



# 2021 Site Environmental Report: An Overview

Community Advisory Council Meeting  
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Manager, Environmental Protection Division

October 13, 2022



# About This Year's Cover

- This year's cover features the removal of the High Flux Beam Reactor (HFBR) Stack.
- The photo story starts on the back cover and shows the stack before the demolition project started and wraps around to the front cover showing the green field at the completion of the project.
- The photos in the honeycomb (inset) follow the progression of demolition, starting with paint removal, to placement of the 'mantis' which was used to remove ~4'x4' sections of the stack, to the final disposition, represented by the flower, of the green field.

## 2021 Site Environmental Report

VOLUME 1





# Purpose of the Site Environmental Report (SER)

- **Required by DOE and prepared in accordance with DOE Order 231.1B, *Environment, Safety and Health Reporting*.**
- **Documents compliance with DOE O 458.1 and 436.1.**
- **Official record of BNL's environmental impact**
  - Serves as an historical record; BNL has been preparing SERs since 1971.
  - Frequently used to respond to Freedom of Information requests.
- **Serves as the principal environmental communications vehicle**
  - Distribution includes DOE, DOE Laboratories, regulators, local libraries, and interested stakeholders.
  - Available as a downloadable file on the BNL web page and in limited hardcopy
- **Showcases BNL's excellence as a leader in the reporting field**

# 2021 SER Table of Contents & Chapter Authors\*

## ■ SER Volume I

- Executive Summary (A. Aponte)
- Chapter 1 – Introduction (A. Engel/A. Aponte)
- Chapter 2 – Environmental Management System (D. Bauer)
- Chapter 3 – Compliance Status (J. Remien)
- Chapter 4 – Air Quality (J. Williams)
- Chapter 5 – Water Quality (T. Green/J. Remien)
- Chapter 6 – Natural and Cultural Resources (T. Green)
- Chapter 7 – Groundwater Protection (B. Dorsch/D. Paquette)
- Chapter 8 – Radiological Dose Assessment (T. Welty)
- Chapter 9 – Quality Assurance (L. Singh)

\* ...and many other Contributors

## ■ SER Volume II

- Groundwater Status Report – Groundwater Group (approved by regulators August 2022)



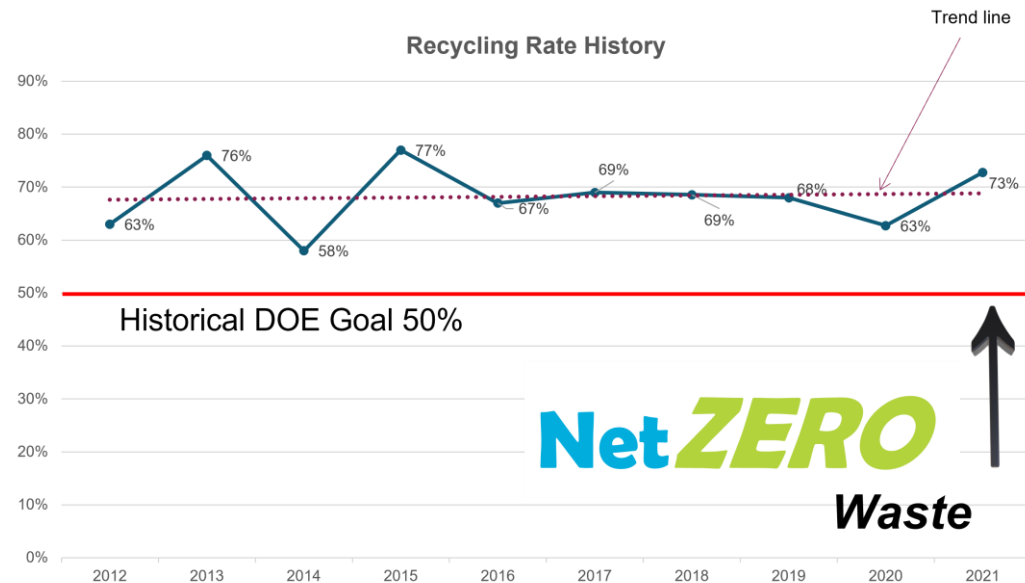
# Chapter 2 - Environmental Management System (EMS) ISO 14001

- External assessment resulted in successful recertification of BNL as conforming to the ISO14001 Standard during 2021
  - The system remains fully integrated and effective.
  - The external assessment by ERM CVS certified the Laboratory to the Standard and identified one nonconformance relating to the objectivity of internal assessors. ERM CVS determined that the Laboratory is in full conformance to the Standard.

