



2020 Site Environmental Report: An Overview

Community Advisory Council Meeting

Jason Remien

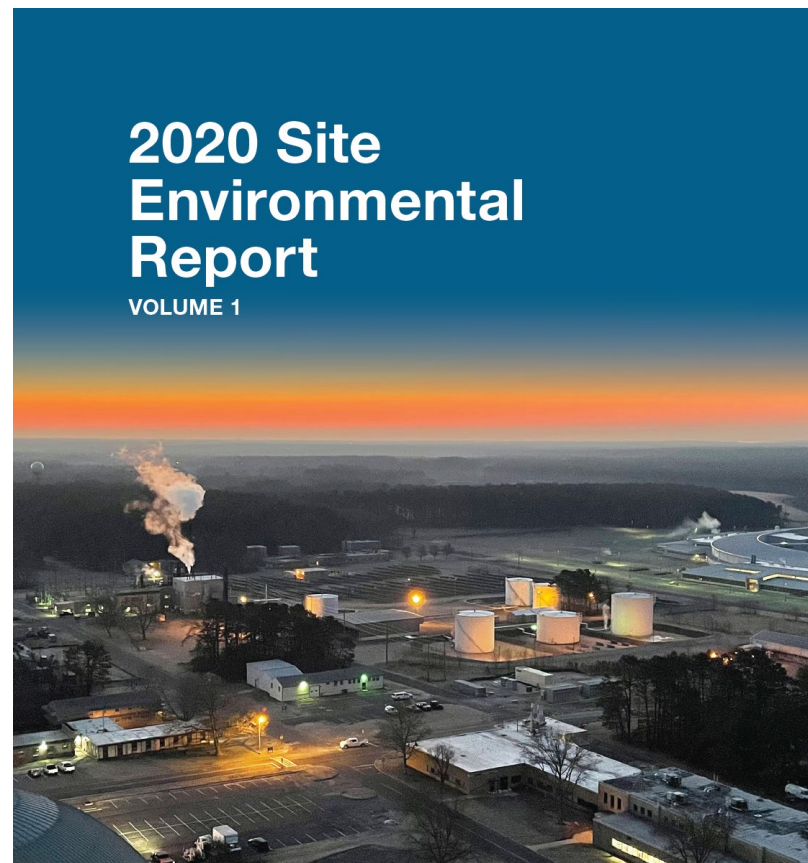
Manager, Environmental Protection Division

October 14, 2021



About This Year's Cover

- The cover of this year's SER was taken by Douglas Beard, Cabrera Services, Inc. Radiological Control Supervisor for the HFBR Stack Demolition Project.
- The photo was taken from the ICC Mantis working platform.
- This image was selected to convey the impact of the COVID-19 pandemic on Laboratory operations as well as the environment.



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**

Keeping you informed...

- **We frequently bring topics of interest to the CAC's attention well before the SER is published**
- **2020 SER Topics covered at CAC meetings included:**
 - ✓ Demolition and Removal of the HFBR Stack
 - ✓ Emerging Contaminants of Concern (PFAS and 1,4-dioxane)
 - ✓ Groundwater Cleanup Updates
 - ✓ Natural Resource Management Updates
 - ✓ Deer Management

2020 SER Table of Contents & Chapter Authors*

■ SER Volume I

- Executive Summary (A. Aponte)
- Chapter 1 – Introduction (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 and 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 September 2020)



