

11 POTABLE WATER

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11.1 POTABLE WATER MONITORING

DQO START DATE	January 1, 2003
IMPLEMENTATION DATE	January 1, 2021
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SUMMARY OF PROPOSED CHANGES

1,4 dioxane is required to be sampled quarterly and hexavalent chromium is required to be sampled annually in calendar year 2021. Lead and copper sampling will be repeated, possibly at a six-month interval. The Granulated Activated Carbon (GAC) system was updated on Well 11 to remove per- and polyfluoroalkyl substances (PFAS) and requires bacteria and PFAS sampling on a quarterly basis. Well 10 is in the process of updating the GAC system and will be sampled quarterly when approved for use.

DESCRIPTION AND TECHNICAL BASIS

Brookhaven National Lab (BNL) maintains five active potable water wells, a water treatment facility, and a distribution system to supply drinking water and water for heating and cooling purposes. In doing so, the Laboratory is considered a public water supplier and must meet the requirements of the Safe Drinking Water Act (SDWA).

BNL's five active potable wells are screened in the mid Upper Glacial aquifer. This Environmental Protection Agency (EPA)-designated sole source aquifer is susceptible to contamination. The quality of the water supply is protected through (1) a comprehensive program of engineered and operational controls of existing aquifer contamination and potential sources of new contamination, (2) groundwater monitoring, and (3) potable water treatment and monitoring. The Laboratory has enacted a monitoring program to demonstrate compliance with SDWA regulations under the guidance of the New York Suffolk County Department of Health Services (SCDHS). The objective of the potable water compliance monitoring efforts is to ensure that the concentrations of regulated contaminants present in the domestic water system are less than the maximum contaminant levels specified by regulation. Monitoring is conducted at the supply wellheads, the water treatment plant, and within the distribution system.

BNL's Source Water Assessment concluded that the Upper Glacial aquifer on site is susceptible to contamination. Several potential sources of groundwater contamination are within two years of travel to supply wells. In addition, some supply wells are located on the margins of existing contamination. To provide early warning of impacts to potable water supply wells, the Laboratory also conducts surveillance monitoring to discern trends in declining water quality.

DRIVERS FOR MONITORING BEING CONDUCTED UNDER THIS PROGRAM

- Compliance
- Support compliance
- Surveillance
- Restoration

The SDWA establishes minimum national standards for levels of contaminants in drinking water. These standards assure that water quality is healthy and wholesome for public consumption and

include primary standards (health-based) and secondary standards (aesthetics-based). The contaminants that are regulated under the primary standards include microorganisms, inorganic chemicals, synthetic organic chemicals, volatile organic compounds (VOCs), radionuclides, and disinfection byproducts. It also establishes a program for the protection of sole source aquifers and implements an underground injection control program that regulates and restricts the subsurface emplacement of fluids. Potable water system monitoring requirements are contained in Title 40 of the Code of Federal Regulations (40 CFR 141-149) and in the New York State Sanitary Code (10 NYCRR Part 5).

Because BNL distributes domestic water to more than 25 users, the Laboratory's water supply is considered a public water system and must meet the performance and monitoring requirements specified by the SDWA, as well as follow corresponding state regulations. These requirements include specific chemical and radiological monitoring and the enforcement of a strict cross connection control program. The SDWA requirements are implemented at the state level by the New York State Department of Health (NYSDOH) under Part 5 of the New York State Sanitary Code and locally by SCDHS, which specifies yearly the locations and frequency of sample collection, as well as the required methods used in sample analysis.

In addition to federal and state water quality regulations, DOE Order 436.1 (2011), *Departmental Sustainability*, requires sites to maintain an Environmental Management System (EMS). BNL's EMS specifies requirements for conducting general surveillance monitoring to evaluate the effects, if any, of site operations. DOE Order 458.1, *Radiation Protection of the Public and the Environment* (2011), requires DOE sites to maintain surveillance monitoring for determining radio- logical impacts to the public and environment.

DATA QUALITY OBJECTIVE ANALYSIS

Step 1: State the Problem

To assure the quality of groundwater, the quality of drinking water during treatment and distribution, and to confirm compliance with federal and state drinking water regulations, the Laboratory performs monitoring of the BNL potable water supply.

