



2022 Site Environmental Report: An Overview

Community Advisory Council Meeting
Jason Remien
Manager, Environmental Protection Division

September 21, 2023



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**

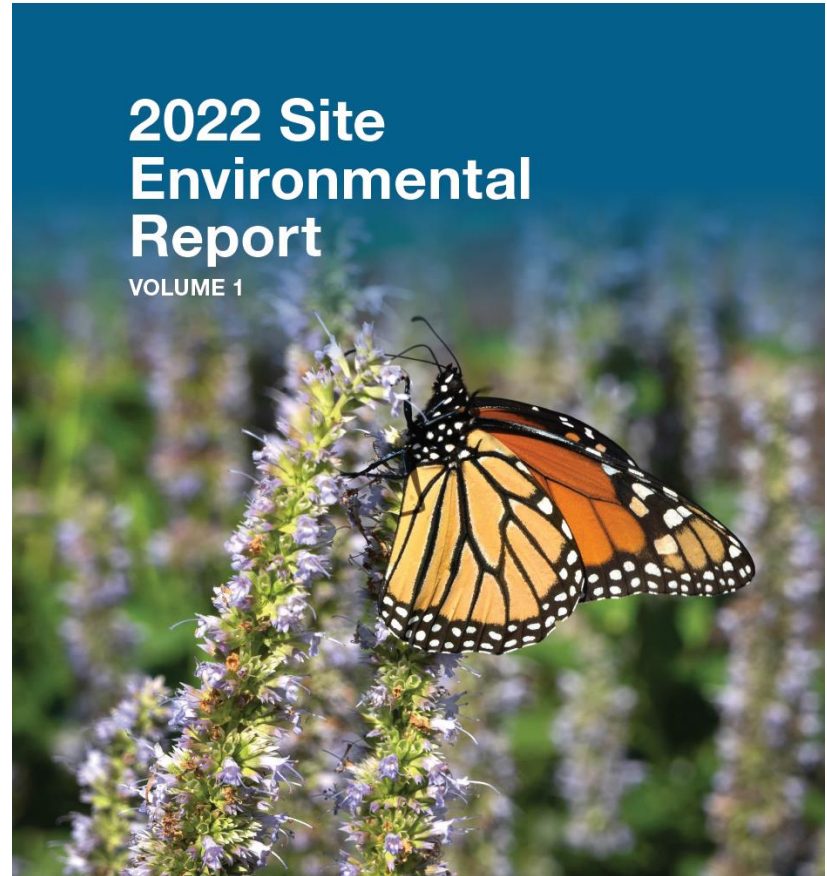
About This Year's Cover/Inside Cover

- Monarchs are one of many species of native pollinators that use the Lab site due to an abundance of native flora like milkweed.
- Native pollinator populations are declining globally.
- In New York State alone, 40-60% of pollinator species are at risk due to habitat loss and pesticide use.
- In 2019, the Environmental Protection Division and Facilities & Operations (F&O) Directorate purchased wildflower seeds and converted 13 acres of mowed lawn to wildflower meadows around the site.
- These no-mow areas have become a haven for native pollinators and reduced pressure on F&O staff to maintain these areas.



2022 Site Environmental Report

VOLUME 1



managed by Brookhaven Science Associates
on behalf of the U.S. Department of Energy



2022 SER Table of Contents & Chapter SME's

▪ SER Volume I

- Executive Summary (A. Aponte)
- Chapter 1 – Introduction (A. Engel)
- 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 and J. Remien)
- Chapter 6 – Natural and Cultural Resources (T. Green/K. Schwager)
- Chapter 7 – Groundwater Protection (B. Dorsch/D. Paquette)
- Chapter 8 – Radiological Dose Assessment (T. Welty)
- Chapter 9 – Quality Assurance (L. Singh)

▪ SER Volume II

- Groundwater Status Report
 - Groundwater Protection Group



Chapter 2 - Environmental Management System (EMS) ISO 14001

- External surveillance assessment was conducted of BNL's ISO14001 Standard EMS. Certification to occur next year as current certificate expires September 2024.

