

BROOKHAVEN NATIONAL LABORATORY
Site Environmental Report **2012**
SUMMARY





Brookhaven National Laboratory has one of the most diverse populations of reptiles and amphibians on Long Island. The photo on the front cover is of an eastern box turtle (*Terrapene c. carolina*). Other species present on the Laboratory site include the snapping turtle (*Chelydra serpentina*), the spotted turtle (*Clemmys guttata*), the painted turtle (*Chrysemys p. picta*), and the musk turtle (*Sternotherus odoratus*).

Interns at the Laboratory have been using radiotelemetry to gain a better understanding of habitat use and box turtle home range and reproductive success on site. BNL's Natural Resources staff are also interested in how much this species uses the Long Island Solar Farm on site. Tracking will continue for up to 6 years in order to gain long-term data.

New and ongoing research on snapping and painted turtles is being conducted by researchers from Hofstra University; specifically, sex determination hormones in developing eggs and the effect of fertilizers on turtle health. BNL serves as a location of low environmental nitrogen loading compared to more developed areas of Long Island with turtle populations.

The Brookhaven National Laboratory 2012 Site Environmental Report is a public document that is distributed to various U.S. Department of Energy sites, local libraries, and local regulators and stakeholders. The report is available to the general public on the internet at <http://www.bnl.gov/ewms/ser/>. A summary of the report is also available and is accompanied by a compact disk containing the full report. To obtain a copy of the report or summary, please write or call:

Brookhaven National Laboratory
Environmental Protection Division
Attention: SER Project Coordinator
Building 860
P.O. Box 5000
Upton, NY 11973-5000
(631) 344-3711





2012 SITE ENVIRONMENTAL REPORT SUMMARY

PREFACE

In accordance with DOE Order 231.1B, Environment, Safety and Health Reporting of the U.S. Department of Energy (DOE), Brookhaven National Laboratory (BNL) prepares an annual Site Environmental Report (SER). The report is written to inform the public, regulators, employees, and other stakeholders of the Laboratory's environmental performance during the calendar year in review. Volume I of the SER summarizes environmental data; environmental management performance; compliance with applicable DOE, federal, state, and local regulations; and performance in restoration and surveillance monitoring programs. BNL has prepared annual SERs since 1971 and has documented nearly all of its environmental history since the Laboratory's inception in 1947.

Volume II of the SER, the Groundwater Status Report, is also prepared annually to report on the status of and evaluate the performance of groundwater treatment systems at the Laboratory. It includes detailed technical summaries of groundwater data and its interpretation, and is intended for internal BNL users, regulators, and other technically oriented stakeholders. In addition, a summary of Volume I is prepared each year to provide a general overview of the report.

Both SER Volumes I and II, as well as this summary, are available in print and as downloadable files on the BNL web page at <http://www.bnl.gov/ewms/ser/>. An electronic version on compact disc containing the full report is distributed with each printed report.

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New York

ABOUT BROOKHAVEN NATIONAL LABORATORY

Established in 1947, Brookhaven National Laboratory is a multi-program national laboratory managed for the U.S. Department of Energy by Brookhaven Science Associates (BSA), a partnership formed by Stony Brook University and Battelle Memorial Institute. BSA has been managing and operating the Laboratory under a performance-based contract with DOE since 1998. From 1947 to 1998, BNL was operated by Associated Universities, Incorporated. Prior to 1947, the site operated as Camp Upton, a U.S. Army training camp, which was active from 1917 to 1920 during World War I and from 1940 to 1946 during World War II.

BNL is one of 10 national Laboratories under DOE's Office of Science, which provides most of the Laboratory's research dollars and direction. BNL has a history of outstanding scientific achievements. For over 60 years, Laboratory researchers have successfully worked to envision, construct, and operate large and innovative scientific facilities in pursuit of research

advances in many fields. Programs in place at BNL emphasize continual improvement in environmental, safety, security, and health performance.

BNL's broad mission is to produce excellent science and advanced technology in a safe and environmentally sound manner with the cooperation, support, and involvement of its scientific and local communities. The fundamental elements of the Laboratory's role in support of DOE's strategic missions are the following:

- To conceive, design, construct, and operate complex, leading-edge, user-oriented research facilities in response to the needs of DOE and the international community of users.
- To carry out basic and applied research in long-term, high-risk programs at the frontier of science.
- To develop advanced technologies that address national needs and to transfer them to other organizations and to the commercial sector.
- To disseminate technical knowledge, to educate future genera-

Long Island Sound



Brookhaven National Laboratory

*Satellite photo showing location of BNL.
The small circle is the Relativistic Heavy
Ion Collider, known as RHIC.*

tions of scientists and engineers, to maintain technical capabilities in the nation's workforce, and to encourage scientific awareness in the general public.

The Laboratory's 5,265-acre site is located in Brookhaven Township, approximately 60 miles east of New York City; BNL is located near the geographical center of Suffolk County, Long Island, New York. Nearly one-third of the approximately 1.49 million people who reside in Suffolk County live in Brookhaven Township, the largest township (both in area and population) in Suffolk County.

BNL is one of the five largest high-technology employers on Long Island, with approximately 3,000 employees that include scientists, engineers, technicians, and administrative personnel. More than 75 percent of BNL employees live and shop in Suffolk County. In addition, the Laboratory annually hosts an estimated 4,000 visiting scientists, more than 30 percent of whom are from New York State universities and businesses. The visiting scientists and sometimes their families, as well as visiting students, reside in apartments and dormitories on site

or in nearby communities.

BNL strengthens Long Island's position as a center of innovation in energy, the life sciences, and other fields crucial to the growth of New York State's economy. With a budget of over \$696 million, the Laboratory has a significant economic impact on New York State.

A report for fiscal year 2009 showed that the economic output generated by the Laboratory and its visitors during that period amounted to \$704 million and created 5,400 jobs throughout New York State—5,190 of them on Long Island. It is estimated that between 2010 and 2014, the Laboratory will generate, on an average annual basis, \$947 million in economic output and 7,092 jobs throughout the state.

In fiscal year 2012, employee salaries, wages, and fringe benefits accounted for over \$401 million of its total annual budget. Supporting local and state businesses whenever possible, BNL also spent \$346 million on goods and services in fiscal year 2012 (\$75.2 million in New York State).



Aerial photograph of the BNL site.

BNL FACILITIES AND OPERATIONS

Most of the Laboratory's principal facilities are located near the center of the site. The developed area is approximately 1,850 acres:

- 500 acres originally developed by the Army (as part of Camp Upton) and still used for offices and other operational buildings
- 200 acres occupied by large, specialized research facilities
- 520 acres used for outlying facilities, such as the Sewage Treatment Plant, research agricultural fields, housing facilities, and fire breaks
- 400 acres of roads, parking lots, and connecting areas
- 200 acres occupied by the Long Island Solar Farm
- Approximately 3,400 acres, which is mostly wooded and represents the native pine barrens ecosystem.

All research and support facilities at the Laboratory must undergo periodic environmental reviews as part of BNL's Environmental Management Program. BNL's major scientific facilities are briefly described.

MAJOR SCIENTIFIC FACILITIES AT BNL

- **Alternating Gradient Synchrotron (AGS).** The AGS is a particle accelerator used to propel protons and heavy ions, such as gold or iron, to high energies for physics research. The Linear Accelerator (Linac) serves as a proton injector for the AGS Booster.
- **AGS Booster.** The AGS Booster is a circular accelerator used for physics research and radiobiology studies. It receives either a proton beam from the Linac or heavy ions from the Tandem Van de Graaff and accelerates these before injecting them into the AGS ring for further acceleration. The Booster also serves as the energetic heavy ion source for the NASA Space Radiation Laboratory, which is used to simulate the harsh cosmic and solar radiation environment found in space.
- **Center for Functional Nanomaterials (CFN).** The CFN provides state-of-the-art capabilities for the fabrication and study of nanoscale materials, with an emphasis on atomic-level tailoring to achieve desired properties and functions. The overarching scientific theme of the CFN is the development and understanding of nanoscale materials that address the nation's challenges in energy security.
- **Linear Accelerator (Linac) and Brookhaven Linac Isotope Producer (BLIP).** The Linac provides beams of polarized protons for the AGS and RHIC. The beam is also used to produce radioisotopes for research and medical imaging at the BLIP. The BLIP is one of the nation's key production facilities for radioisotopes, which are crucial to clinical nuclear medicine. The BLIP also supports research on new diagnostic and therapeutic radiopharmaceuticals.
- **Interdisciplinary Science Building (ISB).** Doors opened April 11, 2013 at the Interdisciplinary Science Building, a new world-class research facility where scientists work to drive breakthrough solutions to the nation's energy challenges.
- **National Synchrotron Light Source (NSLS).** The NSLS uses a linear accelerator and booster synchrotron as an injection system for two electron storage rings that provide intense light spanning the electromagnetic spectrum from the infrared through x-rays. The properties of this light and the 80 specially designed experimental stations, called beamlines, allow scientists to perform a large variety of experiments.



Interdisciplinary Science Building (ISB).

- **National Synchrotron Light Source II (NSLS-II).** The NSLS-II facility, currently under construction and scheduled to start operating in 2015, will provide sophisticated new tools that will allow scientists to see materials at the scale of a nanometer, or one billionth of a meter—a capability not available at any other light source in the world. Working at the nanoscale, researchers will focus on some of the nation’s most important scientific challenges, including developing materials for clean and affordable energy production, molecular electronics, and high-temperature superconductors.
- **Relativistic Heavy Ion Collider (RHIC).** The RHIC is a world-class scientific research facility. The RHIC accelerator drives two intersecting beams of heavy ions or protons head-on to form subatomic collisions. What physicists learn from these collisions may help us understand more about why the physical world works the way it does, from the smallest subatomic particles, to the largest stars.
- **Tandem Van de Graaff.** The Tandem Van de Graff accelerators are used to bombard materials with ions for manufacturing and testing purposes, and to supply RHIC with heavy ions.

The following facilities help support BNL’s science and technology mission by providing basic utility and environmental services.

SUPPORT FACILITIES AT BNL

- **Central Chilled Water Plant.** This plant provides chilled water sitewide for air conditioning and process refrigeration via underground piping. The plant has a large refrigeration capacity and reduces the need for local refrigeration plants and air conditioning.
- **Central Steam Facility (CSF).** This facility provides high-pressure steam for facility and process heating sitewide. Either natural gas or fuel oil can be used to produce the steam, which is conveyed to other facilities through underground piping. Condensate is collected and returned to the CSF for reuse, to conserve water and energy.

