RESTORATION ADVISORY BOARD MEETING
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT, BETHPAGE
TOWN OF OYSTER BAY, BETHPAGE COMMUNITY CENTER
103 GRUMMAN ROAD WEST, BETHPAGE, NEW YORK
THURSDAY, NOVEMBER 14, 2019

The forty-fifth (45th) meeting of the Restoration Advisory Board (RAB) was held at the Bethpage Community Center in Bethpage, New York. Meeting attendees included representatives from the Navy (Brian Murray and Melvin Acree), The Management Edge (Gayle Whaldron), New York State Department of Environmental Conservation (NYSDEC) (Bill Fonda, Don Hesler, and Jason Pelton), New York State Department of Health (NYSDOH) (Steve Karpinski and Shaun Suroni), Nassau County Department of Health (NCDOH) (John Lovejoy and Richard Castle), Bethpage Water District (BWD) (Maureen O'Brien, Teri Black, Mike Ingham, and Michael Boufis), Massapequa Water District (MWD) (Raymond Averna and Stan Carey), South Farmingdale Water District (SFWD) (Gary Brosnan), Town of Hempstead (TOH) Water (John Reinhardt), KOMAN Government Solutions, LLC (Greg Pearman), Tetra Tech (David Brayack, Ernie Wu, Melissa Cushing, Vin Varricchio and Kristi Francisco), APTIM (Monica Smeal and Bill Deane), and Town of Oyster Bay (John Caruso and Matthew Russo). RAB members in attendance were Sandra D'Arcangelo, Jeanne O'Connor, Edward Olmstead, Bill Pavone and David Sobolow. There were approximately 20 residents from Bethpage and neighboring towns in attendance. A local newspaper and television news were also in attendance. The meeting attendee list is provided in Appendix A. The Agenda and Definitions are provided in Appendix B.

OPEN HOUSE SESSION

Prior to the start of the meeting, an open house session was held. The public was invited to peruse the information provided and ask questions to the Navy representatives, contractors, and regulators. A copy of the posters displayed during the open house is presented in Appendix C.

WELCOME AND AGENDA REVIEW

The Navy representative, Mr. Murray welcomed everyone to the RAB meeting and presented the meeting agenda. In addition, Mr. Murray reviewed the background on the Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage facility and gave a brief update on the status of the operable units (OUs), the treatment systems, and wellhead treatment at the water districts. Mr. Murray then introduced Mrs. Whaldron (The Management Edge, serving the role of facilitator in support of the RAB) who then went over the Rules of Conduct to ensure that everyone is allowed the opportunity to

comment. Mr. Murray introduced Mr. Sobolow, the RAB co-chair, Mr. Deane (APTIM) and Mr. Brayack (Tetra Tech).

OPERABLE UNIT (OU) 4 – SITE 1 FORMER DRUM MARSHALLING AREA REMEDIAL CONSTRUCTION UPDATE

Mr. Deane, APTIM, provided an update of the NWIRP Bethpage Site 1- Former Drum Marshalling Area history and the remedial action in progress for the soil, soil vapor, and groundwater remedy. The Remedy consists of soil excavation, offsite disposal and capping, groundwater monitoring, and enhanced soil vapor extraction that is currently being implemented. Mr. Deane reviewed the excavation, restoration and monitoring, progress to date, and remaining schedule for excavation and disposal, and how the traffic, dust, and noise would minimally impact the residents. The presentation is included in Appendix D.

RE108 AREA HOTSPOT TREATMENT SYSTEM UPDATE

Mr. Brayack, Tetra Tech, provided an update on the RE108 Area Hotspot investigation and remediation. The presentation is included in Appendix D.

Phase I RE108 Area Hotspot Treatment System Update:
Mr. Brayack reviewed the Phase I status and provided a timeline for system design. The Phase I system, which addresses the northern portion of the Volatile Organic Compound (VOC)-impacted groundwater, will include an extraction well and double-wall piping from the RE108 Area Hotspot to the Navy's existing GM38 Area Hotspot Treatment System. The existing Nassau County (NC) 495 Recharge Basin currently being used for GM38 discharge will also be utilized for the Phase I RE108 Hotspot discharge. Pending access, the Phase I System is expected to start operation in 2020.

Phase II RE108 Area Hotspot Treatment System Update:
Mr. Brayack reviewed the Phase II status and also provided a timeline for system design. The Phase II system will include groundwater extraction, treatment, and a discharge system to capture the RE108 Area Hotspot groundwater near the downgradient edge. Water will be treated to drinking water standards via air stripping and granular activated carbon. The Navy is anticipating discharging into two recharge basins and are currently conducting infiltration testing and groundwater modeling to determine flow. The system should be in place by 2023.

ONSITE GROUNDWATER SAMPLING FOR PRELIMNARY ASSESSMENT/SITE INSPECTION FOR RADIUM, POLYFLUOROALKYL SUBSTANCES (PFAS), AND 1,4-DIOXANE

Mr. Brayack and Ms. Cushing, Tetra Tech, provided an update of the onsite groundwater sampling for the Preliminary Assessment/Site Inspections for radium, PFAS and 1,4-dioxane. The presentation is included in Appendix D.

Radium Sampling results in onsite groundwater:
Sampling results from the five events indicated that 94 percent of the results were below the U.S. Environmental Protection Agency (EPA) safe Maximum Contaminant Level (MCL) of 5 pCi/L. Sixteen individual samples (at eight monitoring wells) exceeded the EPA safe maximum level, with concentrations ranging from 5.1 to 9.5 pCi/L. Sample results indicate the radium is likely from a natural source, and it is unlikely that a release of radium has occurred.

PFAS Sampling results in onsite groundwater:
Sampling results from the five events indicated that 94 percent of the results were below the EPA Lifetime Health Advisory (LHA) of 70 parts per trillion (ppt). Perfluorooctanoic acid (PFOA) concentrations ranged from non-detect to 157 ppt, with exceedances in five monitoring wells. Perfluorooctane sulfonate (PFOS) concentrations ranged from non-detect to 147 ppt, with exceedances from one monitoring well. Surface Water samples were collected for PFAS but the EPA has not developed a LHA or any other criteria for PFAS in surface water.

1,4-Dioxane Sampling results in onsite groundwater:
Sampling results from the five events indicated that all groundwater sample results were below the current NYSDOH MCL of 50 µg/L. Groundwater samples from nine monitoring wells were above the new recommended MCL of 1 µg/L, which is under review. Concentrations ranged from non-detect to 8.7 µg/L.

The results of the sampling events will be compiled into three individual draft Preliminary Assessment/Site Investigation (PA/SI) reports for regulatory review. The final PA/SI will include recommendations for further action consistent with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidance.

DEPARTMENT OF NAVY COMMENTS ON NYSDEC FEASIBILITY STUDY REPORT AND PROPOSED AMENDED RECORD OF DECISION

Mr. Murray, Navy, provided comments from the Navy to the NYSDEC Feasibility Study Report and Proposed Amended Record of Decision to address the historical

groundwater contamination from the former Northrop Grumman Bethpage and NWIRP sites. The presentation is included in Appendix D.

Mr. Murray reviewed the proposed alternative stated in the NYSDEC Feasibility Study. The proposed alternative consists of Hydraulic Containment of Site Contaminants above Standards, Criteria, and Guidance (SCGs) with Mass Flux Remediation with an estimated capital cost of $240,448,000 and long-term costs of $584,650,000. The Navy's concerns consist of the proposed alternative not being able to achieve the necessary goals and costs being significantly greater than the estimation. The Navy plans to move forward with their planned remedial actions (Phase I and Phase II) in addition to coordinating with NYSDEC to evaluate continued protectiveness and evaluation for remedial actions.

QUESTIONS AND COMMENTS

Following the technical presentations, the meeting was opened for follow-up questions and discussions. Mr. Sobolow offered the floor the RAB members to ask questions before the resident questions were discussed. The discussion questions and answers are below:

1. **Mr. Sobolow inquired, who is responsible for the maintenance and monitoring of the new recharge basins the Navy is proposing?** Mr. Murray replied, the Navy negotiatings with the County for the Arthur Ave basin would likely consist of periodically scraping the basins. The Navy would go to the basin once a month and if there is a storm the Navy will shut the system down. The Navy will use two basins, this allows continued operation when the system is down and balances the water flow. Stormwater basins will eventually clog and either the Navy or the county will maintain it. Mr. Murray added that he met with public works and they are going to provide technical requirements as part of the easement requirement, monitoring and scraping maintenance. The time frame to meet with the residents is December 2019.

2. **Ms. D'Arcanagelo inquired if construction is on schedule at Site 1**? Mr. Deane replied that the construction is on schedule.

3. **Ms. D'Arcanagelo inquired about who is maintaining the Nassau County basins?** Mr. Brayack replied that there is a cooperative decision. The Navy scraped the basin in the past and will check basins once a month and during storm events. Because the Navy discharge is very clean, maintenance from their operations is not expected. Stormwater typically contains solids that will require periodic scraping.

4. **Ms. D'Arcanagelo inquired about how many gallons would be going to Massapequa Creek per day?** Mr. Pelton responded: about three million gallons per day.

5. **Mr.Olmstead questioned if three million gallons per day is being pulled out of the aquifer, how long before water districts (south shore) should worry about salt water intrusion?** Mr. Pelton responded that it is a massive plume and a complex aquifer system, so it is difficult to see how the plume is moving. NYSDEC partnered with the U.S. Geological Survey (USGS) for modeling because they have knowledge of this sole source aquifer. Part of the analysis was done from previous experience. A lot of concerns were raised regarding environmental impacts during the detailed engineering analysis. For instance, how would it influence the fresh/saltwater interface? NYSDEC is pulling a lot out of the aquifer but are returning it back into the aquifer to avoid saltwater intrusion. NYSDEC did not evaluate travel times, but our analysis shows very little saltwater intrusion would occur.

6. **Ms. D'Arcanagelo commented that they were told that Massapequa does not recharge aquifer.** Mr. Pelton responded that there would be three treatment plants south of Southern State Pkwy. The treated water goes to nearby recharge basins that goes back to aquifer. Three million gallons per day would be treated and discharged into Massapequa Creek. There is a lot of capacity in the aquifer system. Karen Gomez and Bill Fonda and lead hydrogeologist Dan St. Germaine with HDR is here too, to answer more questions. Monitoring and testing will be done once system is implemented to make sure the remedy is okay.

7. **Ms. D'Arcanagelo inquired if the Navy was making new basins?** Mr. Murray replied that this will be evaluated. Existing recharge basins will be used.

8. **Mr. Sobolow inquired about the difference between the Navy and the NYSDEC remedy? Who is making the final decision and what is the timeframe?** Mr. Pelton responded that it will be the NYSDEC. The governor will probably decide the schedule. A schedule was laid out back in June 2019. In the middle of finalizing the plan, there was a 45-day public comment period that ended on July 8, 2019. Over 200 comments were received. It was a major effort to respond to comments. All comments were responded to and the process was completed along with a thorough review. The document is now with executives for review. It will be completed in near future. The proposed ROD will then go to final with a responsiveness summary.

9. **Mr. Sobolow inquired about when is the ultimate decision to be made and who decides?** Mr. Pelton responded that they expect the process to be completed in the near future. It will be final soon. It also will include a responsiveness summary that includes all comments – both written and spoken. A final decision document should be issued soon before end of the year.

10. **Mr. Sobolow inquired if the decision for the remedy would be binding between the Navy and Northrup Grumman?** Mr. Pelton responded that NYSDEC will go to the responsible parties to compel them to implement the remedy. If they decline, then the remedy will be pursued using State resources and cost recovery will be sought from the responsible parties.

11. **Mr. Sobolow stated that the RAB recommended to the Navy to engage an independent consultant to get answers that they are not comfortable asking the Navy and NYSDEC.** Mr. Mike Hopman, PE, has experience in water treatment and is from Long Island.

12. **Doesn't the Bethpage Water District have an active ongoing plan to move their wells outside of the plume?** Mr. Boufis responded in the affirmative that the Bethpage Water District started in 2010 to lay out a plan to get outside of the plume with wells 4, 5, and 6. As of 2019, only about 20 percent is coming out of those well fields. BWD is ahead of schedule and continuing to develop new sources north of the plume.

13. **What chemicals were detected in Site 1 soils that were removed?** Mr. Deane responded that primarily PCBs less than 1 to 85 mg/kg were detected in the soil. The other chemicals removed were not of concern for disposal including low level metals and Semi Volatile Organic Compounds (SVOCs). None of these other chemicals would require soil to be disposed of as hazardous.

14. **Where was the location of the 9.5 pCi/L result?** Mr. Brayack replied that the 9.5 pCi/L result was in one of the two down gradient wells. More recent results in the same well were much lower over five sampling events. The 9.5 pCi/L was the maximum result.

15. **When are the sample results and PA/SI due for draft delivery to NYSDEC?** Mr. Murray replied that the draft is due to the Navy within the next 30 days then it will be reviewed and returned for comments. NYSDEC will receive a draft early next year.

16. **Does the Navy preferred solution then rely on further contamination of public water supply wells instead of the NYSDEC proposed Amended Record of Decision (AROD) to protect public water supply wells?** Mr. Murray responded that the Navy's intent is to remove as much of the plume with the Phase 1 and Phase 2 treatment. The plume will migrate and when the public water supply wells are about to be impacted, the Navy will put wellhead treatment on those wells before they are impacted. The outpost wells are positioned at a distance that would give us enough time before the plume migrates. The outpost wells are continuously monitored every quarter and would know well in advance before anything reached the water district wells.

17. **If the Navy would have selected the proper alternative in 2002 as part of the OU2 Record of Decision (ROD) which included extraction wells north of Hempstead Turnpike, would the plume be as large and as significant as it is today?** Mr. Murray responded that is difficult to answer if the Navy had implemented a remedy or not at that time. The ROD is based on a series of alternatives, the best alternative with best chance of success is selected and that is what the Navy did.

18. **When Will Navy and Northrop Grumman clean up the Bethpage Community Park? Bethpage school district pays for testing of ground gas at the high school and Central Blvd. School. This costs the taxpayers tens of thousands a year, every year. Why hasn't Navy paid for this?** Mr. Murray responded the BCP cleanup is being performed by Northrop Grumman, and the Navy cannot speak for them. Mr. Pelton added that this question relates to OU3 cleanup which was detailed in the ROD dated 2013 and NG is currently cleaning up VOCs in groundwater and soil underneath the baseball field to approximately 40-60 feet bgs. The SVE approach is being utilized rather than excavation, which works well for soil contamination. The process is being enhanced by heating up the soil.

19. **Community Member stated that BCP needs to be cleaned up, its been looked at for 20 years. The Navy and Northrop Grumman have been testing for 30 years.** Mr. Pelton replied that Northrop Grumman has done a lot of testing to define area that needs treatment and have installed 230 wells to treat the contamination and are finalizing the remedial action work plan. Then they will start the soil extraction process. NYSDEC is pushing NG to get this work done. The system will probably run for about 5 years heating the soil will take about half a year to clean up the soil, which will prevent groundwater from leaving the park.