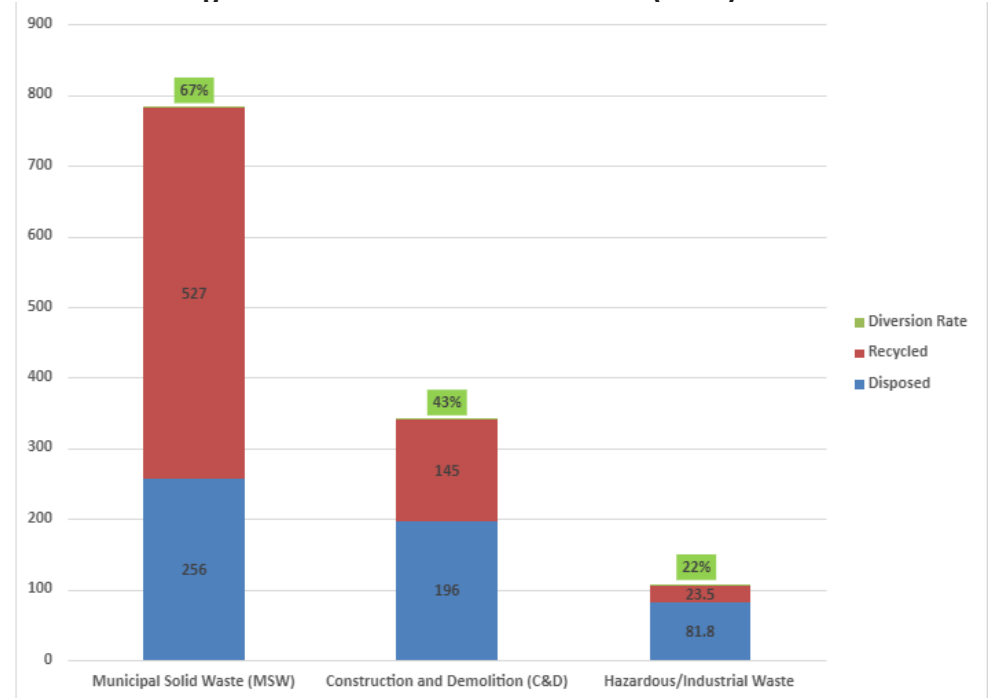


- The system remains fully integrated and effective.
- No nonconformances were identified verifying the Laboratory remains in full conformance to the Standard.

Pollution Prevention (P2) Program

- Cost avoidance or savings of over \$1.4 million
- Approximately 1.4 million lbs. of materials being reduced, recycled, or reused
- The Lab's annual recycling rate was 67% (DOE Goal – 50%)
- Received Green Electronics EPEAT Award, DOE's GreenBuy Award, and a third GreenBuy Superior Award

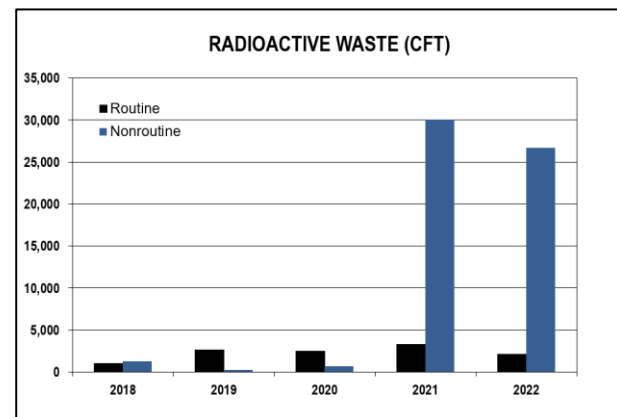
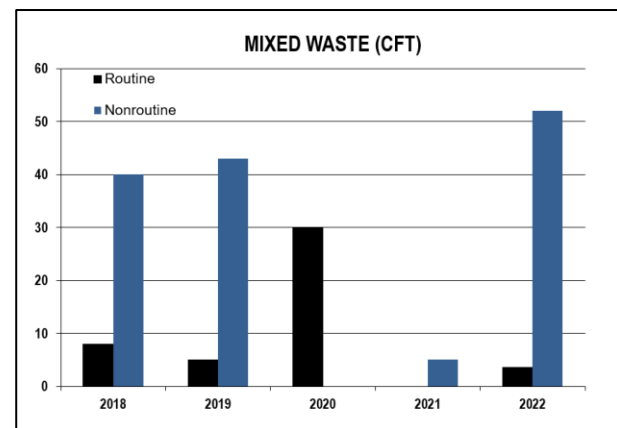
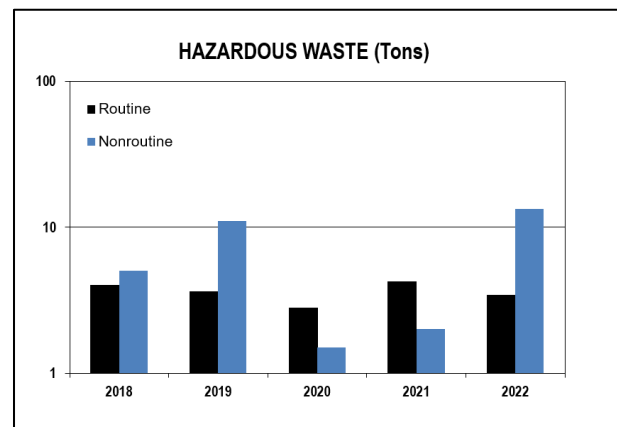
Figure 2-3. Waste Diversion in Tons (2022)



