the Bulletin

BROOKHAVEN NATIONAL LABORATORY

2004 BNL Water Quality Consumer Confidence Report May 28, 2004

2004 BNL Water Quality Report

BNL's Drinking Water Is in Full Compliance With All Regulations

Last year, as in the past, Brookhaven Lab's drinking water was in full compliance with all county, state, and federal regulations. In fact, the Lab's Plant Engineering (PE) Division, which is responsible for the Lab's drinking-water supply system, is proud to report that BNL's water has never violated a primary maximum contaminant level.

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. 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. Each drinking-water contaminant has an allowable maximum contaminant level (MCL). Drinking water that exceeds MCLs for one or more compounds is in violation of the law.

No primary or secondary MCLs were reached or exceeded by BNL's drinking water in 2003, and there were no violations of any government regulations. Of the 113 drinking water contaminants for which testing is required, only 11 compounds (see discussion on page 2 and tables on page 3) were detected in the Lab's drinking water in 2003.

Bulletin Special Edition

2004 BNL Water Quality Consumer Confidence Report

This special edition of The Bulletin is Brookhaven National Laboratory's sixth annual Consumer Confidence Report, which is published to provide an overview of BNL drinking-water quality during calendar year 2003. 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 analytical tests are conducted to ensure its safety
- what those tests reveal about the water
- how those results compare to state standards.

Among its other responsibilities, BNL's Plant Engineering (PE) Division is committed to providing all employees, facility-users, guests, residents, and other visitors with safe drinking water and a reliable drinking-water supply while they are on site. To do so, PE operates BNL's drinking-water supply system, which includes the six wells used for drinking water and the Water Treatment Facility in Bldg. 624 (see photo essay on page 4).

To ensure that the Lab's drinking water meets all local, state, and federal quality standards, PE has BNL's drinking water regularly tested using approved independent and in-house laboratories. Testing results are reviewed by the Lab's Environmental & Waste Management Services (E&WMS) Division, to ensure compliance with all regulatory standards. In addition, PE and E&WMS work with BNL's Environmental Restoration Projects Directorate to ensure that the Lab's potable water supply is not impacted by groundwater contamination or remediation operations.

For more information and/or copies of the complete analyses of BNL's 2003 drinking-water samples, contact those listed below:

- Ed Murphy, PE Division Manager, Ext. 3466 or etmurphy@bnl.gov
- Bill Chaloupka, PE Assistant Division Manager for Operations & Environment, Ext. 7136 or chaloupka@bnl.gov
- Bob Lee, E&WMS Deputy Division Manager for Environmental Programs, Ext. 3148 or 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/water.reports.htm.

Federal Safe Drinking Water Act Turns 30 in December

Federal regulation of drinking-water quality began in 1914, when the U.S. Public Health Service set standards for contagious disease-causing bacteria in drinking water supplied to interstate carriers such as ships and trains. Despite the fact that these standards were expanded and revised over the years, it became apparent by the late 1960s that there were chemicals, pathogens, and aesthetic problems impacting drinking-water quality other than those regulated by the Public Health Service.

This increased awareness led to the passage of several federal environmental and health laws regarding water, including the Safe Drinking Water Act of 1974. Signed into law on December 16, 1974, the Safe Drinking Water Act (SDWA) created the first-ever national, mandatory regulation of the nation's public drinking-water supply systems. The goal of SDWA is to ensure that public water from its sources through to the consumer's tap meets national standards set to protect the public from harmful contaminants. As amended in 1986 and 1996, that law is administered today by the U.S. Environmental Protection Agency (EPA) and the state and local agencies to which it delegates responsibility.

EPA divides the nation's water systems into two categories: public and private. Defined as providing drinking water to at least 25 people or 15 service connections for at least 60 days per year, public water systems can be owned publicly by, for instance, a municipality or governmental agency, or they can be privately held, by, for example, a for-profit water company. Regardless ownership, all public water systems are regulated by the SDWA.

