the Bulletin

BROOKHAVEN NATIONAL LABORATORY

2002 BNL Water Quality Consumer Confidence Report — May 31, 2002

Bulletin Special Edition

2002 BNL Water Quality Consumer Confidence Report

This special edition of The Bulletin is Brookhaven National Laboratory's third annual Consumer Confidence Report, which is published to provide an overview of water quality during calendar year 2001. 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 while they are on site with safe drinking water and a reliable drinking-water supply. To do so, PE operates BNL's drinking-water supply system, which includes the six wells used exclusively for drinking water and the Water Treatment Facility in Bldg. 624 (see story and photo essay on page 3).

To ensure that the Lab's drinking water meets all local, state, and federal quality standards, BNL's Environmental Services Division (ESD) has the Lab's drinking water regularly tested using approved independent and in-house laboratories. In addition, PE and ESD work with BNL's Environmental Restoration Division to ensure that the Lab's potable water supply is not impacted by groundwater contamination on site.

For more information and/or copies of the complete analysis of BNL's 2001 drinking-water samples, contact those listed below. This report is also available at www.bnl.gov/bnlweb/pubaf/bulletin.html.

- Ed Murphy, PE Division Manager, Ext. 3466 or etmurphy@bnl.gov
- William Chaloupka, PE Assistant Manager for Operations & Environment, Ext. 7136 or chaloupka@bnl.gov
- Bob Lee, ESD Deputy Manager, Ext. 3148 or blee@bnl.gov
- Suffolk County Department of Health Services, (631) 853-2251

2002 BNL Water Quality Report

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

Last year, as in the past, BNL'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, is proud to report that BNL's water system has not violated a maximum contaminant level or any other water-quality standard.

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 and NYSDOH have 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.

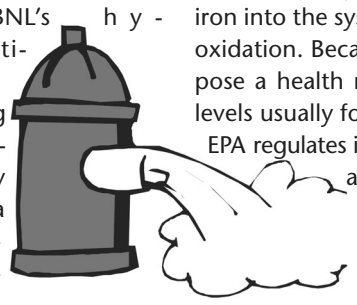
No regulated MCLs were reached or exceeded by BNL's drinking water in 2001, and there were no violations of any government regulations. Of the more than 80 drinking water contaminants for which testing is required, only 11 compounds (see page 2) were detected in the Lab's drinking water in 2001.

Water Versus Plumbing

2002 Water-Main Flushing To Commence This July

Continuing the effort to reduce the amount of insoluble iron in BNL's water supply system — and the number of complaints about "rusty water" — the second year of a renewed and expanded hydrant flushing program will begin this July.

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 the system and to improve water quality. So, July 8-12, the water-treatment engineers from BNL's Water Treatment Facility (WTF) will work with firefighters from BNL's Fire-Rescue Group to flush BNL's hydrants systematically.



Much of Long Island's groundwater is naturally high in iron as a result of its dissolving iron-containing minerals, such as iron oxides in the Upper Glacial aquifer. At BNL, water from three drinking-water wells is low in iron, while water from the three others is high in iron and so requires finishing (see page 3).

Regardless of water treatment, 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 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 humans at levels usually found in water, the EPA regulates it via secondary, or aesthetic, standards (see page 2).

BNL Drinking-Water Quality

Lab Water Places Second to Greenlawn In 2nd Annual BNL Taste Test

After two days of water tasting, the Lab's drinking water emerged in second place out of the four "brands" of drinking water that competed in the second annual blind taste-test, held during Healthfest 2001.

With 646 points and comments about its being "refreshing" and "cool" (but also about its "metallic" and "chlorinated" taste), BNL's drinking water beat Aqua Cool, the bottled water then provided on site, which finished third with 643 points and remarks about its being "bland" and "flat-tasting." The Lab's drinking water also triumphed over water from the Hampton Bays Water District, which came in last with 618 points and complaints of a "strange" "after-taste."