Chapter 2 - Waste Generation

- Routine hazardous waste remains consistent while spike in nonroutine waste is from decommissioning of a lithium bromide chiller.
- The spike in nonroutine mixed waste consisted of HEPA filters from the B650 demolition during 2021.
- Routine radioactive waste generation is mostly from medical isotope production while the spike in nonroutine is from the B650 demolition.

2022	Routine	Nonroutine
Hazardous	3.4 Tons	13.3 Tons
Mixed	3.5 ft ³	52 ft ³
Rad	2,078 ft ³	26,679 ft ³



Chapter 2 - Energy Management & Conservation

2022 Accomplishments

- Clean energy supply includes:
 - 121 million kWh clean hydropower energy.
 - NSERC generated 644,500 kWh of electricity offsetting 365 MT CO₂e.
- NYPA power contract has been extended until 2030 and includes 15 MW of renewable, nearly zero GHG hydropower. This contract saved \$25 million in 2022.
- 24 million kWh purchased renewable energy certificates.
- The Chilled Water Facility uses a 3.2 million gallon chilled water storage tank to create/store chilled water at night for use at peak times.
- New electric, chilled water, and steam meter installations.
- Establishment of demand response to curtail summer energy usage, 3 tier set points for temperature/humidity controls.



View of the Northeast Solar Energy Research Center (NSERC)

- **2022 Statistics** (parenthetical values are 2021 data for comparison)
 - 258 (261) million kilowatt hours of electricity
 - 382,000* (52,395) gallons of fuel oil
 - 9,748 (12,517) gallons of propane
 - 568 (554) million ft³ feet of natural gas
- *Burned #6 oil due to NYS ban. Burned #2 oil for tank testing.

Chapter 2 - Other Topics

■ Environmental Restoration

■ BGRR/HFBR

- Continued long-term surveillance and maintenance, as well as completed demolition of the medical reactor stack.

■ Groundwater Treatment Systems

- Discussed in Chapter 7 and SER Volume 2, Groundwater Status Report

■ Communication and Community Involvement

- In 2022, BNL updated stakeholders both virtually and in person on the following issues:
 - Updates on the demolition of the Medical Reactor Stack and continued characterization of PFAS and 1,4 Dioxane in groundwater.
 - Lab efforts in sustainability.
 - BNL's role in the development of the COVID vaccine.
 - Science role in climate solutions.

■ Environmental Monitoring Program

- Performed 5,342 sampling events of groundwater, potable water, precipitation, air, flora and fauna, soil, sediment, and discharges



Chapter 3 - Compliance Status Overview

- **BNL must comply with multiple permits, including Title V, NESHAPS, SPDES, Tank Storage, Well Permit, and RCRA**
 - Two new SPDES Equivalency Permits from NYSDEC for operation of groundwater treatment systems at Current and Former Firehouse PFAS plumes (expiration date: 9/2032)
- **101 proposed projects reviewed for NEPA**
 - 100 projects were considered minor actions requiring no additional documentation.
 - One project required submittal of notification forms to DOE and determined to be covered by exiting categorical exclusions.
- **Potable Water**
 - Usage increased slightly from 2021 (349 MG vs. 340)
 - Full compliance with regulations
 - Well House 12 and new water tank constructed
 - Rehabilitation of Supply Well 7
 - New water main and hydrants installed
- **Tanks**
 - No findings identified during NYSDEC inspection of Petroleum and Chemical Bulk Storage Programs in 2022.



