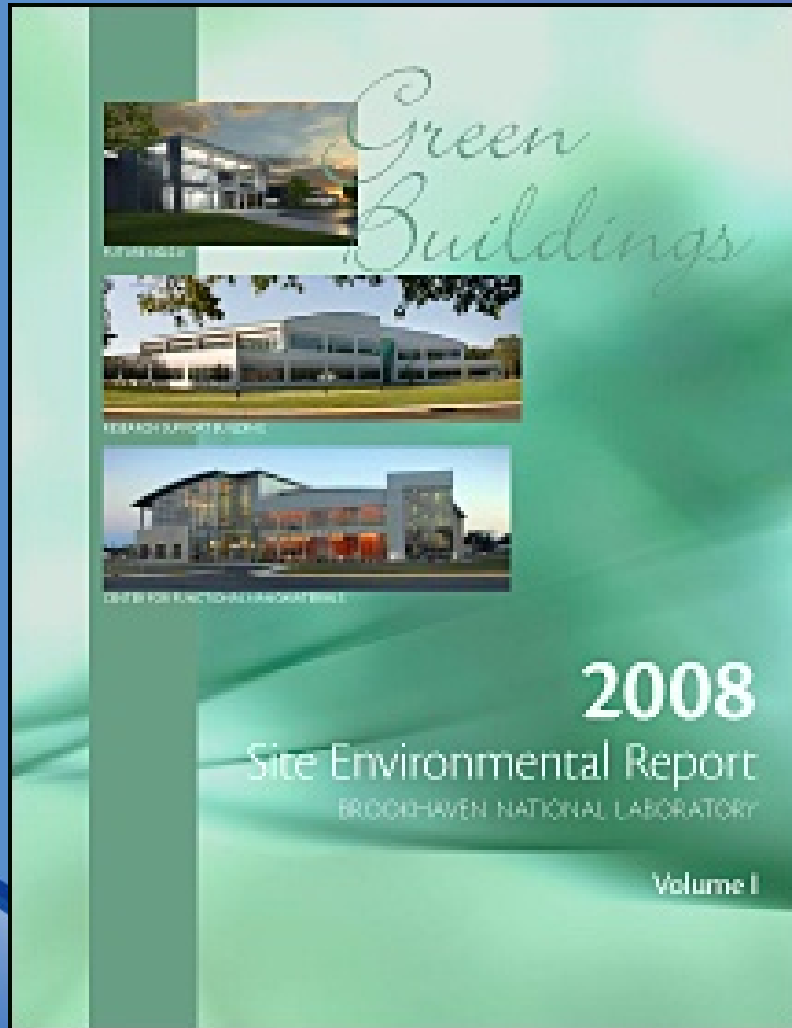


2008 Site Environmental Report



Brookhaven National Laboratory
**Community Advisory
Council Meeting**

December 10, 2009

*George Goode, Manager
Environmental Protection Division*

BROOKHAVEN
NATIONAL LABORATORY

a passion for discovery



2008 SER

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▪ SER Volume II

- Groundwater Status Report

SER Cover Design - Green Buildings

- **Center for Functional Nanomaterials (CFN) & Research Support Building (RSB) – LEED Silver**
 - Low reflectivity roofs
 - Natural light
 - 100 % recycled steel
 - Occupancy sensor lighting
 - Comparable footprint set aside for no future development
 - Priority parking areas for low polluting vehicles
- **Future Buildings**
 - NSLS- II – Portions will be LEED Silver
 - ISB & ISB2 – LEED Gold



