Naval Facilities Engineering Systems Command
NAVFAC MID-ATLANTIC

Department of Navy
Naval Weapons Industrial Reserve Plant
Restoration Advisory Board Meeting

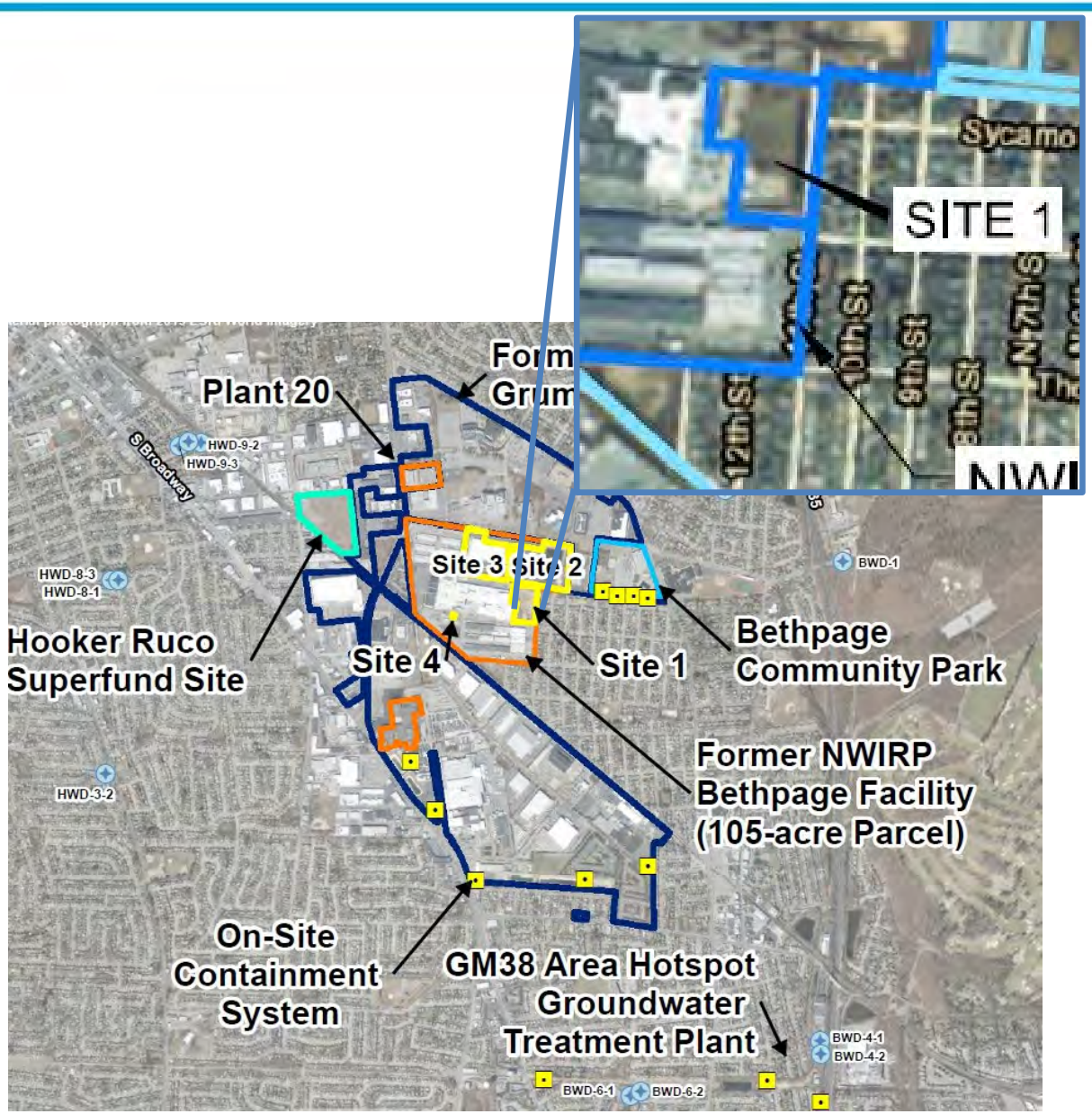
NWIRP Bethpage Program Overview

Presented by:
Scott Sokolowski, Remedial Project Manager
NAVFAC Mid-Atlantic
5 December 2023

Presentation Topics – NWIRP Bethpage Program Overview

- Site 1 General Update
- Site 4 General Update
- Phase I – GM38 Groundwater Treatment Plant Update
- Ongoing/Upcoming Remedial Construction Projects

Site 1



- Former drum marshalling area
- Soil removal actions completed in 2020
- All remedies are in place and operational
- Currently leased to Steel Equities from Nassau County

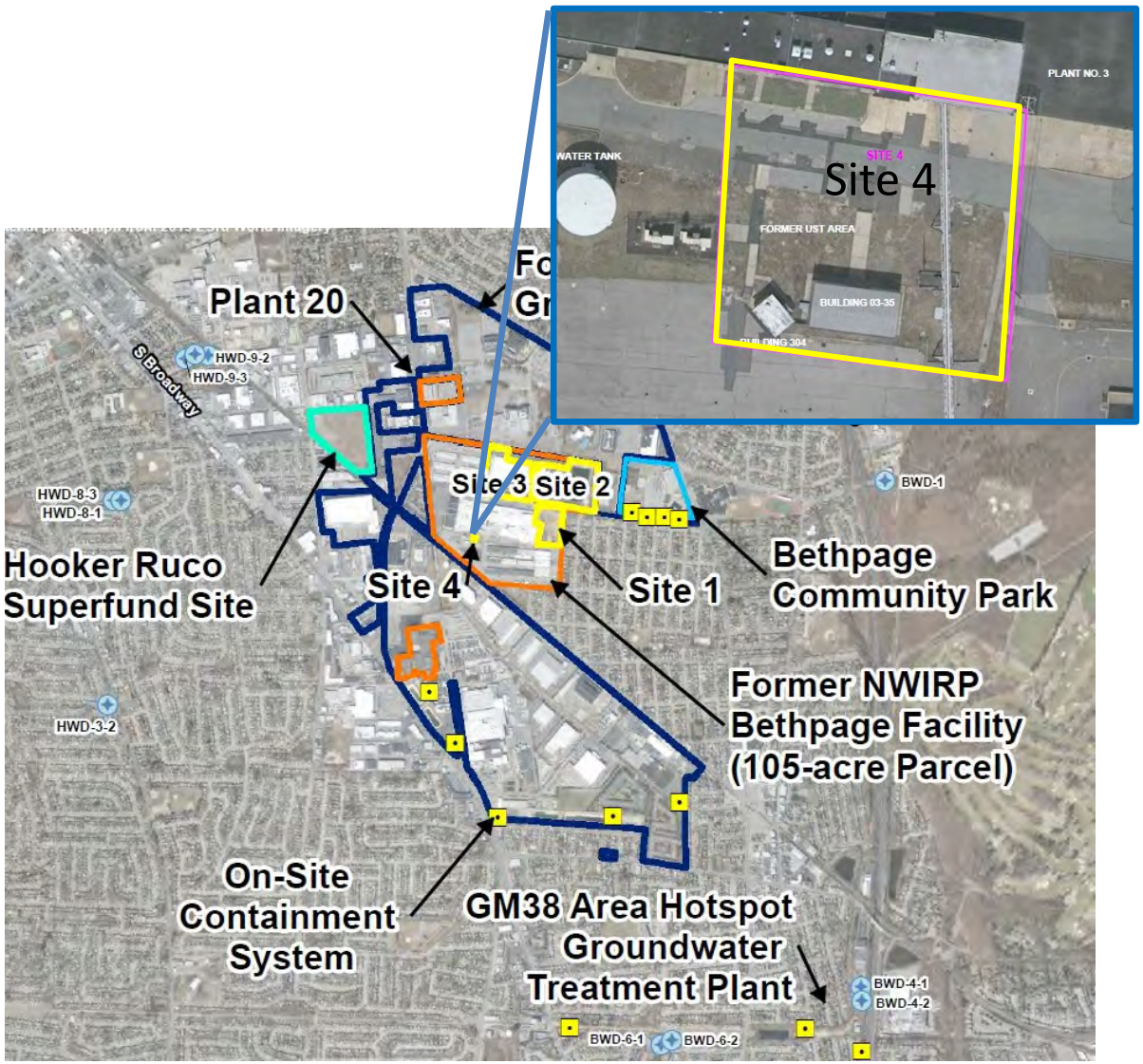
Site 1

General Update

- Remedial Action for Contaminated Soil is in its post construction Operation & Maintenance phase with regular quarterly inspections and site maintenance
- Soil Vapor Extraction Remediation System has been running successfully since August 2022

- Steel Equities utilizes the site as a parking lot

Site 4



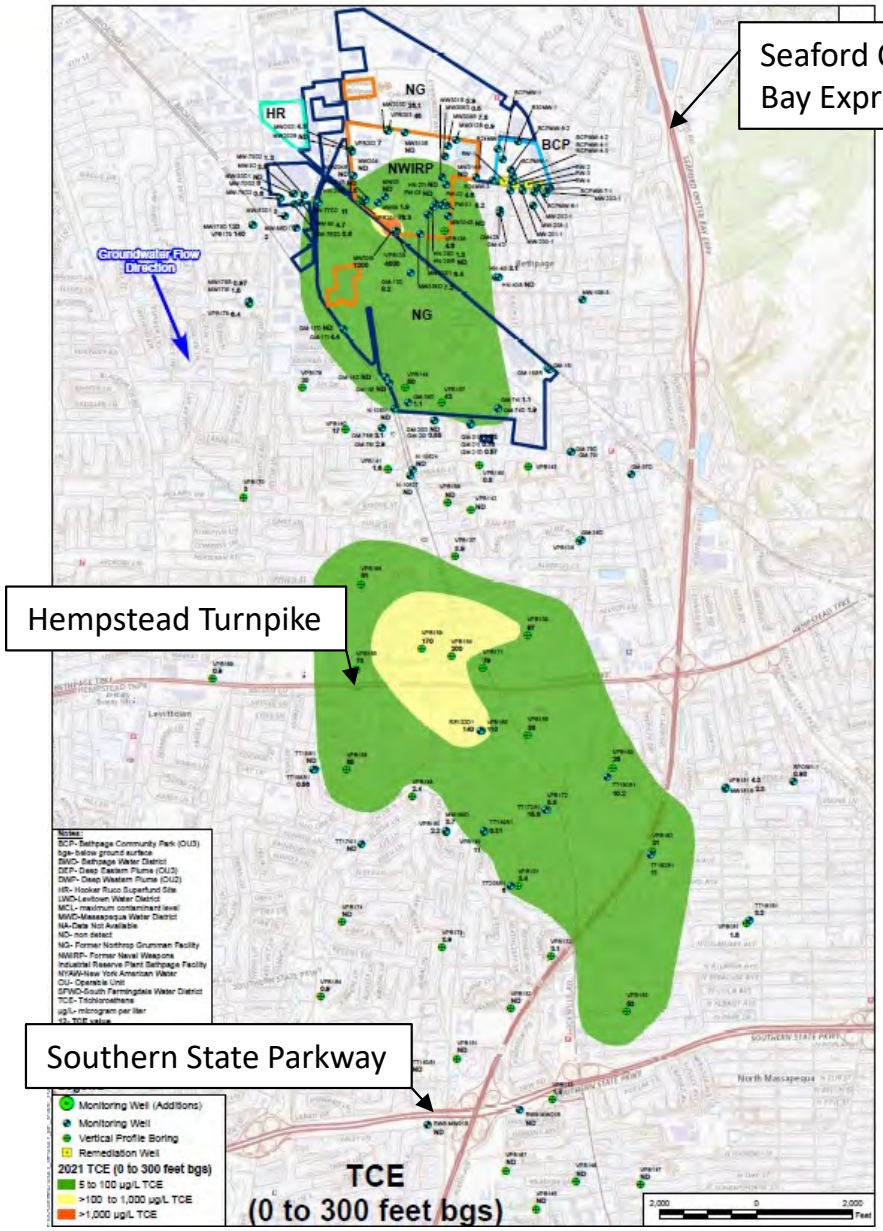
- Environmental concerns were first identified at Site 4 during a 1997 investigation by Northrop Grumman Corporation that identified former Underground Storage Tanks (USTs) and petroleum-contaminated soil in the area
- The steam injection pilot study was run from April 2019 to May 2020
- Biosparge system has been operating since July 2021

Site 4 Update

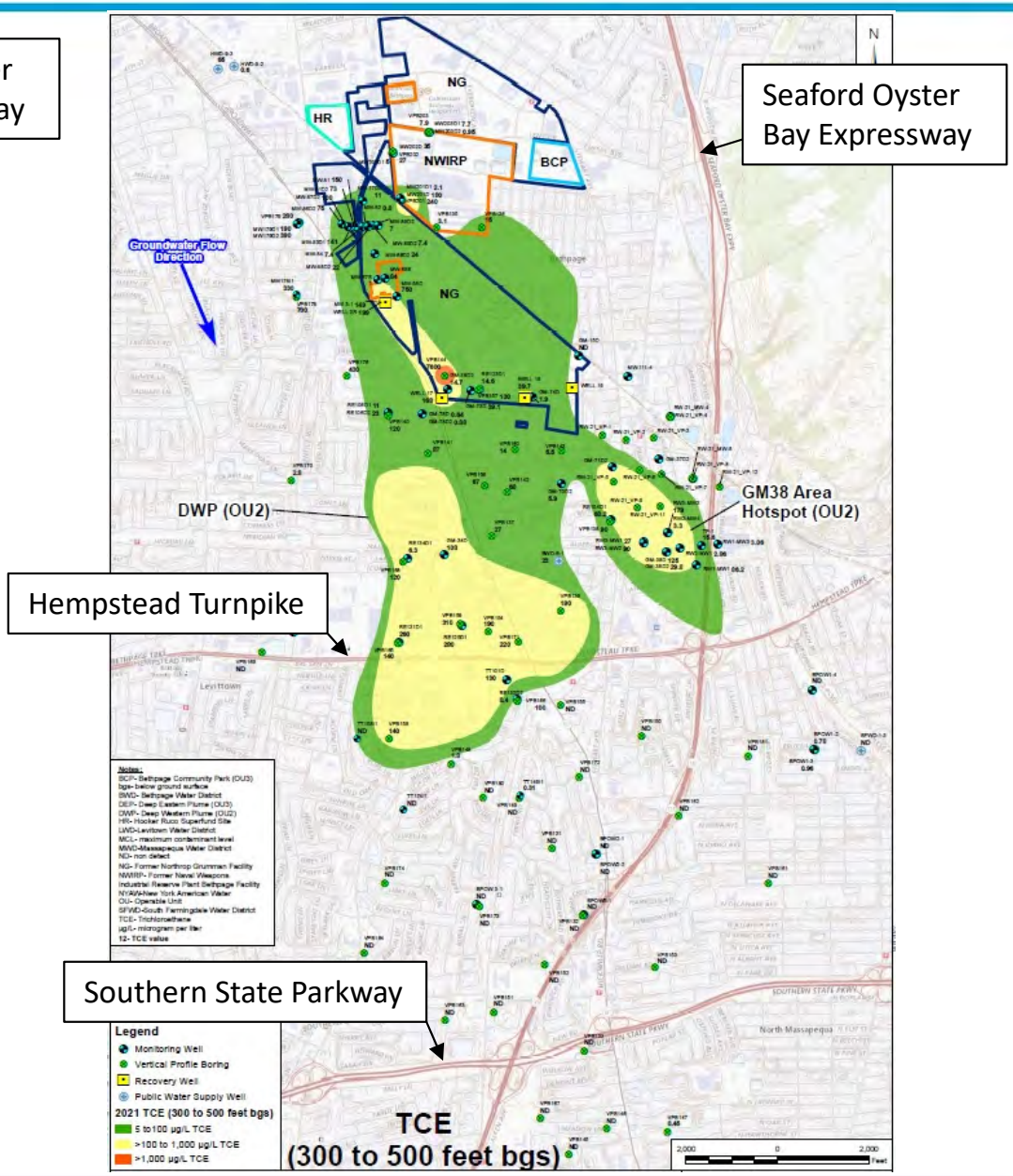
- The biosparge system will continue to operate with annual reviews for continued operation
- Conducting general site maintenance and upkeep

Navy-Northrop Grumman TCE Plume Maps

Shallow



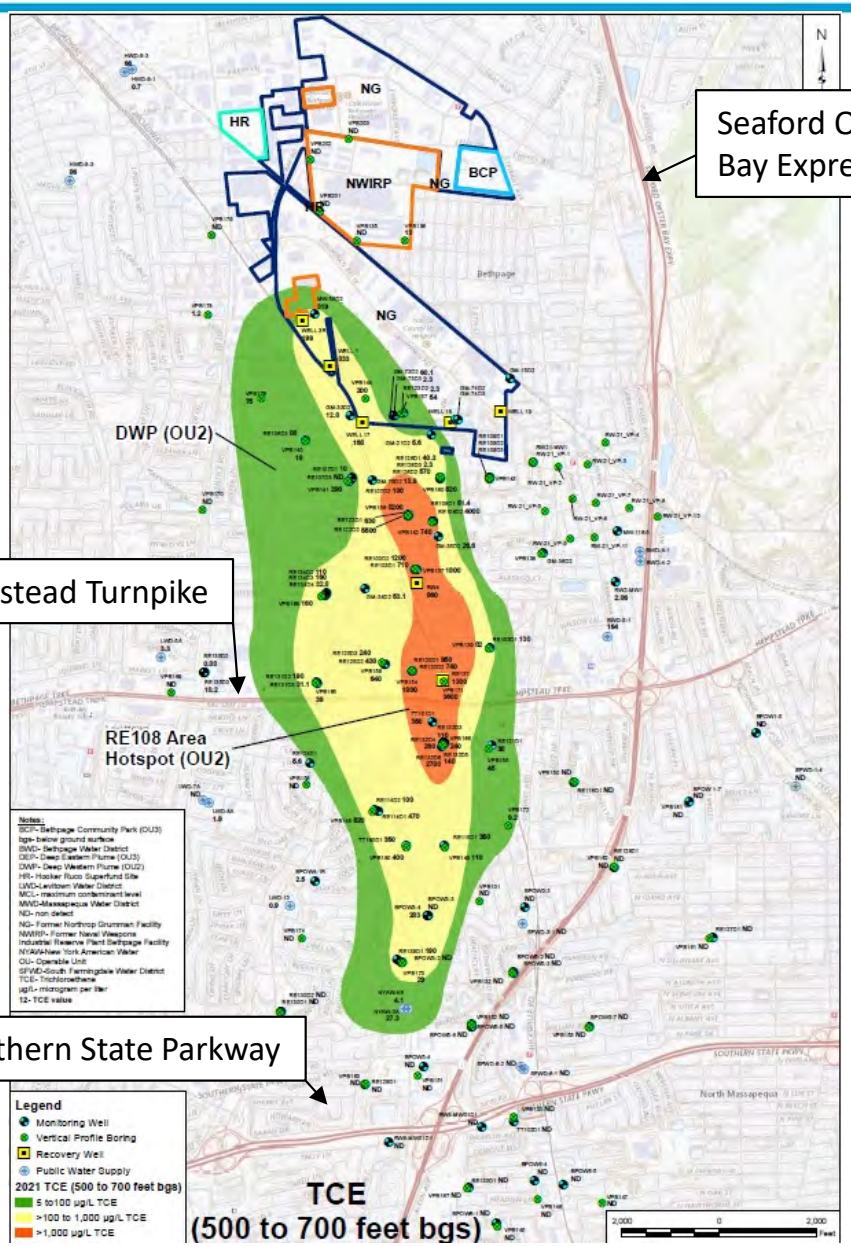
Intermediate

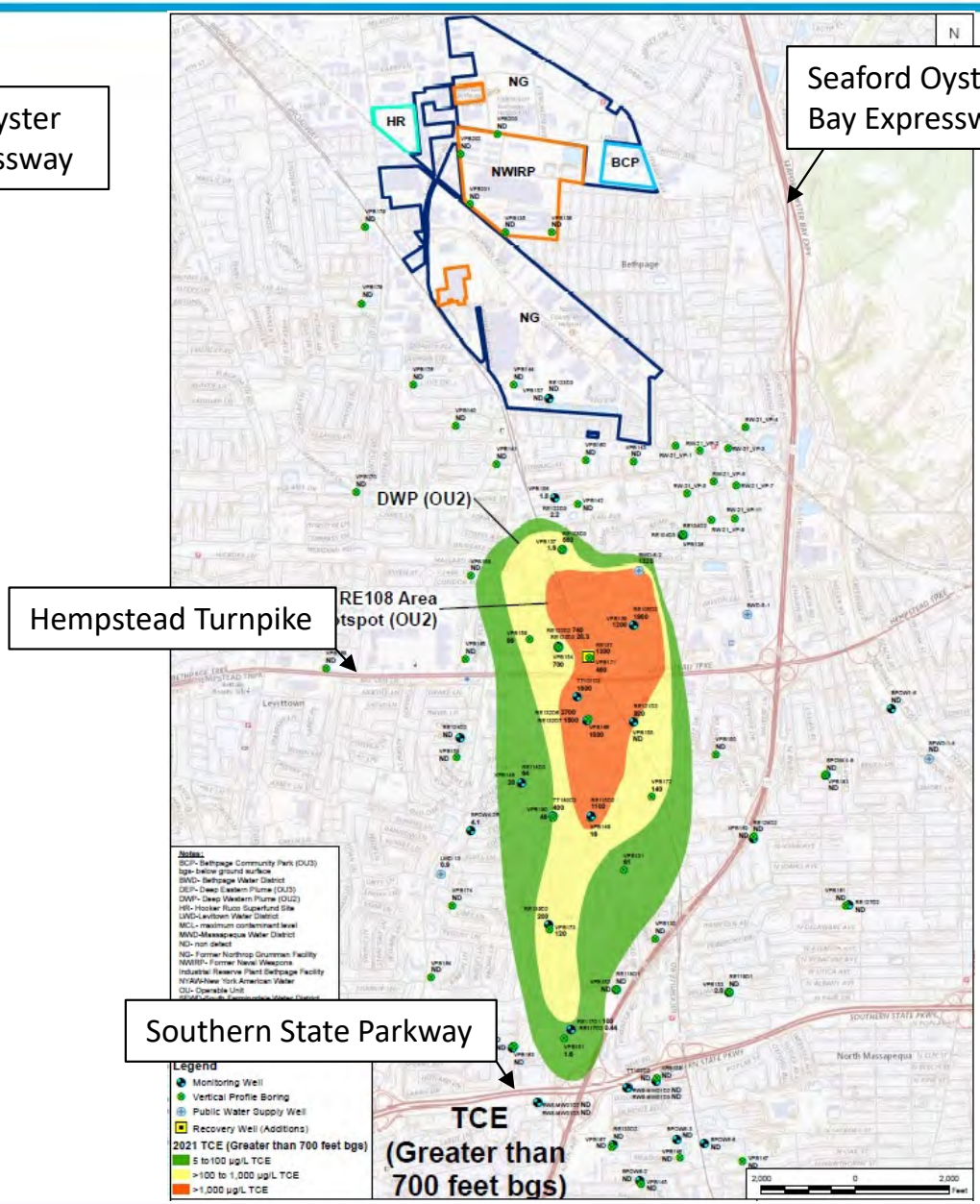


TCE = Trichloroethene

Navy-Northrop Grumman TCE Plume Maps

Deep



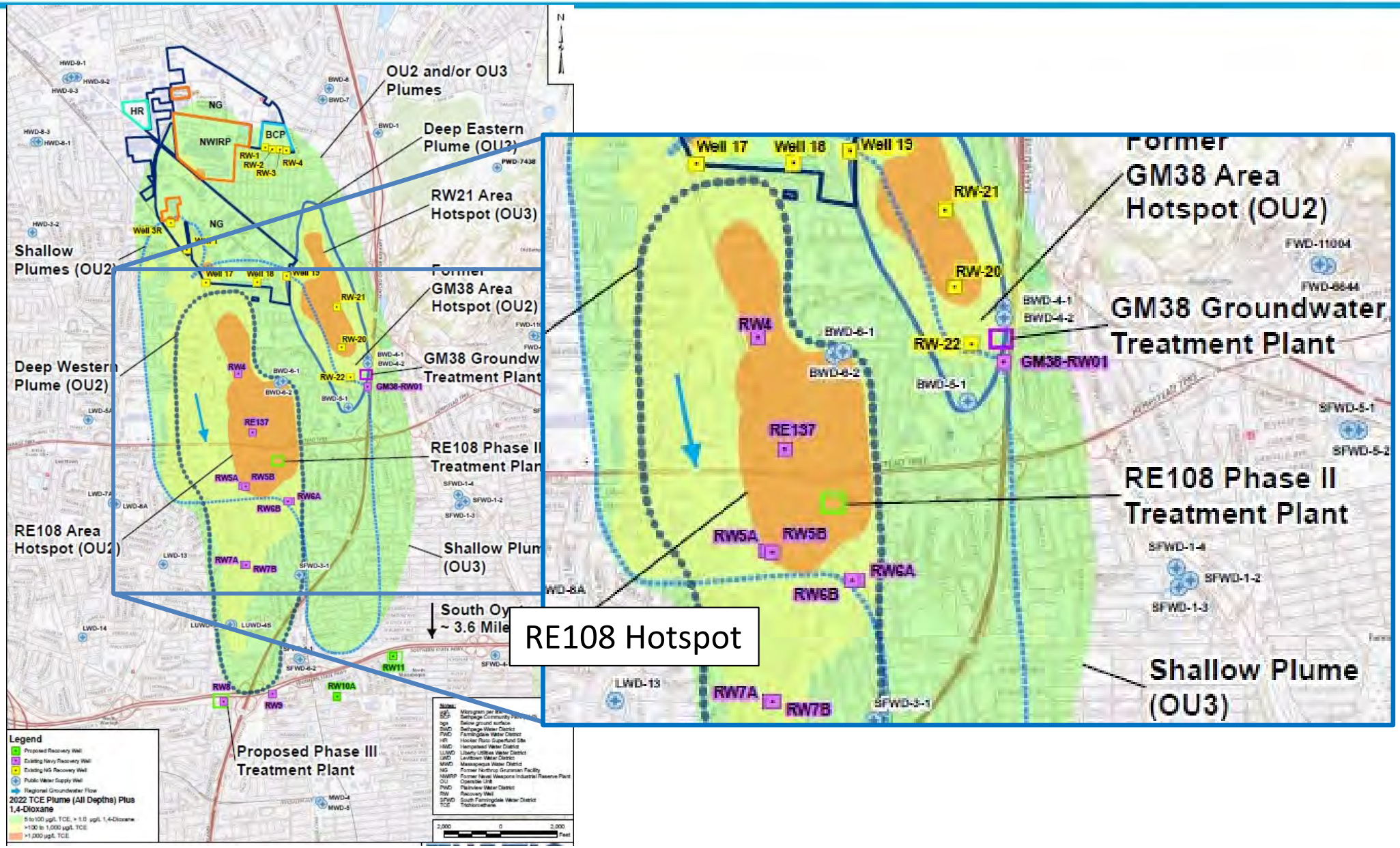


TCE = Trichloroethene

Ongoing/Upcoming Remedial Construction Projects

- Much of the Navy's remedy relies on recovery wells. Recovery wells are strategically placed to pump contaminated water from the plume and treat the water to drinking water standards for discharge to local basins.
- The RE137 temporary treatment system (near the intersection of Hicksville Road and Hempstead Turnpike) will operate until RE137 is connected into the GM38 Groundwater Treatment Plant in 2024.
- Phase II Recovery Wells 5A, 5B, 6A, 6B, 7A, and 7B have been completed. Pipeline work is in progress and will continue into spring 2024.
- Phase II Groundwater Treatment Plant construction began in December 2021 and is projected to be operational in January 2024.
- Phase III Recovery Wells 8 and 9 are complete. RW10A site work will begin in early 2024. The Phase III Groundwater Treatment Plant construction and influent and effluent pipelines will begin in 2024.