2023 BROOKHAVEN NATIONAL LABORATORY Water Quality Consumer Confidence Report

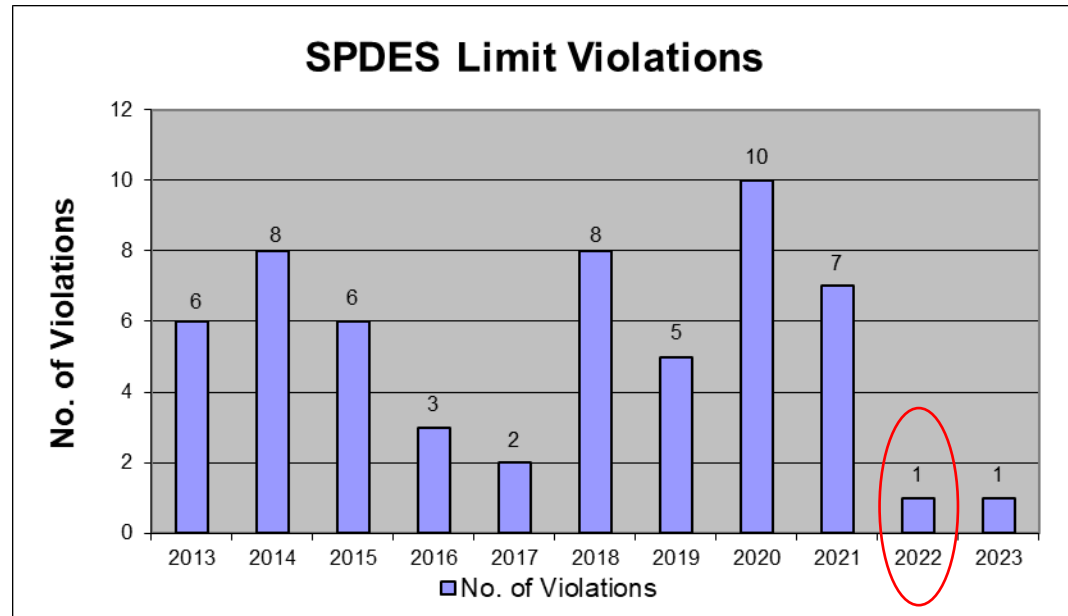


Water Treatment Facility Staff (L-R) Ryan Greener, Nick Krupski, Joe Stanisci, Warren Jensen, Steve Kelvas, Bob Kelley, Nick Risi.

Chapter 3 - Overview (continued)

■ SPDES

- One permit excursion for lead (Outfall 010 – Central Steam Facility)