One such public water system that is owned by the public is Brookhaven Lab's. Designated as federal public water system no. 511891 and owned by the U.S. Department of Energy, the Lab's drinking-water system is the only source on site of what is called potable water for BNL's transient and resident daily population of approximately 3,500 people (see photo essay, page 4).

While the Plant Engineering Division is responsible for producing and distributing BNL water, the Environmental & Waste Management Services Division is charged with ensuring the safety of BNL's source and "finished" water, doing so by making sure that the Lab's water complies with all the requirements of the SDWA and other applicable regulations.

SDWA in 1974, 1986 & 1996

Following the passage of SDWA in 1974, EPA established its first set of drinking-water quality standards governing only 18 contaminants and water-quality indicators. Although SDWA was amended slightly in 1977, 1979, and 1980, the first set of significant changes to the 1974 law came in 1986, when SDWA was reauthorized.

Among the items specified by Congress in the 1986 amendments, EPA was required to: set primary standards for 83 specific contaminants, mandate that all public water be disinfected, develop groundwater-protection programs, establish monitoring requirements for unregulated contaminants, and implement a ban on using lead-based solder and other materials within a water-distribution system.

In 1996, Congress again revised the SDWA, by mandating: risk-based standards setting, reliance on the best available science, pollution prevention programs, strengthened compliance enforcement, and, last but not least, greater public participation in drinking-water issues.

Consumer Confidence Report, Source Water Assessment

To provide improved access to water-quality information, the 1996 SDWA amendments require that community water systems, which are public water systems serving the same people year-round as BNL's does, provide drinking-water consumers with an annual report. First issued in 1999, each consumer confidence report discusses the public system's water source and the analytical

(continued on page 3)

2004 Water-Main Flushing Began This Spring; to Continue Summer, Fall

Water Treatment Engineer Joe Tullo helps to eliminate the site's "rusty" water by systematically flushing BNL's water mains.

For one week this spring, May 17-21, the water-treatment engineers of BNL's Water Treatment Facility (WTF) again worked their way systematically around the site to flush BNL's hydrants. With the goal of reducing the "rusty" water on site, the hydrants will again be flushed over a week this summer and fall.

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 to improve water quality.

Much of Long Island's groundwater is naturally high in iron as a result of dissolved iron-containing minerals, such as iron oxides from the Upper Glacial aquifer. At BNL, water from three drinking-water wells is low in iron; water from the three other drinking-water wells is high in iron and so requires "finishing" (see page 4).

Despite water treatment, there are two sources of iron in BNL's water-distribution system: First, between 1941, when Camp Upton was reopened on 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 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. 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).

When the hydrant flushing schedule is known, water-users around site will be informed via e-mail, and on-site residents will be notified via a flyer.

What Is in Our Drinking Water?

While sources of tap and bottled drinking water include rivers, lakes, streams, ponds, reservoirs, and springs, Long Island — including BNL — draws its drinking water from wells tapping into the aquifer (see story and diagram on page 3). As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, 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, and wildlife.
- **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, and/or farming.
- **pesticides & herbicides:** substances for eliminating problem insects and plants, respectively; may come from a variety of sources such as agricultural operations, storm-water runoff, and/or residential uses.
- **organic chemical contaminants:** natural and synthetic compounds, including volatile organic compounds (VOCs). These chemicals are by-products of industrial processes and petroleum production, and can also come from gas stations, storm-water runoff, and septic systems.
- **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, page 4). Regardless, drinking water — including bottled water — may reasonably be expected to contain at least small amounts of contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk (see below).

Some people may be more vulnerable to disease-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 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 lessen the risk of infection by cryptosporidium, giardia, and other microbial pathogens is 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.

The 11 Compounds Detected in BNL's Drinking Water in 2003

As marked with an asterisk in the analytical data on page 3, the 11 compounds discussed below were detected in BNL's drinking water in 2003.

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. However, the presence of contaminants does not necessarily indicate that the water poses a health risk (see story, above).

