

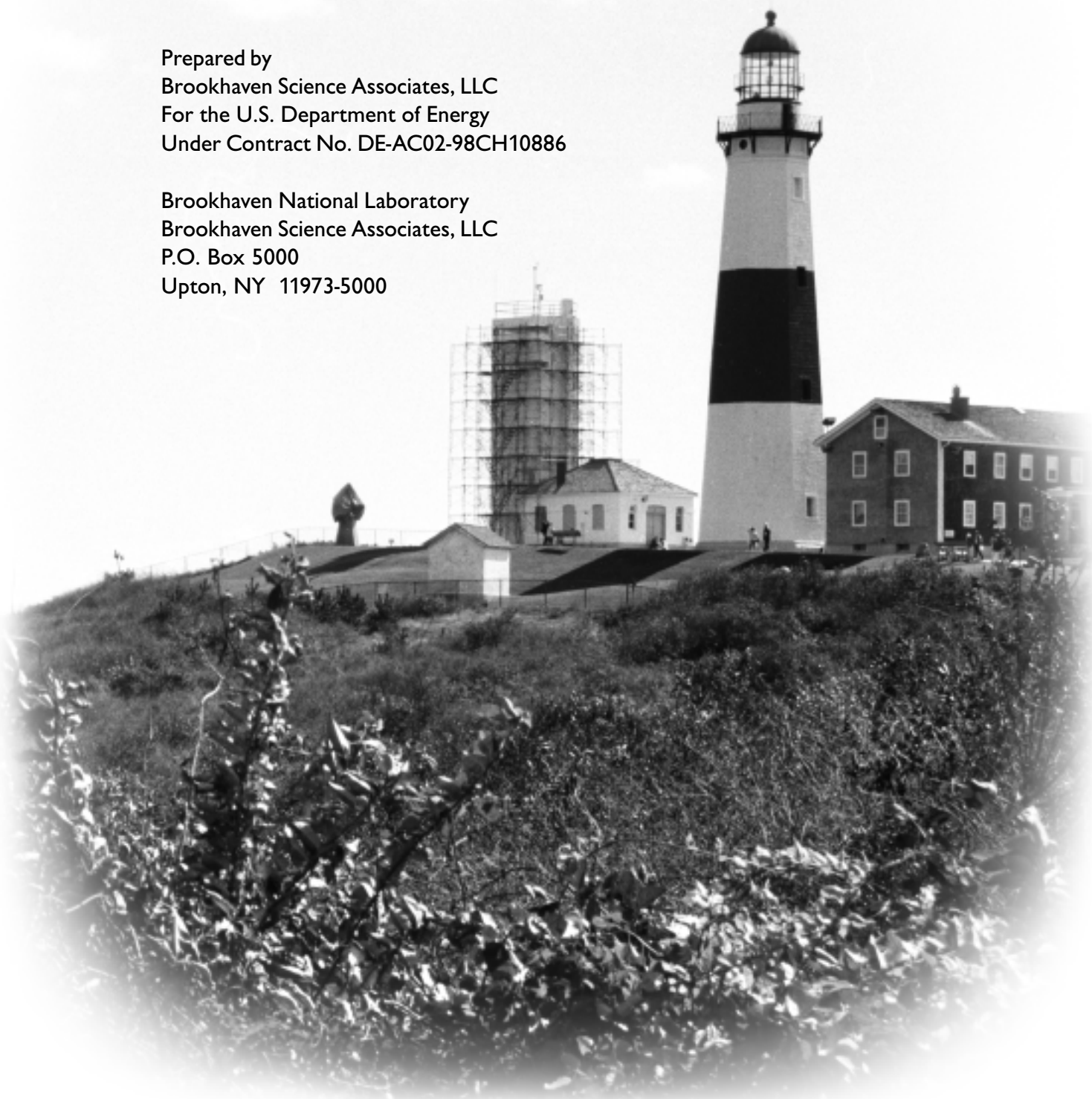
EXPLORING EARTH'S MYSTERIES  
...PROTECTING ITS FUTURE

# 2001 Site Environmental Report

September 2002

Prepared by  
Brookhaven Science Associates, LLC  
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## *A Message*

from the Interim Laboratory Director



Since taking over as the Interim Director of Brookhaven National Laboratory in October 2001, I have been and remain fully committed to excellence in environmental performance and protecting our environment. As a first-rate scientific laboratory, BNL made significant progress in environmental remediation and communications under Dr. Marburger's leadership. I take our environmental stewardship responsibilities very seriously and I expect all of our employees and visitors to do the same.