## Pollution Prevention (P2) Program

- Cost avoidance or savings of over \$1.5 million
- Approx. 1.8 million lbs. of materials being reduced, recycled, or reused
- The Lab's annual recycling rate was 73% (DOE Goal – 50%)
- Received Green Electronics EPEAT Award, DOE's GreenBuy Award, and a second GreenBuy Superior Award

### Recycling Rate for Daily Operations

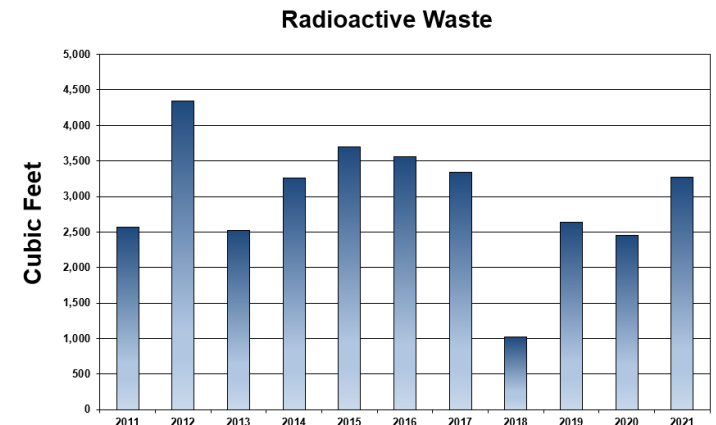
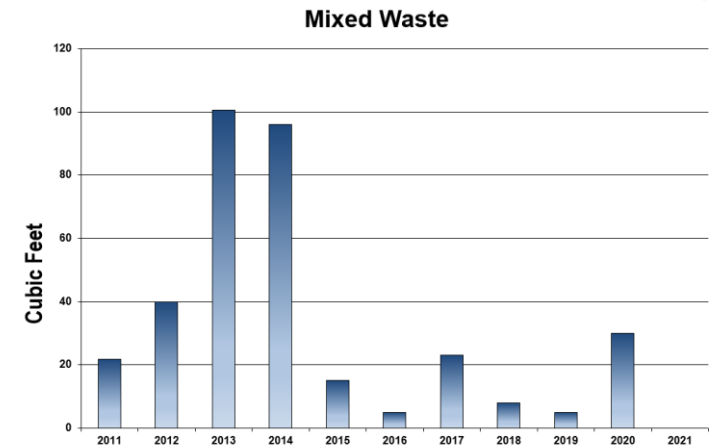


# Chapter 2 - Waste Generation

- Hazardous waste from routine operations in 2021 is increasing while operations recover from COVID.
- No mixed waste disposed of during 2021.
- Radioactive waste generation from routine operations is attributable mainly to medical isotope production.

2021	Routine	Nonroutine
Hazardous	4.2 Tons	0 Tons
Mixed	0 ft <sup>3</sup>	5 ft <sup>3</sup>
Rad	3.276 ft <sup>3</sup>	30,095 ft <sup>3</sup>