They are also operating a containment system. NYSDEC will reach out to the high school to find out about what testing they have been involved in.

20. **Ms. D'Arcangelo commented that the 9 pCi/L detection of radium is near plant 10. If it is not the Navy who is making radiological stuff, then where is it coming from?** Mr. Murray replied that the results from the sampling results the average, which is 1.4 pCi/L. Our results will be evaluated by NYSDEC in the PA/SI report. Mr. Pelton added that NYSDEC is looking into this as well and there are natural and manmade sources for radium. NYSDEC is currently compiling about 3,000 samples. NYSDEC has data from NCDOH to supplement. Radiation experts are looking at historic documents, scanned buildings, soil scans, etc. and have not found any evidence of disposal from the scans. The radium data we have is consistent with other sites around Nassau county.

21. **Will the onsite groundwater PA/SI be made available to public?** Mr. Murray replied, yes, after NYSDEC makes comments which will probably be in the middle of the year.

22. **Ms. D'Arcangelo commented that everyone wants to know where the radon gas detected at the high school came from.** Mr. Murray replied that the Navy has not seen any indication of a release. Mr. Karpinski added that soil vapor has not been detected in any houses along Sycamore. They found very low levels. NG still put in an SVE system in. There is no data for soil that shows impacts to the school. No intrusion is occurring. The system that is in place is preventing the soil gas from traveling and has not impacted any houses, which are along 11th Street.

23. **Ms. D'Arcangelo inquired if freon has traveled from the SVE system and what is to stop it from going across the street?** Mr. Karpinski replied the SVE system is stopping it.

24. **On Page 4 of the RE108 presentation RE108 what happens to all the contamination (yellow area) outside of your capture zone? Where will that contamination go?** Mr. Brayack responded that the RE108 treatment targets the highest concentration. We are pulling pounds and tons of chemicals. What does not get captured will continue to migrate to the south and will naturally reduce in concentration. Mr. Murray added that the capture zone is a conservative area and the Navy can extend well behind and can go out further.

25. **Where will that contamination go**? Mr. Murray replied the contamination will continue migrating. Phase 2 will knock out a lot of that concentration mass.

26. **Why did you only present data for 1,4-dioxane and PFOS-PFOA for onsite monitoring wells?** Mr. Murray responded during the CERCLA investigation process there were three potential contaminants that had not been evaluated in the past. These newer contaminants - 1,4-dioxane, PFAS and radium -are being looked at because of concerns to the public. It is already known that VOCs exist.

27. **What are levels offsite in line of plume heading south?** Mr. Brayack responded that 1,4-dioxane is commonly associated with Chlorinated Volatile Organic Compounds (CVOCs). Testing has been done onsite and offsite for decades, but the method only gave us a detection limit of 10 to 15 ppb testing. There has been a push to reduce the goals for 1,4-dioxane. So the Navy went back to onsite to look for source. Off property has been added to the sampling program, it is in our data reports which are submitted to water districts. The Navy has not done much radium sampling in offsite groundwater. In the onsite groundwater, the average is 1.9 pCi/L. PFAS is a new chemical that the Navy is taking a large interest in. It is associated with aqueous film forming foam (AFFF). AFFF and PFAS issues are fairly prominent at facilities with fire training activities. There was no foam used at NWIRP, but it has been observed to be flowing from offsite to onsite. The Water Districts have been analyzing for PFAS, but the Navy has not tested it in the off-property groundwater wells.

28. **What is the amount of treated water per day at Bethpage? How much is Northrup Grumman treating?** According to Mr. Boufis, Bethpage is treating anywhere from 2 million to 10 million gallons per day and are still waiting on Northrop Grumman to treat water.

29. **How do we get more pressure on NG to get data?** Mr. Pelton responded that the contamination at Bethpage Community Park has left the site to Plants 4 and 5. Northrup Grumman has installed three recovery wells to connect to the treatment plant. They have meetings to hook up pipes. Their schedule was 1.5 years and NYSDEC think they can do that. NG needs to get access to property and NYSDEC has asked NG to sit down with Bethpage Water District. NYSDEC does not want to see it move further south.

30. **What is Bethpage Water District view on radium being naturally-occurring?** Mr. Boufis until proven otherwise, I do not think that it is naturally-occurring. All the other BWD wells are below 1 and the one Bethpage well is above that.

31. **How many of the speakers live in Bethpage or Farmingdale or the Massapequas?** As per Mr. Sobolow stated that is not relevant. They are community members and are very interested. No one lives in this area. How many of the NYSDEC or NYSDOH live in the area? Maybe it's time to get those people on board.

32. **Can the state formulate a phased well/treatment plan that starts with hotspot remediation that the Navy could support?** Mr. Murray responded that Navy is looking at the plan provided, and the concepts being evaluated. The Navy is looking at their review process and seeing where they can work together. The Navy's intent is to see how effective the system is, then add to it.

33. **Do the existing "protectiveness" remedies satisfy downstream locations and using only Navy-planned wells, protect areas south of the planned remediation area?** Mr. Murray responded yes. When the Navy designed the OU2 ROD, they knew the plume would migrate, so it was designed to treat hotspots for the highest mass removal areas. The plan was run by the NYSDEC. The Public Water Supply contingency plan is to provide well head treatment.

34. **What activity occurred at Site 4 (Former [Underground Storage Tank] UST Area) that caused PFAS, radium and 1,4-dioxane contamination? At what depth was contamination found?** Mr. Murray responded the Navy has no reason to believe that there is a source or that there was a release at Site 4 of PFAS, radium, or 1,4-dioxane. The PA/SI is the first stage looking at data then deciding if further investigation is required. There is no good answer why the Navy saw slightly higher concentrations there.

35. **What are average radium levels for the rest of Long Island, excluding Bethpage? With regards to the monitoring wells, what were the depths of these wells where the samples were obtained? Long Island has been regarded as having a normal level of 1 pCi/L. How can 5 pCi/L or greater be considered "natural variability? If radium is five times heavier than water, could it have sunk to the bottom and you missed the window to find it? This is maybe why shallow wells show little or no levels of radium – only the deeper wells would be impacted?** As per Mr. Murray, background and regional radium levels were looked at as a part of PA/SI. Wells were screened at various levels and according to Mr. Brayack, the deepest interval was 300 feet bgs. They are not sure if radium is five times heavier than water.

36. **Why are you not running piping on the south side of the storm basin located on Arthur Ave - away from current large gas lines? There is enough area on south side of basin. Why chance (risk) disturbing existing gas lines?** Mr. Murray responded that currently air knifing is being done to tell where the utilities are. According to Ms. Smeal, the pipeline is outside the fence – basically under the sidewalk. According to Brian Murray, this is the most direct route to tie into the RW3 recovery well. The well piping that is being tied into is on the north side, and this route is much more direct.

NOTE: Mr. Carey was upset about the Navy opposing the NYSDEC's ROD. People of Massapequa will not accept attenuation. The Navy is not willing to negotiate. Start with 5B tomorrow.

RAB Member ends meeting.

CLOSING REMARKS

Following the questions and answer session, Mr. Murray thanked everyone for attending the meeting and announced the next Bethpage Navy RAB meeting would be in the Spring of 2020.

APPENDICES

APPENDIX A

14 NOVEMBER 2019 RAB MEETING ATTENDEE LIST

Attendees for Nov 2019 RAB

1	Atora, Ralph
2	Averna, Raymond
3	Blank, Teri
4	Boufis, Mike
5	Brayak, David
6	Brennan, Gary
7	Candiolte, Flayne
8	Carvo, John
9	Castle, Richard
10	Catalano, Richard
11	Collins, Tim
12	Comer, Christophe
13	Cornth, Bruce
14	Cushing, Melissa
15	D'Arcangelo, Sandra
16	Dean, Bill
17	Factor, Lilia
18	Fanda, Bill
19	Foley, Joanna
20	Francisco, Krist
21	Frost, Tom
22	Gomez, Karen
23	Goodman, John
24	Gordon, Greg
25	Hester, Don
26	Humann, Rich
27	Jughosm, Mike
28	Karpinsky, Steve
29	Kivo, Patricia
30	Koch, Frank
31	LaRocco, Paul
32	Lovejoy, John
33	Luketic, Mike
34	McCarthy, Tom
35	McGovern, Gina
36	Moffa, Ronald
37	Murray, Brian
38	Neesy, Dennis
39	O'Brien, Maureen
40	O'Connor, Jeanne
41	Olmsted, Ed
42	Pavone, Bill
43	Pearlman, Greg
44	Pelton, John

45	Redefagic, Albina
46	Reinhardt, John
47	Retunde, Alex
48	Robinson, John
49	Roden, John
50	Roden, Pam
51	Rogers, Cindy
52	Russo, Matthew
53	Schafer, John
54	Schummel, Peter
55	Schwartz, David
56	Schwartz, Steve
57	Smeal, Monica
58	Sobolow, David
59	St. Germain, Dan
60	Surami, Shaun
61	Tucholaki, Dan
62	Varriccho, vin
63	Waldron, Gayle
64	Wu, Ernie
65	Yang, Yeong

APPENDIX B

RAB MEETING AGENDA AND DEFINITIONS

TETRA TECH

Agenda for Restoration Advisory Board

Naval Weapons Industrial Reserve Plant Bethpage

Date: April 18, 2018

Time: 6:30 PM

Location: Bethpage Community Center-103 Grumman Road West, Bethpage NY

Time: 6:30 PM to 7:00 PM

- Open house - general questions from the public

Time 7:00 PM to 8:00 PM

- Ground Rules – The Management Edge
- Introduction of RAB members and Regulators – Navy Co-Chair/Community Co-Chair
- Distribution of Minutes and Status Update – Navy
- OU-2 Offsite Groundwater Investigation – Resolution
- GM38 Area Hotspot Treatment System – Recharge Basin Rehabilitation and Injection Well Testing – Tetra Tech
- RE108 Hotspot Treatment – Tetra Tech
- OU-4 Site 1 Former Drum Marshalling Area Contaminated Soil, Soil Vapor, and Groundwater – Tetra Tech

Time 8:00 PM to 8:30 PM

- Questions – Community Co-Chair
- Closing remarks – Navy

Copies of information can be found at the document repository located at the Bethpage Public Library, 47 Powell Avenue, Bethpage NY 11714 (516 931 9307) or online at http://go.usa.gov/DyXF

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Definitions and Clarification of Terms, Acronyms and Abbreviations

For the Bethpage Restoration Advisory Board (RAB)

- **Basic:**
  - VOC--Volatile Organic Compounds:
    - Chlorinated solvents (typically used as degreasers in manufacturing)
  - Effluent
    - Is an outflow of water from a treatment source
  - Free Product
    - Substance (usually oil or gasoline) that exists in its own state-it is not dissolved in water.
  - Soil Vapors
    - Gases contained in the pore spaces of soil
  - Capture Zone
    - Area of water whose flow direction is influenced by pumping
  - Ground Water
    - Water flows through open pore spaces of soil
  - Down gradient
    - The direction of groundwater flow
  - Plume
    - An area that impacts from chemicals are detected in
  - Raritan Clay Layer
    - A geologic horizon - Clay that is approximately 800-100 feet below ground surface – accepted to be the bottom of the Magothy aquifer
  - Aquifer
    - an underground layer of water-bearing permeable rock or unconsolidated materials
  - Trichloroethylene-
    - Volatile organic compound of concern (used as a degreaser in manufacturing)
  - OU- Operable Unit
  - BGS - Below Ground Surface
  - PCB- Polychlorinated Biphenols (used as transformer cooling fluid)
  - NG- Northrop Grumman
  - NWIRP-Naval Weapons Industrial Reserve Plant
  - No. 6 Fuel Oil- tar
  - Hot spot
    - Area where trichloroethylene is at a concentration greater than 1000 parts per billion
  - BWD Plants- Bethpage Water District Plants

- **Data Gathering:**
  - Gauging- measurement of ground water levels from top of ground surface
  - In-situ – in place
  - Delineate- define boundaries
  - VPB- Vertical Profile Boring
  - Monitoring Well- (typically 2-6 inches in diameter) a well used to provide a "snapshot" of water quality when sampled

- **Treatment Technologies:**
  - Biosparging
    - Removal of chemicals by breaking them down with bacteria
  - Steam Injection/Free Product Recovery
    - Heating of oil that has a tar like consistency with steam to make it flowable (syrup like consistency) so that it may be removed
  - Air Stripping
    - Removal of dissolved volatile organic compounds from water by transferring it into air
  - Land Use Controls
    - Action that restricts what land can be used for
  - Vapor Phase treatment-
    - Removal of a chemical from gas; used to remove trichloroethylene from air vapor
  - Biodegradation
    - Reduce a chemical by changing conditions so that bacteria can break down the chemical
  - On-site Containment Treatment System (ONCT)
    - Series of wells that remove and treat groundwater at the southern edge of the former Northrop Grumman property
  - SVECS—Soil Vapor Extraction Containment System
    - Vacuum for volatile chemicals trapped in the air between soil particles; used to remove trichloroethylene
  - Equalization Tank
    - Tank for mixing
  - Liquid Phase Granular Activated Carbon Polishing
    - Removal of remnants of a volatile chemical by passing liquid through carbon; used to remove trichloroethylene

- Recharge basin
  - Sandy basin that receives storm water and allows water to filter down into the ground
- Recovery Well
  - (Typically larger diameter 12 to 36 inches) a well used to recover oil or water containing chemicals

- **Regulatory:**
  - Proposed Plan- Plan of action that is sent to the state for approval prior to the Final Record of Decision
  - Feasibility Study- collection of data used to determine if a remedy will work
  - ROD –Record of Decision
  - Compliance sampling- collection of samples to demonstrate that chemicals are below regulatory levels
  - CERCLA- **Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)** – the legal mechanism for cleaning up inactive hazardous waste sites at DOD (Depart of Defense) facilities, this is the defining regulation for the Navy's Environmental Restoration (ER) Program at NWIRP Bethpage under NYSDEC authority.
  - RCRA- **Resource Conservation and Recovery Act (RCRA) Corrective Action** – a statutorily required cleanup program, similar to CERCLA, that addresses active solid waste management units and contaminated media as a condition of RCRA permits - NWIRP Bethpage has a RCRA Permit with NYSDEC
  - NYSDEC- **New York State Department of Environmental Conservation (NYSDEC)** provides regulatory review and approval of Navy actions at NWIRP Bethpage
  - NYSDOH- **New York State Department of Health (NYSDOH)** assists NYSDEC.
  - USEPA- **United States Environmental Protection Agency (USEPA)** Provides federal review of the Navy actions.