This year, BNL demonstrated environmental leadership by becoming fully ISO 14001 registered. BNL is the first Office of Science national laboratory and the first Long Island-based organization to obtain third-party registration to this globally recognized environmental management standard. BNL has made major commitments to the protection of the environment and we are realizing some of these benefits. In 2001, BNL received two Pollution Prevention awards from DOE. Pollution prevention

projects saved nearly \$1.4 million and resulted in the reduction or reuse of more than one and one-half million pounds of industrial, sanitary, radioactive, and hazardous waste. From 1993 to 2001, BNL reduced annual routine hazardous waste generation by 87 percent, mixed hazardous/radioactive waste by 81 percent, and radioactive waste by 72 percent. We have made continual improvements in our compliance record and a significant reduction in our environmental vulnerabilities. We have a groundwater protection program that focuses on the restoration of groundwater quality and preventing future impacts. BNL continues to address historical issues and made significant progress in 2001 in decommissioning the research reactors on site. Additionally, we are supporting ecological research and habitat enhancement at the 530-acre Upton Ecological and Research Reserve. I am committed to an expedited cleanup of our site as well as stewardship of our natural resources.

Communication with our stakeholders—neighbors, regulators, employees, and others—on environmental issues and progress has now become an integral part of how we do business at BNL. In 2001, BNL was named the "Organization of the Year" by the International Association for Public Participation for our success at integrating public participation into our operations, and ensuring that stakeholders are kept informed and have a voice in decisions and issues that affect them. We continue to deliver on our commitments and have made tremendous effort to set in place a permanent environmental stewardship strategy for the Laboratory. As we continue to forge onward with innovative research while improving our environmental operations, we are able to achieve the balance that is in our motto, "Exploring Earth's Mysteries...Protecting Its Future."

A handwritten signature in black ink that reads "Peter Paul". The signature is written in a cursive, flowing style.

Peter Paul, *Interim Laboratory Director*

*Dr. Peter Paul, formerly Brookhaven's Deputy Director for Science and Technology, was appointed as Interim Director on October 26, 2001, when Dr. John H. Marburger was confirmed by the U.S. Senate as Director, Office of Science and Technology Policy.*





BROOKHAVEN NATIONAL LABORATORY  
2001 SITE ENVIRONMENTAL REPORT

## *Executive Summary*

The year 2001 marked a major milestone of environmental accomplishments for Brookhaven National Laboratory (BNL), when it became the first U.S. Department of Energy (DOE) Office of Science Laboratory to obtain third-party registration to the International Organization for Standardization's (ISO) 14001 Standard. An ISO 14001-certified environmental management system (EMS) is an internationally recognized framework for implementing a strategic approach to achieve environmental objectives and control environmental impacts. Using this EMS, Brookhaven National Lab strives to fully integrate compliance assurance, pollution prevention, and community outreach into the planning, decision making, and implementation phases of all site activities.

Operated by Brookhaven Science Associates (BSA), for the Department of Energy, BNL manages its world-class scientific research with particular sensitivity to environmental and community issues. BNL's motto, "Exploring Earth's Mysteries...Protecting its Future," reflects a management philosophy to fully integrate environmental stewardship into all facets of its mission, with a healthy balance between science and the environment.

The *2001 Site Environmental Report* (SER) summarizes the status of BNL's environmental programs and performance, compliance performance, and restoration, as well the impacts that BNL operations, past and present, have had on the environment.