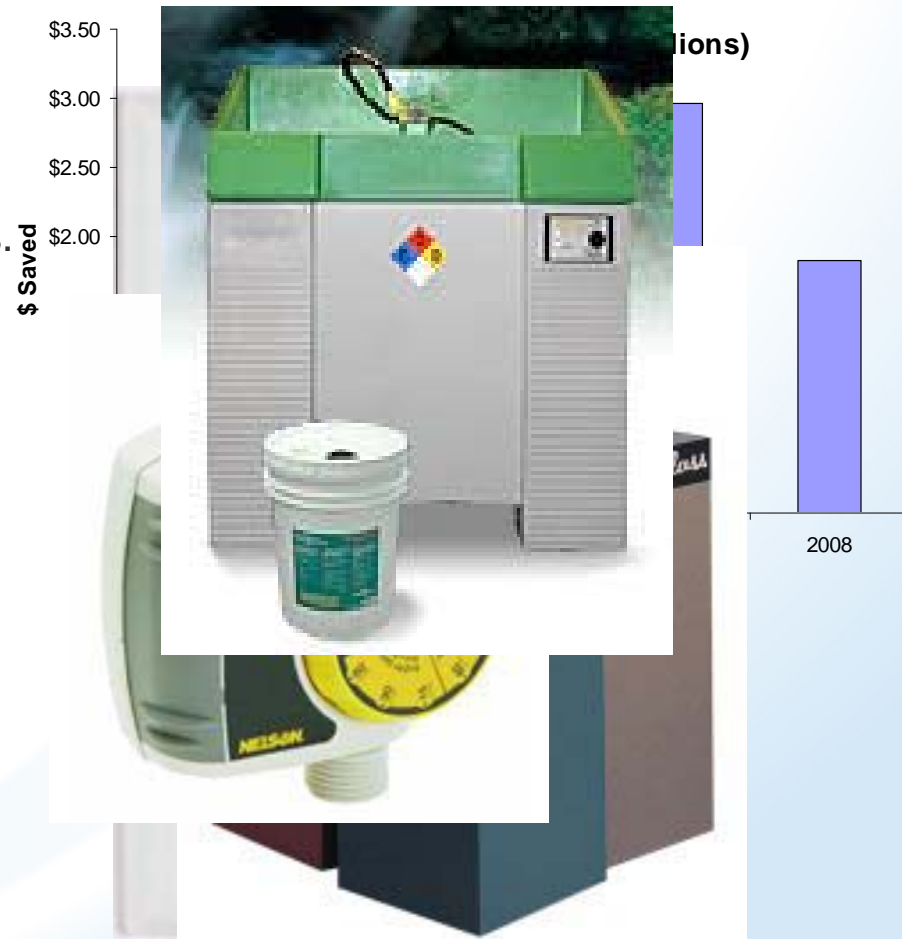
Chapter 2 - Environmental Management System (EMS) ISO 14001

- **BNL certified to the ISO 14001 standard since 2001**
 - Certification requires annual audit by independent registrar
 - In 2008 BNL's EMS was determined to be in conformance with the ISO standard
- **Three Environmental Awards in 2008**
 - Two awards for Electronics Stewardship
 - Federal Environmental Executive Silver Award for Electronics Recycling
 - Northeast Regional Winner – Office of the Environmental Executive, Electronics Reuse and Recycling Program
 - BNL Reused or Recycled 143,600 pounds of electronics in FY08
 - DOE Pollution Prevention Star (Honorable Mention)
 - Study of DNA Repair Using Fluorescently Labeled Oligonucleotides



Chapter 2 – Pollution Prevention (P2) Program

- P2 Program is expanding scope into energy, transportation, electronics, conservation, and sustainability
- Cost avoidance of over \$1.8 million in CY2008
 - Reduced/recycled/reused 9.7 million lbs. of industrial, sanitary, hazardous, and rad waste
- Funds invested in FY2008 = \$16,000
 - 15 proposals submitted, 5 funded
 - Annual cost savings = \$14,000 from new projects
 - Average payback a little more than 1 year
- FY08 projects
 - Water timers
 - Recycling Containers
 - Motion-activated light switches
 - Bio Circle Parts Washer

