

Groundwater Update

*Brookhaven National Laboratory
Review of Plumes, Treatment Systems,
Performance and Progress*

*Presentation to Community Advisory Council
January 10, 2019*

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Groundwater Protection Group*

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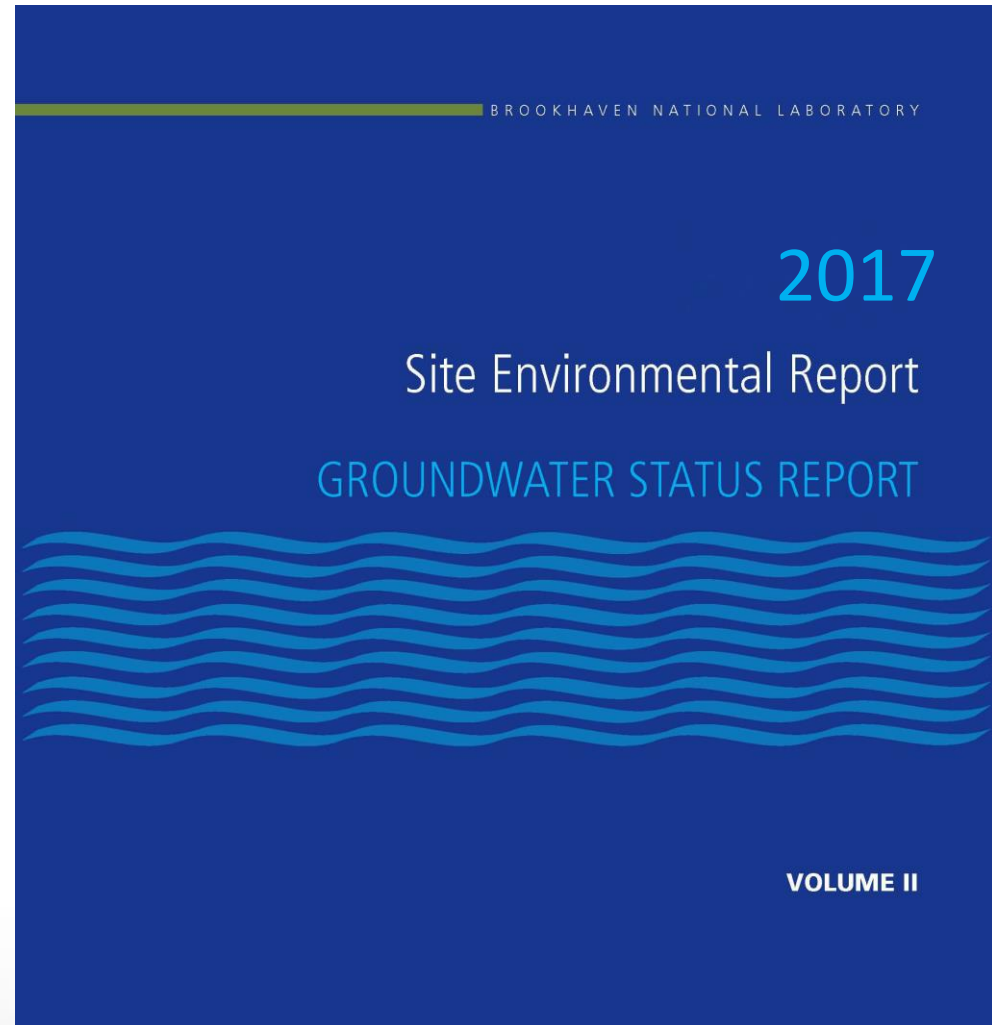


Agenda

- General Status of Plumes and Remediation Systems/System Optimization
- Progress on 2017 Groundwater Status Report Recommendations
- PFAS Characterization Status

Groundwater Status Report (Volume 2 of Site Environmental Report)

- Presentation provides up to date status on groundwater cleanup program progress
- Web link for 2017 Groundwater Status report:
<https://www.bnl.gov/gp/gw-reports.php>



Facility Monitoring

Groundwater monitoring at active research and support facilities:

- 93 monitoring wells
- DOE required groundwater surveillance
 - Accelerator Facilities (AGS, BLIP, RHIC, NSLS-II)
 - Underground gasoline storage tanks
- New York State permit required groundwater surveillance
 - Waste Management Facility
 - Sewage Treatment Plant Recharge Basin Area
 - Major Petroleum Storage Facility (above ground storage tank area)

No new impacts detected during 2017 from active research and support activities

Groundwater Treatment System Completion Process

Achieve plume capture goal for system (typically $< 50 \mu\text{g/L}$ Total VOC (TVOC) in monitoring and extraction wells)



Petition regulators for system shutdown



Upon approval, turn extraction wells off and maintain in standby mode/sample wells for several years, monitor for rebound

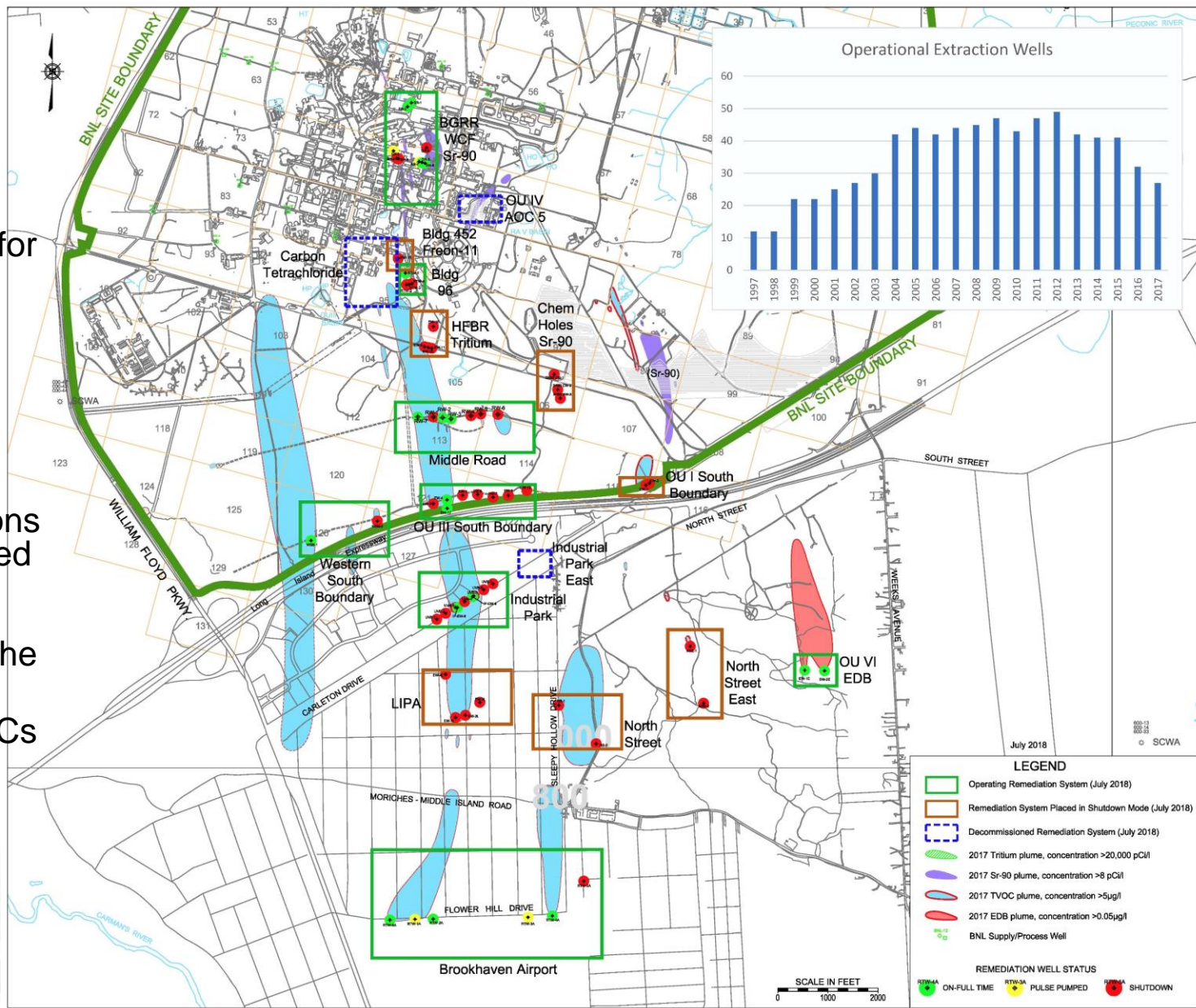


When concentrations are documented to remain low and stable, petition regulators for system closure (upon approval, decommission equipment, abandon wells, limited continued monitoring)