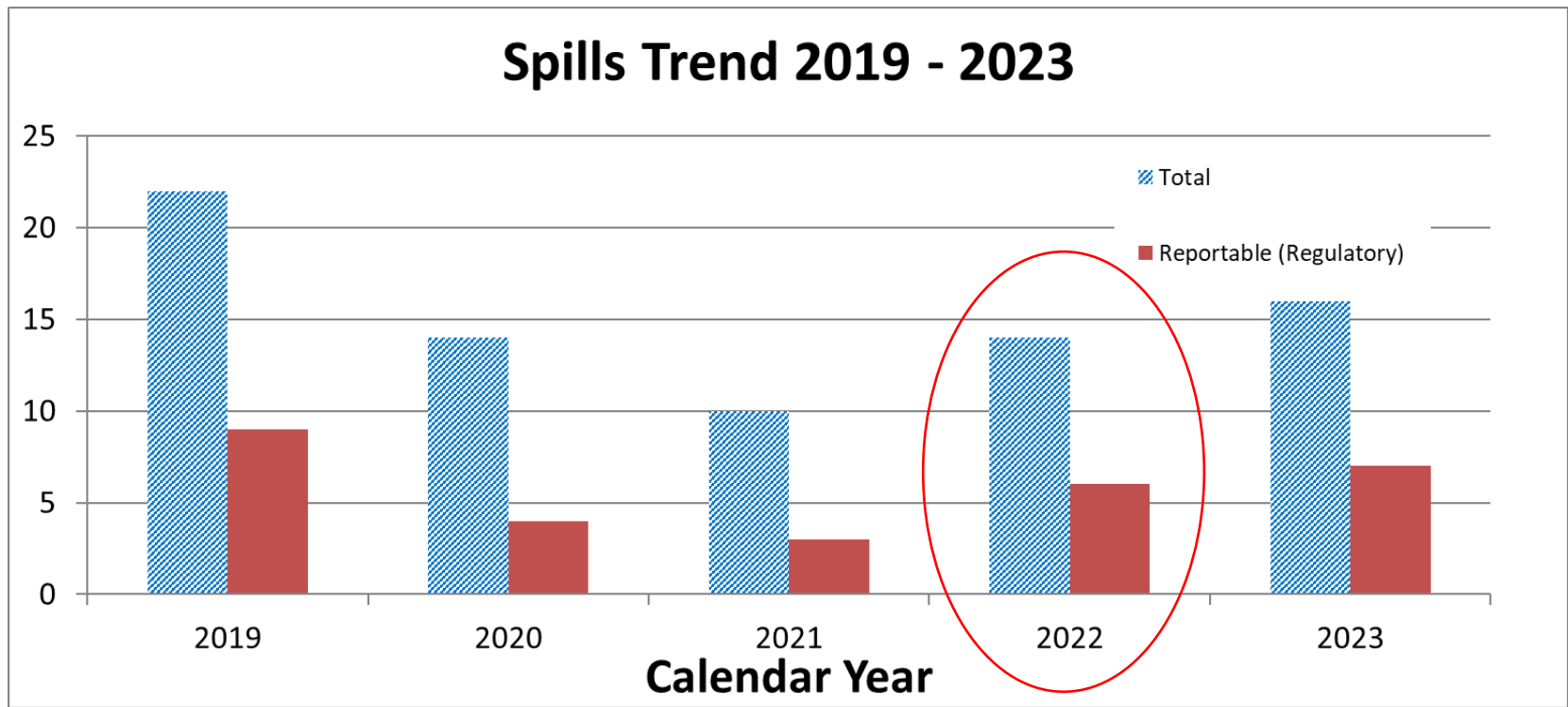


TTA Status

- From 2018 to 2021, the Lab was not able to routinely meet the SPDES permit limit for Tolytriazole (TTA).
- Among the multiple corrective actions taken to address this issue over the years, the Lab hired a consultant to prepare a Tolytriazole Management and Treatability Report in response to a Consent Order issued by the NYSDEC in 2021.
- Based on recommendations made in the report, BNL decided to convert all water treatment chemicals that discharge to a permitted SPDES Outfall to a non-TTA containing treatment chemical that was approved by NYSDEC.

Chapter 3 - Spills and Reportable Incidents

- **14 spills in 2022**
 - Six of those spills met regulatory criteria.
 - All spills were less than one gallon, related to mechanical issues (e.g., hydraulic hose failures, vehicle radiator), and were cleaned up immediately.



Chapter 3 - Inspections and Assessments

- **External Inspections**

- **EPA:**



- In September 2022, the EPA conducted a hazardous waste compliance evaluation inspection at BNL. A letter and report documenting the inspection were received from the EPA on September 27, which indicated that no regulatory concerns were identified.



- **NYSDEC**

- No issues identified during inspections associated with Clean Air Act (Title V Permit), SPDES or PBS and CBS Programs.



- **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 2022: **14,116 Ci** (11,054 Ci in 2021)

■ 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 method detection limits (MDLs)



Chapter 4 - Air Quality (Non-Radiological)

- Continuous Emissions Monitoring System required for Central Steam Facility Boilers 6 & 7
 - No NO_x limit exceedances
 - (9) 6-min period opacity exceedances for Boilers 6 & 7
 - Fuel oil use: 40,432 gals. #2 oil, 342,454 gals. #6 oil (46,235 gals. #6 oil in 2021)
 - SO₂, NO_x, TSP, and VOC emissions well under respective permit limits of 445, 159, 113.3, and 39.7 tons



Central Steam Facility Emissions

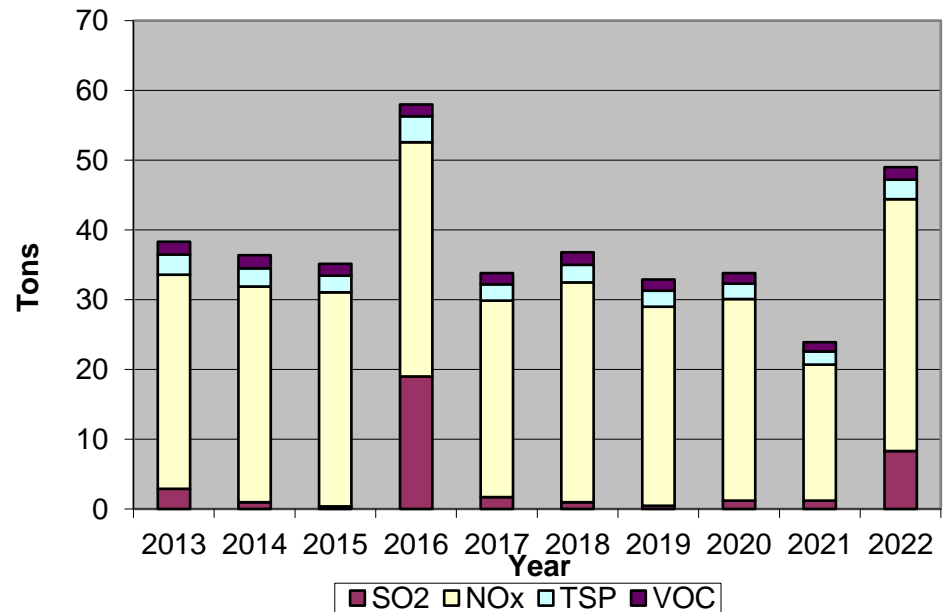
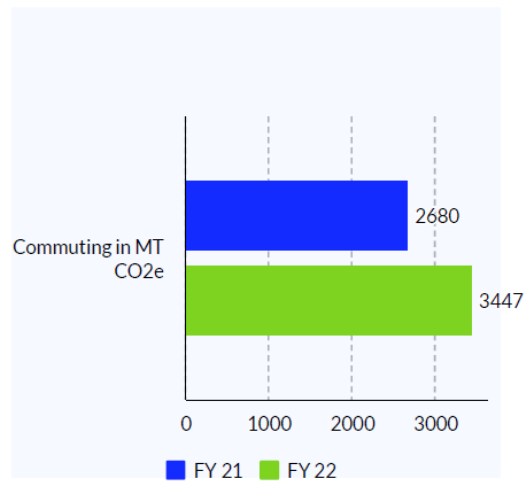
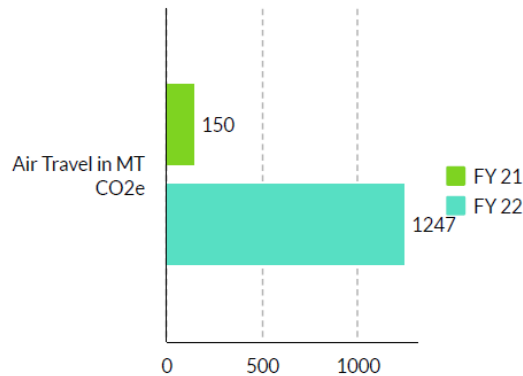