Bldg. 650 Demolition & Decommissioning Project





# Chapter 2 - Other Topics

- **Energy Management & Conservation**
  - *Stay tuned for more details during next months presentation on BNL Sustainability efforts*
- **Groundwater Treatment Systems**
  - Discussed in Chapter 7 and SER Volume 2, Groundwater Status Report (*Highlights will be presented in November*)
- **Communication and Community Involvement**
  - In 2021, BNL updated stakeholders virtually on the following issues:
    - High Energy Accelerator Production of the medical isotope Actinium-225
    - Updates on progress on the Electron Ion Collider (EIC)
    - Updates on the demolition of the HFBR Stack and continued characterization of PFAS and 1,4 Dioxane in groundwater
    - National emission standards for hazardous air pollutants
- **Environmental Monitoring Program**
  - Performed 5,272 sampling events of groundwater, potable water, precipitation, air, flora and fauna, soil, sediment, and discharges



View of the Northeast Solar Energy Research Center (NSERC)



# Chapter 3 - Compliance Status Overview

- **BNL must comply with multiple permits, including Title V, NESHAPS, SPDES, Tank Storage, Well Permit, and RCRA**
  - SPDES permit renewal (expiration date: 12/2030)
- **156 proposed projects reviewed for NEPA**
  - 153 projects were considered minor actions requiring no additional documentation.
  - Three projects required submittal of notification forms to DOE and determined to be covered by exiting categorical exclusions.
  - Environmental Assessment for EIC was completed with a Finding of No Significant Impact (FONSI)
- **Potable Water**
  - Usage decreased slightly from 2020 (340 MG vs. 368)
  - Full compliance with regulations
  - Supply Well GAC Filter Upgrades completed, and deferral request closed out.
- **Tanks**
  - No regulatory inspections of Lab's PBS or CBS-registered tanks in 2021 due to COVID-19.



**2022** BROOKHAVEN NATIONAL LABORATORY  
**Water Quality**  
Consumer Confidence Report



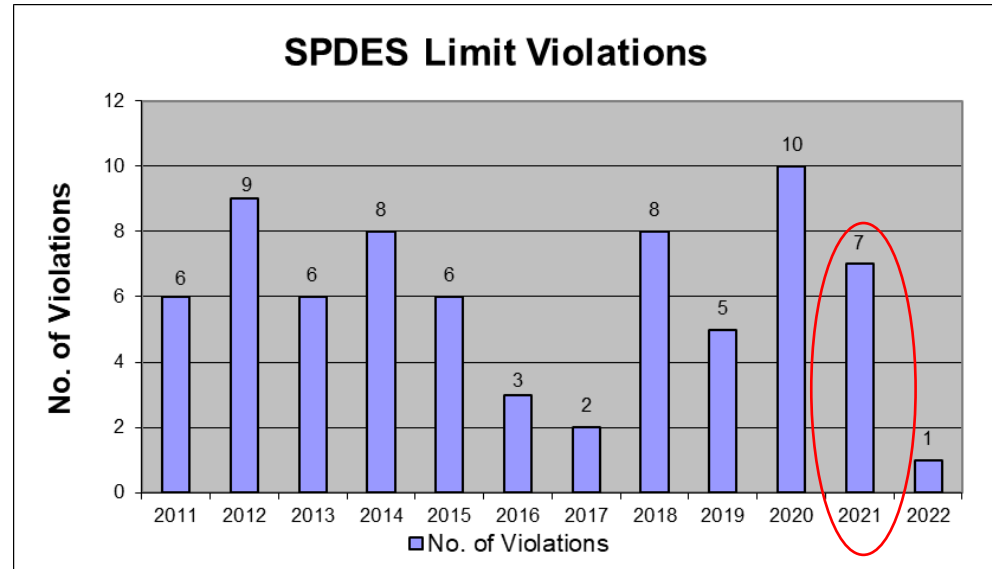
Water Treatment Staff- Supervisor W. Jensen and operators Front L – Front R- W. Jensen, N. Krupski, N. Risi, J. Stanisci, S. Kelvas and R. Kelley.