Phase I
RE108 Hotspot



Phase I
RE108 Hotspot

- GM38 Groundwater Treatment Plant Update
  - Navy is planning upgrades in 2024 to the treatment plant to increase treatment capacity.
  - The GM38 groundwater treatment plant is operating as expected, water testing of the system is taking place monthly and 1,4 dioxane and trichloroethene (TCE) are non-detect or very low in the effluent.

GM38 AOP

GM38 Peroxide Tank

Phase I
RE108 Hotspot - RE137 Pipeline

- Pipeline work will begin in early 2024

RE108 Area Hotspot Treatment System – Phase II System Overview

Construction of Water Treatment Plant

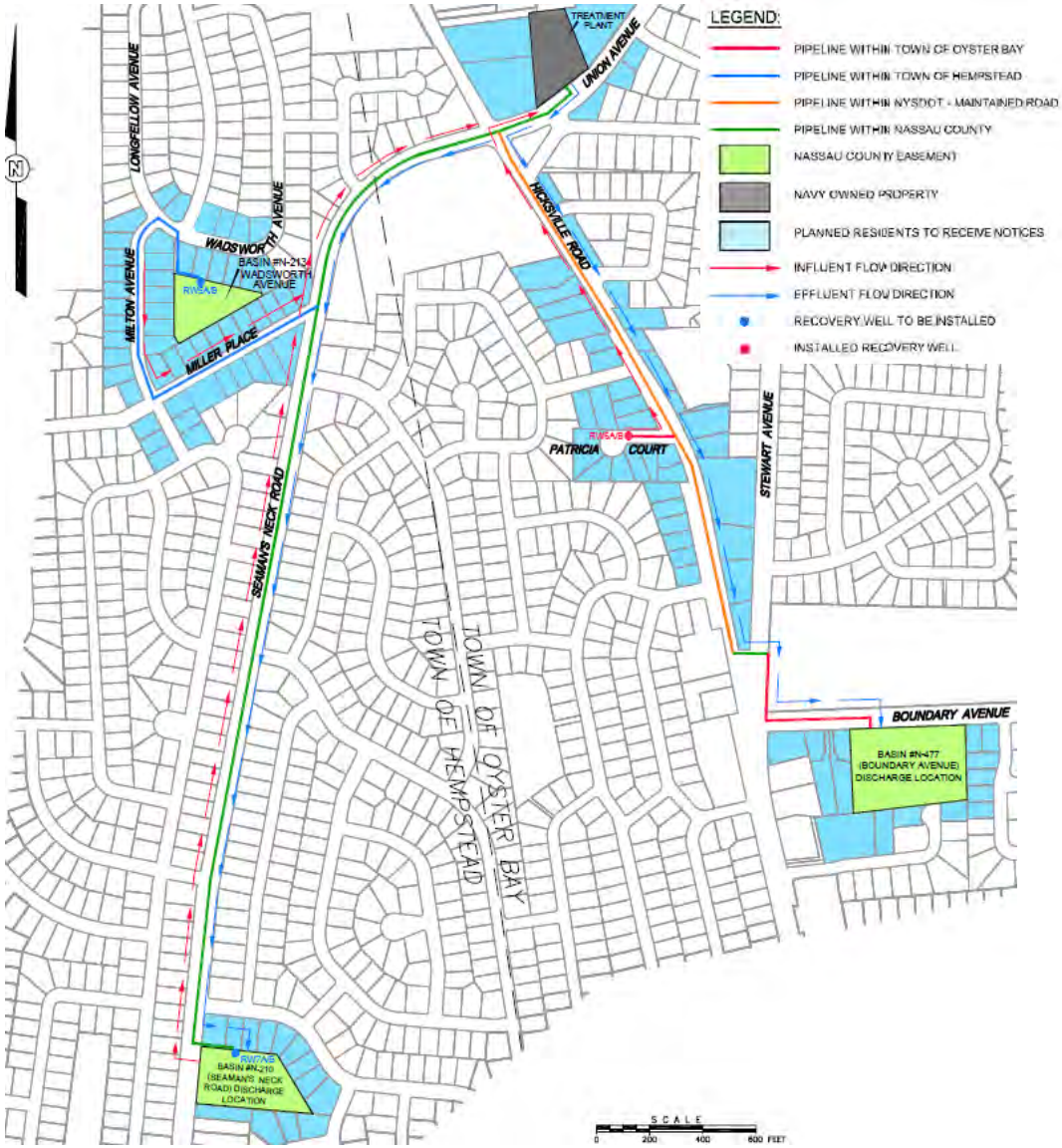
- Construction continues at 11 Union Avenue

Drilling and Installation of Recovery Wells (RWs)

- RW 5A/5B (Longfellow Avenue)
- RW 6A/6B (Patricia Court)
- RW 7A/7B (Seaman's Neck Road)

Installation of Influent and Effluent Pipelines

- RW 5A/5B Extraction Pipeline
- RW 6A/6B Extraction Pipeline
- RW 7A/7B Extraction Pipeline
- Effluent Pipeline to recharge basins N-477 (Boundary Avenue) and N-210 (Seaman's Neck Road)



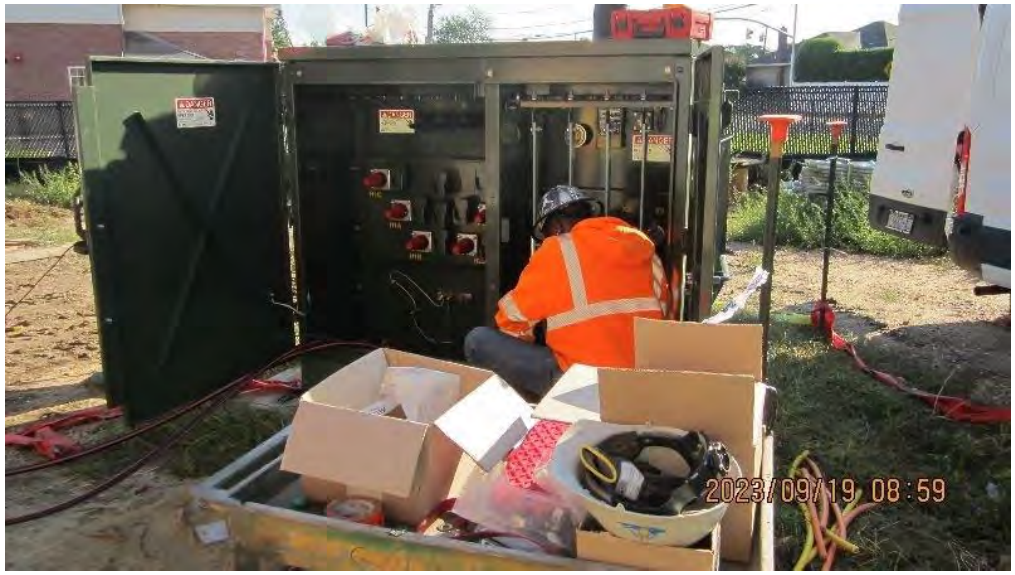
RE108 Area Hotspot Treatment System – Phase II System Status and Schedule

- April 2021 – Demolition of 11 Union Avenue completed
- March 2021 - Tetra Tech began recovery well installation RW5A/5B, RW6A/6B, and RW7A/7B.
- Pipeline Installation continues through 2023 and into 2024.
- December 2021 - Mobilization for construction of the Groundwater Treatment Plant at 11 Union Avenue. Groundwater Treatment Plant construction continues through 2023 and into 2024.

RE108 Area Hotspot Treatment System – Phase II
System Status – Building Construction Pictures

Piping Installation and Electrical Equipment Installation

RE108 Area Hotspot Treatment System – Phase II
System Status – Building Construction Pictures



Piping Installation, Electrical Equipment Installation, and pump installation activities.

Project Outreach and Monitoring (continued)

- The Navy and its contractors will take all reasonable steps to minimize disruption to the neighbors
    - Heavy equipment operations are limited to the hours between 8:00 AM and 5:00 PM to limit noise disturbance
    - Affected school bus schedules will be identified and construction operations modified, as appropriate, to limit interruption and safety risks to the students
    - Noise and dust monitoring will be conducted at the perimeter of the work zones

Phase III

- RW9 pipeline work will begin in early 2024
- Phase III Groundwater Treatment Plant and the RW10A/discharge pipeline work begins later in 2024

RAB Member Questions (10 minutes)

NEXT: OU2 Groundwater Monitoring/Modeling Results
Rick Moore, Tetra Tech

Naval Facilities Engineering Systems Command
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Naval Weapons Industrial Reserve Plant Bethpage
Restoration Advisory Board Meeting

Operable Unit 2 Groundwater Monitoring/ Modeling Results

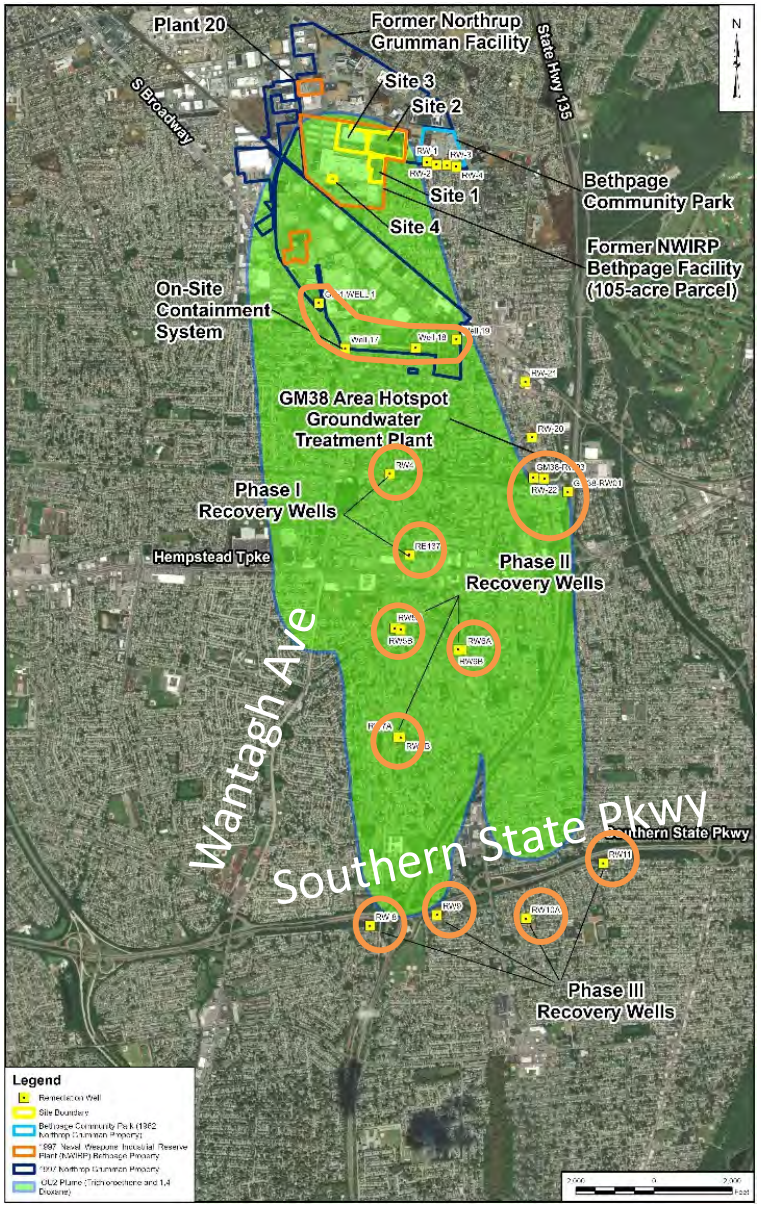
Presented by:
Rick Moore, Project Manager
Tetra Tech
5 December 2023

Operable Unit 2 Groundwater Monitoring and Overview

- OU2 Groundwater Remediation Overview
- OU2 Groundwater Monitoring Activities
- Planned Monitoring Wells and Recovery Wells
- Public Water Supply Contingency Plan Update
- OU2 Groundwater Fate and Transport Modeling

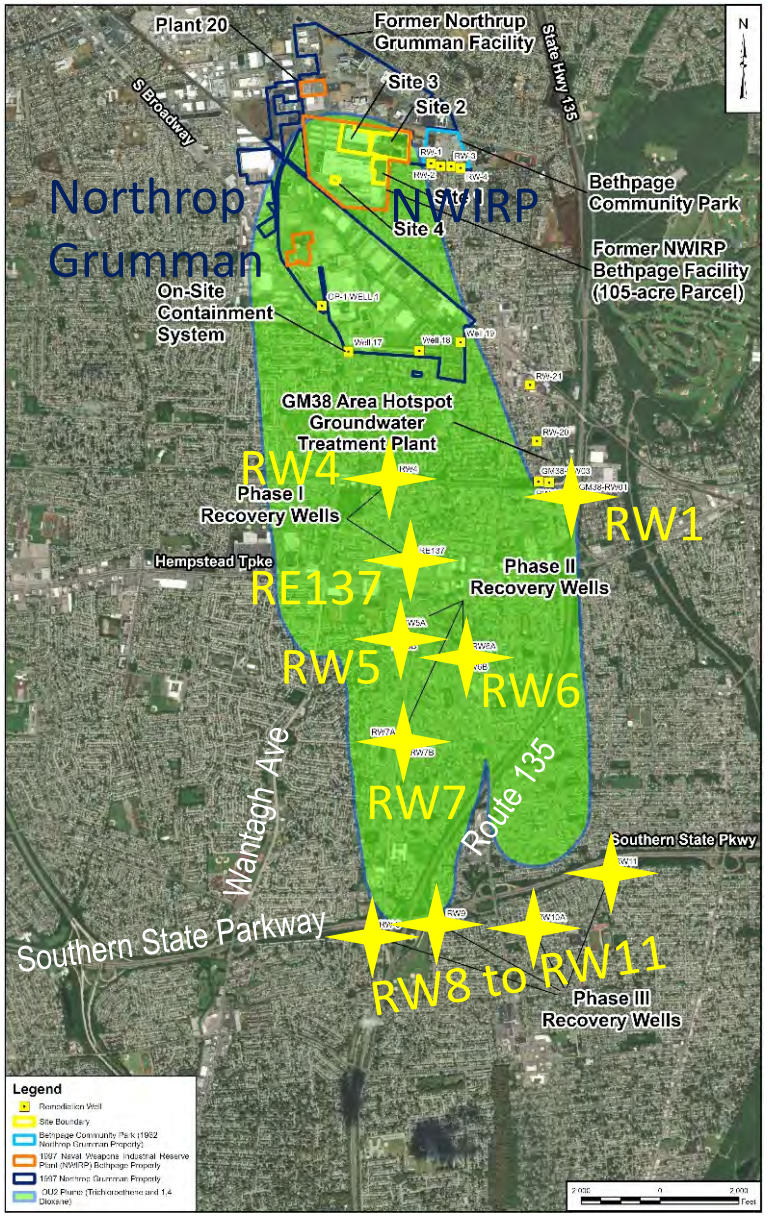
OU2 Groundwater Remediation Overview

- Northrop Grumman Onsite Containment System – 1998
- Navy GM38 Area Hotspot Treatment System – 2009
  - Navy GM38 Advanced Oxidation Process (AOP) for 1,4-dioxane removal – May 2021
- Navy Phase I Recovery Well RW4 to GM38 Treatment System – April 2021
- Navy RE137 Interim Treatment System – March 2022
- Navy Phase II Recovery Wells – complete
- Navy Phase II Treatment System – under construction
- Navy Phase III Recovery Wells – 2 of 4 completed
- Navy Phase III Treatment System – in design



OU2 Groundwater Monitoring Program

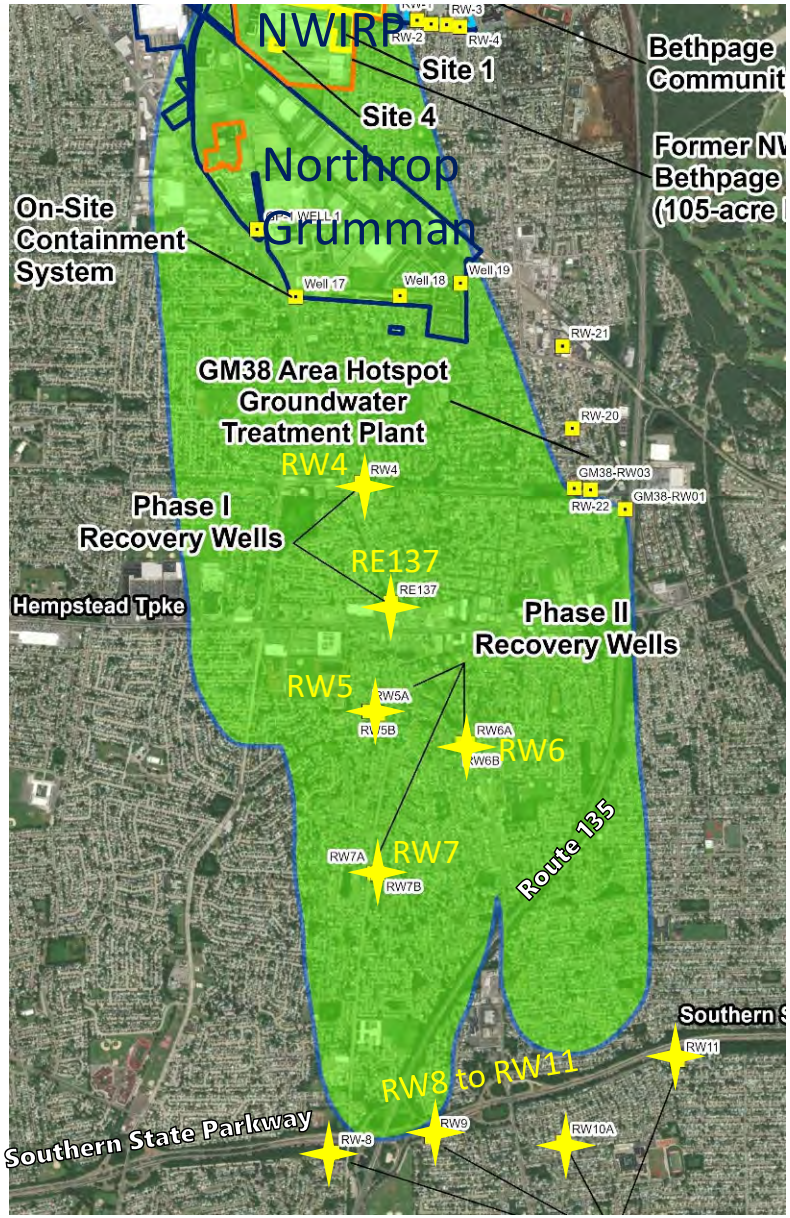
- Monitoring – OU2 plume migration, attenuation, and cleanup
- Groundwater samples – 180 wells on a quarterly, semi-annual, or annual basis, and analyzed for volatile organic compounds (VOCs) and 1,4-dioxane
- Recovery Wells RW1, RW4, and RE137 operating
- Recovery Wells RW5A/5B, RW6A/B, RW7A/B, RW8, and RW9 are installed
- Recovery Well RW10A vertical profile boring and monitoring wells are installed, currently evaluating the data for recovery well design



OU2 Groundwater Monitoring Program

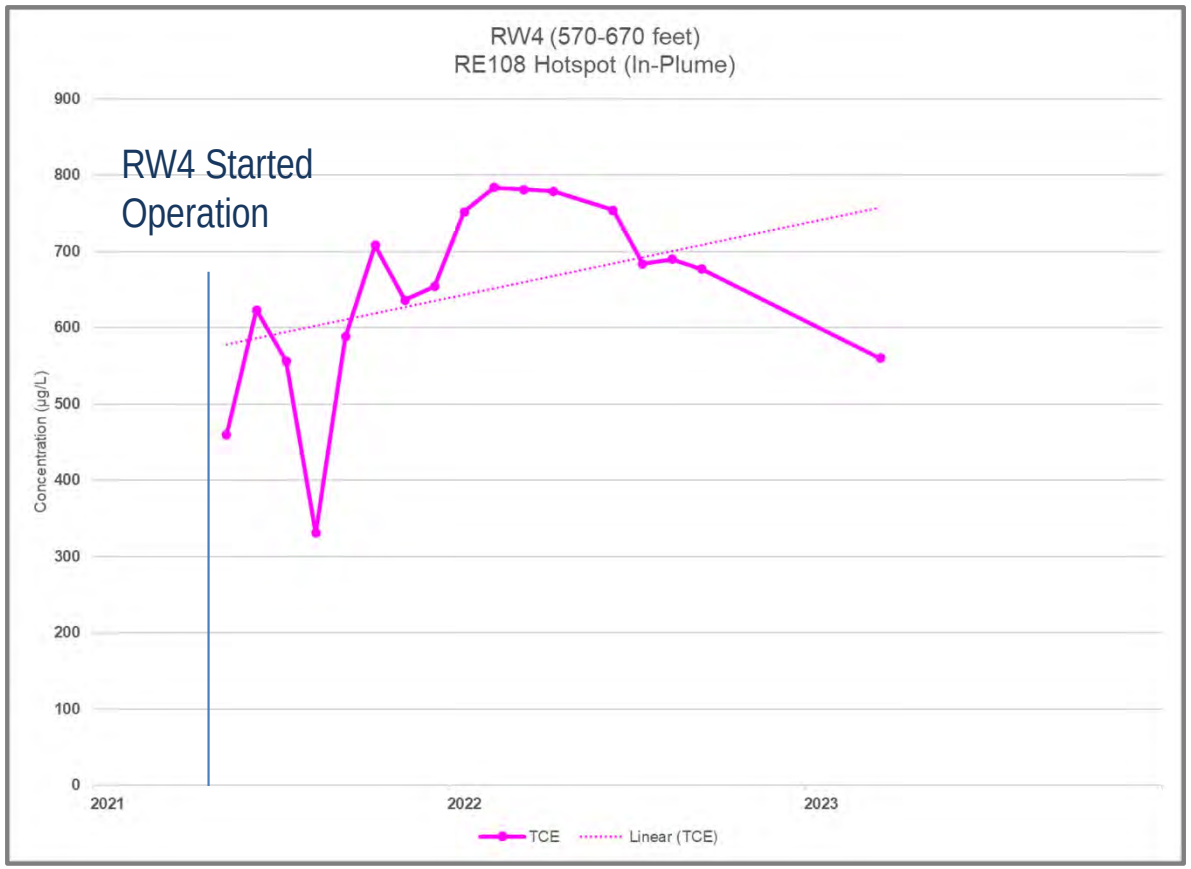
- New monitoring wells continue to be added as needed:
  - ➢Recovery wells for Phase III
  - ➢Monitoring wells for performance monitoring
  - ➢Leading edge monitoring wells
  - ➢Additional data gap wells planned for 2023 and 2024 – to support plume cleanup and capture analysis

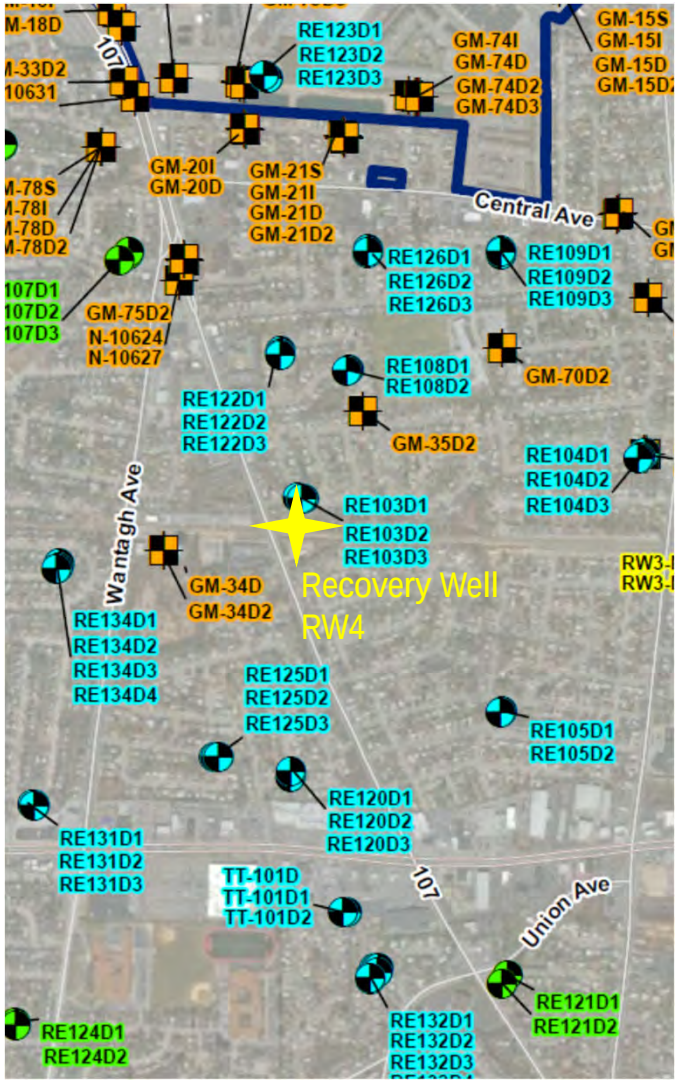
- Monitoring well program has shifted from plume delineation to support of plume cleanup progress



OU2 Groundwater Monitoring – Recovery Well RW4 (Phase I)

- Changes in water level and VOC concentrations in nearby monitoring wells are used to evaluate effectiveness of recovery wells
- Water level data is processed with computer modeling





