Brookhaven National Laboratory

U.S. DEPARTMENT of ENERGY

2024 Groundwater Status Report

Highlights of Plume and Treatment Systems Status, Performance, Progress, and Recommendations

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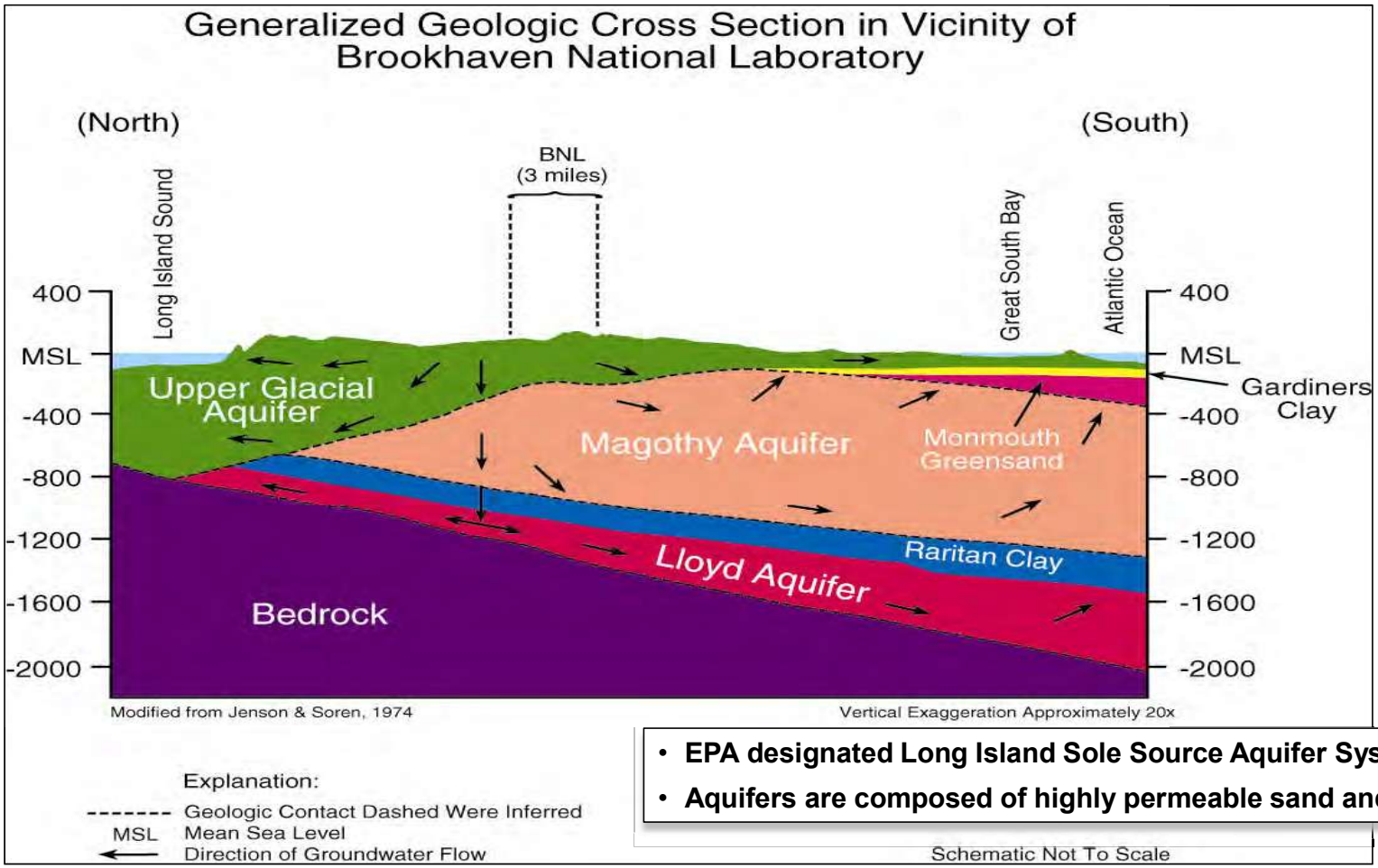
Agenda:

- Intro/Overview
- VOC Remediation and Monitoring
- Radionuclides
- PFAS & 1,4-Dioxane
- Next Steps
- Questions?

BNL Site and Groundwater Flow

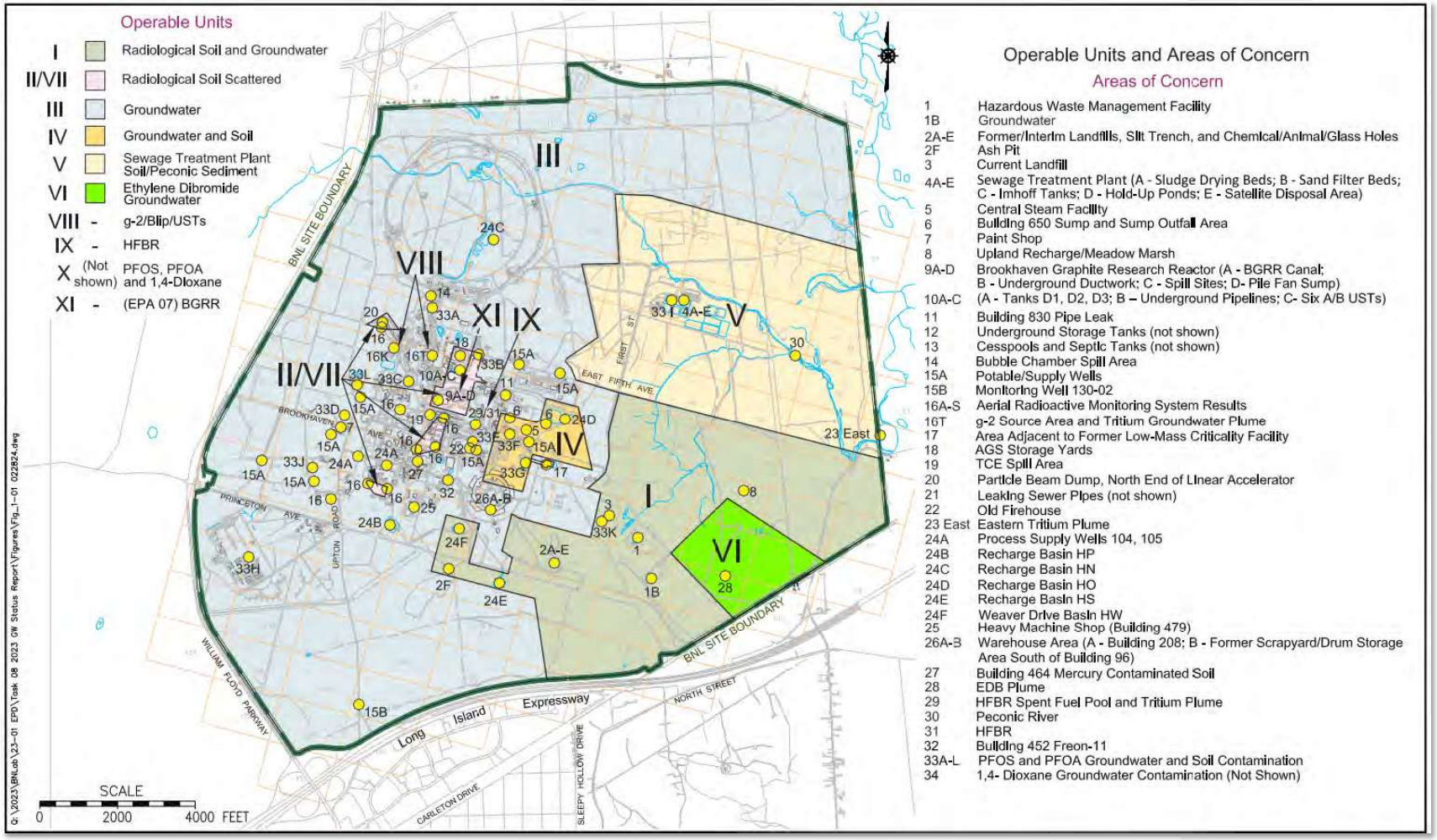
- ~5,300 acres
- Average GW flow rate in Upper Glacial Aquifer ~1 foot per day
- Significant vertical component of flow
- Depth to GW ranges from ~5 feet bgs to 70 feet bgs