With 659 points and praises of its "pure" and "clean" taste, the winner of the 2001 contest was water from the Greenlawn Water District. Judging the event were 280 BNLers who had stopped by at the BNL Water Quality booth at the Healthfest health, fitness & safety fair held on October 17 & 18, 2001.

As it turns out, the 2001 winning drinking water shares a characteristic with water from the Dix Hills Water District, the winner of the 2000 contest: both Greenlawn and Dix Hills draw water from the Magothy aquifer, the middle and largest of Long Island's three aquifer layers. As does Hampton Bay, BNL obtains its water from the top-most Upper Glacial aquifer (see diagram, page 3).

Besides featuring two different "brands" of public drinking water to taste-test in addition to BNL water and on-site bottled water, the 2001 contest offered another twist: what was labeled A, B, C, and D on the first day was not the same as what was under the A-D labels on the second day.

This change was decided upon after the brands in the 2000 contest finished in the order in which they were presented to the tasters. So, the hypothesis is, position influences the outcome.

That may be the case, as the results for each of the 2001 contest's two days are as follows:

Wednesday, October 17	**Thursday, October 18**
A: Greenlawn 324 points	A: BNL 340 points
B: Aqua Cool 307 points	B: Greenlawn 335 points
C: Hampton Bays 306 points	C: Aqua Cool 336 points
D: BNL 306 points	D: Hampton Bays 312 points

To retest this hypothesis, a third annual drinking-water taste test will be held during Healthfest 2002, during which BNL's water will again be put to the test against Nature's Best, the bottled water now supplied on site, plus two yet-to-be-determined brands of public water.

Results From the First BNL Water-Quality Survey

While 70 percent of BNL employees and guests feel that the Lab's water is safe to drink, only 55 percent of them drink it. And, of the 75 percent of BNLers who think that the safety of the Lab's drinking water is or may be an issue of concern to the BNL community, some 97 percent believe that it is an issue that is somewhat to very important.

These are some of the results from the first BNL water-quality survey, which was voluntarily completed by 214 BNL employees and guests who stopped by the BNL water-quality information booth during the two-day Healthfest fair last October 17 & 18. As it is estimated that some 600 BNLers came to the fair, approximately one-third of Healthfest fair attendees participated in the eight-question water survey. The Lab's transient and resident population on a work day is estimated at 3,500.

As most BNLers will agree, it is unusual to work for an employer other than a water company that not only has drinking-water wells, but also has a water treatment facility and a staff dedicated to the safe supply of potable water. While BNLers have been discussing the quality of the Lab's water among themselves for years, the comments, questions, and concerns of a sampling of the internal community regarding BNL water quality had not been documented until this survey.

The informal questionnaire was put together by the Plant Engineering Division, Environmental Services Division, and the Community, Education, Government & Public Affairs Directorate, as part of their effort to improve drinking-water communications and community involvement. As discussed on page 2, the results from the two days of surveying are being used to improve drinking-water operations and management, as well as the consumers' understanding and perception of BNL drinking-water and associated issues.

(continued on page 4)

Analytical Data

Organic Compounds, Pesticides, Micro-Extractables

With one exception, which is noted in the following table and discussed below at right, the following compounds were not detected in the water from the Lab's six drinking-water wells:

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	3.7*	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-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
p-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 "11 Compounds Detected in BNL's Drinking Water," at right.

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 on page 3). 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.

11 Compounds Detected in BNL's Drinking Water

As marked with an asterisk in the analytical data on this page, the following 11 compounds were detected in BNL's drinking water in 2001. As discussed above, the presence of contaminants does not necessarily indicate that the water poses a health risk. In fact, all of the compounds found in BNL drinking water were detected well below what is called the maximum contaminant level goal (MCLG) and the maximum contaminant level (MCL) (see definitions, page 3).

Organic Compound

• TRIHALOMETHANES
MCLG: none MCL: 80 µg/l
BNL max: 3.7 µg/l detected: Jan. 2001
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.

