Naval Facilities Engineering Systems Command
NAVFAC MID-ATLANTIC

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

Operable Unit 2 Groundwater Monitoring/ Modeling Results

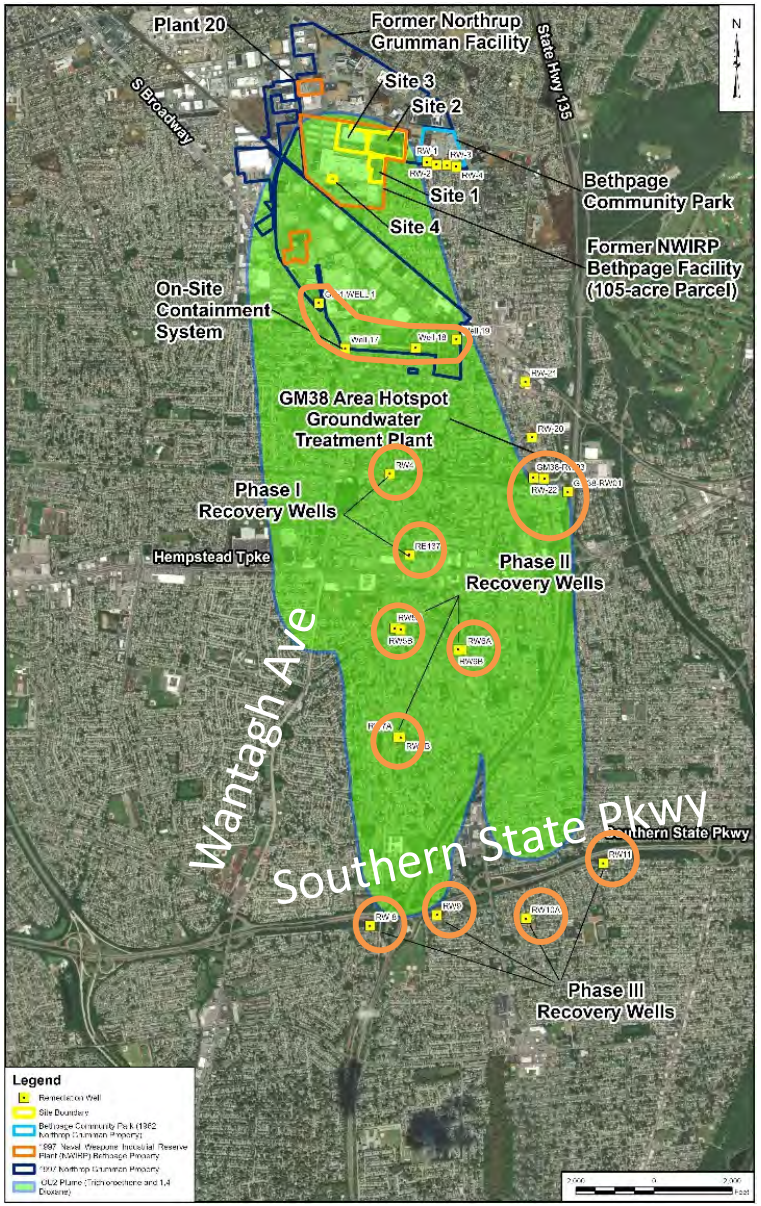
Presented by:
Rick Moore, Project Manager
Tetra Tech
5 December 2023

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

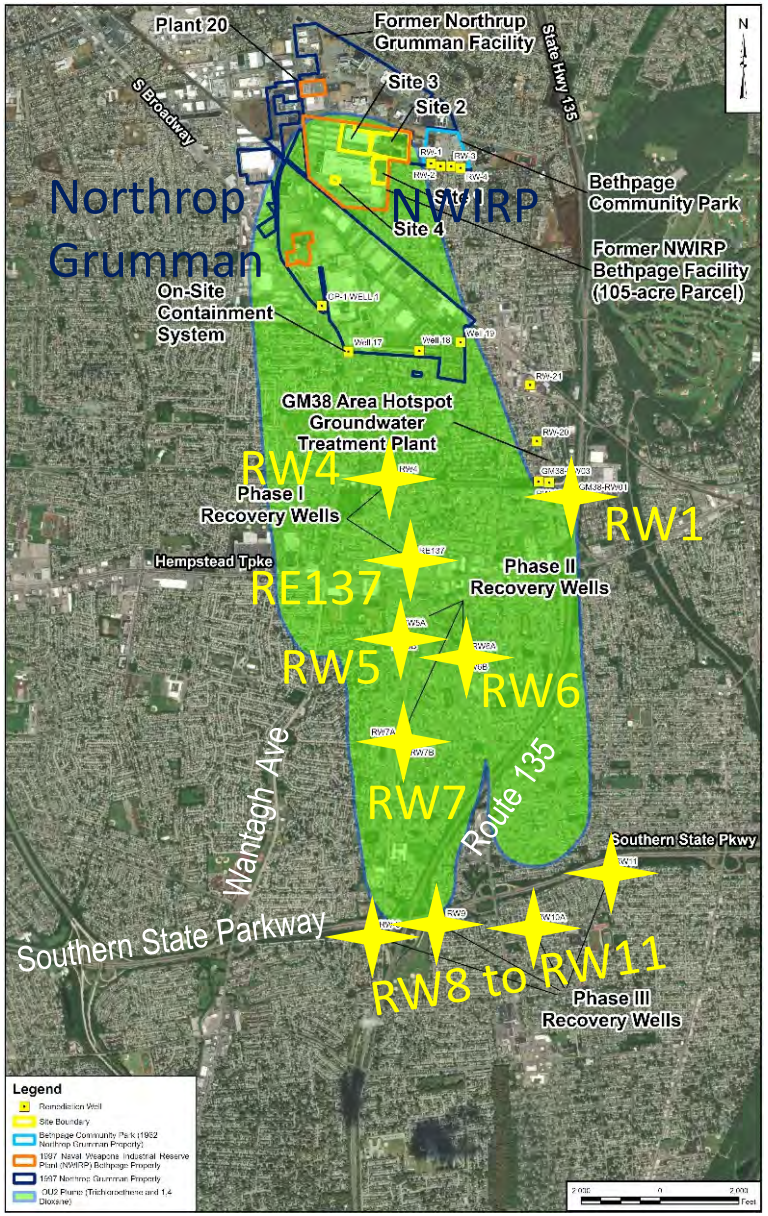
OU2 Groundwater Remediation Overview

- 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

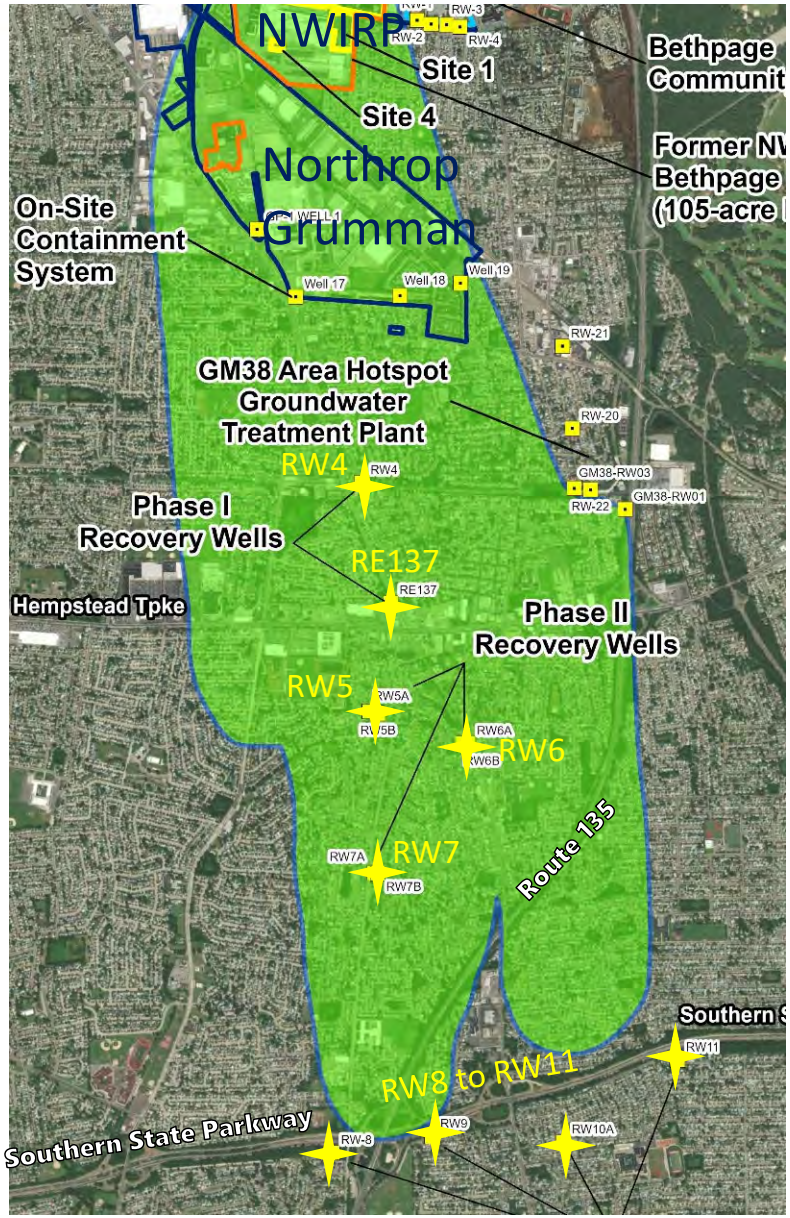
- Monitoring – OU2 plume migration, attenuation, and cleanup
- Groundwater samples – 180 wells on a quarterly, semi-annual, or annual basis, and analyzed for volatile organic compounds (VOCs) and 1,4-dioxane
- Recovery Wells RW1, RW4, and RE137 operating
- Recovery Wells RW5A/5B, RW6A/B, RW7A/B, RW8, 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

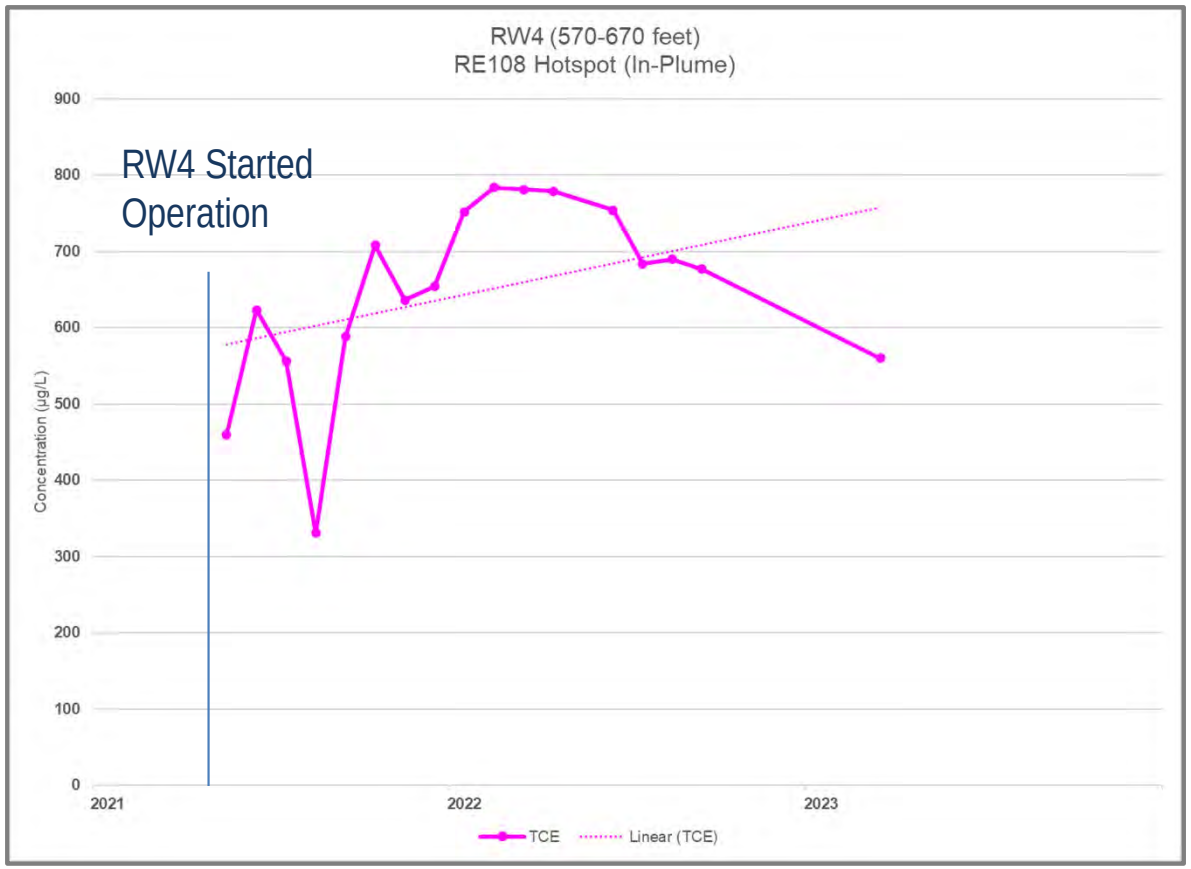
- New monitoring wells continue to be added as needed:
  - ➢Recovery wells for Phase III
  - ➢Monitoring wells for performance monitoring
  - ➢Leading edge monitoring wells
  - ➢Additional data gap wells planned for 2023 and 2024 – to support plume cleanup and capture analysis