Groundwater Treatment Systems/Plumes Status

- 10 systems operating
- 6 systems approved for shut-down
- 3 systems decommissioned

- 1996 – 2017:
- 27 billion gallons of contaminated groundwater treated and recharged to the aquifer
 - 7,500 lbs. VOCs removed
 - 33 mCi Sr-90 removed



BNL ONSITE and OFFSITE GROUNDWATER TREATMENT SYSTEMS & PLUMES

Groundwater Treatment System Status

Treatment System	Original Design Shutdown Date	Shutdown Date (Actual/Projected)	Total Number of Extraction Wells	Extraction Wells Currently Operational	Overall System Status	2017 Report Recommendation
OU 1 S. Boundary	2011	2013 A	2	0	Shutdown	Decommission
Carbon Tet	2004	2004 A	2	0	Decommissioned	
Bldg. 96	2005	2020	4	1	Operational	SVE Pilot Test
Bldg. 452 Freon-11	2016	2016 A	1	0	Shutdown	Decommission
OU 3 Middle Rd.	2025	2025	7	3	Operational	
OU 3 S. Boundary	2011	2021	8	2	Operational	
OU 3 Western South Boundary	2014	2026	2	1	Operational	Modify System
OU 3 Industrial Park	2012	2013A/2020 ^a	9	2	Operational	
OU 3 Industrial Park E.	2009	2010 A	2	0	Decommissioned	
OU 3 North St.	2012	2013 A	2	0	Shutdown	Decommission
OU 3 North St. E.	2013	2014 A	2	0	Shutdown	Characterize EDB
OU 3 LIPA	2014	2018A	4	0	Shutdown	
OU 3 Airport	2014	2025	6	5	Operational	
Magothy ^b	--	--	--	--	--	
OU 4 AS/SVE	2001	2003 A	AS/SVE	0	Decommissioned	
OU 6 EDB	2015	2021	2	2	Operational	
HFBR Pump and Recharge	2012	2013 A	4	0	Shutdown	Decommission ^c
Chemical Holes Sr-90	2015	2018A	3	0	Shutdown	
BGRR Sr-90	2015	2026	9	4	Operational	Extraction wells in standby/pulsed pumping

Notes-

A - Actual

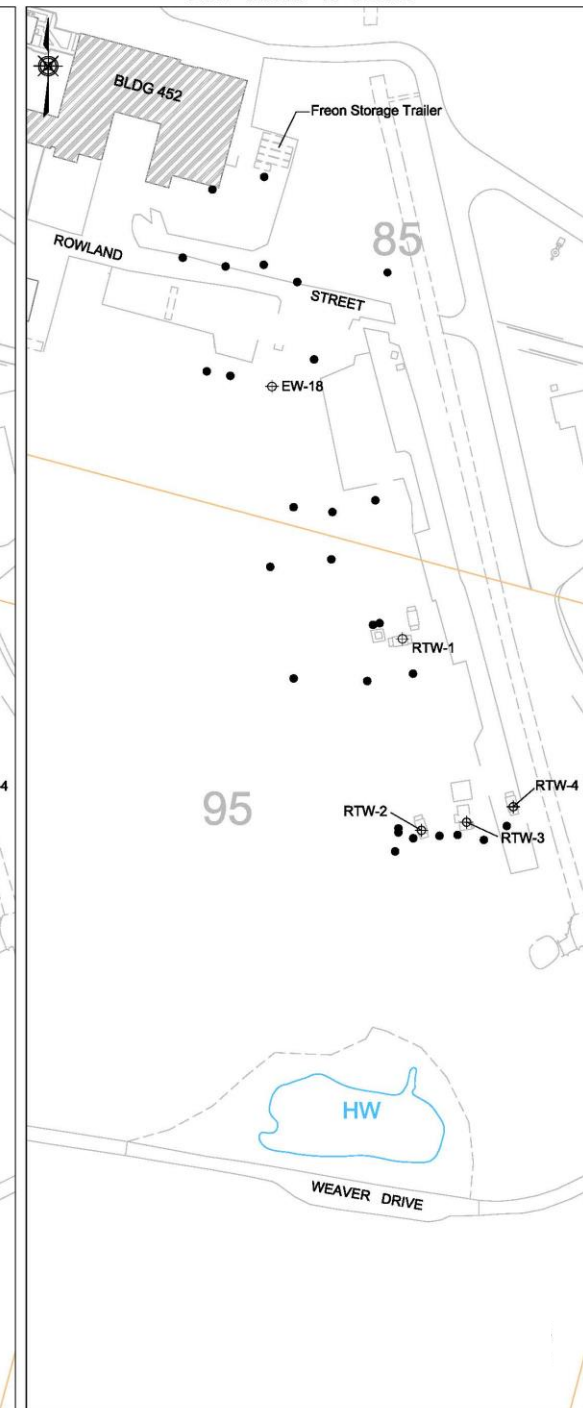
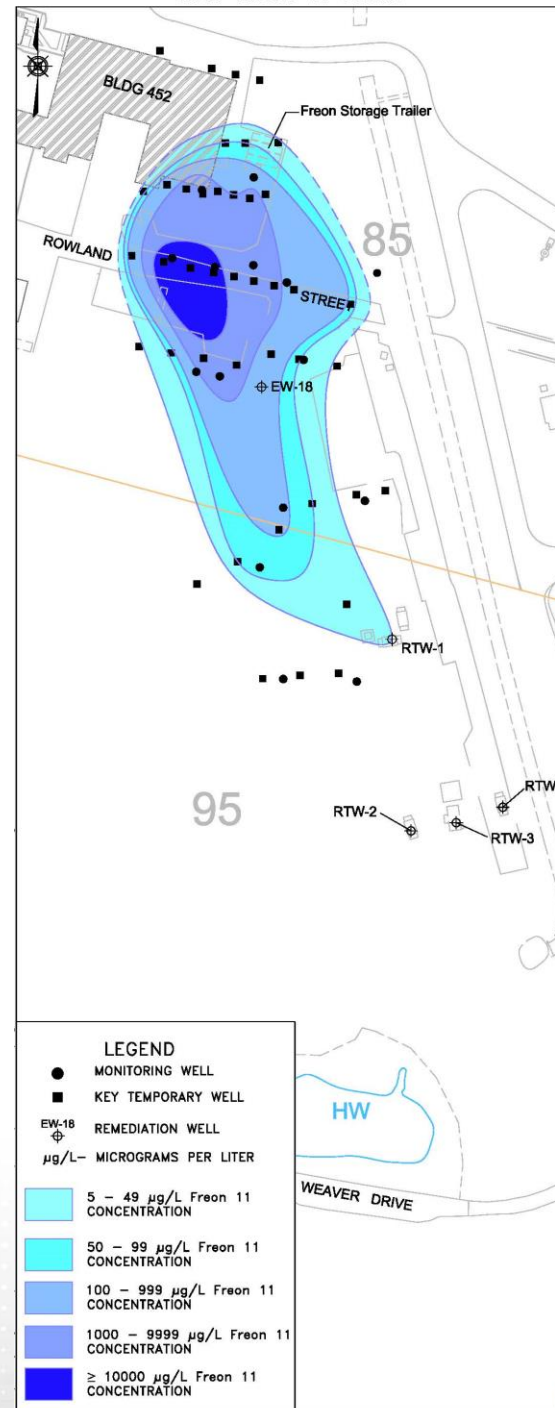
^a Upper Glacial system was approved for shutdown in 2013. Four wells were restarted from 2014 through 2016 due to VOC rebound.