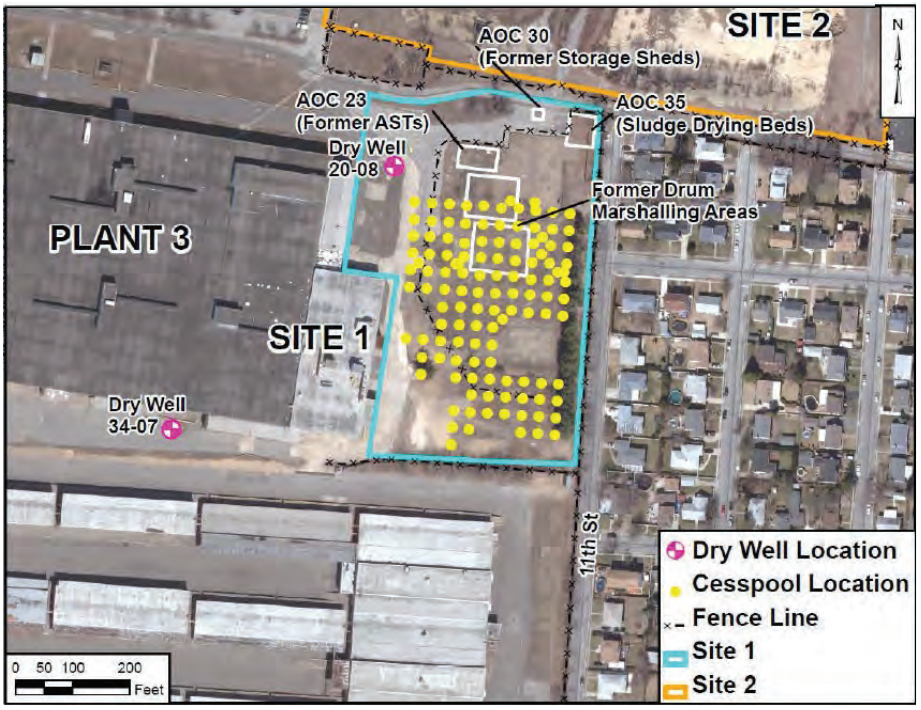
APPENDIX C
POSTERS

SITE 1 – FORMER DRUM MARSHALLING AREA

Storage Area:
- Drums containing chlorinated and non-chlorinated solvents
- Electrical Transformers and Autoclaves containing polychlorinated bi-phenyls (PCBs)

Cesspools:
- 120 abandoned cesspools
- Used to discharge sanitary wastewater from Plant No. 3

Drywell 20-08
- PCB in soil contamination found 20-30 feet deep



Contaminants of Concern
- PCBs
- Volatile and Semi-Volatile Organic Compounds (VOC, SVOCs)
- Metals – Arsenic, Chromium, and Hexavalent Chromium
- Pesticides

Remedial Action Plans for Soil Remediation
- Excavate and dispose of PCB-contaminated soils throughout Site 1
- Removal of cesspools and drywell 20-08
- Install a buried cover to reduce future leaching of contaminants from unsaturated soil to the groundwater
- Backfill excavated areas and restore parking and grassy areas to existing conditions

Remedial Action by the Numbers
- Over 39,300 cubic yards of contaminated material will be excavated and disposed of
- Contaminated soils will be transported off Long Island and disposed of in permitted landfills in several states depending on soil characterization of soil contamination
- Soil will be transported by over the road trucks and rail cars

Timeline
- Planning: Completed
- Mobilization and Site Setup: Completed
- Sheet Piling Install: Completed
- Excavation: Spring 2019 – Winter 2019/20
- Liner Installation: Winter 2019/20
- Transportation and Disposal: Summer 2019 – Winter 2019/20
- Restoration: Spring 2020

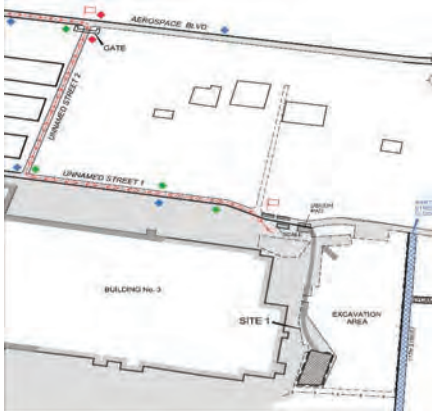
SITE 1 – FORMER DRUM MARSHALLING AREA

Local Impacts from Site 1 Soil Remedial Action

Traffic

- Traffic Control Plan provided to minimize impacts to local roads
- Approximately 3,900 Truck trips required for soil removal and importation
- Where feasible, backhauling of clean fill to reduce overall truck trips.
- Traffic control signs will be installed on and off the NWIRP Property to direct trucking traffic

On-Site Traffic Plan



Off-Site Traffic Plan

Noise (All Construction)

Hours of operation will be **7:00 AM – 5:00 PM Monday – Friday**

Weekend work will be avoided, except when necessary to minimize impacts to surrounding parties

Noise levels will be monitored and will not exceed 85 decibels at the site perimeter

Noise – General Construction Noise

- Installation of Sheet Piles completed in September 2019
- Backup Alarms
- Heavy equipment movement/noise

11th Street Impacts

- Installation of a privacy screen and concrete barrier at Site 1 boundary
- Concrete barrier will extend 18 inches onto 11th Street
- During final phases of excavation, tree line will be removed
- Tree line will be replaced during restoration phase

Dust Control

- Dust monitoring will occur during all construction activities to monitor dust generation on site
- Monitoring will occur upwind, downwind, and at residential points
- Soil or debris will be covered in trucks
- Water or other standard products will be applied to reduce dust on site

Navy 2003 RECORD OF DECISION (ROD)

The Navy, with regulator concurrence, issued its federal cleanup and management plan to address OU2 groundwater contamination resulting, at least in part, from the NWIRP operations.

Approved Groundwater Remedy:

- Legal Restrictions on Groundwater Use
- Groundwater Monitoring and Hotspot Treatment
- Public Water Supply Protection Program

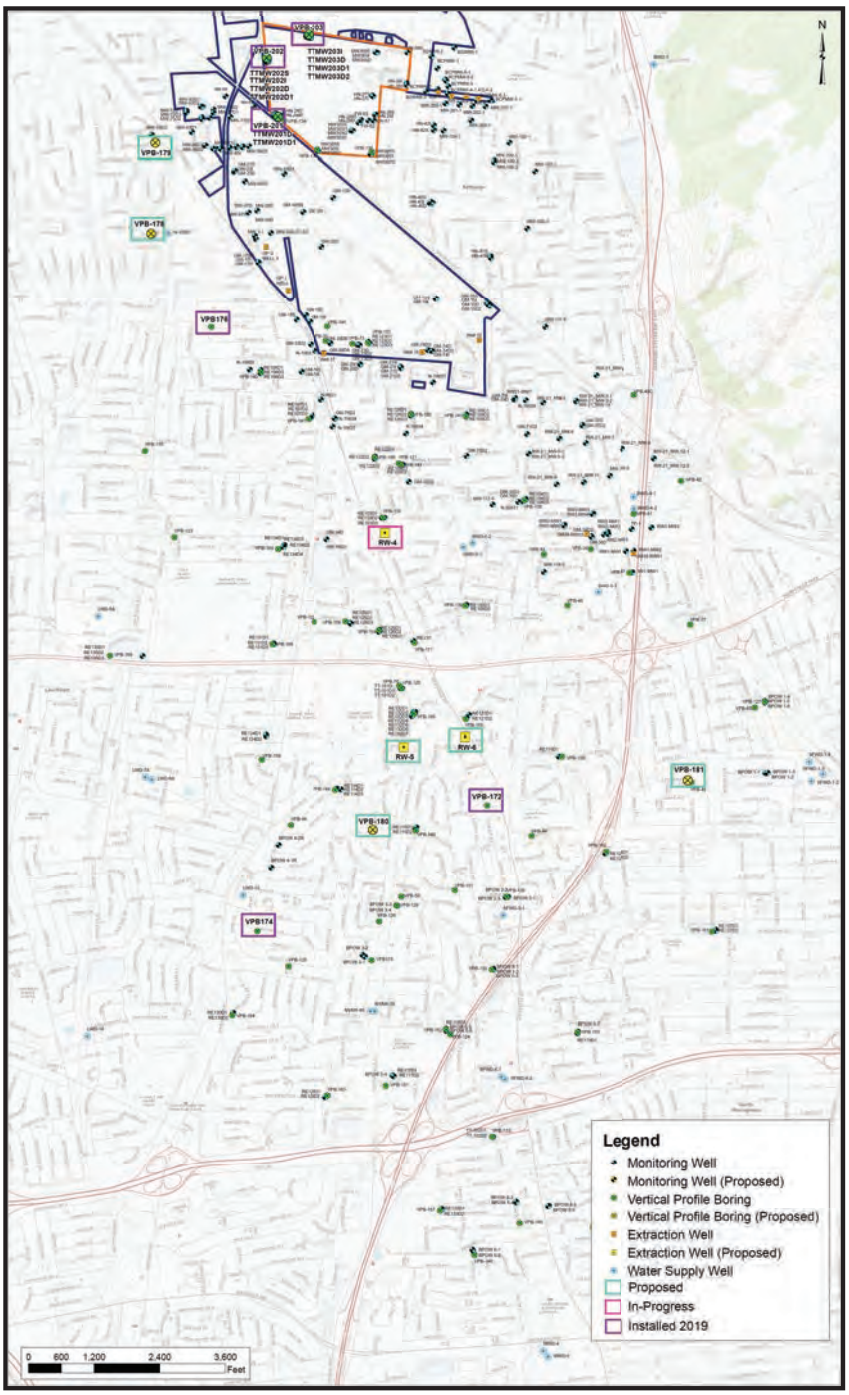
Groundwater Monitoring

PURPOSE

- Determine and monitor groundwater contamination south of NWIRP Bethpage and Northrop Grumman (NG) property
- Implement "hot spot" remedy(ies) as needed
- Provide wellhead treatment for potentially impacted public water supplies
- Coordinate with NG to help it address its OU2 responsibilities under the 2001 NYSDEC ROD

MONITORING COMPONENTS

- Requires property access agreements
- Vertical Profile Borings (VPB) - quickly screen areas for the presence, depth, and concentration of contamination
- Permanent Monitoring Wells (MW) - confirm presence/absence of contamination and develop trends
- Water levels measurements - support U.S. Navy modeling and capture zone analysis



Vertical Profile Borings

- Locations selected by the Navy and NYSDEC
- Generally located on township or county right-of-ways
- Advance notification provided to nearby residents
- **12-inch** diameter hole drilled into the ground
- Final boring is **860 to over 1,000 feet deep** (extending to the Raritan Clay Layer)
- Drilling is stopped at selected depths and a device is lowered to sample the groundwater
- **44 groundwater samples** are collected per boring and analyzed for VOCs
- **4 to 8 weeks** to complete a boring/well

2000-2019: Navy installed over 57 borings and over 103 monitoring wells. Data is shared with NYSDEC, public, and other stakeholders. Additionally, NG has installed its own borings and monitoring wells that also provide data to the OU2 Program.

HOT SPOT TREATMENT

Hot Spots are areas with greater than 1,000 parts per billion (ppb) trichloroethene (TCE), which is the primary Volatile Organic Compound (VOC) contaminant in the OU2 Groundwater

GM38 Hot Spot

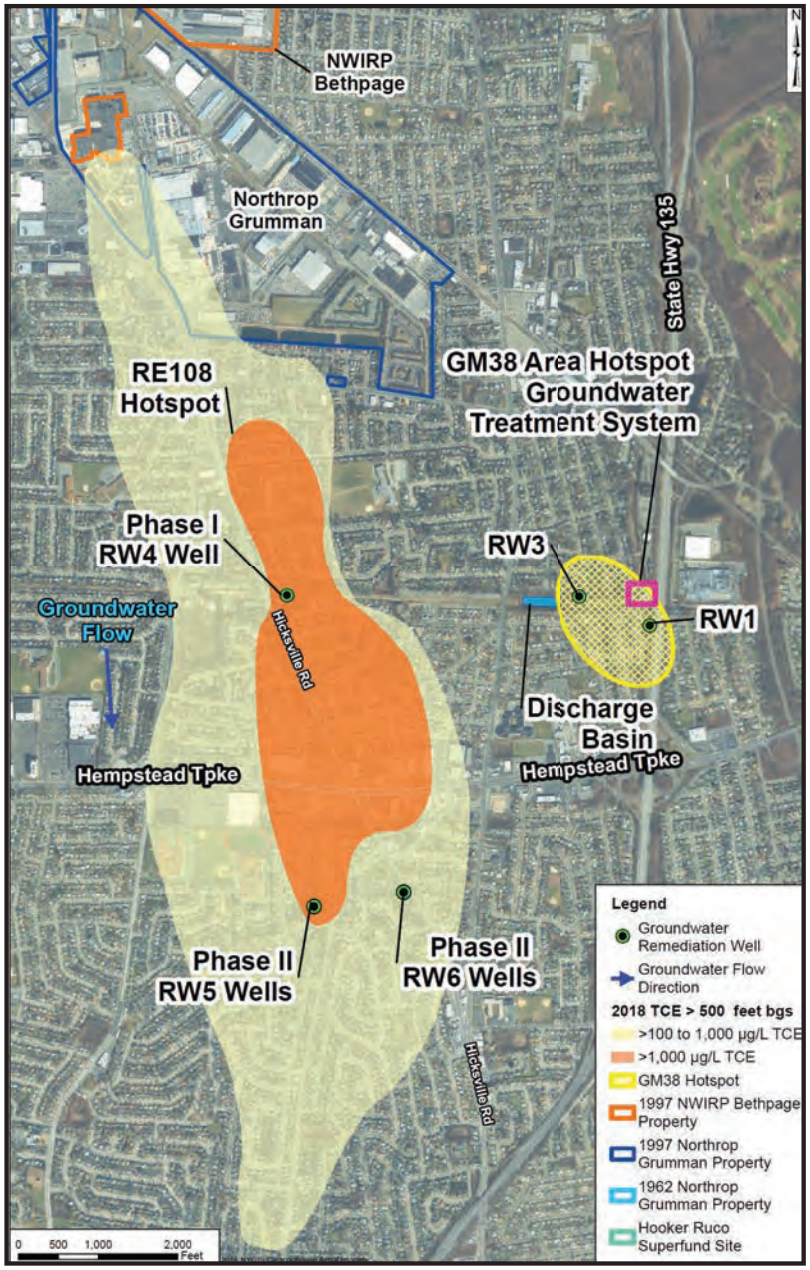
- Approximately 1.6 miles southeast of former NWIRP Bethpage and former Northrop Grumman (NG) property
- Groundwater flows from the former NG and NWIRP facilities to the hotspot area
- Originally 38 acres in size
- Variable depths between 300 to 500 feet deep
- Now less than 200 ppb; groundwater concentrations have decreased by over 80 percent

GM38 Groundwater Treatment System

- Installed, operated, and maintained by the Navy in accordance with the Navy's OU2 ROD
- Operated by the Navy since 2009 to remove VOCs in groundwater to achieve drinking water standards
- Recovery well pulls groundwater to the surface
- VOCs are then removed from the groundwater by air stripping and carbon filters
- Samples are collected from eight monitoring wells to determine the system's effectiveness
- Approximately 4.3 billion gallons of groundwater containing over 5 tons of VOCs have been captured and treated