Chapter 2 - Environmental Management System (EMS) ISO 14001

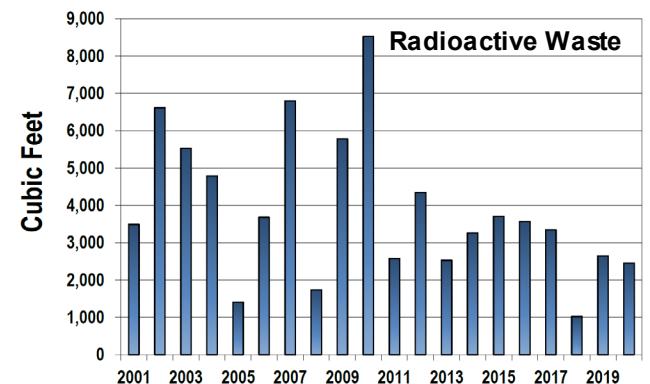
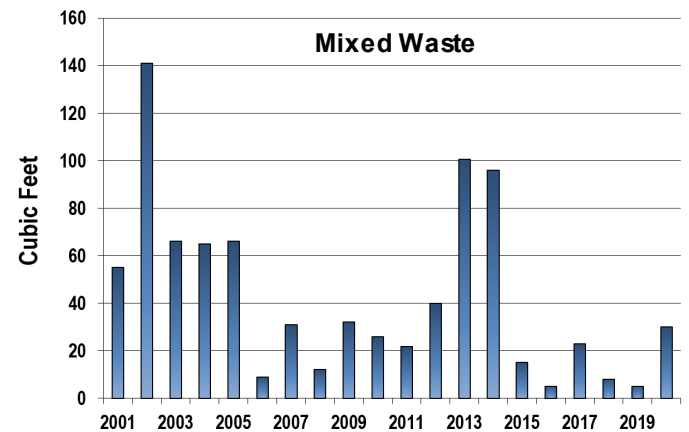
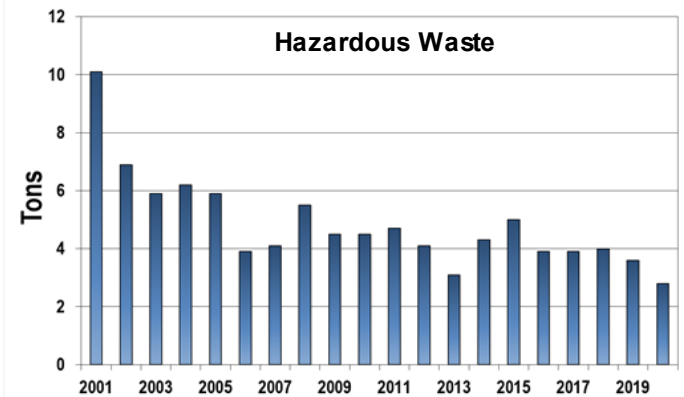
- **External assessment resulted in successful recertification of BNL as conforming to the ISO14001 Standard during 2020**
 - The system remains fully integrated and effective.
 - The external assessment by ERM CVS certified the Laboratory to the Standard and identified no nonconformances and determined that the Laboratory is in full conformance to the Standard.
- **Pollution Prevention (P2) Program**
 - Cost avoidance of over \$1.7 million
 - Reduced/recycled/reused 0.9 million lbs. of industrial, sanitary, & hazardous waste
 - The Lab's annual recycling rate was 63% (DOE Goal – 50%)
 - Received Green Electronics EPEAT Award, DOE's GreenBuy Award, and a second GreenBuy Prime Award



Chapter 2 - Waste Generation

- Hazardous waste from routine operations in 2020 decreased mainly due to COVID-related impacts on normal operations.
- Mixed waste generation increase is due to shielding from accelerator facility beamlines.
- Radioactive waste generation from routine operations has stayed consistent with 2019 generation rates.

2020	Routine	Nonroutine
Hazardous	2.8 Tons	1.5 Tons
Mixed	30 ft ³	7 ft ³
Rad	2,454 ft ³	680 ft ³



Chapter 3 - Compliance Status Overview

- BNL must comply with approx. 70 permits, including Title V, NESHAPS, SPDES, Tank Storage, Well Permit, and RCRA
- **114 additional projects reviewed for NEPA**
 - All were considered minor actions requiring no additional documentation.
 - Environmental Assessment for Electron Ion Collider (EIC) facility was initiated.
- **Potable Water**
 - Usage increased slightly from 2019 (368 million gallons vs. 357)
 - Action level exceedance on lead in the apartment area
 - Well #11 GAC Filter Upgrade for PFAS.
- **Tanks**
 - No regulatory inspections of Lab's Petroleum and Chemical Bulk Storage registered tanks in 2020 due to COVID-19.
 - Continue to perform routine inspections and maintenance