- **Major Petroleum Facility (MPF).** This facility provides reserve fuel for the CSF during times of peak operation. With a total capacity of 2.3 million gallons, the MPF primarily stores No. 6 fuel oil. The 1997 conversion of CSF boilers to burn natural gas as well as oil has significantly reduced the Laboratory’s reliance on oil as a sole fuel source when other fuels are more economical.
- **Fire Station.** The Fire Station houses six response vehicles. The BNL Fire Rescue Group provides on-site fire suppression, emergency medical services, hazardous material response, salvage, and property protection.
- **Sewage Treatment Plant (STP).** This plant treats sanitary and certain process wastewater from BNL facilities prior to discharge into the Peconic River, similar to the operations of a municipal sewage treatment plant. The plant has a design capacity of 3 million gallons per day. Effluent is monitored and controlled under a permit issued by the New York State Department of Environmental Conservation (NYSDEC).
- **Waste Management Facility (WMF).** This facility is a state-of-the-art complex for managing the wastes generated from BNL’s research and operations activities. The facility was built with advanced environmental protection systems and features, and began operation in December 1997.
- **Water Treatment Plant (WTP).** The potable water treatment plant has a capacity of 5 million gallons per day. Potable water is obtained from five on-site wells. Three wells located along the western boundary of the site are treated at the WTP with a lime-softening process to remove naturally occurring iron and by the addition of sodium hypochlorite for bacterial control. The plant is also equipped with dual air-stripping towers to ensure that volatile organic compounds (VOCs) are at or below New York State drinking water standards. Two wells located along the eastern section of the developed site are treated by the addition of sodium hydroxide to increase the pH of the water to make it less corrosive, and by the addition of sodium hypochlorite to control bacteria.

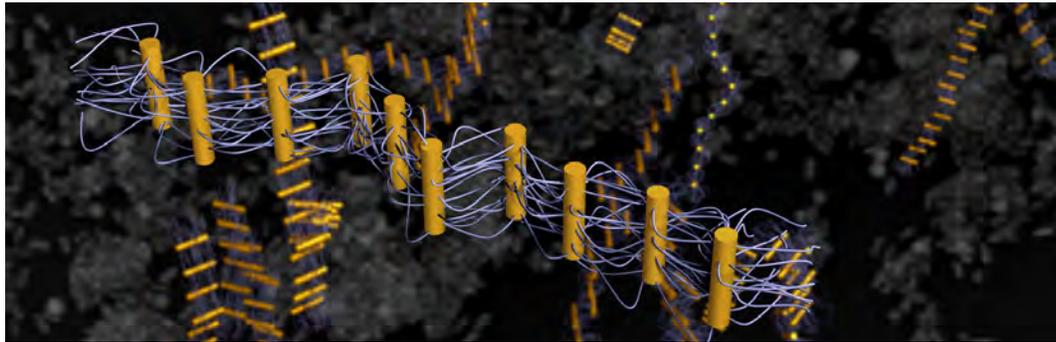
RESEARCH AT BNL

The Laboratory is one of the world's leading research institutions. To date, seven Nobel Prize-winning discoveries have been made at BNL (<http://www.bnl.gov/bnlweb/history/nobel/>). Research themes at the Laboratory include:

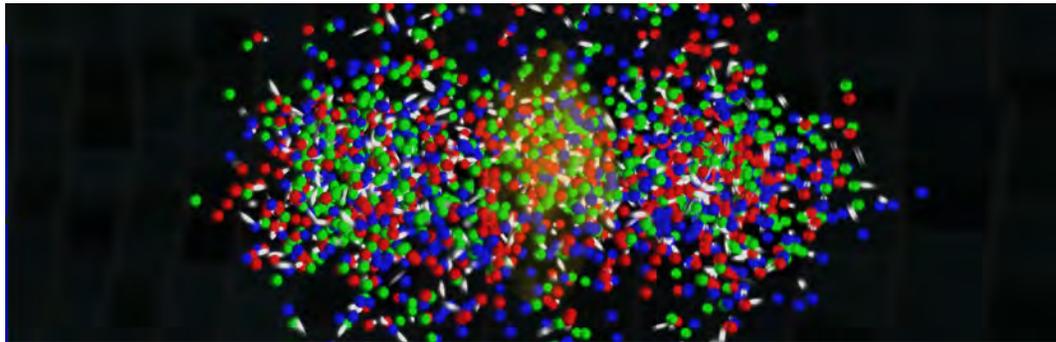
Energy Security: Blazing innovative trails toward a sustainable future powered by solar, wind, hydrogen, and other renewable sources



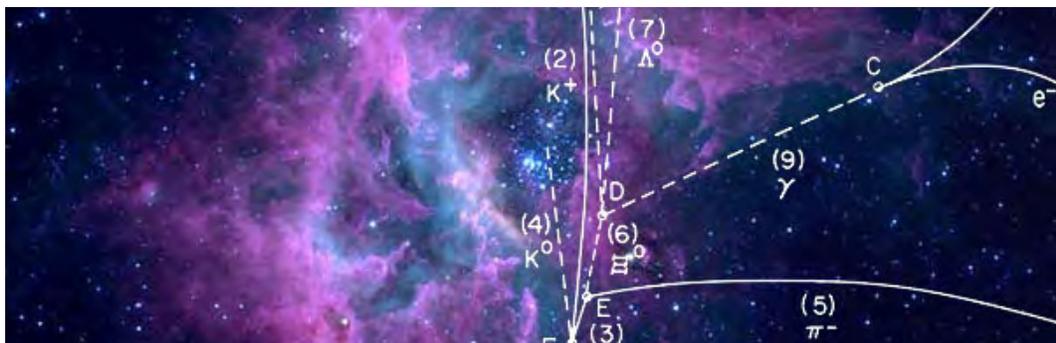
Photon Sciences: Focusing ultra-bright light to reveal the structures of materials critically important to biology, technology, and more



Quark Matter (QCD): Colliding subatomic particles to recreate matter from the dawn of time, and study the force that gives shape to visible matter in the universe today



Physics of the Universe: Exploring cosmic mysteries across the smallest and largest scales imaginable, from neutrinos to dark energy



Climate, Environment, & Biosciences: Mapping climate change, greenhouse gas emissions, and plant biology to protect our planet's future



Environmental, Safety, Security, and Health Policy

Brookhaven National Laboratory

This document is a statement of Brookhaven National Laboratory's (BNL) Environmental, Safety, Security, and Health (ESSH) policy. BNL is a world leader in scientific research and performs this work in an environmentally responsible and safe manner.

I expect every employee, contractor, and guest to take personal responsibility for adhering to the following principles:

ENVIRONMENT

We protect the environment, conserve resources, and prevent pollution.

SAFETY

We maintain a safe workplace, and we plan our work and perform it safely. We take responsibility for the safety of ourselves, coworkers, and guests.

SECURITY

We protect people, property, information, computing systems, and facilities.

HEALTH

We protect human health within our boundaries and in the surrounding community.

COMPLIANCE

We achieve and maintain compliance with applicable ESSH requirements.

COMMUNITY

We maintain open, proactive, and constructive relationships with our employees, neighbors, regulators, DOE, and our other stakeholders.

CONTINUAL IMPROVEMENT

We continually improve ESSH performance.

In addition to my annual review of BNL's progress on ESSH goals and adherence to this policy, I invite all interested parties to provide me with input on our performance relative to this policy, and the policy itself.

Doon Gibbs, Director
April 15, 2013

BNL'S ENVIRONMENTAL MANAGEMENT SYSTEM

An Environmental Management System (EMS) was established at BNL in 2001 to ensure that environmental issues are systematically identified, controlled, and monitored. An EMS also provides mechanisms for responding to changing environmental conditions and requirements, reporting on environmental performance, and reinforcing continual environmental improvement.

The cornerstone of the Laboratory's EMS is BNL's Environment, Safety, Security, and Health (ESSH) Policy. This policy makes clear the Laboratory's commitments to environmental stewardship, the safety and health of its employees, and the security of the site. Specific environmental commitments in the policy include compliance, pollution prevention, conservation, community outreach, and continued improvement in ESSH performance. The policy is posted throughout the Laboratory and on the BNL website at <http://www.bnl.gov/ESHQ/ESSH.asp>. It is also included in all training programs for new employees, guests, and contractors.

The Laboratory's EMS was designed to meet the rigorous requirements of the globally recognized ISO 14001 Environmental Management Standard. BNL was the first laboratory under the DOE Office of Science to become officially registered to this standard. Certification requires the Laboratory to undergo annual audits by an accredited registrar to assure that the systems are maintained and to identify evidence of continual improvement. In 2012, an EMS surveillance audit determined that BNL remains in conformance with the ISO 14000 standard.

Signed in 2009, Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance, sets sustainability goals for federal agencies and focuses on making improvements in environmental, energy, and economic performance. It requires federal agencies to set a greenhouse gas emissions reduction target, increase energy efficiency, reduce fleet petroleum consumption, conserve water, reduce waste, support sustainable communities, and leverage federal purchasing power to promote environmentally responsible products and technologies. Each governmental facility is required to have a Site Sustainability Plan (SSP) in place detailing the strategy for achieving these long-term goals and to provide an annual updated status. These requirements influence the future of BNL's EMS program and have been incorporated into BNL's SSP.



Headwaters of the Peconic River

BNL'S ENVIRONMENTAL MANAGEMENT PROGRAM

BNL's Environmental Management Program consists of several Laboratory-wide and facility-specific environmental monitoring and surveillance programs. These programs identify potential pathways of public and environmental exposure and evaluate the impacts BNL activities may have on the environment. An overview of the Laboratory's environmental programs and a summary of performance for 2012 follows. A complete discussion for each program can be found in the full report on compact disk in the back of this summary booklet.

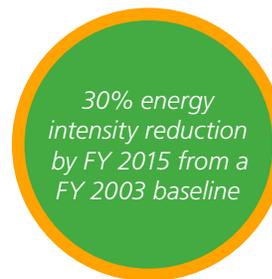
POLLUTION PREVENTION PROGRAM

The Laboratory's strong Pollution Prevention (P2) Program is an essential element for the successful implementation of BNL's Environmental Management System. The P2 Program reflects the national and DOE pollution prevention goals and policies, and represents an ongoing effort to make pollution prevention and waste minimization an integral part of the Laboratory's operating philosophy. The overall goal of the P2 Program is to create a systems approach that integrates pollution prevention and waste minimization, resource conservation, recycling, and affirmative procurement into all planning and decision making.

An important function of the P2 program is to encourage management and staff to develop P2 recommendations for possible funding through the P2 program. In 2012, three P2 proposals, submitted by employees to BNL's P2 Council, were funded, for a combined investment of approximately \$13,500. The anticipated annual savings from these projects is estimated at \$179,000, for an average payback period of approximately 1 month. Initiatives to reduce, recycle, and reuse 13.1 million pounds of industrial, sanitary, hazardous, and radiological waste through the P2 program resulted in more than \$3 million in cost avoidance or savings in 2012.

The Laboratory also has an active and successful solid waste recycling program, which involves all employees. In 2012, BNL collected approximately 142 tons of office paper for recycling. Cardboard, bottles and cans, construction debris, motor oil, scrap metals, lead, automotive batteries, electronic scrap, fluorescent light bulbs, and drill press/machining coolant were also recycled.

ENERGY MANAGEMENT AND CONSERVATION



Even though BNL anticipates growth in the number of staff and facilities, it is expected that our efforts to reduce energy usage will still allow us to meet or exceed the goal by FY 2015.