### **ENVIRONMENTAL PROGRAMS**

BNL's Environmental Management Program consists of several Labwide environmental programs. Programs such as the ISO 14001-certified EMS were implemented to ensure that BNL is managed in an environmentally responsible manner that protects the ecosystem and human health, and improves environmental

quality. The cornerstone of BNL's environmental programs is its Environmental Stewardship Policy, which states intentions and principles regarding overall environmental management and provides a framework for planning and action. The stewardship policy is posted throughout the Laboratory and on the BNL website and is included in all new employee training programs.

The Laboratory's Pollution Prevention/Waste Minimization Program ("P2") is an essential facet of the EMS that represents a continuous effort to make pollution prevention and waste minimization an integral part of the BNL operating philosophy. In 2001, BNL won two national DOE Pollution Prevention Awards for innovative projects, the "Process Evaluation Project" and the "Environmental Management System Principles Leading Change." A third project, "Preparing for High Flux Beam Reactor Facility Stabilization," was selected as a runner-up. Brookhaven National Laboratory's P2 Program focuses on eliminating or reducing waste, effluents, and emissions at their source, conserving natural resources, reusing materials, recycling, and procuring environmentally preferable products. Pollution prevention is integrated into all planning and decision making at the Laboratory.

A newly formed advisory group for the 530-acre Upton Ecological and Research Reserve began developing a natural resource management plan and awarded two research grants to be used to investigate local ecological issues. The reserve permanently preserves a portion of the Central Pine Barrens, a unique ecosystem of forests and wetlands on Long Island that provides habitat for approximately 27 species that are endangered, threatened, or of special concern.

BNL also moved forward with its Cultural Resources Management Program and established a schedule for developing a cultural resources management plan. This plan will be used to guide

the management of all of BNL's cultural resources. In 2001, a survey was completed to determine the potential historic value of BNL's buildings in accordance with the National Historic Preservation Act, and it was determined that the former High Flux Beam Reactor was eligible for listing on the National Register of Historic Places.

The Facility Review Project ranks, schedules, and dispositions environmental issues identified during the 1997 review of all facilities at BNL. By 2001, 68 percent of all issues were dispositioned and 76 percent of the high-priority issues were resolved.

The goal of BNL's Environmental Restoration Project is to complete on-site and off-site cleanup activities of contamination from past disposal practices. In 2001, approximately 1 billion gallons of groundwater were treated and 600 pounds of volatile organic chemicals were removed from the aquifer. Further highlights are discussed under Environmental Restoration.

#### **COMPLIANCE WITH ENVIRONMENTAL REGULATIONS**

BNL is subject to more than 50 sets of federal, state, and local environmental regulations; 65 site-specific permits; 8 equivalency permits for operation of groundwater remediation systems; as well as other binding agreements. The Laboratory is committed to achieving and maintaining full compliance with these environmental requirements and agreements.

Results for 2001 in air emissions monitoring of nitrogen oxides, carbon monoxide, and sulfur dioxide were all within permit limits; monitoring of the BNL potable water system met all regulatory requirements; and groundwater monitoring at the Major Petroleum Facility continues to demonstrate that current oil storage and transfer operations are not affecting groundwater quality. Liquid effluents discharged to surface water and groundwater met New York State Pollutant Discharge Elimination System permit requirements with the exception of six excursions at the Sewage Treatment Plant and six excursions at other outfalls. Ten petroleum product spills, most of them of one gallon or less, and three spills of regulated materials (ethylene glycol and heat exchange fluid) were reportable.

All spills were cleaned up to the satisfaction of the New York State Department of Environmental Conservation.

External regulatory agencies conducted 13 environmental audits at BNL in 2001. These audits included reviews of petroleum and chemical storage, hazardous waste operations, and air emissions from the Central Steam Facility, as well as inspections of the Sewage Treatment Plant, outfalls and recharge basins, and the potable water system. Of the 1,200 New York State hazardous waste compliance requirements, BNL met all but two, receiving a notice of violation for administrative deficiencies. Corrective actions were identified and immediate actions were taken to address these issues.

