

2007 Site Environmental Report



Brookhaven National Laboratory
**Community Advisory
Council Meeting**

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BROOKHAVEN
NATIONAL LABORATORY
a passion for discovery



Purpose of the Annual Site Environmental Report

- **Official record of BNL's environmental impact for calendar year 2007**
 - Serves as an historical record; BNL has been preparing SERs since 1971
 - Frequently used to respond to Freedom of Information (FOI) requests
- **Serves as the principal environmental communications vehicle**
 - Distribution includes DOE, DOE Laboratories, regulators, local libraries, and interested stakeholders
 - Over 200 hardcopies and 400 CD versions requested and distributed last year
- **Prepared in accordance with DOE Order 231.1, Environment, Safety and Health Reporting**
 - Documents compliance with DOE O 450.1 and 5400.5
- **Available as a downloadable file on the BNL web page, in hardcopy, and as a summary booklet that includes a CD version of the full report, including SER Volume II, Groundwater Status Report. Summary report should be available in early November.**

2007 SER

Table of Contents/Chapter Authors

- **SER Volume I**
 - Executive Summary
 - Chapter 1 – Introduction
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 - Chapter 7 – Groundwater Protection
 - Chapter 8 – Radiological Dose Assessment
 - Chapter 9 – Quality Assurance
- **SER Volume II**
 - Groundwater Status Report

Chapter 2 - Environmental Management System (EMS) ISO 14001

- **BNL undergoes both an internal and external audit of its EMS annually.**
- **In 2007 BNL's EMS was Recertified to the standard by our Registrar.**
 - 24 examples of continual improvement
 - One minor non-conformance
 - Four Opportunities for Improvement
- **Eight Awards**
 - **“Expanding the Envelope of the BNL EMS through Voluntary Participation”**
 - **White House Closing the Circle Award**
 - **P2 Star Award (DOE)**
 - **P2/Environmental Stewardship Award**
 - **Other DOE P2 and Environmental Stewardship Awards**
 - **Composting Program**
 - **Recycling efforts**
 - **Federal Environmental Executive Silver Award for Electronics Recycling**
 - **Environmental Outreach Award from the National Environmental Performance Track Program**
 - **Long Island Transportation Management Inc. 2007 Commuter Choice Leadership award**

Chapter 2 – Pollution Prevention (P2) Program

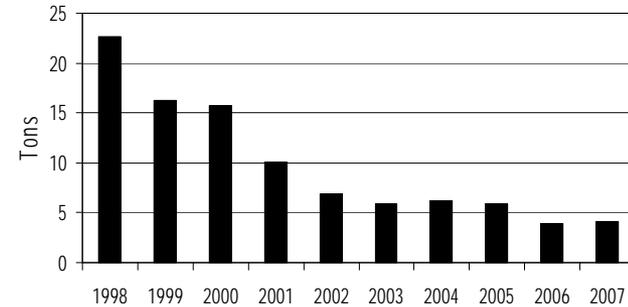
- **Cost avoidance of over \$2.9 million in CY2007**
 - Reduced/recycled/reused 14.5 million lbs. of industrial, sanitary, hazardous, and rad waste
- **Funds invested in FY2007 = \$9,950**
 - 19 proposals submitted, 6 funded
 - Annual cost savings = \$38,000 from new projects
 - Average payback of less than 1 year
- **FY07 projects**
 - a portable drum mixer
 - Aerosol Can disposal system
 - Motion activated light switches