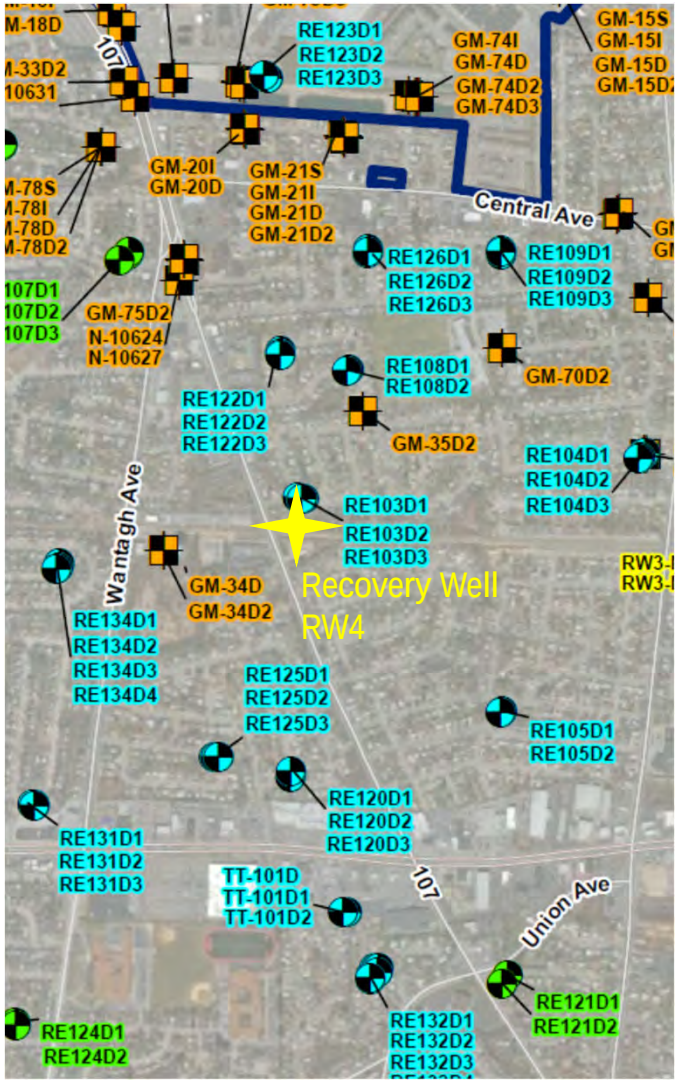
- Monitoring well program has shifted from plume delineation to support of plume cleanup progress



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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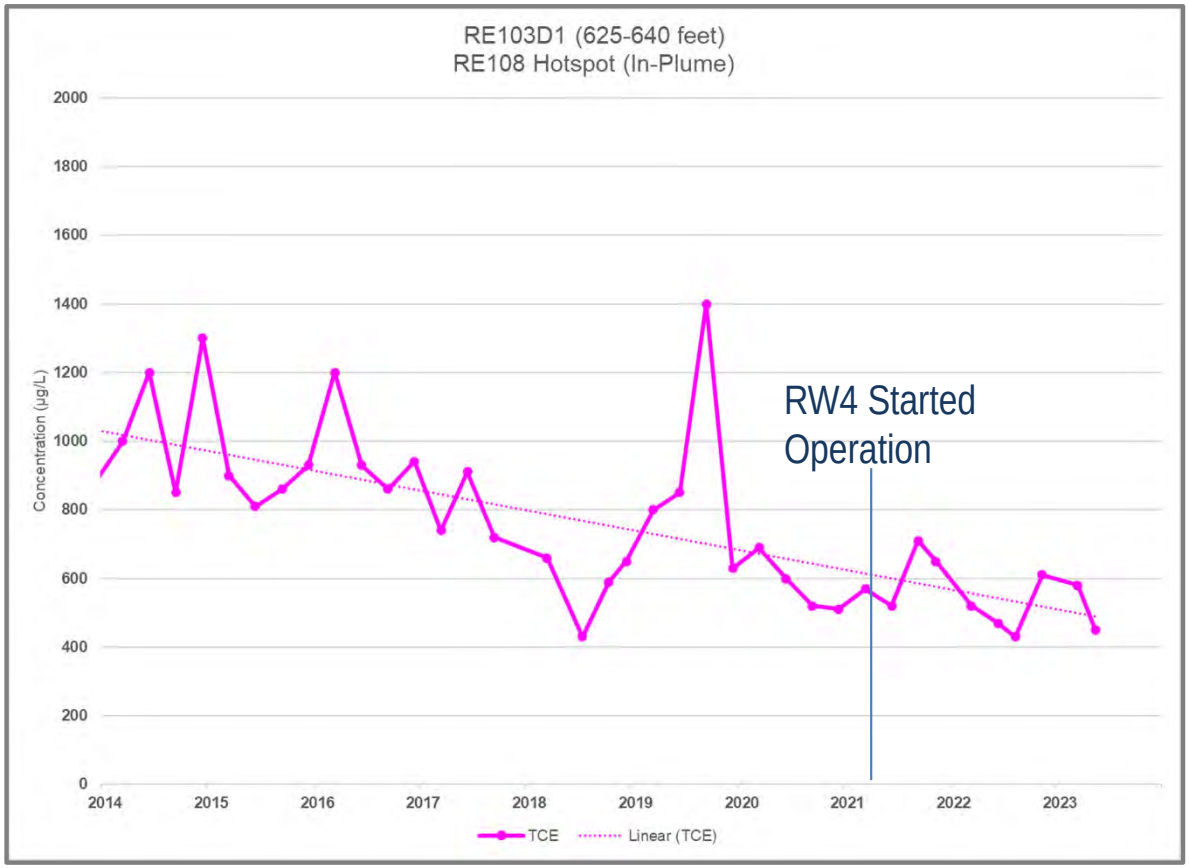

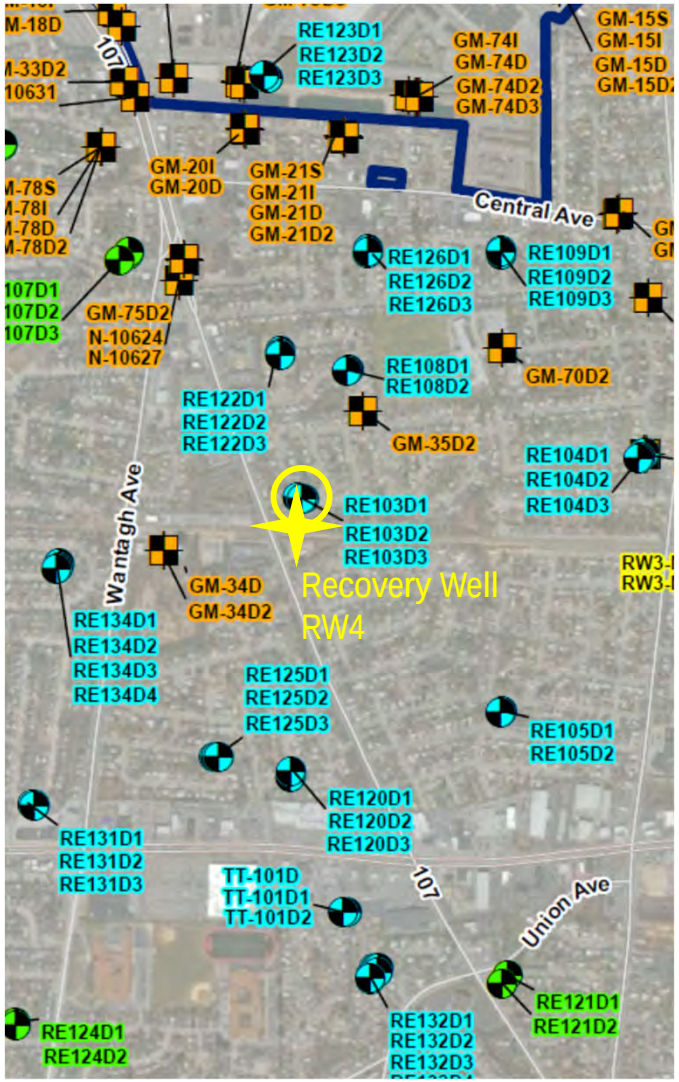

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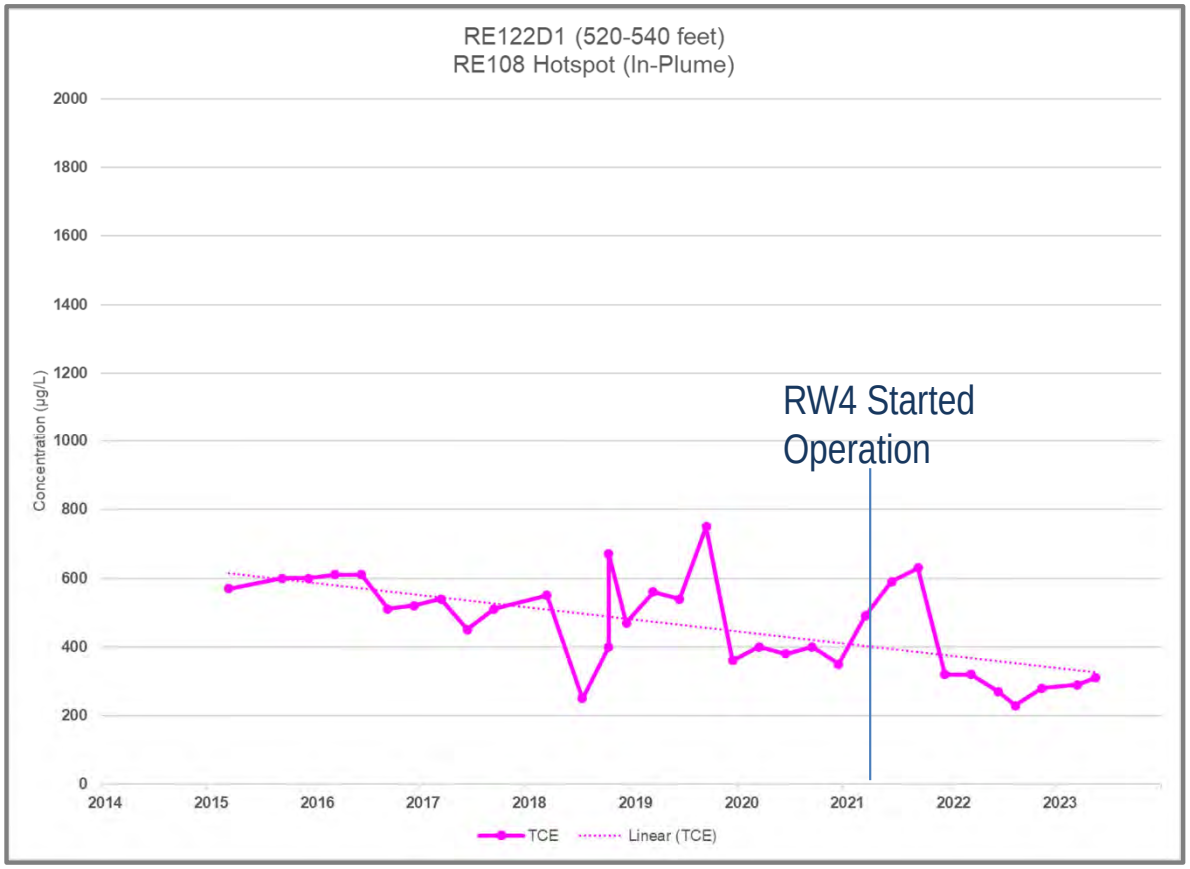