BNL Geology



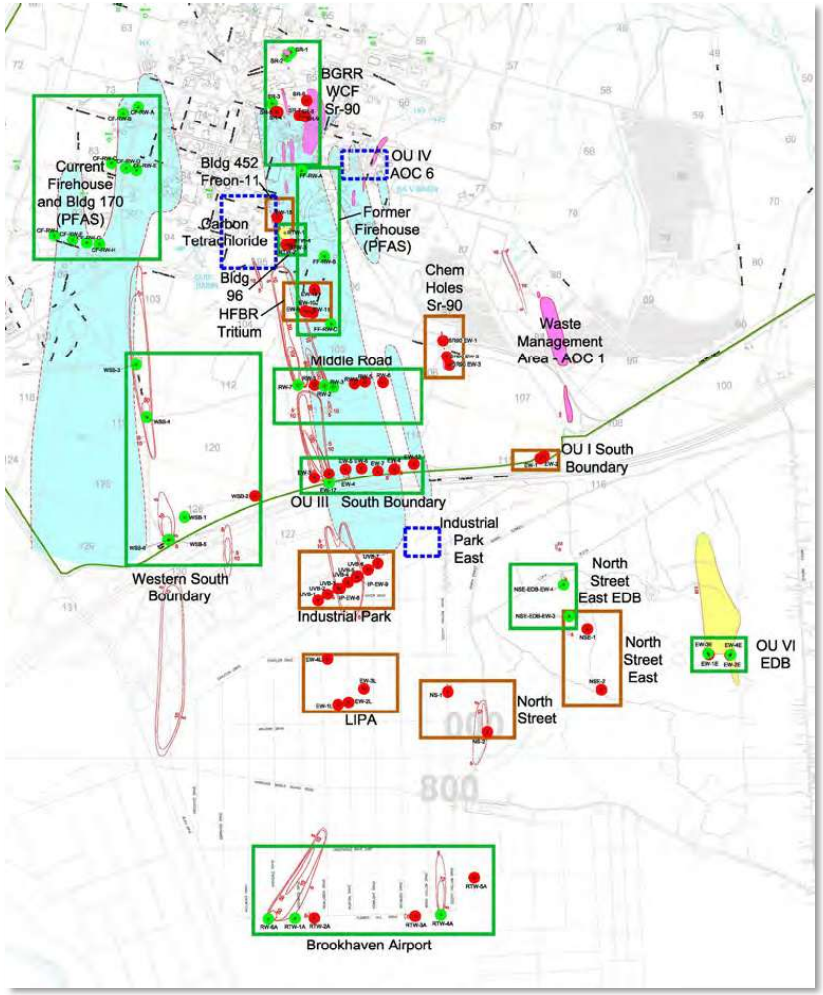
- **EPA designated Long Island Sole Source Aquifer System (1975)**
- **Aquifers are composed of highly permeable sand and gravel**

CERCLA OUs and AOCs



Remediation Systems Summary

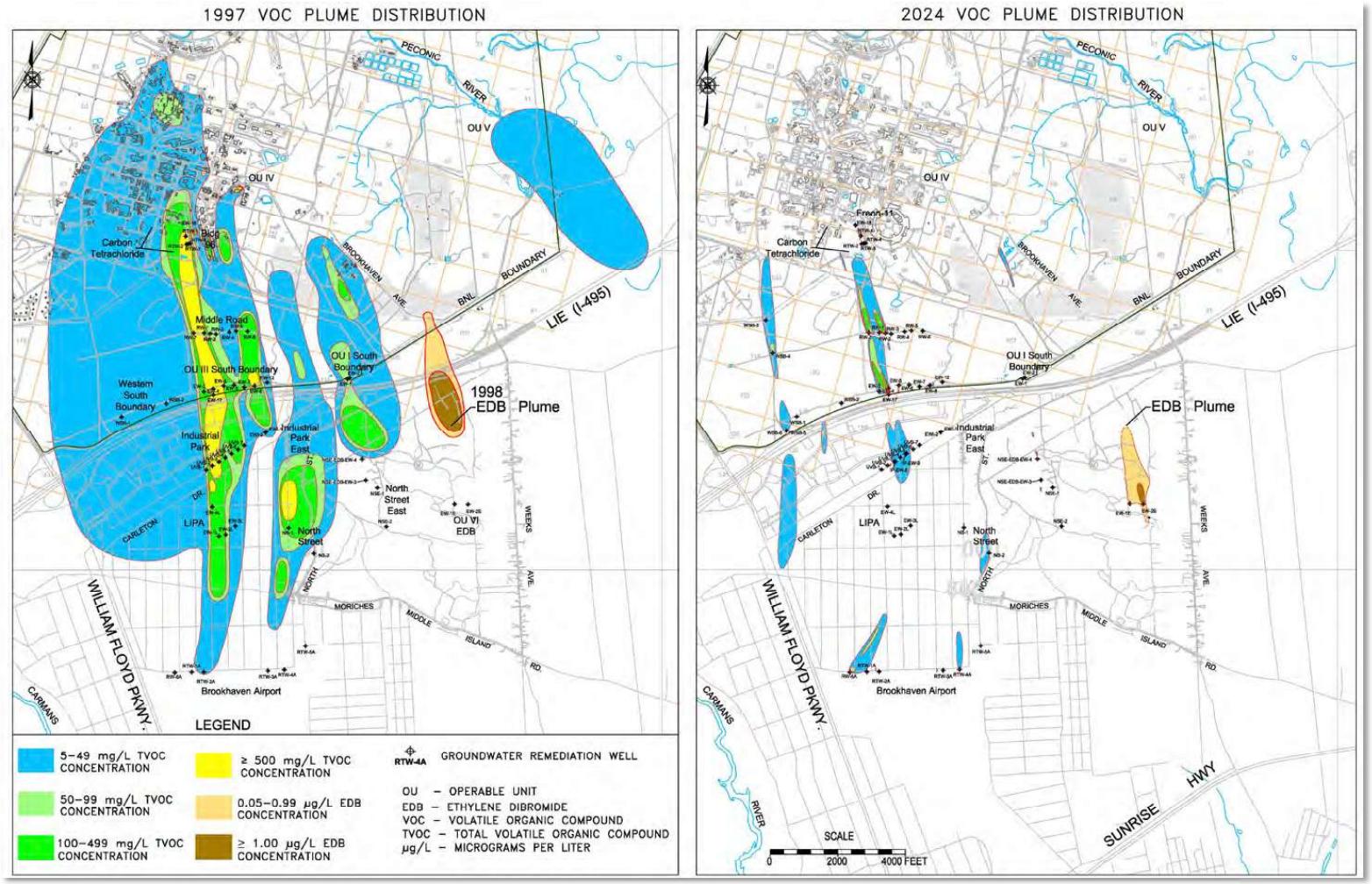
	2023	2024	Totals
(7) VOC	856 MG 53 lbs	753 MG 41 lbs	32 BG 7,913 lbs
(1) Sr-90	6 MG 0.15 mCi	6.6 MG 0.1 mCi	297 MG 35 mCi
(2) PFAS	313 MG 0.51 lbs	320 MG 0.7 lbs	667 MG 1.3 lbs
Total Pumpage	1.2 BG	1.1 BG	33 BG
No. Extraction Wells	32 of 83	31 of 83	