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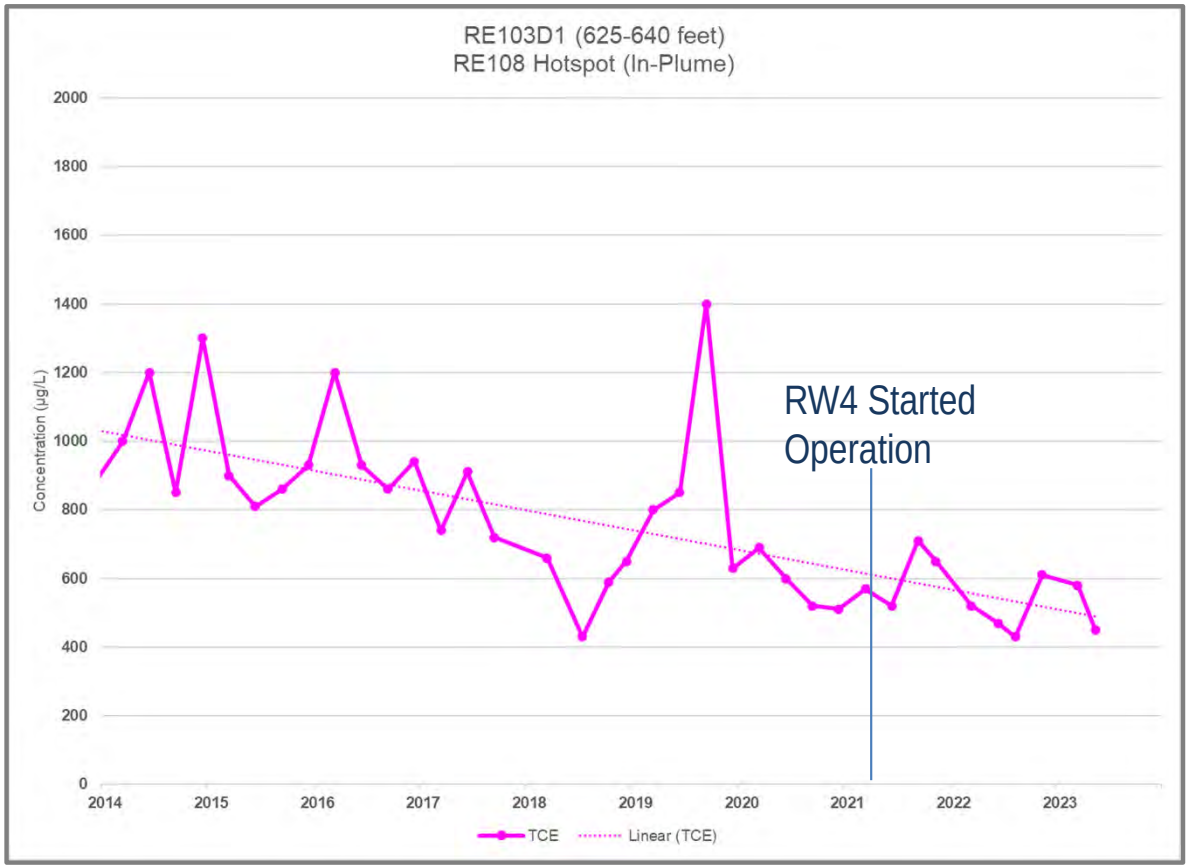

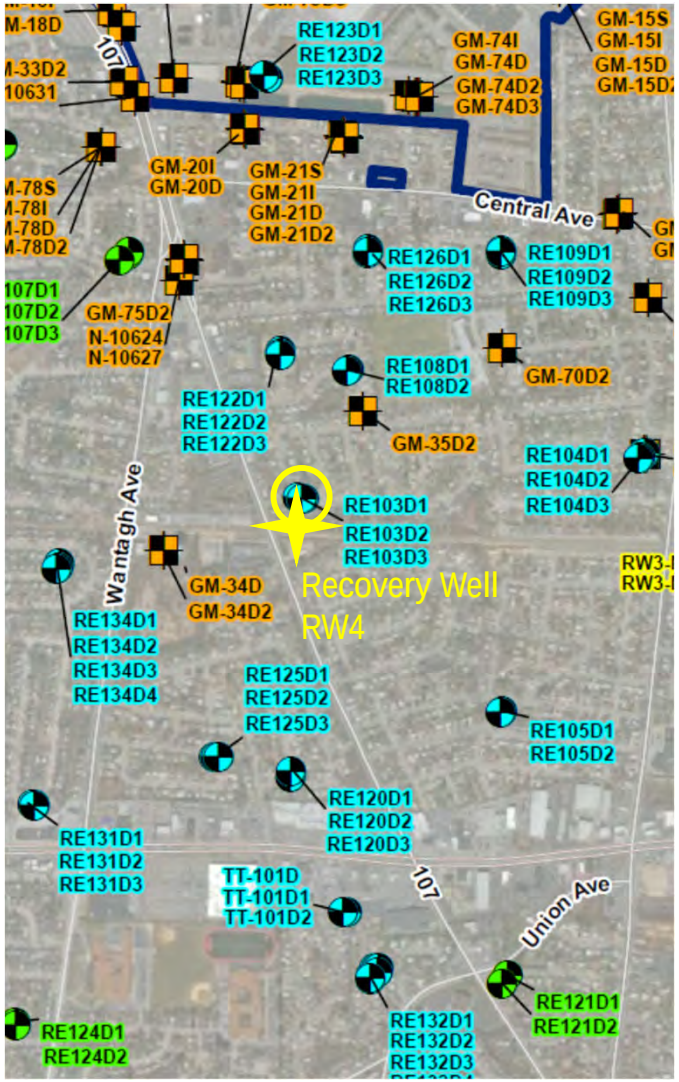

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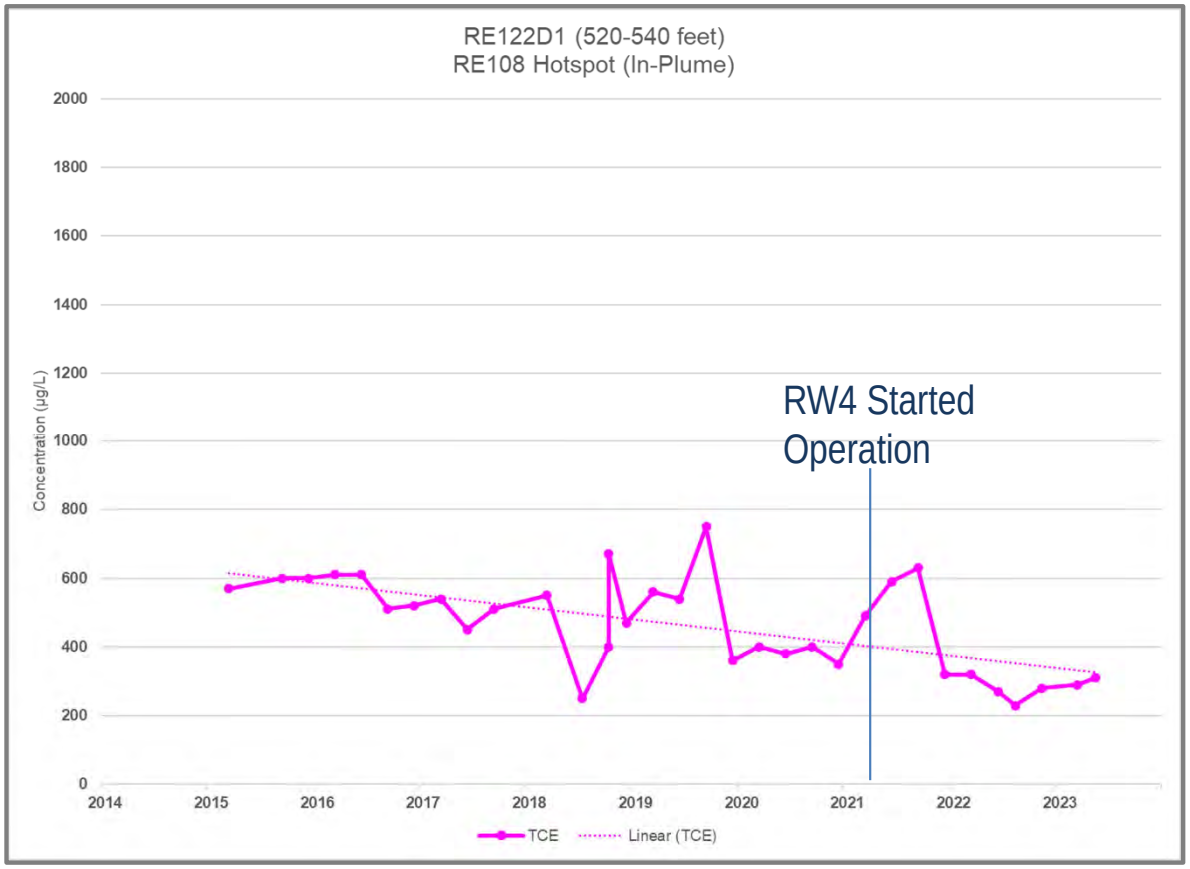

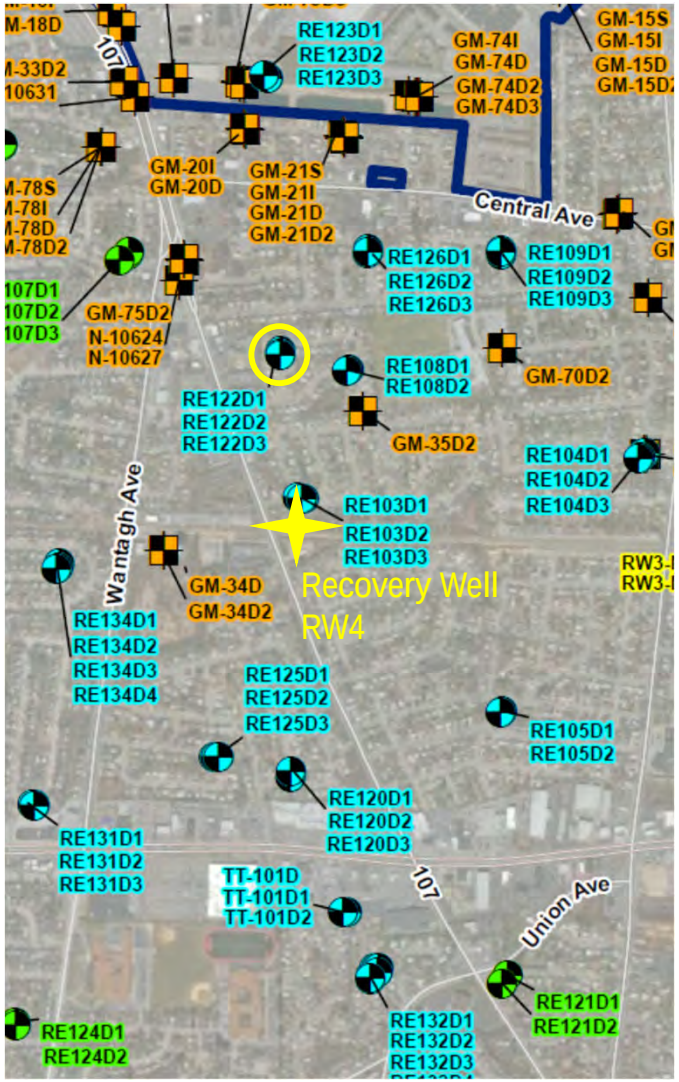

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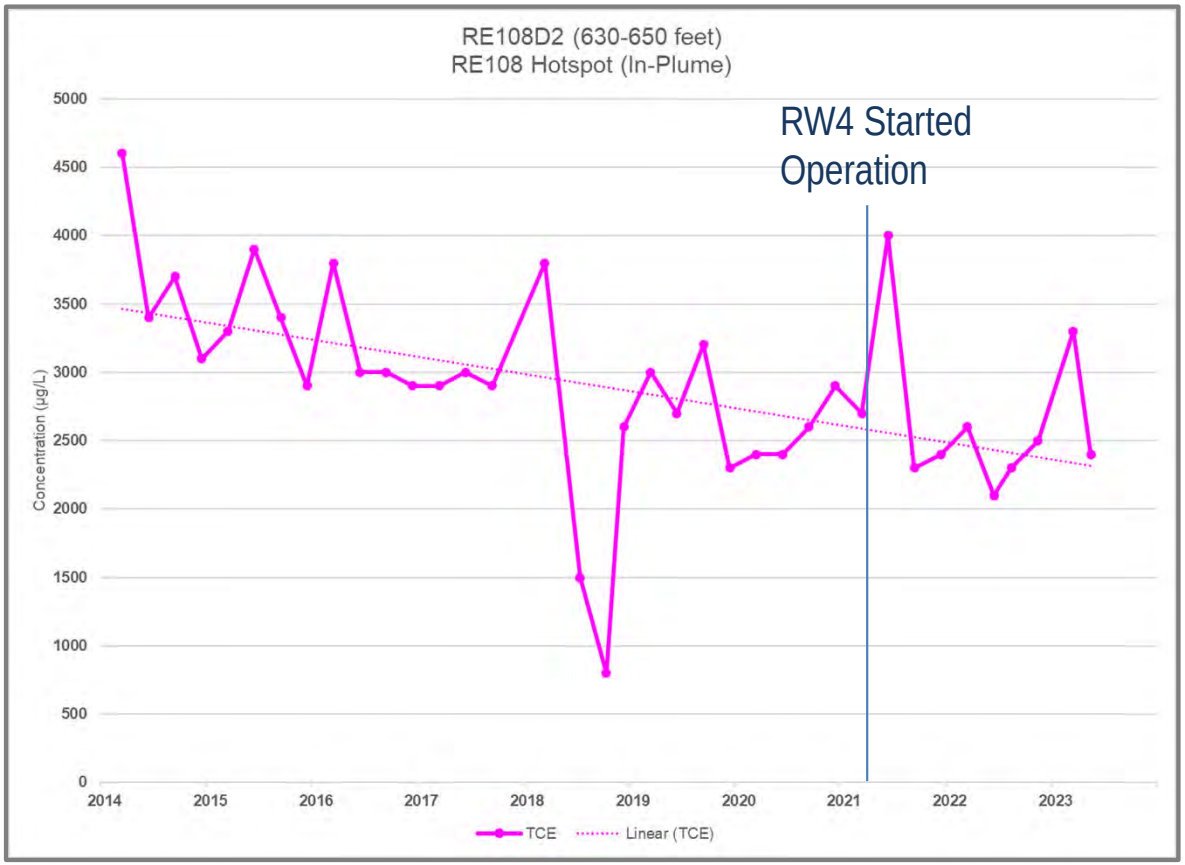
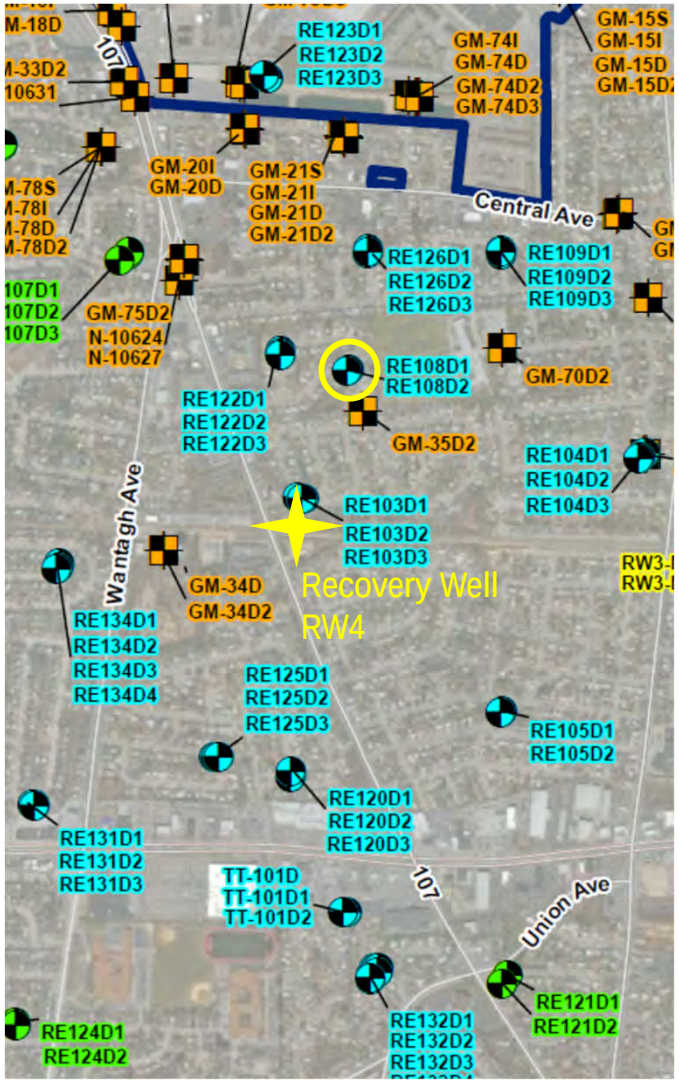
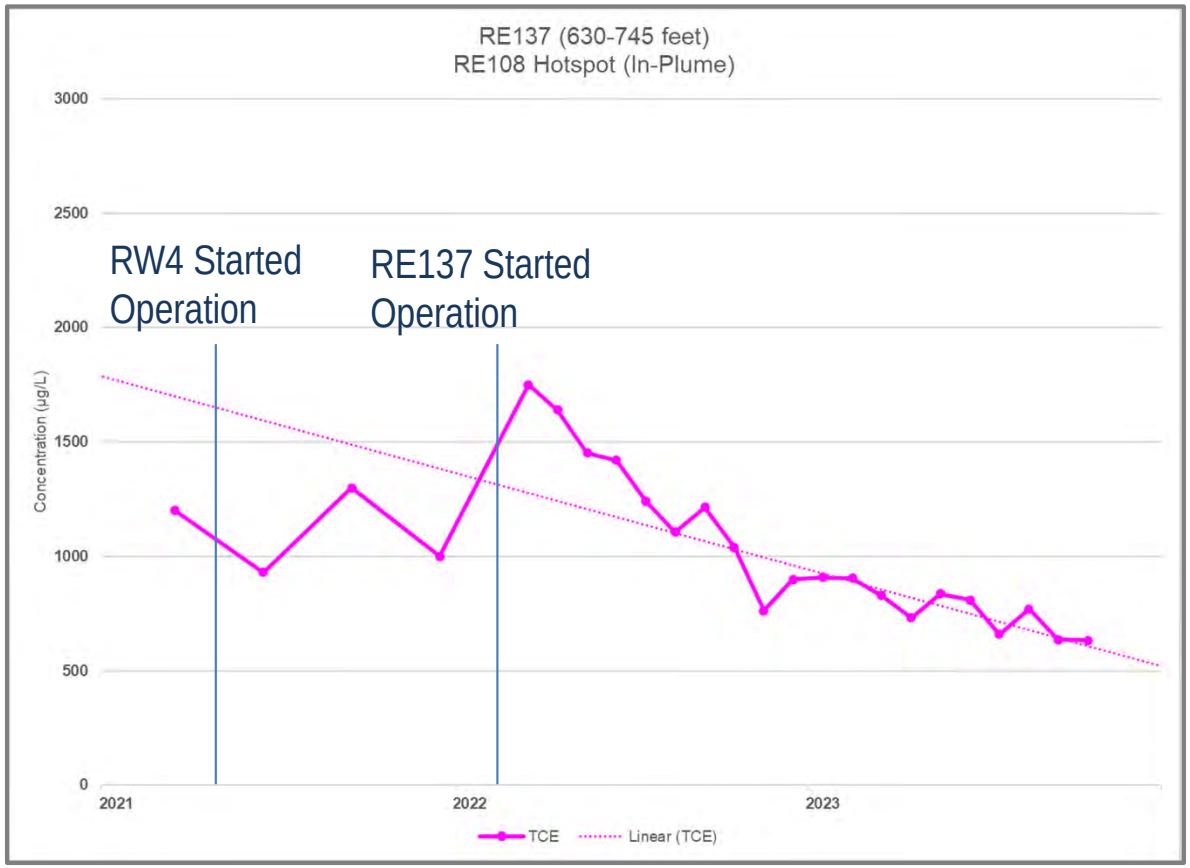
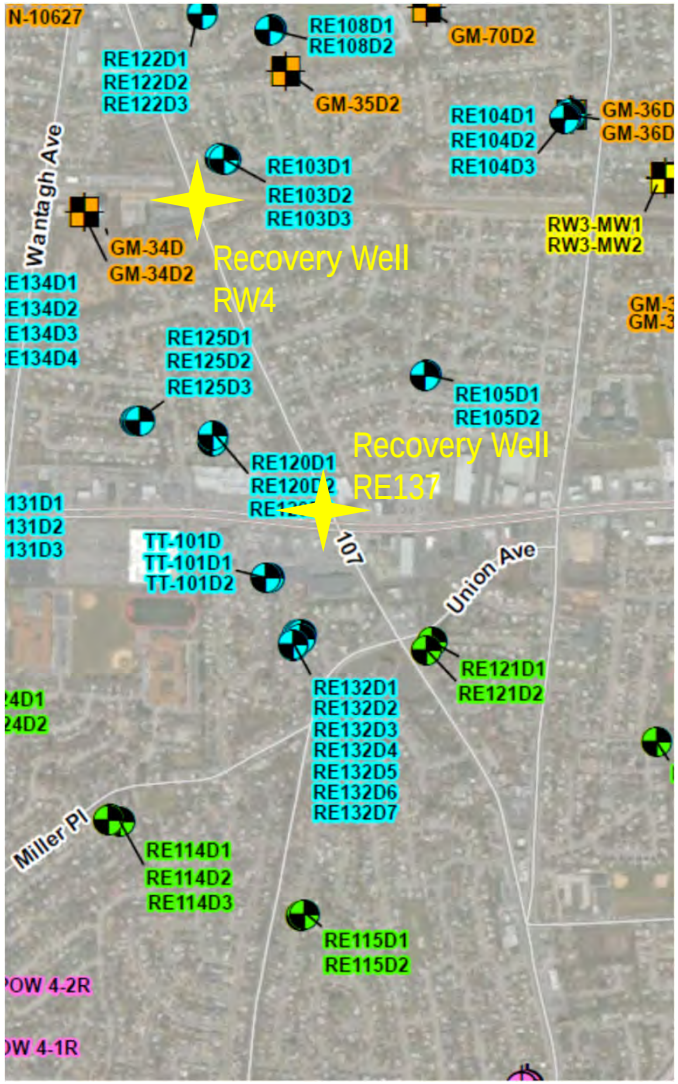




OU2 Groundwater Monitoring – Recovery Well RE137

- Pilot testing – Startup in March 2022
- Planned operation until piping complete to GM38 treatment system (2024)





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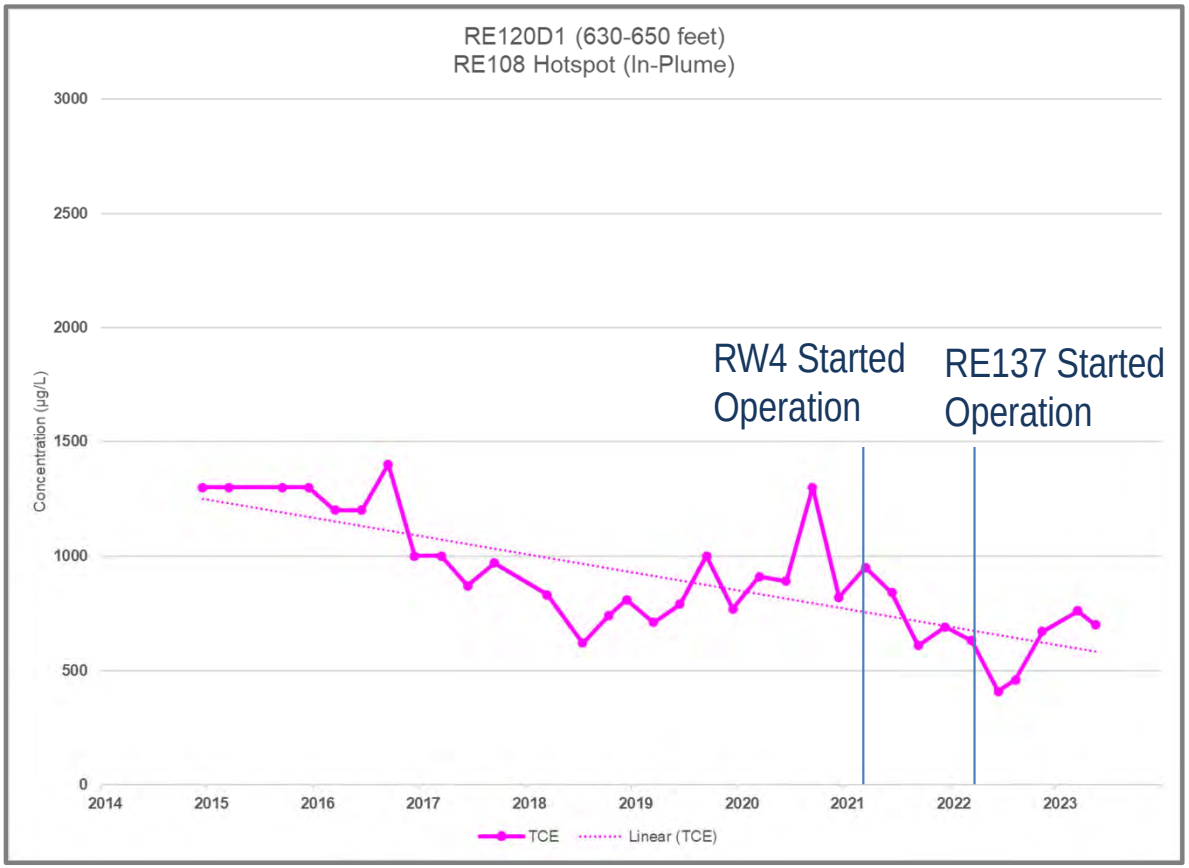