^b Magothy wells are integrated into other treatment systems.

^c Awaiting regulatory approval

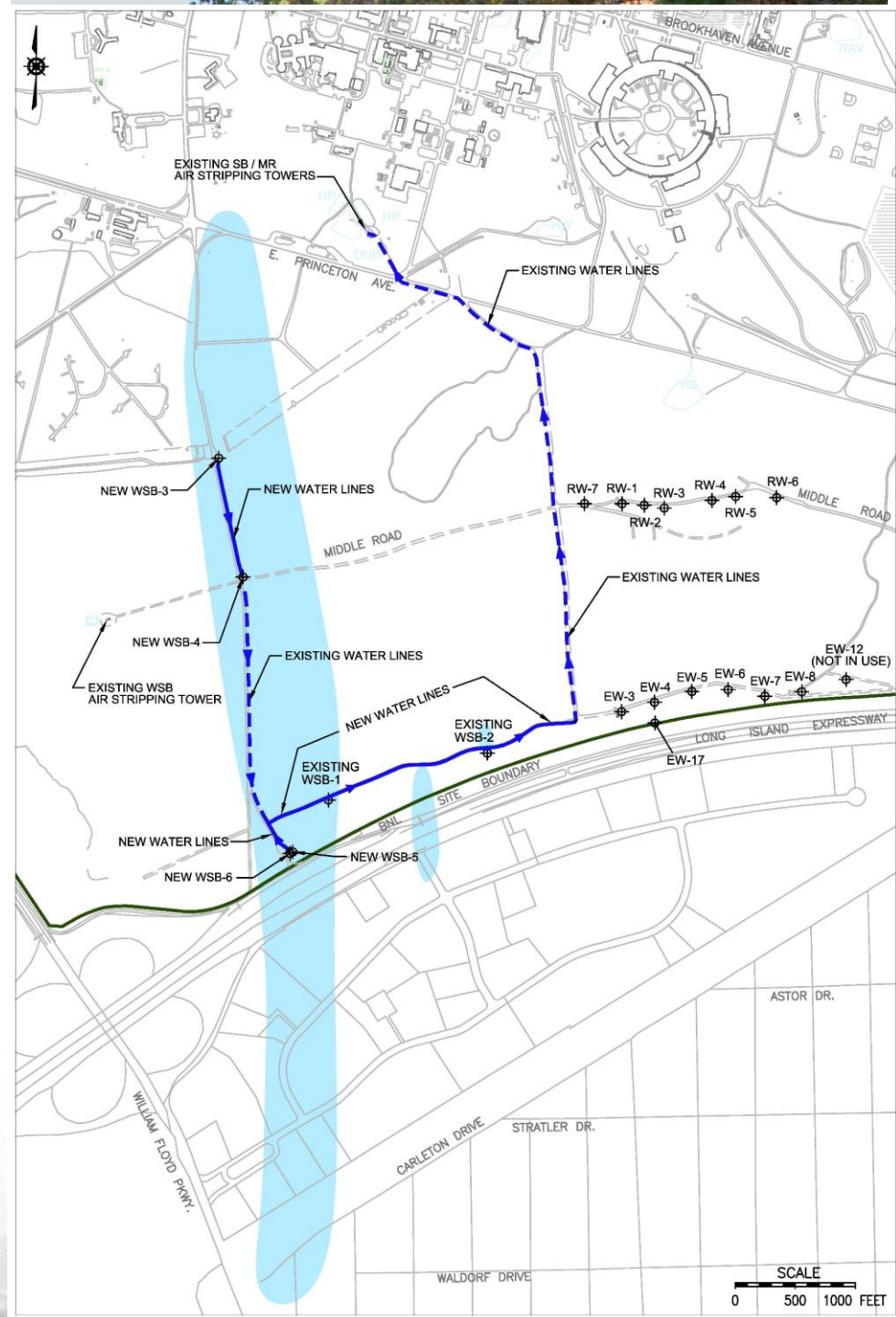
Building 452 Freon-11

- System began operation in 2012. Placed in Shutdown mode in 2016
- Maximum Freon-11 detection in 2017 was 5 $\mu\text{g}/\text{L}$. Most recent sampling round (August 2018) maximum concentration was 3 $\mu\text{g}/\text{L}$
- The cleanup objectives for this system have been met
 - Based on low Freon-11 concentration over previous two years prepare a petition for closure for this system