# Chapter 3 - Overview (continued)

## ■ SPDES

- 7 permit excursions (four at Sewage Treatment Plant [STP] and three at recharge basins)
  - All Tolyltriazole (TTA)

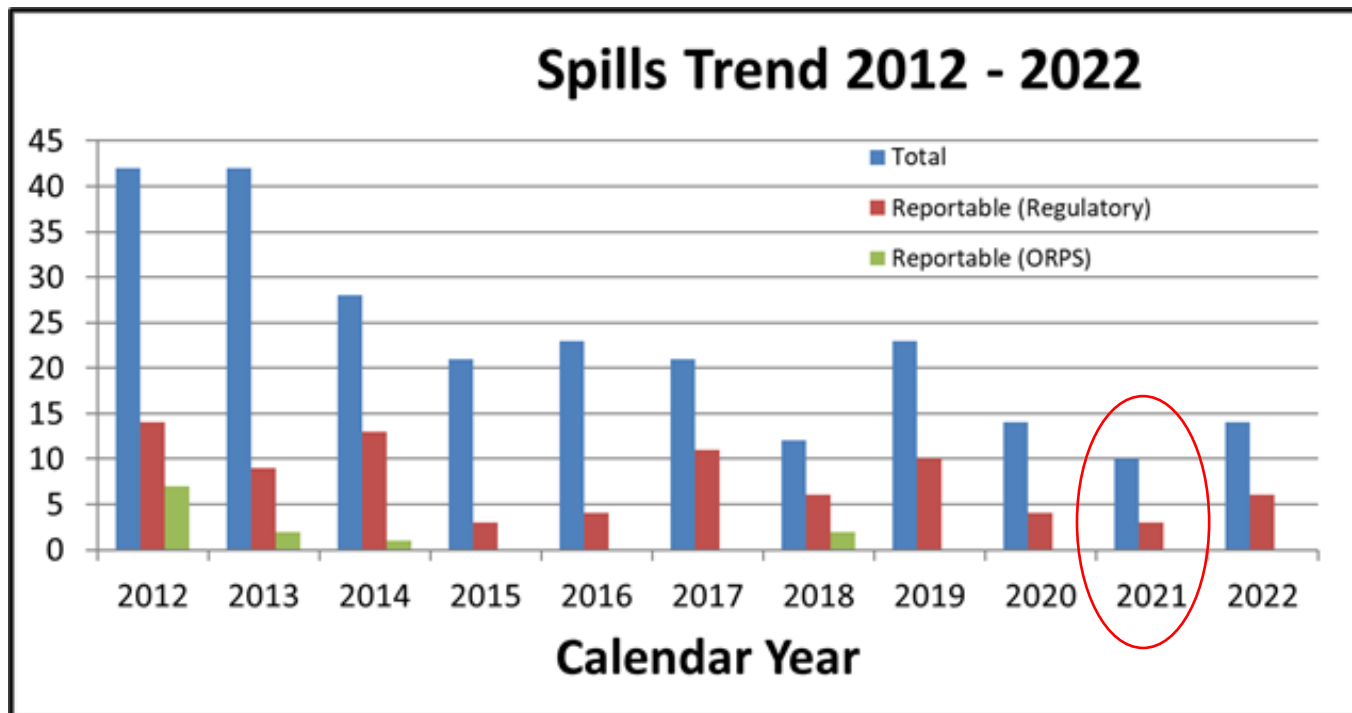


## Status

- Decided to turn off all the corrosion inhibitor pumps serving cooling towers that did not have a TTA-free inhibitor.
- In August, BNL officially received a Notice of Violation (NOV) for continuing violation of the permit limit for TTA.
  - A formal non-compliance report, which included a corrective action plan, was submitted to NYSDEC in September 2021.
  - Primary action was the procuring of an environmental consulting firm to provide engineering services to evaluate the management, alternatives, and possible treatment of TTA.