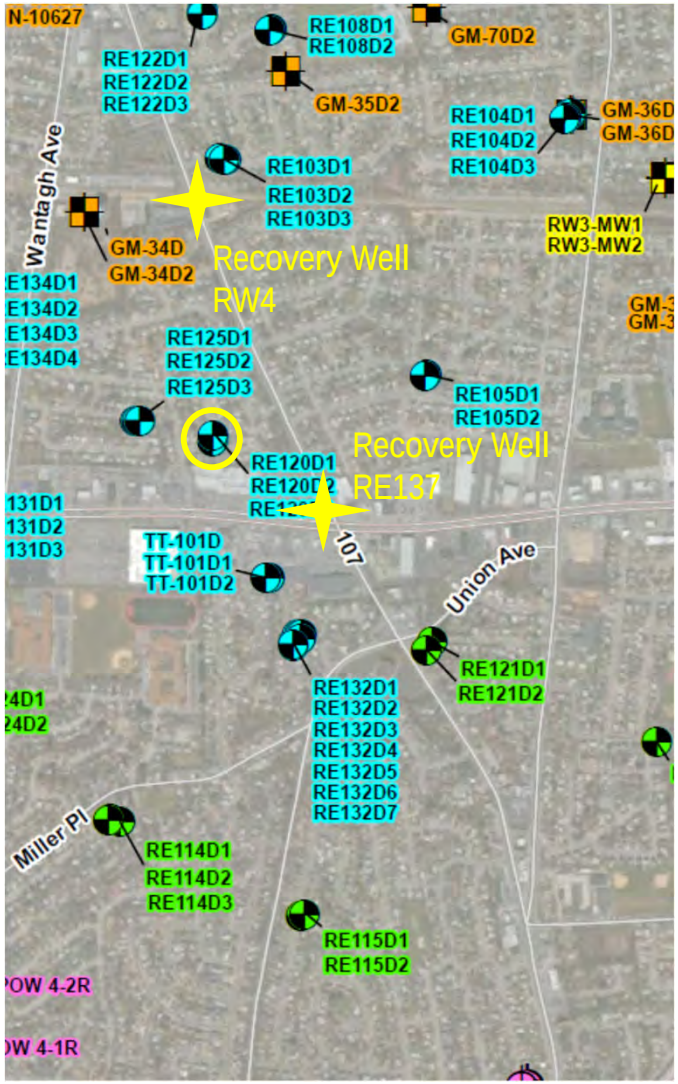

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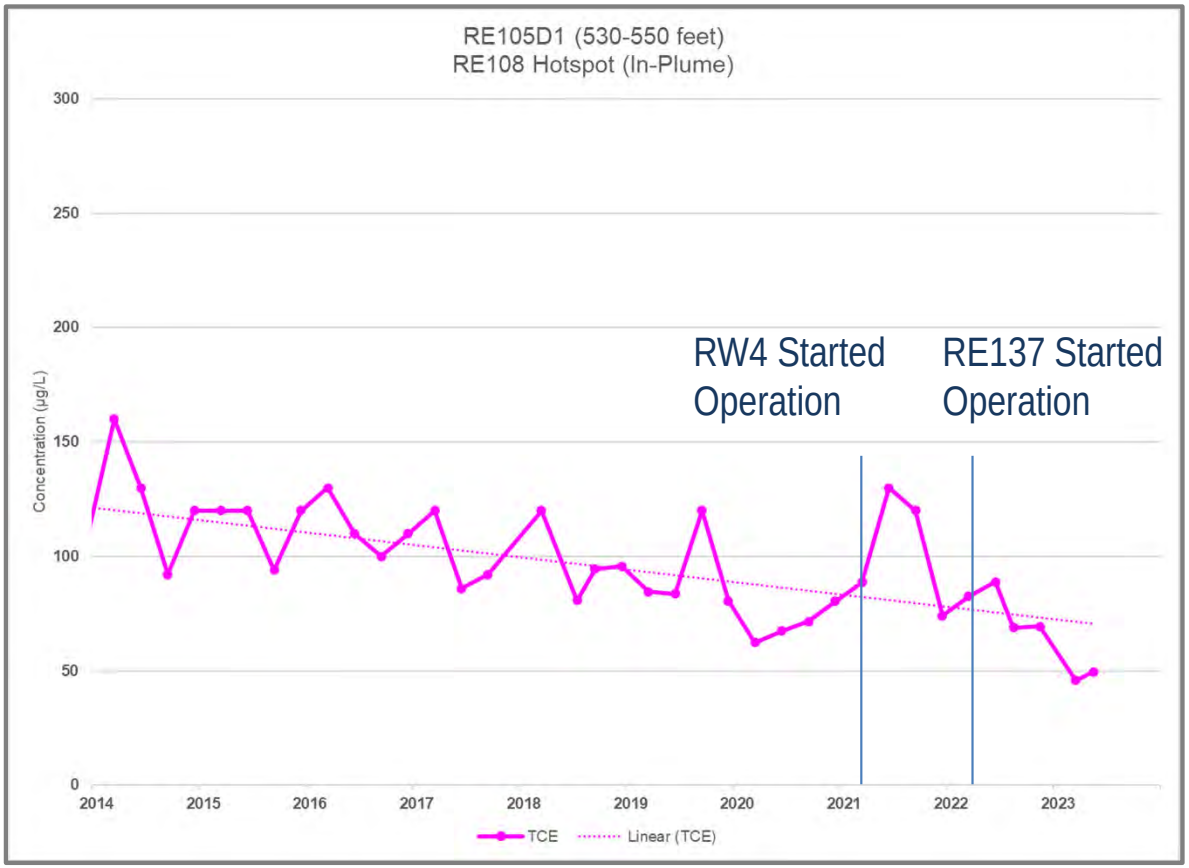

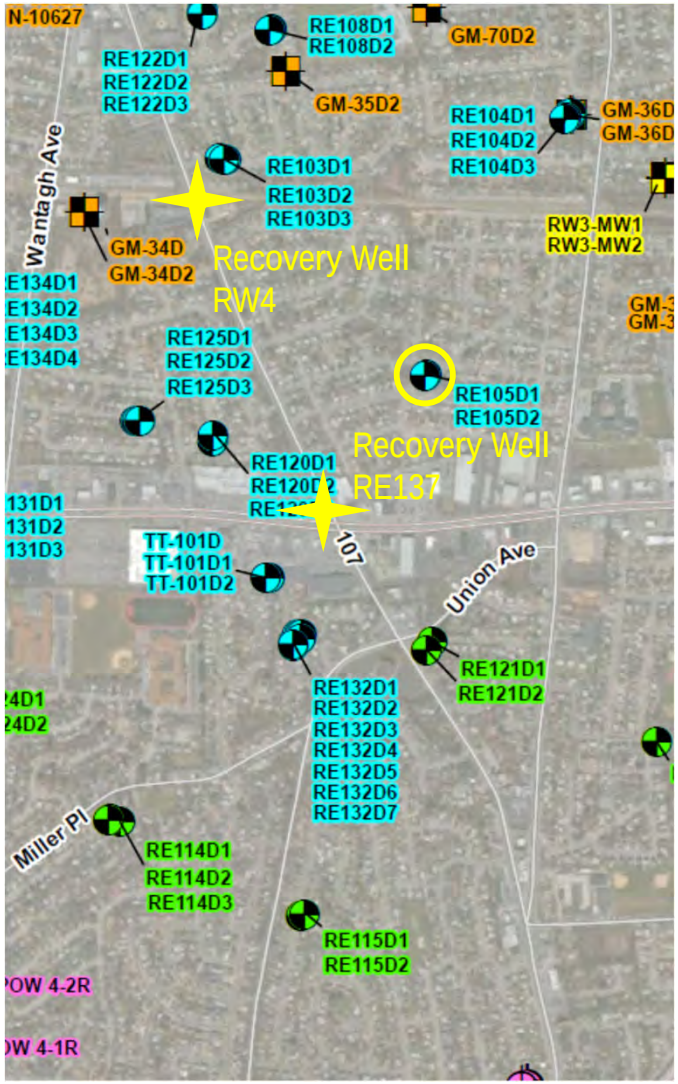

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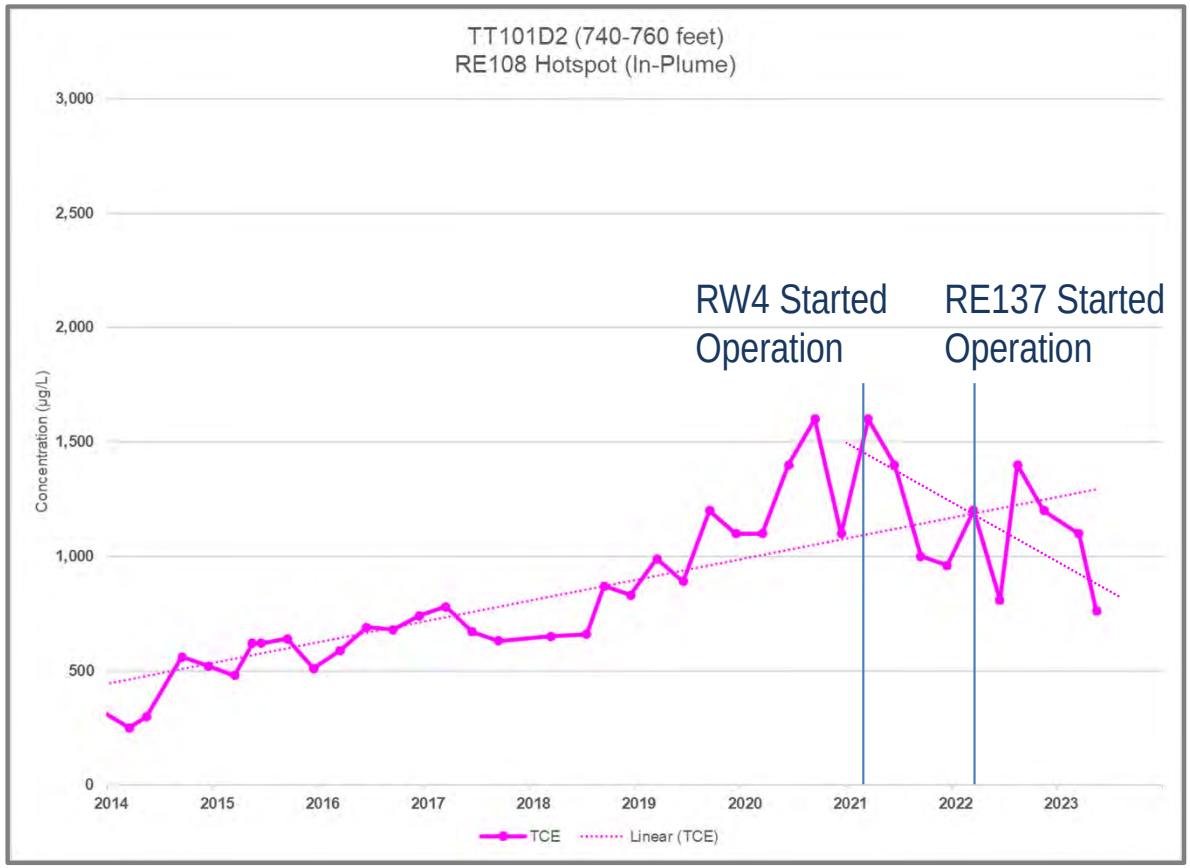
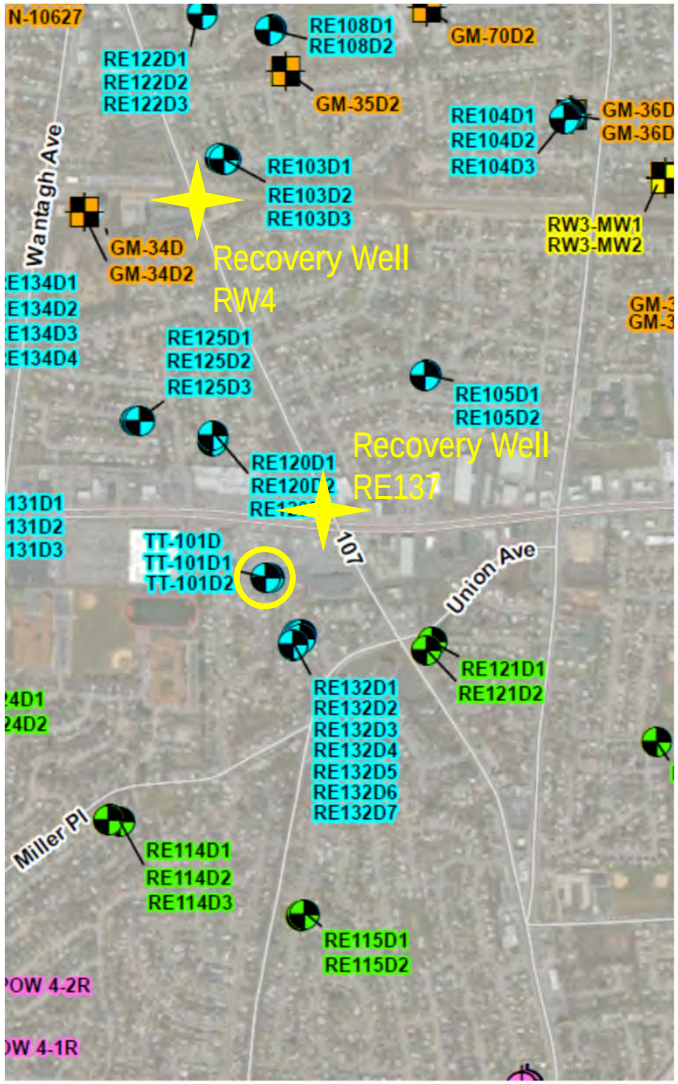
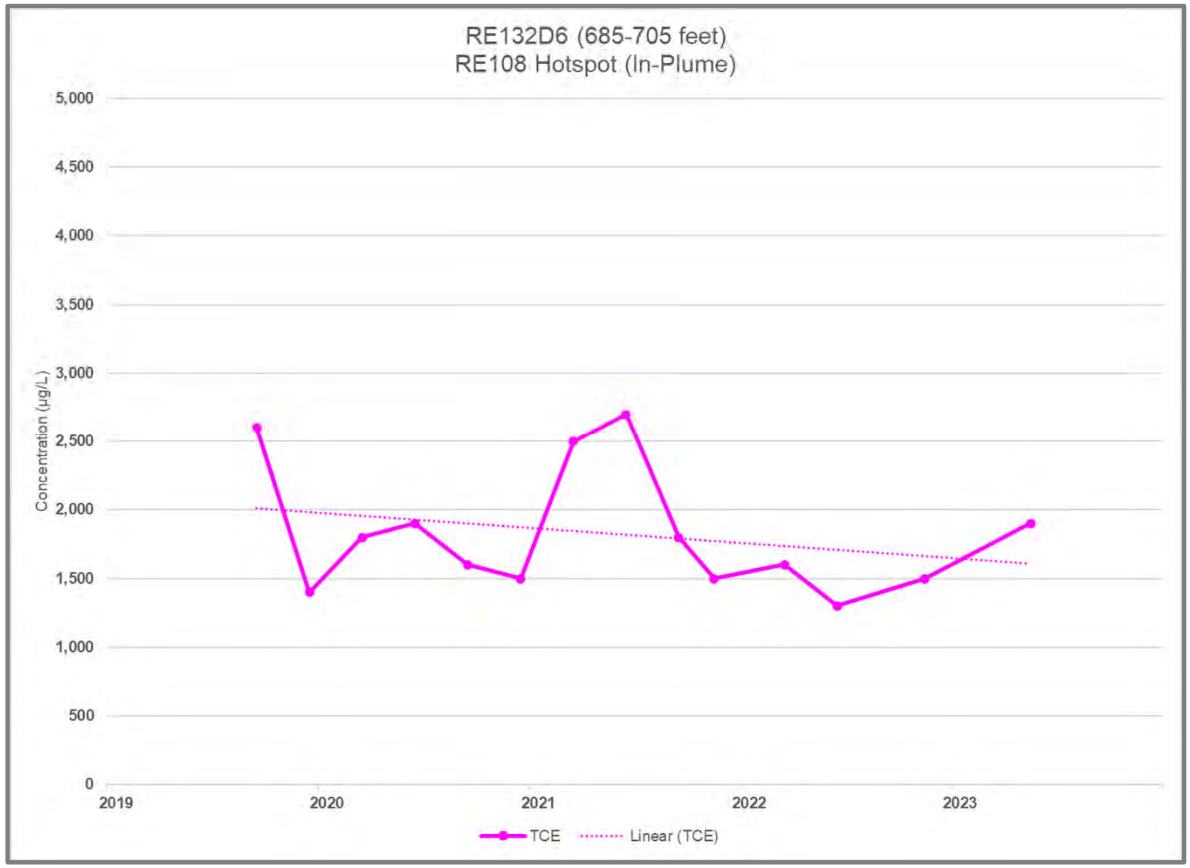
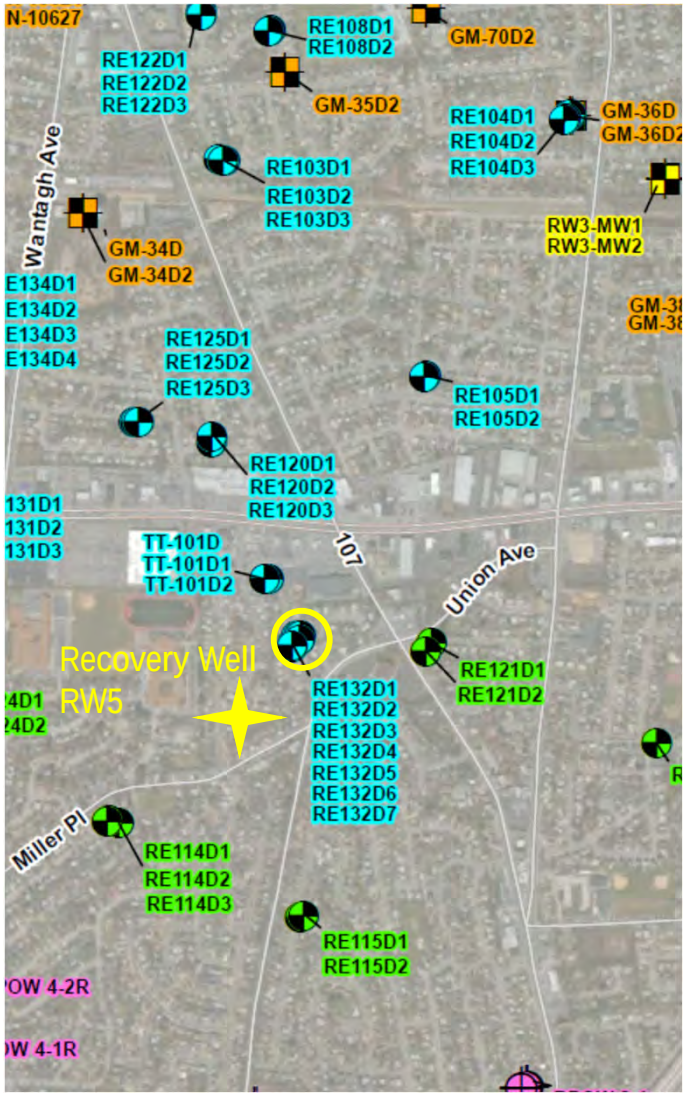




OU2 Groundwater Monitoring – Recovery Well RW5 (Phase II)

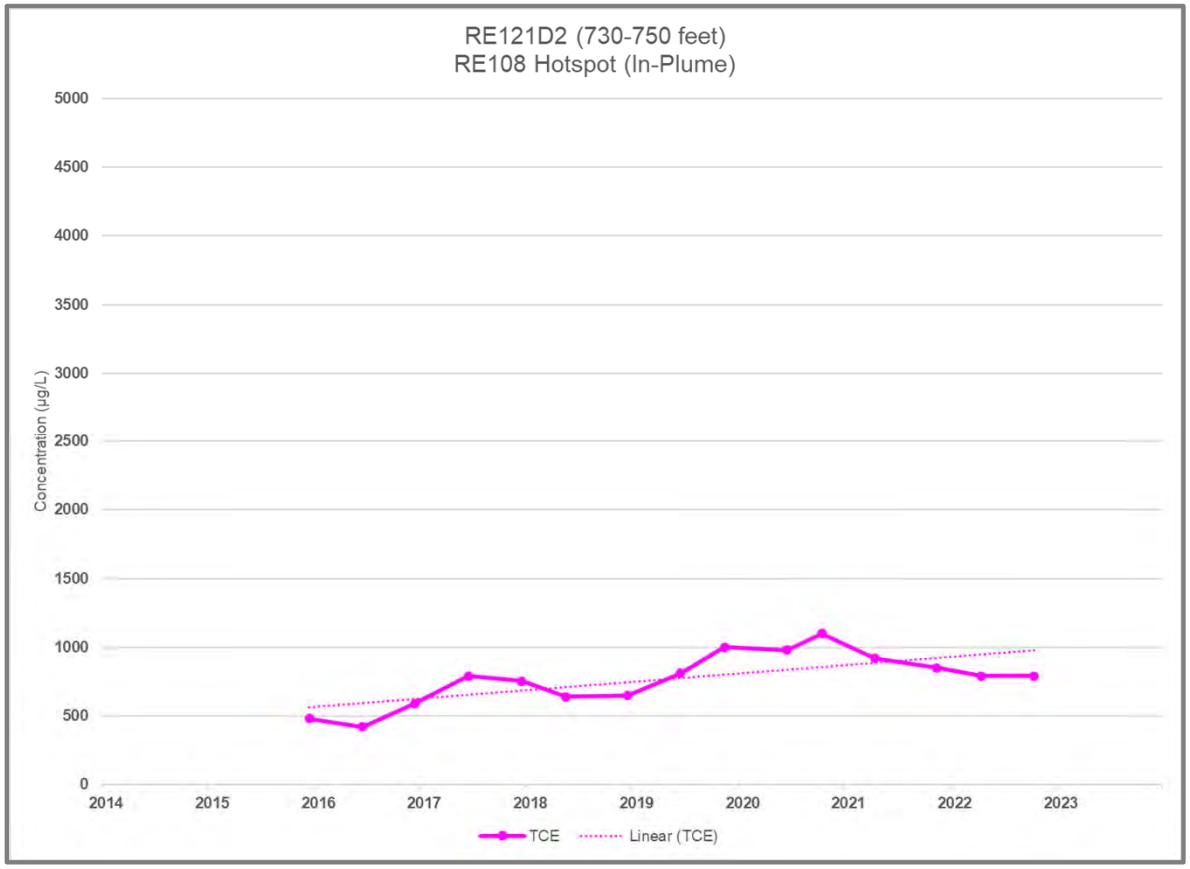
- RW5A/B are installed and planned for operation in 2024

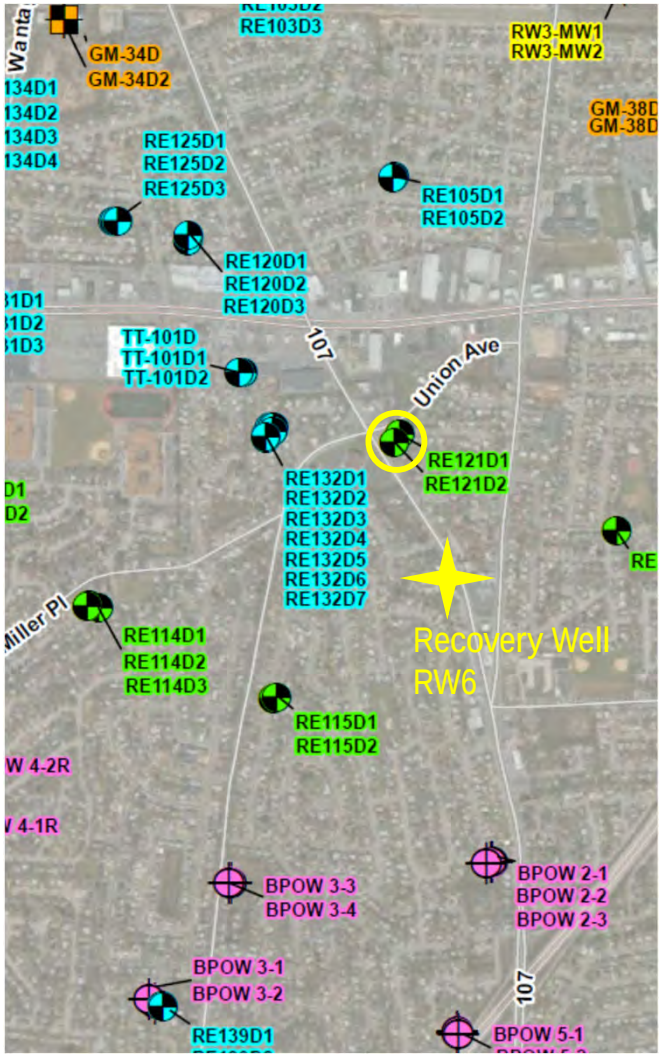




OU2 Groundwater Monitoring – Recovery Well RW6 (Phase II)

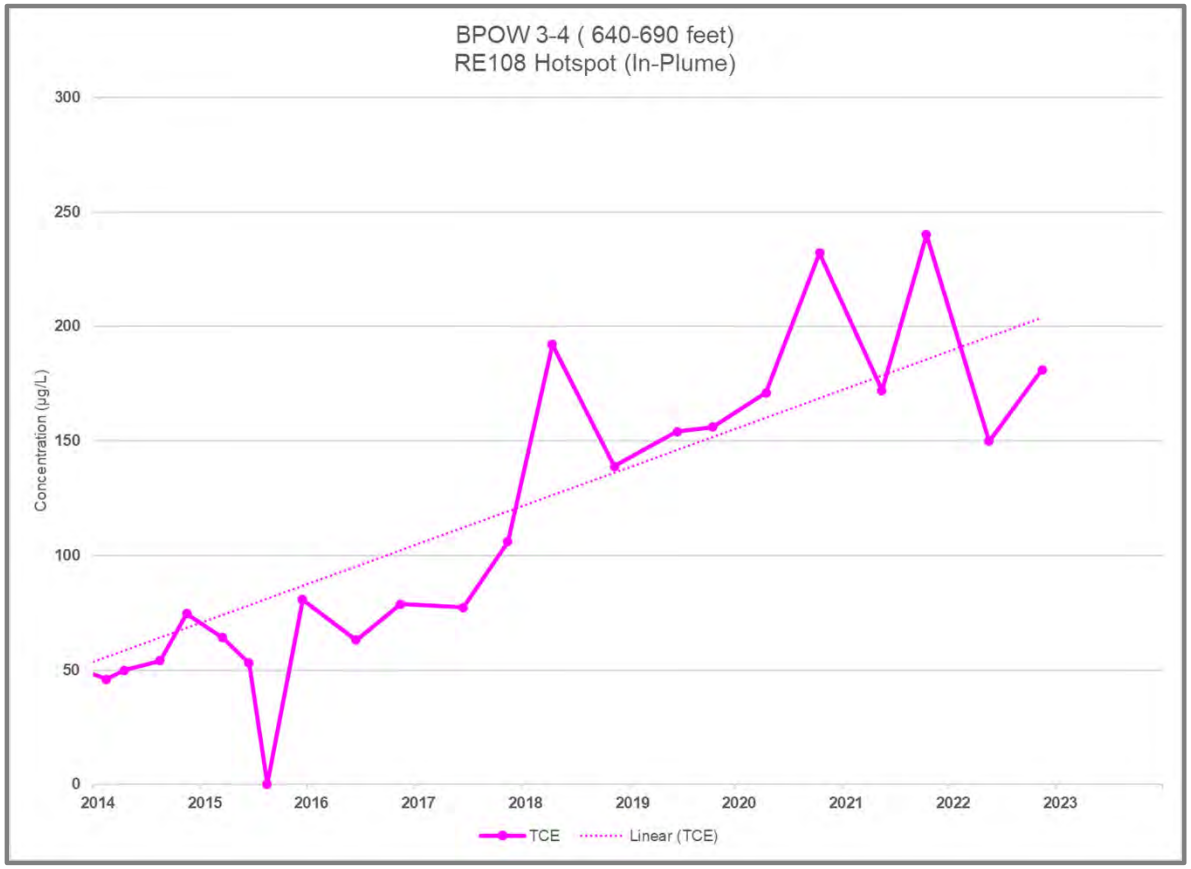
- RW6A/B are installed and planned for operation in 2024