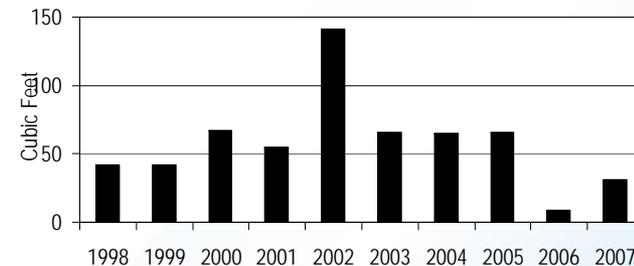
Chapter 2 – Waste Generation

- As a result of research and cleanup activities, BNL generated regulated waste requiring careful handling and disposal.
- In 2007, BNL generated the following types and quantities of waste (trend noted):
 - Routine Operations
 - Hazardous Waste: 4.1 tons - flat
 - Mixed Waste: 31ft³ - up
 - Radioactive Waste: 6,796 ft³ - up
 - Nonroutine Operations (ER and BNL)
 - Hazardous Waste: 362 tons – up
 - Lead contaminated soil generated as part of CSF and Water tank clean-ups contributed to higher nonroutine hazardous waste rates.
 - Mixed Waste: 148 ft³ - flat
 - Radioactive Waste: 59,643 ft³ – up