DOE Sustainability Goal

Since 1979, the Laboratory's Energy Management Group has been working to reduce energy use and costs by identifying and implementing cost-effective, energy-efficient projects; monitoring energy use and utility bills; and obtaining the least expensive energy sources possible. The group is responsible for developing, implementing, and coordinating BNL's Energy Management Plan and assisting DOE in meeting the energy and sustainability goals in Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance; DOE Order 436.1, Departmental Sustainability; and the Secretary's Transformational Energy Action Management (TEAM) initiatives.

The Laboratory has more than 4 million square feet of building space, and many BNL scientific experiments use particle beams generated and accelerated by electricity. In 2012, the Laboratory used approximately 278 million kilowatt hours (kWh) of electricity. BNL's energy use in 2012 was 30 percent less than in FY 1985 and 4 percent less than in



FY 2003. Energy use for buildings and facilities is largely weather dependent.

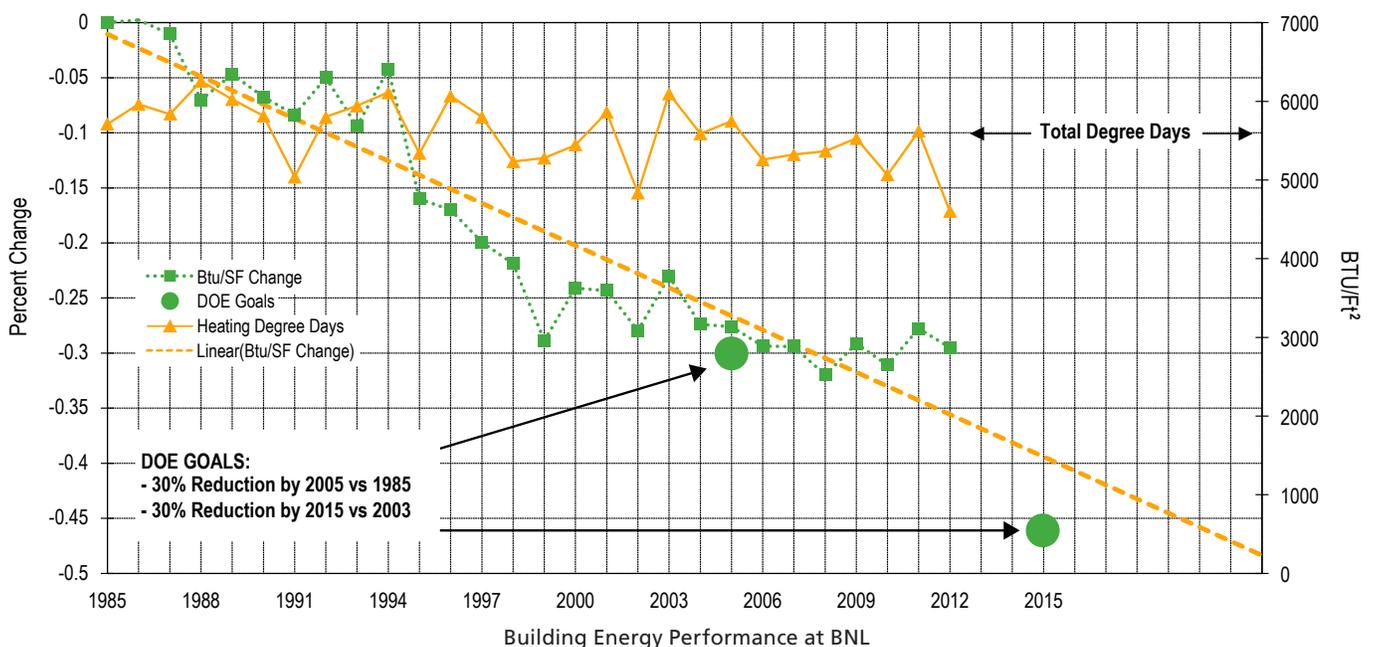
The Laboratory is a participant in the New York Independent System Operator (NYISO) Special Case Resource (SCR) Program, which is an electric load reduction curtailment program. Through this program, BNL has agreed to reduce electrical demand during critical days throughout the summer when NYISO expects customer demand to meet or exceed the available supply. In return, the Laboratory receives a rebate for each megawatt (MW) reduced on each curtailment day. Three curtailment days were required in 2012, saving the Laboratory approximately \$2 million in electric costs. BNL also maintains a contract with the New York Power Authority (NYPA) that resulted in an overall cost avoidance of \$30.2 million in 2012.

BNL continues to keep electric loads at a minimum during the summer by scheduling operations at the Laboratory's Relativistic Heavy Ion Collider (RHIC) to avoid peak demand

periods. This scheduling reduced the electric demand by 25 MW, which allowed BNL to save approximately \$2 million in electric costs in 2012, and greatly helps maintain the reliability of the Long Island Power Authority (LIPA) electric system to meet all of its users' needs.

BNL used 108,000 gallons of fuel oil, 17,000 gallons of propane, and 581 million ft³ of natural gas for site needs, and approximately 24,000 gasoline equivalents of natural gas (for the Laboratory's vehicle fleet) in 2012. Responding to market conditions, fuel oil and natural gas were used whenever each respective fuel was least expensive. However, wherever possible, BNL will purchase natural gas over oil in order to help reduce greenhouse gas emissions.

The Laboratory continues to seek alternative energy sources to meet its future energy needs, support federally required "green" initiatives, and reduce energy costs wherever possible.





*Long Island Solar Farm at BNL
Solar power helps eliminate carbon dioxide, the chief greenhouse gas responsible for global warming and climate change.*

In 2011, construction of the Long Island Solar Farm (LISF) on DOE/BNL property was completed. The array is currently the largest solar photovoltaic (PV) array (32MW) in the Northeast and spans 200 acres with 164,000 panels. BNL worked extensively with LIPA, BP Solar, the State of New York, and other organizations to evaluate the site and develop the project, with LIPA purchasing the electrical output through a 20-year Power Purchase Contract. The designed annual output of 44 million kilowatts (kWh) will result in an avoidance of approximately 31,000 tons of carbon per year over its 30- to 40-year life span. The output for the first operational year was 54 million kWh.

In addition, the Laboratory is in the process of installing approximately 1 megawatt of solar PV on site for additional savings and research. The Federal Energy Management Program (FEMP) recognizes the importance of the efforts of DOE to host the LISF and is providing credit toward BNL's Site Sustainability Plan renewable energy goal.

WATER CONSERVATION PROGRAM

BNL's Water Conservation Program has achieved dramatic reductions in water use since the mid 1990s. The Laboratory continually evaluates water conservation as part of facility upgrades or new construction initiatives. These efforts include more efficient and expanded use of chilled water for cooling and heating/ventilation and air conditioning (HVAC) systems, and reuse of once-through cooling water for other systems, such as cooling towers.

The Laboratory's goal is to reduce the consumption of potable water. Total water consumption for 2012 was approximately 111 million gallons less than in 2011. The continued decrease can be attributed to water conservation efforts and less water used for cooling.



BNL Water Storage Tower



Aerial photograph of the Waste Management Facility

WASTE MANAGEMENT PROGRAM

As a byproduct of the world-class research it conducts, BNL generates a large range of wastes. These wastes include materials common to many businesses and industries, such as office wastes (e.g., paper, plastic, etc.), aerosol cans, batteries, paints, and oils. However, the Laboratory's unique scientific activities also generate waste streams that are subject to additional regulation and special handling, including radioactive, hazardous, and mixed waste.

BNL's Waste Management Facility handles the collection, storing, transporting, and the disposal of waste generated at the Laboratory. This modern facility is comprised of three staging areas: a facility for hazardous waste, regulated by the Resource Conservation and Recovery Act (RCRA); a mixed-waste building for material that is both hazardous and radioactive; and a reclamation building for radioactive material. The RCRA and mixed-waste buildings are managed under a permit issued by the New York State Department of Environmental Conservation (NYSDEC). These buildings are used for short-term storage of waste before it is packaged or consolidated for off-site shipment to permitted treatment and disposal facilities. Due to the relatively small quantities and infrequent generation of mixed waste, BNL has reduced its waste storage footprint by consolidating hazardous and mixed wastes into its RCRA waste building.

Hazardous waste from routine operations in 2012 was basically unchanged from 2011 generation rates. Mixed waste and radioactive waste generation increased in 2012 and can be attributed primarily to increased operations at BNL's Collider Accelerator Department.

Wastes generated by remediation projects, decommissioning activities, or one-time events (e.g., lab cleanout) are considered non-routine. In 2012, BNL continued to reduce the inventory of legacy waste materials through lab cleanouts. Restoration and decommissioning activities included debris remaining from BNL's Brookhaven Graphite Research Reactor decommissioning. Other non-routine wastes included disposal of lead contaminated debris, lead shielding, and polychlorinated biphenyl (PCB) wastes.



Peconic River

COMPLIANCE MONITORING PROGRAM

BNL has an extensive program in place to ensure compliance with all applicable environmental regulatory and permit requirements. The Laboratory must comply with more than 100 sets of federal, state, and local environmental regulations, numerous site-specific permits, 13 equivalency permits for the operation of groundwater remediation systems, and several other binding agreements. In 2012, the Laboratory complied with the majority of these requirements, and instances of noncompliance were reported to regulatory agencies and corrected expeditiously.

Under the Clean Air Act (CAA), which is administered by the Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (NYSDEC), the objectives are to improve or maintain regional ambient air quality through operational and engineering controls on stationary or mobile sources of air pollution. Both conventional and hazardous air pollutants are regulated under the CAA.

BNL's Central Steam Facility utilizes four boilers that are subject to NYSDEC regulations. In 2012, emission testing of the boilers showed that nitrogen oxides, carbon monoxide, and sulfur dioxide were all within permit limits. Nine opacity excursions occurred within 1 day in January due to a sudden buildup of soot across the transmitter light path, for which there was no apparent cause.

In 2012, 1,319 pounds of ozone-depleting substances were recovered and recycled from refrigeration equipment that was serviced. Halon portable fire extinguishers at the Laboratory continue to be removed and replaced by dry-chemical or clean agent units.

In 2012, the Laboratory notified the EPA Region II office regarding the removal of materials containing asbestos. During the year, 9,500 linear feet of pipe insulation, 145,930 square feet of siding material, and 120 cubic yards of asbestos-containing debris were removed and disposed of according to EPA requirements.

The disposal of wastewater generated by BNL operations is regulated under the Clean Water Act (CWA) as implemented by NYSDEC and under DOE Order 458.1, Radiation Protection of the Public and the Environment. The goals of the

CWA are to achieve a level of water quality that promotes the propagation of fish, shellfish, and wildlife; to provide waters suitable for recreational purposes; and to eliminate the discharge of pollutants into surface waters. NYSDEC has issued a State Pollutant Discharge Elimination System (SPDES) permit to BNL to regulate wastewater effluents at the Laboratory. Each month, BNL prepares a Discharge Monitoring Report that describes monitoring results, evaluates compliance with permit limitations, and identifies corrective measures taken to address any permit excursion.