The 11 compounds detected in BNL drinking water in 2003 were found at concentrations well below what are called the maximum contaminant level (MCL; see definitions, below), so no violation of the Safe Drinking Water Act or any other applicable regulation occurred.

For more information on these contaminants, go to EPA's Web site: www.epa.gov/safewater/hfacts.html.

WATER-QUALITY INDICATORS

• COLOR*

MCLG: none — MCL: 15 units
BNL max: 30 units* — detected: July 10, 2003
BNL range: <5-30 units — violation?: No

- ***major sources in drinking water:*** Natural presence of metals such as copper, iron, and manganese.
- ***possible health effects:*** Water color has no health effects. When color is present at levels as low as 5 units, some people may find the color aesthetically displeasing and objectionable.

• CHLORIDES

MCLG: none — MCL: 250 mg/l
BNL max.: 29.2 mg/l — detected: July 10, 2003
BNL range: 4.4-29.2 mg/l — violation?: No

- ***major sources in drinking water:*** Naturally occurring or indicative of road-salt contamination.
- ***possible health effects:*** No health effects. The MCL for chloride is the level above which the taste of water may become objectionable. In addition to the adverse taste effects, high chloride concentrations in water contribute to the deterioration of domestic plumbing and water heaters. Elevated chloride concentrations may also be associated with sodium in drinking water.

• NITRATES

MCLG: 10 mg/l — MCL: 10 mg/l
BNL max: 0.56 mg/l — detected: July 10, 2003
BNL range: 0.11-0.56 mg/l — violation?: No

- ***major sources in drinking water:*** Runoff from fertilizer use; leaching from septic tanks, and/or sewage; erosion of natural deposits.
- ***possible health effects:*** Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue baby syndrome.

• SULFATES

MCLG: none — MCL: 250 mg/l
BNL max.: 10.5 mg/l — detected: July 10, 2003
BNL range: 5.9-10.5 mg/l — violation?: No

- ***major sources in drinking water:*** Naturally occurring.
- ***possible health effects:*** High sulfate concentrations in drinking water can have three effects: first, water containing appreciable amounts of sulfate tends to form hard scales in boilers and heat exchangers; second, sulfates affect the taste of water; and, third, sulfates can act as a laxative if intake is excessive. Sulfates' laxative effect is usually observed in transient users of a water supply, as people who are accustomed to high sulfate level do not respond adversely. Diarrhea may result from sulfate levels greater than 500 mg/l, but, typically, from levels nearer 750 mg/l.

ORGANIC COMPOUNDS

• TRIHALOMETHANES

MCLG: none — MCL: 80 µg/l
BNL max: 21.7 µg/l — detected: October 2, 2003
BNL range: 0.5-21.7 µg/l — violation?: No

- ***major sources in drinking water:*** By-product of drinking-water chlorination, which is performed to kill harmful organisms. Trihalomethanes are formed when source water contains large amounts of organic matter.
- ***possible health effects:*** Some people who drink water containing trihalomethanes in excess of the MCL over many years may experience liver, kidney, or central nervous system problems, and may have an increased risk of getting cancer.

METALS

• IRON*†

MCLG: none — MCL: 0.3 mg/l
BNL max.: 3.23 mg/l — detected: July 10, 2003
BNL range: <0.02-3.23 mg/l — violation?: No

- ***major sources in drinking water:*** Naturally occurring.
- ***possible health effects:*** Iron usually has no health effects. When iron reaches 1 mg/l, a substantial number of people will notice the bitter, astringent taste of iron. At this concentration, it also imparts a brownish color to laundered clothing and stains plumbing fixtures with a characteristic rust color. Staining can result at levels of 0.05 mg/l, which is lower than those detectable to taste buds. Therefore, MCL of 0.3 mg/l represents a reasonable compromise, as, at this level, adverse aesthetic effects are minimized. Many multivitamins contain 3,000-4,000 mg of iron per capsule.

• LEAD

MCLG: 0 µg/l — MCL: 15 µg/l
BNL max.: 1.31 µg/l — detected: January 9, 2003
BNL range: <1.0-1.31 µg/l — violation?: No

- ***major sources in drinking water:*** Corrosion of household plumbing.
- ***possible health effects:*** Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight defects in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.