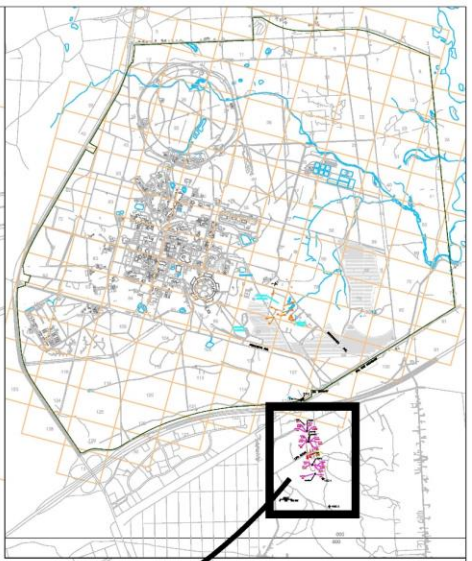
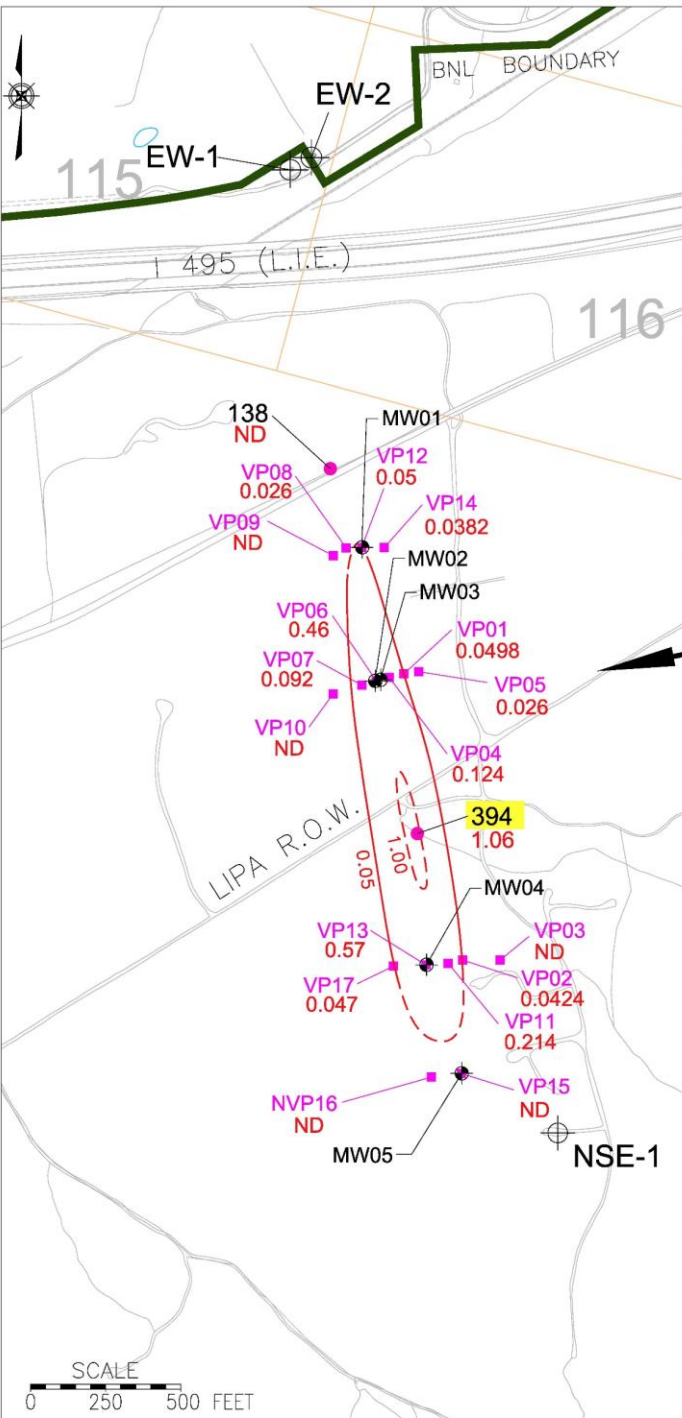
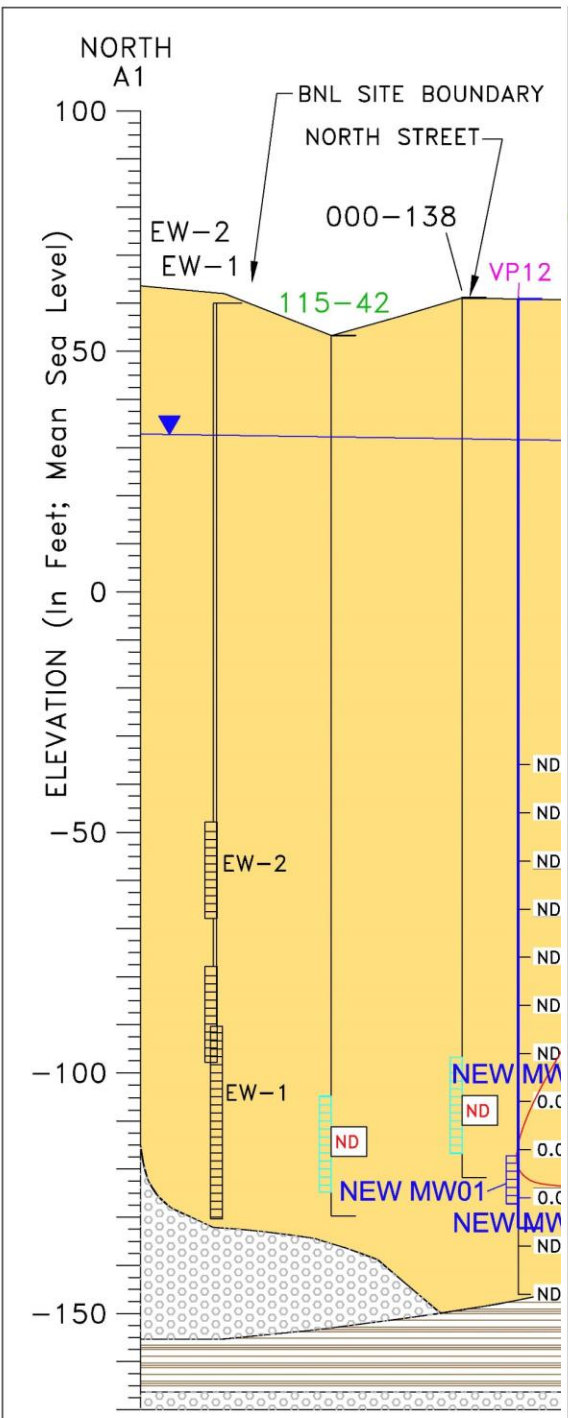


OU III Western South Boundary

- As discussed during the CAC update last May, modifications to the treatment system were needed to meet the cleanup objectives.
 - Began system modification construction in June 2018
 - Completed installation and



- System Treatment since s
- Ethylene in well (Drinki
- Since I an add (total o based
- Also in monito
- Current modeli
- treatment necess
- Will pro update a path



LEGEND

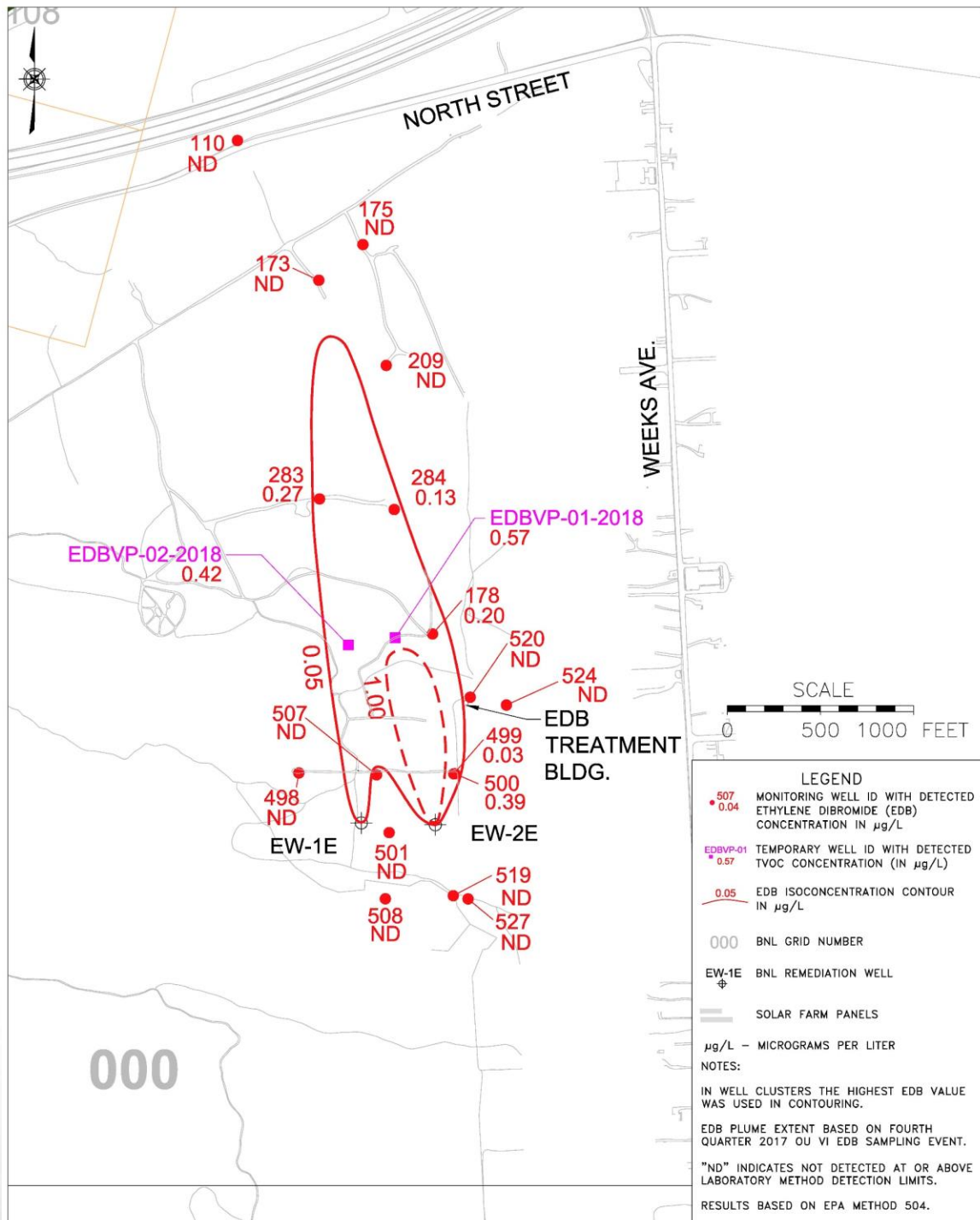
- 394** MONITORING WELL ID WITH DETECTED ETHYLENE DIBROMIDE (EDB) CONCENTRATION IN µg/L IN 4TH QTR 2017
- 1.06** CONCENTRATION IN µg/L IN 4TH QTR 2017
- NSE-VP01** TEMPORARY WELL ID WITH MAXIMUM DETECTED EDB CONCENTRATION (IN µg/L)
- 0.0498** MAXIMUM DETECTED EDB CONCENTRATION (IN µg/L)
- 116** BNL GRID NUMBER
- NSE-1** BNL REMEDIATION WELL
- µg/L** - MICROGRAMS PER LITER

