL has also identified that one well 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 cannot provide water that meets drinking-water standards, then the Lab would immediately remove it from service.

A copy of the complete NYSDOH assessment may be reviewed by contacting either Doug Paquette, Ext. 7046, or Bob Lee, Ext. 3148.

2008 Analytical Data

Organic Compounds, Pesticides, Micro-Extractables

With two exceptions noted in the table below and discussed on page 3, the following compounds were not detected in source water from the Lab's six drinking-water wells or finished water at the Water Treatment Facility:

compounds	*BNL max.*	*MCL µg/l*
dichlorodifluoromethane	<MDL	5
chloromethane	<MDL	5
vinyl chloride	<MDL	2
bromomethane	<MDL	5
chloroethane	<MDL	5
fluorotrichloromethane	<MDL	5
1,1-dichloroethene	<MDL	5
methylene chloride	<MDL	5
trans-1,2-dichloroethene	<MDL	5
1,1-dichloroethane	<MDL	5
cis-1,2-dichloroethene	<MDL	5
2,2-dichloropropane	<MDL	5
bromochloromethane	<MDL	5
1,1,1-trichloroethane	<MDL	5
carbon tetrachloride	<MDL	5
1,1-dichloropropene	<MDL	5
1,2-dichloroethane	<MDL	5
trichloroethene	<MDL	5
1,2-dichloropropane	<MDL	5
dibromomethane	<MDL	5
trans-1,3-dichloropropene	<MDL	5
cis-1,3-dichloropropene	<MDL	5
1,1,2-trichloroethane	<MDL	5
total trihalomethanes*	6.5	80
1,1,2,2-tetrachloroethane	<MDL	5
1,3-dichloropropane	<MDL	5
chlorobenzene	<MDL	5
bromobenzene	<MDL	5
1,2,3-trichloropropane	<MDL	5
2-chlorotoluene	<MDL	5
4-chlorotoluene	<MDL	5
1,3-dichlorobenzene	<MDL	5
1,4-dichlorobenzene	<MDL	5
1,2-dichlorobenzene	<MDL	5
1,2,4-trichlorobenzene	<MDL	5
hexachlorobutadiene	<MDL	5
tetrachloroethene	<MDL	5
1,1,2,2-tetrachloroethane	<MDL	5
1,2,3-trichlorobenzene	<MDL	5
benzene	<MDL	5
toluene	<MDL	5
ethylbenzene	<MDL	5
m,p-xylene	<MDL	5
p-xylene	<MDL	5
o-xylene	<MDL	5
styrene	<MDL	5
isopropylbenzene	<MDL	5
n-propylbenzene	<MDL	5
1,3,5-trimethylbenzene	<MDL	5
tert-butylbenzene	<MDL	5
1,2,4-trimethylbenzene	<MDL	5
sec-butylbenzene	<MDL	5
4-isopropyltoluene	<MDL	5
n-butylbenzene	<MDL	5
methyl tertiary butyl ether*	0.6	50
lindane	<MDL	0.2
heptachlor	<MDL	0.4
aldrin	<MDL	5
heptachlor epoxide	<MDL	0.2
dieldrin	<MDL	5
endrin	<MDL	0.2
methoxychlor	<MDL	40
toxaphene	<MDL	3
chlordane	<MDL	2
polychlorinated biphenyls (PCBs)	<MDL	0.5
2,4,5-TP (silvex)	<MDL	10
dinoseb	<MDL	50
dalapon	<MDL	50
pichloram	<MDL	50
dicamba	<MDL	50
pentachlorophenol	<MDL	1
hexachlorocyclopentadiene	<MDL	5
di(2-ethylhexyl)phthalate	<MDL	50
di(2-ethylhexyl)adipate	<MDL	50
hexachlorobenzene	<MDL	5
benzo(A)pyrene	<MDL	50
aldicarb sulfone	<MDL	NS
aldicarb sulfoxide	<MDL	NS
aldicarb	<MDL	NS
oxamyl	<MDL	50
3-hydroxycarbofuran	<MDL	50
carbofuran	<MDL	40
carbaryl	<MDL	50
methomyl	<MDL	50
glyphosate	<MDL	50
diquat	<MDL	50
ethylene dibromide	<MDL	0.05
1,2-dibromo-3-chloropropane	<MDL	0.2
2,4-D	<MDL	50
alachlor	<MDL	2
simazine	<MDL	50
atrazine	<MDL	3
metolachlor	<MDL	50
metribuzin	<MDL	50
butachlor	<MDL	50
propachlor	<MDL	50

<MDL: less than the minimum detection limit.
NS: drinking-water standard not specified.
* discussed in "2008: 15 Parameters Detected in BNL's Drinking Water," page 3.