• MANGANESE†

MCLG: none — MCL: 0.3 mg/l
BNL max.: 0.13 mg/l — detected: July 10, 2003
BNL range: <0.01-0.13 mg/l — violation?: No

- ***major sources in drinking water:*** Naturally occurring; indicative of landfill contamination.
- ***possible health effects:*** An estimated safe and adequate daily dietary intake of manganese is 20-50 mg/l for adults. Those who consume large amounts of vegetables often consume even higher amounts of manganese. Since drinking water contains iron and manganese, it is better if it is not used to make infant formula. Excess manganese produces a brownish color in laundered goods, and it affects the taste of tea, coffee, and other beverages. Concentrations may cause a dark brown or black stain on porcelain plumbing fixtures. As does iron, manganese may form a coating on distribution pipes, which may slough off, causing black particles in the water and/or brown blotches on laundry.

• SODIUM

MCLG: none — MCL: none
BNL max.: 16.5 mg/l — detected: July 10, 2003
BNL range: 6.2-16.5 mg/l — violation?: No

- ***major sources in drinking water:*** Naturally occurring, or due to road salt, water softeners, and/or animal waste.
- ***possible health effects:*** Water containing more than 20 mg/l of sodium should not be used for drinking by people on severely restricted sodium diets. Water containing more than 270 mg/l of sodium should not be used for drinking by people on moderately restricted sodium diets.

RADIOACTIVITY

• GROSS ALPHA

MCLG: 0 pCi/l — MCL: 15 pCi/l
BNL max.: 2.62 pCi/l — detected: October 22, 2003
BNL range: 1.31-2.62 pCi/l — violation?: No

- ***major sources in drinking water:*** Erosion of natural deposits.
- ***possible health effects:*** Certain minerals are radioactive and may emit a form of radiation known as alpha radiation. Some people who drink water containing alpha emitters in excess of the MCL over many years may have an increased risk of getting cancer.

• BETA/PHOTON EMITTERS

MCLG: 0 pCi/l — MCL: 50 pCi/l
BNL max.: 3.92 pCi/l — detected: October 22, 2003
BNL range: <1.98-3.92 pCi/l — violation?: No

- ***major sources in drinking water:*** Decay of natural and man-made deposits.
- ***possible health effects:*** Certain minerals are radioactive and may emit forms of radiation known as photons and beta radiation. Some people who drink water containing beta and photon emitters in excess of the MCL over many years may have an increased risk of getting cancer.

****NOTE:*** *Color in BNL water is due to iron. Color was noted in well water before its treatment at the Water Treatment Facility, where well water is finished to reduce iron concentration before it is distributed around site.*

†***NOTE:*** *If iron and manganese are present, then the total concentration of both should not exceed 0.5 mg/l.*

Confidence-Report Terms Defined

- **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.
- **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 is a measure of the concentration of ions, such as dissolved salts, in the water.
- **Milligrams per liter (mg/l):** Equals one part of liquid per million parts of liquid, or parts per million (ppm).
- **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 the presence of asbestos fibers longer than 10 micrometers.

Safe Drinking Water Act of 1974 Turns 30

Long Island's 'Sole Source' Aquifer Is BNL's Drinking-Water Source

One provision of the original Safe Drinking Water Act that has stood the test of time and has not been modified since the law's enactment in 1974 is the sole-source aquifer-protection program.

An aquifer is an underground, geological formation that contains water. Water in the aquifer originates as precipitation that percolated down through the soil, and this groundwater may be the source for natural springs or man-made wells.

The Long Island aquifer system is made up of three primary formations lying one on top of the other, and all three run under BNL's site (see map). 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.