Figure 4-4. BNL Scope 3 Greenhouse Gases: Impacts of Covid 19 (2021-2022)

BNL Greenhouse Gases



2021-2022 BNL impacts

↑ 731.3%
BNL air travel

↑ 28.6%
BNL commuting

↑ 27.4%
BNL Scope 3 GHG emissions

↓ 17%
BNL telecommuting

Chapter 5 - Water Quality (Radiological Monitoring)

- Tritium less than MDL in all sample locations
- No gamma-emitting nuclides attributable to BNL detected
 - Natural products only
- Peconic River had no flow offsite in 2022, (7th year of dry conditions); radiological values (Sr-90, gross alpha, gross beta) were all comparable to historical levels and can be attributed to worldwide fallout or natural products.



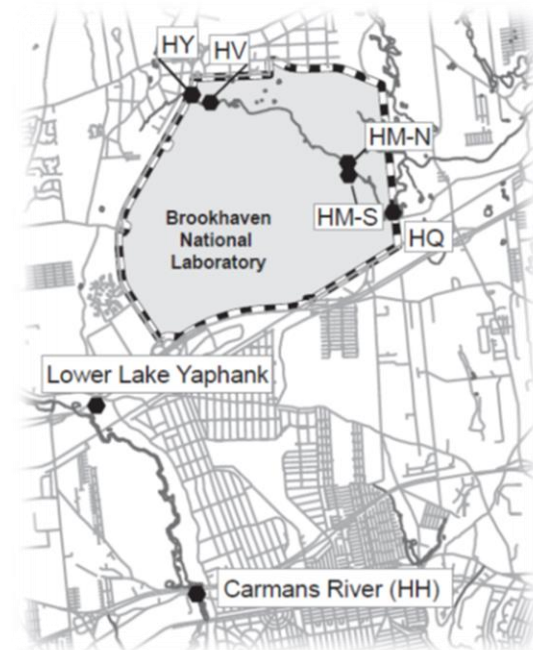
Upstream of Monitoring Station HQ

Chapter 5 – Water Quality (Non-Radiological Monitoring)

- **Sewage Treatment Plant**
 - Full compliance was met entire year
- **Recharge Basins**
 - All metals complied with the respective water quality or groundwater discharge standards.
 - VOCs – low concentrations of disinfectant (bromine and chlorine) by-products seen in basins HO, HS, HT-W and HN.
 - 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