Water-Quality Indicators

• CHLORIDES
MCLG: none MCL: 250 mg/l
BNL max.: 27.3 mg/l detected: July 2001
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: 0.4 mg/l detected: July 2001
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.: 8.5 mg/l detected: July 2001
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.

Metals

• IRON†
MCLG: none MCL: 0.3 mg/l
BNL max.: 0.17 mg/l detected: July 2001
major sources in drinking water: Naturally occurring.
possible health effects: Iron has no health effects. When iron reaches 1,000 µg/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 50 µg/l, which is lower than those detectable to taste buds. Therefore, MCL of 300 µg/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.: 6.2 µg/l detected: July 2001
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.

*Note: Sampling for lead and copper as regulated at the consumers' tap was done in 2000, and results were reported in the confidence report of 2001. Sampling will be repeated in July 2003 and reported in 2004.

• MANGANESE†
MCLG: none MCL: 0.3 mg/l
BNL max.: 0.12 mg/l detected: July 2001
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 laundered clothing.

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

Analytical Data

Inorganic Chemicals, Bacteria, Radioactivity

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

Water-Quality Indicators

compound	*BNL sample*	*MCL*
tot. coliform	ND	ND
color	<MDL	15 units
odor	0 units	3 units
chlorides	27.3 mg/l*	250 mg/l
sulfates	8.5 mg/l*	250 mg/l
nitrates	0.4 mg/l*	10 mg/l
nitrites	<MDL	1.0 mg/l
alkalinity	39.0 mg/l	NS
ammonia	<MDL	NS
calcium	11.0 mg/l	NS
conductivity	285 µmhos/cm	NS
cyanide	<MDL	NS
pH	6.3 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	0.17 mg/l*	0.3 mg/l
lead	6.2 µg/l*	15 µg/l
manganese	0.12 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	15.6 mg/l*	NS
thallium	<MDL	2.0 µg/l
zinc	0.04 mg/l*	5.0 mg/l

Other

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

Radioactivity

compound	*BNL well max.*	*MCL*
gross alpha	2.49 pCi/l*	15 pCi/l
beta	3.12 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 "11 Compounds Detected in BNL's Drinking Water," at left.

• SODIUM
MCLG: none MCL: none
BNL max.: 15.6 mg/l detected: July 2001
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.

• ZINC
MCLG: none MCL: 5 mg/l
BNL max.: 0.04 mg/l detected: July 2001
major sources in drinking water: Naturally occurring; mining waste.
possible health effects: Zinc has no health effects unless detected in very high concentrations. The presence of zinc may result in an undesirable taste in drinking water.

Radioactivity

• GROSS ALPHA
MCLG: 0 pCi/l MCL: 15 pCi/l
BNL max.: 2.49 pCi/l detected: July 2001
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.: 3.12 pCi/l detected: July 2001
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: The U.S. EPA and New York State consider 50 pCi/l to be of concern for beta particles.

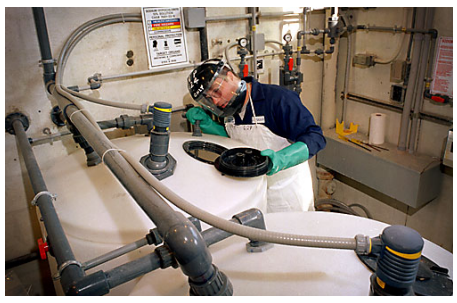
Where Does BNL's Water Come From? How Is Our Water 'Finished'?

CN10-144-00

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.

CN10-147-00

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.



CN10-143-01

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.