#### **ENVIRONMENTAL MONITORING**

BNL maintains a comprehensive sitewide Environmental Monitoring Program that identifies potential pathways for exposure to the public and the environment, evaluates any impacts BNL activities may have on the environment, and ensures compliance with environmental permit requirements.

Compliance monitoring is conducted to ensure that wastewater effluents, air emissions, and groundwater monitoring data comply with regulatory and permit limits issued under the federal Clean Air Act, Clean Water Act, Oil Pollution Act, Safe Drinking Water Act, and the New York State equivalents. Restoration monitoring is used to determine the overall impacts of past operations, to delineate contamination, and to ensure that removal actions are effective and remediation systems are performing as designed. Surveillance monitoring is used to assess potential environmental impacts resulting from routine facility operations.

In 2001, there were a total of 5,578 sampling events, which included collection of groundwater, potable water, precipitation, air, flora and fauna, soil, sediment, and wastewater discharges. This does not include samples taken to characterize wastes for disposal purposes or nonroutine samples collected in support of restoration characterization activities. Groundwater plumes were tracked, evaluated, and remediated as necessary. Of note, there was a significant

reduction in the inventory of tritium at the HFBR due to continued decommissioning efforts.

Deer and fish sampling results were consistent with previous years, and vegetables grown in the BNL garden plot continue to support historical analyses that there are no Laboratory-generated radionuclides in farm produce.

Recent characterization work at the Brookhaven Graphite Research Reactor (BGRR) detected higher than expected levels of strontium-90 (Sr-90) in the shallow groundwater beneath the reactor's below-ground ducts, which will be addressed through the legacy contamination cleanup program.

BNL's Landtrek Project, an innovative computer program that BNL continues to work on, is an extension of the BNL Environmental Information Management System and provides environmental monitoring data to the public and BNL staff over the Internet.

#### **ENVIRONMENTAL RESTORATION**

The Environmental Restoration Program made significant progress in its ongoing efforts to manage on-site and off-site cleanup activities resulting from past disposal practices and accidental spills. Some highlights of the major cleanup activities in 2001 include:

- Installing and operating two additional groundwater treatment systems, bringing the total number of installed treatment systems to eight
- Receiving regulatory agency approval for the shutdown of the Operable Unit IV air sparge and soil vapor extraction system
- Receiving a signed Record of Decision for the Operable Unit V Sewage Treatment Plant and the Operable Unit VI EDB Plume (the last decision document for groundwater)
- Pre-design characterization activities for six planned off-site groundwater treatment systems, which involved drilling additional temporary and permanent monitoring wells in portions of East Yaphank and Manorville to refine the location for the treatment systems
- Completion of the remediation and restoration of the Operable Unit I Landscape Soils Project

- Significant progress in decommissioning the BGRR, including the removal of a belowground duct cooler, removal of an aboveground duct, and the development of an Engineering Evaluation and Cost Analysis for the BGRR Canal.

#### **RADIOLOGICAL DOSE ASSESSMENT**

An evaluation of radiological dose impact above natural background levels to the members of the public and the environment determined that impact from BNL operations was minimal and well below regulatory limits. The environmental pathways evaluated include air inhalation, immersion, and ingestion of local deer and fish, as well as direct gamma exposure. Radiological dose to aquatic and terrestrial biota was also assessed and was found to be insignificant and comparable to natural background radiation levels. Sixteen remediation projects were assessed for potential radiological air emissions, and the dose impact from all the projects was determined to be only minimally above natural background radiation.

The U.S. Environmental Protection Agency regulates the airborne emissions from DOE facilities and includes compliance monitoring and reporting requirements for radiation doses to members of the public. Under these regulations, BNL is required to submit an annual National Emissions Standard for Hazardous Air Pollutants (NESHAPs) report describing air emissions from all sources, and stationary point sources. Due to extra beam irradiation time in 2001, the Brookhaven Linac Isotope Producer facility exceeded 1 percent of the NESHAPs standard, thereby requiring continuous monitoring for air emissions. The effective dose equivalent was estimated to be 0.14 mrem (1.4 mSv) per year from the short-lived gases oxygen-15 and carbon-11. Discussions with the Environmental Protection Agency were initiated to determine cost-effective controls and acceptable monitoring methods.