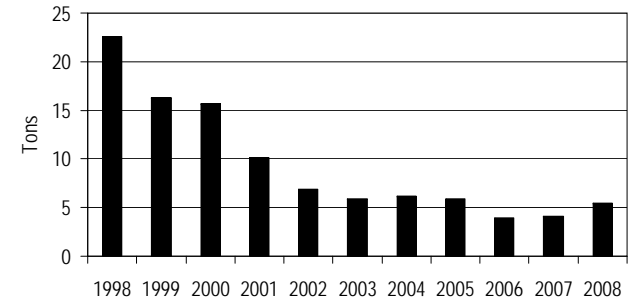


Chapter 2 – Waste Generation

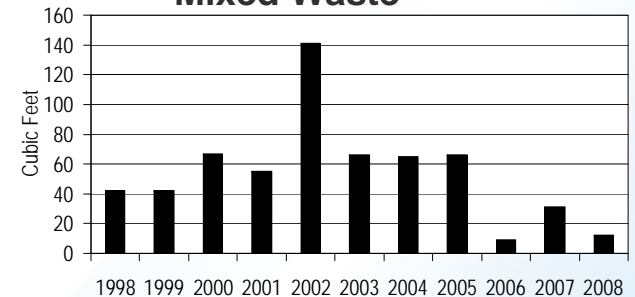
- As a result of research and cleanup activities, BNL generates regulated waste requiring careful handling and disposal
 - All hazardous and radioactive waste is disposed at licensed facilities, which are audited by BNL and regulators
- In 2008, the following types and quantities of waste were generated:
 - **Routine Operations**
 - Hazardous Waste: 5.5 tons
 - Mixed Waste: 12 ft³
 - Radioactive Waste: 1,738 ft³
 - **Nonroutine Operations (mainly clean-up projects)**
 - Hazardous Waste: 5.72 tons
 - Mixed Waste: 846 ft³
 - Radioactive Waste: 64,555 ft³