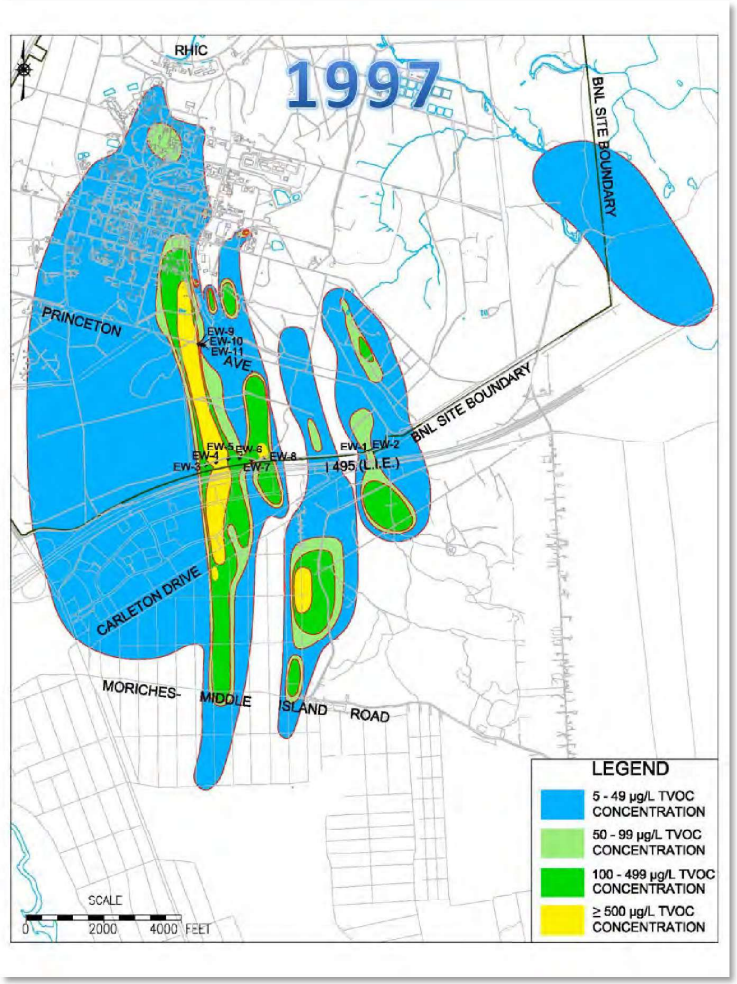
Volatile Organic Compounds

Groundwater Remediation and Monitoring

VOC Plume Comparison (1997 vs. 2024)



VOC Animation (1997 to 2024)

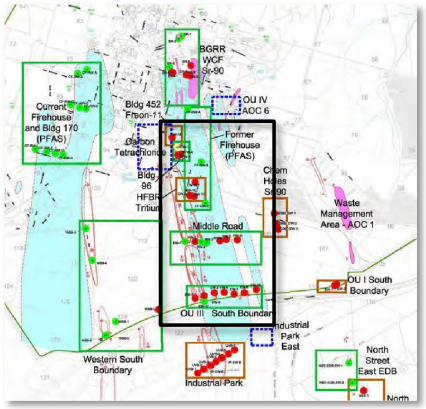


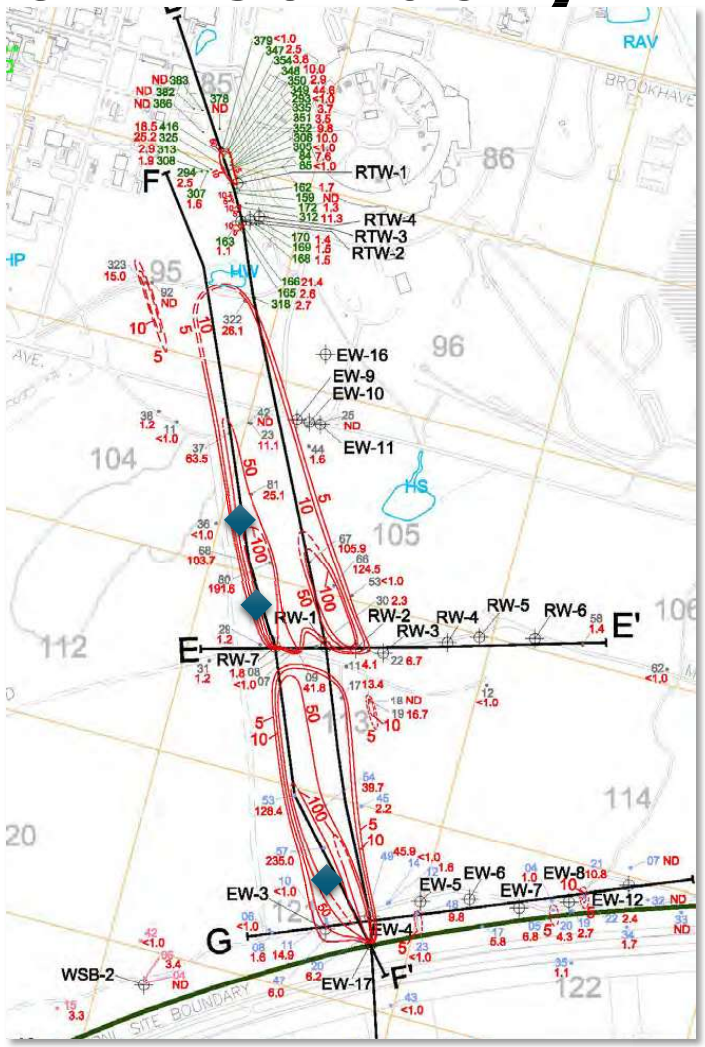
2024 – 2025 VOC Project Highlights

- LIPA system administratively closed
- Industrial Park system administratively closed (2025)
- Completed Building 96 source area chemical treatment
- Startup of two new deep extraction wells at OU VI EBD
- Completed groundwater modeling for the evaluation of the OU III Middle Road/South Boundary remediation timeframe