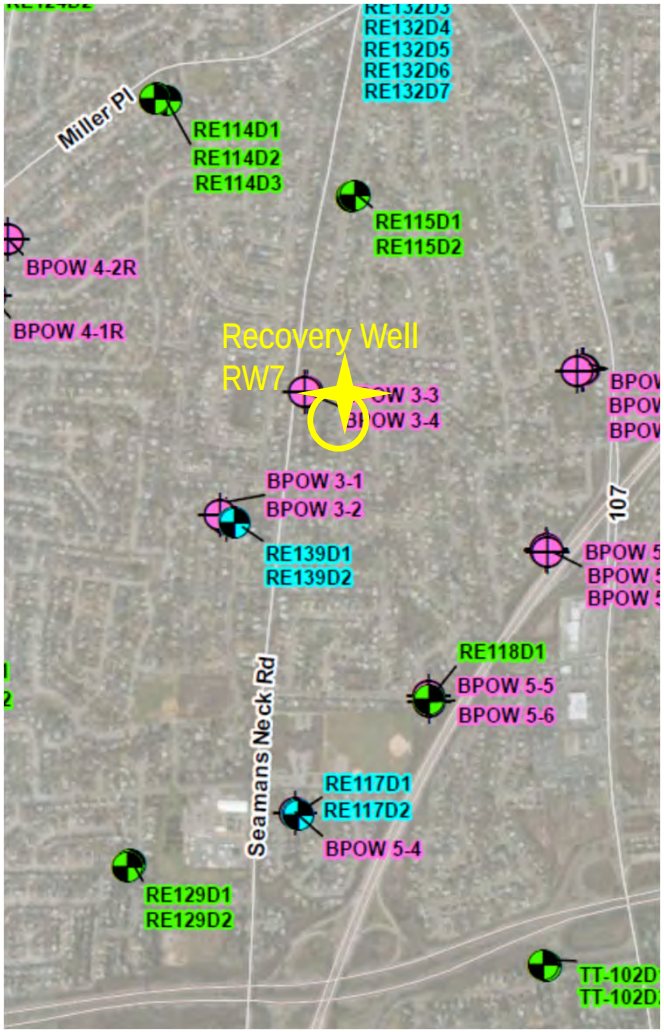




OU2 Groundwater Monitoring – Recovery Well RW7 (Phase II Extension)

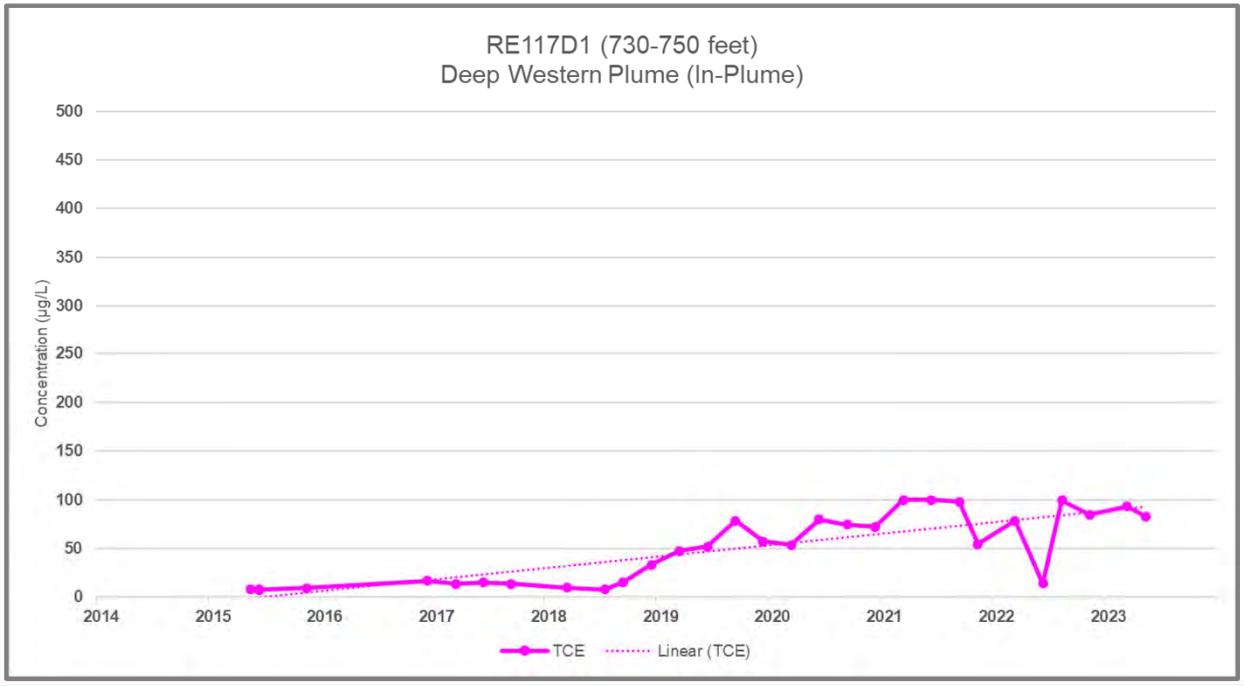
- RW7A/B are installed and planned for operation in 2024

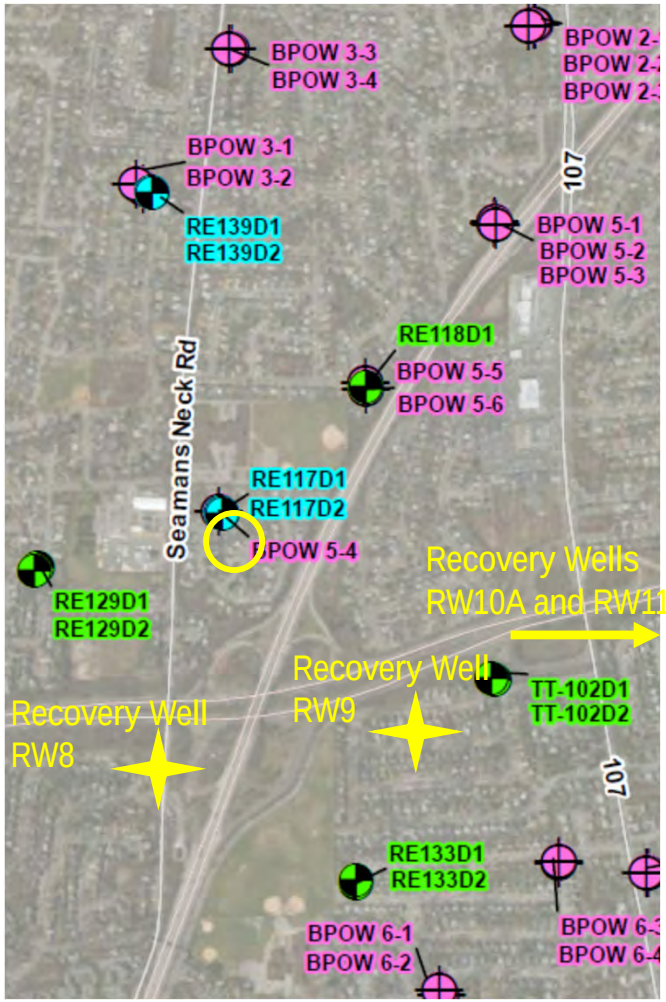




OU2 Groundwater Monitoring – Recovery Well RW8 to RW11 (Phase III)

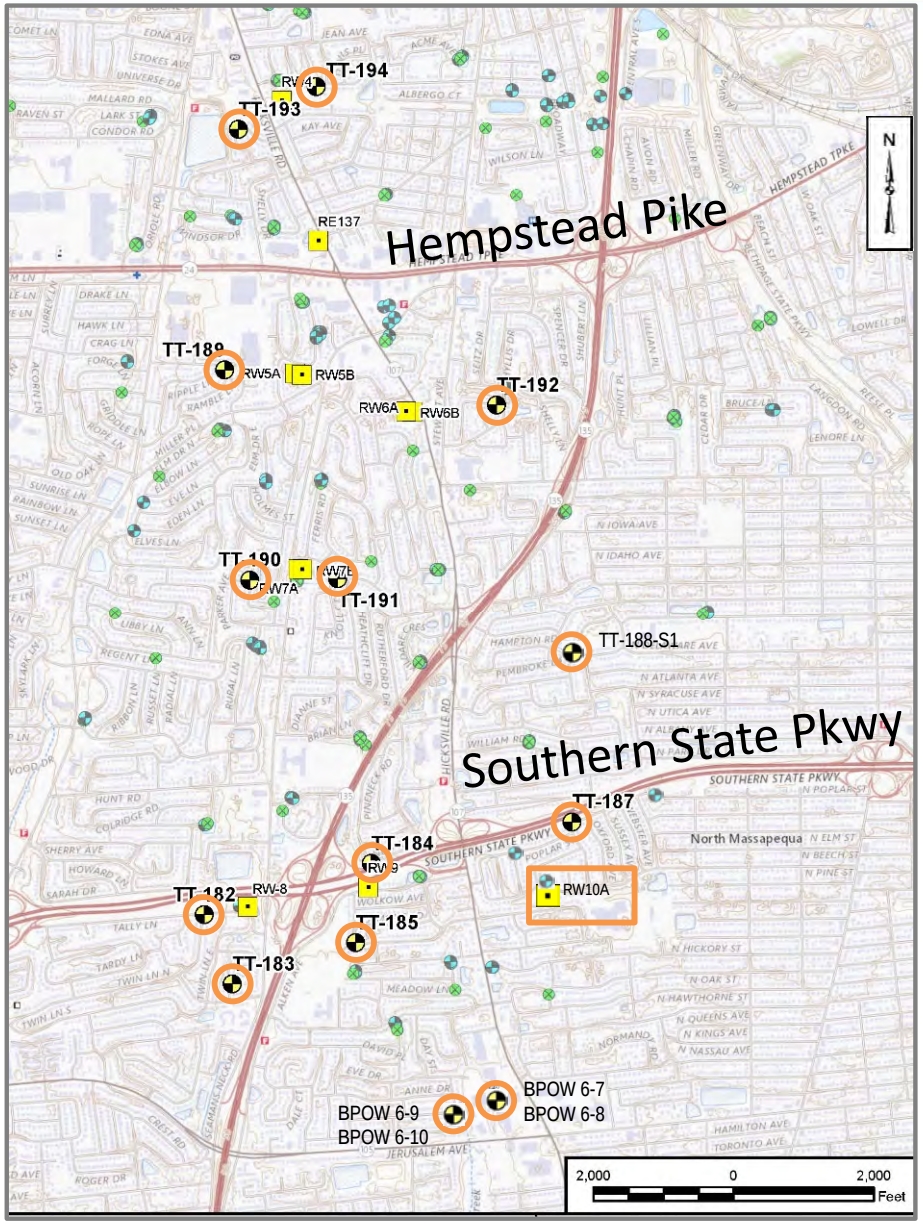
- Recovery wells RW8 and RW9 target deep groundwater at monitoring well RE117
- RW8 and RW9 are installed, pumping tests completed in December 2022
- RW10A/ RW11 VPB and monitoring wells completed
- Design activities are underway, with system to be constructed in 2024





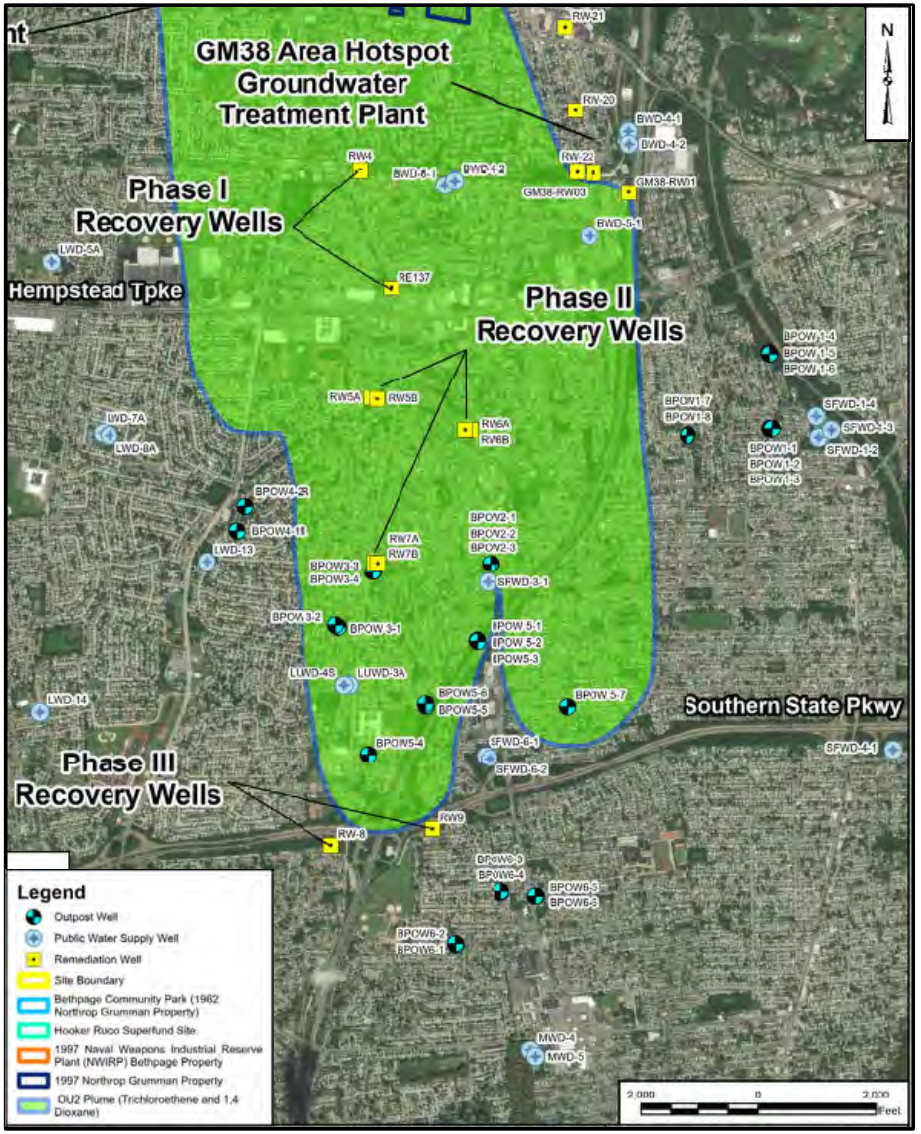
Planned Monitoring Wells and Recovery Wells

- Recovery well RW10A planned for 2024
- Monitoring wells planned to evaluate the performance of groundwater recovery wells and OU2 plume migration
- Additional monitoring wells will be added as necessary



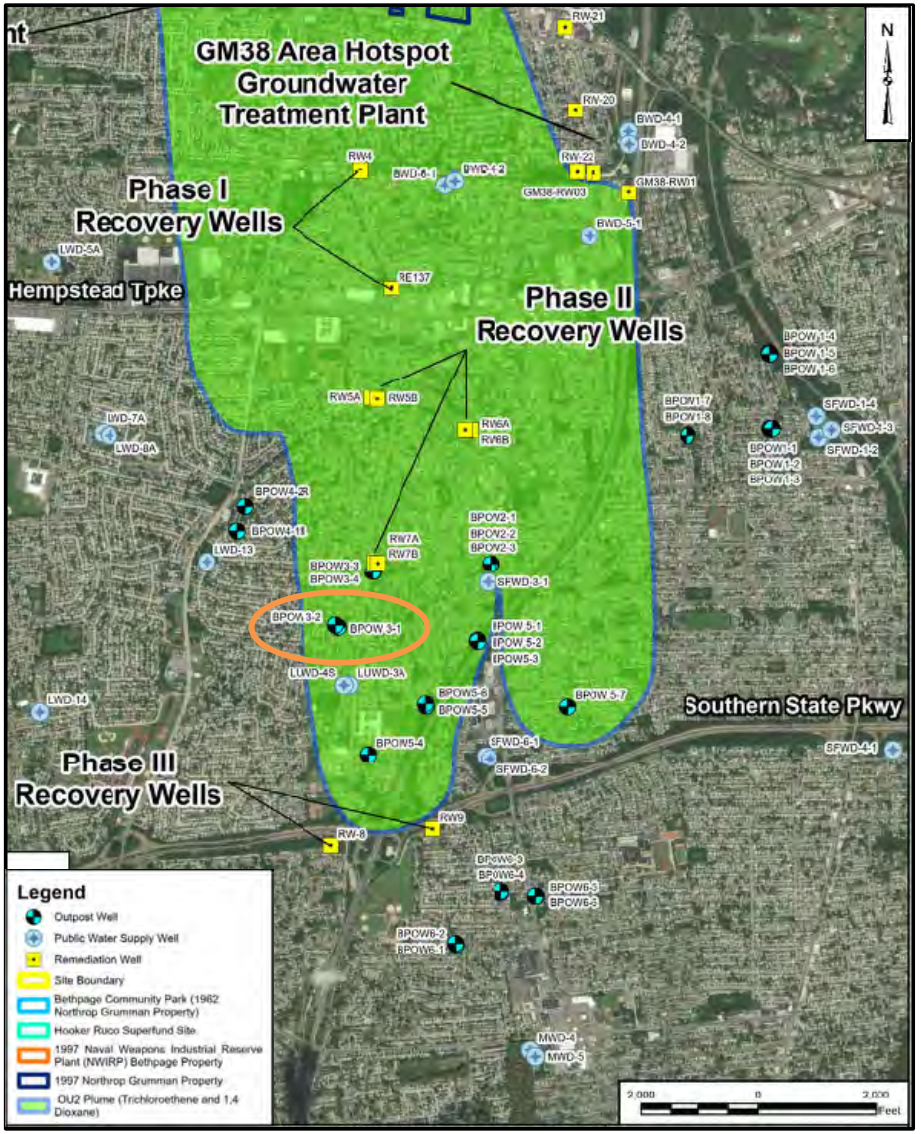
Public Water Supply Contingency Plan (PWSCP) Update

- Original PWSCP issued in 2003
- Two addenda in 2015 and 2016
- Established the following:
  - Groundwater modeling
  - Bethpage Outpost Wells (BPOW)
  - Groundwater monitoring of outpost wells
  - Trigger values
  - Well Treatment/Comparable Alternative Measures
- PWSCP Update issued in October 2023



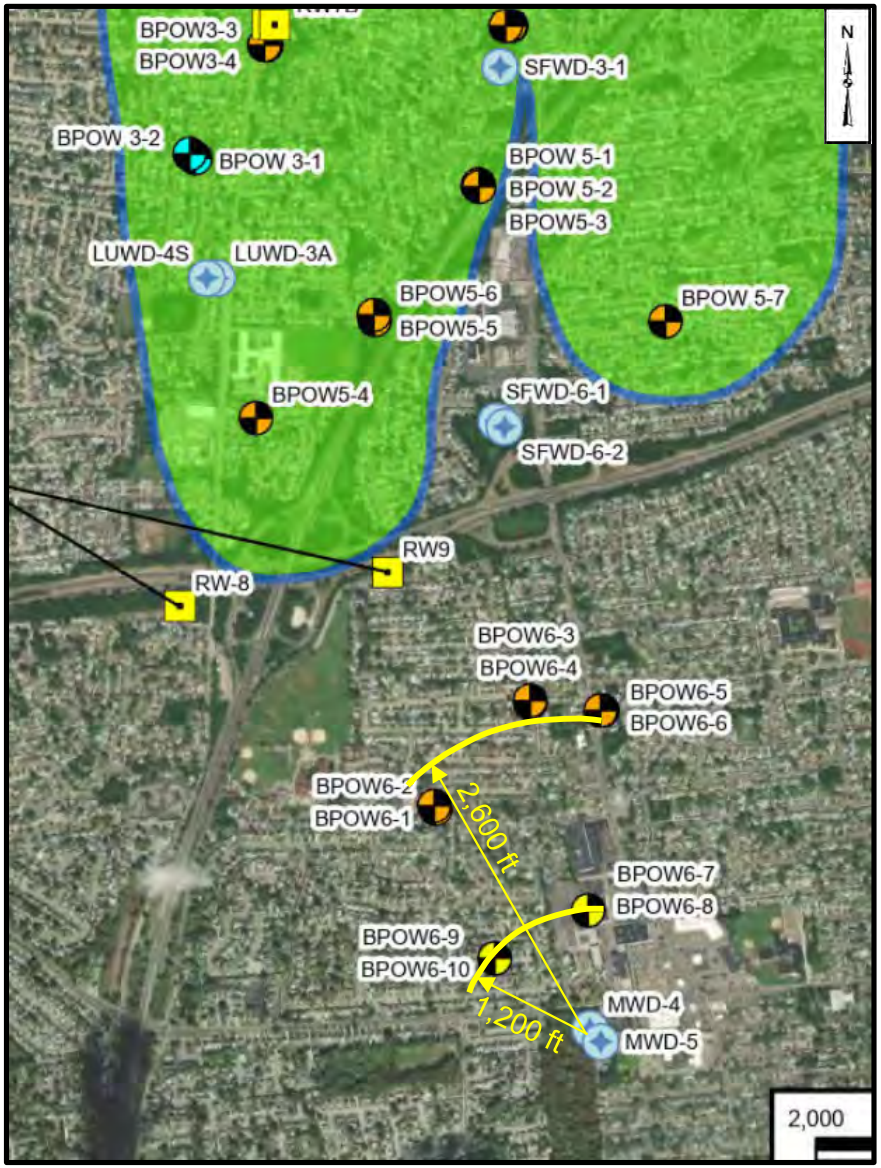
Public Water Supply Contingency Plan (PWSCP) Update

- Exceedance of a trigger value at an outpost well would prompt well head treatment, or comparable alternative measures
- 30 outpost wells installed
- Since the 2003 PSWCP, treatment has been or is being implemented at Operable Unit 2 (OU2) plume impacted or prospectively impacted water districts
- Wells will continue to be tested to monitor OU2 plume migration and remediation
- Two outpost wells (BPOW 3-1/3-2) remain to monitor potential impacts from an adjacent Freon plume



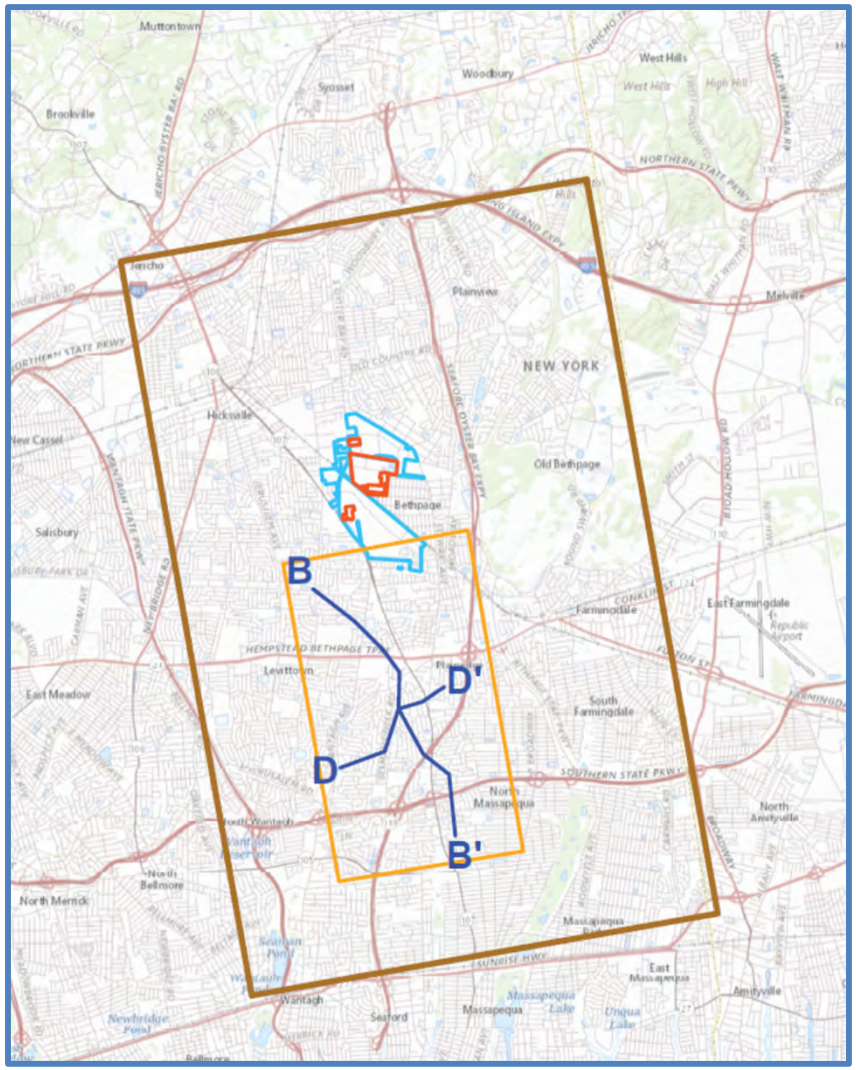
Public Water Supply Contingency Plan (PWSCP) Update

- BPOW 6-1 to 6-6 cluster anticipated to provide 11 years to greater than 30 years advance notice to downgradient water supply wells
- Construction of Phase III groundwater treatment system (GWTS) is predicted to slow plume migration and increase groundwater travel times
- Four new outpost wells (BPOW 6-7 through 6-10) will be installed starting in December 2023
- The new outpost well locations are expected to provide a minimum of 5 years notice under current conditions, and 5 to 10 years notice with planned operation of Phase III GWTS.