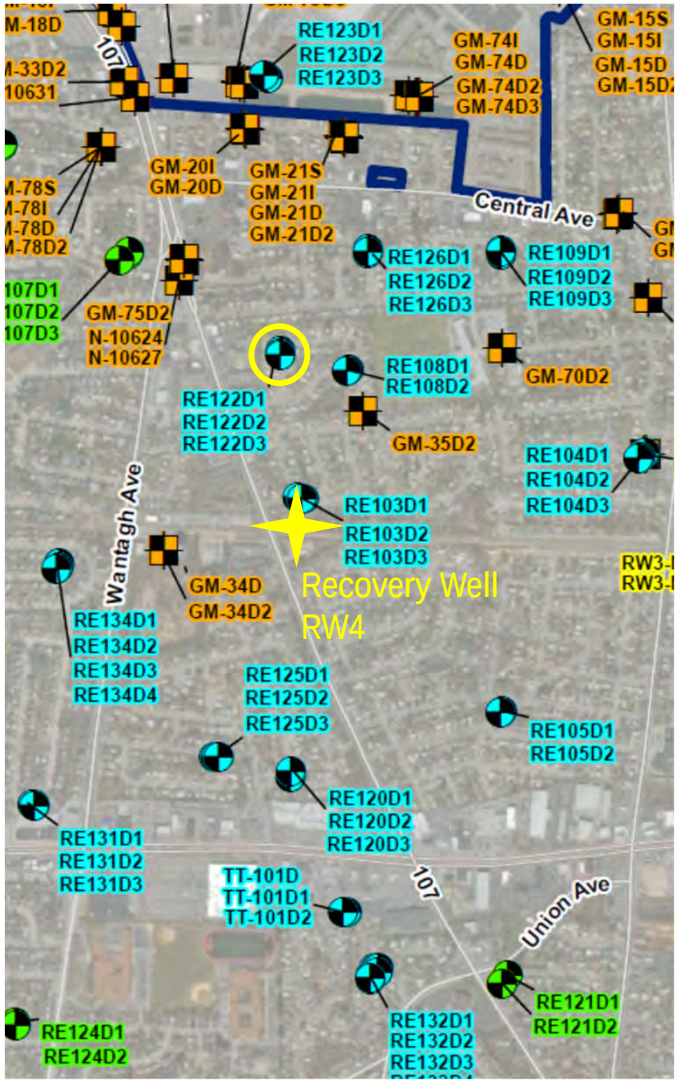

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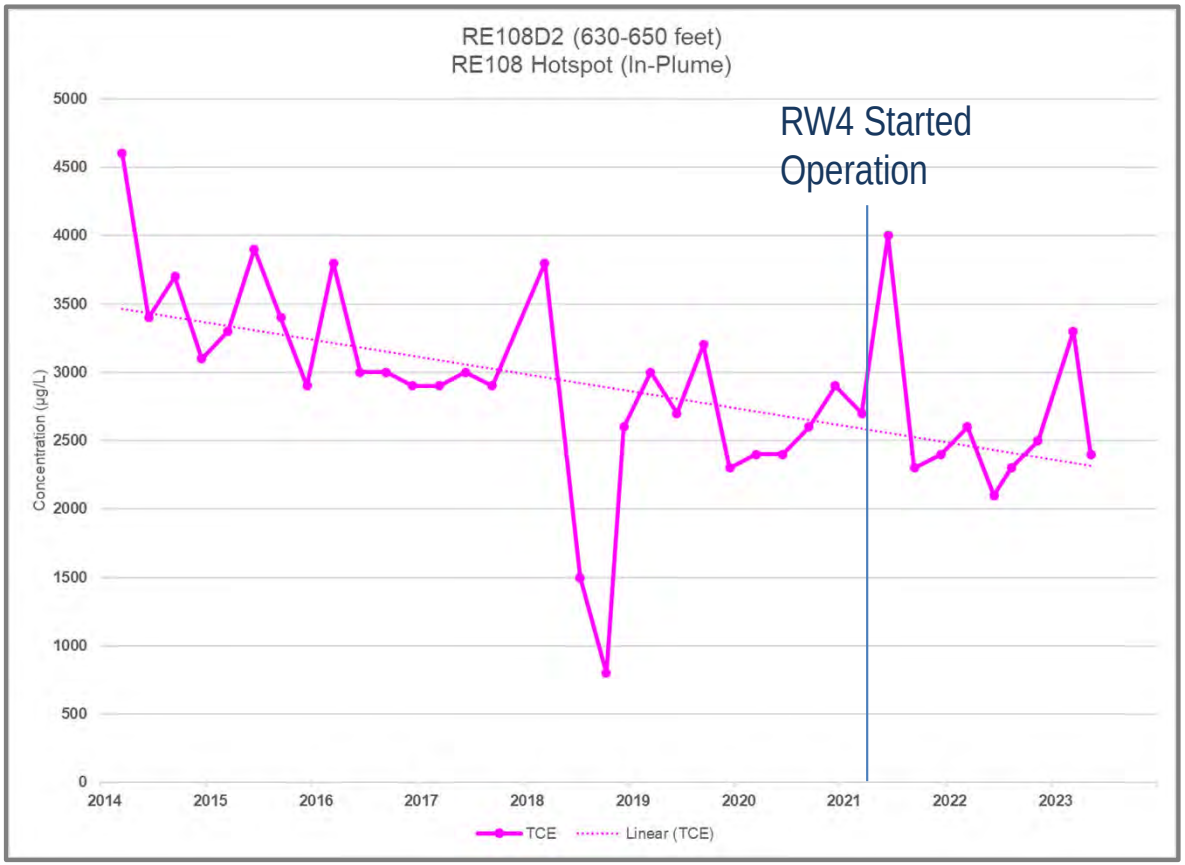
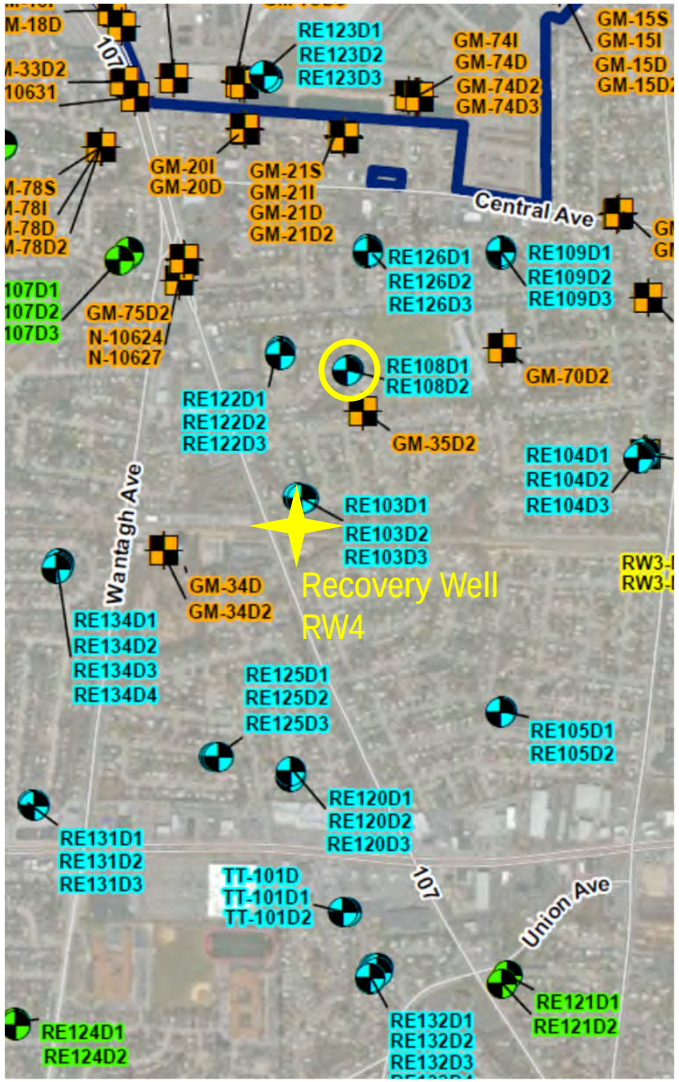
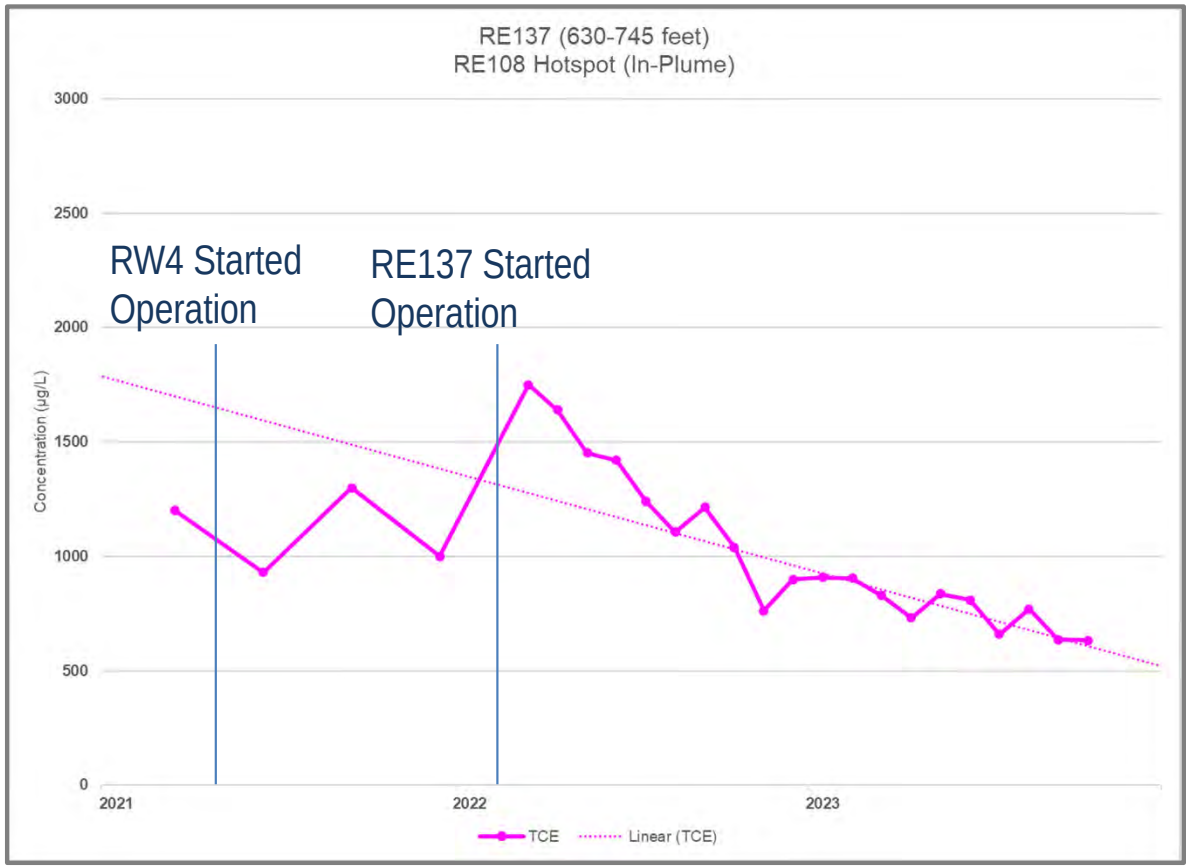
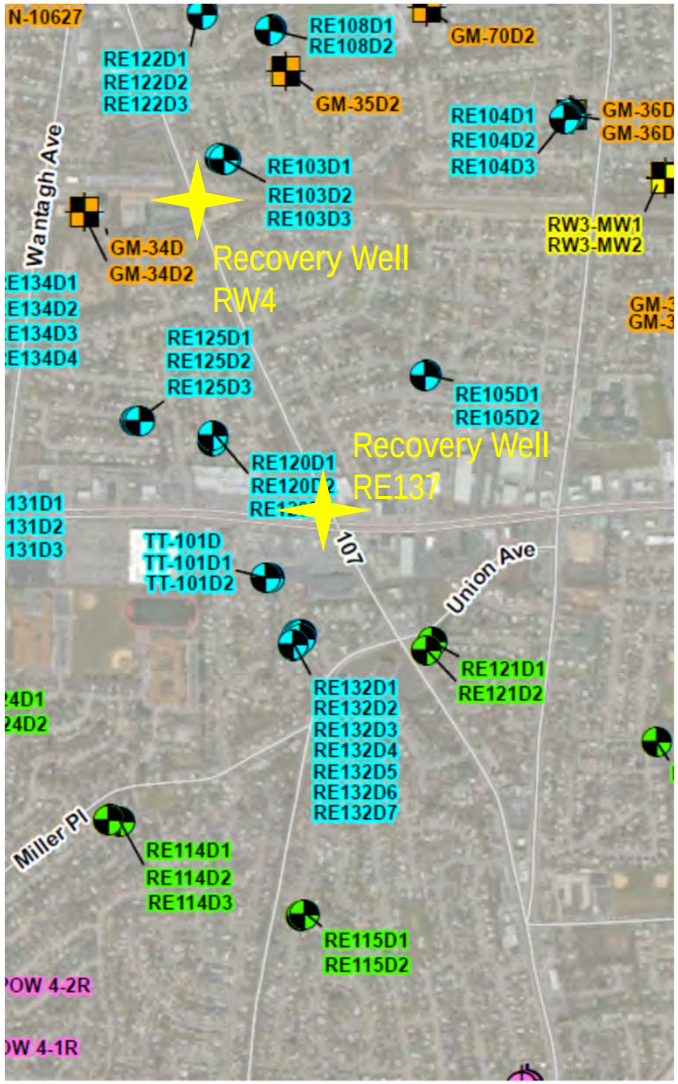




OU2 Groundwater Monitoring – Recovery Well RE137

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





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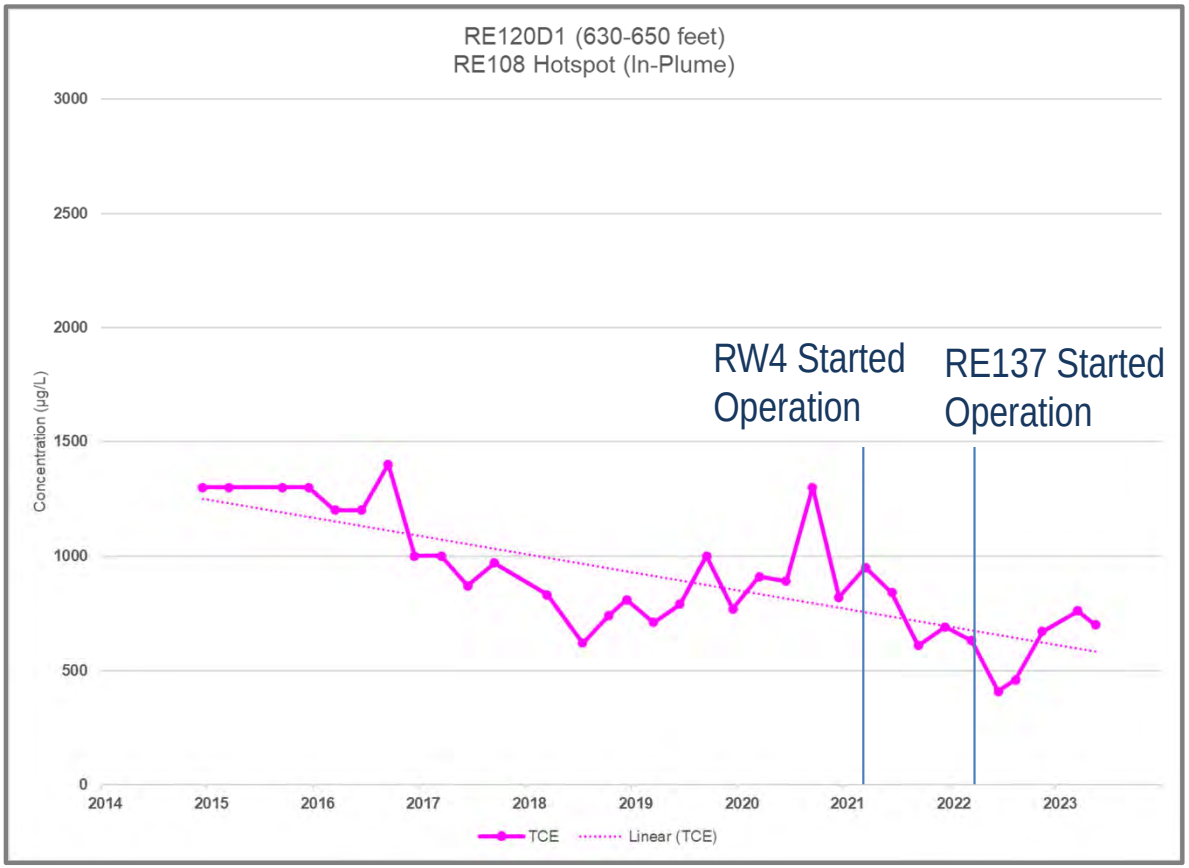