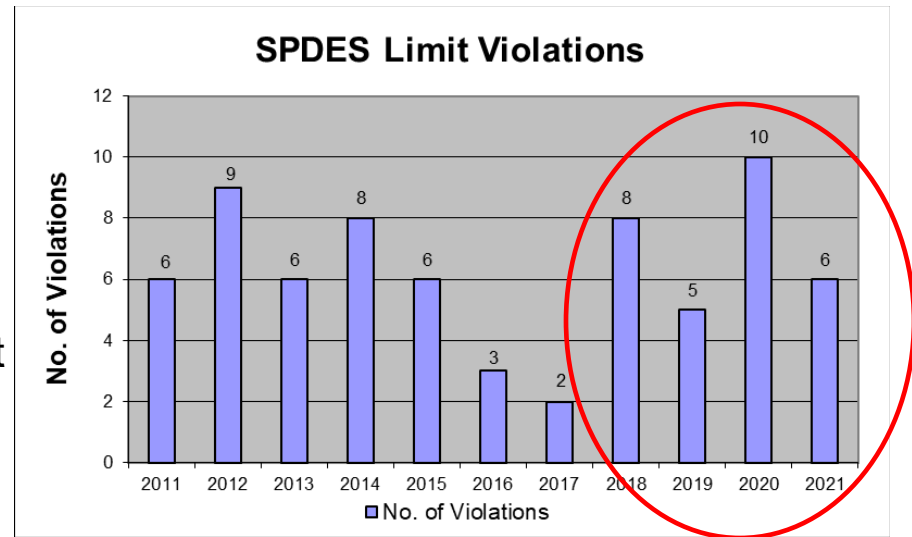
2021 BROOKHAVEN NATIONAL LABORATORY
Water Quality
CONSUMER CONFIDENCE REPORT



Chapter 3 - Overview (continued)

■ SPDES

- 10 permit excursions (nine at Sewage Treatment Plant [STP] and one at Outfall 002 [HN])
 - All due to Tolyltriazole (TTA)
- Investigation into cause(s) of these exceedances and corrective actions has been on-going since TTA was first detected at STP in January 2018



Cause(s)

- NYSDOH Legionella Disease prevention regulations enforced in 2015.
- Much lower flow conditions at the STP (especially during COVID-19).
- Sheer number of cooling towers and chilled water systems (no alternative corrosion inhibitor products for copper systems).