Most of the liquid effluents discharged to surface water and groundwater met applicable SPDES permit requirements; however, nine minor excursions above permit limits were reported in 2012. Three occurred at the Laboratory's Sewage Treatment Plant (iron, total nitrogen load, and total nitrogen), five pH excursions were recorded for discharges to recharge basins on site, and one oil and grease excursion. The permit excursions were reported to NYSDEC and the Suffolk County Department of Health Services (SCDHS). Groundwater monitoring at BNL's Major Petroleum Facility continues to demon-

strate that current oil storage and transfer operations are not affecting ground-water quality.

Efforts to reduce the number and minimize the severity of spills on site continued in 2012. There were 15 reportable spills of petroleum products, antifreeze, or chemicals in. The severity of releases were minor and cleaned up to the satisfaction of NYSDEC.

A number of federal, state, and local agencies oversee BNL activities. In addition to external audits and oversight, the Laboratory has a comprehensive self-assessment program in place to review operations. In 2012, the Laboratory participated in 10 environmental inspections or reviews by external regulatory agencies. These inspections included BNL's Sewage Treatment Plant operations, waste water discharges to regulated outfalls and recharge basins, waste water discharges to other regulated outfalls and recharge basins, and BNL's potable water system. There were no significant instances of noncompliance.

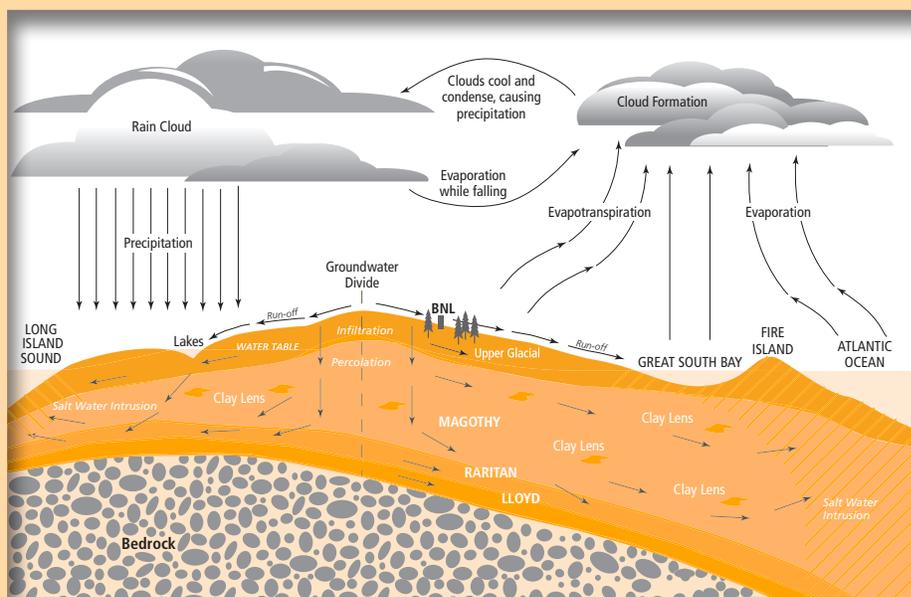
The Laboratory did, however, receive two Notices of Violation (NOV) from the State of Utah for shipments of waste

LONG ISLAND'S 'SOLE SOURCE' AQUIFER IS BNL'S WATER SOURCE

The Long Island aquifer system is made up of three primary formations. From the surface to approximately 150 feet down is the Upper Glacial aquifer, from 150 to 1,000 feet is the Magothy, and from 1,000 to about 2,000 feet is the Lloyd. Drilled into the Upper Glacial, BNL's five in-service drinking-water wells draw up to 1,000 gallons per minute, or about 1.34 million gallons of water a day for use as drinking water, process cooling water, or fire protection. In 2012, the Laboratory pumped 400,000,000 gallons of water.

Long Island's aquifer system is one of 72 "sole source" aquifers in the nation recognized under the aquifer-protection program authorized by the U.S. Safe Drinking Water Act. As required by the 1996 amendments to the Safe Drinking Water Act, an assessment of the source water used by BNL's public water system is performed annually by the New York State Department of Health. Based upon available hydrogeological, land use, and water-quality susceptibility information, the assessment of the Laboratory's source water provides additional information for use in protecting the source of BNL's drinking water.

Each year, BNL publishes an annual Water Quality Consumer Confidence Report. In addition to reminding consumers of the importance and need to protect drinking-water sources, the report's purpose is to inform consumers where our water comes from, what analytical tests are conducted, what the test results reveal, and how those results compare to state standards. In 2012, as in the past, BNL's drinking water was in full compliance with all county, state, and federal regulations. Additional information regarding the complete analysis can be found at <http://www.bnl.gov/bnlweb/pubaf/water/reports.htm>.



Precipitation Cycle in the Area of Brookhaven National Laboratory

received at EnergySolutions that did not comply with the site's Waste Acceptance Criteria. Corrective actions were identified and completed to prevent recurrence of these violations. In addition, EPA issued a Notice of Non-Compli-

ance to BNL as a result of some findings from an inspection visit in July and review of BNL's 2011 rad-NESHAPs Report. A revised annual report was submitted to address the non-compliance findings.

AIR QUALITY PROGRAM

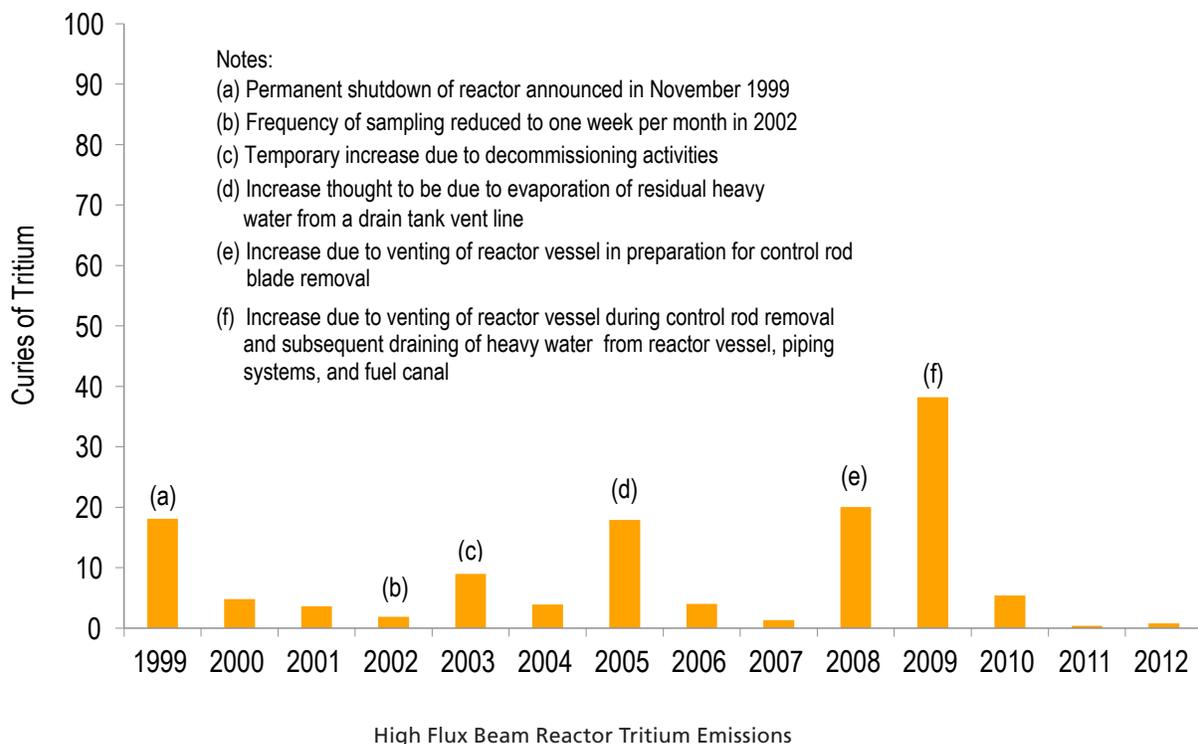
BNL monitors both radioactive and nonradioactive emissions at several facilities on site to ensure compliance with the requirements of the Clean Air Act (CAA). Environmental Protection Agency (EPA) regulations require continuous monitoring of all sources that have the potential to deliver an annual radiation dose greater than 0.1 mrem to a member of the public; all other facilities capable of delivering any radiation dose require periodic confirmatory sampling. During 2012, Laboratory facilities released a total of 4,901 curies of short-lived radioactive gases.

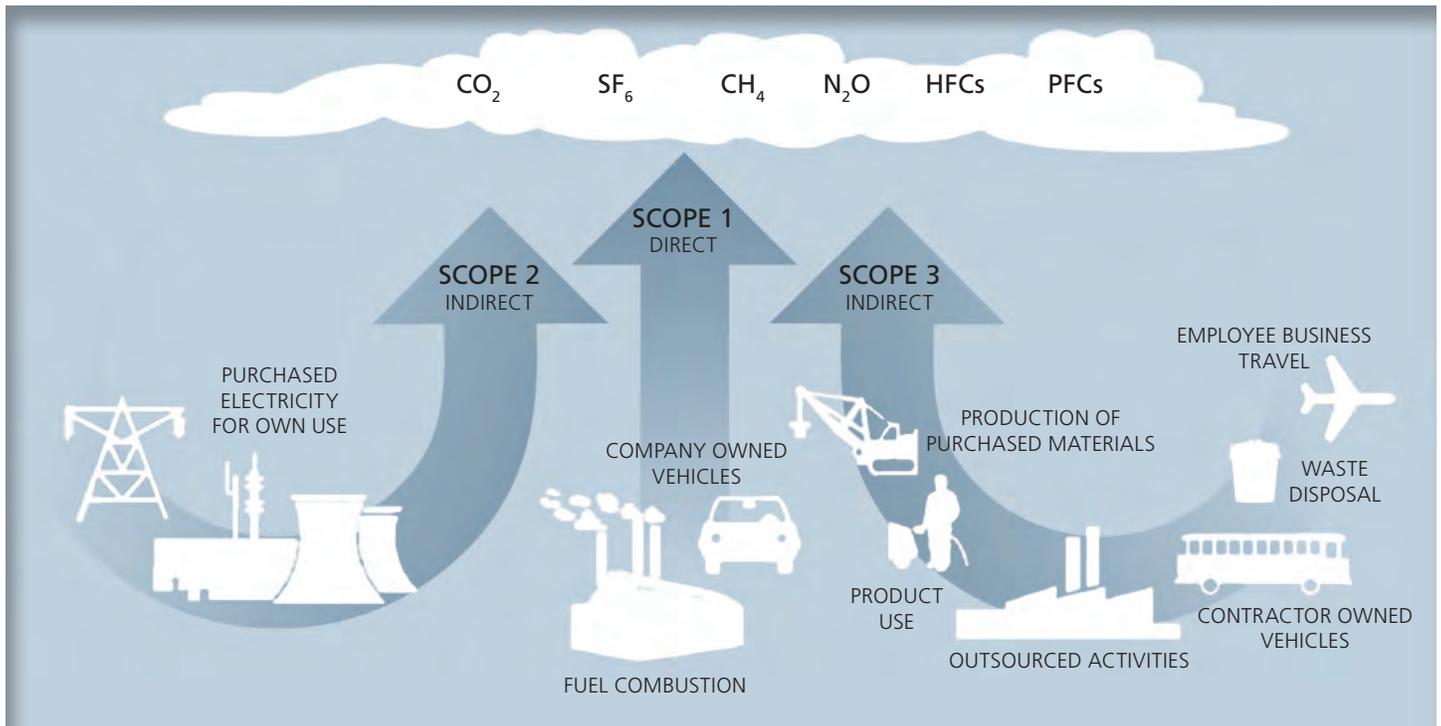
BNL's Brookhaven Linear Isotope Producer (BLIP) is the only Laboratory facility subject to EPA's continuous monitoring requirements. Oxygen-15 (half-life: 122 seconds) and carbon-11 (half-life: 20.48 minutes) emitted from the BLIP constituted more than 99.9 percent of radiological air emissions at the Laboratory in 2012.