2008: 15 Parameters Detected in BNL's Drinking Water

As marked with an asterisk in the analytical data on pages 1 and 2, and on page 3 below, the 15 parameters discussed below were detected in BNL's drinking water in 2008.

According to the U.S. Environmental Protection Agency, it is reasonable to expect that drinking water—including bottled water—may contain at least small amounts of some contaminants. The presence of contaminants, however, does not necessarily indicate that the water poses a health risk (see story, page 2).

The 15 parameters detected in 2008 in drinking water were found at concentrations well below what are called the maximum contaminant level (MCL; see term definitions on page 4). Thus there were no violations of the federal Safe Drinking Water Act, as amended, or any other applicable government regulation. For more information on these contaminants, go to EPA's Web site: www.epa.gov/safewater/hfacts.html.

BACTERIA

• TOTAL COLIFORM

MCLG: none **# positive samples:** 1 **detected:** 08/08/08, Bldg. 640
MCL: no positive sample **violation?:** No
major sources in drinking water: Naturally present in the environment.

RADIOACTIVITY

• GROSS BETA

MCLG: 0 pCi/l **BNL max.:** 2.85 pCi/l **detected:** 04/14/08, Well #12
MCL: 4 mrem/year **BNL range:** <1.20-2.85 pCi/l **violation?:** No
major sources in drinking water: Decay of natural deposits and man-made emissions.

• RADIUM-228

MCLG: 5 pCi/l **BNL max.:** 1.78 pCi/l **detected:** 07/21/08, Well #6
MCL: 5 mrem/year **BNL range:** <0.42-1.78 pCi/l **violation?:** No
major sources in drinking water: Decay of natural deposits and man-made emissions.

INORGANIC CONTAMINANTS

• CHLORIDES

MCLG: none **BNL max.:** 48.1 mg/l **detected:** 06/06/08, well #11
MCL: 250 mg/l **BNL range:** 15.2-48.1 mg/l **violation?:** No
major sources in drinking water: Naturally occurring or indicative of road-salt contamination.

• COPPER*

COPPER AT THE CONSUMERS' TAP*

MCLG: 1.3 mg/l **BNL range:** <0.02-0.46 mg/l **AL at 90th percentile:** 1.3 mg/l
 # samples exceeding AL: 0 of 20 **BNL value at 90th percentile:** 0.23 mg/l
location of 90th percentile sample: Bldg. 911 bathroom
location of highest sample: Bldg. 703 bathroom
sampling date: 08/04/06 **violation?:** No
major sources in drinking water: Corrosion of household plumbing.

** note: These are the latest results from sampling at the consumers' tap, which last took place in 2006. Sampling will again take place in 2009; those results will be reported in 2010.*

• IRON

MCLG: none **BNL max.:** 2.68 mg/l **detected:** 06/06/08, well #6
MCL: 0.3 mg/l **BNL range:** <0.02-2.68 mg/l **violation?:** No
major sources in drinking water: Naturally occurring.

• LEAD*

LEAD AT THE CONSUMERS' TAP*

MCLG: 0 µg/l **BNL range:** <1.0-28.7 µg/l **AL at 90th percentile:** 15 µg/l
 # samples exceeding AL: 2 of 20 **BNL value at 90th percentile:** 11.4 µg/l
location of 90th percentile sample: Bldg. 371 bathroom
location of highest sample: Apt. 1A kitchen
sampling date: 08/04/06 **violation?:** No
major sources in drinking water: Corrosion of household plumbing, typically plumbing in older buildings.

** note: These are the latest results from sampling at the consumers' tap which last took place in 2006. Sampling will again take place in 2009; those results will be reported in 2010.*

• MANGANESE

MCLG: none **BNL max.:** 0.22 mg/l **detected:** 06/06/08, Well #4
MCL: 0.3 mg/l **BNL range:** <0.01-0.22 mg/l **violation?:** No
major sources in drinking water: Naturally occurring; indicative of landfill contamination.

• NITRATE

MCLG: 10 mg/l **BNL max.:** 0.72 mg/l **detected:** 06/06/08, well #11
MCL: 10 mg/l **BNL range:** <0.01-0.72 mg/l **violation?:** No
major sources in drinking water: Runoff from fertilizer use; leaching from septic tanks, and/or sewage; erosion of natural deposits.

• SODIUM

MCLG: none **BNL max.:** 25.5 mg/l **detected:** 06/06/08, well #11
MCL: none **BNL range:** 10.1-25.5 mg/l **violation?:** No
major sources in drinking water: Naturally occurring, or due to road salt, water softeners, and/or animal waste.