RE108 Phase I and Phase II

- Identified by the Navy 2011; located north of Hempstead Turnpike
- Approximately one mile south of former NWIRP Bethpage and NG property
- Approximately 500-750 feet deep
- Phase I construction pending final access agreements
- Phase II design is in process



PUBLIC WATER SUPPLY PROTECTION

Navy works with NYSDEC, water districts, and NG to use groundwater monitoring results to predict potential impacts to public water supply wells and install wellhead treatment systems to remove VOCs down to concentrations meeting drinking water standards

Wellhead Treatment Systems Funded by U.S. Navy

Bethpage Water District (BWD)

- Plant 5 - 1996
- Plant 6 - upgrades, 2011

South Farmingdale Water District (SFWD)

- Plant 1 - 2011
- Plant 3 - 2013

New York American Water (NYAW) Seamans Neck Rd,

- Interim system, 2012
- Full scale system, 2015

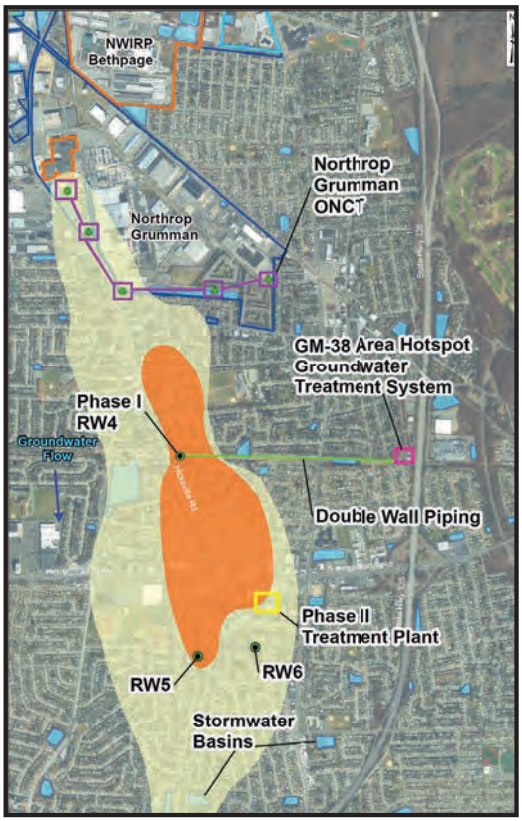
RE108 AREA HOTSPOT TREATMENT SYSTEM

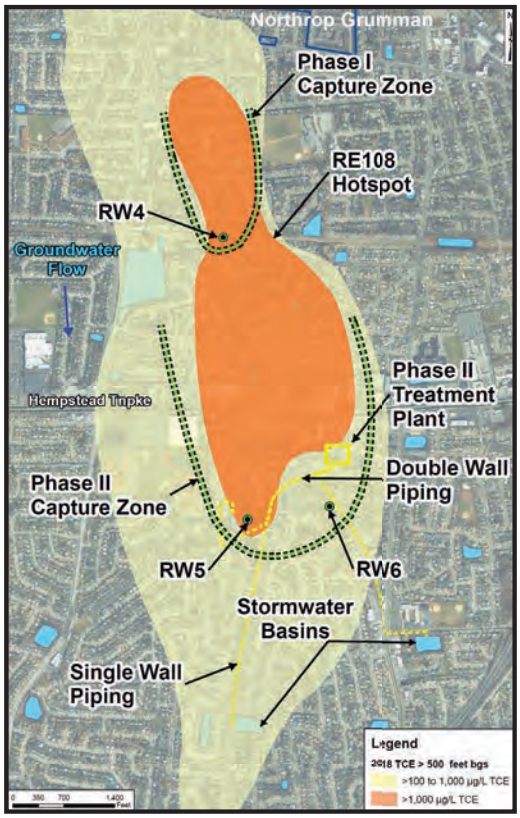
Background

- Navy is addressing the RE108 Area Groundwater Hotspot
- Work is being conducted in two phases
  - **Phase I** located north of Hempstead Turnpike, to address northern portion of the Hotspot
  - **Phase II** located south of Hempstead Turnpike to address remainder of the Hotspot

Phase I - Description

- The Phase I System would consist of an extraction well (RW4), piping along the existing utility corridor, and the existing GM38 Treatment System
- Phase I System would treat the northern portion of the plume, remove significant mass, and accelerate cleanup times
- Design is complete, and based on property access, construction (3 to 4 months) is expected to be completed in 2020





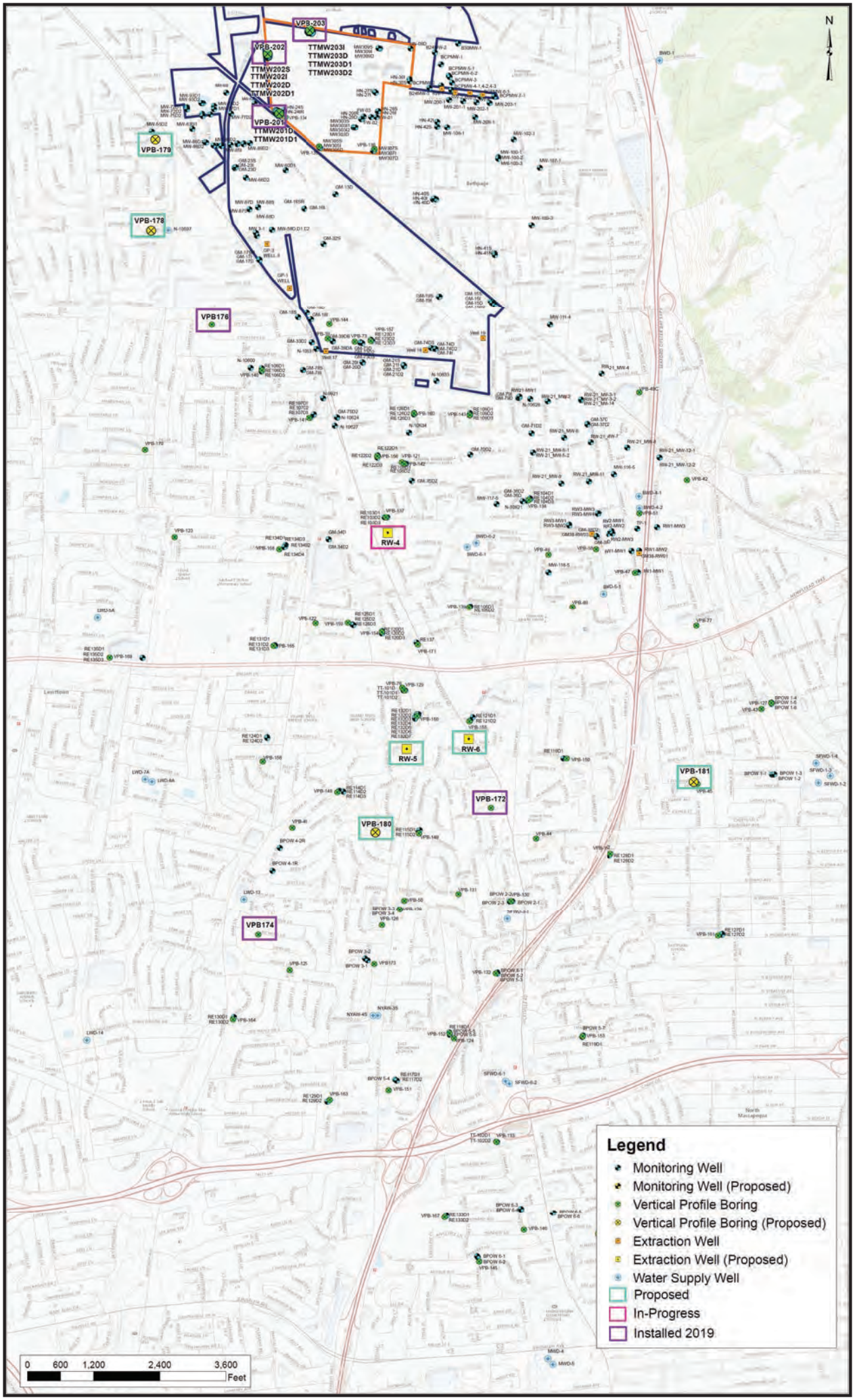
Phase II - Description

- Phase II System would consist of 4 new extraction wells (RW5A, RW5B, RW6A and RW6B) near the 2023 projected southern extent of the RE108 Area Hotspot Capture zone and to the South
- Extraction wells would be installed in vaults, below grade
- Navy purchased property for treatment plant, plant would be similar in size to GM38 Area Hotspot Treatment System
- Pipe routes would follow existing roadways
- Treated water would be re-introduced to the aquifer through stormwater basins

GM-38 Area Hotspot Treatment System, looking southeast

NORTHROP GRUMMAN ON-SITE CONTAINMENT

- Captures groundwater at the south and southwest edges of the former NG property to prevent further off-site movement
- **System is operated and monitored by NG with quarterly and annual reports provided – Navy has no control over or involvement in environmental cleanup decisions for NG**
- VOC data indicate some contamination may be bypassing the system
- NG evaluated the effectiveness of the ONCT system in 2016 and determined that the system was operating properly
- Navy is continuing to review data to verify that residual NWIRP contamination is not migrating beyond NG's containment system.


N
VPB-203
VPB-202
TTMW203I
TTMW203D
TTMW203D1
TTMW203D2
TTMW202S
TTMW202I
TTMW202D
TTMW202D1
VPB-201
TTMW201D
TTMW201D1
VPB-179
VPB-178
VPB176
RW-4
RW-5
RW-6
VPB-172
VPB-180
VPB-181
VPB174
Legend
Monitoring Well
Monitoring Well (Proposed)
Vertical Profile Boring
Vertical Profile Boring (Proposed)
Extraction Well
Extraction Well (Proposed)
Water Supply Well
Proposed
In-Progress
Installed 2019
0
600
1,200
2,400
3,600
Feet

APPENDIX D
PRESENTATIONS

GROUND RULES
APRIL 2018 RESTORATION ADVISORY BOARD (RAB)

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE LONG ISLAND, NEW YORK

4/18/2018

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE RAB GROUND RULES

- **Respect others:**
  - **One Speaker at a time**
  - **No interruptions**
  - **No side conversations**
  - **Listen and stay open to all points of view**
- **Ask questions or make statements after all the presentations are given: (approximately 8:00)**
  - **During the presentations, write any questions on the cards on your table and pass them forward, or raise them and they will be picked up and taken to the RAB Community Co-Chair.**
  - **They will be answered after presentations are completed.**
- **Stay focused on the topics; avoid digressions.**
- **Turn cell phones and /or pagers off, or on vibrate, and respond during breaks, except for emergencies.**

The Management | Edge

OPERABLE UNIT 2 - OFFSITE GROUNDWATER INVESTIGATION AND WELL RECOVERY EFFECTIVENESS ANALYSES UPDATE

APRIL 2018 RESTORATION ADVISORY BOARD

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE LONG ISLAND, NEW YORK

4/18/2018

PRESENTATION LAYOUT

Is My Water Safe to Drink?

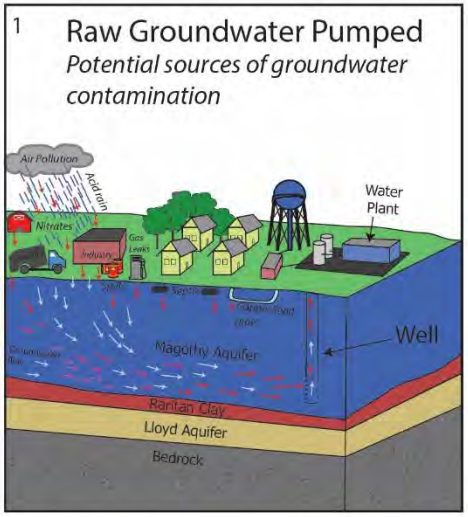
Operable Unit 2

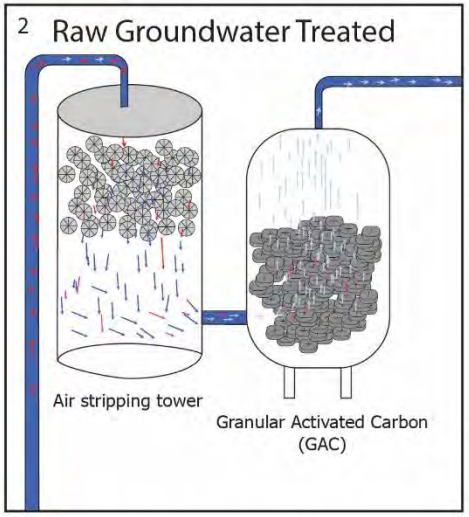
1. Navy's Objectives for OU2 Investigation
2. Local Groundwater Geology and Applicability to Bethpage Plume
3. 2009 – 2018 Vertical Profile Borings and Monitoring Wells
4. Recent Work (Performed since last Restoration Advisory Board)
5. Future Work
6. Assessing Results and Recent Reports and Findings

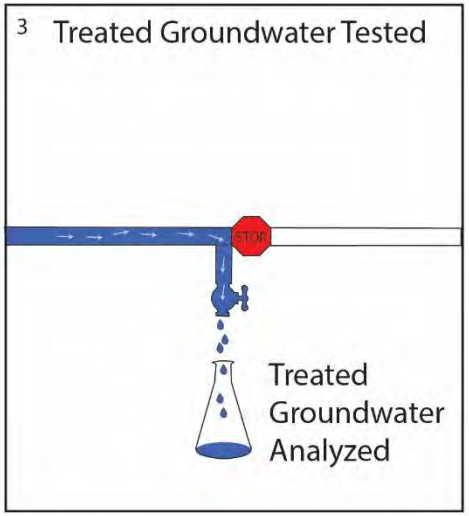
Well Recovery Evaluation

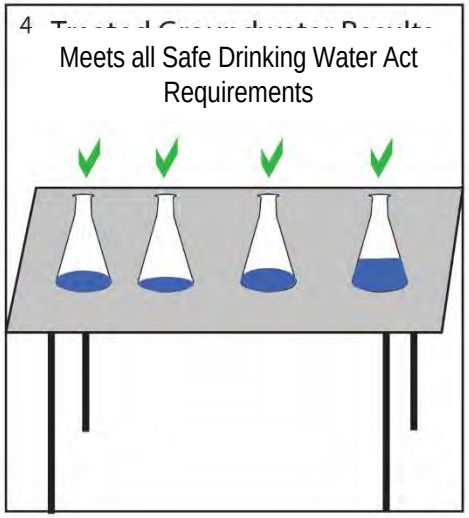
1. Update – New York American Water (NYAW) and South Farmingdale Water District (SFWD) Plant 6 Wells

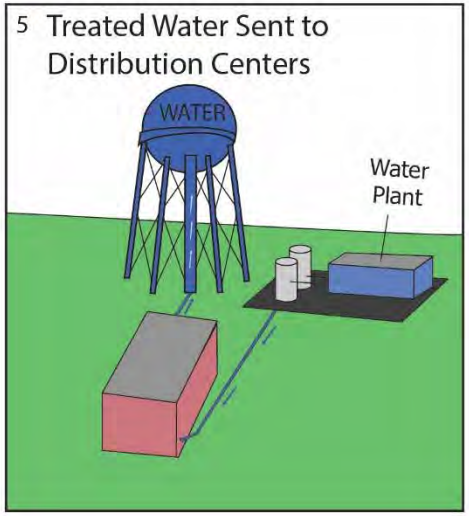
IS MY WATER SAFE TO DRINK?
THE ANSWER IS YES