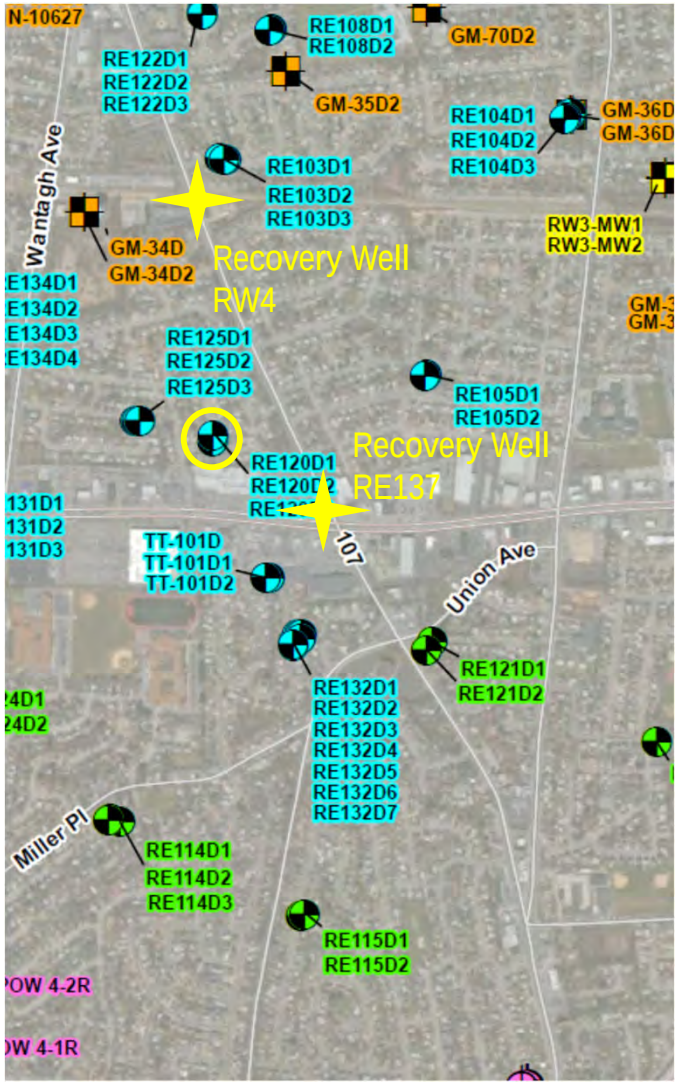

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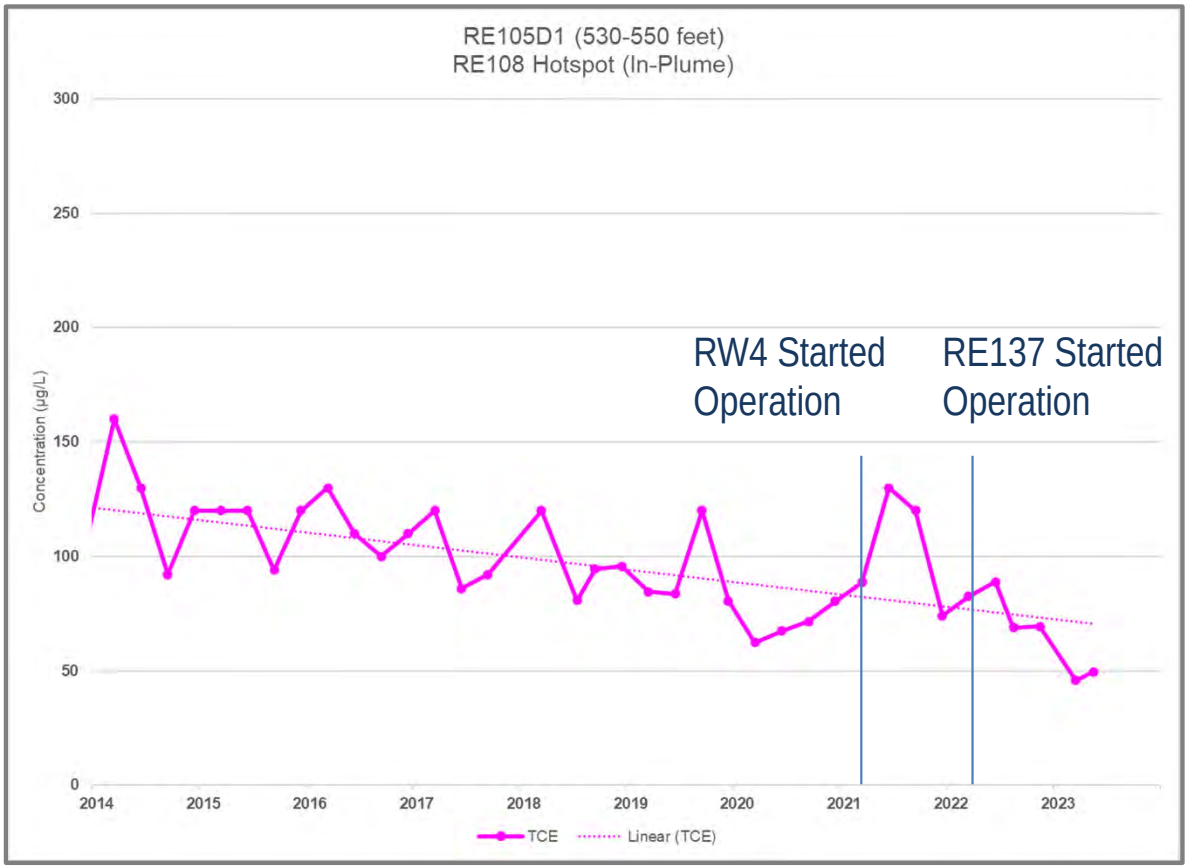

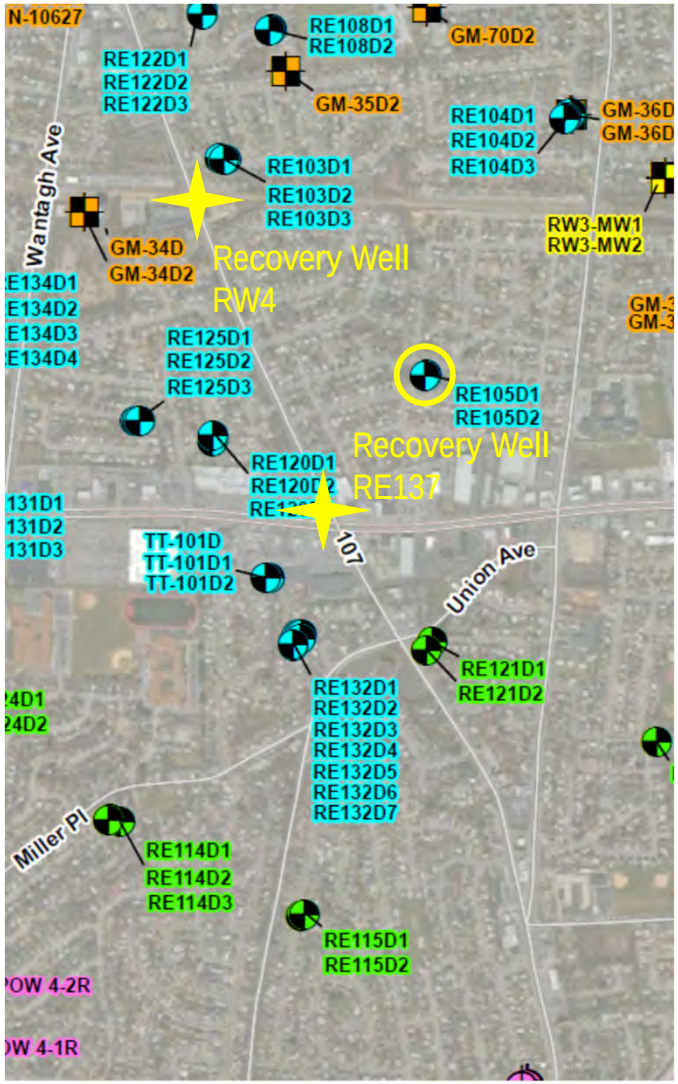

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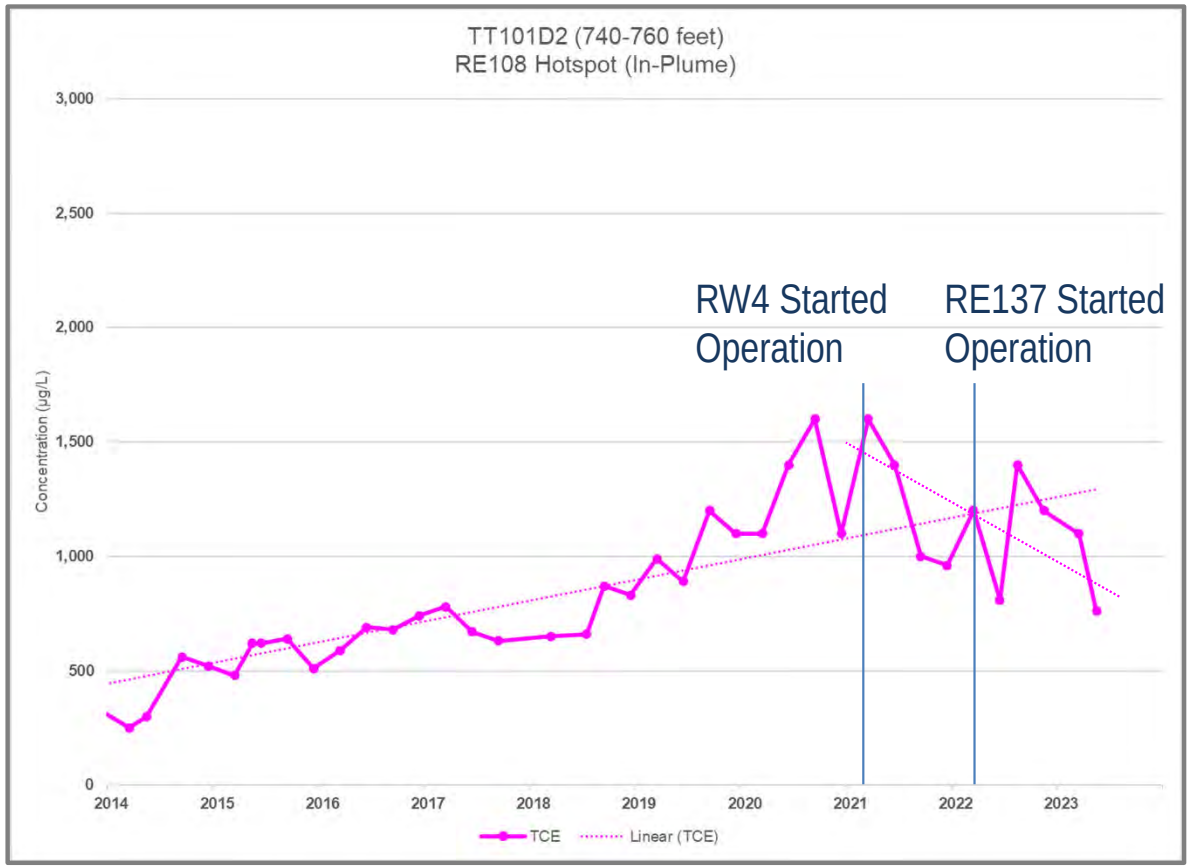
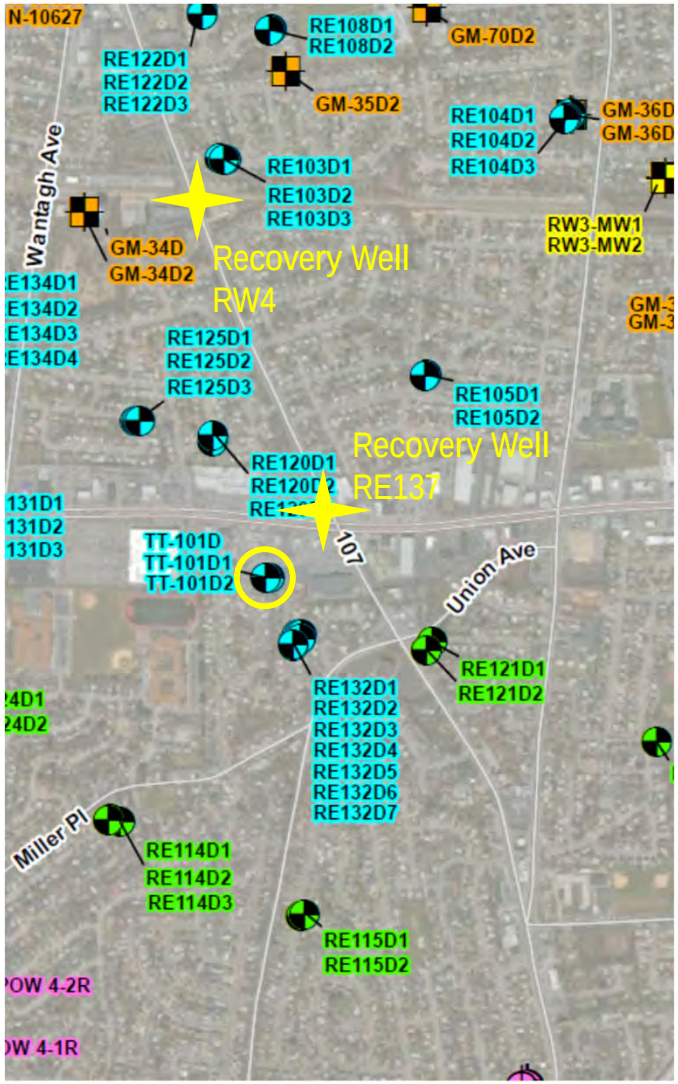
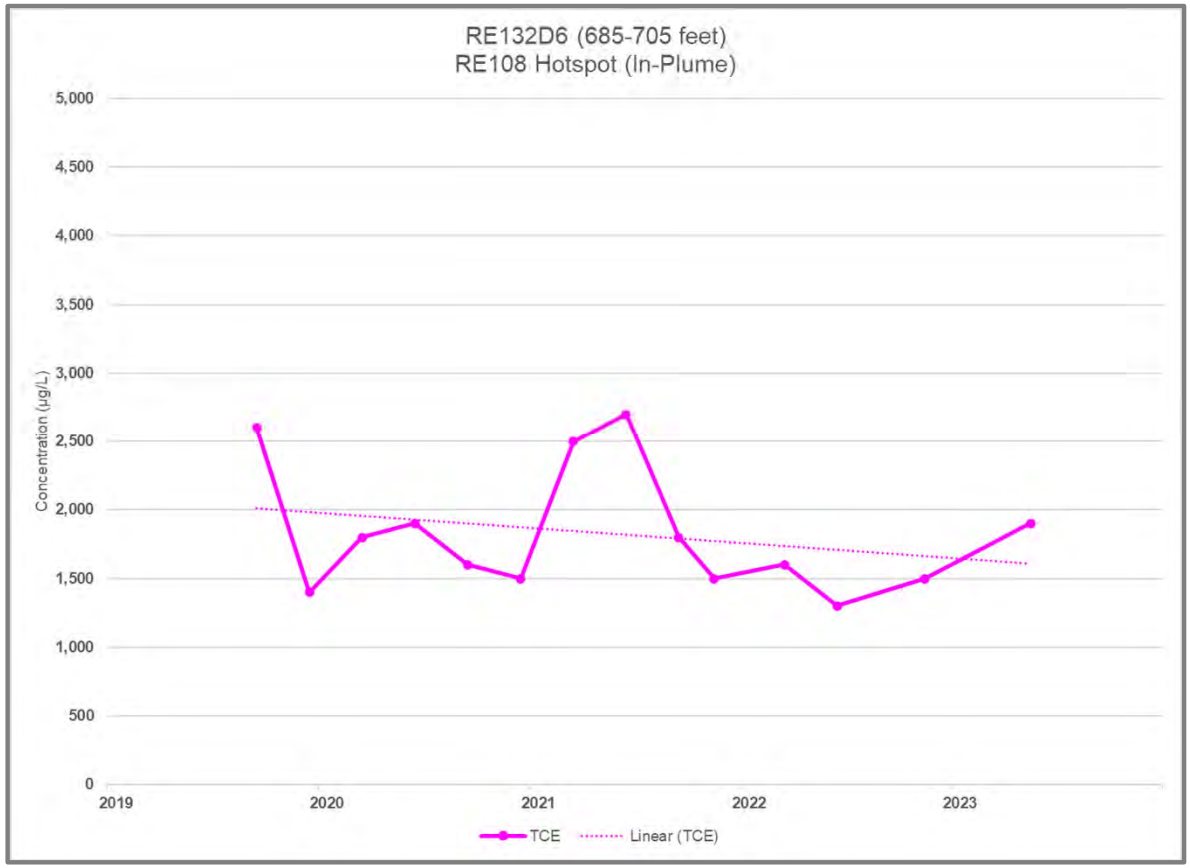
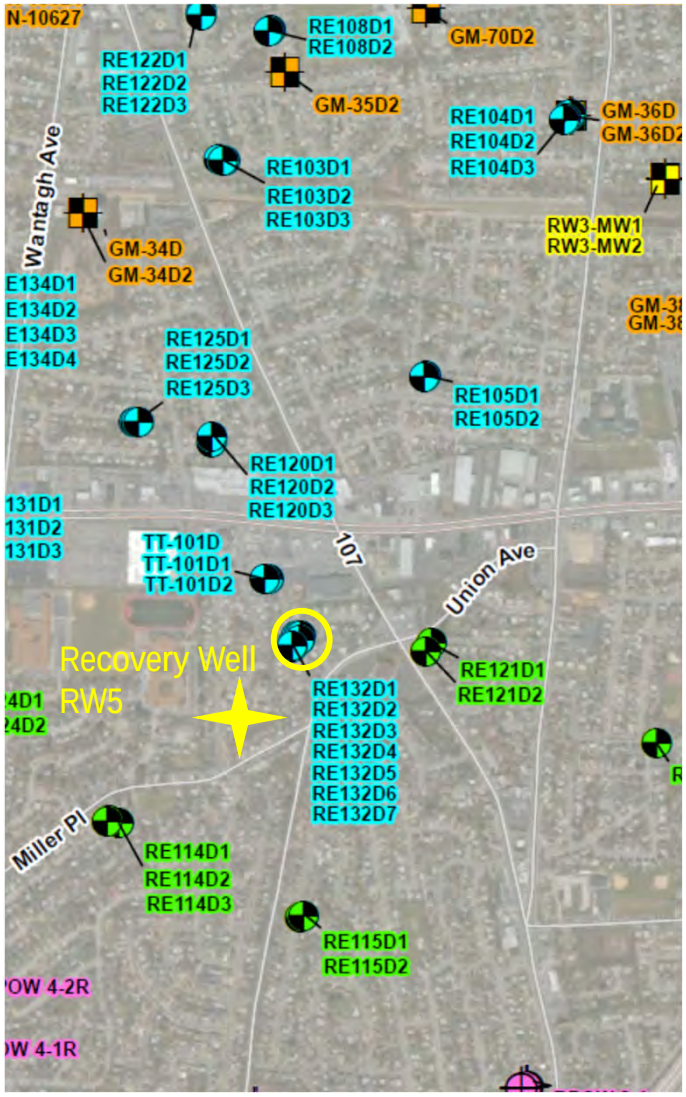