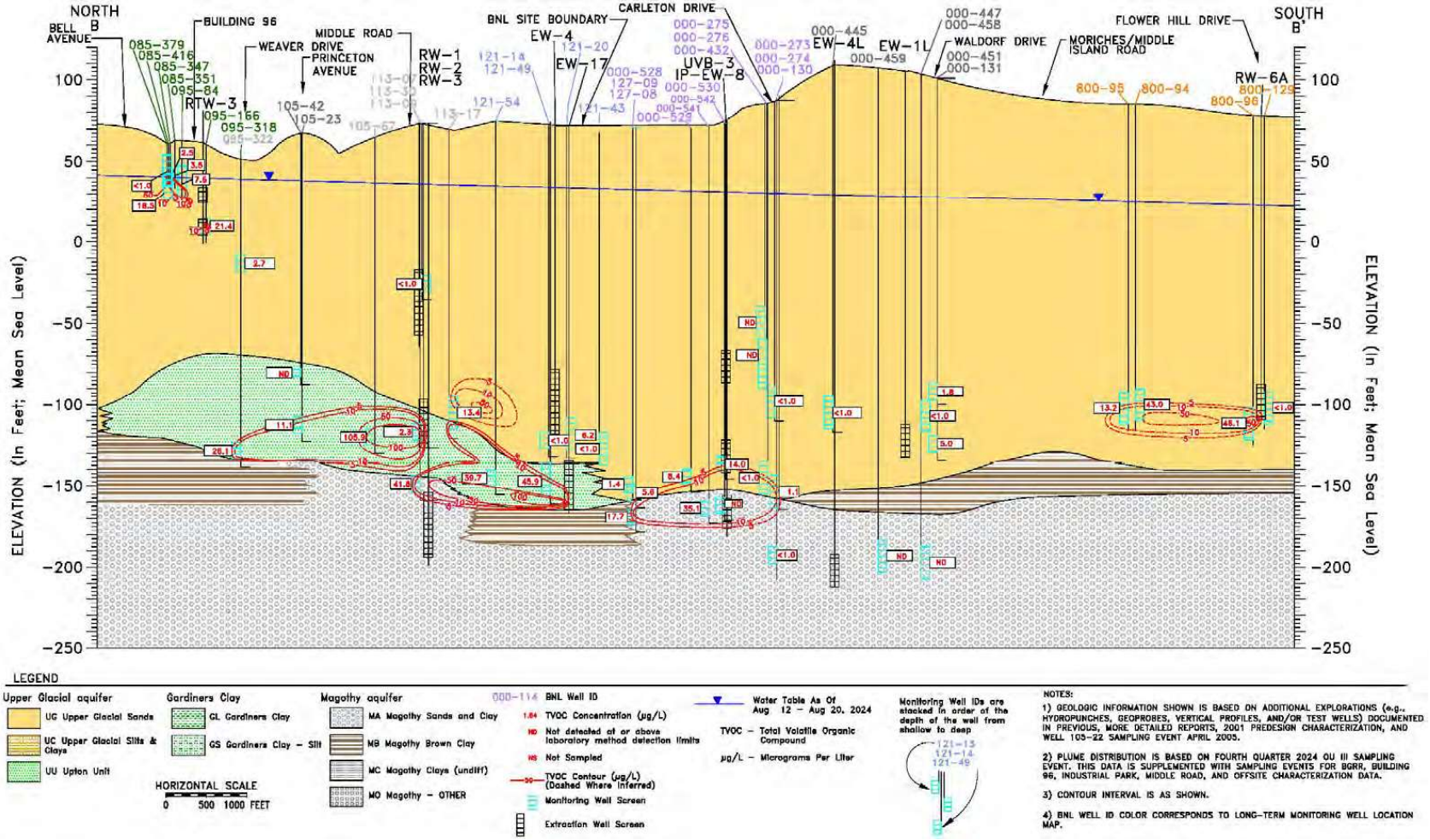
OU III Middle Road/South Boundary

- Based on monitoring data, is unlikely the systems will achieve the 2030 ROD cleanup goal
- VOCs remain elevated in the deep Upper Glacial Aquifer
- Systems remain effective at treating and containing VOCs onsite
- Modeling recommended the installation of additional extraction wells to enhance cleanup timeframe
- BNL to develop designs and cost estimates for future planning





OU III Middle Road/South Boundary



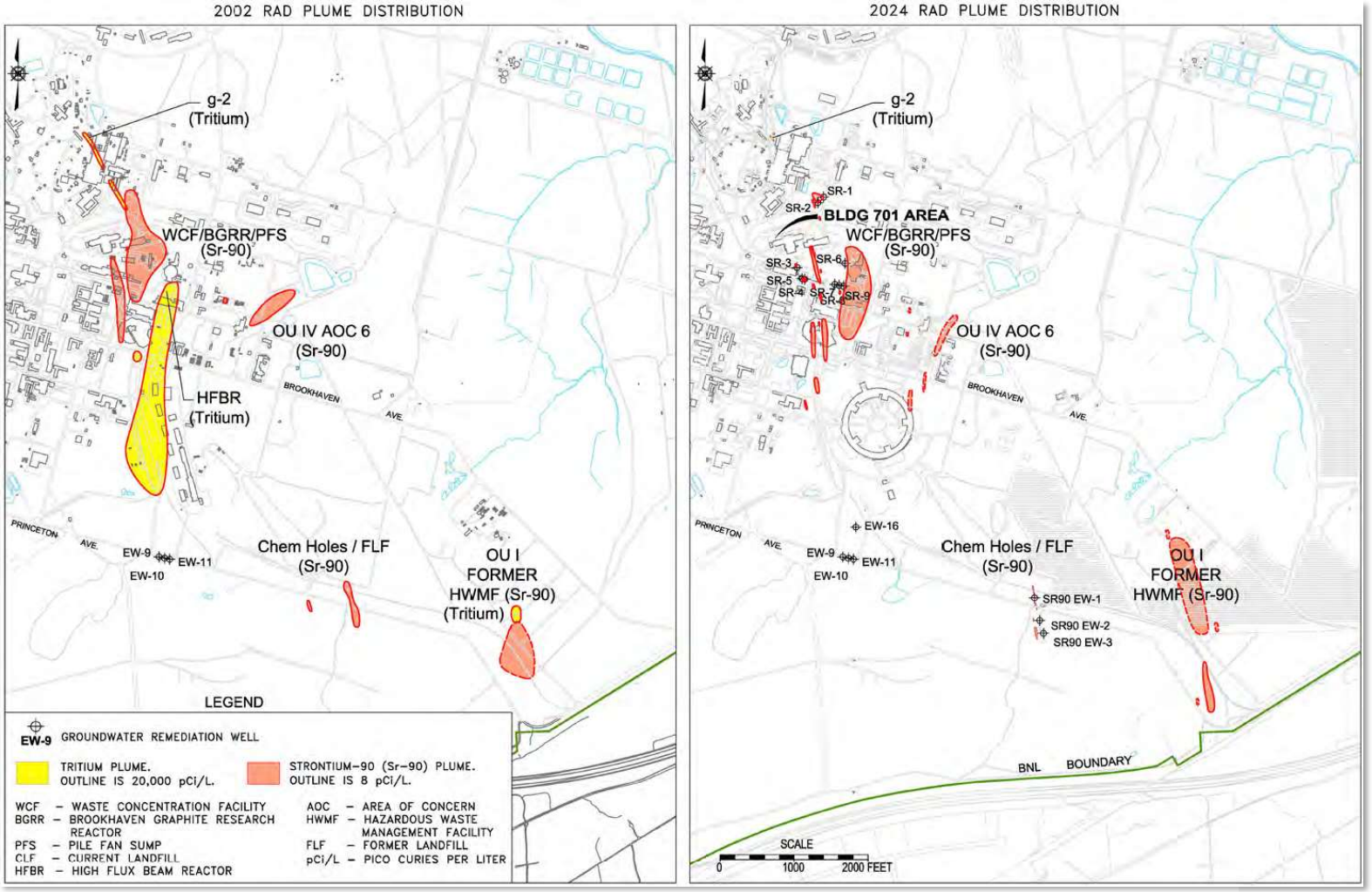
VOC Project Recommendations

- Submit petitions for shutdown of the OU III Western South Boundary and North Street East EDB treatment systems
- Complete the engineering design and cost estimate for the OU III Middle Road/South Boundary treatment system optimization