Routine Waste Generation Rates

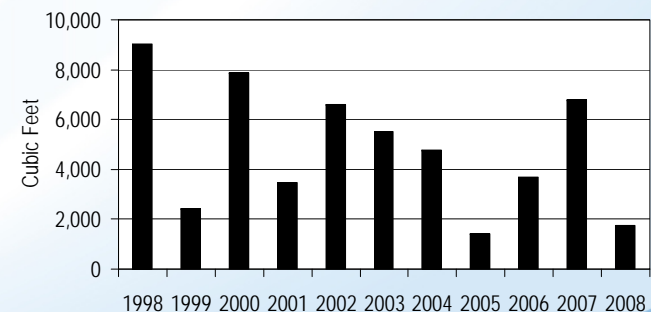
Hazardous Waste



Mixed Waste



Radioactive Waste

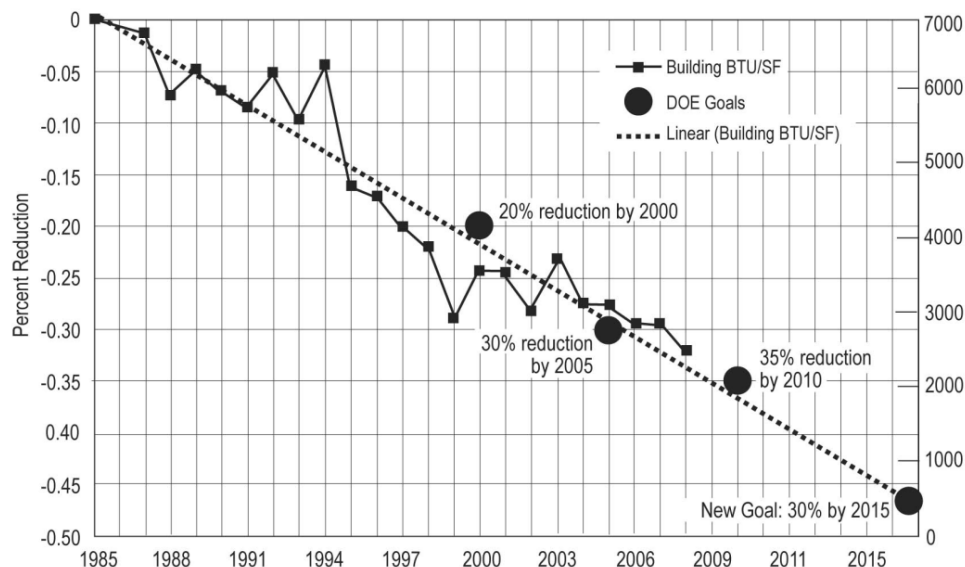


Chapter 2 – Energy Management and Conservation

2008 Statistics

- BNL has >4 million sqft Bldg space
- 233 million kilowatt hours of electricity used (Total)
- 708,000 gallons of fuel oil
- 36,000 gallons of propane
- 517 million cubic feet of natural gas
- Energy use per square foot in 2008 was 30% less than in 1985 and 11.6% less than in 2003
- New Executive Order 13514 establishes further reductions in: water consumption, fuel for transportation (fleet and travel), energy use and requires federal agencies to establish targets for GHG reductions

**BNL Actual and Target
Building Energy Performance, 1985-2015**



Chapter 3 – Compliance

- **BNL must comply with 34 environmental permits**
 - Title V Air Permit was renewed in June 2008
 - SPDES Wastewater Permit renewal application was submitted to NYSDEC (issued final in June 2009)
 - Initiated new NESHAPs permit for BLIP operations
- **NEPA activity in 2008**
 - **63 projects were reviewed for NEPA, including:**
 - Small science projects (paper studies to bench scale research)
 - Natural Resource Management studies
 - Construction, renovation and demolition
 - All Categorically Exempt; No Environmental Assessments required in 2008
- **PCBs/TSCA**
 - BNL is now near 100% PCB free, with only 1 PCB Article remaining
 - > 99% reduction since 2003
- **Assessments**
 - BNL was inspected by regulatory agencies 11 times in 2008
 - 1 Notice of Violation (NOV) issued for RCRA waste labeling
 - No other major findings

Chapter 3 – Compliance (continued)

■ SPDES Wastewater Permit

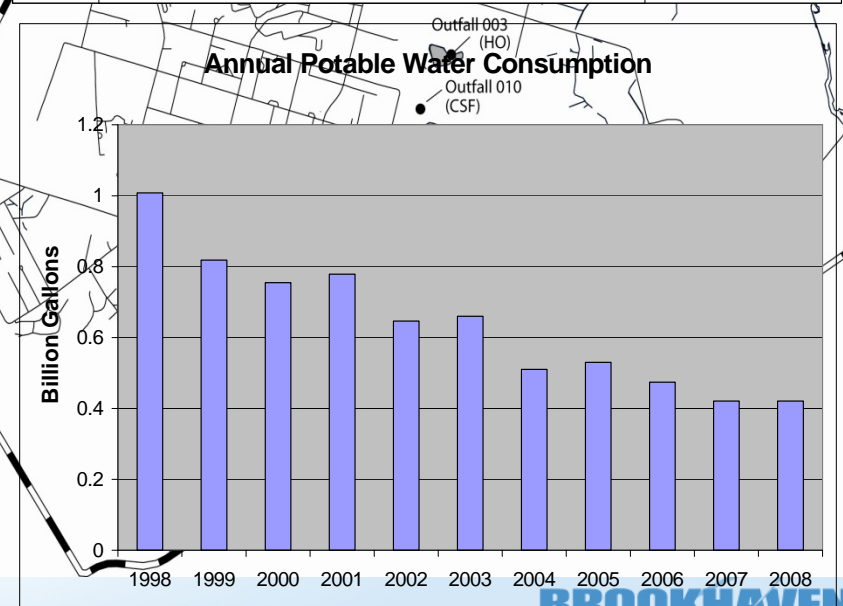
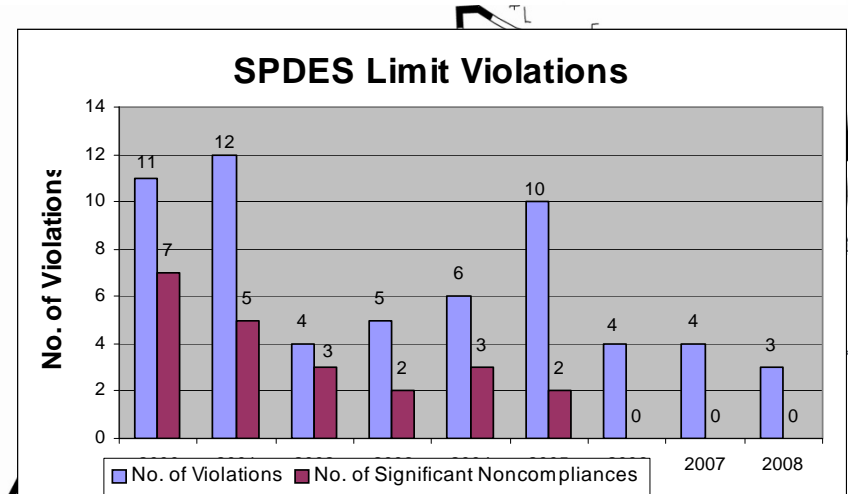
- 3 permit excursions; none significant
 - 1 pH, 2 for Total Nitrogen
 - Supplemental feeding in 2008/2009 have helped Nitrogen problem
- Extensive monitoring being conducted in 2009 under new SPDES permit
- Copper, iron, lead, nickel, mercury and zinc routinely discharged at concentrations > ambient water quality standards, but at or near the SPDES limit; significant issue for 2009 and beyond