Monitoring was also conducted at one other active facility, the Target Processing Laboratory (TPL), and one inactive facility, the High Flux Beam Reactor (HFBR). Releases from the TPL in 2012 continued to be very small (0.0944 μ Ci). The release of low levels of tritium from the HFBR (0.81 Ci) were primarily due to the presence of residual tritium in ambient air exhausted from the facility.

The Laboratory also conducts ambient radiological air monitoring to verify local air quality and assess possible environmental and health impacts from BNL operations. Samples collected from air monitoring stations around the perimeter of the site were analyzed for tritium and gross alpha and beta airborne activity. Results for 2012 continued to demonstrate that on-site radiological air quality was consistent with air quality measured at locations in New York State that are not located near radiological facilities.

Various state and federal regulations governing non-radiological releases require facilities to conduct periodic or continuous emissions monitoring to demonstrate compliance with emission limits. The BNL Central Steam Facility (CSF) is the only Laboratory facility that requires monitoring. Two of the four boilers at the CSF (Boilers 6 and 7) are equipped with continuous emission monitors to measure nitrogen oxide (NO_x) emissions and opacity. NO_x emissions cannot exceed 0.30 lbs./MMBtu when No. 6 fuel oil is burned or 0.20 lbs./MMBtu when natural gas or No. 2 fuel oil is combusted. Opacity levels cannot exceed 20 percent, except for one 6-minute period per hour of not more than 27 percent opacity.





In 2012, there were no measured exceedances of the NO_x emission standards for either boiler. However, there were nine excess opacity measurements recorded for Boiler 6 during routine operations in January due to an unexplained buildup of soot across the transmissometer light path. After operators shut down the boiler and cleared soot from the light path, no further exceedances occurred.

Because natural gas prices were lower than residual fuel oil prices throughout 2012, BNL used natural gas to supply more than 99 percent of the heating and cooling needs of major facilities during the year. As a result, annual facility emissions of particulate matter, nitrogen oxides, and sulfur dioxide were at their lowest in the last decade.

One of the overarching goals of Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance, is for Federal agencies to establish agency-wide greenhouse gas (GHG) reduction targets for their combined Scope 1 and 2 GHG emissions and for their Scope 3 GHG emissions. Scope 1 emissions are direct GHG emissions from sources that are owned or controlled by a Federal agency. Scope 2 emissions are indirect GHG emissions resulting from the generation of electricity, heat, or steam purchased

by a Federal Agency. Scope 3 emissions are GHG emissions from sources not owned or directly controlled by a Federal Agency, but related to agency activities such as vendor supply chains, delivery services, and employee travel and commuting.

DOE has set the following GHG emission reduction goals to be achieved by fiscal year (FY) 2020: reduce Scope 1 and 2 GHG emissions by 28 percent and reduce Scope 3 GHG emissions by 13 percent relative to their FY 2008 baselines. These goals are included in BNL's Site Sustainability Plan.

Due to planned programmatic growth with the addition of the Laboratory's National Synchrotron Light Source-II and other programs, meeting the Scope 1 and 2 reduction goal will be especially difficult, and BNL's Site Sustainability Plan identifies a number of actions that have or will be taken to help the Laboratory move towards this goal. These include offsets from the Long Island Solar Farm, receiving hydropower from the New York Power Authority, and the proposed construction of a 5 megawatt combined heat and power plant. To meet the 2020 Scope 3 GHG emissions reduction goal, the Laboratory will focus its efforts on reducing employee airline travel and increasing employee ride-sharing.

WATER QUALITY SURVEILLANCE PROGRAM

The Laboratory discharges treated wastewater into the headwaters of the Peconic River via BNL's Sewage Treatment Plant (STP), and non-contact cooling water and storm water runoff to groundwater via recharge basins. Some wastewater may contain very low levels of radiological, organic, or inorganic contaminants. Monitoring, pollution prevention, and careful operation of treatment facilities ensure that these discharges comply with all applicable requirements and that the public, employees, and the environment are protected.

In 2012, the average gross alpha and beta activity levels in the STP discharge were within the typical range of historical levels and well below New York State Drinking Water Standards (NYS DWS). Tritium was detected once in the STP effluent at a concentration just above the minimum detectable activity, which is less than 3 percent of the NYS DWS. Analysis of the STP effluent and the Peconic River continued to show no detection of cesium-137, strontium-90, or other gamma-emitting nuclides attributable to historical BNL operations.

The STP is also monitored for nonradiological contaminants. In 2012, monitoring of the STP effluent showed that, except for isolated incidents of noncompliance for metals, organic and inorganic parameters were within State Pollutant Discharge Elimination System (SPDES) effluent limitations or other applicable standards, and no volatile organic compounds (VOCs) were detected.

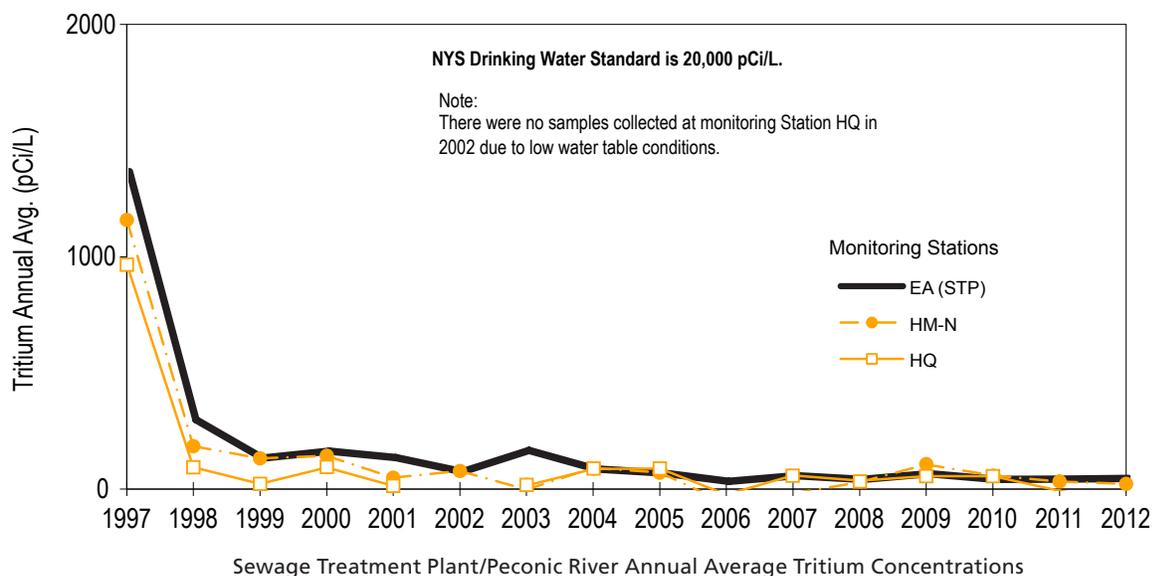
Discharges to recharge basins are sampled throughout the year for analyses of gross alpha and beta activity, gamma-emitting radionuclides, and tritium. Each recharge basin is a permitted point-source discharge under the Laboratory's SPDES permit. In 2012, there were no reported gamma-emitting nuclides attributable to BNL operations in any discharges to recharge basins, and tritium was detected at a very low level in a single sample. Inorganics (i.e., metals) were



Modular Aeration Tank at BNL's Sewage Treatment Plant

detected; however, their presence is due primarily to sediment run-off in stormwater discharges.