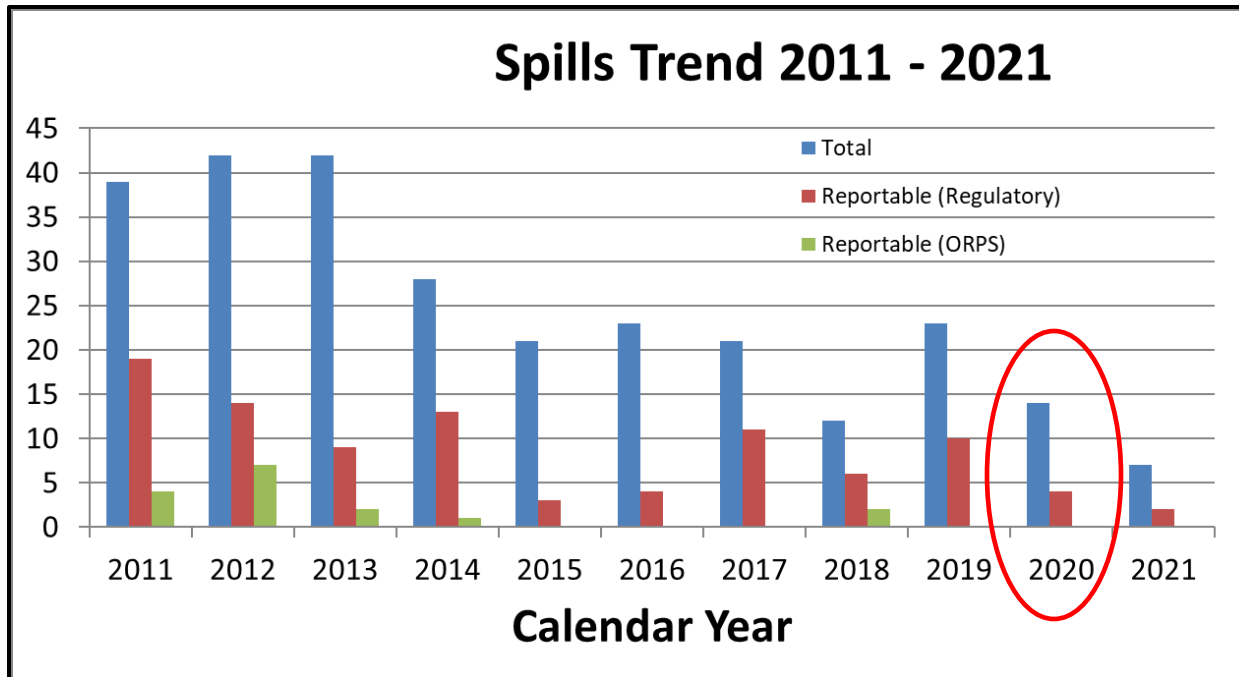


Corrective Actions

- Continued a pilot study using a new chemical that does not contain TTA
- Decreased the amount of TTA used in cooling tower systems
- Continued installation of automated chemical control systems
- Initiated hydrogen peroxide treatments at targeted cooling towers to help alleviate Legionella issues

Chapter 3 - Spills and Reportable Incidents

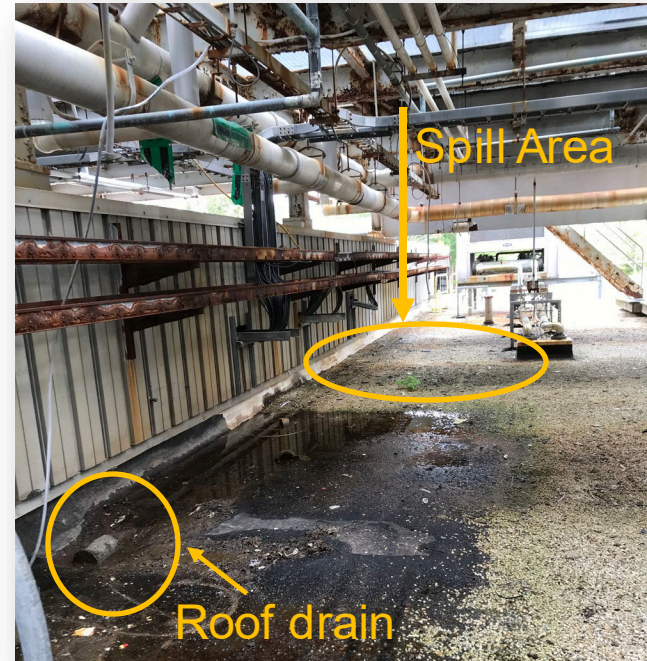
- **14 spills in 2020**
 - Four of those spills met regulatory reporting criteria
 - Three <2 gallons
 - <2 gallons of diesel fuel from fuel tank fill line of a trailer mounted generator
 - <1 gallon of antifreeze from failed valve on a contractor vehicle
 - <1 gallon of hydraulic fluid from lawn mower
 - 148-gallons of motor oil discovered in secondary containment of a double-walled tank in Building 423 (Motor Pool)