OU2 Groundwater Fate and Transport Modeling

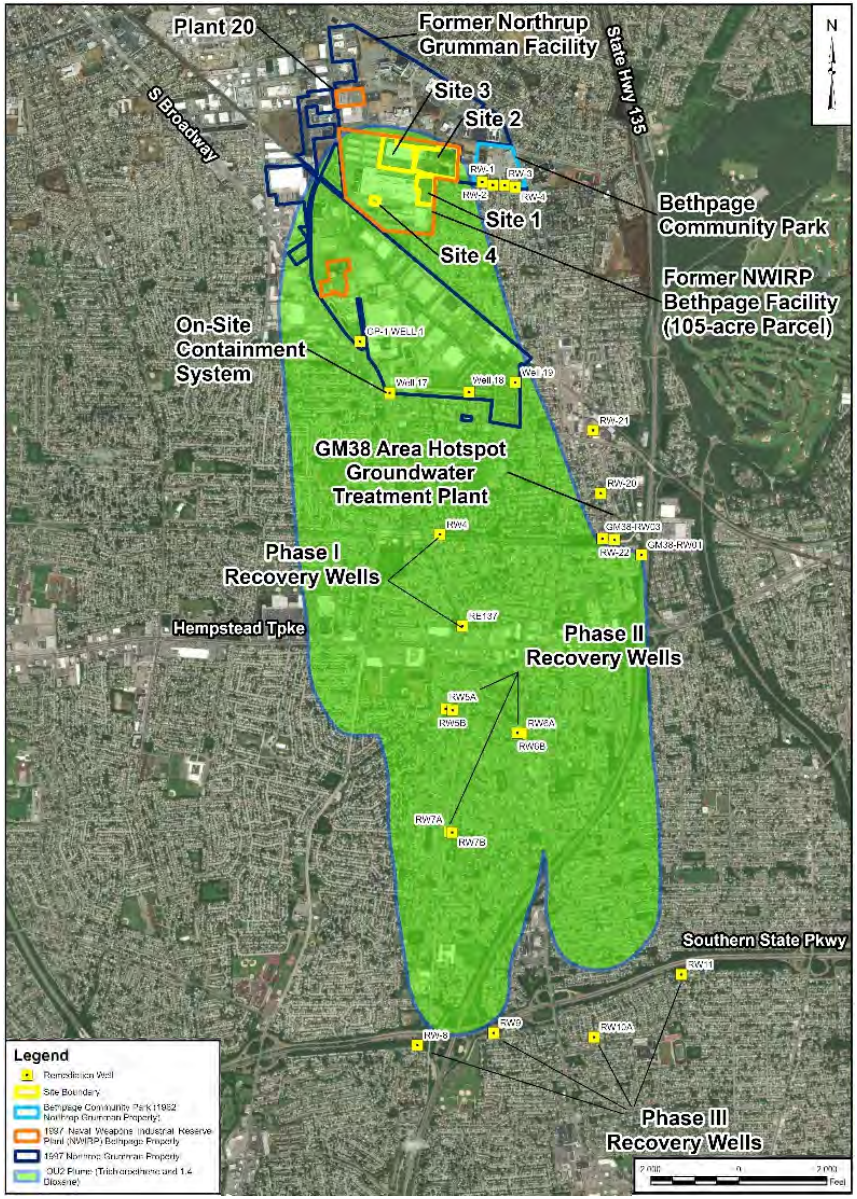
- Flow model used to evaluate OU2 plume behavior over time
- Model is approximately 42 square miles and 2 million cells
- Design, evaluate, and optimize remedial systems



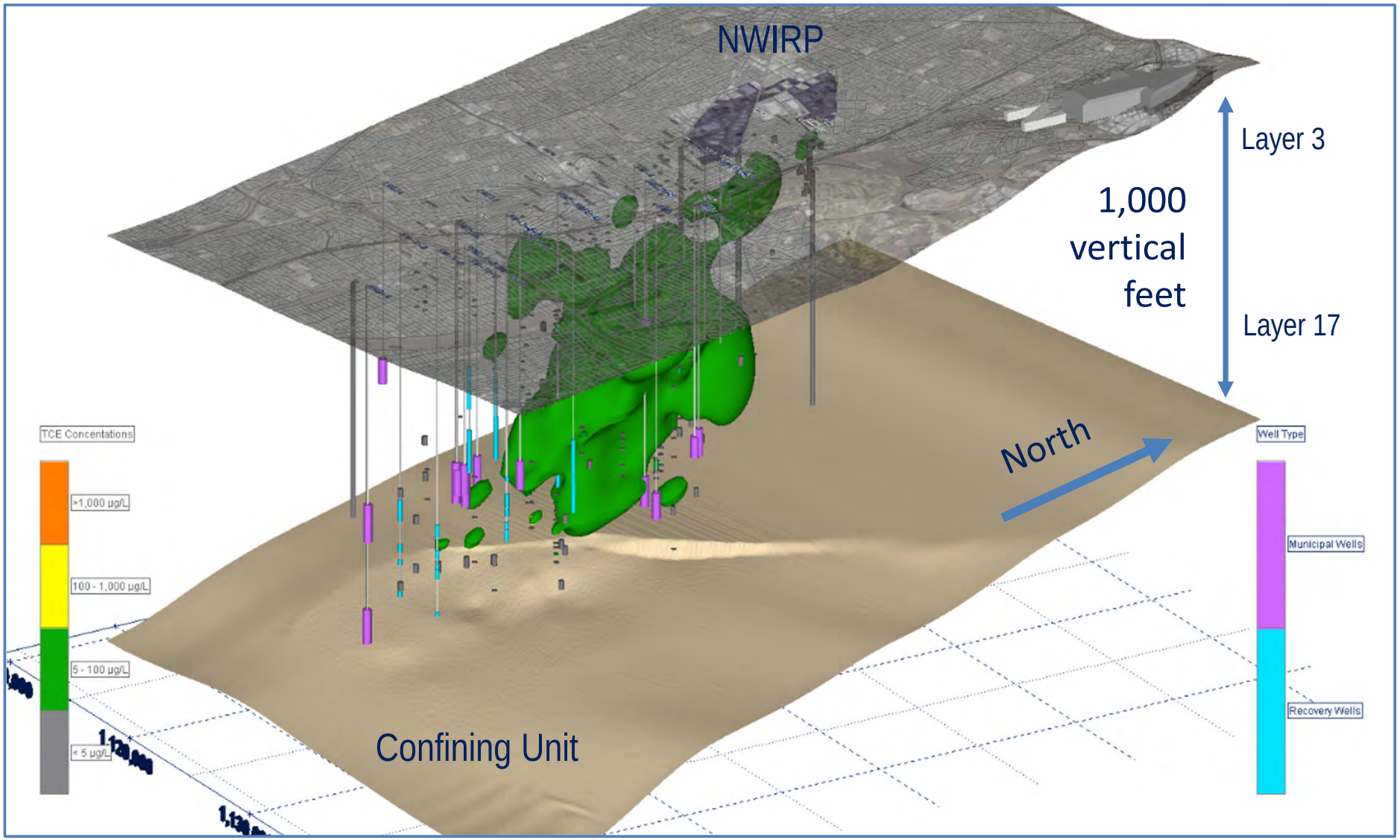
"Fate and transport" refers to how contaminants might change, where they go, and how fast they travel as they move through the environment.

OU2 Groundwater Fate and Transport Modeling

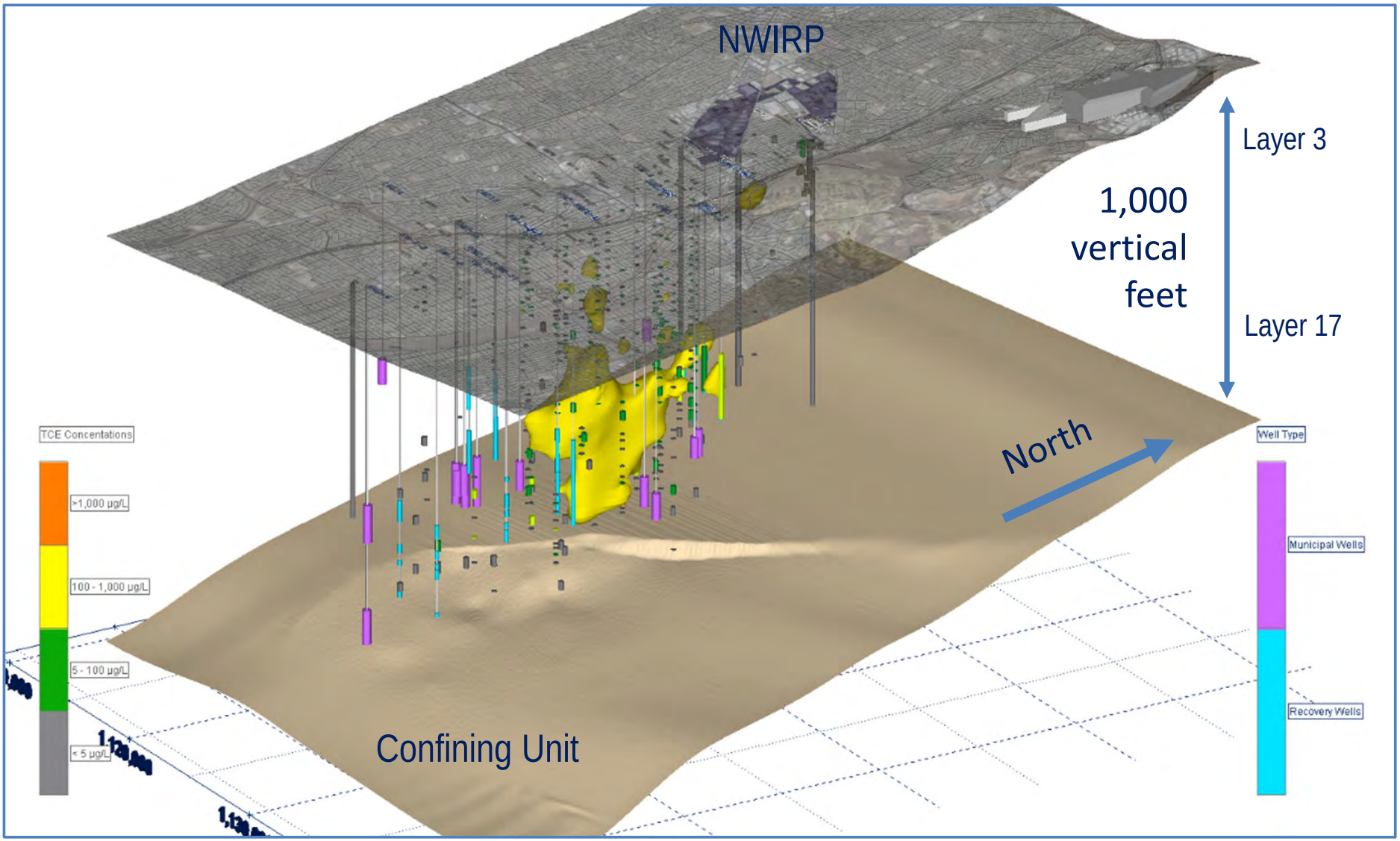
- OU2 plume boundaries are shown using trichloroethene (TCE) and 1,4-dioxane above drinking water standards



OU2 Groundwater Fate and Transport Modeling – 3D TCE Plume



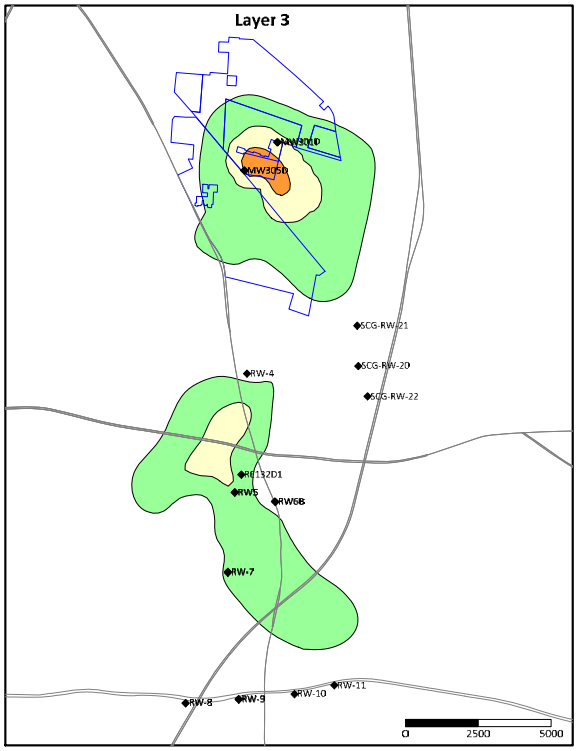
OU2 Groundwater Fate and Transport Modeling – 3D TCE Plume



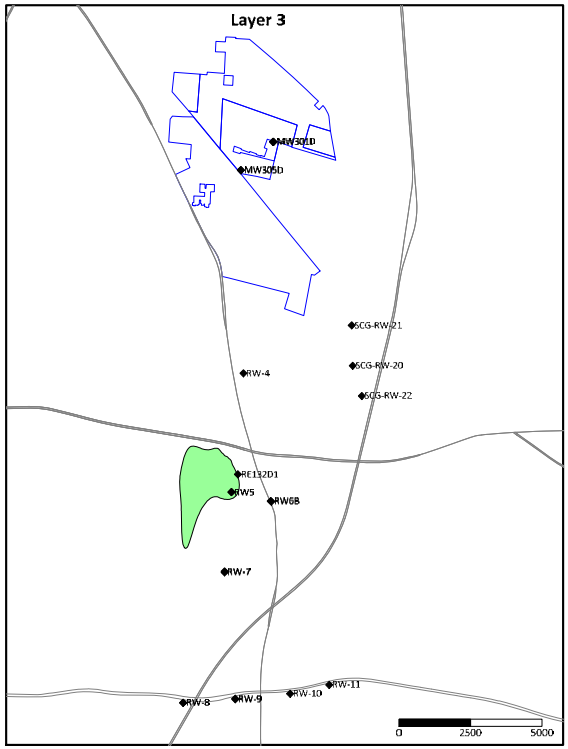
OU2 Groundwater Fate and Transport Modeling

- Layer 3 (Approx. 250 feet below ground surface) plume cleanup estimates (Trichloroethene)
- Different layers and concentrations cleanup at different rates (shallow layers cleanup faster)

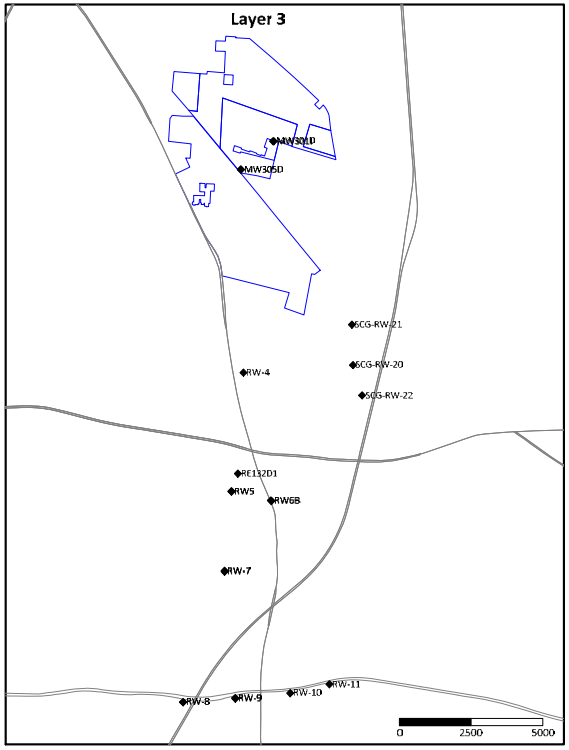
2020

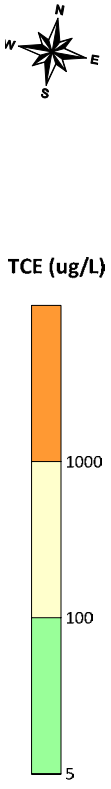


2050



2070

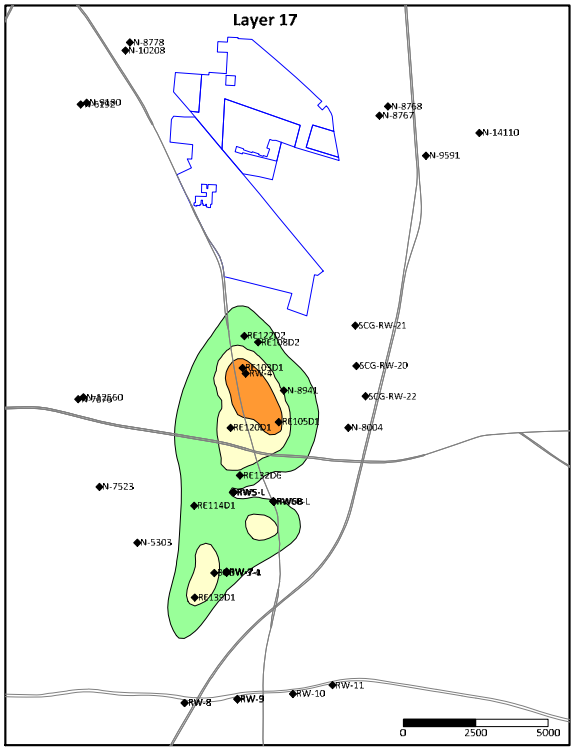




OU2 Groundwater Fate and Transport Modeling

- Layer 17 (Approx. 700 feet below ground surface) plume cleanup estimates (Trichloroethene)
- Different layers and concentrations cleanup at different rates (deeper layers take longer)

2020



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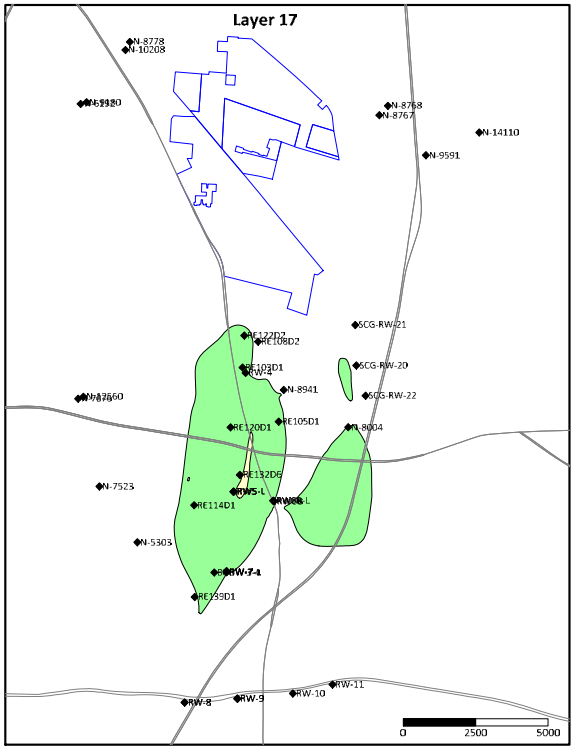
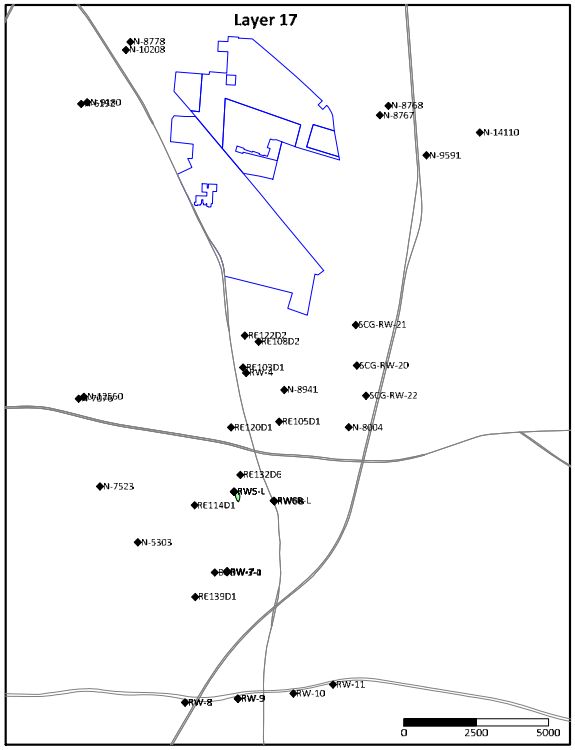
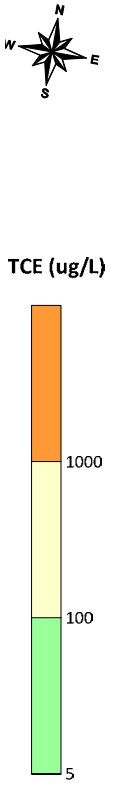


2080





OU2 Groundwater Fate and Transport Modeling

- Three-dimensional plume video

RAB Member Questions (10 minutes)

NEXT: Recovery Wells RW4 and RE137 Interim Action Update
Dave Brayack, Tetra Tech

Naval Facilities Engineering Systems Command
NAVFAC MID-ATLANTIC

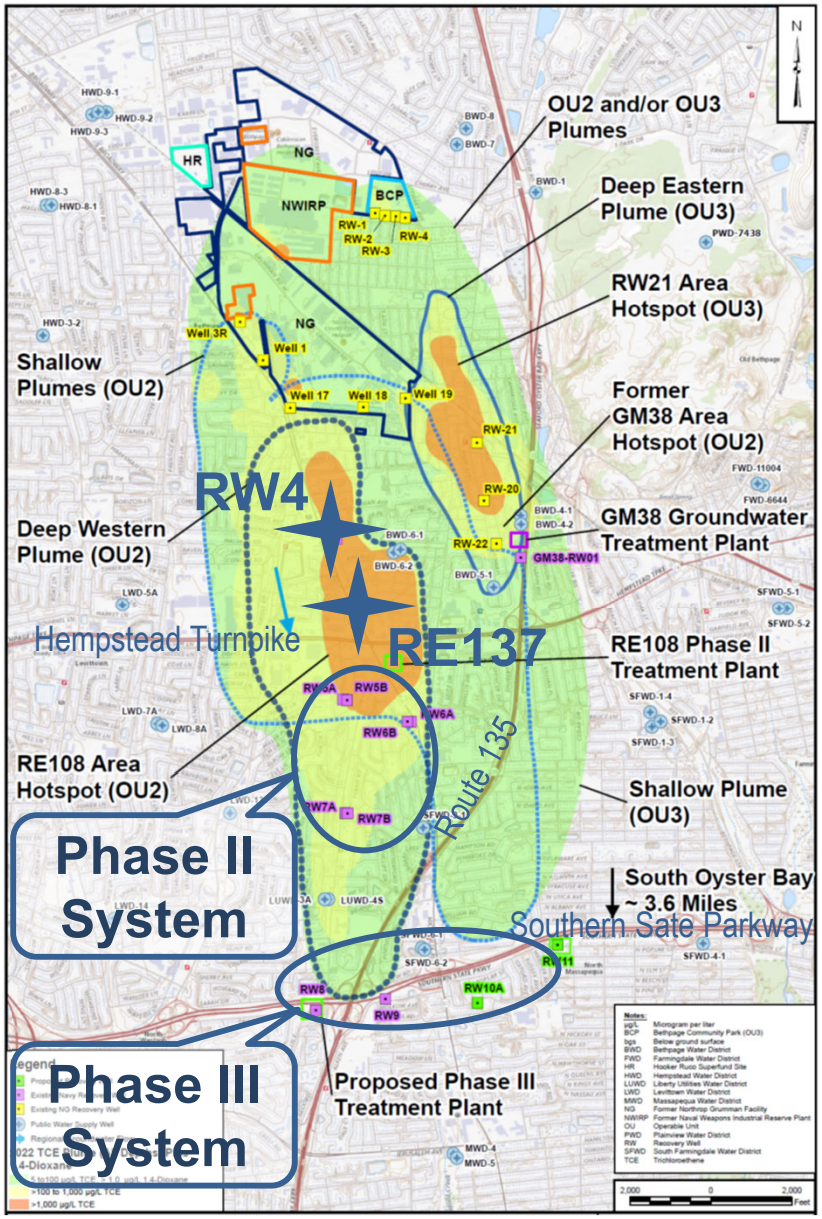
Department of Navy
Naval Weapons Industrial Reserve Plant Bethpage
Restoration Advisory Board Meeting

Recovery Wells RW4 and RE137 Interim Action Update

Presented by:
David Brayack, Project Manager
Tetra Tech
5 December 2023

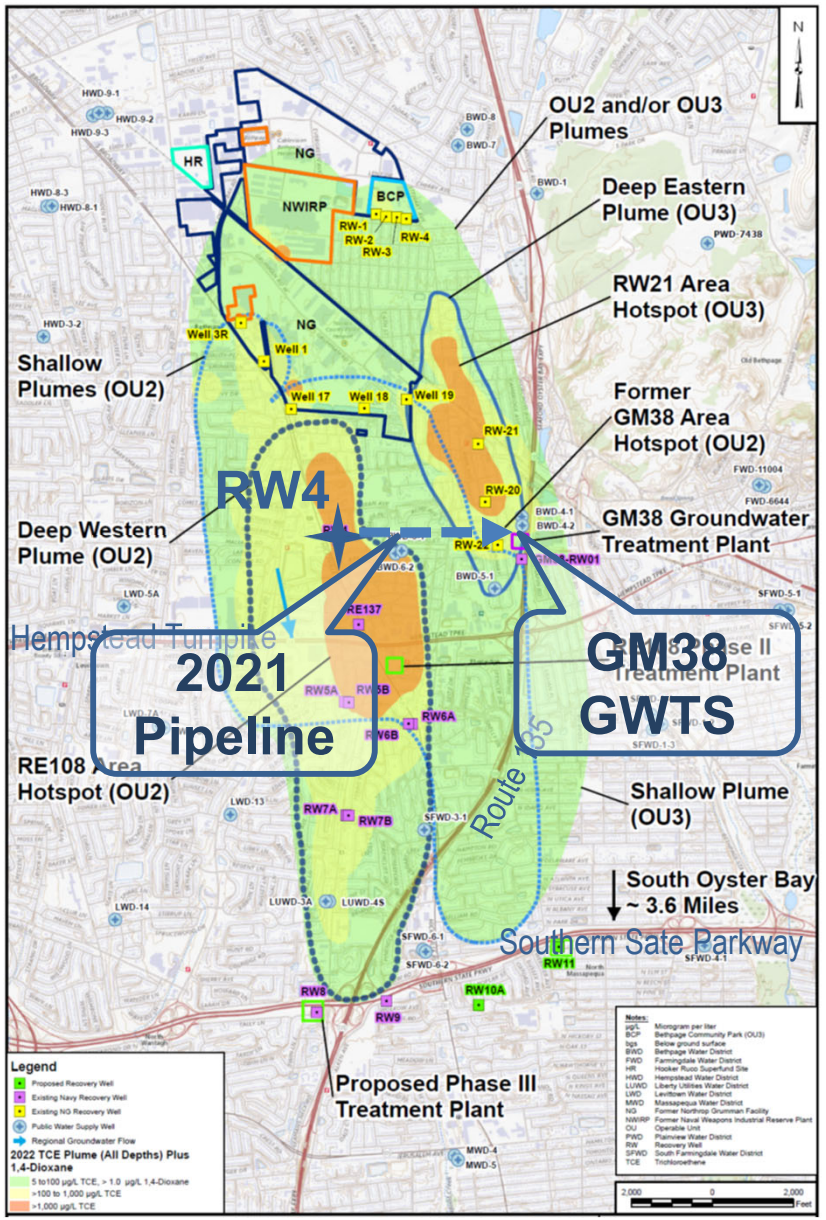
Recovery Wells RW4 and RE137 Overview

- Recovery Wells RW4 and RE137 both target the northern portion of the Operable Unit 2 (OU2) Hotspot Area Groundwater – Also referred to as the Phase I System
- Operation of these systems will shorten the overtime needed to clean up the OU2 plume
- A hotspot is groundwater with volatile organic compounds greater than 1,000 micrograms per liter (orange)
- Primary contaminant is trichloroethene (TCE), an organic solvent that has used for decades in many areas
- There are one current (RE108) and one former (GM38) Area Hotspots that the Navy is addressing under OU2
- Northrop Grumman is addressing the RW21 Area Hotspot under the New York State's OU3 remedy
- Downgradient (southern) portions of the OU2 plume are being addressed by Phase II and Phase III Remediation Systems