# Chapter 3 - Spills and Reportable Incidents

- **10 spills in 2021**
  - Three of those spills met regulatory criteria.
    - ~3 gallons of hydraulic fluid from Bldg. 1005S elevator shaft
    - ~2 quarts of hydraulic fluid from contractors manlift (HFBR Stack D&D Project)
    - ~1 pint of hydraulic fluid from BNL excavator used for Bldg. 421 demolition project



# Chapter 3 - Inspections and Assessments

## External Inspections



- **EPA:** In February 2021, the EPA conducted a comprehensive Off-Site Compliance Monitoring Activity that covered RCRA, Underground Storage Tank (UST), and Clean Air Act (CAA) requirements. A letter received in March indicated that there were no concerns identified during the off-site compliance monitoring activity.



- **NYSDEC**
  - No issues identified during inspections associated with CAA, SPDES, and RCRA compliance.



- **SCDHS (STP, potable water):** No issues identified at STP (quarterly); F&O addressing identified potable water deficiencies.



# Chapter 4 - Air Quality (Radiological)

## ■ Radiological Emissions Monitoring

- Three facilities monitored for radionuclide releases:
  - BLIP, Building 801 Target Processing Lab, and HFBR
  - Total radionuclides released in 2021: **11,054 Ci** (19,022 Ci in 2019)
  - BLIP didn't produce radioisotopes in 2020 due to year-long operational reviews & improvements.

## ■ Ambient Air Monitoring

- Radiological air quality monitored at four on-site locations around the perimeter of the site
  - Gross alpha and beta concentrations consistent with natural background
  - Average tritium concentrations at or less than typical minimum detection limits (MDLs)

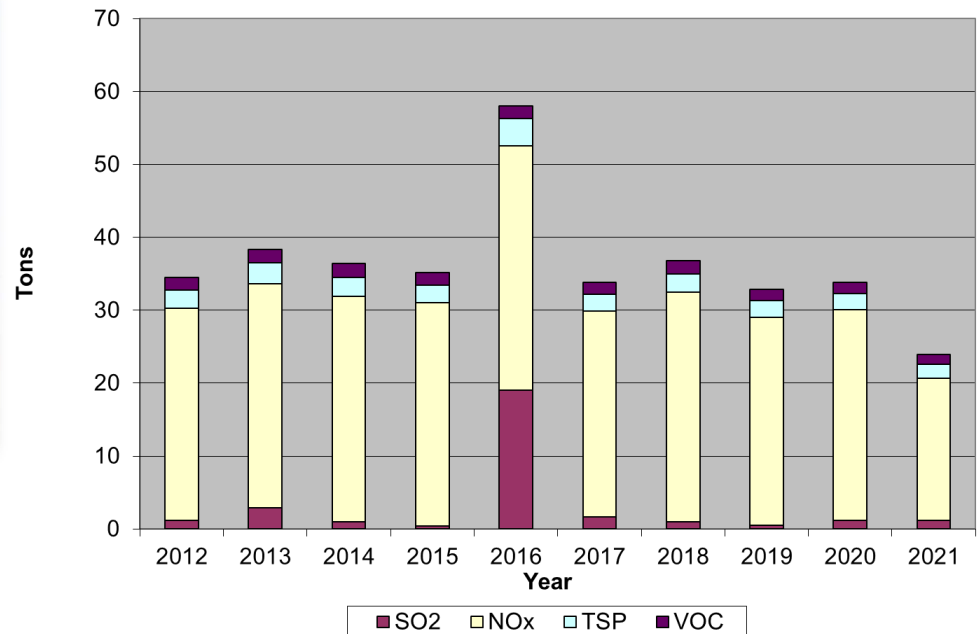


# Chapter 4 - Air Quality (Non-Radiological)

- Continuous Emissions Monitoring System required for Central Steam Facility Boilers 6 & 7
  - No NO<sub>x</sub> limit exceedances
  - (7) 6-min period opacity exceedances for Boilers 6 & 7
  - Fuel oil use: 46,235 gals (44,200 gals in 2020)
  - SO<sub>2</sub>, NO<sub>x</sub>, TSP, and VOC emissions well under respective permit limits of 445, 159, 113.3, and 39.7 tons