• SULFATES

MCLG: none **BNL max.:** 13.6 mg/l **detected:** 06/06/08, well #12
MCL: 250 mg/l **BNL range:** 7.6-13.6 mg/l **violation?:** No
major sources in drinking water: Naturally occurring.

• ZINC

MCLG: none **BNL max.:** 0.035 mg/l **detected:** 06/06/08, well #6
MCL: 5 mg/l **BNL range:** <0.02-0.035 mg/l **violation?:** No
major sources in drinking water: Naturally occurring, or due to mining waste or corrosion of household plumbing.

VOLATILE ORGANIC CONTAMINANT

• TOTAL TRIHALOMETHANES

TOTAL TRIHALOMETHANES AT THE WELL OR IN WTF EFFLUENT

MCLG: none **BNL max.:** 6.5 µg/l **detected:** 10/03/08, WTF effluent
MCL: 80 µg/l **BNL range:** <0.5-6.5 µg/l **violation?:** No

TOTAL TRIHALOMETHANES AT CONSUMERS' TAP

MCLG: none **BNL annual value:** 20 µg/l **detected:** 08/08/08, Bldg. 363
MCL: 80 µg/l **violation?:** No
major sources in drinking water: By-product of water chlorination, which is performed to kill harmful organisms. Trihalomethanes are formed when source water contains large amounts of organic matter. Total trihalomethanes is the sum of chloroform, bromodichloromethane, dibromochloromethane, and bromoform.

DISINFECTANT AND BY-PRODUCTS

• CHLORINE RESIDUAL

MCLG: none **annual average:** 0.6 mg/l **detected:** 10/03/08, Bldg. 49
MRDLG: 4 mg/l **BNL range:** 0.3-1.3 mg/l **violation?:** No
major sources in drinking water: By-product of drinking-water chlorination.

• HALOACETIC ACIDS (FIVE)

MCLG: none **annual value:** 3 µg/l **detected:** 08/08/08, Bldg. 363
MCL: 60 µg/l **violation?:** No
major sources in drinking water: By-product of drinking-water chlorination.

2008 Analytical Data

Chlorine Disinfectant and Its By-Products

Daily, 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 called sodium hypochlorite is used by BNL for disinfection of 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.

As a result, the Safe Drinking Water Act was amended in 1996 to regulate disinfectants and their by-products. So, since January 2004, BNL has been complying with rules regulating chlorine and its by-products.

BNL's 2008 averages for chlorine residual and by-products are based on results from finished tap water, as follows:

disinfection residual	2008 running annual average	MRDLG
chlorine*	0.6 mg/l	4 mg/l
disinfection by-products	**2008 BNL annual sample**	**MCL**
total trihalomethanes[1] *	20 µg/l	80 µg/l
haloacetic acids (five)[2]*	3 µg/l	60 µg/l

* Discussed in "2008: 15 Parameters Detected in BNL's Drinking Water," above.

[1] Total trihalomethanes are the sum of the concentrations 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.

2008 Water-Supply System Modifications

Activated-Carbon Filters, Well #12 Removed From Service

In 2008, the Lab's water system was modified twice.

In fall, some 20,000 pounds of activated-carbon which was no longer needed as water filter material was removed from the six carbon-filtration vessels housed in buildings next to each well house; and, on October 13, well #12 was removed from service, following the accidental destruction of its well house.

The Lab had installed the six large carbon-filter vessels, two each at wells #10, 11 and 12, in the 1990s, following finding volatile organic compounds (VOCs) in groundwater in the eastern portion of the site. The vessels were filled with activated carbon, which, by adsorbing any VOCs in the source water for those three wells, acted as a filter, removing the VOCs to levels below drinking-water standards.

Over the years, monitoring of these wells showed that the concentration of VOCs has dropped significantly. As a result, filtration with activated carbon was no longer required. The Suffolk County Department of Health Services gave BNL permission to remove the filters from service.

Since activated carbon degrades over time, the vessels were emptied, the carbon disposed of and piping to by-pass the system was installed. The vessels were left in place in case of future need.

Constructed in 1985 on East Fifth Avenue, Bldg. 637, the well house for well #12, was accidentally destroyed during the evening of October 13 because of a low-energy explosion of propane gas, which had accumulated within the 34-foot by 20-foot, concrete-block building as a result of a leak.

Propane had been used to fuel a back-up engine to drive the well pump in the event electric power was lost to the primary engine. No one was working in the building at the time, no one was injured, and there were no releases to the environment. The investigation of the accident is complete and corrective actions are being implemented.

Since only two of the Lab's six wells are required at any given time, the loss of the well house and use of the well has had minimal impact on the Lab's water-supply system.