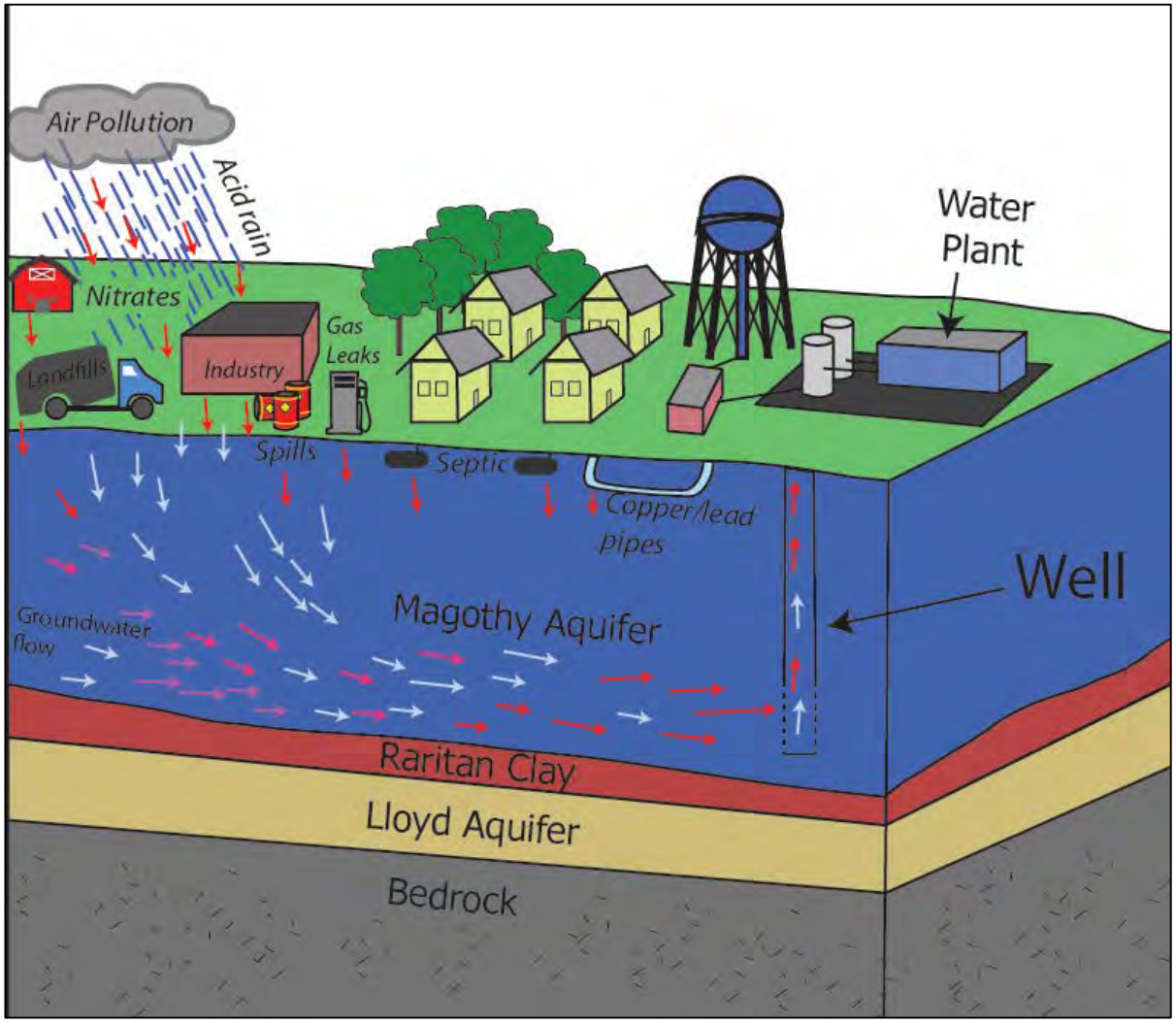




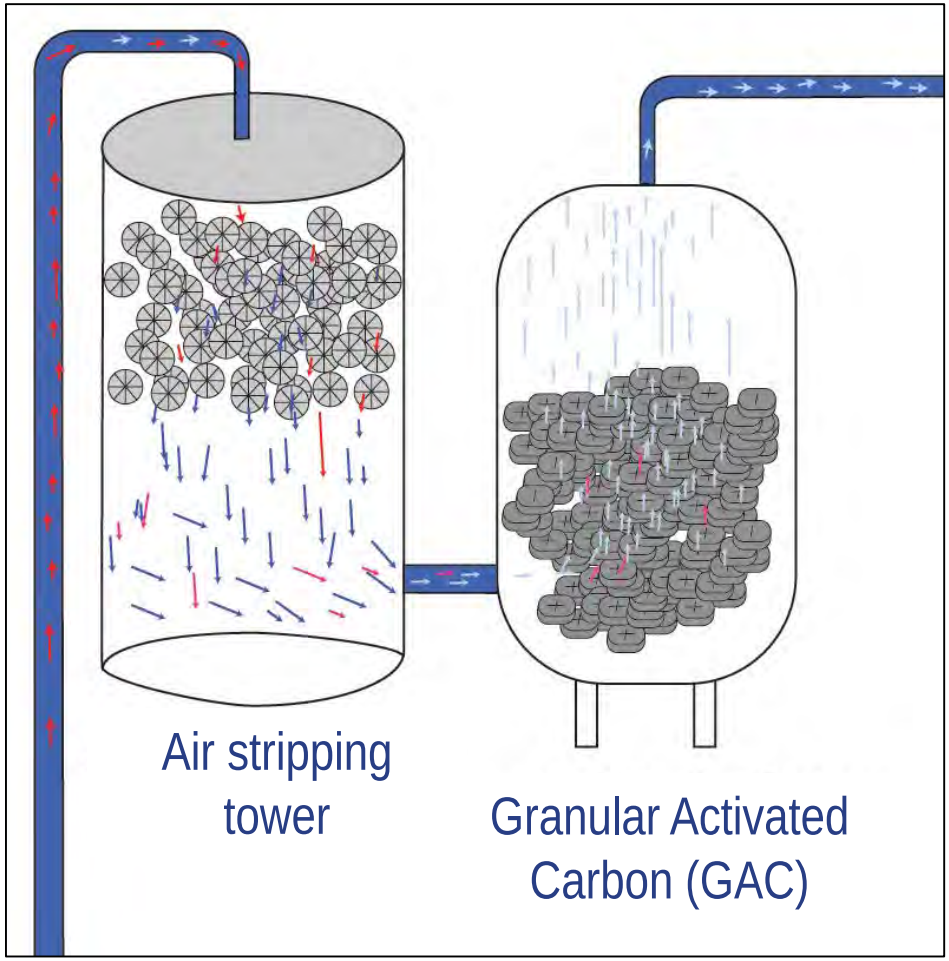




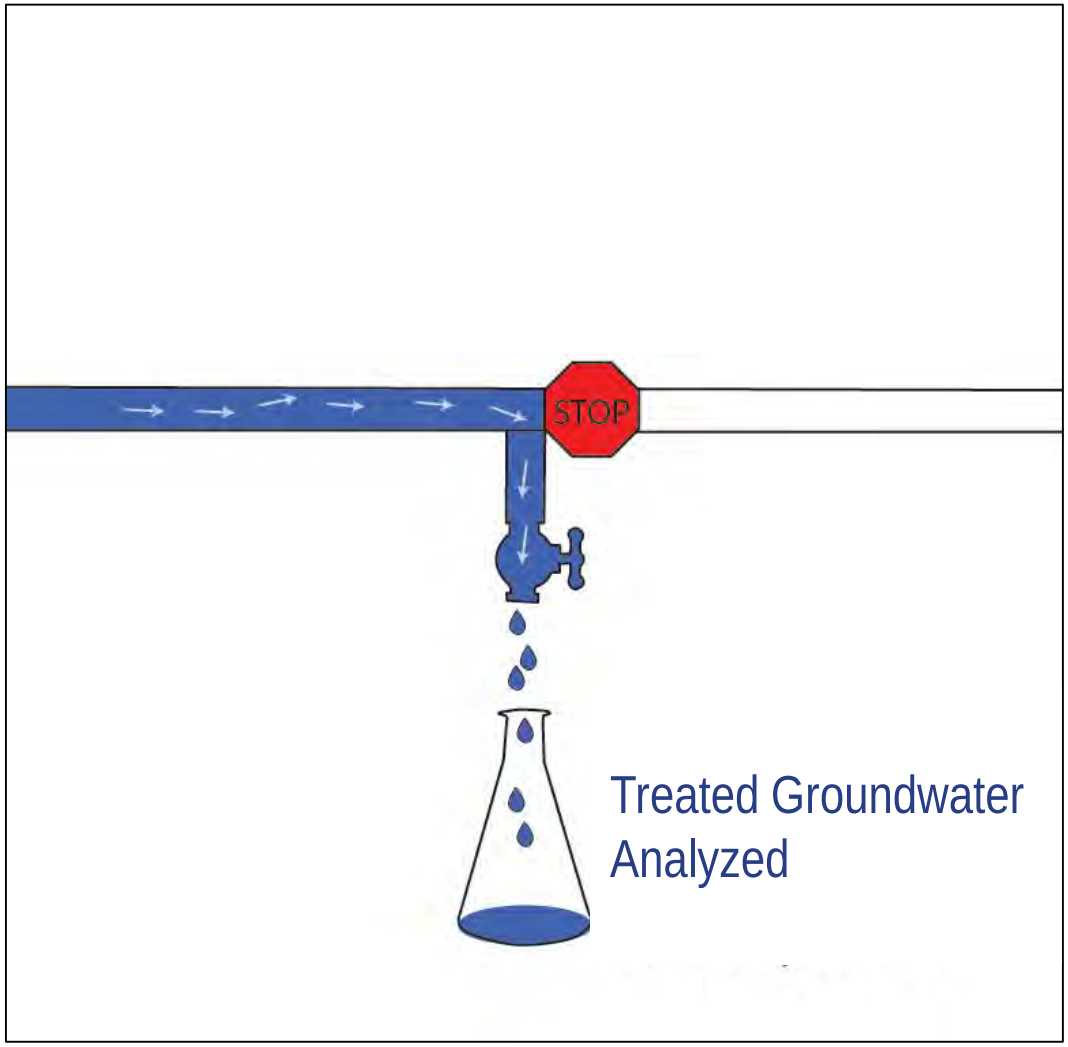
RAW GROUNDWATER PUMPED MAY CONTAIN CONTAMINANTS



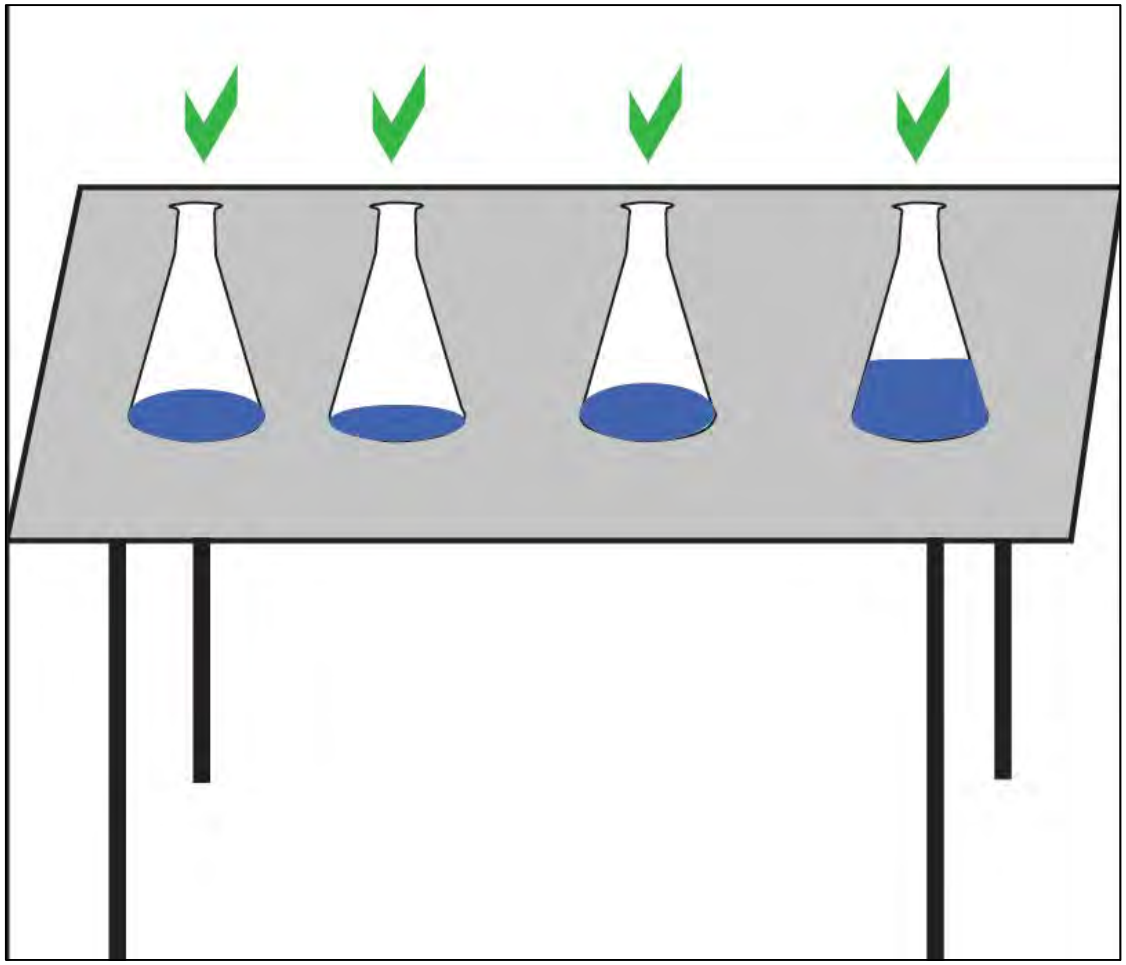
RAW GROUNDWATER TREATMENT FOR VOLATILE ORGANIC COMPOUNDS (VOC's)