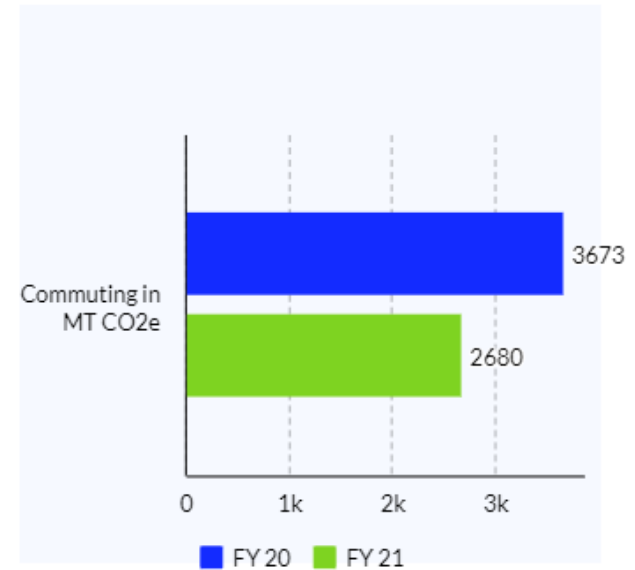
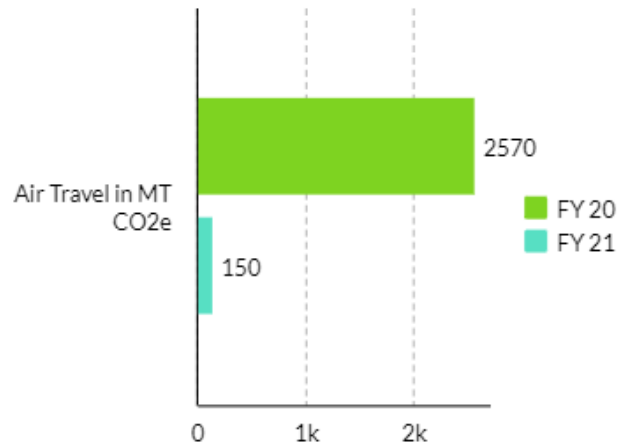
Central Steam Facility Emissions



# BNL Scope 3 Greenhouse Gases: Impacts of Covid 19

## BNL Greenhouse Gases

Brookhaven National Lab saw significant reductions in greenhouse gas emissions



## 2020-2021 BNL impacts

 **94.2%**  
BNL air travel

 **27%**  
BNL commuting

 **26.1%**  
BNL Scope 3 GHG emissions

 **67%**  
BNL telecommuting

 **3,617**  
In Metric Tons CO2e



# Chapter 5 - Water Quality (Radiological Monitoring)

- Tritium generally less than MDL in all sample locations
  - Tritium was detected above the MDL at STP in January (450 pCi/L); all other months were less than MDL and well below DWS of 20,000 pCi/L.
- No gamma-emitting nuclides attributable to BNL detected.
  - Natural products only
- Peconic River had no measurable flow offsite in 2021; radiological values (Sr-90, gross alpha, gross beta) were all comparable to historical levels and can be attributed to worldwide fallout or natural products.



Upstream of Monitoring Station HQ

# Chapter 5 – Water Quality (Non-Radiological Monitoring)

## ▪ Sewage Treatment Plant

- Full compliance was met with exception of Tolytriazole exceedances which were discussed earlier