NOTES:

- "ND" INDICATES NOT DETECTED AT OR ABOVE LABORATORY METHOD DETECTION LIMITS.
- RESULTS BASED ON EPA METHOD 504.

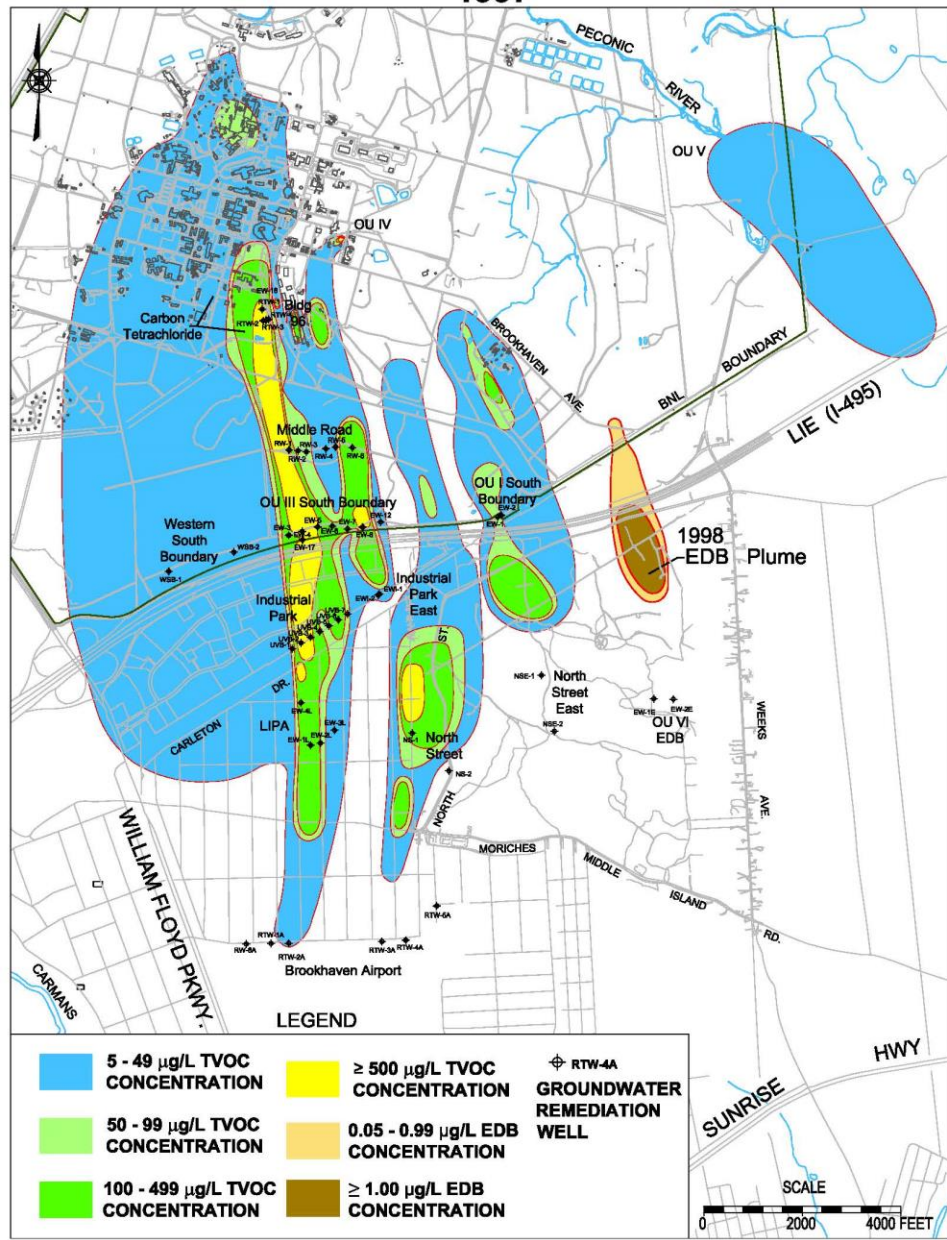
OU VI EDB

- Treatment system in operation since 2004
- Based on 2017 Report recommendation, installed 2 temporary vertical profile wells in 2018 to address data gap regarding northern extent of higher concentrations
- Two permanent monitoring wells to be installed in January at both vertical profile locations