Radionuclides

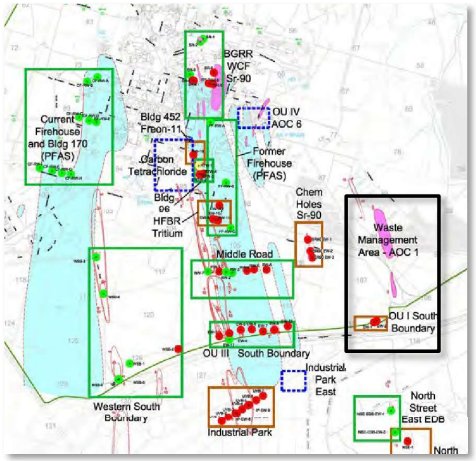
Groundwater Remediation and Monitoring

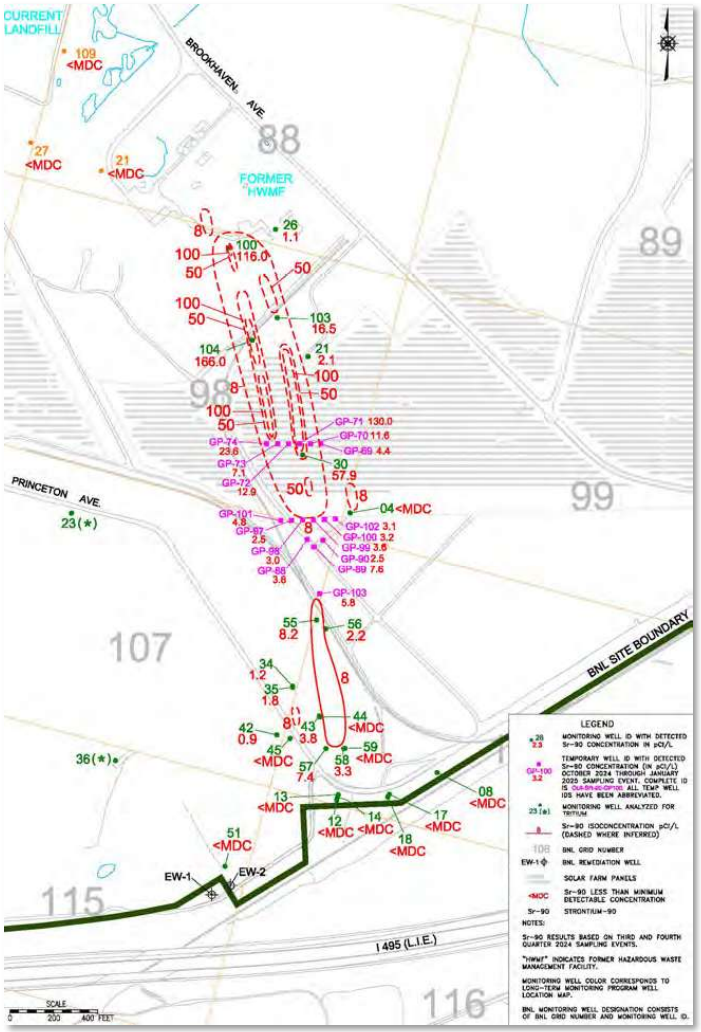
Radionuclide Comparison (2002 vs. 2024)



OU I South Boundary

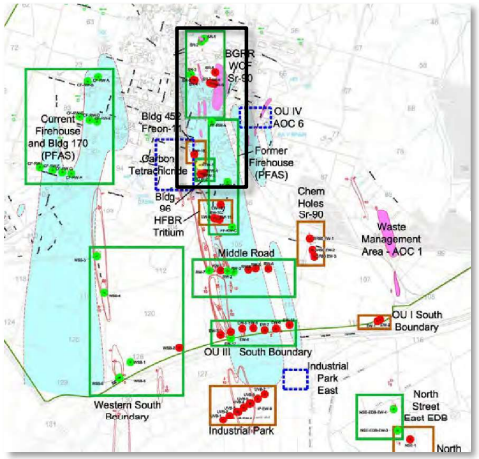
- Continue to track Sr-90 migrating south
- Results consistent with previous years and indicate that the leading edge of the plume is attenuating to below the DWS south of the solar farm

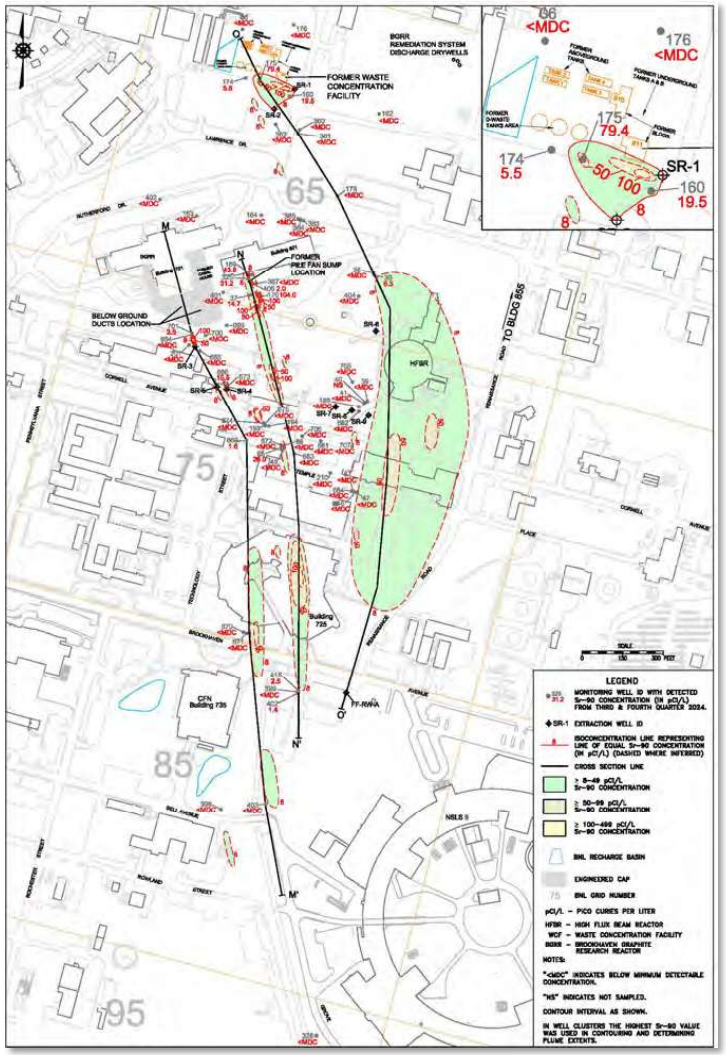




OU III BGRR/WCF/PFS

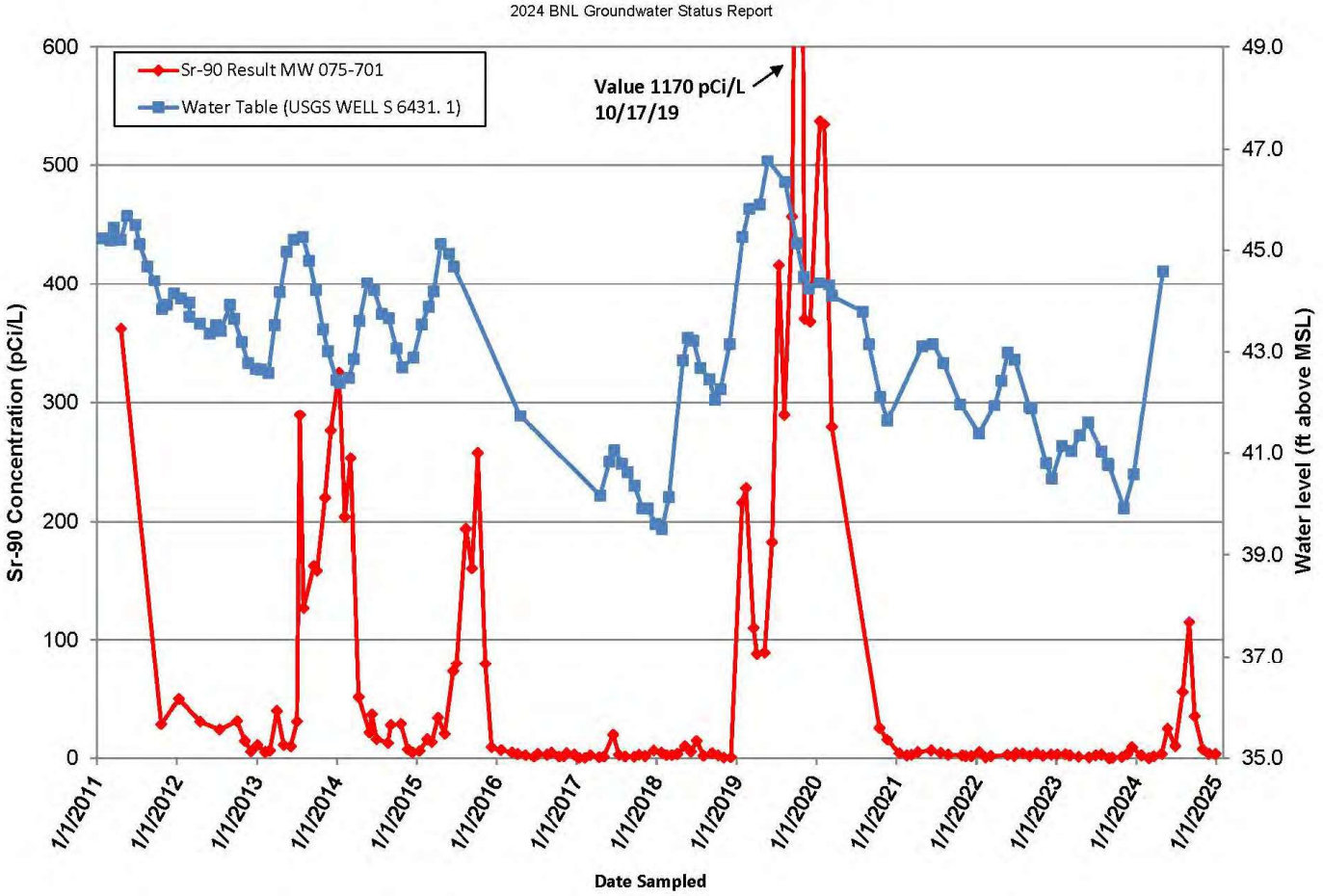
- Shut down SR-2 due to continuously low concentrations of Sr-90
- Install triennial temporary wells in the downgradient portion of the WCF plume