CN10-43-00

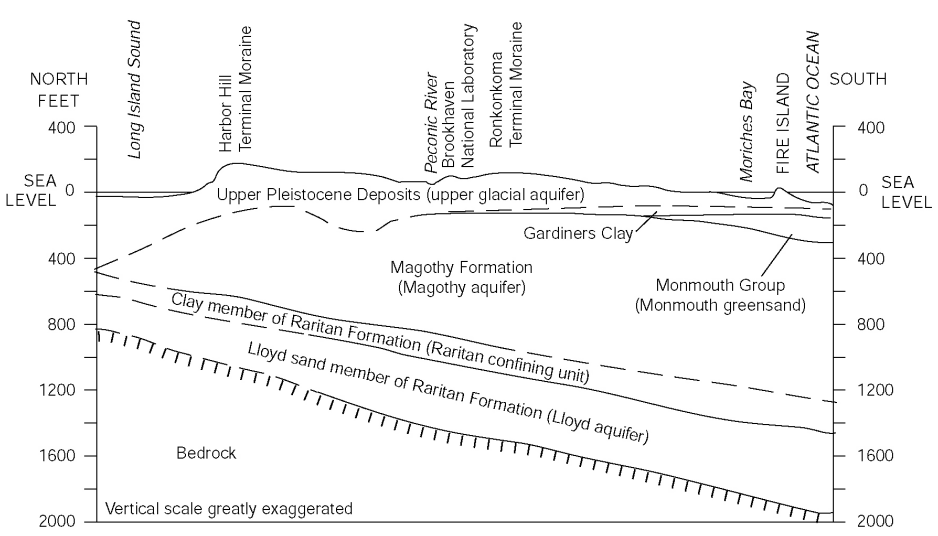
3. AERATION TANK reduces carbon dioxide gas and aids in the oxidation of iron. At the aeration tank, Steve Barcelo (right) describes the action to Frank Masia.

CN10-36-00

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.

CN10-37-00

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.



All of the water supplied by BNL comes from beneath the ground, and so is referred to as groundwater. Groundwater is stored in a sandy, geological formation known as an aquifer. Water in the aquifer originates as precipitation that percolated down through the soil.

The Long Island aquifer system is made up of three primary formations lying one on top of the other (see diagram above): from the surface to about 150 feet down is the Upper Glacial, from 150 to 1,000 feet is the Magothy, and from 1,000 to 2,000 feet is the Lloyd. Drawing up to 1,000 gallons per minute, the Lab's six drinking-water wells tap into the Glacial aquifer.

The Lab's "finished" water is produced with pride by the staff of BNL's Water Treatment Facility (WTF) of the Plant Engineering (PE) Division, using what is identified as "federal public water system No. 511891." This is the only source on site of what is called potable water for BNL's 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 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.

Only the water from three wells (numbered 4, 6, and 7) is delivered to the WTF because that water is high in iron. Water from the other three wells (numbered 10, 11, and 12) is low in iron, so that water is distributed directly, after passing through activated carbon filters.

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. They are: Steve Barcelo, Tom Boucher, Jack Kulesa, Richard Lutz, Phil Pizzo, and Joe Tullo. WTF operations are overseen by William Chaloupka, 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 staff are shown in photos by Roger Stoutenburgh and described starting at top left.

CN10-35-00

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.

CN10-39-00

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.

CN10-38-00

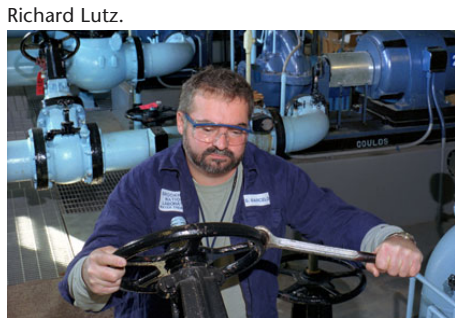
8. WET WELL stores the filtered water before it is pumped into the air-stripping towers. While Jack Kulesa (background) inspects the wet-well pump seals, Richard Lutz works on a check valve.

CN10-34-00

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.

CN10-146-00

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 Jack Kulesa (left) and Richard Lutz.



CN10-42-00

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.

CN10-44-00

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. At a pressure of 55 to 70 pounds per square inch, water from the two towers is delivered on site via 45 miles of distribution pipe, which is a mix of cast iron dating from World War II Camp Upton, transite, plastic, and cement-lined ductile iron. When distribution pipe is added or replaced, cement-line ductile iron is used.