OU2 Groundwater Monitoring – Recovery Well RW5 (Phase II)

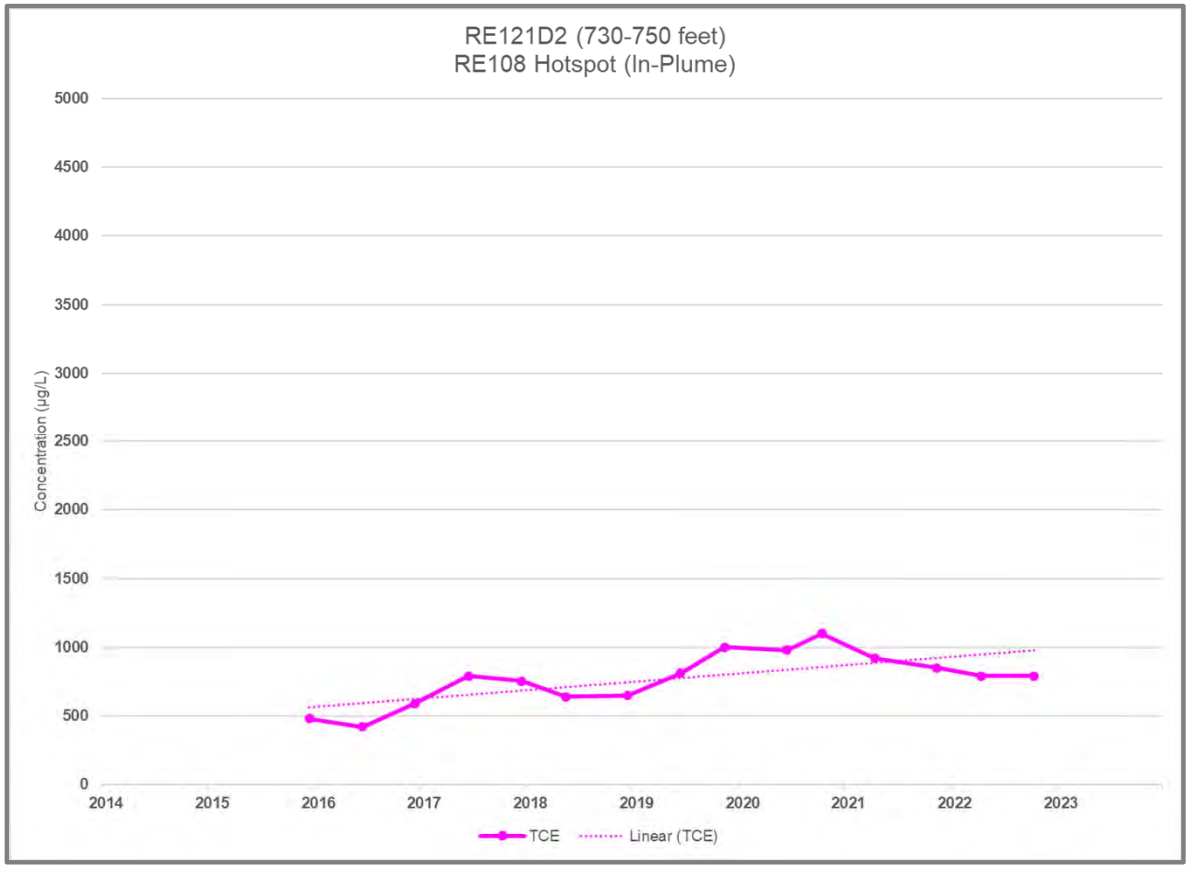
- RW5A/B are installed and planned for operation in 2024

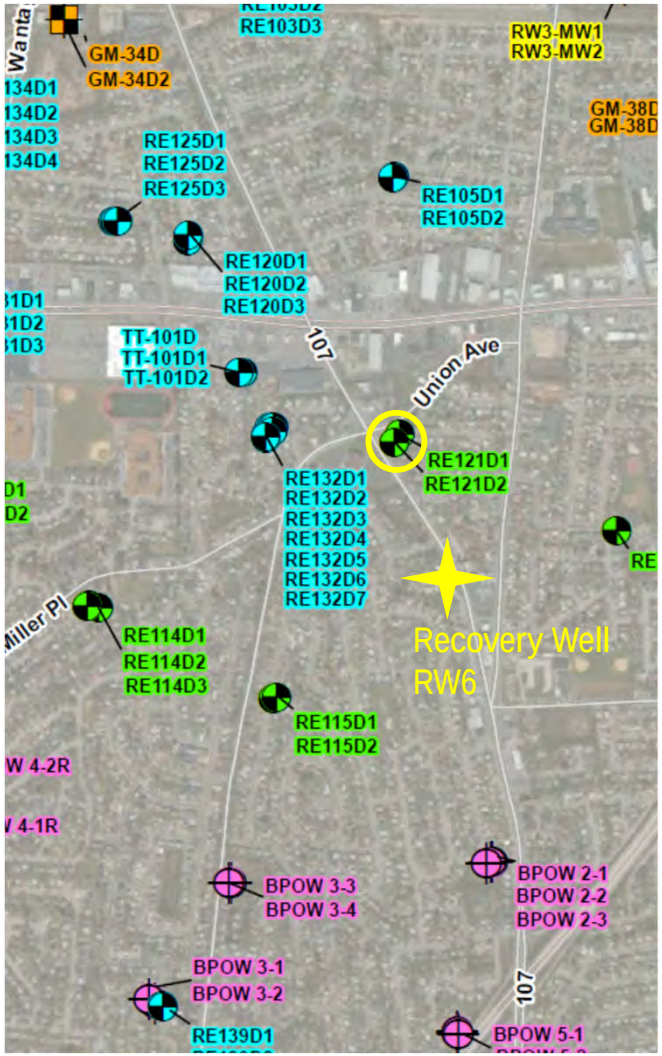




OU2 Groundwater Monitoring – Recovery Well RW6 (Phase II)

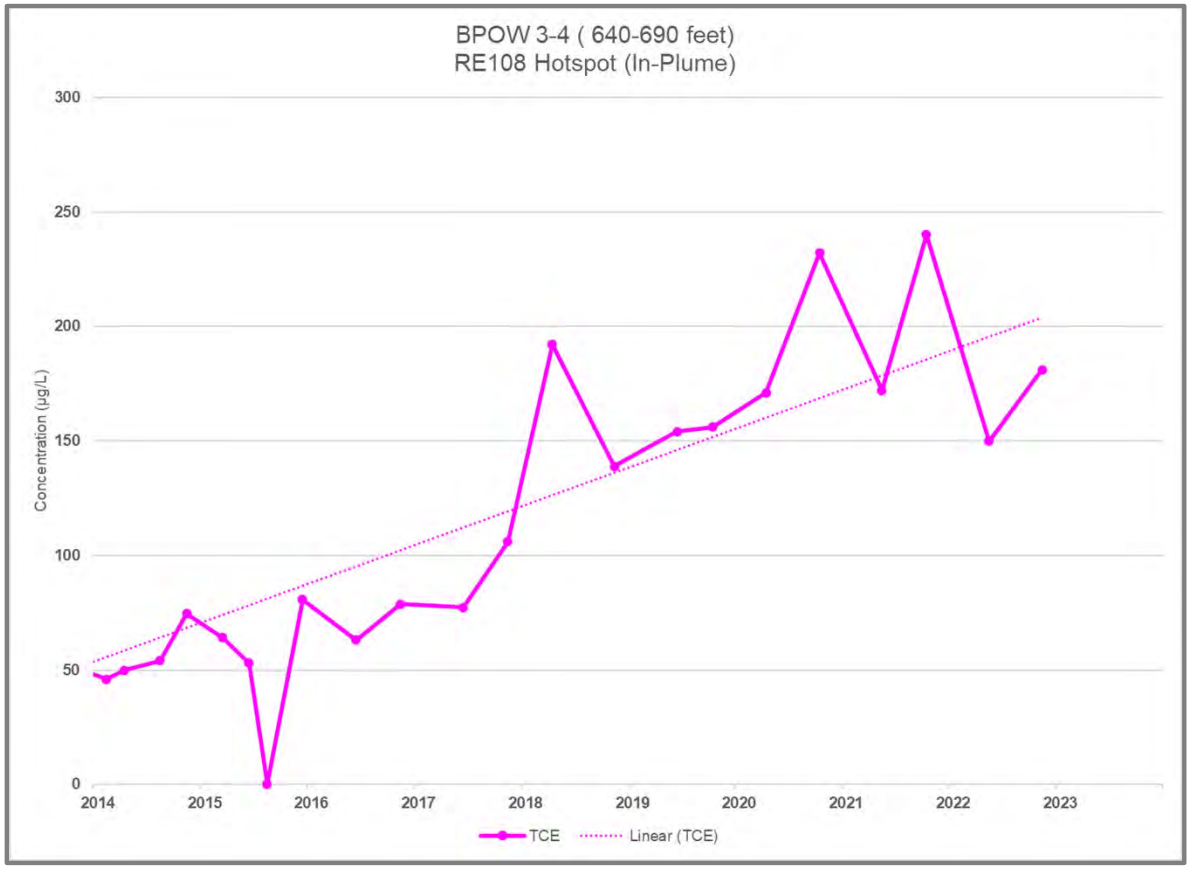
- RW6A/B are installed and planned for operation in 2024

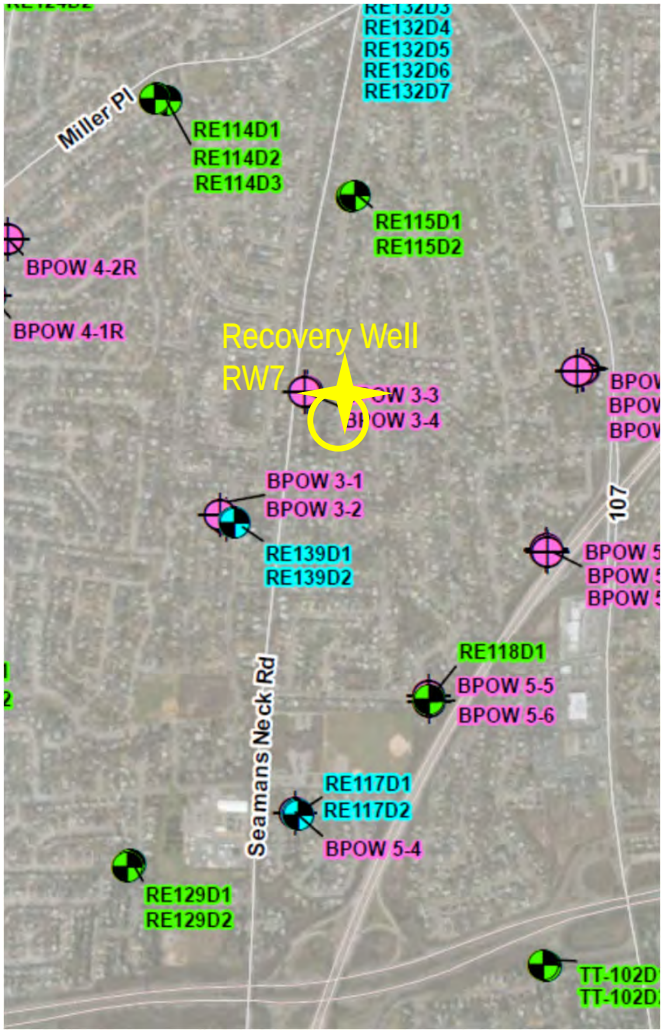




OU2 Groundwater Monitoring – Recovery Well RW7 (Phase II Extension)