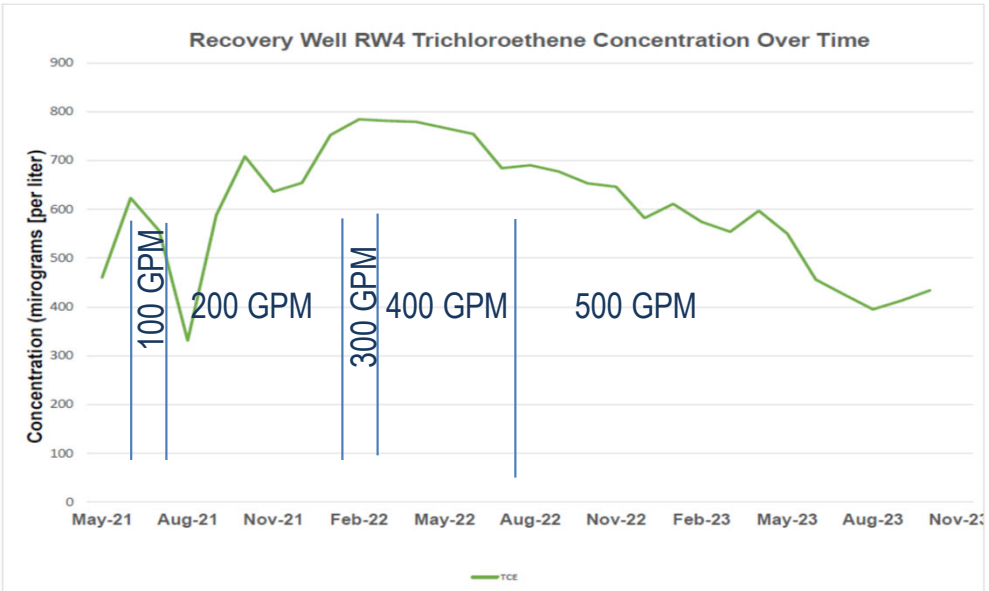
Recovery Well RW4 Operation

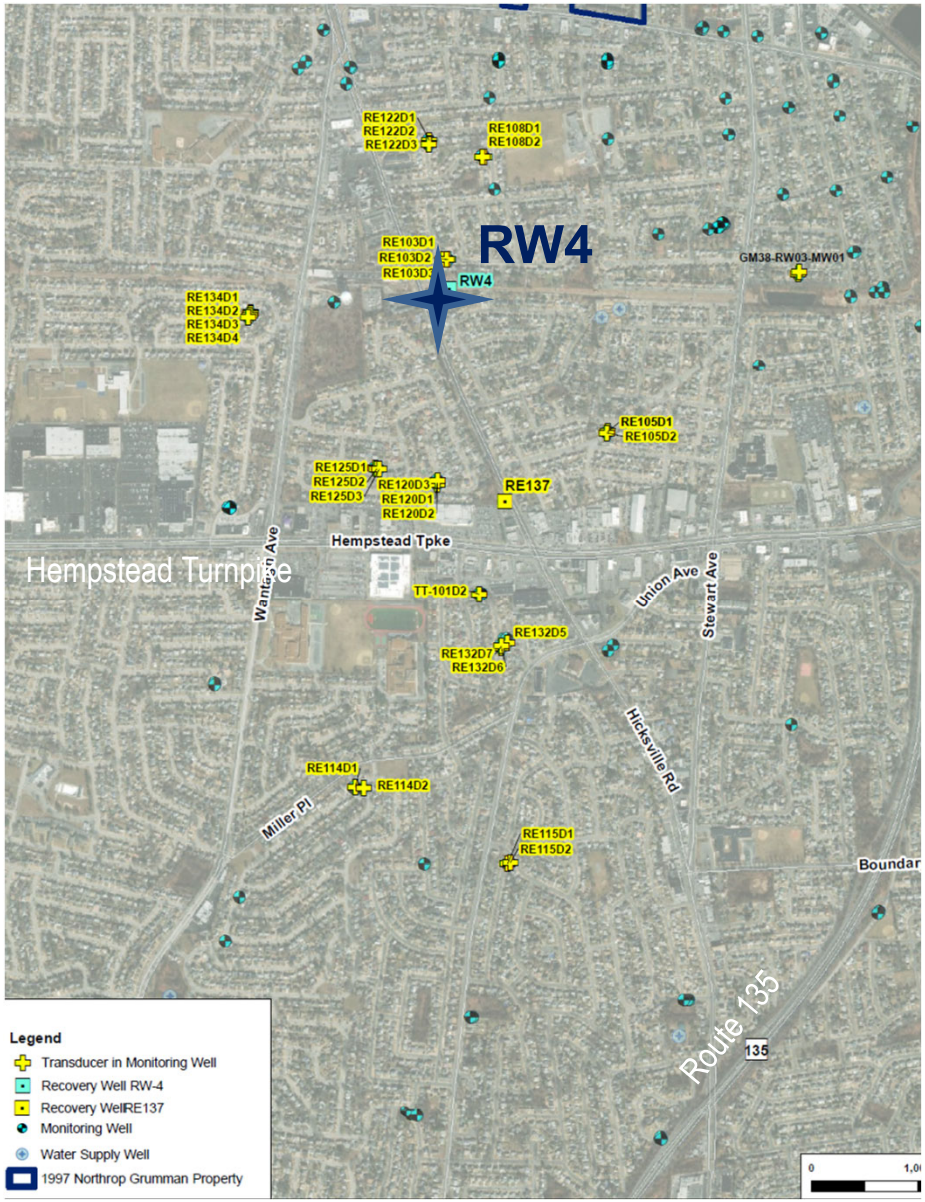
- Recovery Well RW4 is located in the northern portion of RE108 Area Hotspot
- In 2021, a 3,600-foot pipeline was constructed from RW4 to an existing pipeline for the GM38 Groundwater Treatment System
- This connection allows the existing GM38 GWTS to remediate a portion of the RE108 Area Hotspot groundwater
- In 2021, an advanced oxidation process (AOP) system was added to GM38 GWTS to remove 1,4-dioxane from extracted groundwater
- Other treatment at GM38 consists of filtration, air stripping with vapor phase treatment, and liquid granular activated carbon
- Since 2021, RW4 has extracted 460 million gallons of groundwater and the GM38 GWTS has removed 2,300 pounds of volatile organic compounds



Recovery Well RW4 Operation

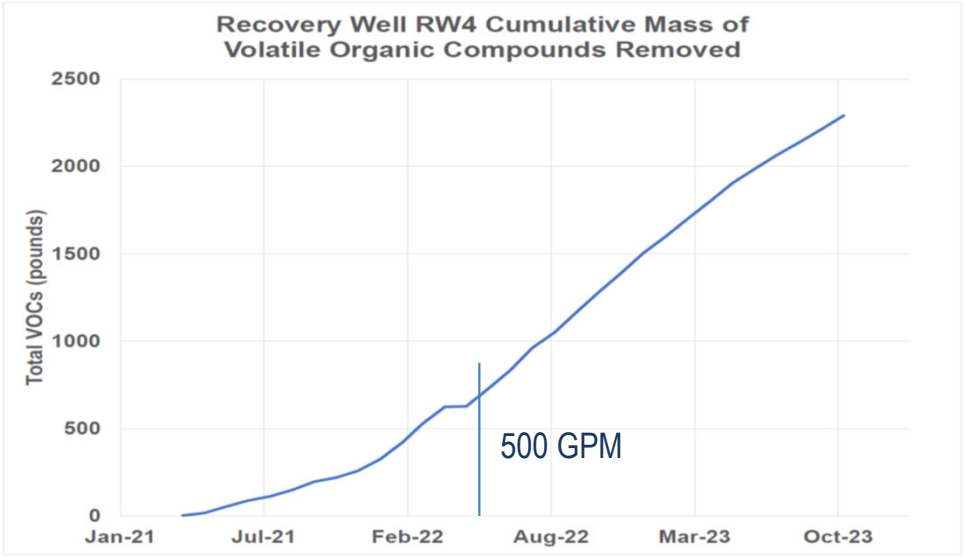
- RW4 is currently pumping 260 million gallons per year or 500 gallons per minute (GPM)
- Monitoring wells (yellow highlight) are being used to evaluate Recovery Wells RW4 (and RE137)
- Concentration of volatile organic compounds in RW4 have been decreasing over time, usually an indication of cleaner water being pulled into the capture zone of the extraction well
- System flow rate varied over time to evaluate aquifer response

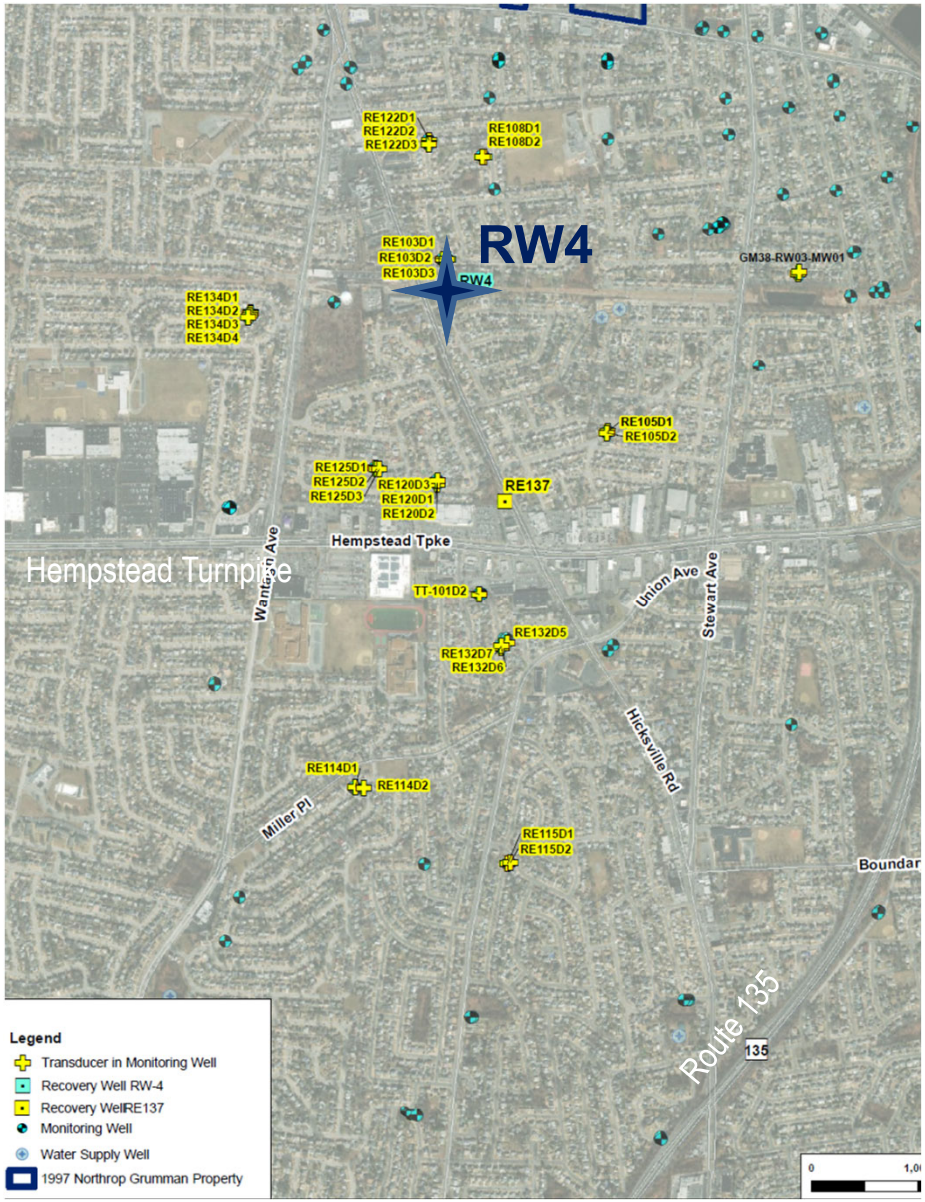




Recovery Well RW4 Operation

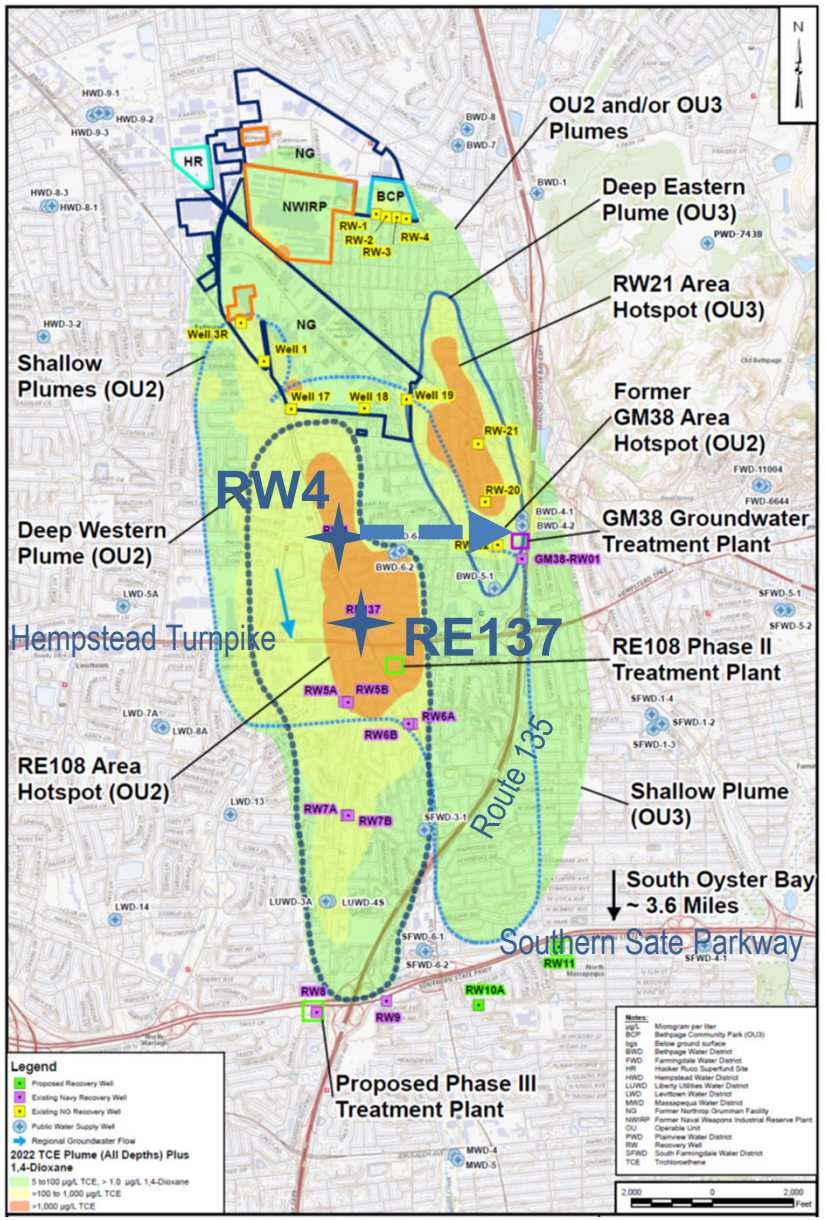
- Cumulative mass of Volatile Organic Compounds (VOCs) removed over time, notice a slight leveling off as VOC concentration decreases
- Current plan is to maintain a relatively high rate (500 GPM) for the next several years, with a longer-term design rate of 200 to 300 GPM





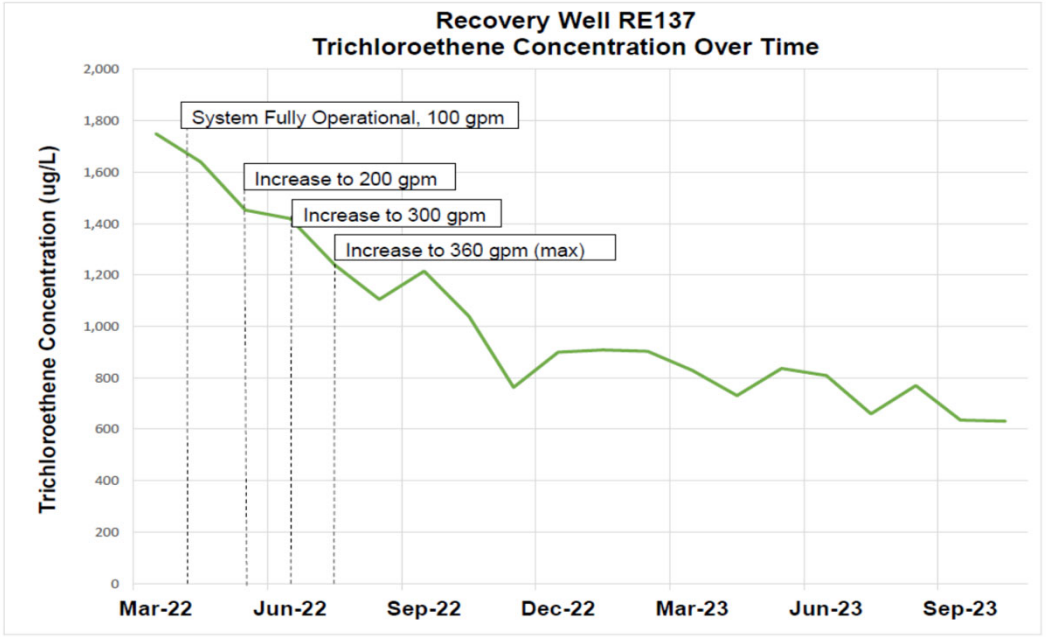
Recovery Well RE137 Operation

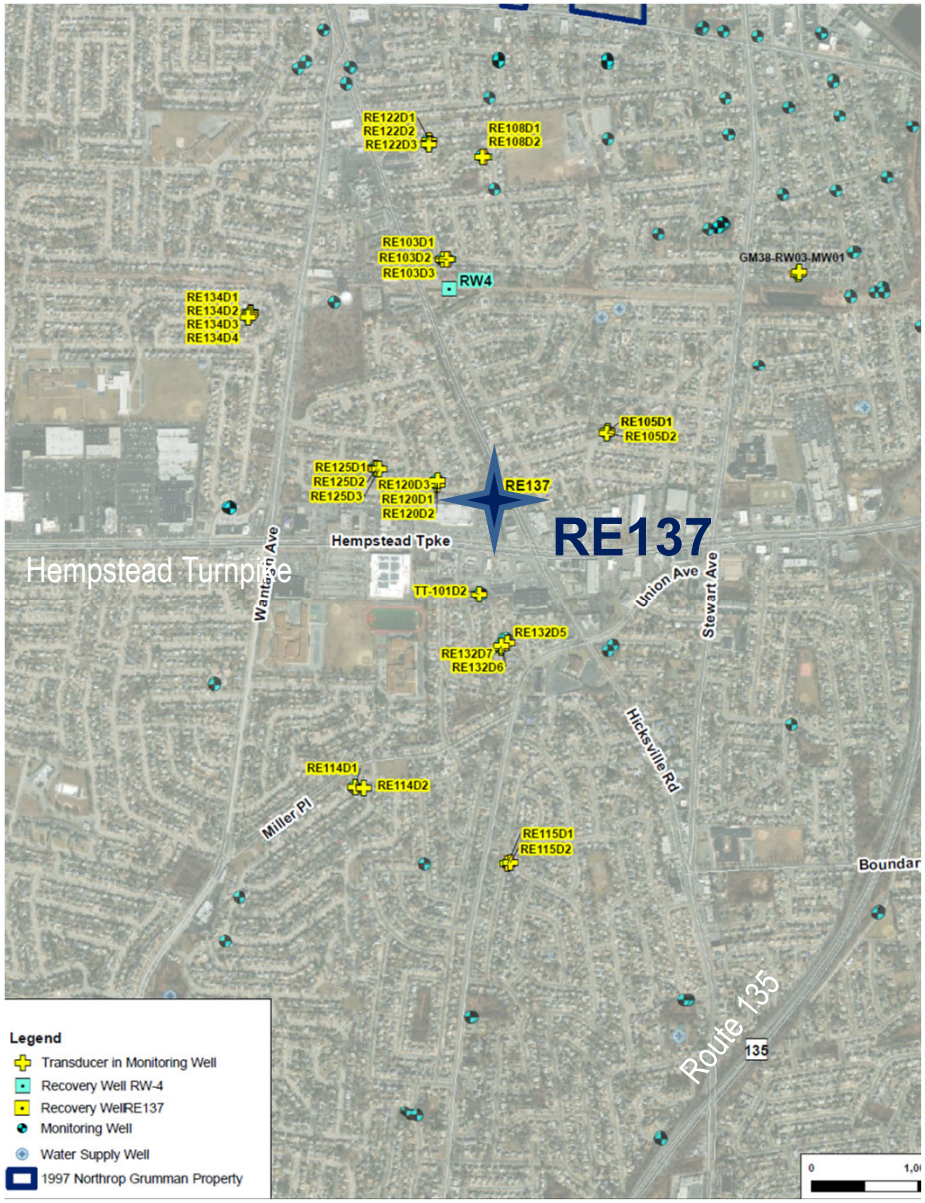
- Recovery Well RE137 is also located in the northern portion of RE108 Area Hotspot, but 2,000 feet south of RW4
- In 2022, RE137 started operation as an interim treatment system
- Treatment system consists of filtration, Advanced Oxidation Process (AOP) unit, and liquid granular activated carbon, with discharge to a local basin
- An air stripping system is being added to remove low levels (less than drinking water standards) of Freon 113 prior to discharge
- Since 2022, RE137 has extracted 230 million gallons of groundwater and the RE137 Groundwater Treatment System (GWTS) has removed 1,800 pounds of volatile organic compounds



Recovery Well RE137 Operation

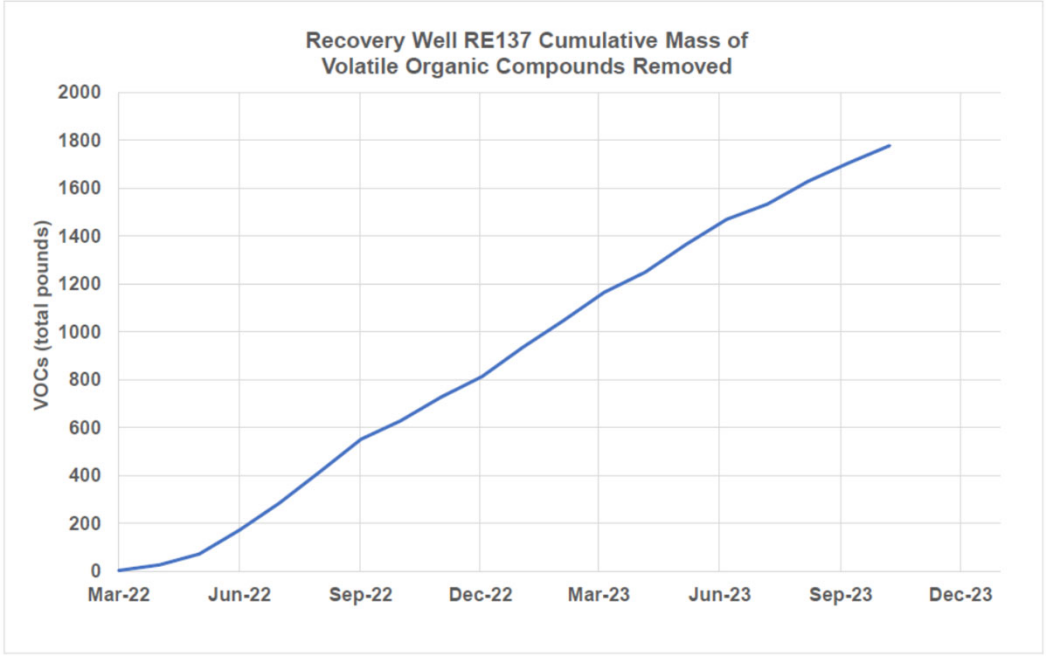
- RE137 is pumping 190 million gallons per year or 360 gallons per minute
- Monitoring wells (yellow highlight) are being used to evaluate Recovery Wells RE137 (and RW4)
- Concentration of volatile organic compounds have been decreasing over time, usually an indication of cleaner water being pulled into the capture zone, but appears to be leveling off