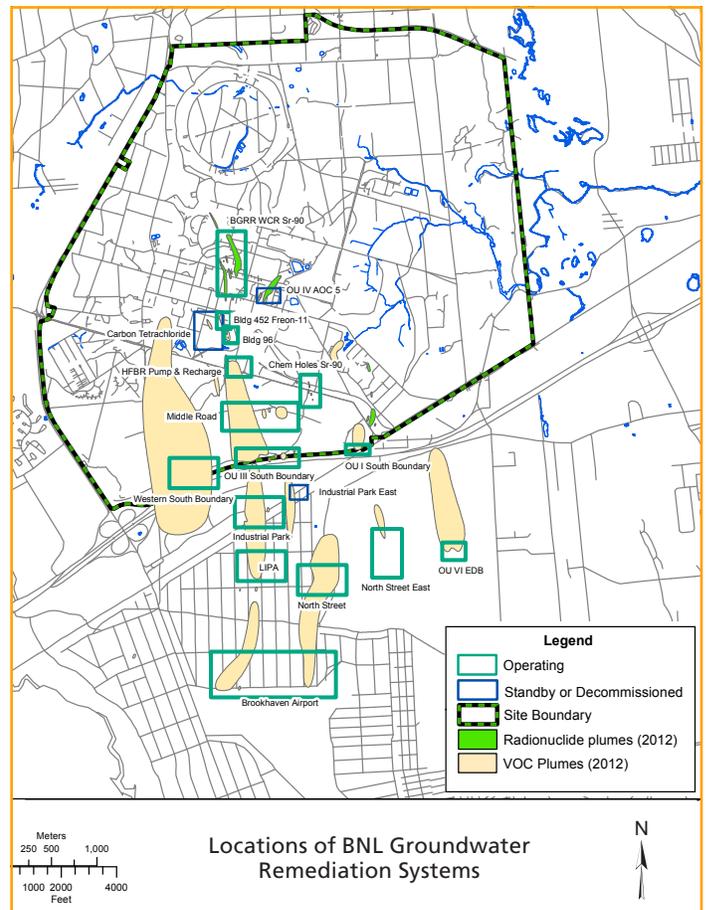
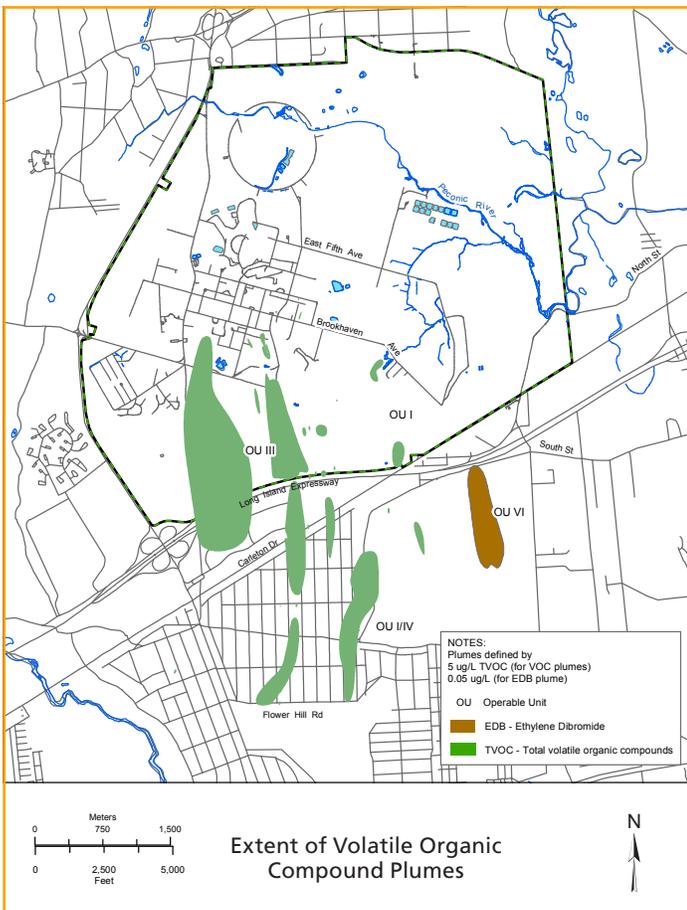
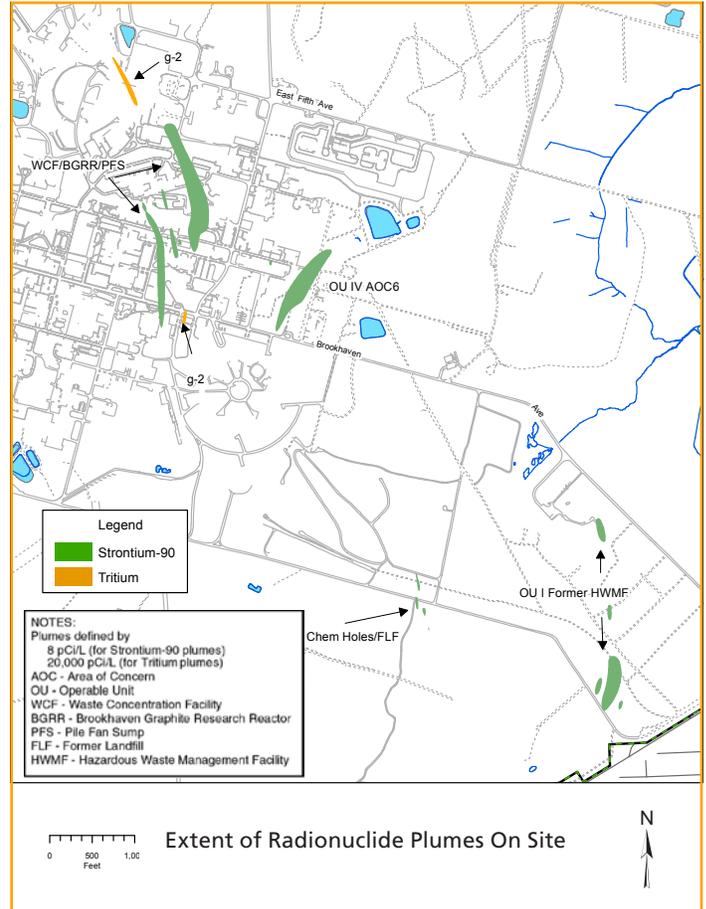
To assess the potential impact of STP discharges on the water quality of the Peconic River, surface water monitoring is conducted at several locations upstream and downstream of the discharge point. The Carmans River, located to the west of BNL, is monitored as a geographical control location for comparative purposes, as it is not affected by Laboratory operations. Radiological data from Peconic River surface water sampling in 2012 showed that the average concentrations of gross alpha and gross beta activity from off-site locations and control locations were indistinguishable from BNL on-site levels, and all detected levels were below the applicable NYS DWS. No gamma-emitting radionuclides attributable to Laboratory operations were detected either upstream or downstream of the STP. Inorganic data from Peconic River samples collected upstream, downstream, and at control locations demonstrated that elevated amounts of aluminum and iron detected in the river are associated with natural sources. Concentrations of copper, lead, and zinc detected were consistent with concentrations found in the STP discharge and were all within SPDES permit limits.



GROUNDWATER PROTECTION MANAGEMENT PROGRAM

The mission of the Laboratory's Groundwater Protection Program is to protect and restore the aquifer system at BNL. BNL's extensive groundwater monitoring well network is used to evaluate progress in restoring groundwater quality, to comply with regulatory permit requirements, to monitor active research and support facilities, and to assess the quality of groundwater that enters and exits the site. The Laboratory monitors research and support facilities where there is a potential for environmental impact, as well as areas where past waste handling practices or accidental spills have already degraded groundwater quality. In 2012, the Laboratory collected groundwater samples from 796 permanent monitoring wells during 1,791 individual sampling events. No new impacts to groundwater quality were discovered in 2012.

During 2012, BNL continued to make significant progress in restoring groundwater quality. Approximately 239 pounds of VOCs and 1.9 mCi of Sr-90 were removed from the groundwater, and 1.5 billion gallons of treated groundwater were returned to the aquifer. To date, 6,948 pounds of VOCs have been removed from the aquifer, and noticeable improvements in groundwater quality are evident in several monitored areas. Also to date, two of the treatment



systems have removed approximately 27 mCi of Sr-90 from the groundwater. Highlights of the groundwater monitoring program for 2012 include:

- Approximately 71 pounds of Freon-11 were removed from the aquifer near Building 452. Significant reductions in Freon-11 concentrations in groundwater were observed. Compared to 2011 when Freon-11 concentrations up to 38,000 µg/L were detected in source area wells, concentrations decreased to less than 1,150 µg/L by November 2012.
- The Operable Unit (OU) III South Boundary Treatment System was modified in 2012 to include the addition of a new extraction well. The new extraction well has been effective in capturing and treating volatile organic compound (VOC) contamination in the deep Upper Glacial aquifer at the site boundary.
- Significant reductions in VOC concentrations have been observed in the Building 96 source area monitoring wells following the 2010 excavation of contaminated source area soils. In a monitoring well located immediately downgradient of the excavation, total VOC concentrations decreased from a maximum of 2,435 µg/L in early 2011, to 161 µg/L in late 2012.
- Although all VOC concentrations in the OU V monitoring wells were below the drinking water standards from 2008 through 2010, trichloroethylene (TCE) was detected at slightly above the 5 µg/L standard in a single off-site monitoring well during 2011 and 2012. The well will continue to be monitored annually.
- Following the 2010 detection of strontium-90 (Sr-90) concentrations up to 491 pCi/L in the groundwater immediately downgradient of BNL's Brookhaven Graphite Research Reactor (BGRR), Sr-90 levels were significantly lower during 2011 and 2012, with concentrations dropping to less than 10 pCi/L by December 2012. Continued monitoring is required to determine the long-term effectiveness of the engineered cap installed in 2011. The cap is designed to prevent rainwater infiltration into the contaminated soils below the BGRR.
- Tritium concentrations in the groundwater immediately downgradient of BNL's High Flux Beam Reactor (HFBR) remained below the 20,000 pCi/L drinking water standard during 2012.
- The HFBR Pump and Recharge system was operational during all of 2012. Monitoring data for 2010 through 2012 indicate that tritium concentrations in the downgradient segment of the plume have remained below the 20,000 pCi/L drinking water standard.
- Tritium continues to be detected in the g-2 source area monitoring wells at concentrations above the 20,000 pCi/L drinking water standard, with a maximum concentration of 88,200 pCi/L in January 2012. By October 2012, the maximum tritium concentration was 37,700 pCi/L. The overall reduction in tritium concentrations observed over the past 10 years indicates that the engineered stormwater controls are effectively protecting the activated soil shielding at the source area.
- Since April 2006, all tritium concentrations in the Brookhaven Linear Isotope Producer (BLIP) facility surveillance wells have been less than the 20,000 pCi/L DWS. The maximum tritium concentration during 2012 was 4,360 pCi/L. These results indicate that the engineered stormwater controls are effectively protecting the activated soil shielding.
- At the on-site Upton Service Station, VOCs associated with petroleum products and the solvent tetrachloroethylene (PCE) continue to be detected in the groundwater directly downgradient of the facility. Groundwater monitoring results indicate that the petroleum-related compounds break down within a short distance from the facility. It is believed that the contaminants detected in groundwater originate from historical vehicle maintenance activities and are not related to current operations.

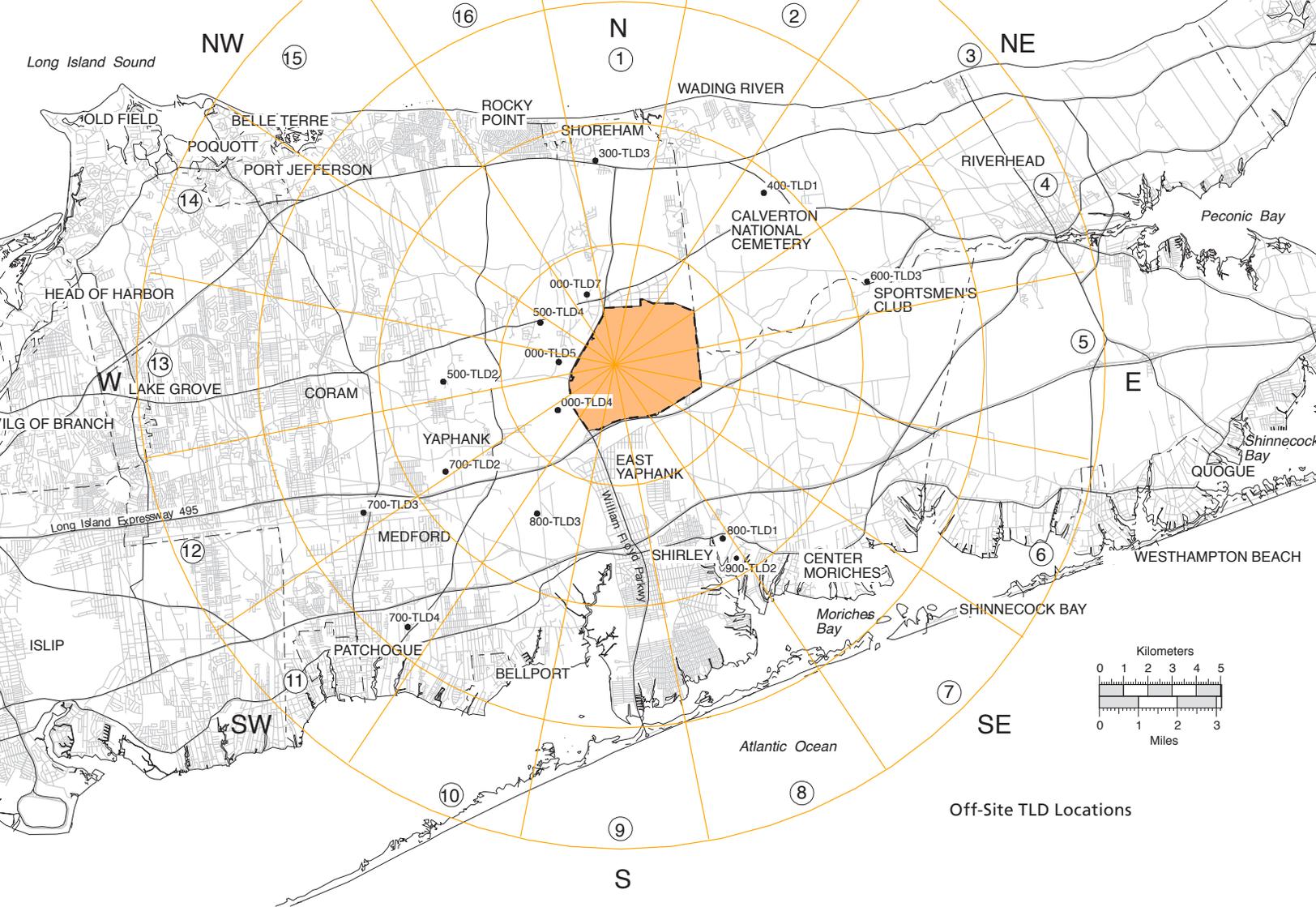
A detailed Groundwater Status Report is provided as Volume II of the Site Environmental Report, and provides a comprehensive summary of data collected during the calendar year, as well as an evaluation of Groundwater Protection Program performance.