■ Potable Water

- Comparable to 2007 usage
- Complied with all drinking water requirements

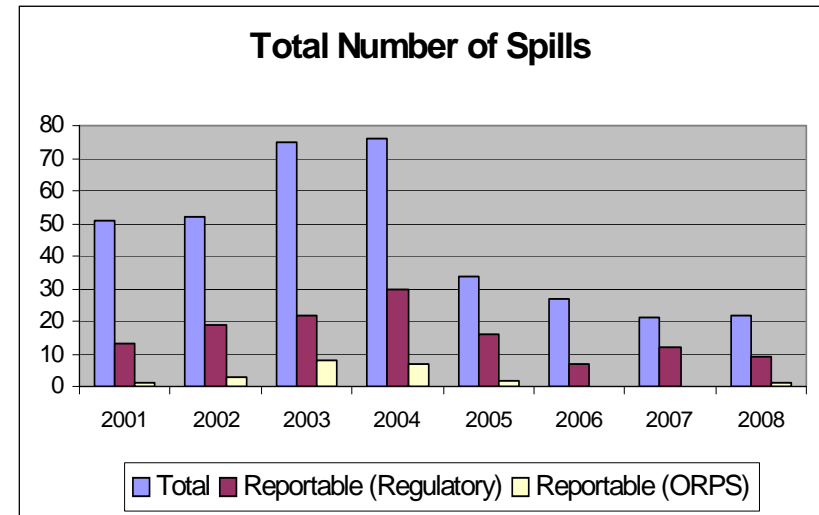
■ Tanks

- Inspections by NYSDEC and SCDHS showed minor deficiencies; all have been corrected



Chapter 3 – Spills and Reportable Incidents

- **Staff trained to report all spills**
 - BNL subject to very stringent reporting requirements (any amount to soil)
- **Spill awareness training initiated in 2005 continues to be effective**
 - Vegetable based lubricants
 - Stainless steel reinforced hoses
 - Don't overfill or top-off fuel tanks
 - Don't park vehicles on the grass
- **22 spills in 2008;**
 - 13 spills very small and released to impermeable surfaces and cleaned up immediately
 - 9 spills reportable to NYSDEC including:
 - Antifreeze (1)
 - Vehicle oil (2)
 - Power steering fluid (1)
 - Hydraulic Fluid (2)
 - Sodium Hydroxide (1)
 - Gasoline (1)
 - Compressor oil (1)