#### **QUALITY ASSURANCE**

BNL uses its on-site Analytical Services Laboratory and four off-site, contract laboratories to analyze its environmental samples. All the labs are certified by New York State and are subject

to oversight that includes state and national performance evaluation testing, review of quality assurance programs, and audits.

In 2001, BNL received a combined score of 96 percent “overall satisfactory” for the 593 radiological and nonradiological performance evaluation tests carried out, which is considered excellent. The two primary laboratories used to report radiological analytical data scored 92 percent and 100 percent satisfactory results in state and federal performance evaluation programs, an improvement from last year’s overall score of 89 percent and 95 percent. BNL received a satisfactory rating of 96.9 percent in nonradiological performance evaluation testing under the New York State Environmental Laboratory Approval Program, and the three off-site, contract laboratories for nonradiological work scored between 93.3 percent and 94.8 percent.

Quality control is maintained through daily instrument calibration, efficiency and background checks, and testing for precision and accuracy. These controls ensure that all analytical data reported for the *2001 Site Environmental Report* are reliable and of high quality.

#### **COMMUNICATION, OUTREACH, AND INVOLVEMENT**

BNL conducted a number of outreach activities in 2001, including presentations and meetings with key stakeholder groups and the

public to keep them informed and to gather feedback; regular communications with the local, state, and federal regulators and elected officials; and interactions with the business and educational community. In 2001, more than 25,000 visitors participated in educational and public outreach activities conducted on site.

BNL also celebrated the thirty-first anniversary of Earth Day with a variety of activities involving BNL staff and the community. These activities included awards for employees who had demonstrated an outstanding effort in pollution prevention and waste minimization; a student art contest, with the winning artwork selected for inclusion in the *2001 Site Environmental Report*; and an on-site 4-mile race through the Pine Barrens for children and adults. BNL was also selected as the “Organization of the Year” by the International Association for Public Participation, for integrating public participation into its operations and ensuring that stakeholders are kept informed and have a voice in decisions and issues that may affect them.

#### **CONCLUSION**

Overall, Brookhaven National Laboratory continues its progress toward integrating environmental stewardship into all its scientific endeavors and routine site operations. In 2001, the Laboratory reached its three-year goal of certified environmental management and will continue to improve operations in the future.



# Acknowledgments

The production of the BNL *2001 Site Environmental Report* (SER) requires the knowledge, skill, experience, and cooperation of many people and organizations at the Laboratory. Responsibility for producing the SER is with the Environmental Services Division, which is managed by Lori Cunniff. The lead authors, co-authors, and other contributing staff and organizations involved in this year's SER are listed below.

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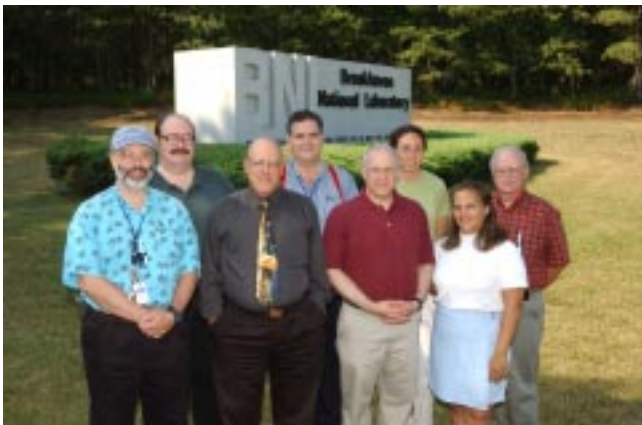
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*A Note from the Editor*

Throughout the *Site Environmental Report*, there are many references to Brookhaven National Laboratory (BNL), the U.S. Department of Energy (DOE), and the U.S. Environmental Protection Agency (EPA). These acronyms, and others that are explained at the point of first use in each chapter, are used interchangeably with their spelled-out forms as an aid to readers. Also, Appendix A opens with a list of acronyms and their meanings.

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