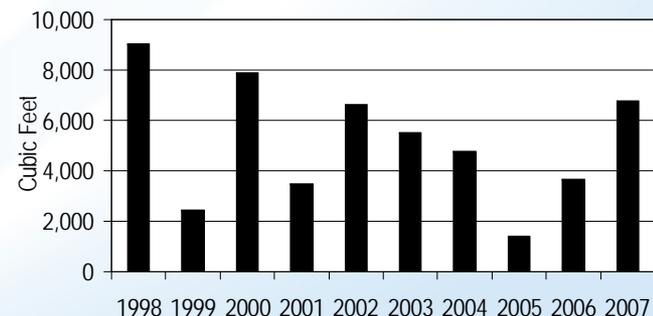
Hazardous Waste



Mixed Waste

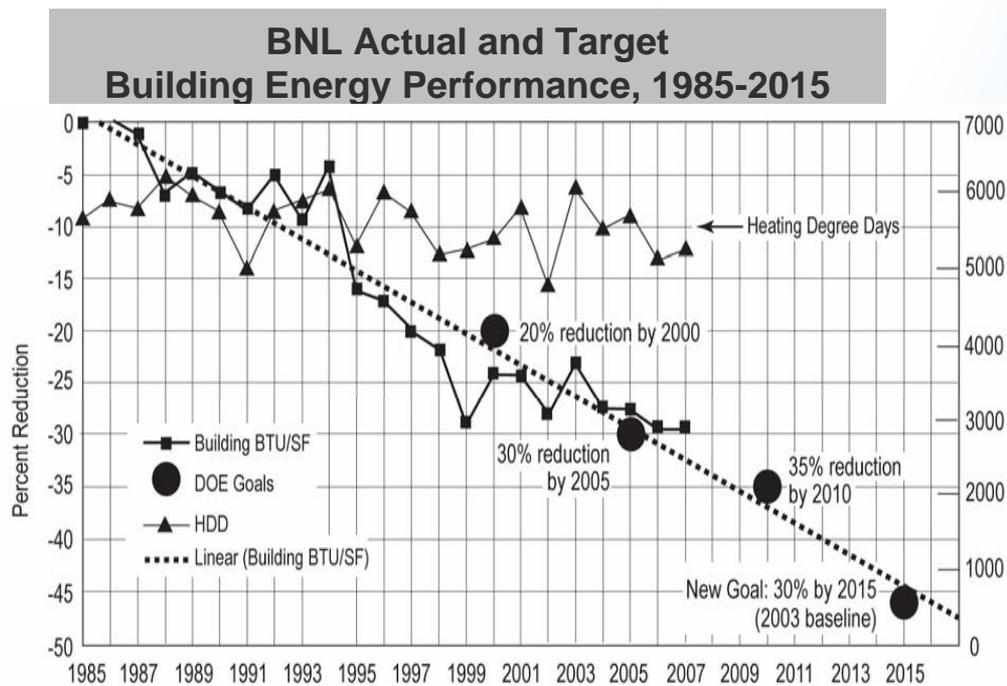


Radioactive Waste



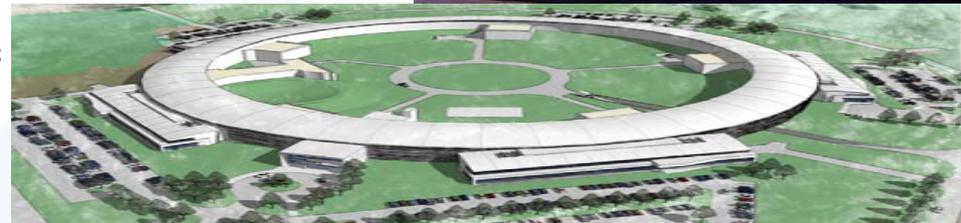
Chapter 2 – Energy Management and Conservation

- Operation of large research machines is energy intensive.
- DOE has established goals to minimize energy use.
- **2007 Statistics**
 - 233 million kilowatt hours of electricity
 - 3 million gallons of fuel oil
 - 36,000 gallons of propane
 - 163 million cubic feet of natural gas
 - Energy use per square foot in 2007 was 29% less than in 1985 and 8.3% less than in 2003
- **To Further reduce energy intensity**
 - Compressed Natural Gas vehicles saved 25,000 gallons of gasoline equivalent energy
 - Participating in demand curtailment program.
 - LEED Certification achieved for new facilities: Research Support Building (2006), CFN (2007)
 - Energy Savings Performance Contracts being implemented to identify energy savings.
 - 40 MW Photovoltaic power station being considered.



Chapter 2 – Other Topics in Chapter 2

- **Environmental Restoration Project**
 - Progress in achieving ERP Goals will be subject of future CAC presentations.
- **Communication and Community Involvement**
 - Public notified on Annual Groundwater Report
 - Peconic River Monitoring Report
 - ROD for the g-2 Tritium Source area and plume, BLIP, and USTs
 - Remedies for the decommissioning of the HFBR
 - Engineered Nanomaterials – Recognized by BNL as an extremely important issue and raised to level of Significant Environmental Aspect
- **Environmental Monitoring Program**
 - Over 8,600 sampling events



Chapter 3 – Compliance Status Overview

- **BNL complies with 34 permits or authorizations**
 - Permit changes in 2007
 - Title V: draft permit received and comments presented to NYSDEC
 - Several NYS permits obtained for work in the Peconic River corridor (RHIC)
- **Air**
 - BNL monitors the steam plant for several parameters in real-time. During 2007, 27, 6-minute opacity excursions reported for the year: 5 during boiler restart after a prolonged period of non-use and 22 due to equipment malfunction.
- **NEPA**
 - **91 additional projects reviewed for NEPA**
 - 87 minor actions
 - 4 Environmental Evaluation Notification forms
 - All were categorically excluded; no Environmental Assessments
- **PCBs/TSCA**
 - PCB article inventory reduced 44% from 2006 quantities (55 large caps)
 - > 90% reduction since 2003
 - Goal is to be PCB free in the next 2 years

Chapter 3 – Overview (continued)