Chapter 4 – Air Quality Radiological

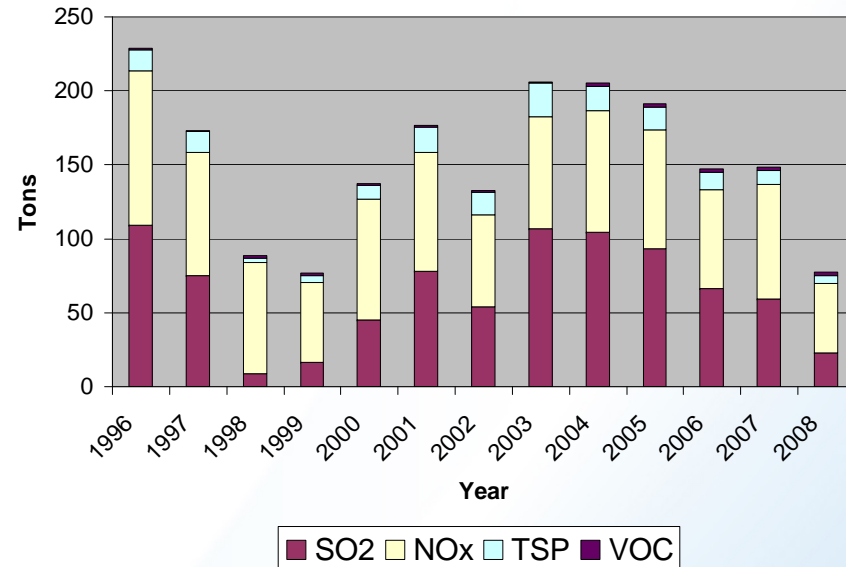
- **Radiological Emissions Monitoring**
 - **Three facilities are monitored for radionuclide air emissions**
 - BLIP, Building 801 Target Processing Lab, and HFBR
 - Total radionuclides released: 2,650 Ci (vs. 2,536 Ci in 2007)
 - BLIP emissions of short-lived radioactive gases O-15 and C-11 accounted for 99% of total
 - (Half life: O-15 = 122 seconds, C-11 = 20.4 min)
- **Ambient Air Monitoring**
 - Radiological air quality is monitored at 9 onsite locations around the perimeter of the site
 - Gross alpha and beta concentrations consistent with natural background
 - Slightly higher tritium concentrations measured at HFBR due to periodic venting of reactor vessel during D&D activities (control rod removal)



Chapter 4 – Non-Radiological

- **Continuous emissions monitoring required at Central Steam Facility**
 - No exceedances of NO_x or Opacity limits
 - Sitewide Fuel oil use (1,007,493 gallons); lowest total since 1999; Natural gas was primary energy source
 - SO₂, NO_x, TSP, and VOC emissions well under respective permit limits

Central Steam Facility Emissions



Chapter 5 – Water Quality Radiological Monitoring

■ Sewage Treatment Plant

- 2008 STP effluent considered to be at or below background
 - Tritium detected once in 2008 (possibly false positive)
 - Average concentration 42 pCi/L (background ~ 80 - 90 pCi/L)
- 0.012 Ci Tritium released (40% less than 2007)
- Cs-137/Sr-90 remain undetected