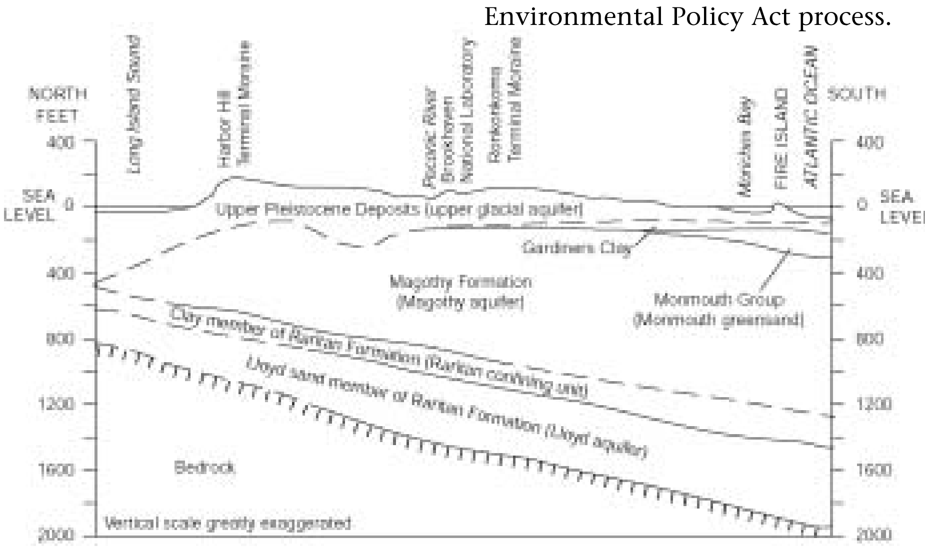
Tapping into just the Upper Glacial, the Lab's six drinking-water wells draw up to 1,000 gallons per minute, or about 2.2 million gallons of water a day for use as drinking water, process cooling water, and fire protection.

Under the SDWA's aquifer-protection program, any individual or group may petition EPA to designate an aquifer as sole, or principal source of drinking water for a community.

To be designated, an aquifer must serve as the principle drinking-water source for more than 50 percent of the population in the area overlying the aquifer. There must be no other drinking-water source that could physically, legally, or economically serve that population. As a result, if such an aquifer were contaminated, then it would create a significant public health hazard and cause significant hardship.

Nationwide, 72 aquifers, including the one beneath Nassau and Suffolk Counties, have been designated. Long Island's regional aquifer was so named on June 21, 1978, following a 1975 petition made to the EPA by the Environmental Defense Fund.

Once an aquifer is designated, then the EPA has the authority to review and approve any federally financed projects that have the potential to contaminate the aquifer. At BNL, this project review is conducted as part of the National Environmental Policy Act process.



Safe Drinking Water Act Turns 30

continued

results of drinking-water tests for the previous year. Complying with this requirement, the Lab has produced six annual drinking-water quality reports since 1999, including the one that you are now reading.

This year, however, a new provision of the 1996 SDWA amendments is taking effect: the publication within each confidence report of a summary of what is called a source-water assessment.

The 1996 amendments required each state to develop a source-water assessment program by 1999 and to complete assessments of each water source used by public drinking water systems by May 2003. Within New York, the New York State Department of Health (NYSDOH) was responsible for developing the state-wide program. Within Suffolk County, the Suffolk County Department of Heath Services (SCDOHS) coordinated the process for NYSDOH. The assessments for public water sources in Suffolk and Nassau Counties were performed by a water-resources engineering firm hired by NYSDOH.

At BNL, hydrogeologists within the Environmental & Waste Management Services Division worked with NYSDOH, SCDOHS, and its contractor to develop the assessment (www.bnl.gov/esd/GPMP_filesSource%20Water%20Assessment.pdf) and its summary statement (see below).

New SDWA Requirement

BNL Source-Water Assessment

As required by the 1996 amendments to the Safe Drinking Water Act (see story, starting on page 1), the New York State Department of Health (NYSDOH) completed what is called a source-water assessment of all public water systems, including BNL's. Based upon available hydrogeologic, land use, and water-quality susceptibility information, the assessment of the 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.