RADIOLOGICAL DOSE ASSESSMENT PROGRAM

BNL routinely assesses its operations to ensure that any potential radiological dose to members of the public, BNL workers, visitors, and the environment is "As Low As Reasonably Achievable" (ALARA). The potential radiological dose is calculated as the largest possible dose to a hypothetical Maximally Exposed Off-Site Individual (MEOSI) at the BNL site boundary. For dose assessment purposes, the pathways include direct and indirect radiation exposure, inhalation, ingestion, immersion, and skin absorption. Radiological dose assessments at the Laboratory have consistently shown that the effective dose equivalent from operations is well below the Environmental Protection Agency and DOE regulatory dose limits for the public and the environment.

To measure direct radiation from Laboratory operations, 58 environmental thermoluminescent dosimeters (TLDs) were placed on site in known radiation areas and 12 TLDs were placed in surrounding communities in 2012. A TLD is a device used to measure radiation dose to occupational workers and radiation levels in the environment. The average dose from all TLDs showed there was no additional contribution to on- and off-site locations from BNL operations in 2012.

In 2012, the annual on-site external dose from all potential sources, including cosmic and terrestrial radiation, was estimated as 68 ± 12 mrem (680 ± 120 µSv), and the annual off-site external dose was estimated as 62 ± 10 mrem (620 ± 100 µSv). The effective dose to the MEOSI from air emissions was estimated as $0.235E-01$ mrem (2.4 µSv). The ingestion pathway dose was estimated as 2.21 mrem (22 µSv) from the consumption of deer meat and $0.1E-01$ mrem (1.0 µSv) from consumption of fish caught in the vicinity of the Laboratory. The total dose from Laboratory operations to the MEOSI from all pathways was



estimated as 2.55 mrem (26 μ Sv). The dose from the inhalation pathway attributable to BNL operations was approximately 3 percent of the Environmental Protection Agency’s annual regulatory dose limit of 10 mrem (100 μ Sv), and the total dose was less than 3 percent of DOE’s annual dose limit of 100 mrem (1,000 μ Sv) from all pathways. Doses to aquatic and terrestrial biota were also evaluated and found to be well below the regulatory limits.

Other short-term projects, such as remediation work and waste management disposal activities, were assessed for radiological emissions; the potential dose from each of these activities was below regulatory limits, and there was no radiological risk to the public, workers, or the environment. In summary, the overall dose impact from all Laboratory activities in 2012 was comparable to natural background radiation levels.

NATURAL RESOURCE MANAGEMENT PROGRAM

The BNL Natural Resource Management Program was designed to promote stewardship of the natural resources found on site and to integrate natural resource management and protection with the Laboratory’s scientific mission. The goals of the program include protecting and monitoring the ecosystem on site, conducting research, and communicating with the public, stakeholders, and staff members regarding environmental issues. Precautions are taken to protect and enhance habitats and natural resources. Activities to eliminate or minimize negative effects on sensitive or critical species (such as the eastern tiger salamander, eastern hognose

snake, and banded sunfish) are incorporated into procedures or into specific programs or project plans. Restoration efforts continue to remove pollutant sources that could contaminate habitats. In some cases, habitats are enhanced to improve survival or increase populations. The Laboratory also monitors and manages other wildlife populations, such as white-tailed deer and Canada geese.

BNL conducts routine monitoring of flora and fauna to assess the impact, if any, of past and present activities on the Laboratory’s natural resources. Generally, deer sampled on site or within 1 mile contain higher concentrations of

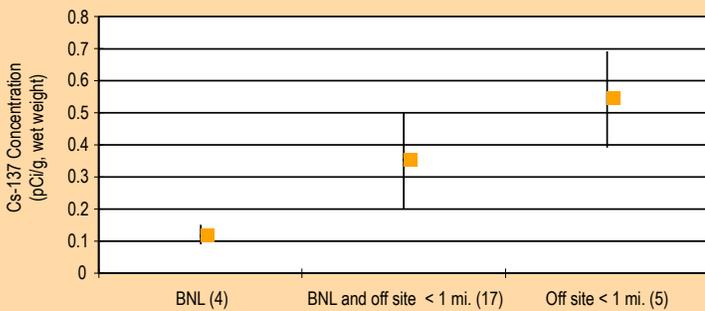
cesium-137 (Cs-137) than deer sampled from more than 1 mile off site. This is most likely because on-site deer consume small amounts of contaminated soil and graze on vegetation growing in soil where elevated Cs-137 levels are known to exist. The maximum on-site concentration in 2012 in deer meat was 0.27 pCi/g, wet weight. The wet weight concentration is before a sample is dried for analysis, and is the form most likely to be consumed. The maximum on-site and within 1 mile concentration was 1.52 pCi/g, wet weight. The New York State Department of Health has formally reviewed the potential public health risk associated with Cs-137 levels in on-site deer and determined that neither hunting restrictions nor formal health advisories are warranted.

Testing of deer bones for strontium-90 (Sr-90) indicated background levels. Sr-90 is present in the environment at background levels as a result of worldwide fallout from nuclear weapons testing.

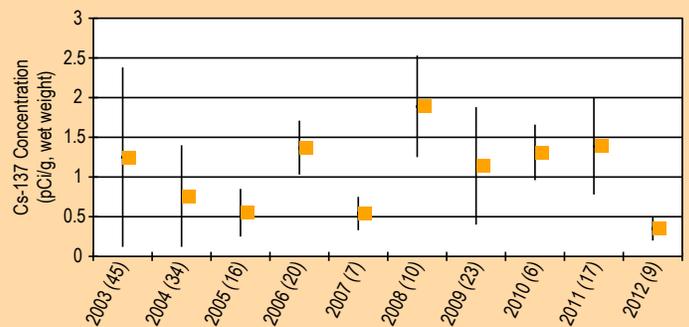
In collaboration with the New York State Department of Environmental Conservation (NYSDEC) Fisheries Division, BNL maintains an ongoing program for collecting and analyzing

fish from the Peconic River and surrounding freshwater bodies. In 2012, Cs-137 was detected at low levels and appears to be declining compared with historic values. The cleanup of both on- and off-site portions of the Peconic River has removed approximately 88 percent of Cs-137 in the sediment that was co-located with mercury. Natural radioactive decay will result in further decreases.

Nonradiological analysis of fish in 2012 showed that metals concentrations are considered safe and do not pose any health risks to humans or other animals that may consume fish. Due to its known health risk, mercury is the metal of most concern. In general, a trend of decreasing mercury content downstream from BNL's Sewage Treatment Plant (STP) is evident. Polychlorinated biphenyl (PCB) analysis in fish was discontinued off site, but continued to be performed on site. All values were less than the method detection level. Historically, PCBs have been found in both fish and sediment at BNL and periodically at other locations in the Peconic River. The cleanup of the Peconic River has removed most PCBs within the sediments on site.



Notes: Averages are shown for samples collected at BNL, on site and off site within 1 mile, and off site but within 1 mile of BNL. Numbers in parentheses indicate the number of samples in that data set. All values are presented with a 95% confidence interval. Cs-137 = cesium-137



Notes: Averages are shown for samples collected at BNL, and within 1 mile. Numbers in parentheses indicate the number of samples in that data set. All values are presented with a 95% confidence interval. Cs-137 = cesium-137

Comparison of Cesium-137 Average Concentrations in Deer Meat

Ten-Year Trend of Cesium-137 Concentrations in Deer Meat



Eastern Hognose Snake (Heterodon platyrhinos).



Banded Sunfish (Enneacanthus obesus). This fish was released immediately after the photo was taken.



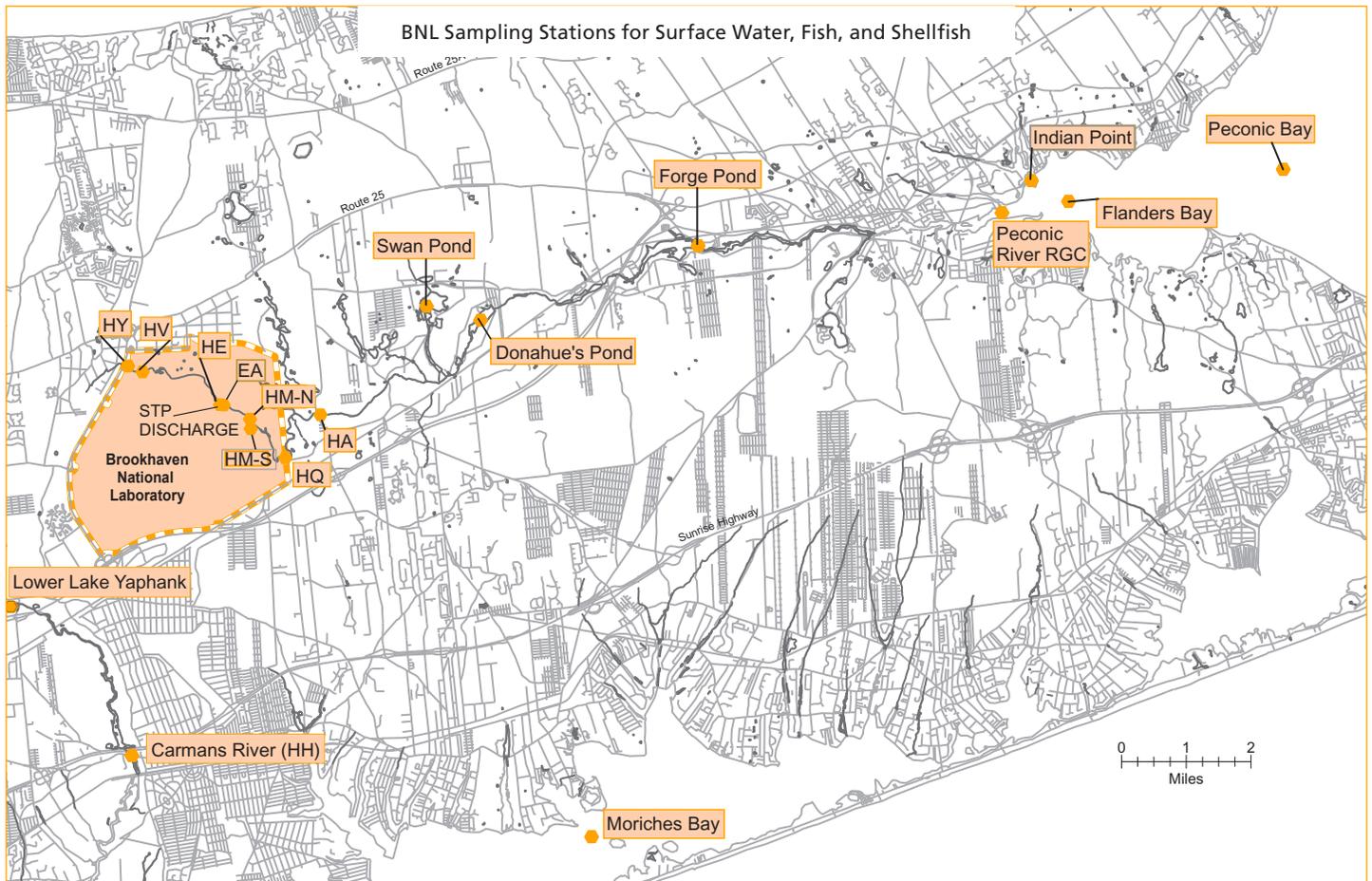
Eastern Tiger Salamander (Ambystoma t. tigrinum).