Step 2: Identify the Decision

Does the Laboratory's potable water supply comply with the federal and state drinking water standards?

Is the groundwater quality at the wellhead declining such that the Environmental Protection Division (EPD) should implement the Environmental Monitoring Standard Operating Procedure (EM-SOP), EM-SOP-309, Groundwater Protection Contingency Plan-Response to Unexpected Monitoring Results?

Step 3: Identify Inputs to the Decision

Inputs necessary to support the decisions in Step 2 include:

- Federal and State potable water system monitoring requirements in 40 CFR 141-149 and 10 NYCRR Part 5
- New York State Department of Environmental Conservation Long Island Well Permit 1-4722-00032/00113

- BNL Annual Potable Water Sampling Plan
- SCDHS Annual Minimum Monitoring Requirements for BNL
- BNL Source Water Assessment for Drinking Water Supply Wells
- BNL Monthly Water Treatment Facility Reports
- BNL Annual Water Quality Consumer Confidence Report
- Collection and analysis of samples performed according to EPA, state, or other regulatory agency standards or guidelines
- EPD EM-SOP-304, Water Sample Collection Procedure for Potable Supply Wells
- Analytical results for the supply wells and distribution system
- Review of analytical results by project managers in accordance with EPD data review procedures to ensure data is of acceptable quality

Step 4: Define the Study Boundaries

The study boundary includes the BNL supply wells, treatment systems, water treatment facility, and the distribution system. In accordance with SDWA requirements, potable water samples are collected at the wellhead, post treatment, and from the distribution system. The specific location for collecting each sample is contingent upon the type of analysis, method of water treatment, and the purpose of the sample (i.e., to assess groundwater quality or impacts of distribution system piping). Yearly requirements are developed under the guidance of SCDHS and usually exceed the sampling requirements under the SDWA.

To assess source water quality, water samples are typically collected at the wellhead. Analytes assessed at the wellhead include VOCs, pesticides, synthetic organic chemicals, inorganics, perfluoroalkyl substances, and bacteriology. To assess the efficiency of water treatment systems, samples are collected immediately post-treatment for VOCs and/or inorganic analysis. Post-treatment system samples are no longer taken since analysis of the source water shows all VOCs are less than the drinking water standard. The carbon treatment units have subsequently been taken out of service. To ensure that the potable water is not corrosive to the BNL distribution system, the piping system material is sound, and to ensure proper disinfection, analyses for asbestos, trihalomethanes, haloacetic acids, and inorganic analyses are conducted on water samples collected at the point of consumption.

Step 5: Develop the Decision Rule

Decision 1

Does the Laboratory's potable water supply comply with the federal and state drinking water standards?

The analytical data generated from the potable water monitoring programs are compared with the drinking water standards.

If the comparison shows the data to be below regulatory limits, **then** the water supply operations and monitoring will continue.

If this comparison yields a violation of a regulatory standard, **then** stakeholders are notified and long- and short-term corrective actions are taken in accordance with the SCDHS and the EPD EM-SOP-309, Groundwater Protection Contingency Plan-Response to Unexpected Monitoring Results. Additional samples will be collected, as required, by the drinking water regulations and

an evaluation will be conducted under EM-SOP-309, Groundwater Protection Contingency Plan-Response to Unexpected Monitoring Results, to determine the cause of contamination.

Decision 2

Is the groundwater quality at the wellhead declining such that the BNL Groundwater Protection Contingency Plan should be implemented?

Analytical data generated from the potable water monitoring program will be evaluated and compared with historical levels to ensure that existing engineered and operational controls of known aquifer contamination are working correctly and to ensure potential sources of new contamination are located. Based on the amount of monitoring data collected for this project since its inception, full verification of the analytical results is not necessary. All new monitoring results undergo routine review by the project manager. If anomalous results are reported, a further quality assurance review of the data will be conducted.

If this evaluation reveals that a contaminant is present at levels approaching drinking water standards, **then** an evaluation will be conducted under the EPD EM-SOP-309, Groundwater Protection Contingency Plan-Response to Unexpected Monitoring Results, to determine the source of the contaminant and to identify any operational controls needed to manage the groundwater contaminant.