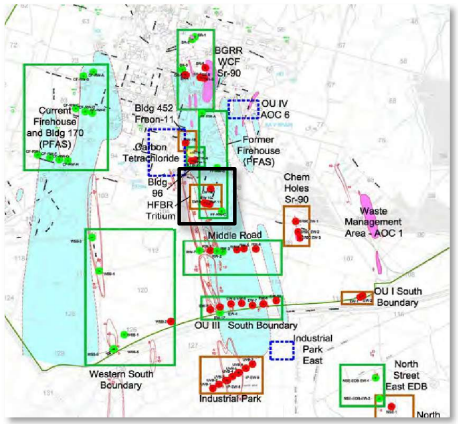
OU III BGRR/WCF/PFS

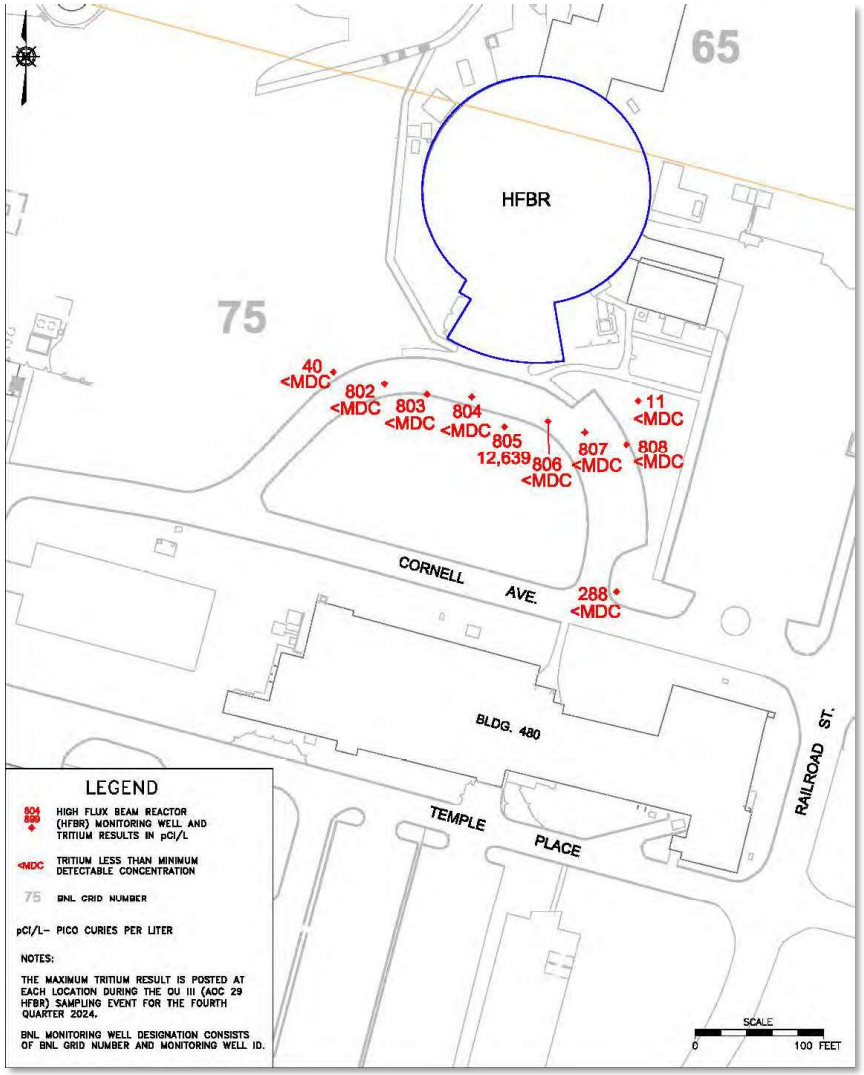
Figure 3.2.11-6
OU III BGRR/WCF Monitoring Well 075-701
Sr-90 Concentration Comparison to Water Table Elevation



OU III HFBR

- The highest tritium concentration observed in 2024 was 12,639 pCi/L
- The magnitude and frequency of peak tritium concentrations has significantly diminished over the past 25 years





Radionuclide Project Recommendations

- Submit a petition for closure of the OU III Chemical/Animal Holes groundwater treatment system
- Install triennial temporary wells downgradient of the Building 650 Sump Outfall
- Install temporary and permanent monitoring wells at the OU I South Boundary

PFAS & 1,4-Dioxane

Characterization, Remediation, and Monitoring

2024 - 2025 PFAS & 1,4-Dioxane Project Highlights

- Performed downgradient characterization of the OU X Current Firehouse/Building 170 and Former Firehouse PFAS plumes
- Installed six permanent monitoring wells at the southwest site boundary for routine monitoring of PFAS and 1,4-dioxane
- Performed limited source area soil characterization at the Current Firehouse, Building 170, and the Former Firehouse source areas