## ▪ Recharge Basins

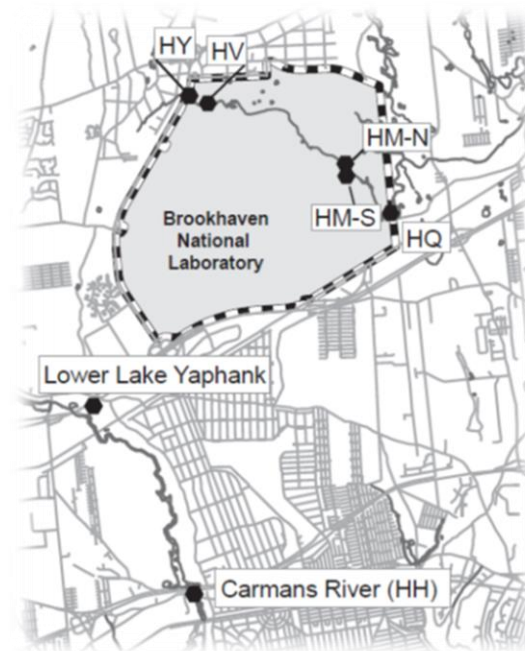
- All metals complied with the respective water quality or groundwater discharge standards.
- VOCs – toluene was detected above method detection limits at the CSF basin at  $0.97\mu\text{g/L}$ , most likely an analytical laboratory contamination issue.
- All water quality analytes were within effluent standards.

## ▪ Peconic River

- Some metals exceed ambient water quality.
  - Filtration of samples often showed source of inorganics to be suspended sediment.
  - Iron and aluminum are attributable to natural sources.
- No VOCs detected above contract Laboratory's MDLs.
- Water quality data was consistent for locations sampled.



Sampling STP Effluents



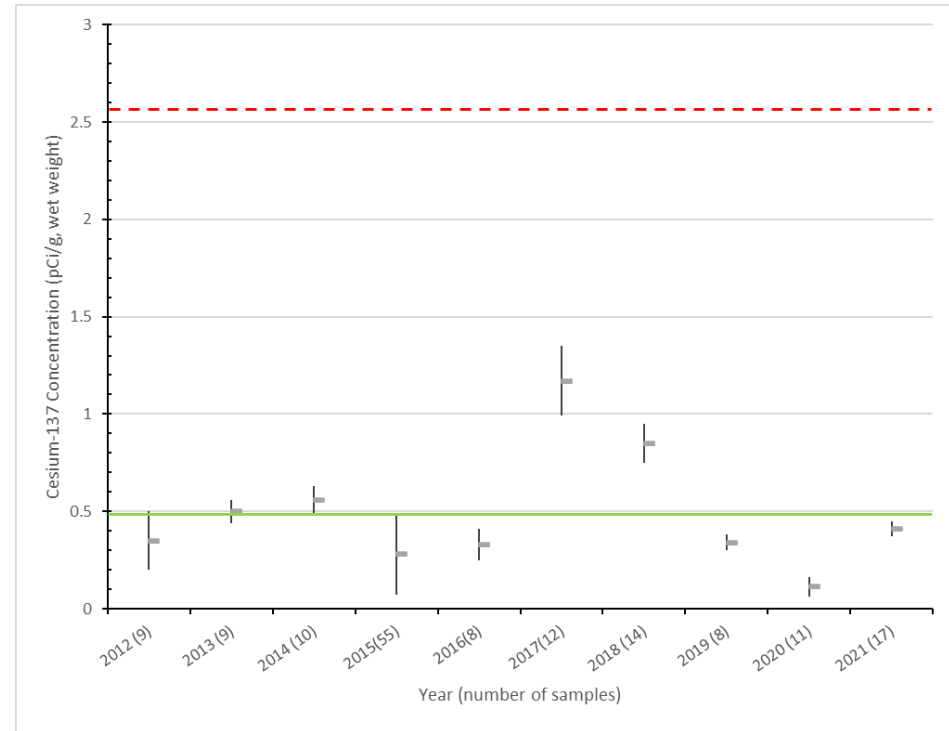
# Chapter 6 - Natural and Cultural Resources

## ■ Natural Resource Management

- Deer Management
  - End of 2020 population ~425 deer
  - Population reduction of 81 deer
  - End of 2021 population ~400 deer
  - Epizootic Hemorrhagic Disease likely helped in population reduction.
- Prescribed fire program remained on hold.
- Turkey population at 350-500 birds
- Internships greatly reduced due to COVID-19 – one intern working on 4-Poster™ data analysis.