■ SPDES

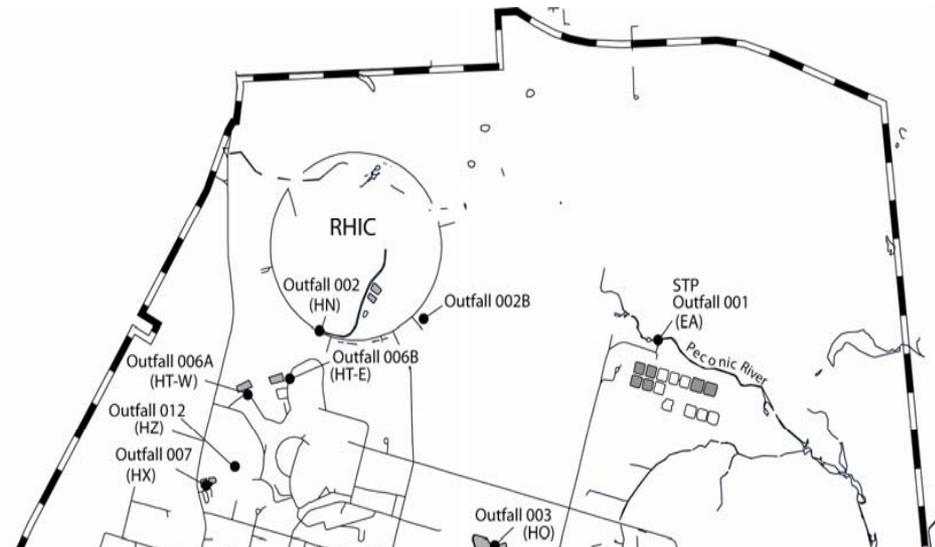
- 4 permit excursions at STP; none significant
 - All for Total N: Attributed to low BOD
 - Supplemental feeding in 2008 shows promise for reducing violations
- No excursions for recharge basins

■ Potable Water

- Potable Water
- 11% less than 2006 usage
- Complied with all drinking water requirements

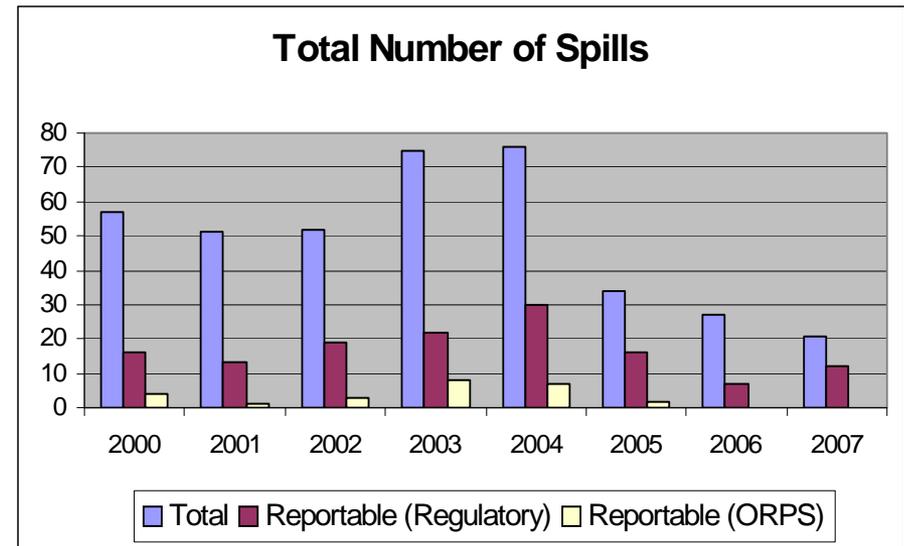
■ Tanks

- ~ 350 total facilities
 - 9 underground
- Inspections by NYSDEC showed minor deficiencies; all have been corrected.
- Continue to work with SCDHS to assure full conformance to Article 12.



Chapter 3 – Spills and Reportable Incidents

- BNL very concerned over impacts of spills. Targeted spill reduction in 2004.
- Spill awareness training continues to be effective; spills reduced 22% in 2007.
 - Vegetable based lubricants
 - Stainless steel reinforced hoses
 - Don't overfill or top-off fuel tanks
 - Don't park vehicles on the grass
- **21 spills in 2007**
 - 12 spills reportable to NYSDEC
 - 4 antifreeze releases
 - 7 hydraulic fluid
 - 1 waste oil
 - Zero de minimus oil to soil
 - One Pound RQ for antifreeze