While 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. In addition, if a contaminant is present, then it does not necessarily mean that there is a health risk. For a discussion of contaminants detected in 2003, see "The 11 Compounds Detected in BNL's Drinking Water in 2003" on page 2.

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 to have 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 existing treatment facilities (carbon filters or air stripping, see page 4) before the water is delivered to the consumer.

In addition, BNL has also identified that one well is susceptible to radionuclide contamination. 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 will 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.

2003 Analytical Data

Inorganic Chemicals, Bacteria, Radioactivity

The following values for water-quality indicators, metals, and other compounds were measured in samples of well or finished water. Data for radioactivity are the maximum values obtained from samples drawn at BNL's six potable drinking-water wells. The 10 compounds noted in this table as being detected in BNL water are discussed on page 2.

compound	BNL sample	MCL
WATER-QUALITY INDICATORS		
total coliform	ND	ND
color	30 MDL*	15 units
odor	0 units	3 units
chlorides	29.2 mg/l*	250 mg/l
sulfates	10.5 mg/l*	250 mg/l
nitrates	0.56 mg/l*	10 mg/l
nitrites	<MDL	1.0 mg/l
alkalinity	53.4 mg/l	NS
ammonia	<MDL	NS
calcium	10.1 mg/l	NS
conductivity	285 µmhos/cm	NS
cyanide	<MDL	NS
pH	5.9-6.8 SU	NS
methylene blue active substances	<MDL	NS
METALS		
compound	*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	3.23 mg/l*	0.3 mg/l
lead	1.31 µg/l*	15 µg/l
manganese	0.13 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	16.5 mg/l*	NS
thallium	<MDL	2.0 µg/l
zinc	<MDL	5.0 mg/l
OTHER		
compound	*BNL sample*	*MCL*
asbestos	<MDL	7 MFL
RADIOACTIVITY		
compound	*BNL well max.*	*MCL*
gross alpha	2.62 pCi/l*	15 pCi/l
beta	3.92 pCi/l*	50 pCi/l
tritium	<MDL	20,000 pCi/l
strontium-90	<MDL	8 pCi/l

<MDL: less than the minimum detection limit.
NS: drinking-water standard not specified.
ND: not detected.
SU: standard units.
* discussed in "The 11 Compounds Detected in BNL's Drinking Water in 2003," on page 2.

2003 Analytical Data

Organic Compounds, Pesticides, Micro-Extractables

With one exception, as noted in the table below and discussed on page 2, the following compounds were not detected in the water from the Lab's six drinking-water wells or the finished water from 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
trichloroethane	<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
trihalomethanes	21.7*	100
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 tert. butylether	<MDL	50
lindane	<MDL	0.2
heptaclor	<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
hexachlorcyclopentadiene	<MDL	5
di(2-ethylhexyl)phthalate	<MDL	50
di(2-ehtylhexyl)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
carbarl	<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
alachor	<MDL	2
simazine	<MDL	50
atrazine	<MDL	3
metolachor	<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 "The 11 Compounds Detected in BNL's Drinking Water in 2003," on page 2.

BNL Drinking Water: Produced With Pride by the WTF's Certified Staff

While BNL's "raw" water comes from six on-site drinking-water wells tapped 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 Plant Engineering (PE) Division. They employ "federal public water system no. 511891" to make what is called potable water for BNL's daily transient and resident population of approximately 3,500 people.

The centerpiece of the Lab's drinking-water system is the Water Treatment Facility (WTF), 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.

Because it is high in iron, water from three wells (numbered 4, 6, and 7), which are located in the western portion of the site, is delivered to the WTF.

Water from the other three wells (numbered 10, 11, and 12), which are located in the eastern part of the site, is low in iron, so it does not require treatment. Therefore, after passing through activated carbon filters and being chlorinated and pH-adjusted, that water is directly delivered to the system for distribution around site.