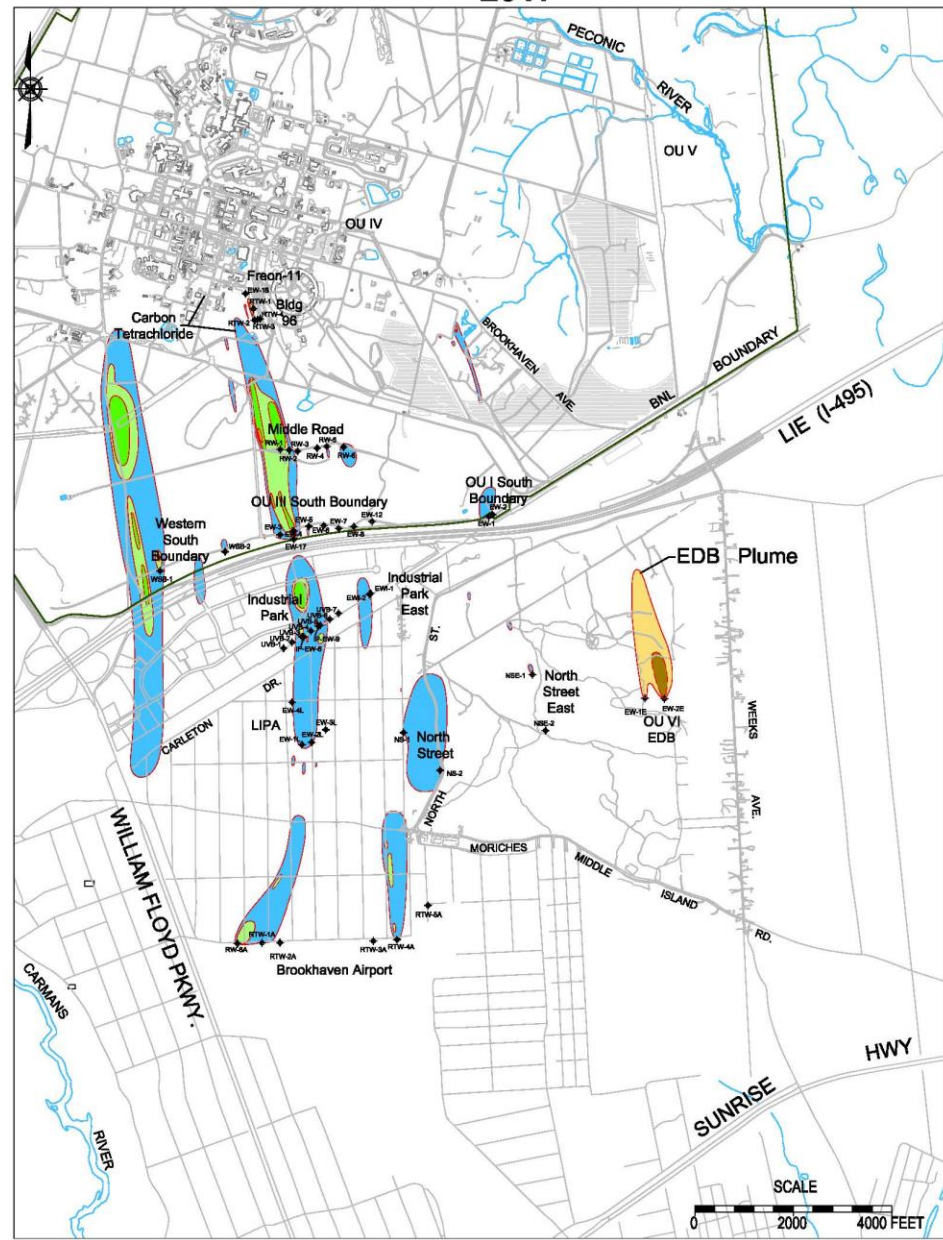


VOC Remediation Progress 1997 to 2017

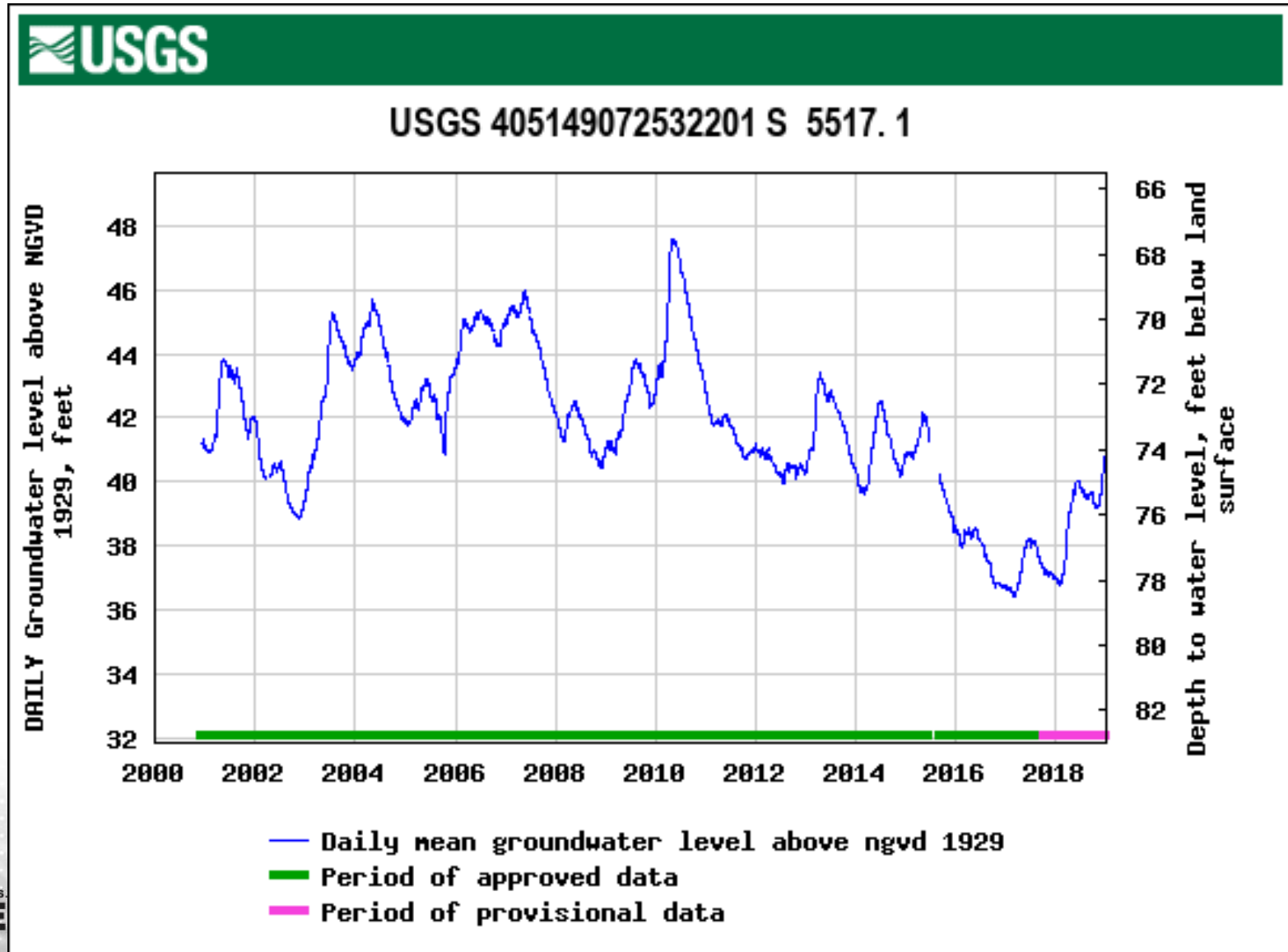
1997



2017

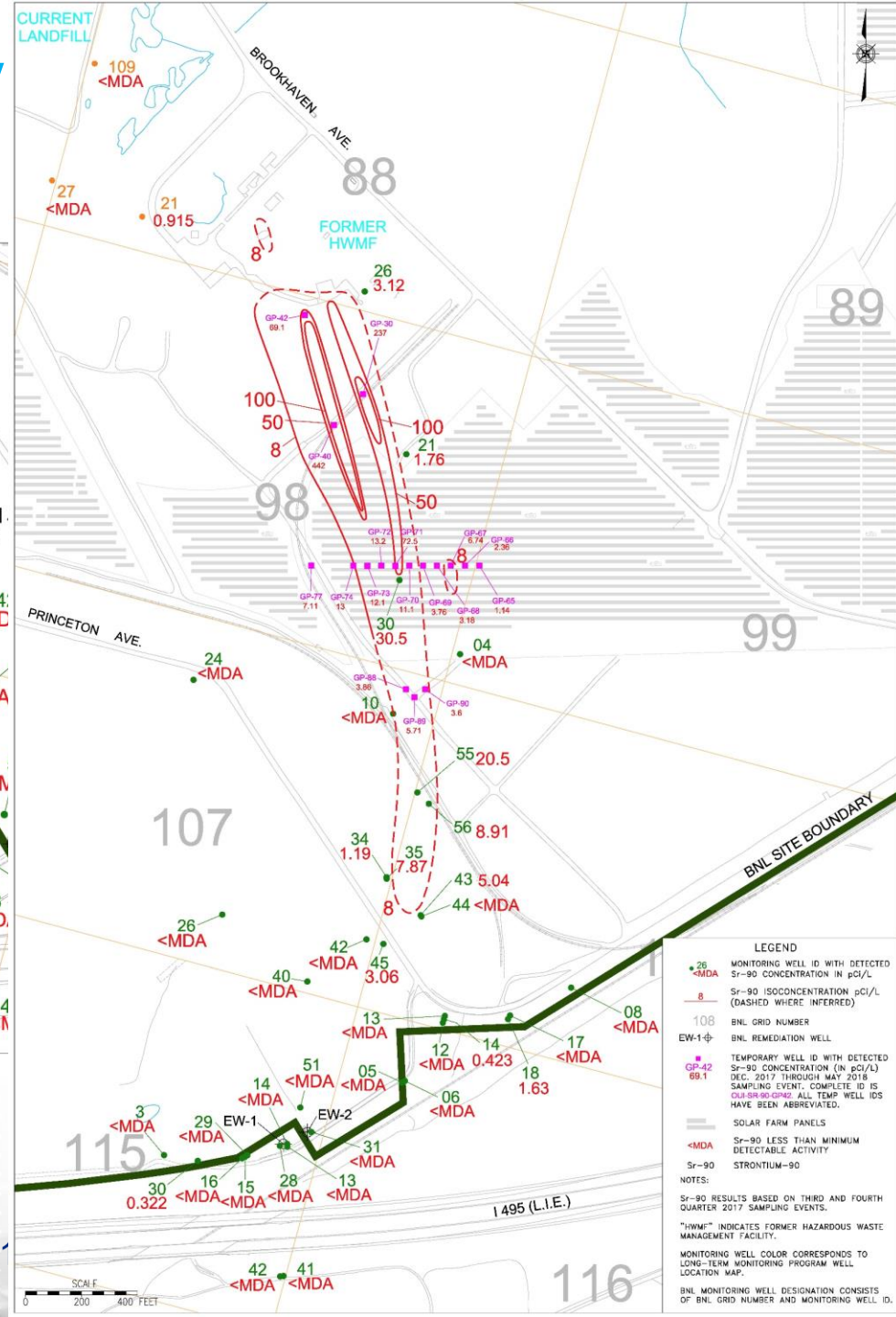
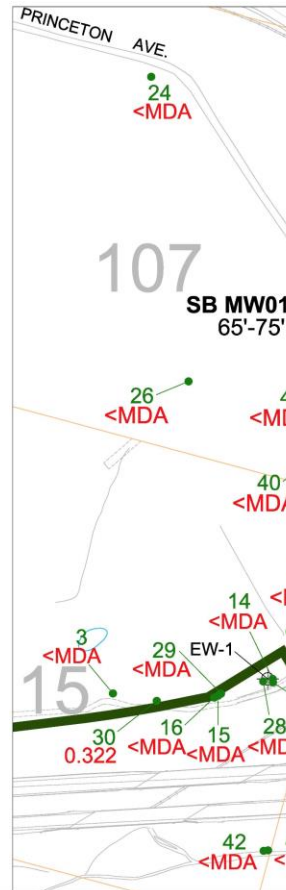