Chapter 3 – Environmental Events

Building 911 Evaporative Cooler Release of Tritium

- On July 28, 2020, an evaporative cooler on the roof of Building 911, used for the AGS main magnet cooling, leaked approximately 100 gallons of tritiated water when a coupling failed.
- The evaporative cooler automatically shut down from the water loss.
- Last sample collected of the water in the system was on 8/15/19 and Tritium concentration was 29,900 pCi/L.
 - Drinking Water Standard is 20,000 pCi/L
- Some of the tritiated water may have reached a roof drain located nearby that leads to a stormwater outfall
- BNL concluded that any residual amount/concentration of Tritium observed at the outfall would not be a risk to personnel or impact the environment and was not reportable to regulatory agencies.
 - This was based on observations made on the day of the event and calculations that accounted for the continuous flow of clean water on the roof and total volume of water typically measured at Outfall 002 (~200,000 gallons/day).
- Event was reported internally (DOE/BSA) and determined to be a management concern.



Chapter 3 – Environmental Events (cont.)

- An investigation team was formed and performed fact finding, causal analysis, and development of corrective actions.
- During the time of the investigation a second, similar event occurred on September 10, 2020.
- The investigation into these two events resulted in the following corrective actions that were completed for the exterior Main Magnet Cooling System piping:
 - Replaced all couplings
 - Re-insulated all valves, couplings, and other clamps above the platform
 - Developed inspection plan involving random sampling of coupling/clamps



Chapter 3 – External Inspections



- **EPA:** In December 2020, BNL received a data request from the USEPA to facilitate the performance of an Off-site Compliance Monitoring (OfCM) activity to determine RCRA compliance. Data requested included photos of waste storage areas, copies of relevant permits, transportation documents, and shipping manifests. The requested information was collected and forwarded to the USEPA and a closeout meeting to discuss the results of the OfCM was scheduled for February 2021.



- **NYSDEC**
 - SPDES – No issues identified during annual surveillance inspection.



- **SCDHS (STP, potable water):** No issues identified at STP (quarterly); BNL 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 2020: **0.242 Ci**
 - BLIP didn't produce radioisotopes 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)

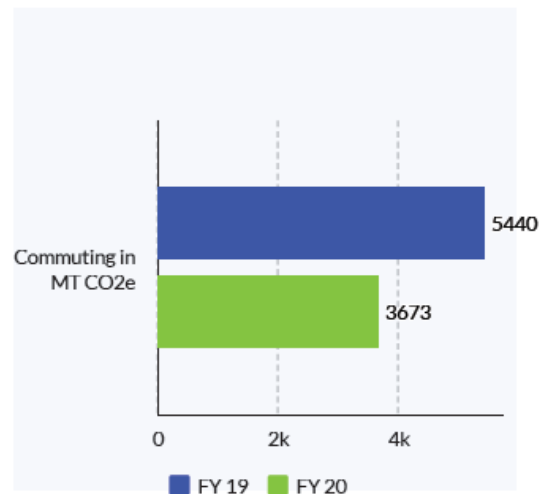
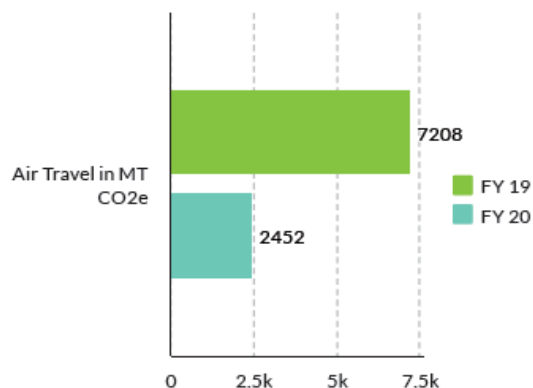


Chapter 4 – Air Quality (Non-radiological)

Figure 4-4: BNL Scope 3 Greenhouse Gases – Federal Impact of COVID-19

BNL Greenhouse Gases

Brookhaven National Lab mirrored the federal and state governments and saw significant reductions in greenhouse gas emissions



2019-2020 BNL impacts

↓ 66%
BNL air travel

↓ 33%
BNL commuting

↓ 29.8%
BNL Scope 3 GHG emissions

↑ 64%
BNL telecommuting

↓ 5,715
In Metric Tons CO2e

Chapter 5 - Water Quality (Radiological Monitoring)