Chapter 4 – Air Quality Radiological

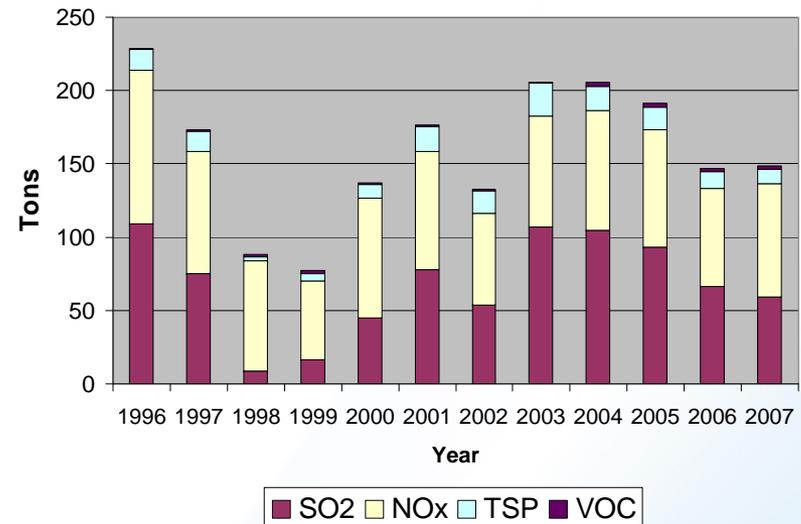
- **Radiological Emissions Monitoring - facility**
 - **BNL monitored 3 facilities for radionuclide releases**
 - BLIP, Building 801 Target Processing Lab, and HFBR
 - BLIP and the Target Processing lab make radioisotopes used in medical imaging and diagnostics
 - Dose from release calculated at 0.06 mrem
- **Radiological Air Monitoring – site-wide**
 - Radiological air quality monitored via six blockhouses and three battery operated samplers
 - Gross alpha and beta concentrations consistent with natural background
 - Tritium was not detected at all eight tritium samplers.



Chapter 4 – Non-Radiological

- **Continuous emissions monitoring required for Central Steam Facility Boiler Nos. 6 and 7**
 - Fuel oil use (2,542,850 gallons); comparable to amounts in 2002.
 - 263 million cubic feet nat. gas
 - No measured exceedances of NO_x limits.
 - Emissions lower in 2006 and 2007 due to higher percentage of gas burned.
 - Emissions well under permit limits.