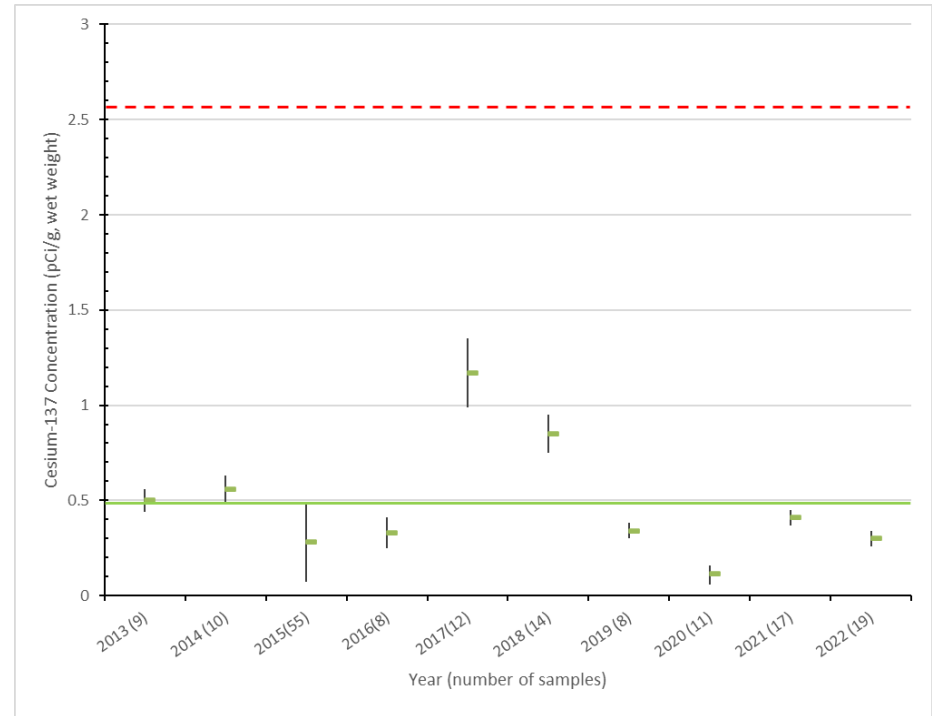
Chapter 6 - Natural and Cultural Resources

■ Natural Resource Management

- Deer Management
 - End of 2021 population ~350 deer
 - Population reduction of 134 deer
 - End of 2022 population ~350 deer
- (1) 23-acre prescribed fire program conducted in July
- Turkey population still at 350-500 birds
- Internships returned to in-person
 - 4 summer and 2 fall interns working on bats, camera trapping, small mammal surveys, and use of bottled water.

■ Surveillance Monitoring

- Cs-137 in deer had similar results as past years - highest value 2.62 pCi/g, wet weight, off-site in Ridge west of Lab.
- Ten-year trend shows decline; 2022 on-site average in meat was 0.22 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 0.16 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

- **Evaluation of remaining buildings and infrastructure over age 50**
 - Gamma Forest determined eligible for listing on National Register of historic places
- **NYSHPO**
 - MOA for demolition of BMRR Stack
 - Continue negotiation of MOA for demolition of 1940s era water tower