- Tritium typically less than method detection limit (MDL) in all sample locations
 - Tritium was detected in a single sample above the MDL at STP in January (3,020 pCi/L), well below the DWS of 20,000 pCi/L
 - All other months were less than MDL
- No gamma-emitting nuclides attributable to BNL detected
 - Natural products only
- Peconic River had no measurable flow offsite in 2020; radiological values (Sr-90, gross alpha, gross beta) were all comparable to historical levels and can be attributed to worldwide fallout or natural products.



Monitoring Station HM-N

Chapter 5 – Water Quality (Non-Radiological Monitoring)

- **Sewage Treatment Plant**
 - Full compliance was met with exception of Tolyltriazole exceedances which are continuing to be investigated
- **Recharge Basins**
 - All metals complied with the respective water quality or groundwater discharge standards.
 - VOCs – acetone was detected above MDL at the CSF basin at 22 $\mu\text{g/L}$.
 - 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 MDLs.
 - Water quality data were consistent for locations sampled.



Sampling STP Effluents

Chapter 6 - Natural and Cultural Resources

■ Natural Resource Management

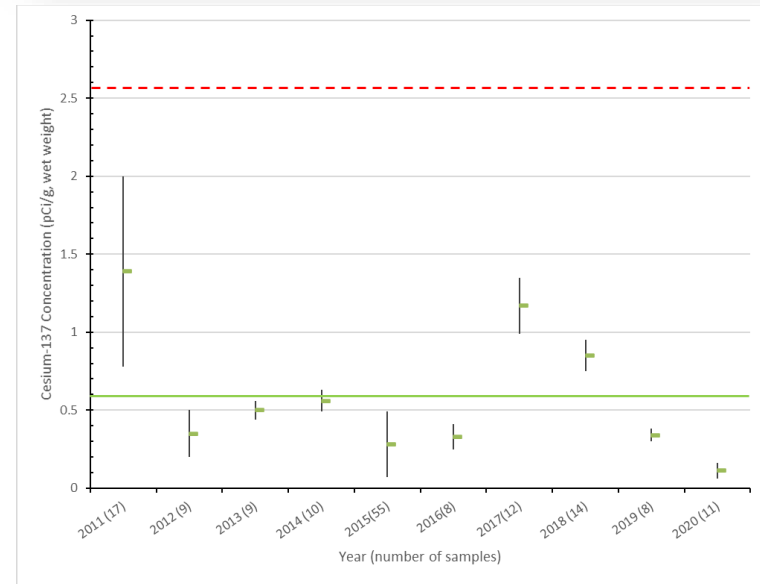
- Deer Management
 - Population reduction of 82 deer
 - End of 2020 population ~425 deer
- Prescribed fire program remained on hold
- Turkey population at 350-500 birds
- Internships greatly reduced due to COVID-19 – one intern working on natural resources
- Key effort: Forest health monitoring in partnership with Central Pine Barrens Commission



2019 Forest Health Monitoring Team

■ Surveillance Monitoring

- Ten-year trend of Cs-137 in deer meat shows decline; 2020 on-site average in meat was 0.06 pCi/g, wet weight, with ten-year on-site average being 0.59 pCi/g, wet weight
- No fish monitoring – Peconic River had low water levels throughout the year
- Grassy vegetation and soil sampling results consistent with past years
- Low level mercury continues to be detected – highest value 8.37 ng/L



Ten-Year Trend of Cs-137 Concentrations in Deer Meat, dashed line is pre-cleanup avg., solid line is 10-year avg. 0.59 pCi/g wet weight.