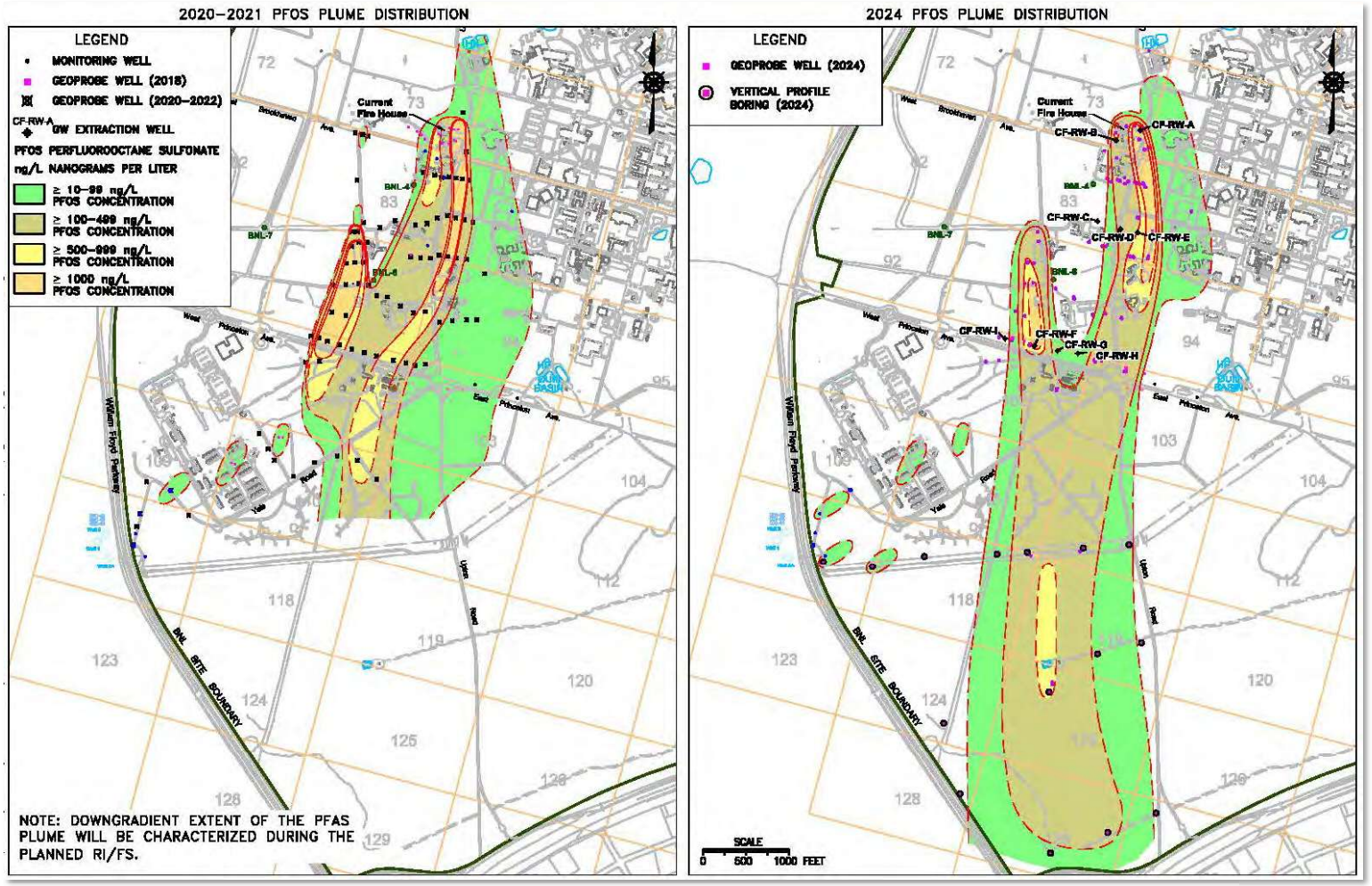
OU X PFAS Treatment Systems

- CFH/Building 170 began operations in October 2022
- FFH began operations in January 2023
- Combined, these systems can treat ~750 gpm
- Using GAC filtration, PFOS, PFOA, and most other PFAS are reduced to non-detectable levels
- Treated water is returned to the aquifer using recharge basins
- The systems are meeting the NYS Effluent Limits for PFOS and PFOA

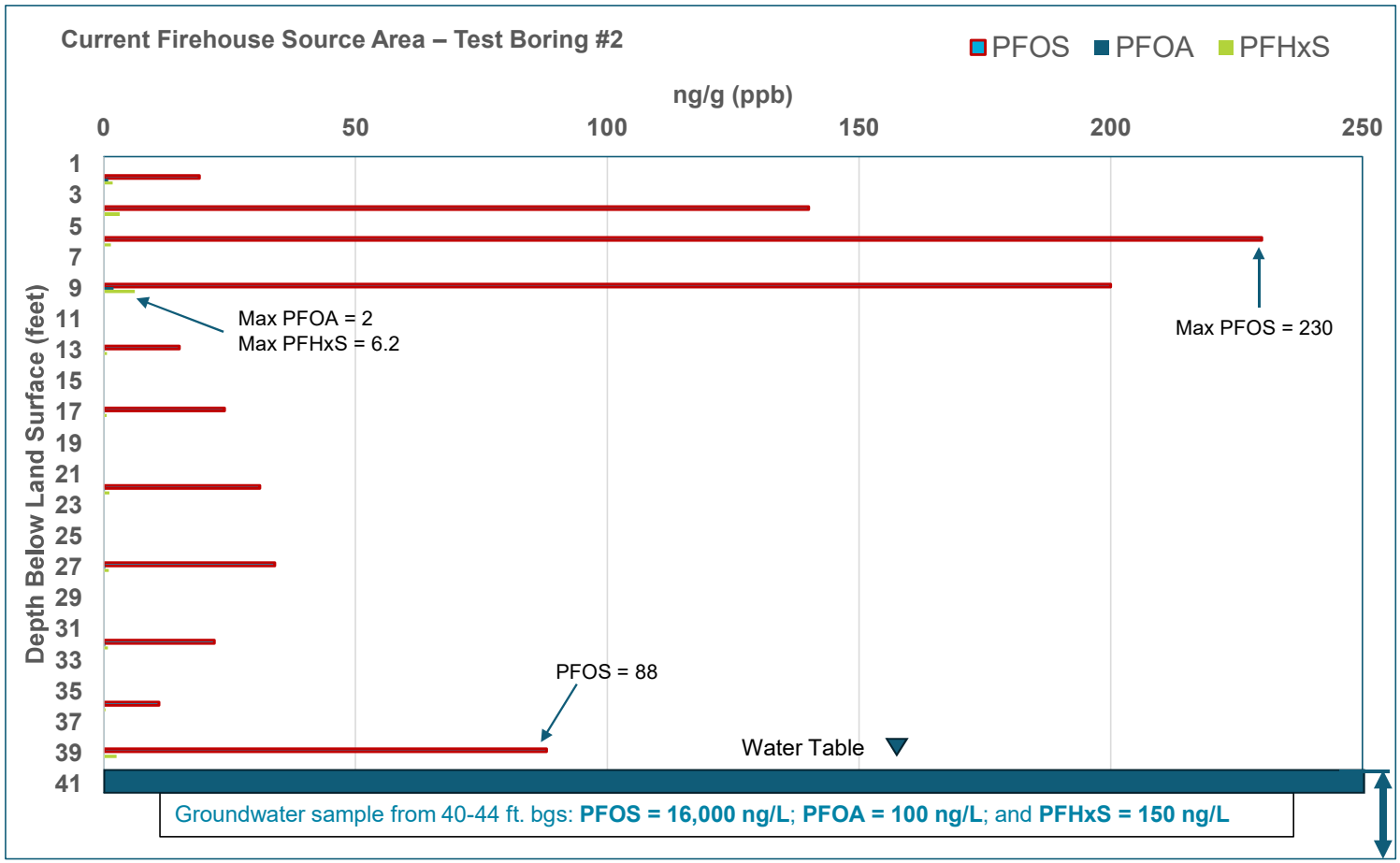
Treatment System for Former Firehouse PFAS Plume
Granular Activated Carbon Filters

To date, the two systems have removed ~1.7 lbs. of total PFAS while treating ~900 MG of groundwater