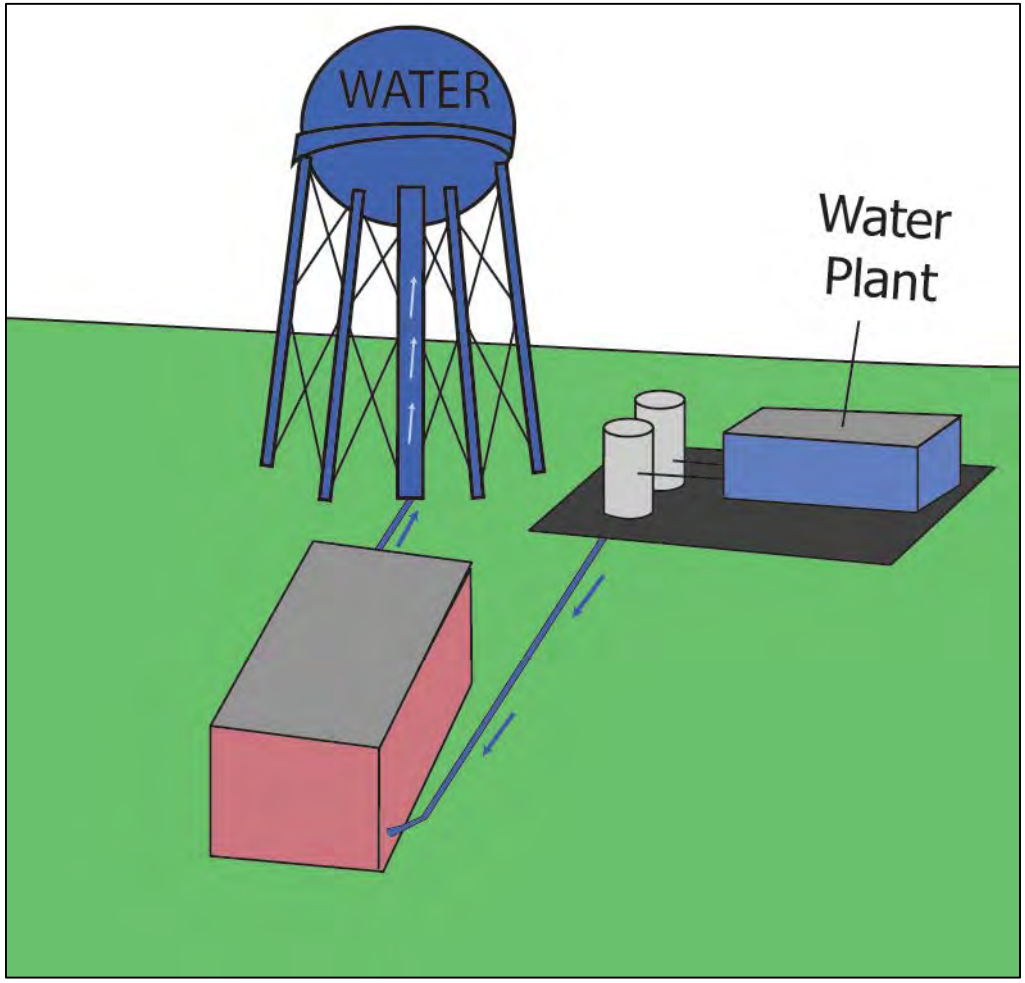
TREATED GROUNDWATER TESTED



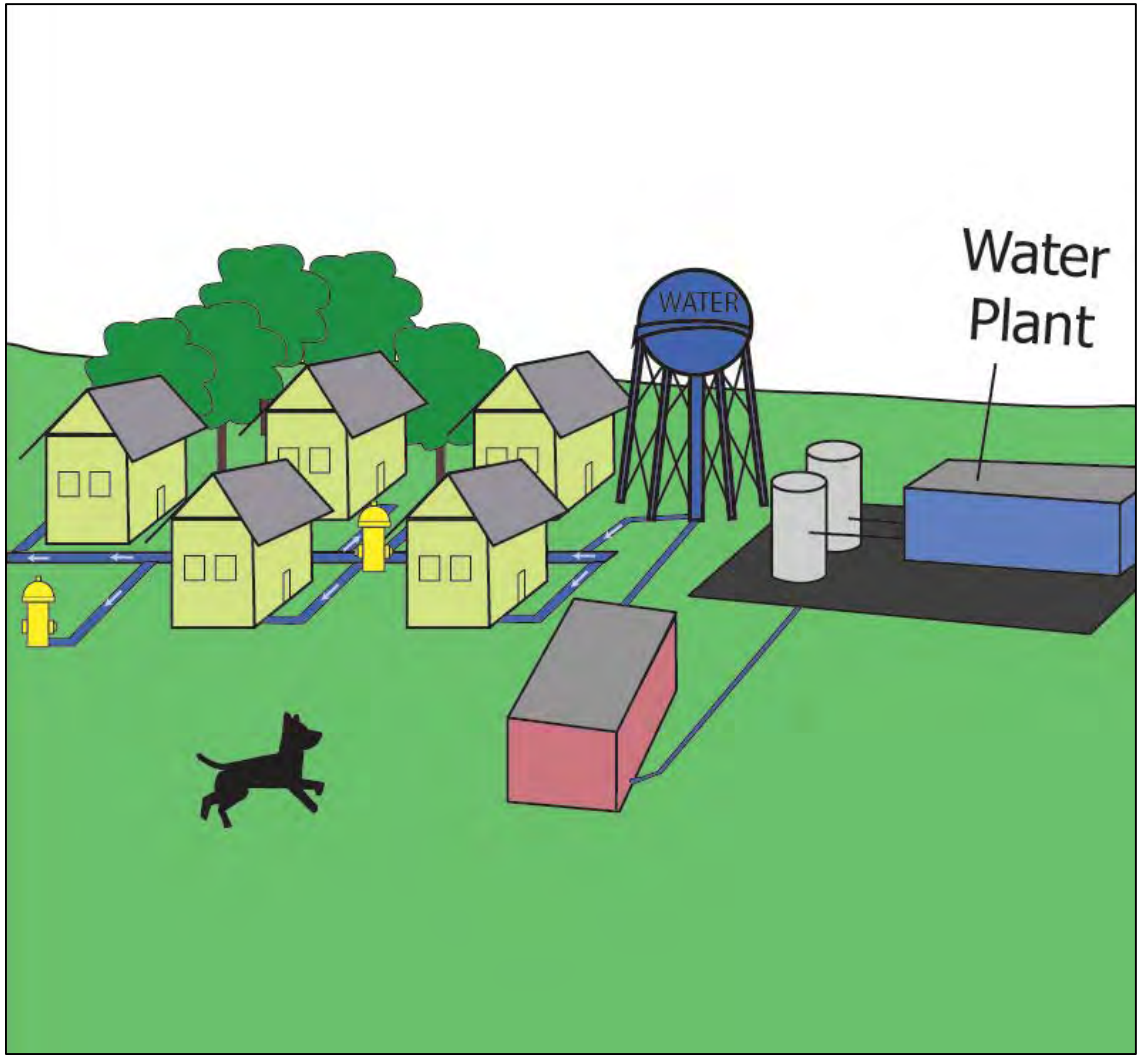
TESTING CONFIRMS TREATED GROUNDWATER MEETS ALL SAFE DRINKING WATER ACT REQUIREMENTS



TREATED WATER IS THEN SENT TO DISTRIBUTION CENTERS



WATER MEETING SAFE DRINKING WATER ACT REQUIREMENTS ARE DELIVERED TO YOUR HOME



THE NAVY'S OBJECTIVES FOR THE OFFSITE GROUNDWATER INVESTIGATION

1. Protection of public water supply wells –
   - All currently planned outpost and monitoring wells are in place and being monitored quarterly.
2. Continue to Investigate the OU2 Plume –
   - Installation of Monitoring Wells and Vertical Profile Borings to delineate the overall plume and the RE108 Hotspot; *Very complicated geology influencing plume migration, requiring intensive investigation*
   - Quarterly groundwater sampling to determine contaminant trends and plume migration.
3. Investigate how well supply wells recover contamination at the leading edge of offsite plume-
   - Develop groundwater model with pumping data from South Farmingdale Water District (SFWD) and New York American Water (NYAW);
   - Aquifer testing and analysis of test recovery well RE137 in the area southwest of Bethpage Water District (BWD) Well 6-2 (completed March 2018) to support the groundwater modeling.

OFFSITE GROUNDWATER INVESTIGATION – *What are the parts?*

Purpose: Identify groundwater contamination in areas south of Naval Weapons Industrial Reserve Plant Bethpage – *Information will be used to chart the path to successful cleanup of offsite plume*

Program Components:

- **Vertical Profile Borings (VPB) -** quickly screen areas for the presence, depth, and concentration of contamination; drilling can take 4-8 weeks to complete
- **Installation/Sampling of Permanent Monitoring Wells -** confirm presence/absence of contamination and develop trends; drilling can take 2-6 weeks to complete
- **Data Logging of Water Levels and Evaluation of Data -** support groundwater modeling and effectiveness of recovery wells

VERTICAL PROFILE BORINGS (VPB) AND WELLS – *What are they and how are they used?*

- **Vertical Profile Boring - 12-inch** diameter hole drilled into the ground;
- Final boring is **860 to greater than 1,000** feet deep (extending to the Raritan Clay Layer, the bottom of the main Long Island Aquifer);
- Drilling is stopped at selected depths and a device is lowered to sample the groundwater;
- **On average, 44 groundwater samples** are collected per boring and analyzed for Volatile Organic Compounds;
- **Permanent wells** at different depths are then installed at the VPB location to verify the VPB results and to continue monitoring of the plume;
- **It usually takes 4 to 8 weeks** to complete a VPB or well.

VPB AND WELL INSTALLATION PROCESS – *How are locations chosen?*

Process:

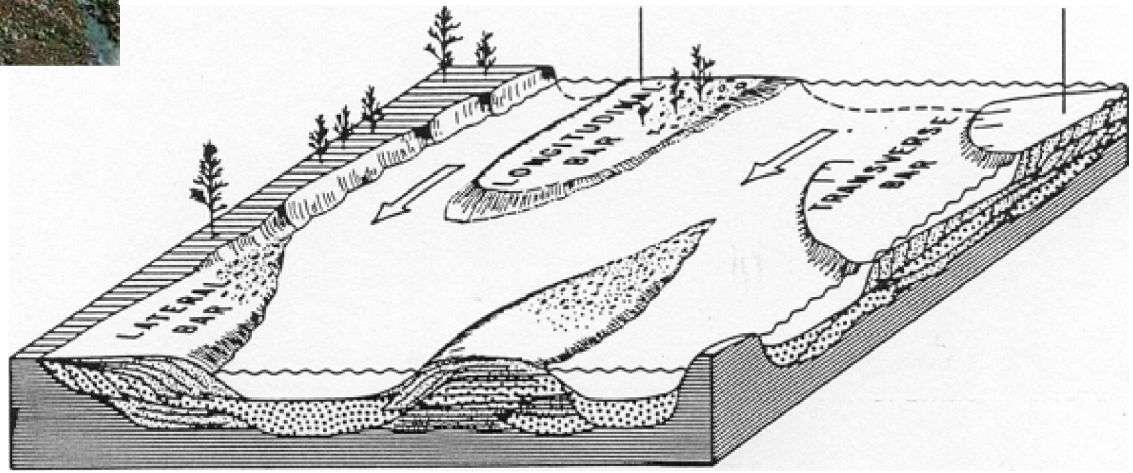
- Ideal map location selected by Navy and State;
- Location is then ground-proofed (visual check onsite) by the Navy;
- Drilling rig requires minimum of 100 feet with no overhead obstructions;
- Municipal properties preferred (drainage basins or township right of ways);
- Considerations to minimize inconvenience to residents nearby:
  - Health and Safety Concerns
  - Getting in and out of neighborhoods
  - Noise – operate on weekdays 8 to 5
- Process includes advanced notification to nearest residence

LOCAL GROUNDWATER GEOLOGY – *How does this affect plume migration?*

BASAL MAGOTHY AQUIFER

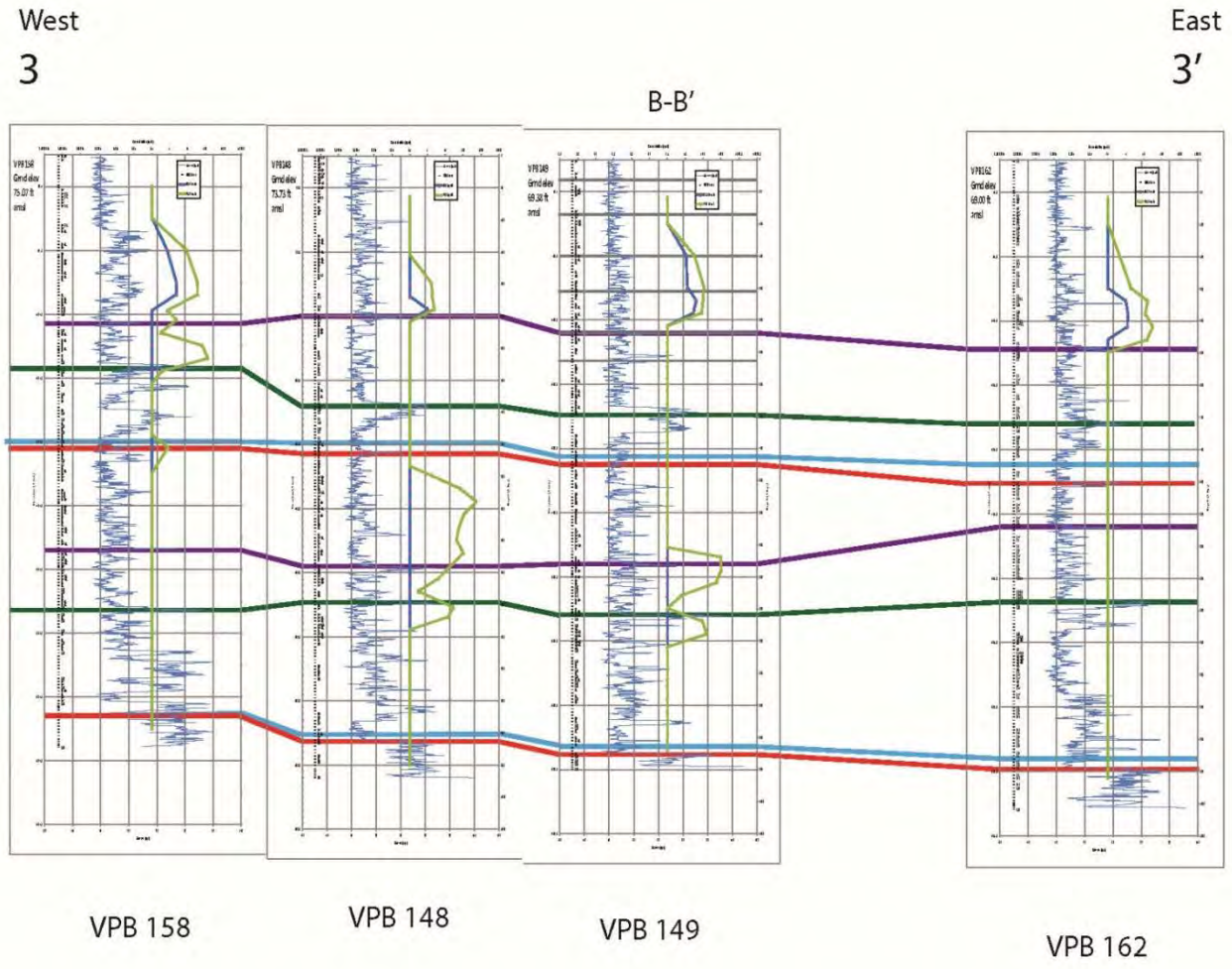
Interbedded clays, sands, and gravels

Geologic layers are not the same at each location



MAGOTHY GEOLOGIC CROSS SECTION – *Understanding the geology and the offsite plume*

The geology can be separated into layers that correspond to contaminant concentrations. These are used to identify the location and migration of the plume.