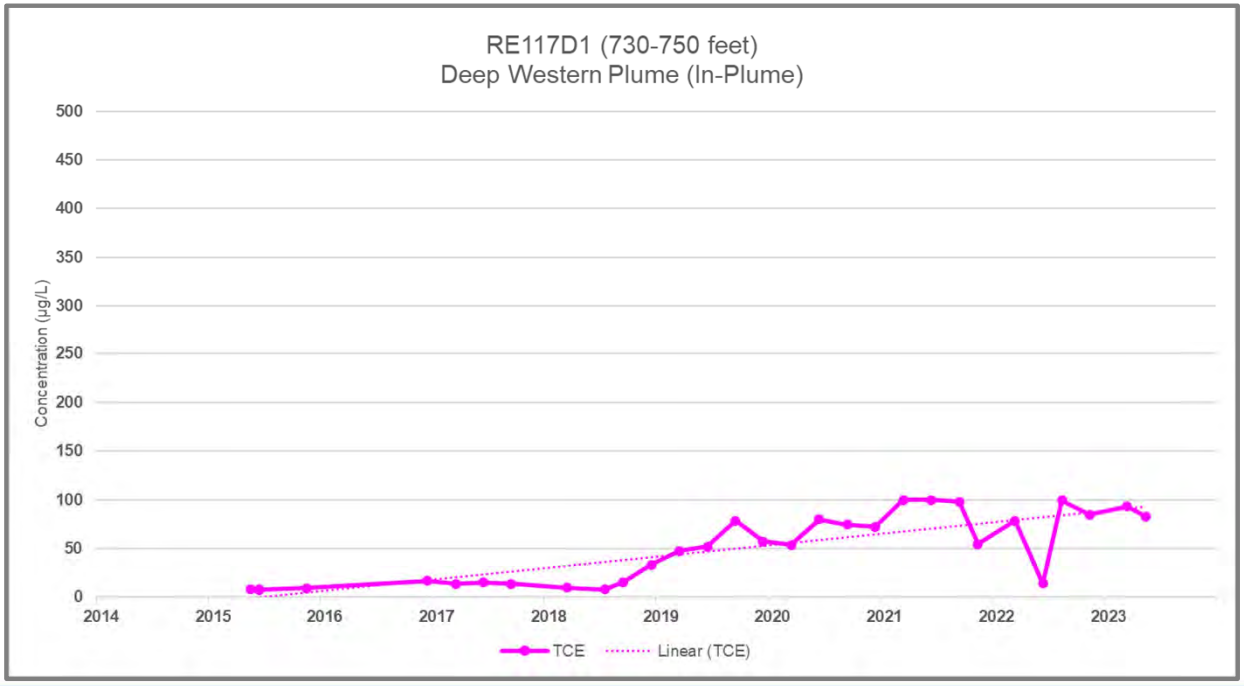
- RW7A/B are installed and planned for operation in 2024

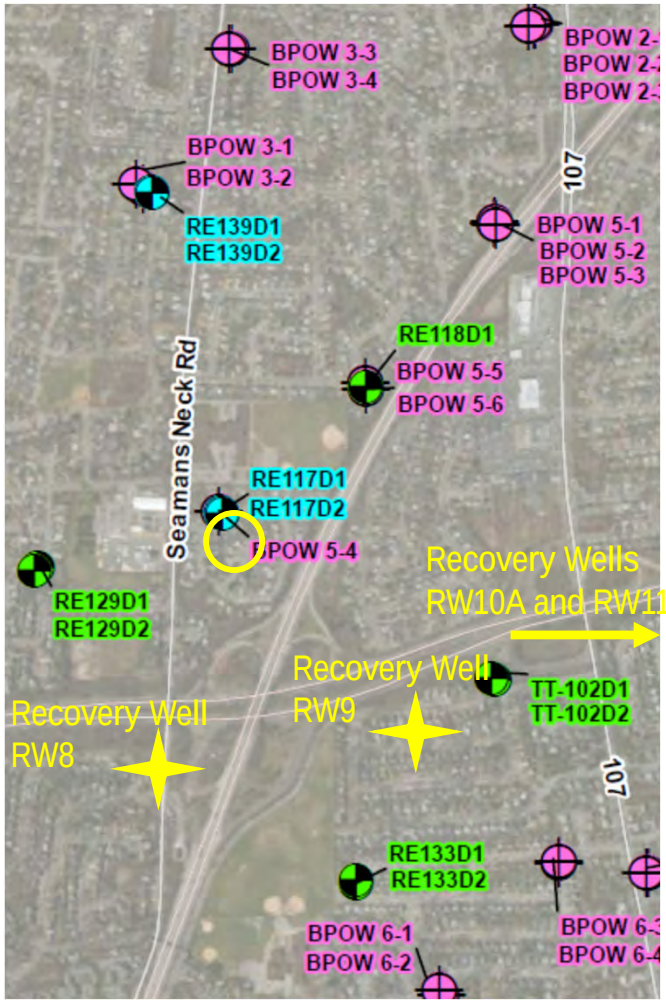




OU2 Groundwater Monitoring – Recovery Well RW8 to RW11 (Phase III)

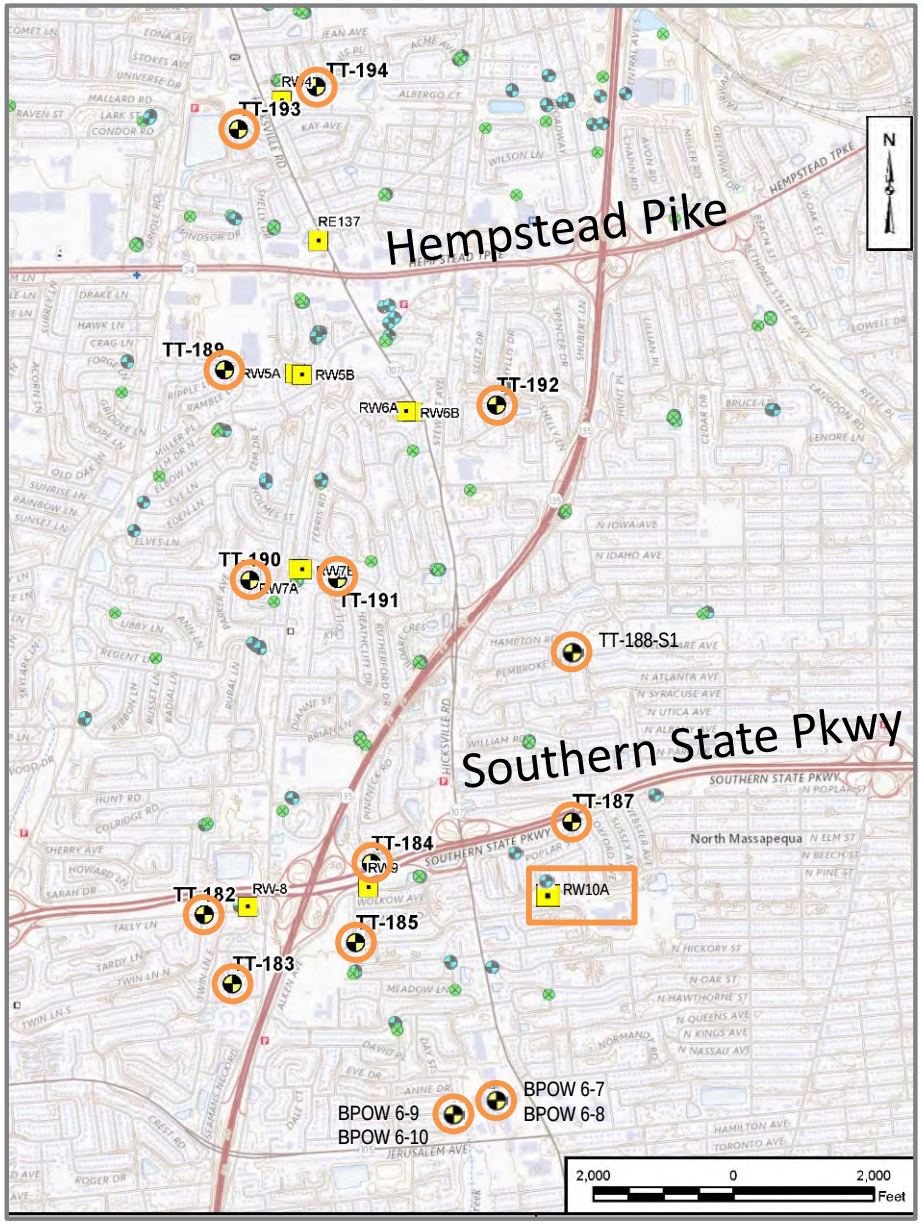
- Recovery wells RW8 and RW9 target deep groundwater at monitoring well RE117
- RW8 and RW9 are installed, pumping tests completed in December 2022
- RW10A/ RW11 VPB and monitoring wells completed
- Design activities are underway, with system to be constructed in 2024





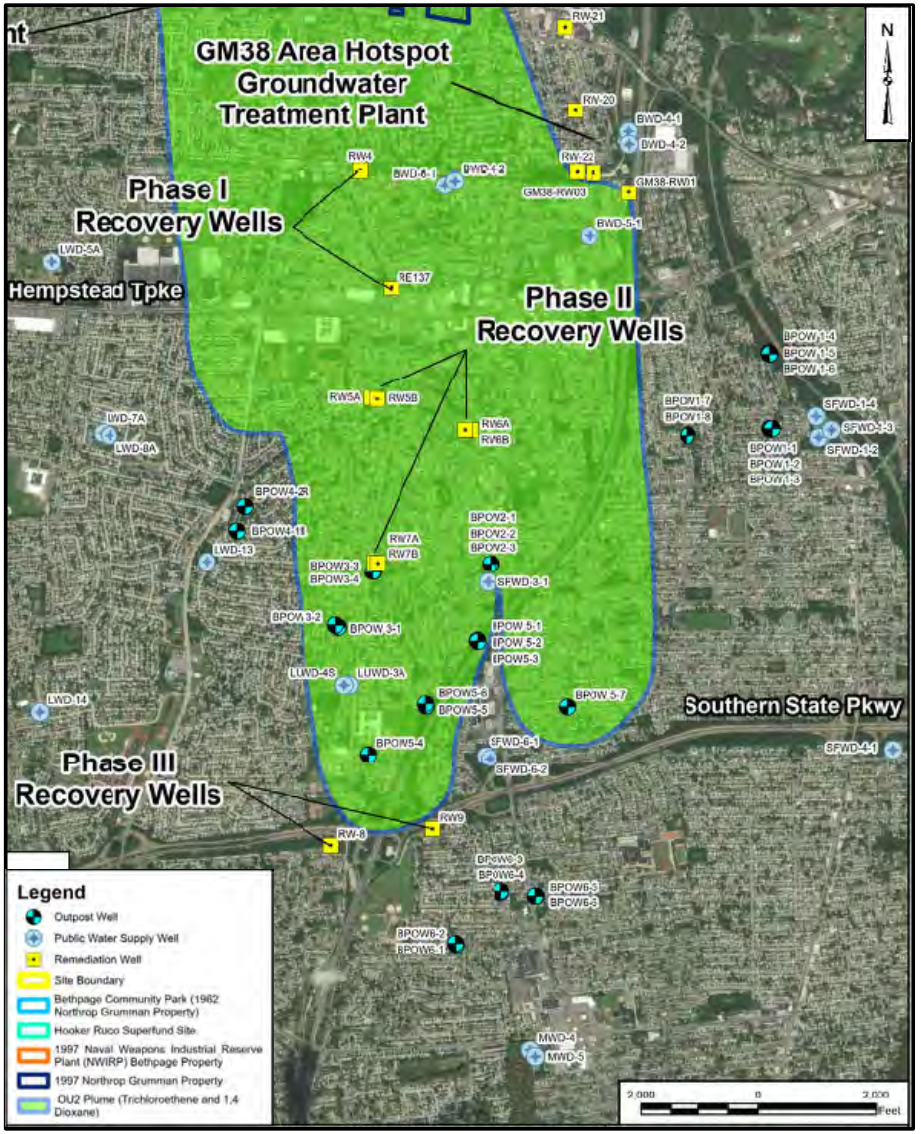
Planned Monitoring Wells and Recovery Wells