OU X Current Firehouse/Building 170

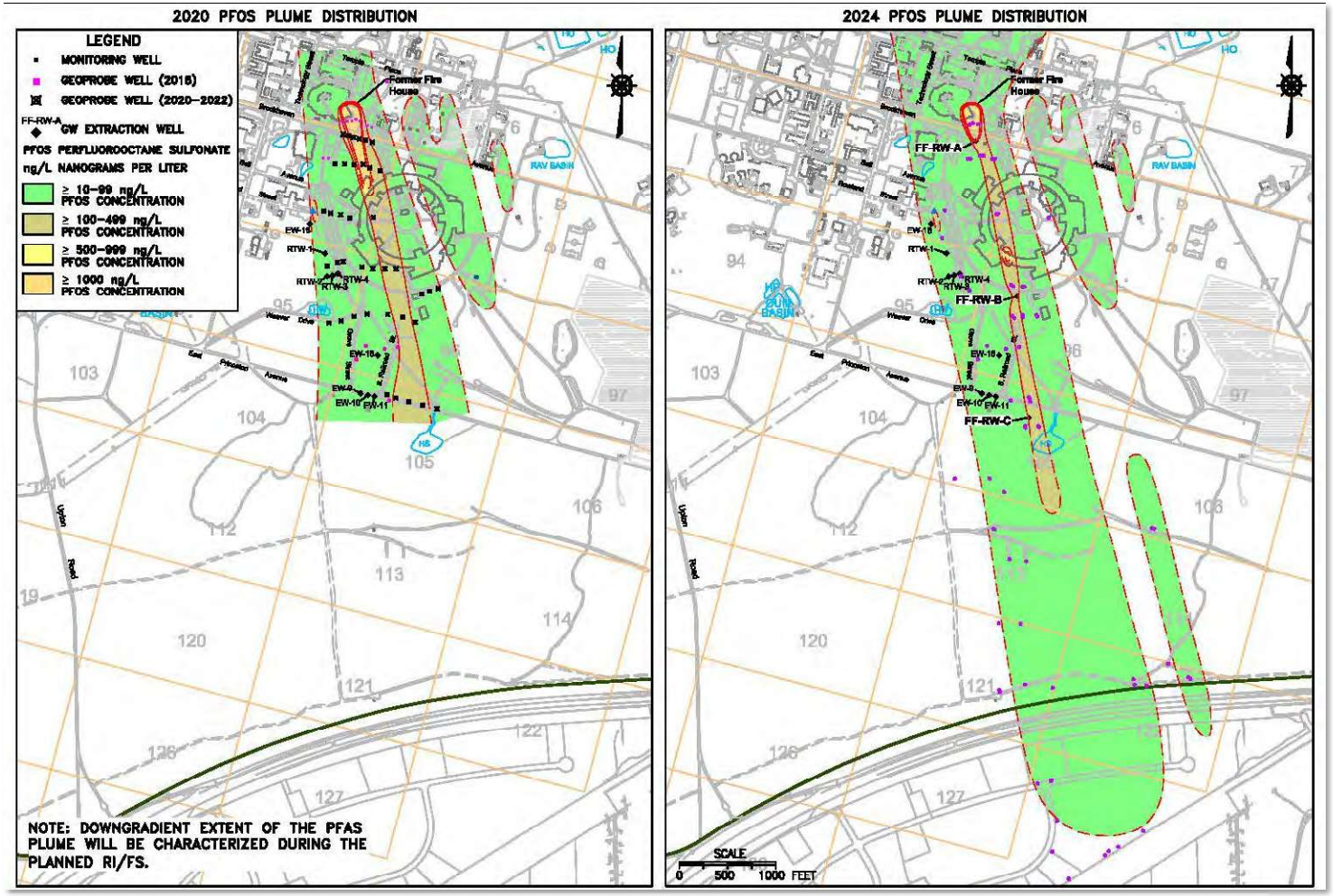


OU X CFH Source Area Soil Characterization



New York State Soil Guidelines for Groundwater Protection: PFOS = 1.0 ppb
PFOA = 0.8 ppb

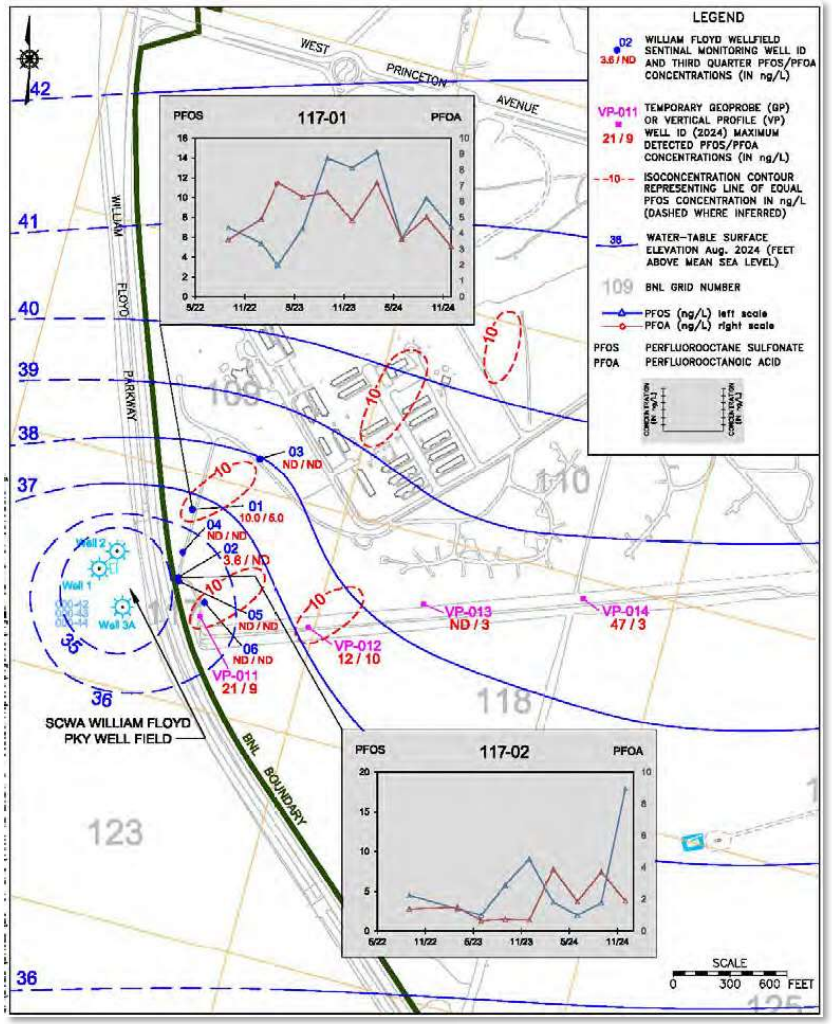
OU X Former Firehouse



Southwest Area of BNL

Adjacent to William Floyd Well Field

- PFOS and PFOA detected above their NYS AWQS in wells 117-01 and 117-02
  - Max PFOS 18 ng/L
  - Max PFOA 7 ng/L
- 1,4-dioxane detected in two wells but below the AWQS
- Highest concentrations of PFOS and PFOA detected in the shallow groundwater (85 – 90 feet bgs) in VP-011 and VP-012
- Trace levels of 1,4-dioxane detected in sentinel wells
- Highest concentration of 1,4-dioxane (0.34 µg/L) in VP-011 at 185-190 feet bgs.



1,4-Dioxane

- CFH/Building 170
  - Exceeded the AWQS in seven permanent monitoring wells with a maximum concentration of 5.7 µg/L
- Western South Boundary (as part of CFH/B170 characterization)
  - Detected in 12 temporary VPs and exceeded the AWQS in nine of the temporary VPs. The maximum concentration was 12 µg/L in VP-021
  - Detected at the site boundary at 9.6 µg/L
- Downgradient of Former Firehouse (OU III MW network)
  - Exceeded the AWQS in three monitoring wells with a maximum concentration of 1.0 µg/L

Treatment System Discharge Compliance

- Continue monitoring treatment systems influent and effluent for PFAS and 1,4-dioxane
- Engineering design and cost estimate completed for construction of two AOP treatment systems (OU III MR/SB/WSB and Airport)
- Characterized groundwater in three recharge basin areas
  - Permanent monitoring wells were installed to allow for routine monitoring
- BGRR effluent had exceeded PFOS limit but recent carbon changeout has addressed the issue
- Several systems continue to discharge PFAS and/or 1,4-dioxane above effluent limits

PFAS & 1,4-Dioxane Recommendations

- Evaluate system optimizations to improve capture of high concentration plume segments and develop an engineering design and cost estimate
- Conduct additional investigation/characterization in PFAS source areas as resources allow
- Continue monitoring for 1,4-dioxane in select monitoring wells from the existing well network

Next Steps

- 2024 Groundwater Status Report published as Volume II of the Site Environmental Report
  - https://www.bnl.gov/gpg/reports.php
  - https://www.bnl.gov/gpg/gw-reports.php
- Utilize and develop project specific engineering designs and cost estimates for planning, seeking funding, and construction where possible
- Implement recommendations to treatment systems and groundwater monitoring

Questions?