CN10-41-00

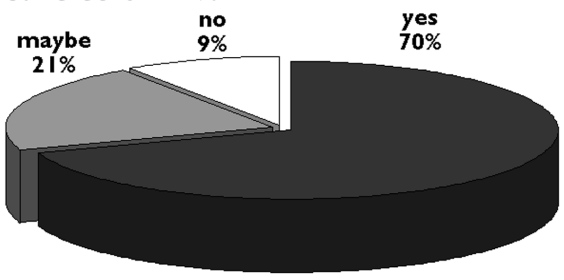
13. TESTING THE QUALITY OF BNL'S DRINKING WATER at the WTF is Tom Boucher. The Lab's drinking water is tested in various locations weekly, monthly, quarterly, semi-annually, and annually, depending upon the specific test. Test samples are analyzed by certified laboratories, and results are reported to the Suffolk County Department of Health Services, which conducts its own annual tests of all county water systems. In addition, the results are delivered to BNL's Environmental 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.

Definitions of Terms Used on Page 2

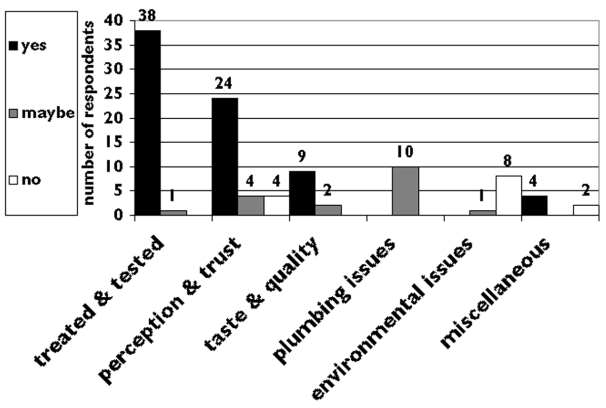
- **Maximum contaminant level (MCL)**: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to what is called the maximum contamination level goal (MCLG) as possible.
- **Maximum contamination level goal (MCLG):** The level of a contaminant in drinking water below 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.

What BNLers Think About the Lab's Drinking Water *(cont'd)*

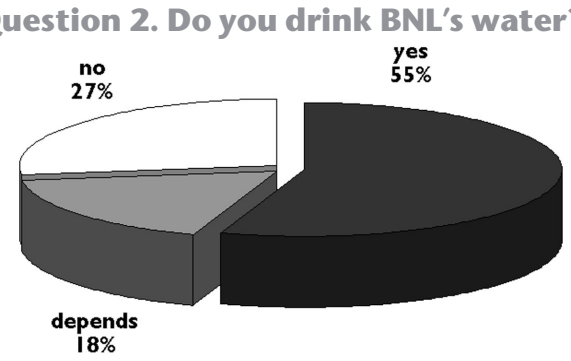
Question 1. Do you feel that BNL's water is safe to drink?



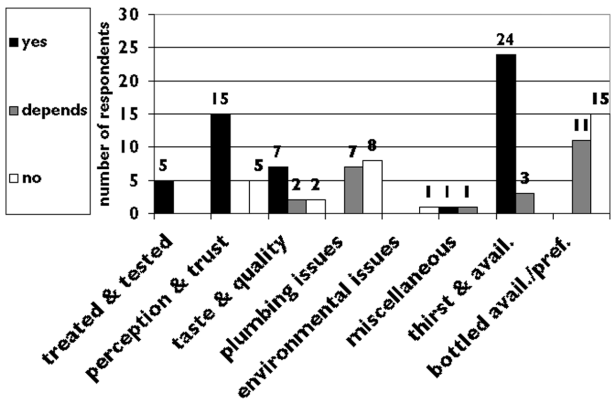
Of the 149 who answered "yes," they feel that BNL's water is safe to drink, 75 noted why. Of the 45 who answered "maybe," 17 explained why. And of the 20 who answered "no," ten stated their reasons why. Their reasons are summarized below:



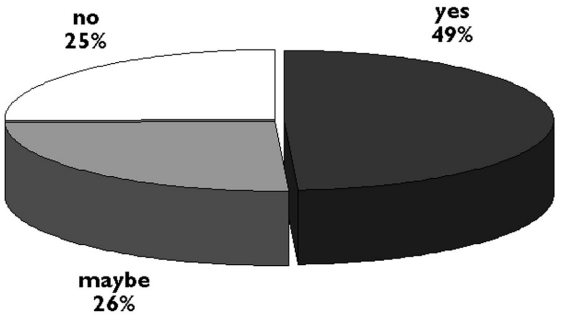
Question 2. Do you drink BNL's water?



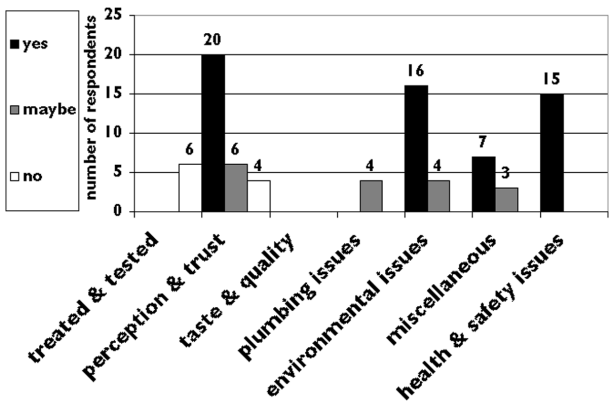
Of the 118 who answered "yes," they drink BNL's water, 52 noted why. Of the 38 who answered "depends," 24 explained why. And of the 58 who answered "no," 31 stated their reasons why. Their reasons are summarized below:



Question 3. Do you feel that the safety of BNL's drinking water is an issue of concern to the Laboratory community?

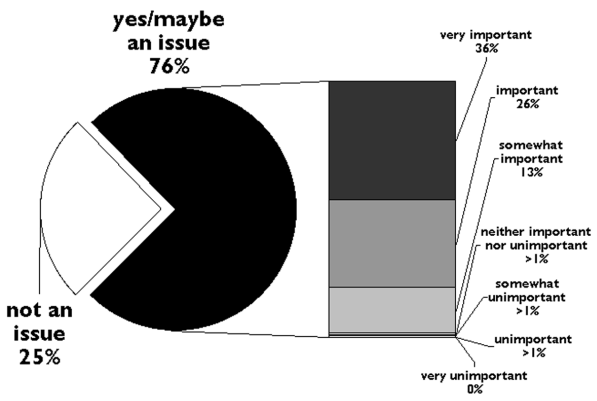


Of the 105 who answered "yes," they feel that the safety of BNL's drinking water is an issue of concern, 75 noted why. Of the 55 who answered "maybe," 18 explained why. And of the 54 who answered "no," 14 stated their reasons why. Their reasons are summarized below:

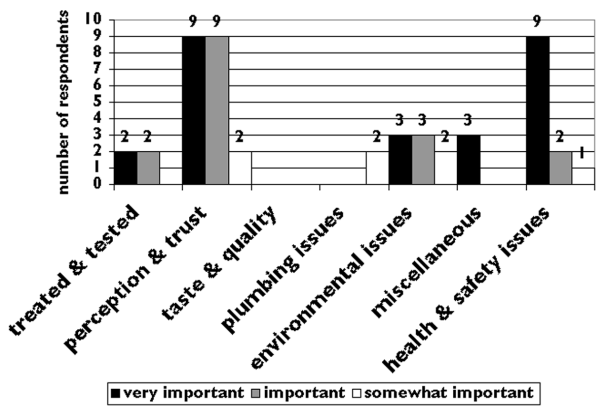


Question 4. If you feel that the safety of BNL's drinking water is an issue of concern to the Laboratory community, then how important an issue do you feel that it is?