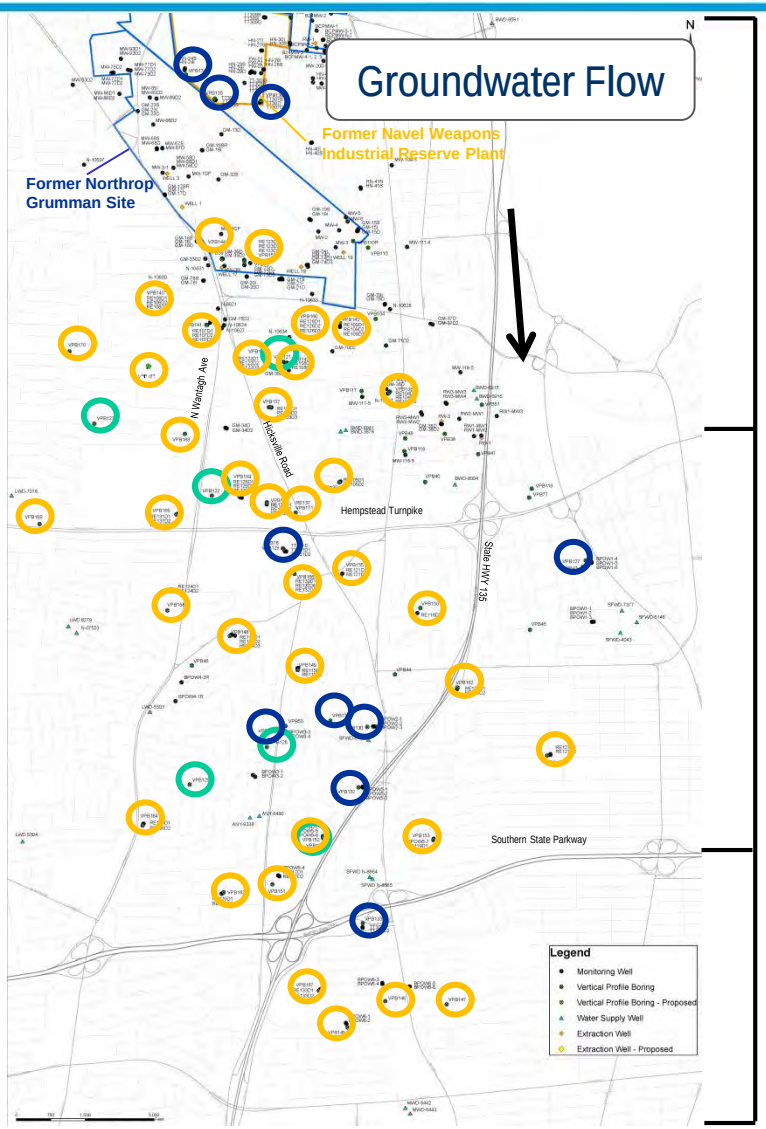


VERTICAL PROFILE BORINGS AND WELLS – *What has been done by the Navy?*

2009 Completed (green)

2010 to 2012 Completed (blue)

2012 to 2018 Completed (orange)



North of Hempstead Turnpike Area

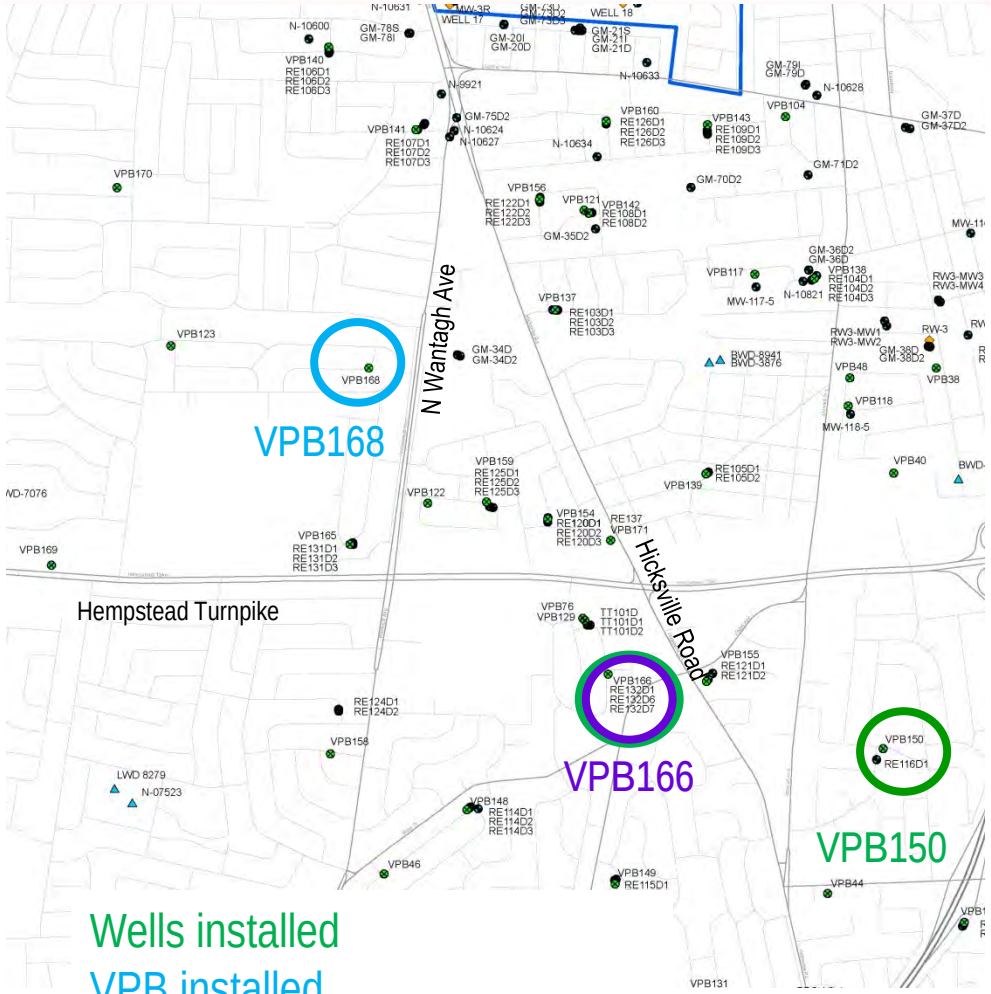
North of Southern State Parkway Area

South of Southern State Parkway Area

WORK PERFORMED SINCE THE LAST RAB - *VPBs and Wells*

From November 2017 (last RAB) to present

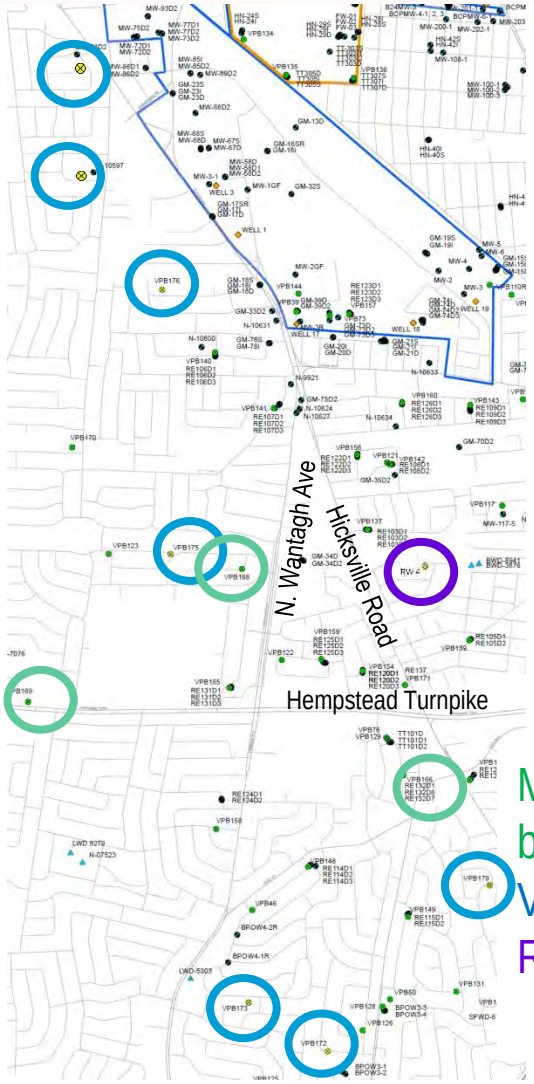
- Operation of 1 drilling rig
- South of Hempstead Turnpike
  - Installation of two monitoring wells associated with VPB166 and one monitoring well associated with VPB150
  - Currently installing RE137D5 (VPB166 location)
- North of Hempstead turnpike
  - Installation of one VPB (VPB168)
- Completion of 2 rounds of quarterly groundwater sampling (December 2017 and March 2018)
- Completion of 2 rounds of water level measurements in December and March.



FUTURE WORK
VERTICAL PROFILE BORINGS & MONITORING WELLS

Planned work through March 2019:

- Operation of 2 drilling rigs
- Installation of Vertical Profile Borings
  - 4 north of Hempstead Turnpike Area (To be sited),
  - 3 north of Southern State Parkway Area (To be sited)
- Installation of Monitoring Wells
  - 7 north of Hempstead Turnpike Area
  - 4 north of Southern State Parkway
- Installation of 1 Recovery Well and associated VPB North of Hempstead Turnpike (To be sited)



Monitoring wells to be installed
VPB to be installed
RW to be installed

ASSESSING GROUNDWATER RESULTS – *How do we use this information?*

Laboratory analysis is performed on groundwater samples for multiple volatile organic compounds (VOC's).

The primary VOC being used to track the plume is trichloroethene (TCE) because it is present in the plume at the highest concentrations.

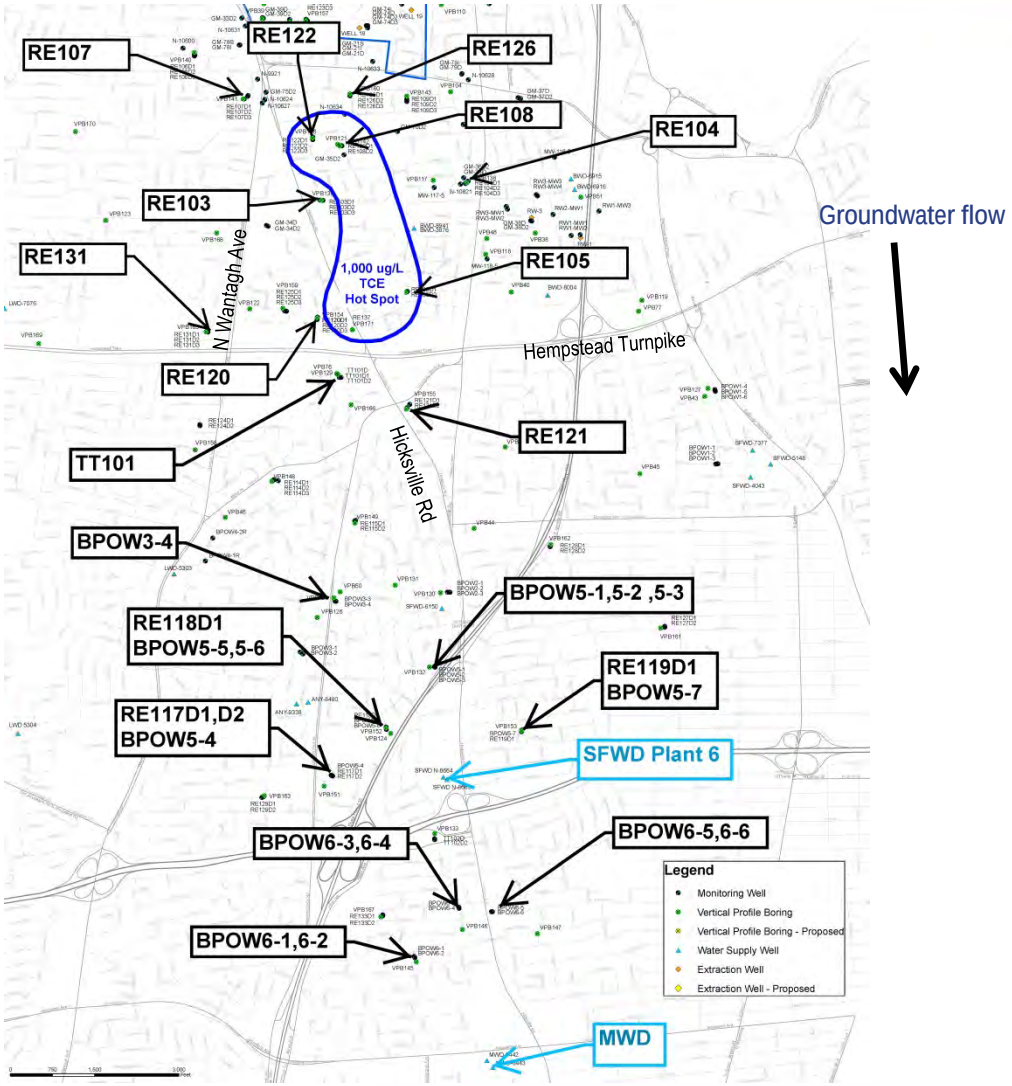
- The Maximum Contaminant Limit (MCL) for TCE is a limit established by Federal and State regulations;
- The MCL for TCE is 5 parts per billion;
- A "Hotspot" as defined in the Operable Unit 2 Offsite Groundwater 2003 Record of Decision is an area of groundwater with >1,000 parts per billion of total VOC's.