- 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



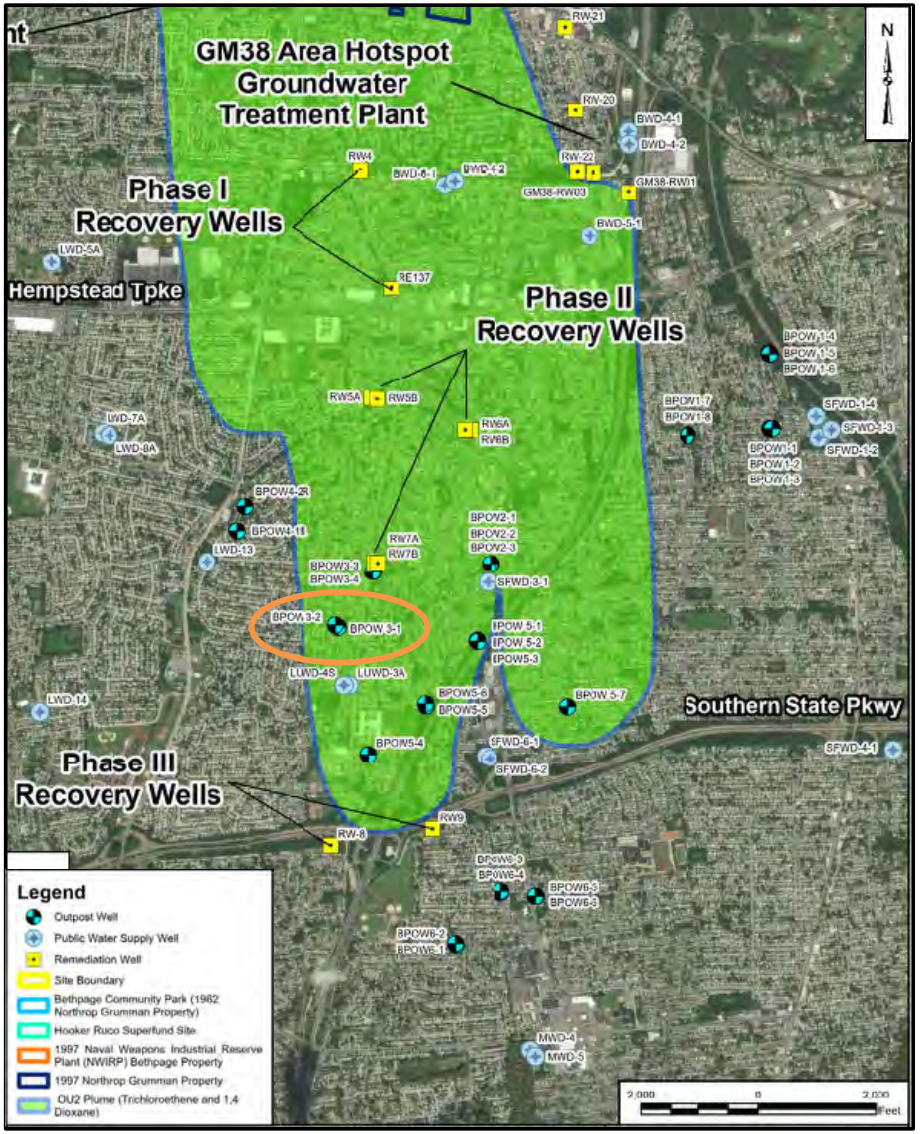
Public Water Supply Contingency Plan (PWSCP) Update

- 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



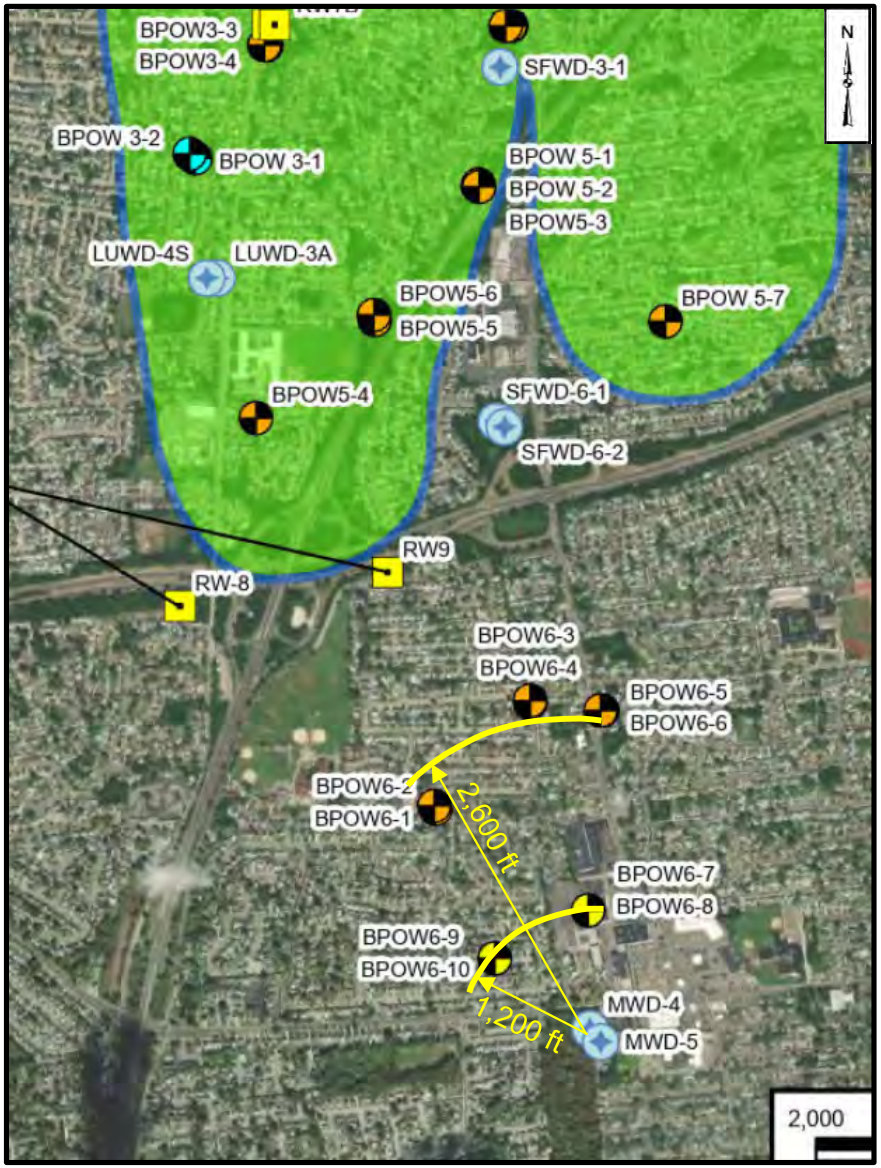
Public Water Supply Contingency Plan (PWSCP) Update

- 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



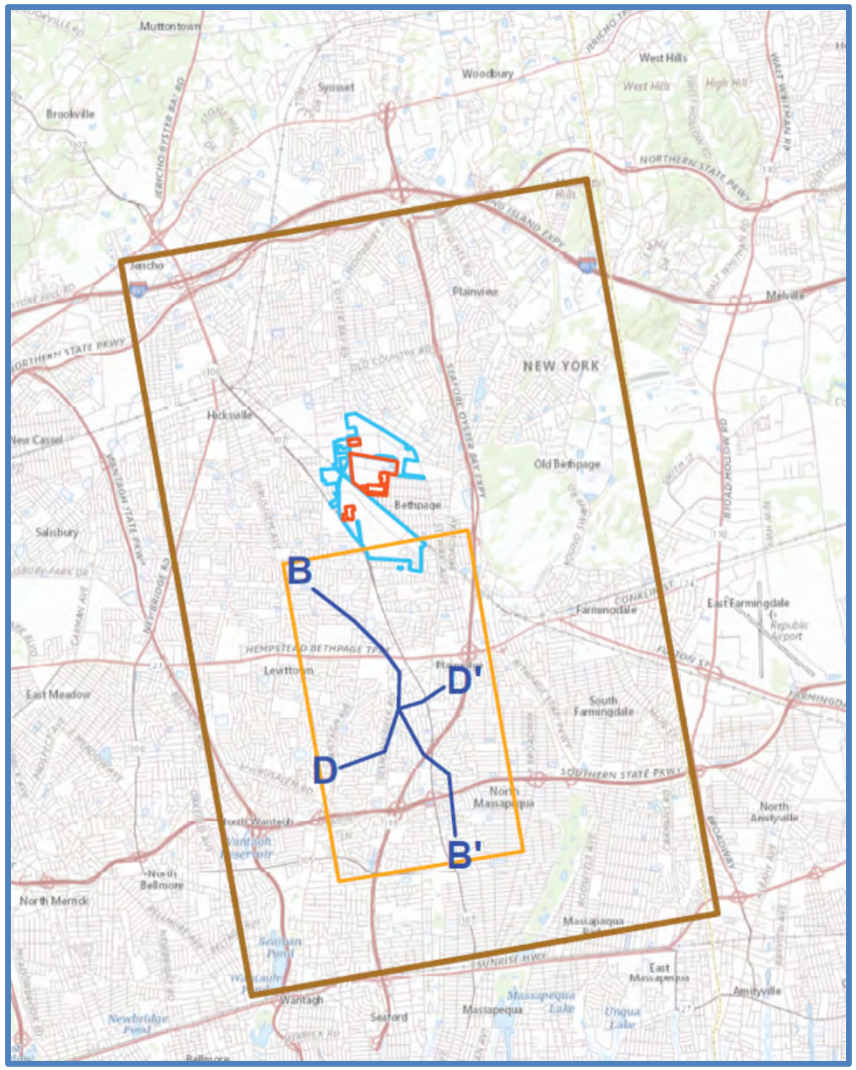
Public Water Supply Contingency Plan (PWSCP) Update

- 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

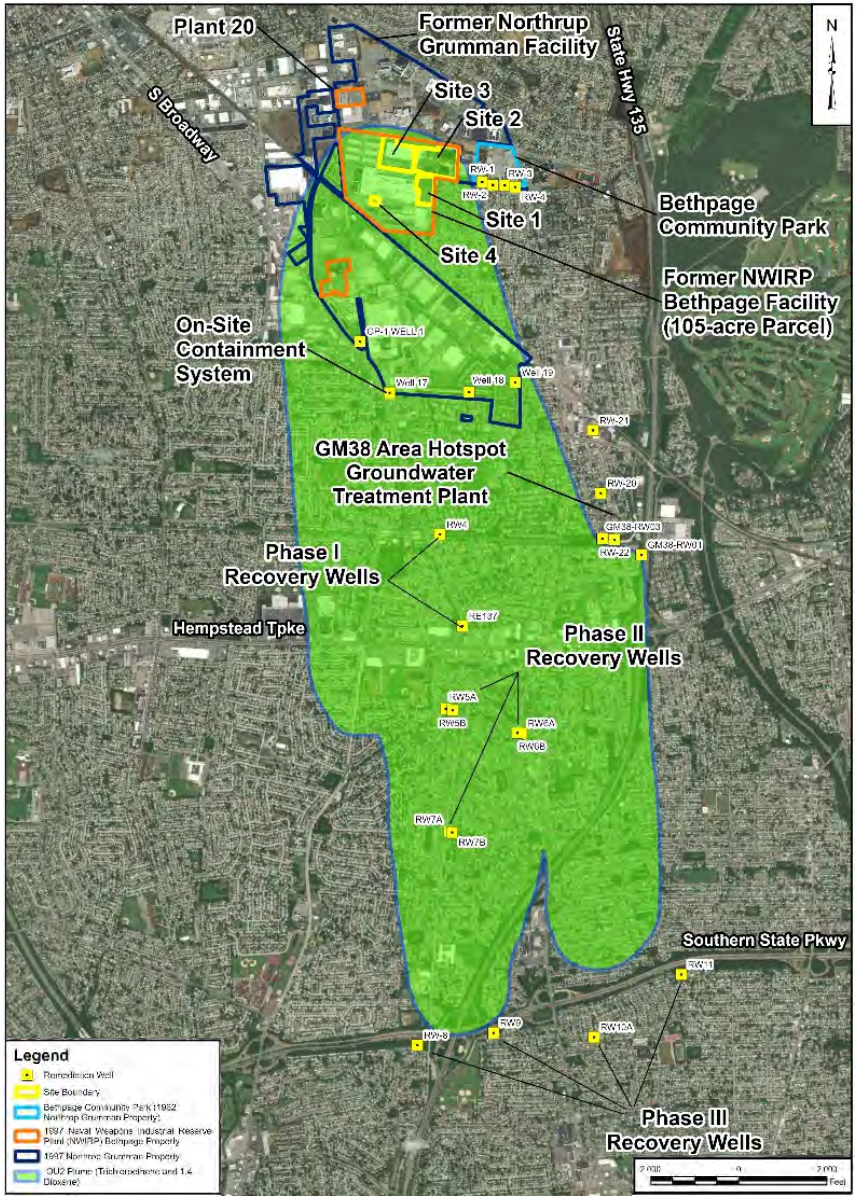
- Flow model used to evaluate OU2 plume behavior over time
- Model is approximately 42 square miles and 2 million cells
- Design, evaluate, and optimize remedial systems



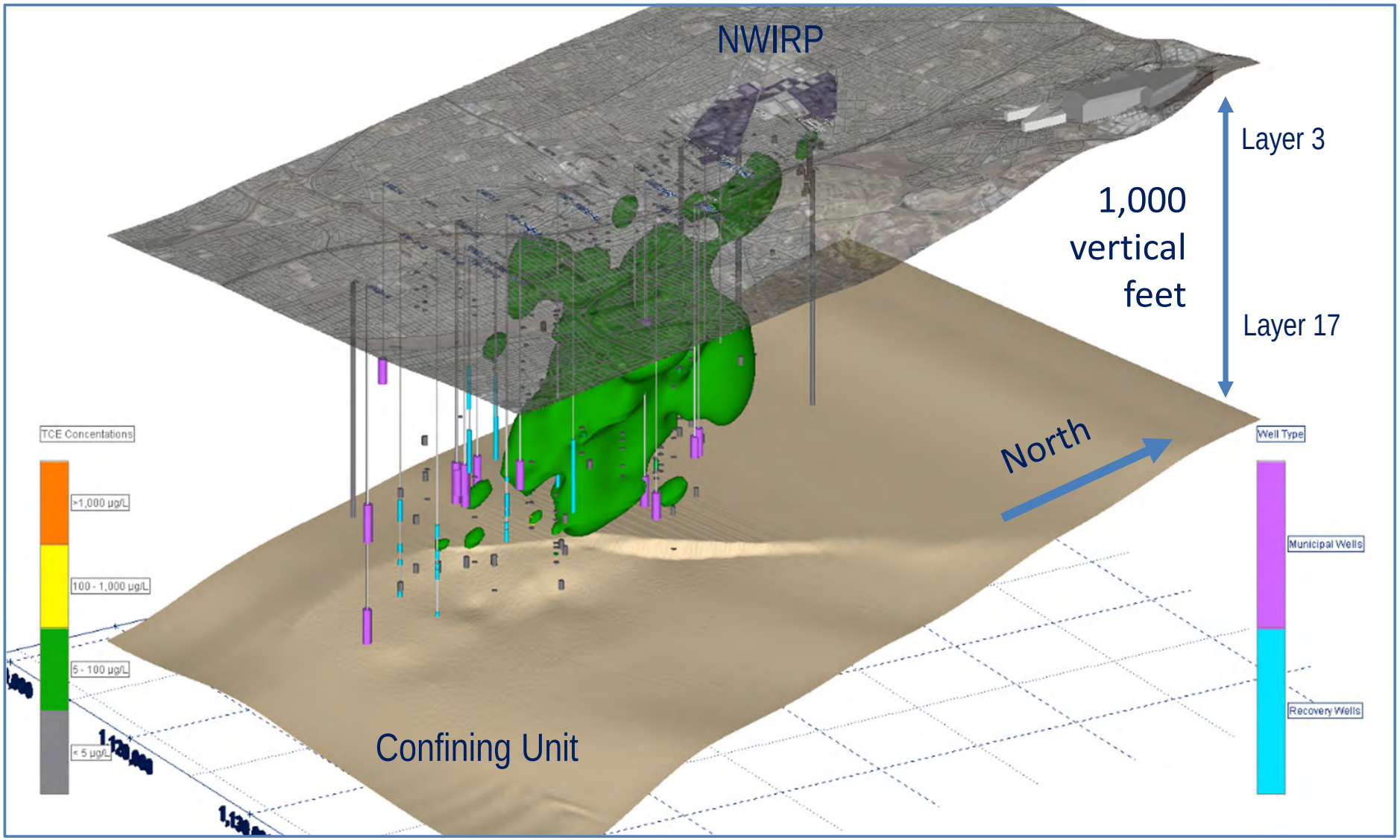
"Fate and transport" refers to how contaminants might change, where they go, and how fast they travel as they move through the environment.