Of the 160 out of 214 who answered question 3 "yes" or "maybe," they answered question 4 as follows: 74 felt that the safety of BNL's drinking water is a "very important" issue, 55 felt that it is "important," 28 felt that it is "somewhat important," and 1 each felt that it is "neither important nor unimportant," "somewhat unimportant," or "unimportant." None of the 160 felt that it is a "very unimportant issue."

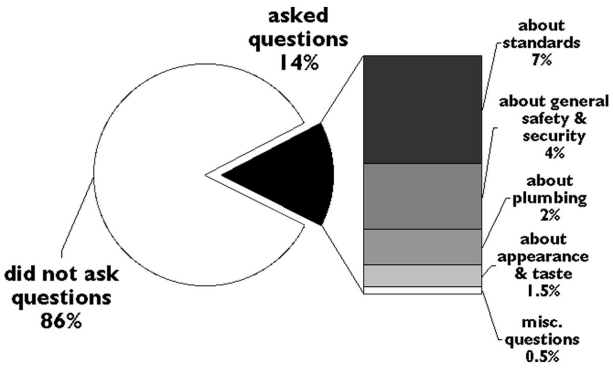


Of the 74 who answered "very important," 26 noted why. Of the 55 who answered "important," 16 explained why. Of the 28 who answered "somewhat important," 7 stated their reasons why. Their reasons are summarized below. The others did not offer an explanation.

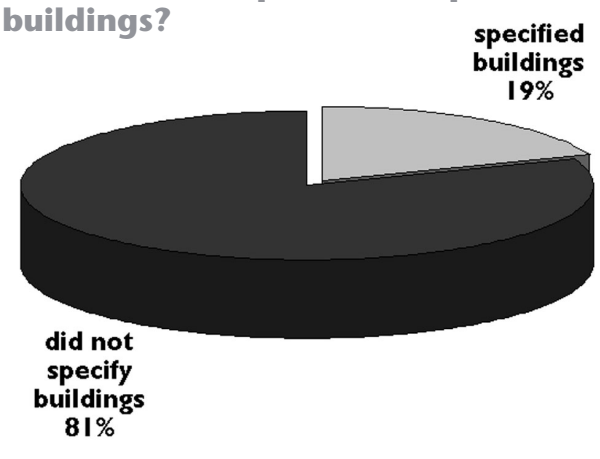


Question 5. What unanswered questions do you have about the Lab's drinking water?

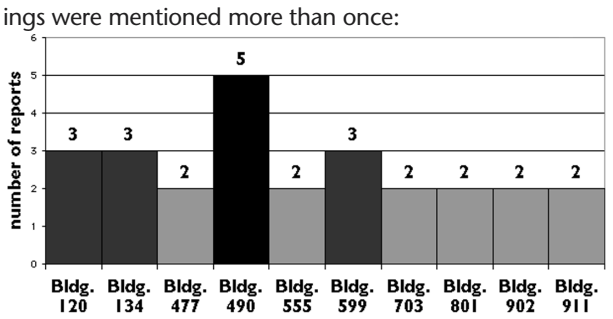
Of the 30 out of 214 who noted their questions, 15 inquired about standards, 9 about the safety and security of the water, 5 about plumbing, 3 about appearance and taste, and 1 had a general question. These questions will be posed and answered in this and other publications, including fact sheets and a periodic column in the Bulletin.



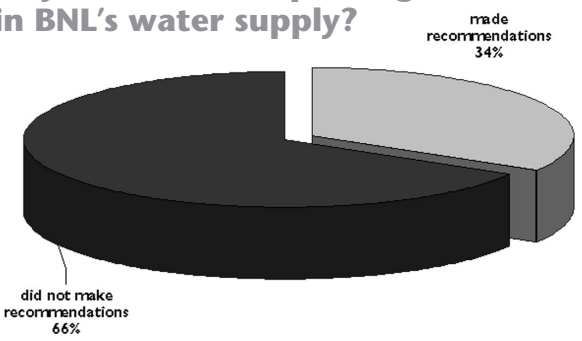
Question 6. What questions do you have about specific drinking-water fountains or tap water in particular buildings?