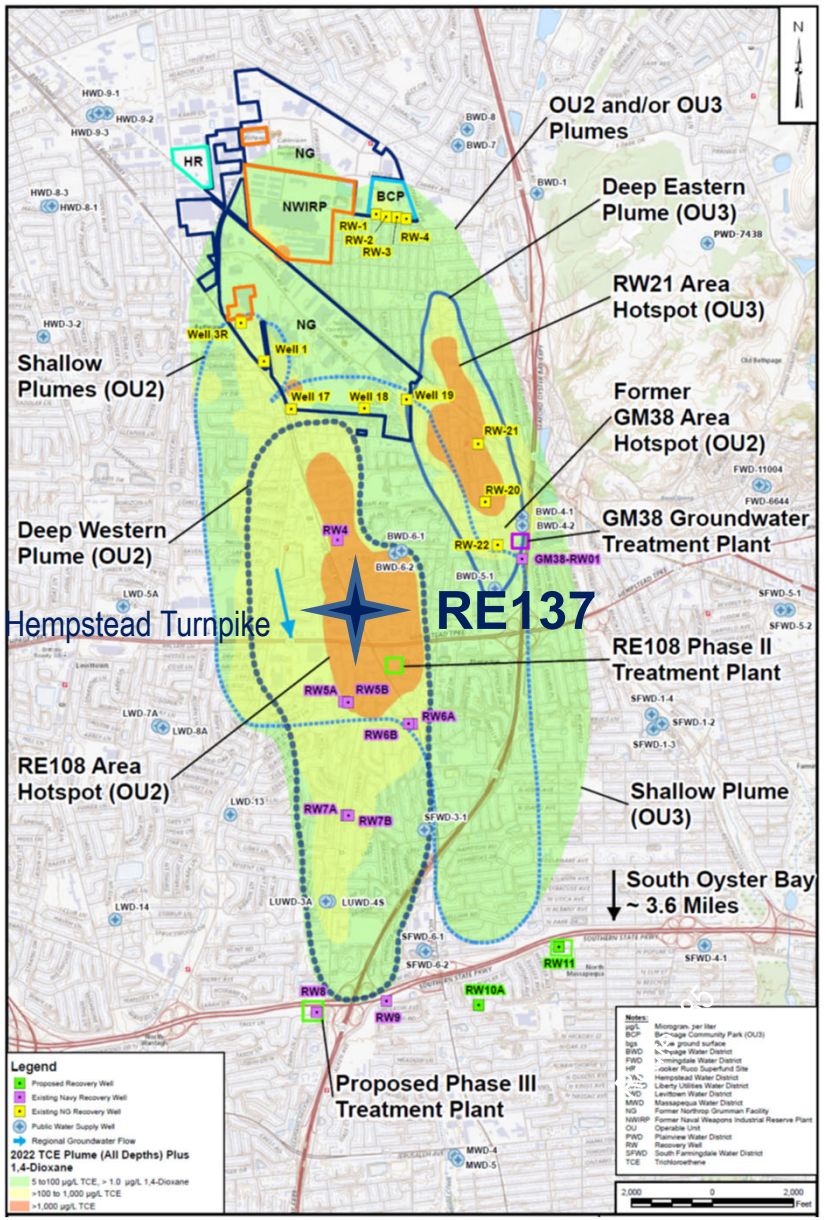




Recovery Well RE137 Operation

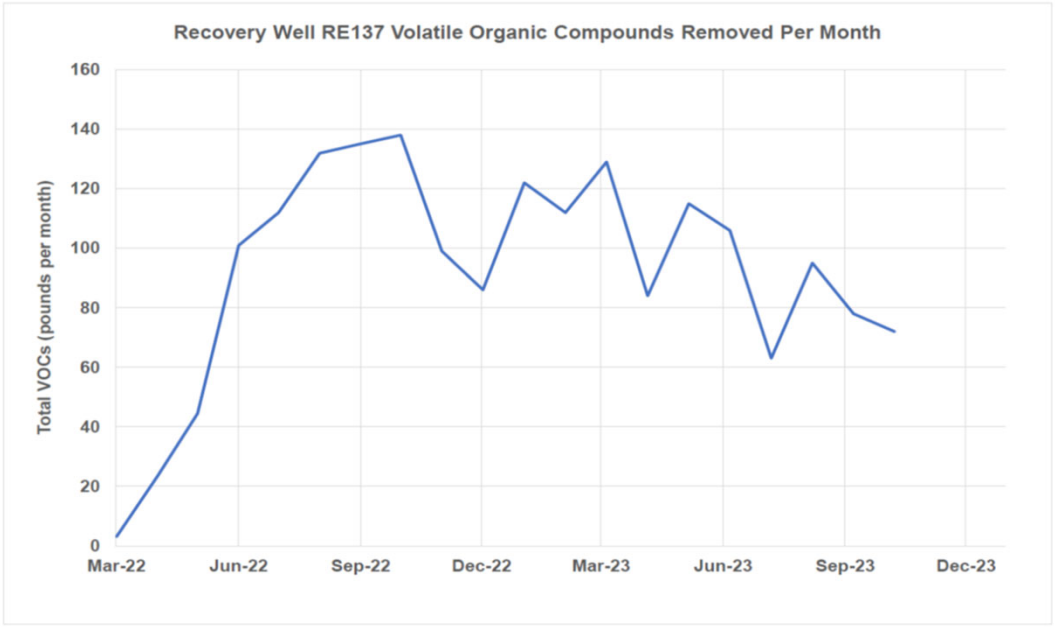
- RE137 is currently pumping 190 million gallons per year or 360 gallons per minute
- Good removal of volatile organic compounds continues

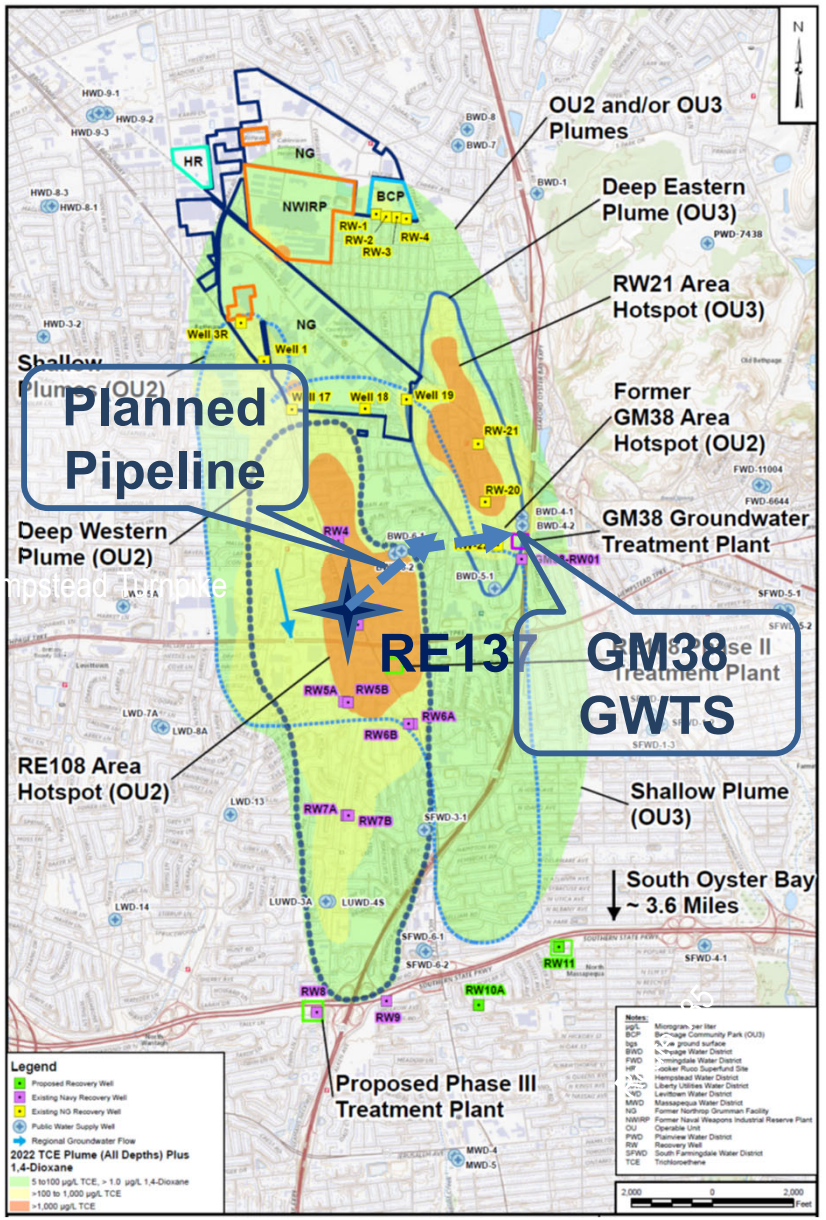




Recovery Well RE137 Operation

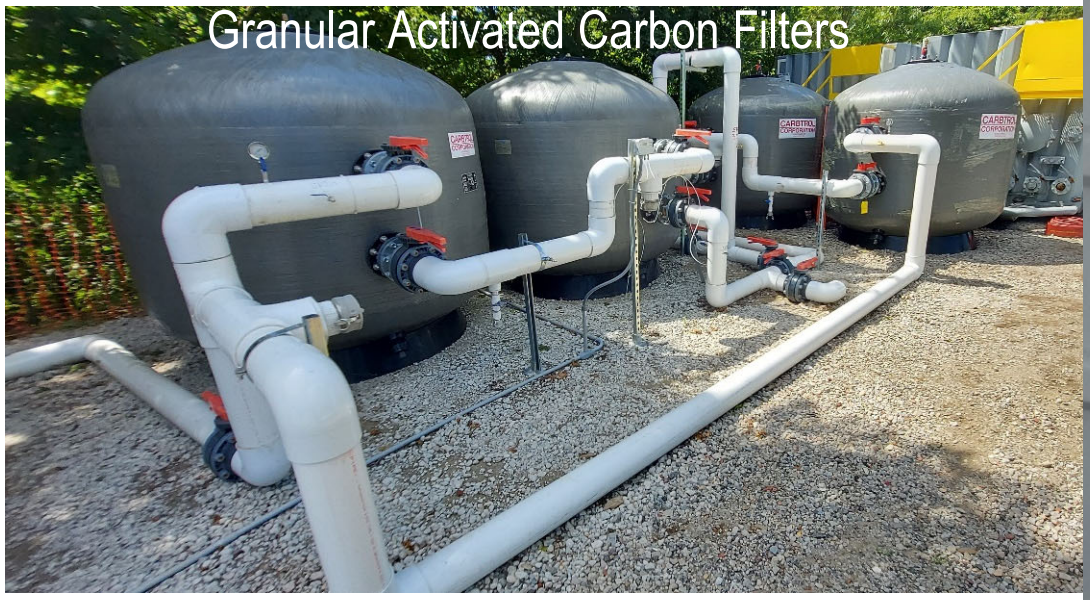
- A reduction in VOC removed per month is usually an indication of cleaner water being pulled into the capture zone
- Current plan is to continue to operate at 360 gallons per minute, at least through July 2024
- Groundwater will be routed to the GM38 GWTS for long-term operation via a new pipeline, with a long-term pumping rate of 200 to 400 gallons per minute





Recovery Well RE137 Operation

Recovery Well RE137 Operation



Recovery Well RE137 Operation

- Performance Results: greater than 99 percent removal

Parameter	RE137 - Influent (micrograms per liter)	Treatment System Effluent (micrograms per liter)
1,4-Dioxane (8260 SIM)	17	Not detected
1,1,2-Trichloroethane	1.1	Not detected
1,1-Dichloroethane	1	Not detected
1,1-Dichloroethene	6.9	Not detected
Carbon Tetrachloride	2.8	Not detected
Chloroform	1.4	Not detected
cis-1,2-Dichloroethene	3.9	Not detected
Freon 113	25.1	Not detected to 4.1
Tetrachloroethene	3.6	Not detected
Trichloroethene	1,930	Not detected

RAB Member Questions (10 minutes)

NEXT: Phase III (RW8 to RW11) – Southern Plume Intercept Treatment System Update

Naval Facilities Engineering Systems Command
NAVFAC MID-ATLANTIC

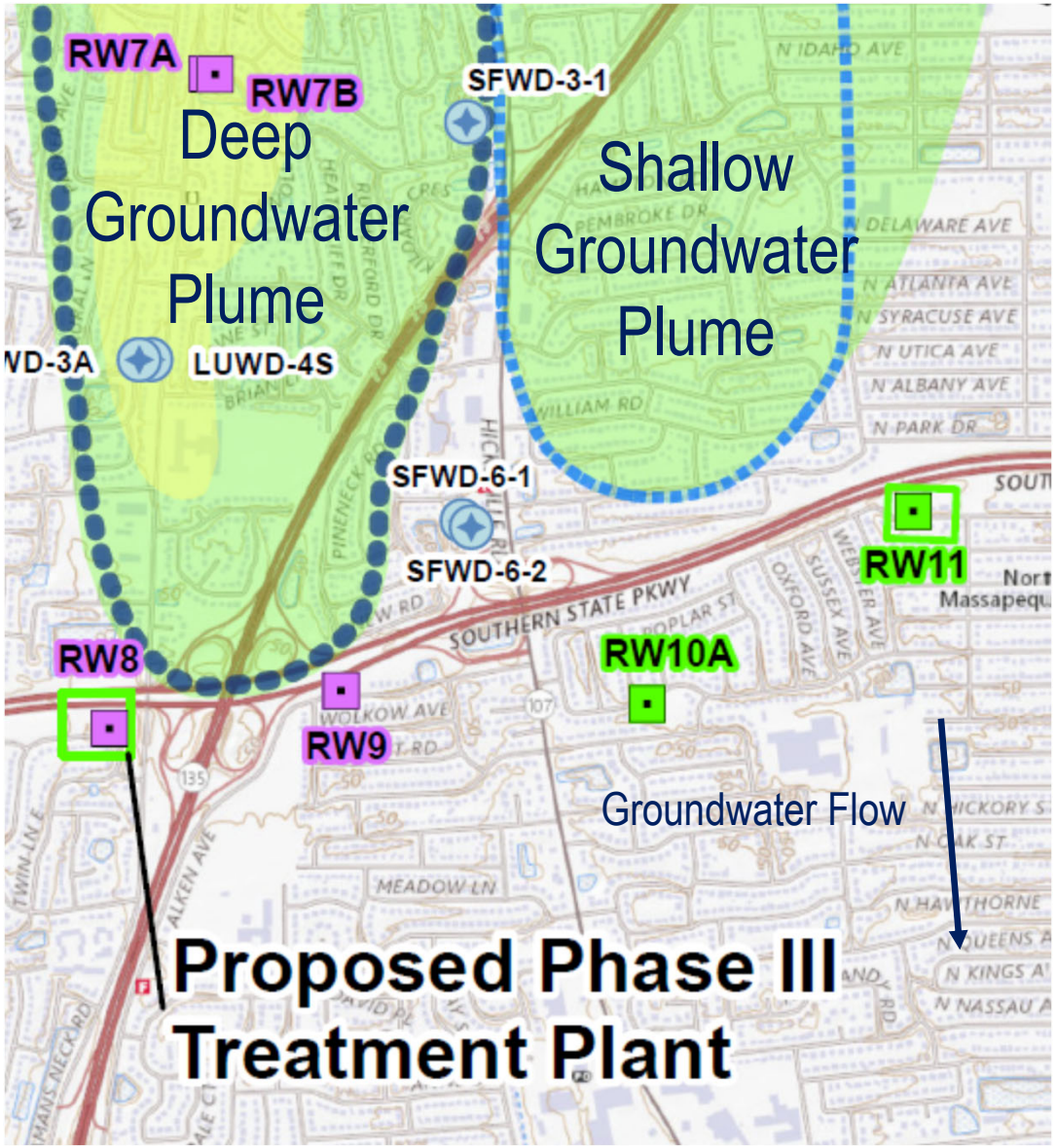
Department of Navy
Naval Weapons Industrial Reserve Plant Bethpage
Restoration Advisory Board Meeting

Phase III (RW8 to RW11) – Southern Plume Intercept Treatment System Update

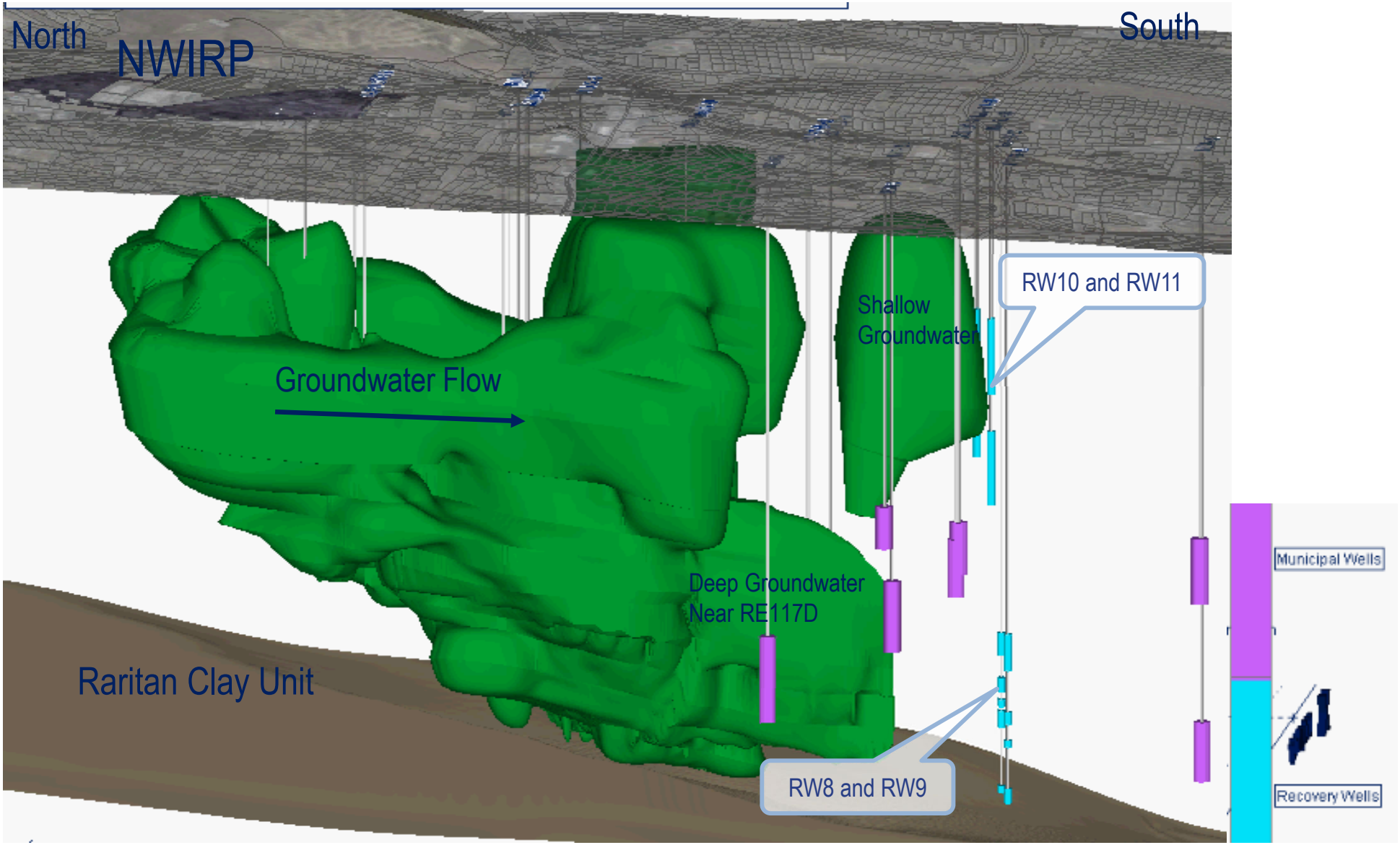
Presented by:
David Brayack, Project Manager
Tetra Tech
5 December 2023

Phase III – Southern Plume Intercept Treatment System Update

- Location based on extensive monitoring of plume migration and space available
- Recovery wells RW8 and RW9 target deep groundwater that is not captured by Recovery well RW7 – Initial focus on deep groundwater
- Recovery wells RW10A and potentially RW11 target shallow groundwater to the east, with a possibility of a separate treatment plant – shallow groundwater

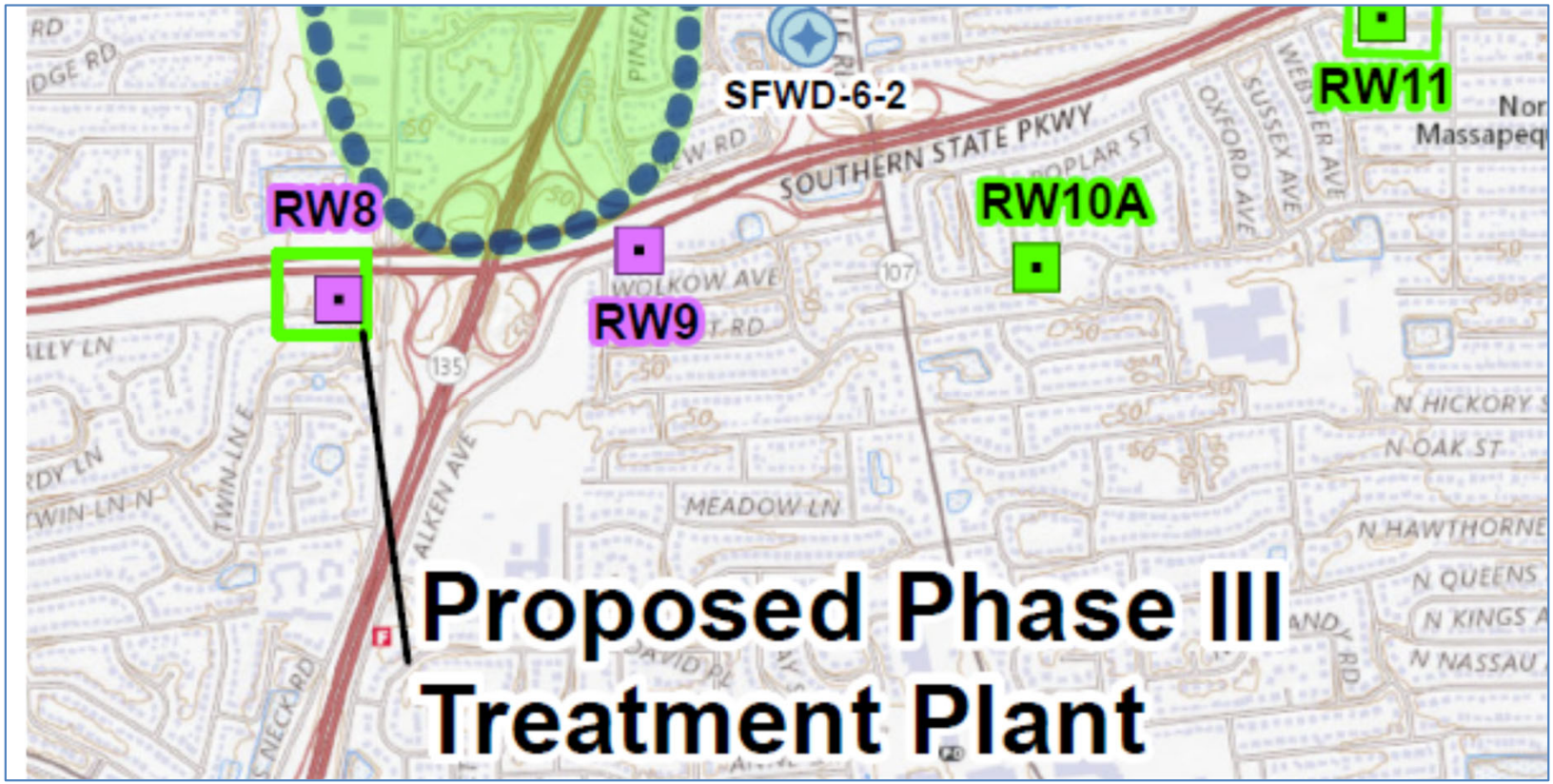


Phase III – Southern Plume Intercept Treatment System Update



Phase III – Southern Plume Intercept Treatment System Update

- RW8 and RW9 VPBs, monitoring wells, and recovery wells are complete
- RW10 and RW11 VPBs are complete and associated monitoring wells are in progress



Phase III – Southern Plume Intercept Treatment System, Recovery Well RW8 Area

Phase III – Southern Plume Intercept Treatment System, Recovery Well RW8 Pumping Test Equipment

- Pumping tests conducted at 1,000 gallons per minute for three days
- Although water was clean, filtration and granular activated carbon (GAC) was used to treat water prior to discharge
- Data is used to check model calibration and, if necessary, modify the model calibration in this area

Phase III – Southern Plume Intercept Treatment System Update – Path Forward

- Phase III (RW8, RW9, and RW10A) Treatment System design: 2022 to 2024
  - Surveying and basin infiltration testing underway
  - Preliminary layout of treatment plant
  - RW9 to RW8 pipeline construction awarded
  - Design of full system in progress
- Treatment Plant construction to start in 2024
- Treatment will consist of aeration, iron oxidation, filtration, AOP treatment, and liquid phase granular activated carbon polishing
- Building roughly 80 feet by 140 feet
- System is being designed to treat 2.3 million gallons of groundwater per day from RW8, RW9, and RW10A

RAB Member Questions (10 minutes)

NEXT: Community Involvement Plan and RAB Membership Drive
Scott Sokolowski, Navy

Presentation Topics – Restoration Advisory Board, Community Involvement Plan

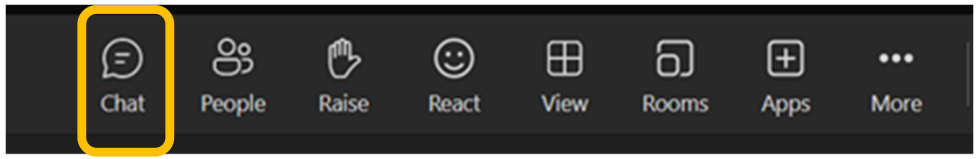
- RAB Drive – ongoing
  - Apply online (flyer available online as well)
- Environmental Concerns Survey
  - Data collected will be provided in the CIP
  - Helps us better communicate with the community
  - Will provide an email update when survey is ready to be sent

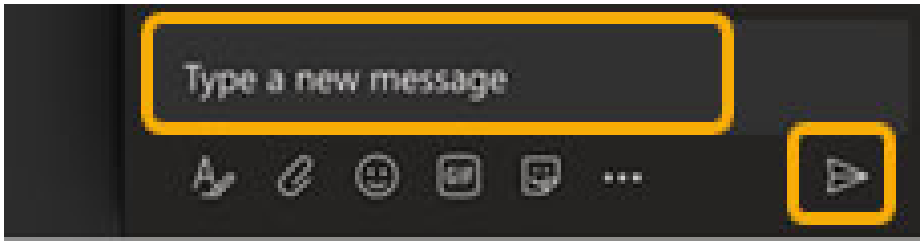
16 November 2022

Questions and Answers from the Public

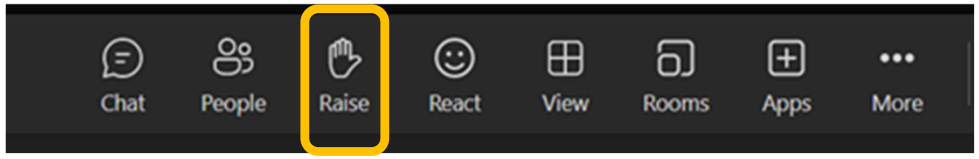
Virtual Attendee Questions

1) To ask a question, select ‘Chat’, then type your question in the text box, and then select Send.





2) Raise your hand to be recognized and have your microphone unmuted. Select ‘Raise your hand’ icon in the meeting controls.



3) Phone-only attendees can dial *6 to raise their hand and have the opportunity to ask a question.

Closing Remarks

Thank you for attending tonight's RAB Meeting!