Chapter 6 - Cultural Resource Management

- **Contract to review early BNL buildings - additional reports received in 2020**
 - 19 additional buildings determined to be National Register Eligible
 - Buildings eligible due to science, architect and/or architecture, association with Nobel Prizes
 - Will require continued discussions with NY State Historic Preservation Office



WW II era Water Tower



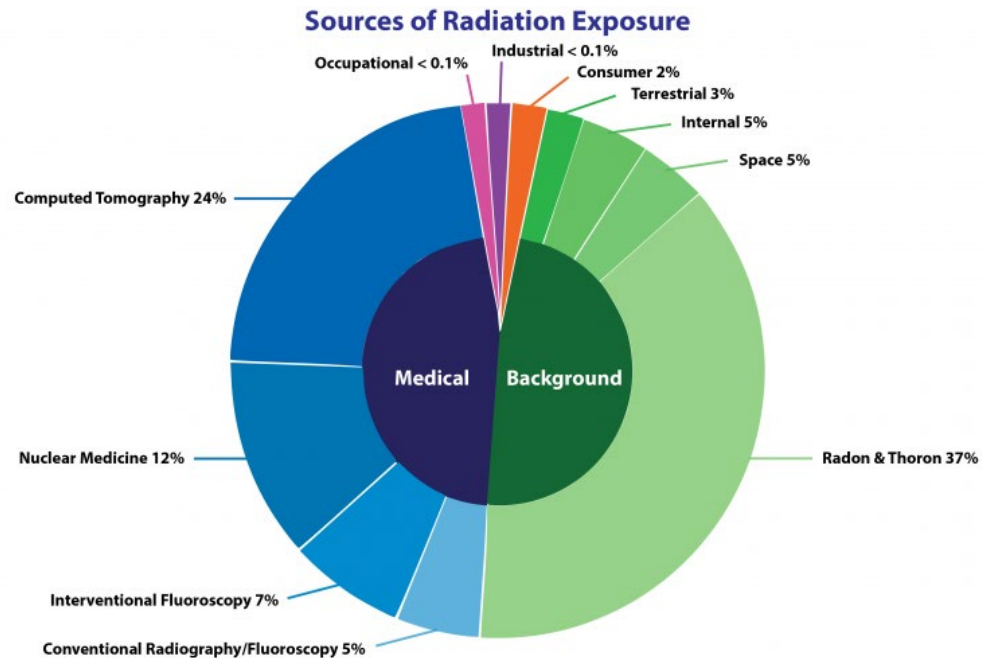
Building 490 – former Medical Complex



Alternating Gradient Synchrotron Complex

Chapter 8 - Radiological Dose Assessment

- **Ambient external dose (TLDs)**
 - 64 mrem on site and 61 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 2020 from inhalation (0.000056 mrem) and ingestion (0.913 mrem) pathways was 0.91 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)**

QUESTIONS?

Backup Slide



Note: Some outfalls have multiple basins.

Table 5-2. Radiological Analysis of Samples From On-Site Recharge Basins

Basin		Gross Alpha	Gross Beta	Tritium
		(pCi/L)		
No. of Samples		2	2	2
HN	max.	2.63 ± 1.66	9.01 ± 1.6	< 387
	avg.	1.27 ± 2.67	5.36 ± 7.15	< MDL
HO	max.	2.72 ± 1.66	3.28 ± 1.16	< 306
	avg.	1.8 ± 1.81	2.2 ± 2.11	< MDL
HS	max.	< 2.44	3.51 ± 1.01	< 357
	avg.	0.73 ± 0.32	2.56 ± 1.85	< MDL
HT-E	max.	< 5.66	5.76 ± 2.34	< 377
	avg.	1.15 ± 1.66	4.06 ± 3.33	< MDL
HT-W	max.	< 1.7	2.24 ± 0.74	< 367
	avg.	0.69 ± 0.48	1.46 ± 1.52	< MDL
HW	max.	1.98 ± 0.92	4.16 ± 0.97	< 324
	avg.	1.34 ± 1.25	3.04 ± 2.2	< MDL
HZ	max.	4.04 ± 1.66	3.13 ± 0.9	< 324
	avg.	2.28 ± 3.45	1.83 ± 2.55	< MDL
SDWA Limit		15	(a)	20,000