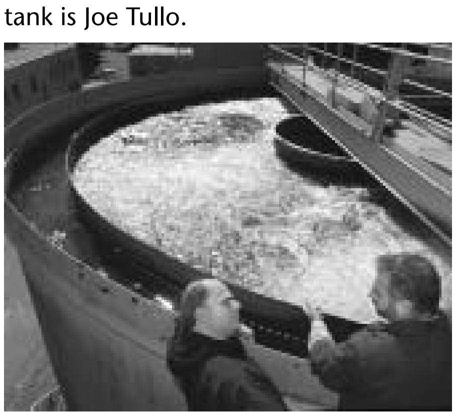
Drinking-water production is the role and responsibility of Water System Supervisor Tony Ross, who holds a New York State Department of Health (NYSDOH) grade IA certification. Ross is assisted by six water-treatment engineers, each having NYSDOH grade IIA certification. In alphabetical order, they are: Steve Barcelo, Tom Boucher, Jack Kulesa, Richard Lutz, Phil Pizzo, Greg Stawski, and Joe Tullo. WTF operations are overseen by Bill Chaloupka, who is PE Assistant Division Manager for Operations & Environment.

The flow of water through the Lab's treatment system and the on-the-job performance of the WTF's certified staff are shown in photos taken by Roger Stoutenburgh.

1A. WELLS 4, 6, and 7 provide source water high in iron that must be "finished" at BNL's Water Treatment Facility (WTF). At one of these wells, Phil Pizzo performs preventive maintenance on pump motor.

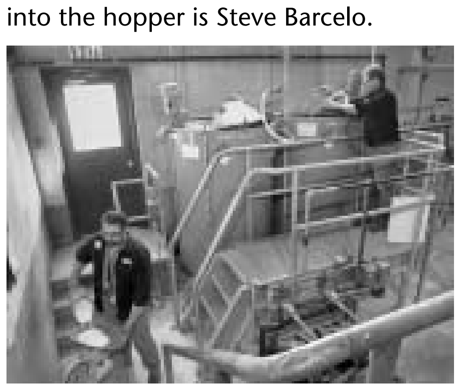
1B. CARBON FILTRATION AT WELLS 10, 11, and 12 is designed to remove volatile organic compounds before the low-iron water from these three wells directly enters the drinking-water distribution system. Noting the pressure of the carbon filtration system is Richard Lutz.

2. CHLORINATION of water from wells 4,6, and 7 is performed at this point using sodium hypochlorite to kill bacteria and oxidize the iron in the water. Iron removal by oxidation and filtration reduces the water's iron concentration from 3 to 4 milligrams per liter (mg/l) to the "finished" water's 0.03 mg/l. Inspecting a liquid sodium hypochlorite storage tank is Joe Tullo.

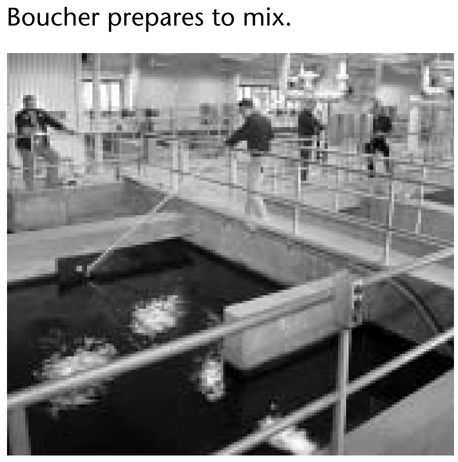


3. AERATION TANK reduces carbon dioxide gas and aids in the oxidation of iron. At the aeration tank, Steve Barcelo (right) describes the action to Frank Masia.

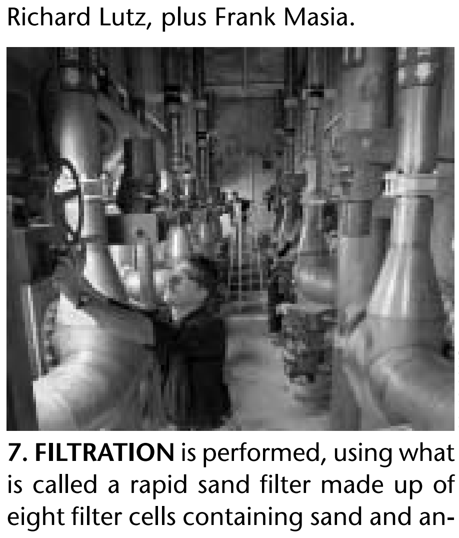
4. LIME is added after aeration (no. 3) and before retention (no. 6) to raise the pH and soften the water. Feeding lime into the hopper is Steve Barcelo.