1940s era Water Tower



Gamma Forest c. 1976



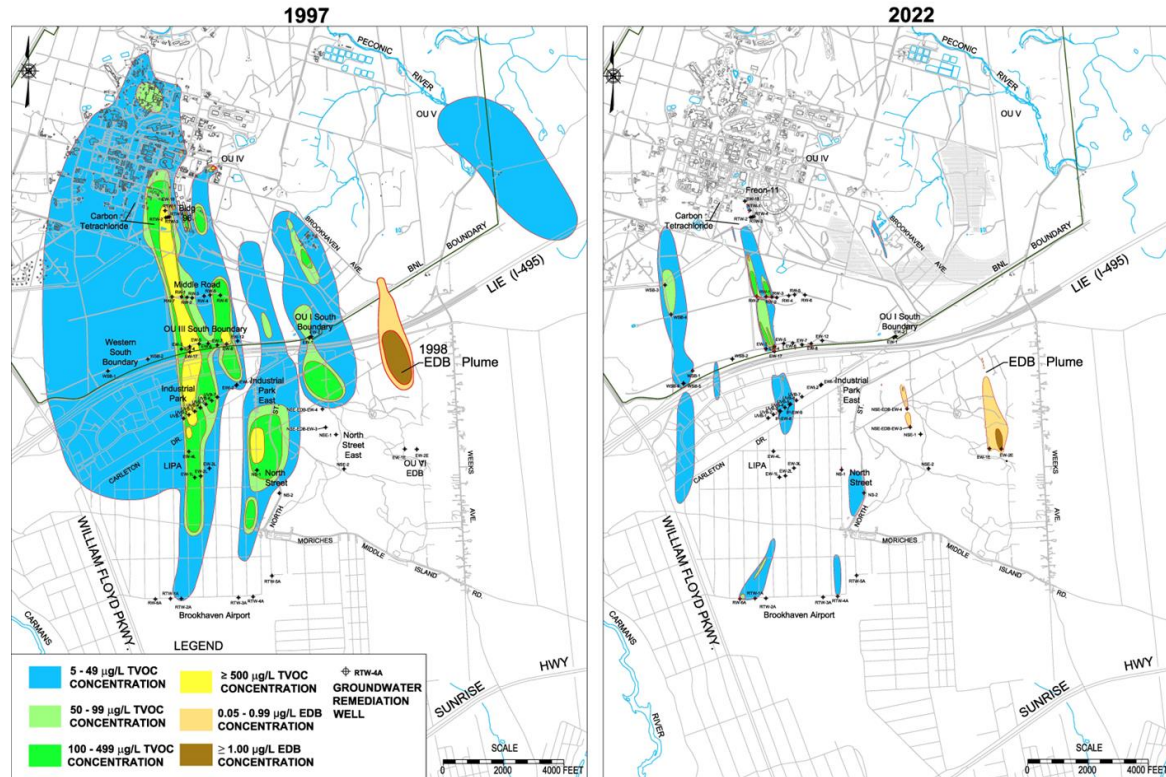
Gamma Forest 2023



BMRR w/stack c. 1958

Chapter 7 - Groundwater Protection: Highlights

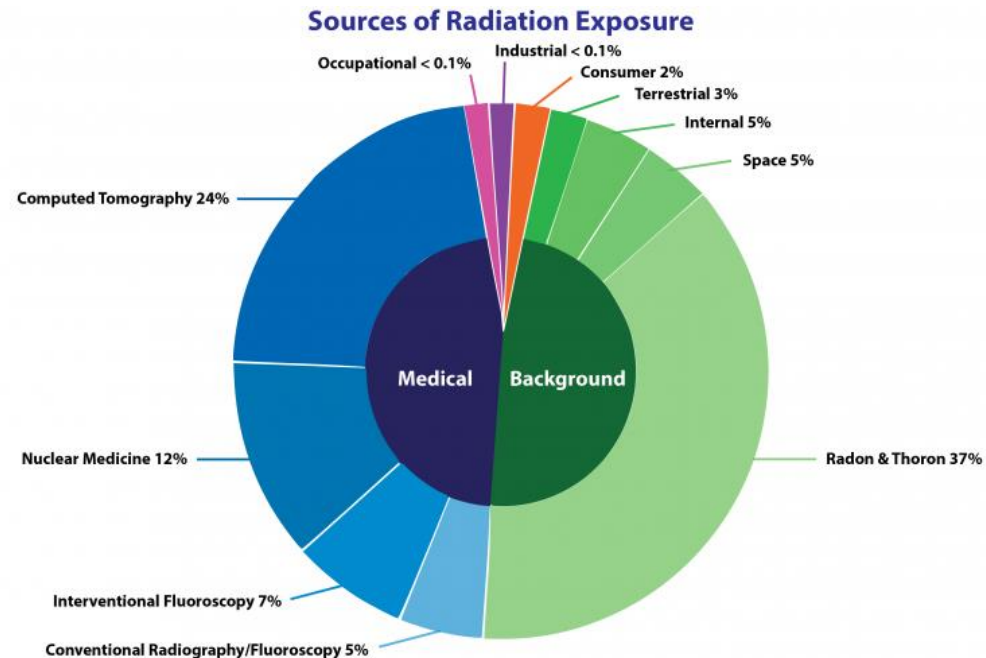
- Nine active systems treated ~950 million gallons of groundwater, and removed:
 - 53 lbs. of VOCs
 - 0.08 lbs. of PFAS
 - 0.3 mCi of Sr-90
- Current Firehouse PFAS Treatment System started operations in late October 2022
 - Former Firehouse PFAS Treatment System started operations in January 2023
 - Both systems are effectively remediating PFAS
- Continued improvements in groundwater quality in many areas demonstrate the effectiveness of the treatment system operations
 - Problematic areas were evaluated, including the OU VI EDB system where two additional extraction wells will be installed during 2023



- SER Volume I provides high level summary of the groundwater protection program
- SER Volume II provides full details of the program, including data tables, trend charts, contaminant plume maps and cross sections. Volume II is submitted to regulatory agencies by mid-June of each year

Chapter 8 - Radiological Dose Assessment

- **Ambient external dose (TLDs)**
 - 61 mrem on site and 58 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 2022 from inhalation (1.19 mrem) and ingestion (3.82 mrem) pathways was 5.01 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)

A photograph of a piece of white lined paper with vertical lines. The word "Questions?" is written in a large, cursive, black marker. Below the word, a thick, curved black line is drawn. In the bottom right corner, the tip and part of the black marker are visible, with the word "Carpenter" partially legible on its side.

Questions?