Annual sampling of sediment and vegetation in the Peconic River and a control location on the Carmans River was also conducted in 2012. Cs-137 was not detected in any on-site aquatic vegetation samples and was detected at levels near the detection level at off-site locations. In addition, low levels of Cs-137 were detected in sediments at off-site locations. Metals analysis conducted indicated metals at background levels and many are common in the environment.

Water column sampling for mercury and methyl mercury was performed at Peconic River sampling locations, BNL's STP, and one reference location on the Connetquot River in 2013. The general trend of total mercury in water samples

decreased with increasing distance downstream from the STP. Methyl mercury concentrations increased slightly from the STP to the BNL site border; then decreased gradually with increasing distance downstream of the site border until reaching the historic range of concentrations for the Connetquot River reference station.

On-site garden sampling in 2012 did not detect any Cs-137 in vegetables, but was detected in soils at a very low level and are considered consistent with background levels. Grassy vegetation samples also contained very low levels of Cs-137 and is also considered consistent with historical background levels.



UPTON ECOLOGICAL AND RESEARCH RESERVE

The Upton Ecological and Research Reserve is managed by BNL and the Foundation for Ecological Research in the Northeast (FERN). The property, 530 acres, is located on the eastern boundary of BNL, and is home to a wide variety of flora and fauna. It contains wetlands and is largely within the core preservation area of the Long Island Central Pine Barrens. Based on information from a 1994–1995 biological survey of the Laboratory, experts believe the reserve is home to more than 200 plant species and at least 162 species of mammals, birds, fish, reptiles, and amphibians.

Research supported by FERN in 2012 included continued investigation into the microbial world of soils located within the pine barrens and experimental areas on site. Microbial research carried out by a scientist at Dowling College, New York, has identified several new species of fungus and bacteria. Funding was also provided for bat and horseshoe crab larvae research.



WILDLIFE PROGRAMS

The Laboratory sponsors a variety of educational and outreach activities involving natural resources. These programs are designed to help participants understand the ecosystem and to foster interest in science. Wildlife programs are conducted at BNL in collaboration with DOE, local agencies, colleges, and high schools. Ecological research is also conducted on site to update the current natural resource inventory, gain a better understanding of the ecosystem, and guide management planning.

In 2012, BNL and FERN hosted 13 interns and 2 faculty members who worked on a variety of projects, some of which included: ongoing work on soil microbial studies of Pine Barrens soils; a statistical analysis of 12 years' worth of migratory bird data; box turtle home range determination and resource use; flying squirrel radio-telemetry surveys and genetics; acoustic surveys of bats; and impact assessments of the Long Island Solar Farm. In addition, BNL and several environmental groups began working together to develop the Long Island Nature Organization (www.longislandnature.org) and hosted the first annual Long Island Natural History conference in November.

CULTURAL RESOURCE MANAGEMENT PROGRAM

The goal of BNL's Cultural Resource Management Program is to ensure the proper stewardship of BNL and DOE historic resources. Additional goals include maintaining compliance with various historic preservation and archeological laws and regulations, and ensuring the availability of resources to Laboratory personnel and the public for research and interpretation.

Cultural resource management activities performed in 2012 included: the loan of the "Atoms for Peace" art work, a Brookhaven Graphite Research Reactor model, and period material from the 1950s to the Long Island Museum for a display titled "Long Island America's 1950s Frontier; a presentation of the history of the BNL site to the Bellport Historical Society; and a talk at the First Annual Natural History Conference on the natural history of the BNL site with a focus on the historical aspects of human use of the site.

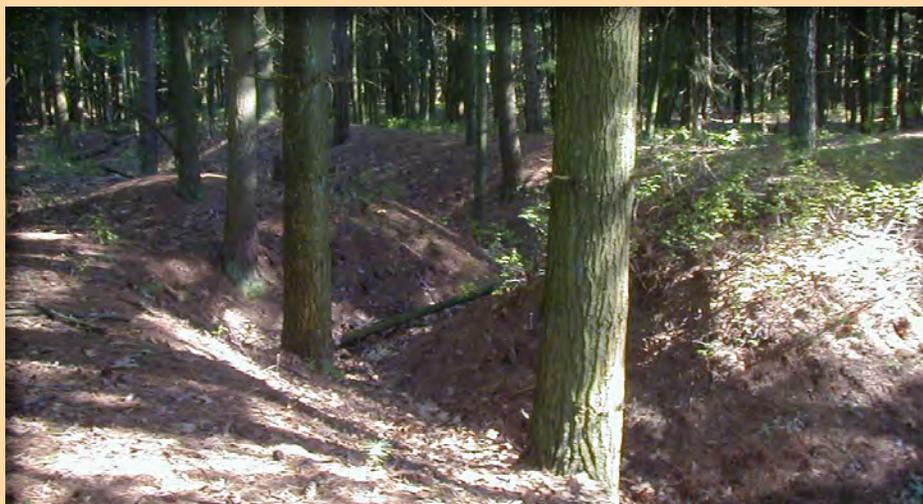
In October, the American Chemical Society's NY Section named the BNL Chemistry Building an Historical Chemical Landmark. The designation was given in recognition to the significant contribution by BNL scientists for the development of 18FDG; the first successful radiotracer for positron emission tomography that continues to be widely used worldwide for brain research and cancer diagnosis.

WORLD WAR I TRENCHES

From 1917 through 1920, the site of what is now the Laboratory was the U.S. Army's Camp Upton. Named for Civil War General Emory Upton, Camp Upton was one of 16 U.S. Army training camps. Here, recruits mostly from the New York metropolitan area were trained for the famed 77th Infantry Division, also known as the Liberty Division, which began leaving Camp Upton for fighting in France in March 1918.

Training included marching, weapons-use and, among other techniques, trench warfare. Trench warfare was a form of combat in which armies dug zig-zagging lines of interconnected ditches. Within these trenches, troops lived in muddy water, among rats and lice while defending their territory and combating their opponents.

The trenches shown here may be some of the only surviving examples of WWI earthworks in the U.S., and they have been determined to be eligible for listing on the National Register of Historic Places.



COMMUNICATION AND COMMUNITY OUTREACH

Communication and community involvement are commitments under BNL's Environmental Management System. The Laboratory maintains relationships with its employees, key stakeholders, neighbors, elected officials, regulators, and other community members. The goals are to provide an understanding of BNL's science and operations, including environmental stewardship and restoration activities, and to incorporate community input in the Laboratory's decision making.

To facilitate effective dialogue between the Laboratory and key stakeholders, several forums for communication and involvement have been established at BNL. The Brookhaven Executive Roundtable (BER), established in 1997 by DOE's Brookhaven Site Office, meets routinely to update local, state, and federal elected officials and regulatory agencies on environmental and operational issues, as well as on scientific discoveries and initiatives. The Community Advisory Council (CAC), established by BNL in 1998, advises the Laboratory Director, primarily on environmental, health, and safety issues related to the Laboratory that are of importance to the community.

BNL's Community Relations Office website is used to host

links to the CAC webpage, which contains meeting agendas, as well as past meeting presentations and minutes, and also hosts links to important cleanup documents and announcements for public meeting dates. Local elected officials and their staff are provided with up-to-the-minute information and updates on environmental issues and research breakthroughs.



Summer Sundays at BNL

The Community Relations Office also manages several outreach programs that provide opportunities for stakeholders to become familiar with the Laboratory's facilities and research projects, as well as new initiatives. The Tour Program offers the opportunity for college, university, professional, and community groups to learn about BNL. Groups visit the Laboratory's scientific machines and research facilities and meet with scientists who conduct research. The Speaker's Bureau provides speakers for educational and other organizations, such as Rotary Clubs, civic organizations, professional societies, and other groups to update the community about Laboratory research and/or operations accomplishments, including environmental stewardship.

The Summer Sundays program enables the public to visit BNL science facilities, experience hands-on activities, and learn about research projects and environmental stewardship activities.

BNL's Media and Communications and Internal Communications Offices issue press releases and publish *Brookhaven Digest*, a weekly employee newsletter. A Director's Office

web-based publication, *Monday Memo*, is issued bi-weekly to employees and focuses on administrative topics important to the Laboratory population. The Laboratory maintains an informative website at <http://www.bnl.gov>, where these publications, as well as extensive information about BNL's science and operations, past and present, are posted. In addition, employees and the community can subscribe to the Laboratory's e-mail news service at <http://lists.bnl.gov/mailman/listinfo/bnl-announce-1>. Community questions and comments may be submitted via the "Contact Us" form found on the Community Relations Office website at: <http://www.bnl.gov/community/>.

In addition, the Laboratory participates in various annual events, such as BNL's celebration in honor of Earth Day, off-site Earth Day fairs and festivals, and the William Floyd Summit Night Out.

Working closely with the community, employees, elected officials, and regulatory agency representatives, DOE and BNL continue to openly share information on issues and projects and provide feedback on how that input was used.

Annual "Your Environment" Art Contest in Celebration of Earth Day



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One event BNL hosts each year in honor of Earth Day is the "Your Environment" art contest. Students from local schools in grades 3-5 are asked to create a poster focusing on suggested environmental themes. The winning students receive a \$100 gift check and all students who enter the contest receive a Certificate of Appreciation at our annual awards celebration.

The winning posters for Earth Day 2013 were created by:

- a) Alyssa Colorio, John S. Hobart Elementary School
- b) Ella Anthony, Coram Elementary School
- c) Julia Kranenberg, Laddie A. Decker Sound Beach School
- d) Khristopher Mercado, Ridge Elementary School



a)



b)



c)



d)



BROOKHAVEN
NATIONAL LABORATORY