Step 6: Specify Acceptable Error Tolerances

National Primary Drinking Water Regulations (NPDWRs, or “primary standards”) are legally enforceable standards that apply to public water systems. Primary standards protect public health by limiting the levels of contaminants in drinking water. EPA has issued drinking water standards, or Maximum Contaminant Levels (MCLs), for more than 80 contaminants. MCLs are set based on known or anticipated adverse human health effects, the ability of various technologies to remove the contaminant, the effectiveness of the technologies, and the cost of treatment. In addition, EPA has established National Secondary Drinking Water Regulations that set non-mandatory water quality standards for 15 contaminants. EPA does not enforce these secondary maximum contaminant levels (SMCLs), but New York State does regulate some of the contaminants. They are established only as guidelines to assist public water systems in managing their drinking water for aesthetic considerations, such as taste, color, and odor. These contaminants are not considered to present a risk to human health at the SMCL.

The Laboratory’s compliance monitoring program exceeds the requirements issued by SCDHS in their oversight of the implementation of the SDWA. BNL performs more analyses on a greater frequency and collects additional samples under the surveillance program to ensure the highest quality drinking water. The Laboratory will maintain this heightened sampling program because the standards are health-based. A violation of the standards could produce adverse health effects for the BNL population and visitors on site, regulatory violations and fines, as well as a loss of employee, public, and regulatory confidence.

Historically, the Laboratory’s drinking water has been in full compliance with the requirements of the SDWA, with the exception of an iron-sampling violation, and has not violated any maximum contaminant level standard. Some wells were shut down in the early to mid-1980s due to 1,1,1-trichloroethane (TCA) groundwater contamination. Operational controls were installed (GAC filtration) to remove the contamination before distribution. Current monitoring of these systems has shown the levels of VOCs to be much less than the drinking water standard and had been removed. Recently, however, the carbon filtration systems were reinstalled to remove PFAS that has been detected above the 10 ppt NYS limit.

Water removed from the western well field (wells #4, #6, and #7) has exceeded the secondary contaminant levels (aesthetic, not health-based) for color and iron, because there are naturally high levels of this element in the groundwater on Long Island. However, this water is treated at the BNL Water Treatment Facility to remove the iron. After treatment, the water meets all primary and secondary standards.

Step 7: Optimize the Design

The following table summarizes the potable water monitoring programs. As discussed in Step 6, the Laboratory's compliance monitoring program exceeds the requirements issued by SCDHS in their oversight of the implementation of the SDWA. Furthermore, BNL's compliance monitoring program is supplemented by the surveillance program.

Table 11.1 SAMPLING AND ANALYSIS FOR POTABLE WATER MONITORING PROGRAM

2021 POTABLE WATER COMPLIANCE MONITORING PROGRAM		
Analysis	Sampling Location	Frequency
Bacteriological	Distribution System	7 times per month
	Supply wells (pre and post GAC)	1 per quarter
Inorganic Compounds	Distribution System	2 per year
	Supply Wells	1 per year
Iron	Supply Wells	1 per quarter
Nitrate/Nitrite	Distribution System	2 per year
	Supply Wells	1 per year
Asbestos	Distribution System	1 per year
Water Quality	Distribution System	1 per quarter
	Supply Wells	2 per year
Principal Organic Compounds, Vinyl Chloride, and MTBE	Supply Wells (pre and post GAC)	1 per quarter
Synthetic Organic Compounds and Pesticides	Supply Wells	1 per year
Trihalomethanes and Haloacetic Acids	Distribution System	2 per year
Lead and Copper	Distribution System	40 samples once every six months
Perfluoroalkyl substances (PFAS)	Supply Wells	1 per quarter
Radiological (gross alpha and beta, Cs-137 Sr-90, Ra -228 and gamma analysis)	Supply Wells	1 per quarter
Tritium	Supply Wells	1 per quarter
Hexavalent Chromium	Supply Wells	1 per year
1,4 Dioxane	Supply Wells	1 per quarter

See Appendix B for the monitoring program for this DQO.

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