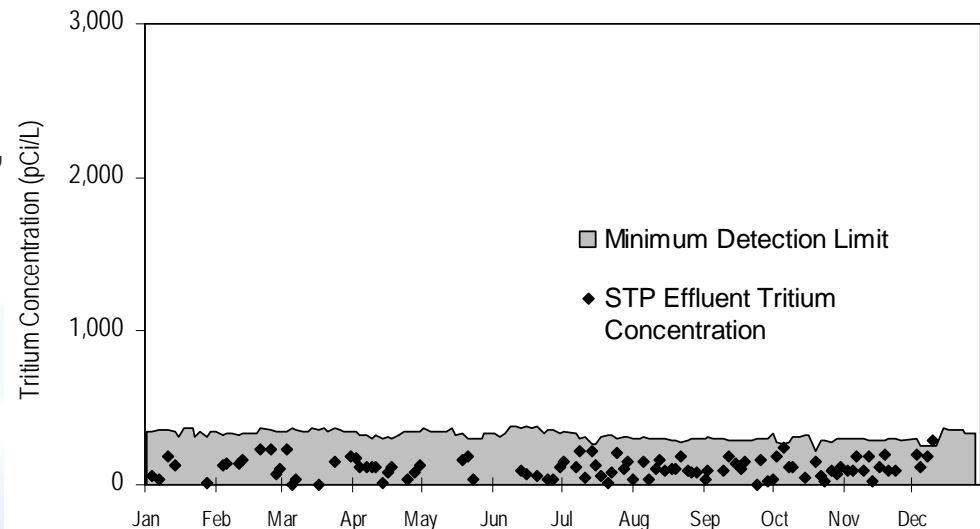
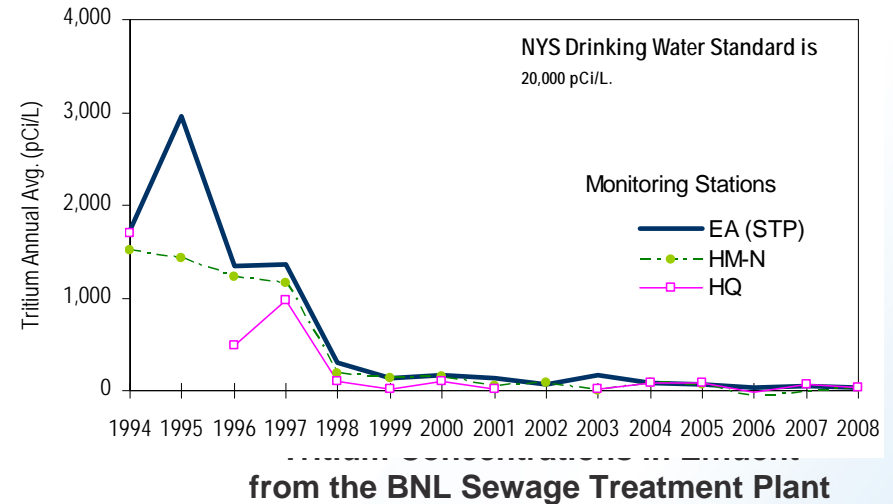
■ Recharge Basins

- No activity detected (alpha, beta, gamma and tritium) above background

■ Peconic River

- No activity detected (alpha, beta, gamma and tritium) above background

Tritium Released to the Peconic River
15-Year Trend (1994-2008)



Chapter 6 – Natural and Cultural Resources Flora and Fauna Monitoring

■ Terrestrial Sampling

- Farm and garden vegetables: no detection of Cs-137
- Farm soils at background levels

■ Aquatic Sampling

- On- and Off-site fish sampling indicated low levels of Cs-137 and mercury consistent with previous years, and Peconic River Post Clean-up data
- On- and off-site aquatic vegetation and sediments contained low levels of Cs-137 consistent with previous years

■ Precipitation Monitoring

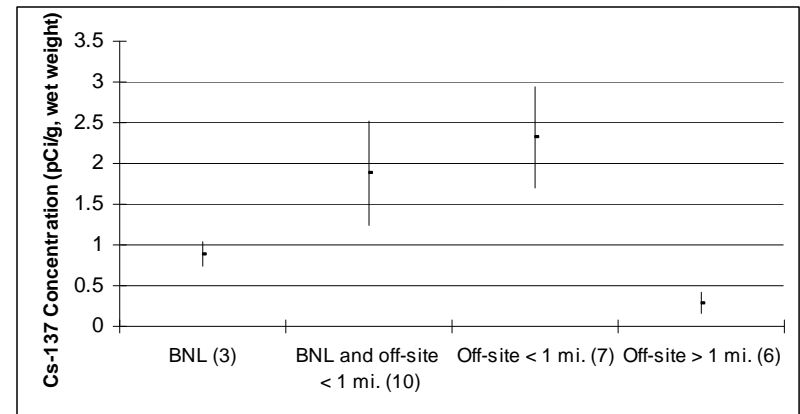
- Quarterly analysis for radiological components indicated normal background
- Mercury analysis indicated depositional values between 4.5 and 13.7 ng/L

Chapter 6 – Natural and Cultural Resources Flora and Fauna Monitoring (cont.)