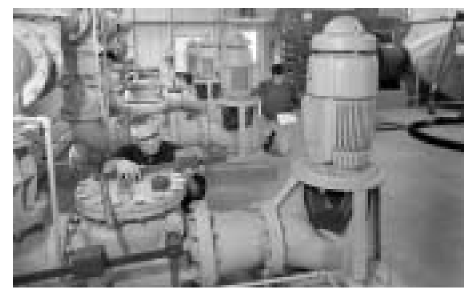
5. POLYMER is also added to the water after aeration to aid in a process called flocculation, whereby very small hydroxide particles stick together to form larger particles, called floc, which are more easily settled and removed (see no. 6). The polymer is mixed with the water in a rapid-mix tank. Steve Barcelo (left) is seen measuring the polymer, while Tom Boucher prepares to mix.



6. RETENTION TANK holds the water long enough to allow the chemicals time to react and form floc. To aid in the formation of floc, the water is then sent to a slow-mix tank. At the retention tank are: (from left) Steve Barcelo, Jack Kulesa (who is checking for floc particles), and Richard Lutz, plus Frank Masia.



7. FILTRATION is performed, using what is called a rapid sand filter made up of eight filter cells containing sand and anthracite. Inspecting the valves in the filtration valve gallery are: (front to back) Jack Kulesa, Richard Lutz, and Steve Barcelo.



8. WET WELL stores the filtered water before it is pumped into the air-stripping towers. While Jack Kulesa (background) inspects the wet-well pump seals, Richard Lutz works on a check valve.

9. AIR-STRIPPING TOWERS remove any volatile organic compounds (VOCs) from the water undergoing the WTF process by spraying the water down over whiffle ball-like fill while air flows upward through the water spray. Inspecting the towers from the top is Steve Barcelo. Frank Masia looks on from below.

10. CLEAR WELL stores up to 250,000 gallons of what is now called "finished" water before its final chlorination and distribution. Seen taking a water sample at the clear well are Richard Lutz (left) and Jack Kulesa.

11. HIGH-SERVICE PUMPS send finished water from the WTF to the two water towers on site. Adjusting the flow rate of a high-service pump is Steve Barcelo.

12. ONE-MILLION-GALLON WATER STORAGE TOWER, as viewed from its base, is the larger of the Lab's two water towers. Built in 1985, and located at Cornell and North Sixth Street, this tank is 126 feet above the ground; its bowl is 75.5 feet in diameter. Located next to Police Headquarters, Bldg. 50, the other water storage tank holds 300,000 gallons and was built for the U.S. Army in 1941, when the site was Camp Upton. Water from the two towers is delivered on site at a pressure of 55 to 70 pounds per square inch via 45 miles of distribution pipe. The piping is a mix of cast iron dating from World War II Camp Upton, transite, plastic, and cement-lined ductile iron. When pipe is added or replaced, cement-line ductile iron is used.

13. TESTING THE QUALITY OF BNL'S DRINKING WATER at the WTF is Tom Boucher. The Lab's drinking water is tested in various locations weekly, monthly, quarterly, semi-annually, and annually, depending upon the test. Test samples are analyzed by certified laboratories, and results are reported to the Suffolk County Department of Health Services, which conducts its own annual tests of public water systems in the county. BNL results are also delivered to BNL's Environmental & Waste Management Services Division, which ensures that the Lab's water is in compliance with all applicable regulations. The results are summarized in this publication, the Lab's annual Water Quality Consumer Confidence Report.

BNL Water Quality Consumer Confidence Report

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