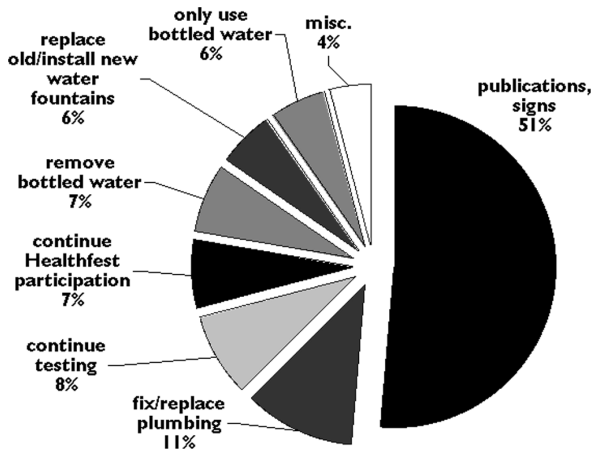
Forty-one respondents specified 27 buildings for which they had questions about specific drinking-water fountains or tap water. The problem noted most frequently, 16 out of the 41 problems reported, was rust. Plant Engineering and/or Environmental Services is in the process of looking into the reported locations. The following ten buildings were mentioned more than once:



Question 7. What recommendations do you have for improving confidence in BNL's water supply?

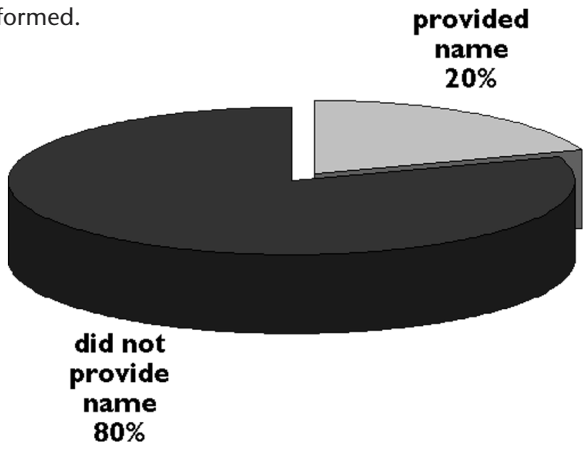


Of the 72 out of 214 who made recommendations, 37 advised more publications and signs, 8 suggested fixing or replacing plumbing, 6 recommended continued testing, 5 advocated continuing Healthfest participation, another 4 urged removing bottled water around site, 4 proposed replacing old and installing new water fountains, 4 suggested only using bottled water on site, and 3 made miscellaneous recommendations.



Question 8. *(optional)* For more information, provide your name, Bldg., Ext., and e-mail.

When the input of a focus group on BNL water quality is needed, the 42 out of 214 who provided their names will be contacted. So other interested employees and guests within the Laboratory community may join, a notice will be placed in the Bulletin when such a group is formed.



BNL Water Quality Consumer Confidence Report

This annual supplement to The Bulletin is published by the Media & Communications Office of the Community, Education, Government & Public Affairs Directorate, with the assistance of the Environmental Services Division and the Plant Engineering Division, for the approximately 3,500 on-site drinking-water consumers served by federal public water system no. 5111891 at Brookhaven National Laboratory, Upton, New York 11973, which is owned by the U.S. Department of Energy.

Marsha Belford, editor, Ext. 5053, belford@bnl.gov
William Chaloupka, advisor, Ext. 7136 , chaloupka@bnl.gov
Robert Lee, advisor, Ext. 3148, blee@bnl.gov

phone: (631)344-2345
e-mail: bulletin@bnl.gov
Web: www.bnl.gov/bnlweb/pubaf/bulletin.html