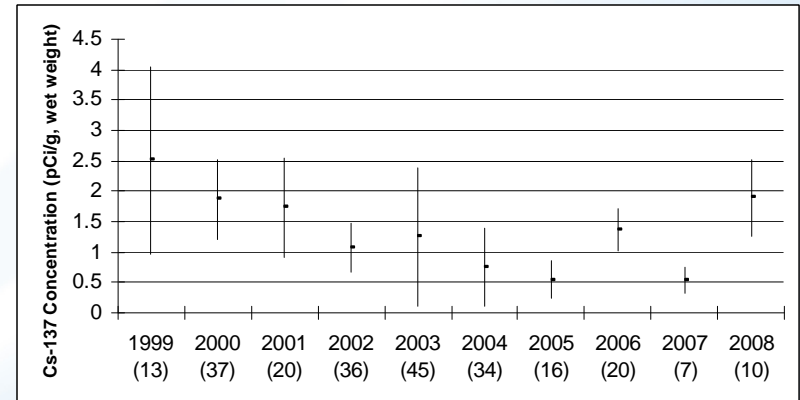
■ Deer Sampling

- 3 on site, 13 off-site samples
- Bone samples analyzed for Sr-90 indicate background levels
- Cs-137 averages
 - Onsite 0.89 pCi/g
 - Within 1 mile 2.32 pCi/g
 - > 1 mile 0.29 pCi/g
- Highest value 8.61 pCi/g
- Ten-year trend indicating stabilizing trend with average values less than 2.0 pCi/g, wet weight since 2003

Average by Sampling Group 2008



Long-term Trend in Cs-137 Average
On and Near Off-site Sampling 2008



Radiological Dose Assessment

- Radiological Exposure is calculated for a hypothetical Maximally Exposed Individual (MEI): Person who lives at site boundary 24 hrs/day 365 days/yr, eats home grown vegetables, and locally caught deer and fish.
- Direct Exposure: Ambient external dose (Thermoluminescent Dosimeters)
 - 69 mrem on site (monitored at 49 on-site locations)
 - 63 mrem off site (monitored at 15 off-site locations)
 - Statistical comparison shows that there is no contribution from BNL Operations
- Indirect Exposure: Total effective dose to the BNL MEI in 2008 from inhalation, immersion, and ingestion pathways was 12.63 mrem

| Pathway | Amt. Consumed | Dose | Regulatory Limit |
|-----------------|---------------|------------|--|
| Air immersion | NA | 0.06 mrem | EPA – 10 mrem |
| Ingestion Fish | 15 pounds | 0.09 mrem | NYSDOH – 10 mrem (based on average conc. in flesh) |
| Ingestion Deer | 64 pounds | 12.48 mrem | |
| Ingestion Water | None | No Dose | EPA – 4 mrem |
| All Pathways | TOTAL DOSE | 12.63 mrem | DOE – 100 mrem |

Deer is predominant contributor to the MEI dose. Dose is calculated using worst case scenario (maximum concentration = 8.61 pCi/g). Using average of 1.89 pCi/g yields a dose of 2.74.

Chapter 6 - Natural and Cultural Resources

Natural Resource Management

- Wild Turkey population ~500 birds
- Deer Surveys estimate ~800 deer (97/sq.mi.); healthy population is 10-30/sq. mile; planning for management started
- Nineteen interns and one faculty member conducted research
 - Eastern Box Turtle Radio Telemetry and disease isolation effort continued
 - Red and Grey Fox trapping, radio collar, and genetic study continued
 - Salamanders
 - Damselflies & Dragonflies
 - Leopard frogs
 - Banded Sunfish



Natural Resource Activities

- FERN
 - Freshwater Wetland Health Monitoring protocols completed
 - Carmans River macro-invertebrate study started (continued in 2009)
 - Initiated Protocols Video for Open Space Stewardship Program
- GREEN Institute and Open Space Stewardship Program established by Office of Education continues to grow
 - Annual Teacher Workshops – 15 Teachers
 - 30 Schools participate
 - 1500 or more students participating



Chapter 6 – Cultural Resource Management

■ Outreach

- BNL hosted “Casing of the Colors” Ceremony marking the retirement of the 77th Division (77th was born at Camp Upton in 1918)
- Tours of WW I trenches for 77th Division officers and local groups