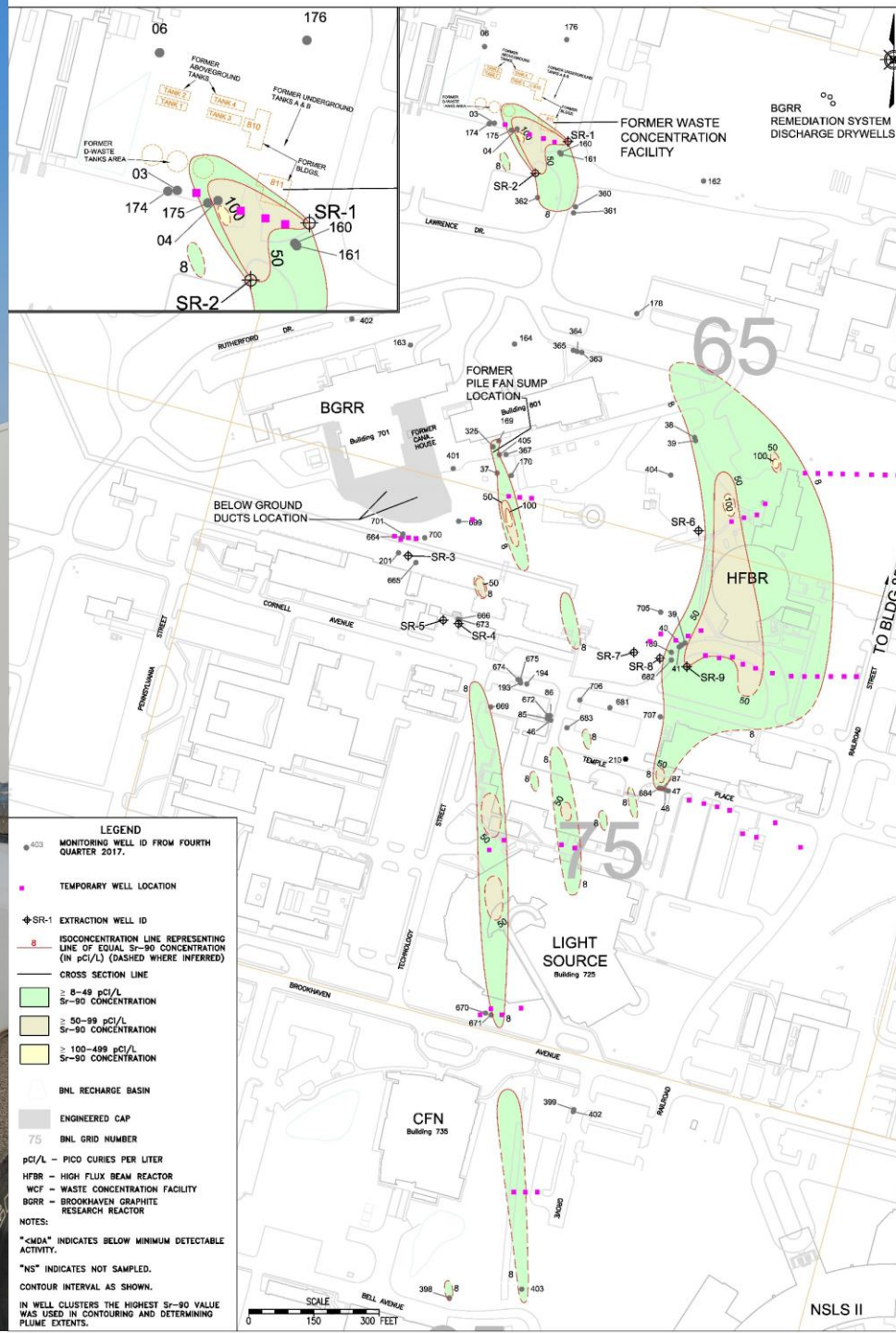
BNL Water Table Elevation



OU I South Boundary Sr-90

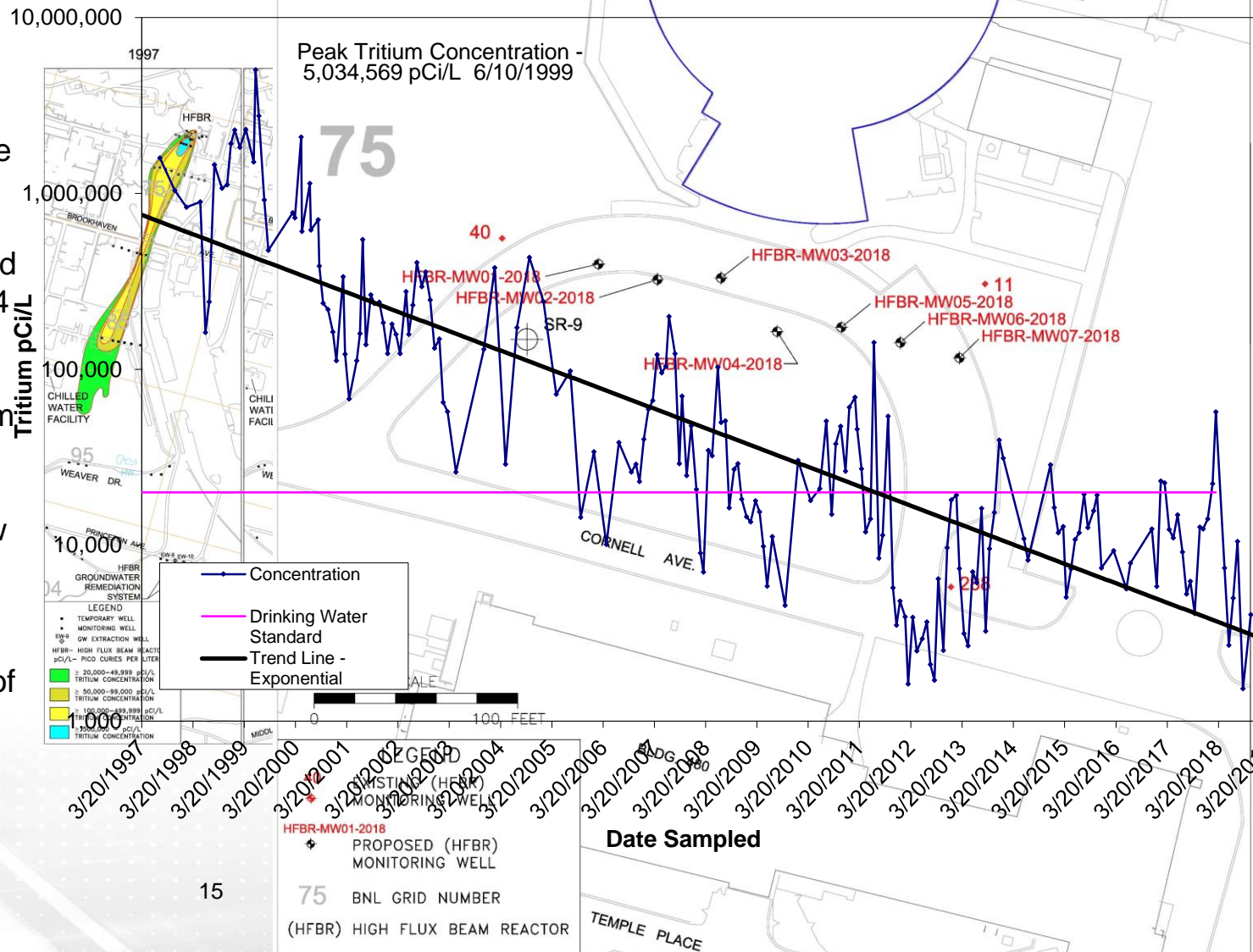
- Continued plume monitoring in 2017
- Supplemented monitoring network with 14 temporary wells
- Installed six temporary wells in 2018 to assess the shifting of the leading edge of plume based on 2017 Groundwater Status Report recommendation
- Installed 3 new plume outpost monitoring wells to address changing groundwater flow direction in area





HFBR Tritium Plume

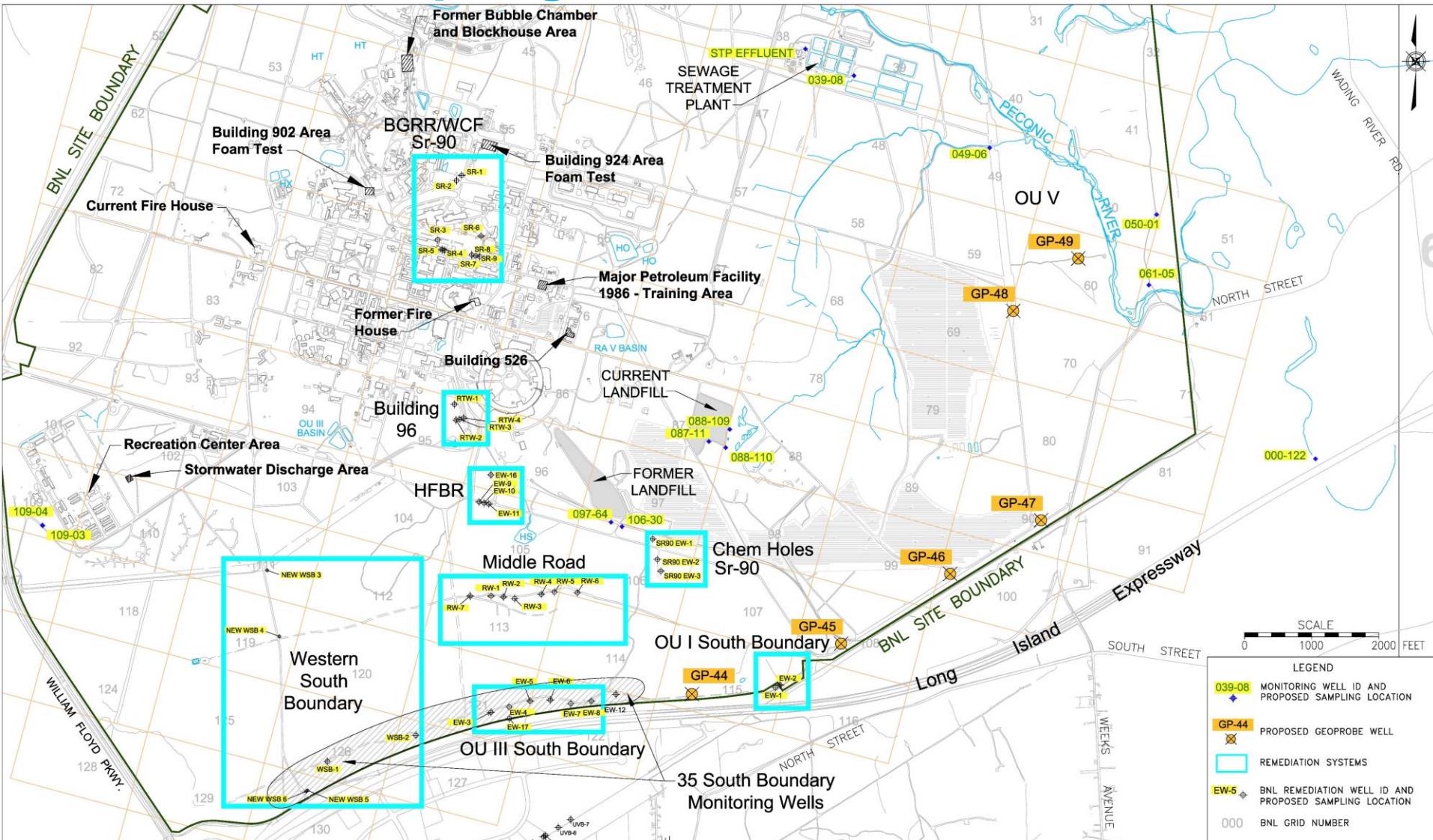
- Tritium concentrations in source area show consistent decrease over time
- Monitoring network at its peak consisted of 159 wells in 2004
- Gradually reduced downgradient monitoring as tritium concentrations declined
- Installed seven new wells in 2018 in source area and reduced plume monitoring to total of 10 wells



PFAS Characterization Status

- Phase 1: PFAS characterization in source water contributing areas for BNL potable supply wells (*completed May 2018*)
- Phase 2: PFAS characterization at eight known firefighting foam release areas (*completed November 2018*)
- Phase 3: PFAS characterization of treatment systems, landfills, and site boundary areas (*started December 2018*)
 - On-site groundwater treatment systems and associated extraction wells
 - Sewage Treatment Plant (STP) effluent
 - Monitoring wells downgradient of the two landfills and the STP
 - Install temporary wells and sample existing permanent monitoring wells along BNL southern boundary (analyze samples for PFAS and 1,4-dioxane)

Phase 3 Sampling Locations



Questions?