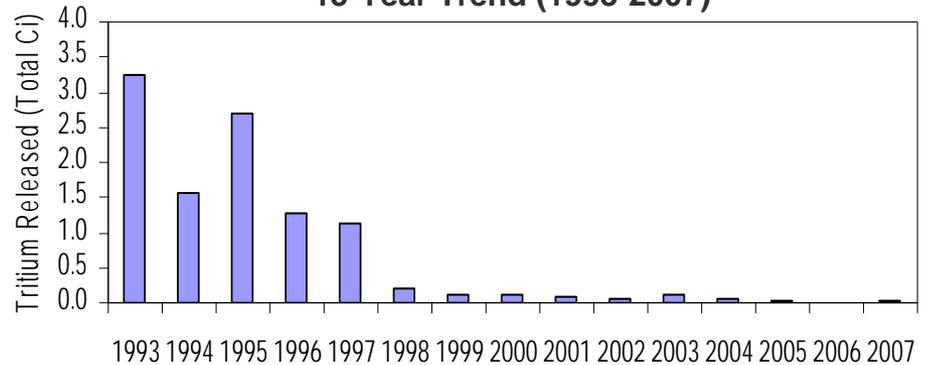
Central Steam Facility Emissions



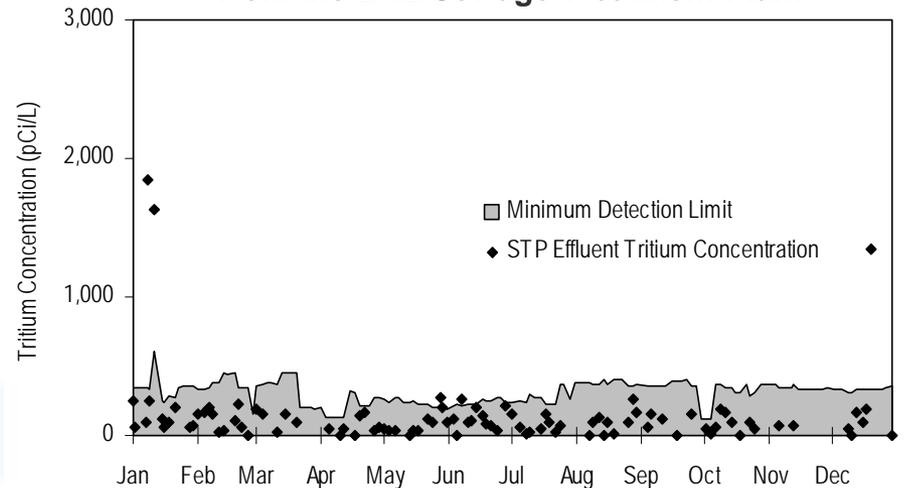
Chapter 5 – Water Quality Radiological Monitoring

- **Sewage Treatment Plant**
 - Tritium releases remained very low ~ 0.021 Ci released in 2007
 - Frequency of detections lower and never detected in the influent.
 - Maximum concentration - 1840 pCi/L
 - Annual average << min. detectable limit
 - Cs-137/Sr-90 remain undetected
- **Recharge Basins**
 - No gamma emitters detected
 - Natural products only
 - One reported detection of tritium at basin HT-W, ~430 pCi/L
- Nonradiological monitoring covered previously in Ch. 3

Tritium Released to the Peconic River
15-Year Trend (1993-2007)



Tritium Concentrations in Effluent
from the BNL Sewage Treatment Plant



Chapter 5 – Radiological Monitoring

- **Peconic River**
 - Most radioactivity levels similar upstream and downstream of the STP and consistent with background
 - No gamma emitting nuclides attributable to BNL detected
 - Low-level alpha and beta upstream and downstream attributed to natural products (e.g., K-40)
 - No Sr-90 detected
 - Single detection of tritium downstream of STP (421 pCi/L)



Chapter 5 – Non-Radiological Monitoring

■ Peconic River

- Water quality of Peconic upstream of STP similar to downstream relative to permit limits
- Metals exceed ambient water quality standards upstream and downstream of STP
 - Filtration of samples showed source of inorganics to be suspended sediment
 - Iron and aluminum are attributable to natural sources
 - Concentrations of metals higher downstream of the STP than upstream, but are consistent with SPDES permit limits
 - SPDES permit currently undergoing NYSDEC review; expect Hg limits to be lower in the new permit
- No routine detections of organics

Chapter 8 - Radiological Dose Assessment

Radiological dose is calculated for a hypothetical Maximally Exposed Individual (MEI): Person who lives at site boundary, eats home grown vegetables, and locally caught deer and fish.

- **Total effective dose** to the BNL MEI in 2007 from inhalation, immersion, and ingestion pathways was 3.16 mrem
- **Direct Exposure: Ambient external dose (Thermo luminescent Dosimeters)**
 - 70 mrem on site and 64 mrem off site; these data are statistically insignificant due to the error of uncertainty associated with these values.
- **Regulatory Limits**
 - EPA – 10 mrem (Air pathway)
 - NYSDOH – 10 mrem (Ingestion pathway)
 - DOE – 100 mrem from all pathways

Pathway	Amt. Consumed	Dose
Air immersion	NA	0.06 mrem
Ingestion Fish	15 pounds	0.08 mrem
Ingestion Deer	64 pounds	3.02 mrem
Ingestion Water	None	No Dose
	TOTAL DOSE	3.16 mrem