## ■ Surveillance Monitoring

- Cesium-137 (Cs-137) in deer had similar results as past years - highest value 1.99 pCi/g, wet weight, on-site northeast corner of Lab.
- Ten-year trend shows decline; 2021 on-site average in meat was 0.41 pCi/g, wet weight, with ten-year on-site average being 0.49 pCi/g, wet weight.
- Average of 13 deer samples taken in cull was 0.26 pCi/g, wet weight.



Ten-Year Trend of Cs-137 Concentrations in Deer Meat, dashed line is pre-cleanup avg. (2.57 pCi/g, wet weight), solid line is 10-year avg. 0.49 pCi/g wet weight.



# Chapter 6 - Cultural Resource Management

- NY State Historic Preservation Office agreed with National Register eligibility determination for 19 buildings
- NYSHPO visited BNL in October 2021
  - Toured eligible buildings
  - Visited two structures scheduled for demolition
  - Recommended entering into Programmatic Agreement for managing historic buildings



WW II era Water Tower



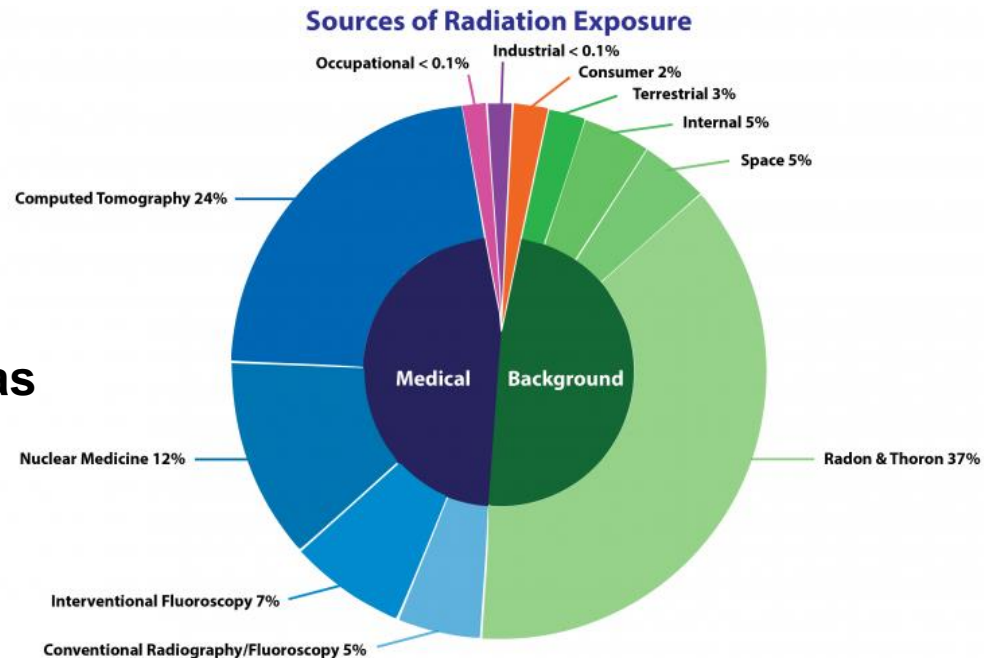
Building 490 – former Medical Complex



Alternating Gradient Synchrotron Complex

# Chapter 8 - Radiological Dose Assessment

- **Ambient external dose (TLDs)**
  - 68 mrem on site and 68 mrem off site (includes cosmic and terrestrial background)
  - No external dose contribution from BNL operations
- **Total effective dose to the Maximally Exposed Off-site Individual (MEOSI) in 2021 from inhalation (0.71 mrem) and ingestion (2.9 mrem) pathways was 3.61 mrem**
- **Well Below Regulatory Limits**
  - EPA: 10 mrem/year (air pathway)
  - NYSDOH: 10 mrem/year (ingestion pathway)
  - DOE: 100 mrem/year (from all pathways)



Average dose to individual is **620 mrem/year**

From NCRP Report No. 160, "Non-Occupational Ionizing Radiation Exposure of the Population of the United States" (2009)

# Future Presentations

- Chapter 7: Groundwater Protection (November)