OU2 Groundwater Fate and Transport Modeling

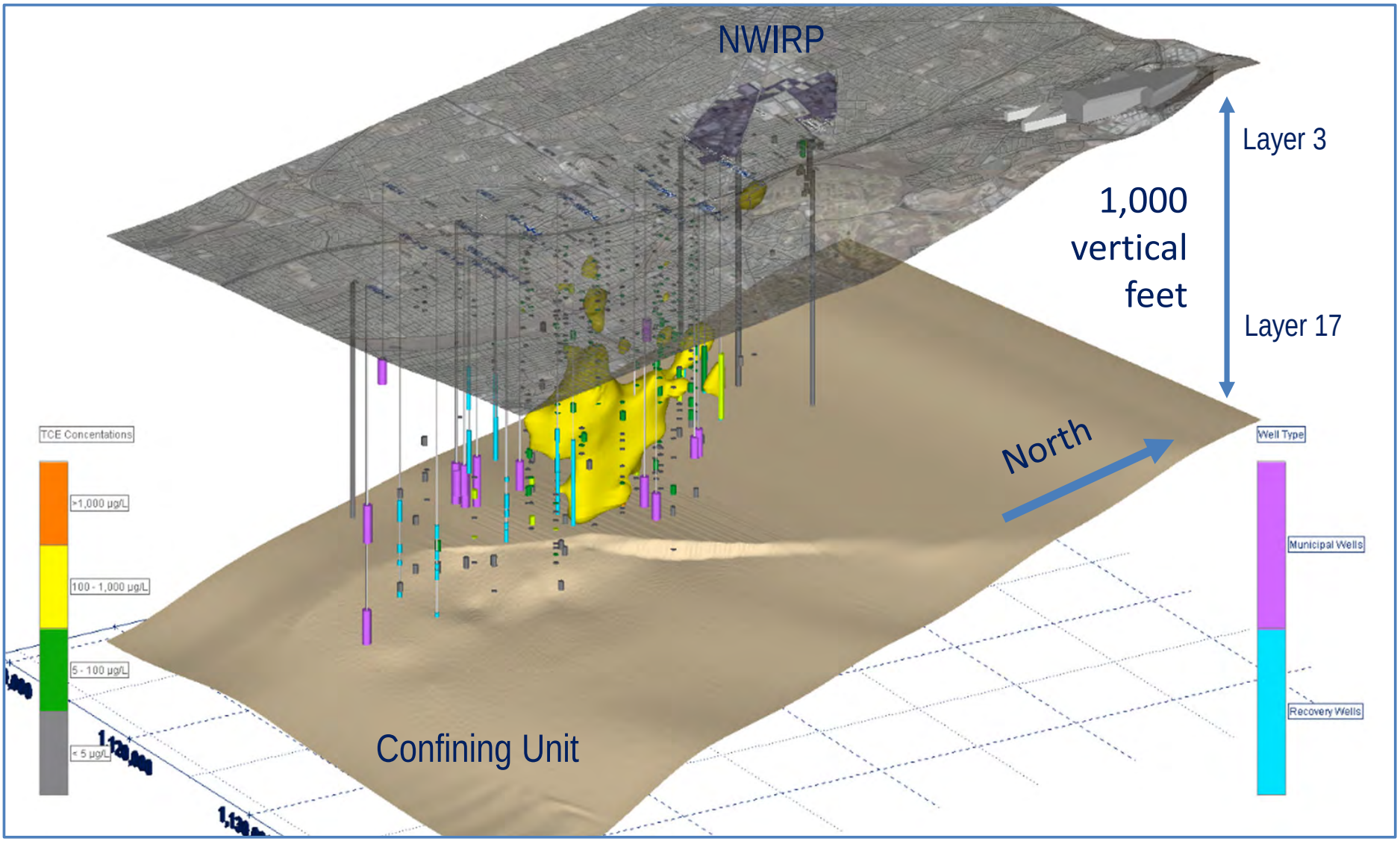
- OU2 plume boundaries are shown using trichloroethene (TCE) and 1,4-dioxane above drinking water standards



OU2 Groundwater Fate and Transport Modeling – 3D TCE Plume



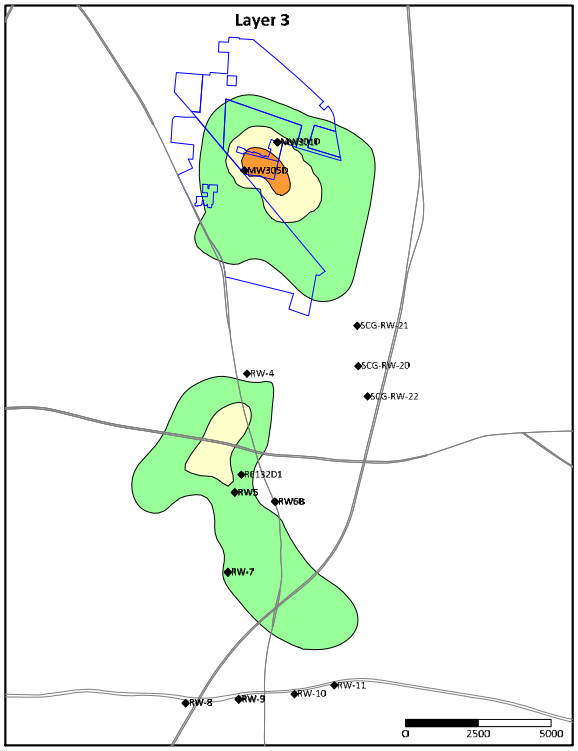
OU2 Groundwater Fate and Transport Modeling – 3D TCE Plume



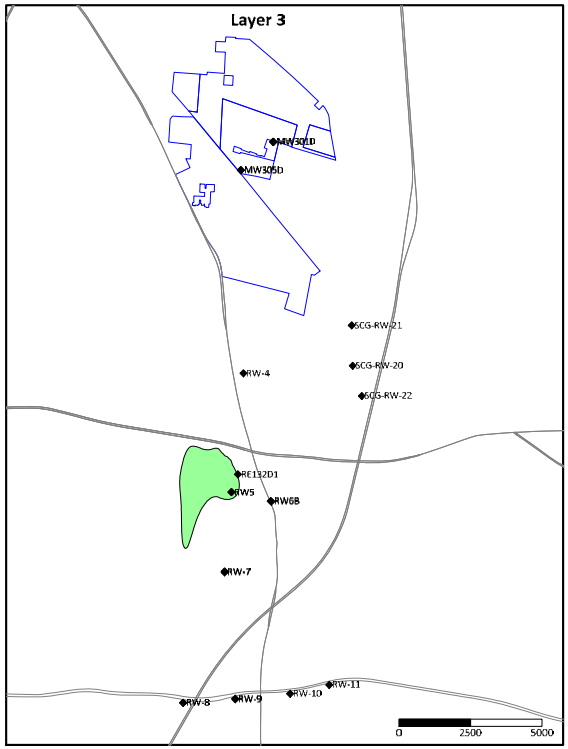
OU2 Groundwater Fate and Transport Modeling

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

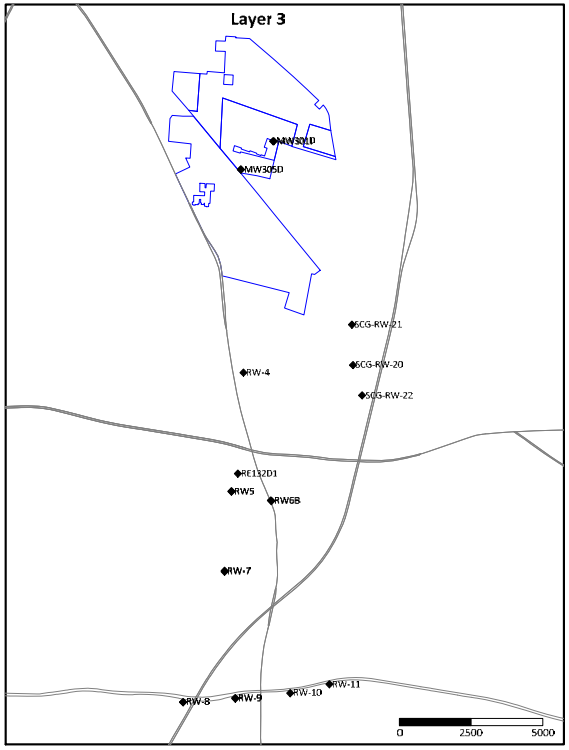
2020

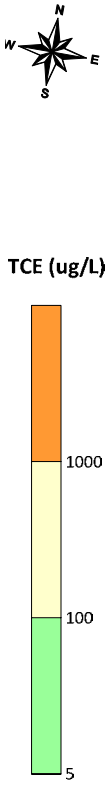


2050



2070

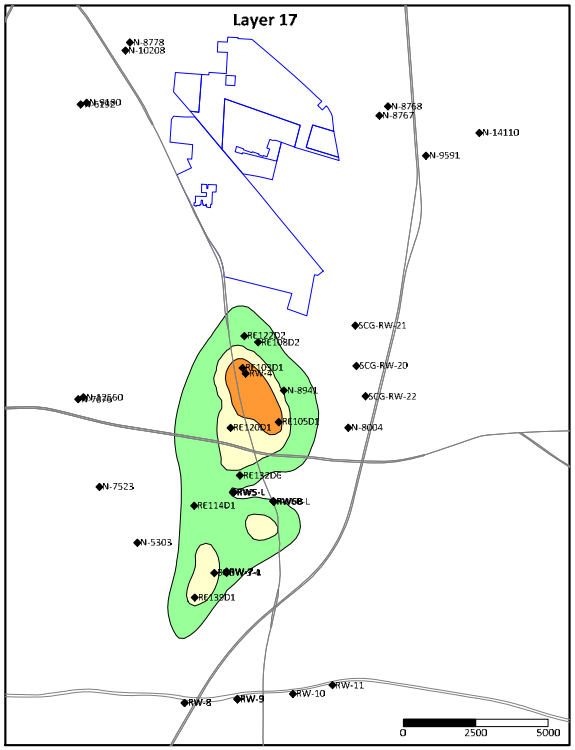




OU2 Groundwater Fate and Transport Modeling

- 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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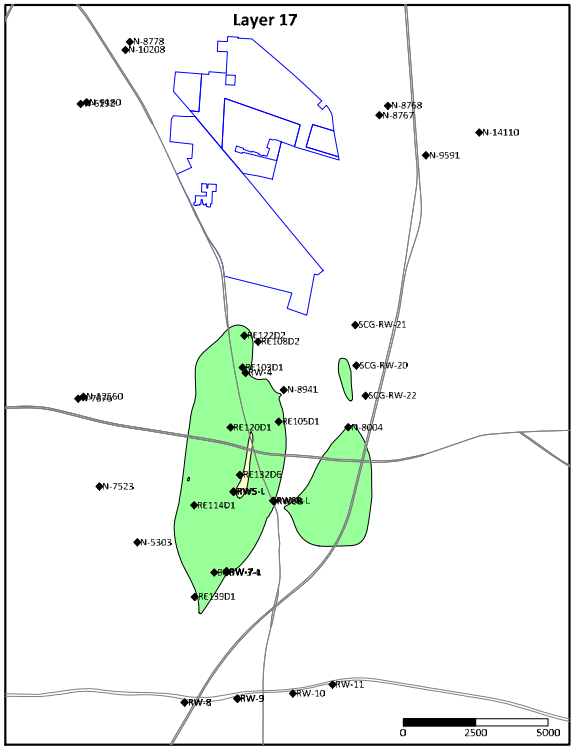
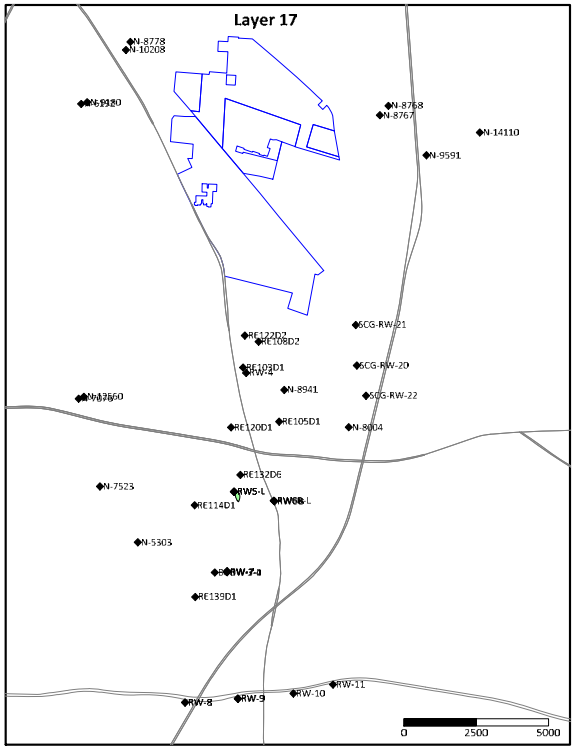
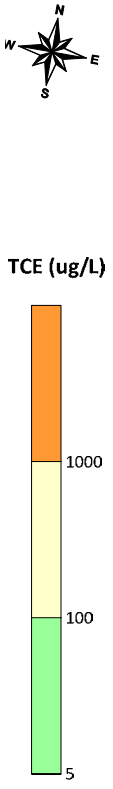


2080





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