INDEX MAP OF TREND ANALYSIS WELLS - *What is the plume doing?*

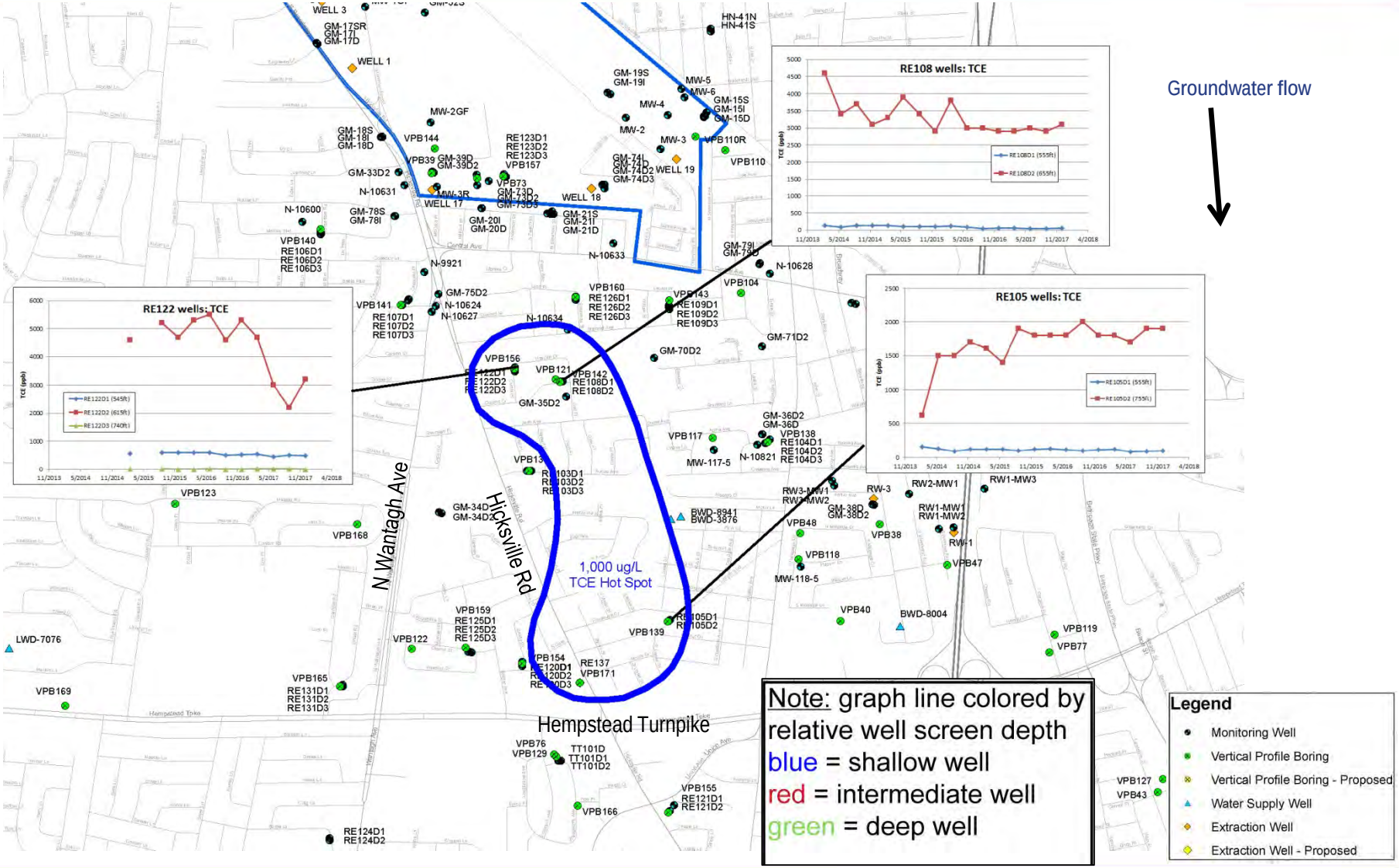
Questions

- What's happening inside RE108 Hotspot?;
- What's happening near the outside of the RE108 Hotspot?;
- What's happening with the downgradient outpost wells?

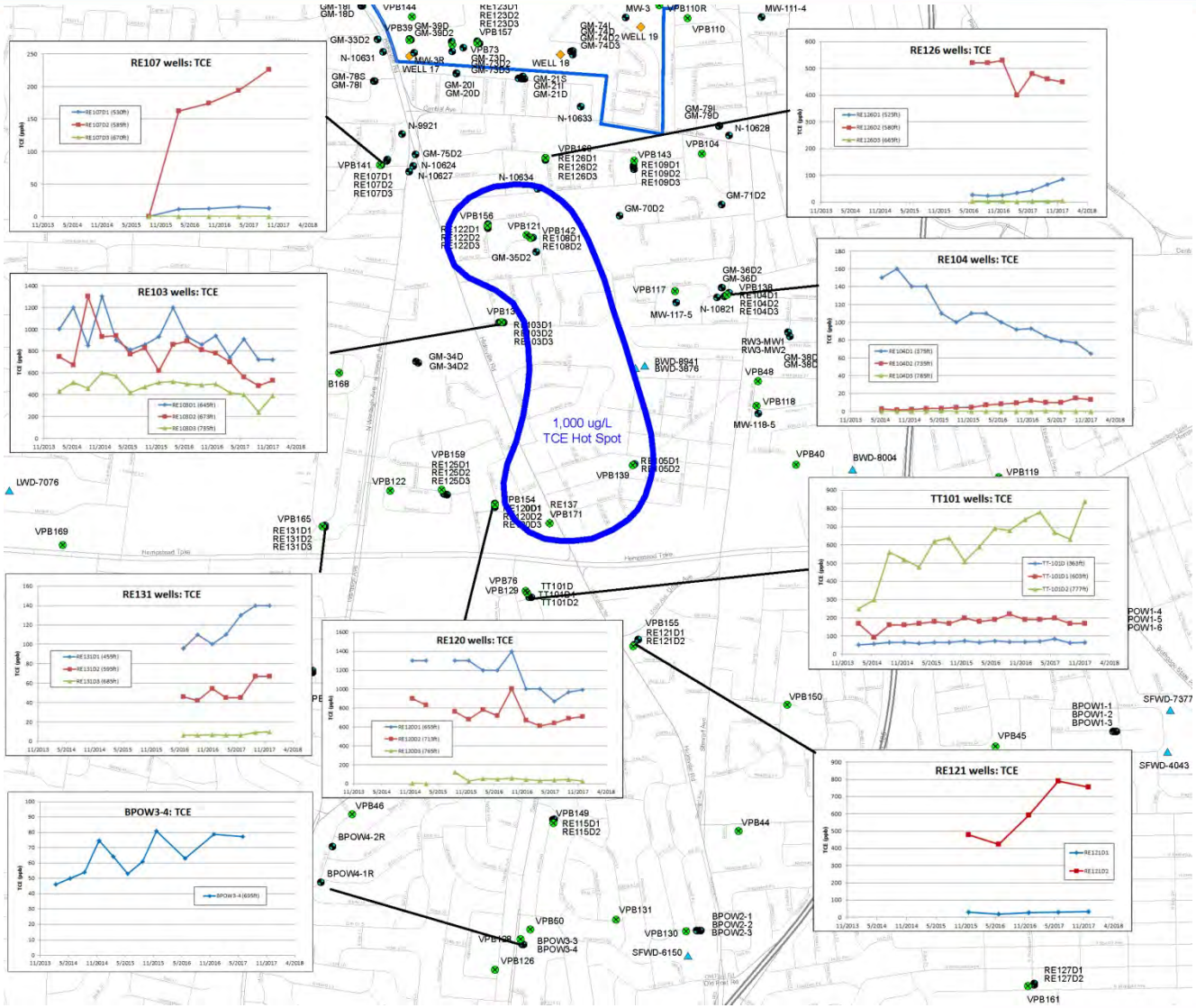
Here's a set of wells to look at each of those questions



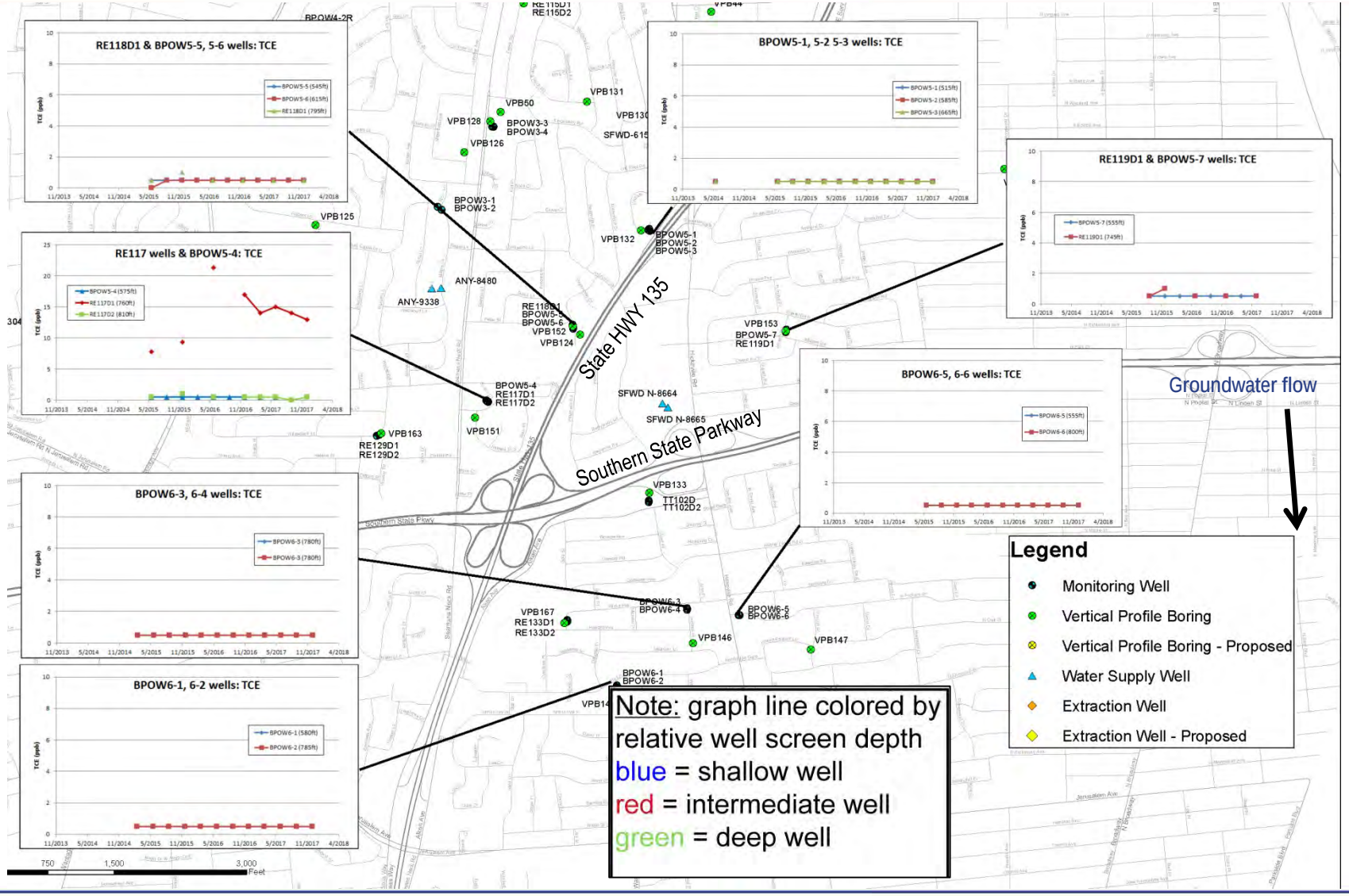
TRENDS INSIDE THE RE108 HOTSPOT FROM QUARTERLY GROUNDWATER SAMPLING



TRENDS OUTSIDE THE RE108 HOTSPOT FROM QUARTERLY GROUNDWATER SAMPLING



OUTPOST WELLS TRENDS SOUTH OF THE RE108 HOTSPOT FROM QUARTERLY GROUNDWATER SAMPLING



NAVY'S OU2 GROUNDWATER OBJECTIVES RESULTS – *Where are we?*

- Results:

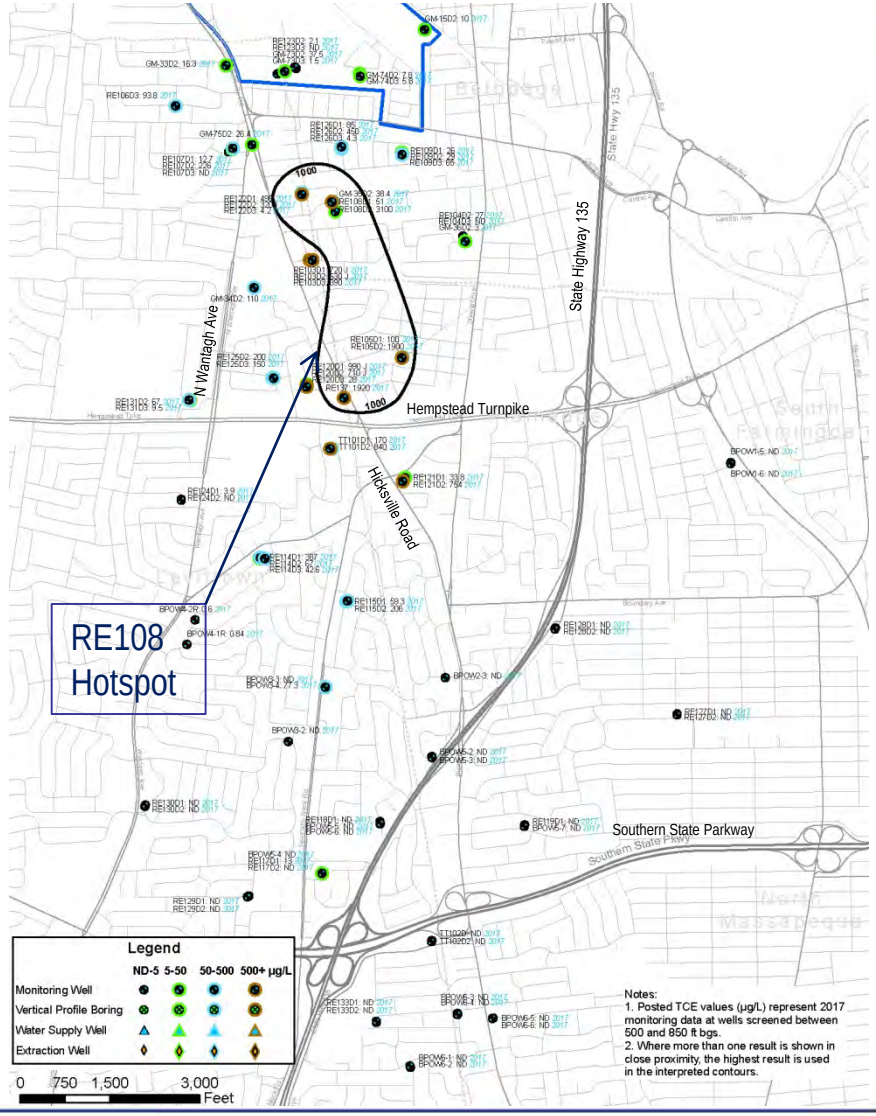
Objective 1 – Protection of Public Water Supply Wells:
Outpost wells installed and are sampled regularly.

Objective 2 – Characterization of the OU2 Plume:

- RE108 Hotspot has been delineated and tracked by Navy drilling and regular sampling program;
- Trichloroethene found above 1,000 parts per billion in the area North of Hempstead Turnpike Area at depths greater than 600 feet;
- Ongoing VPB and well installation to complete delineation of overall plume;
- Ongoing quarterly groundwater sampling to continue tracking of the off site plume.

Objective 3 – Well Recovery Evaluation Analysis:

- Treatment options are being evaluated to address potential impacts to public water supply wells and to address RE108 Hotspot.



WELL RECOVERY EVALUATION ANALYSES – *Use of existing wells for groundwater cleanup*

Well Recovery Evaluation (How wells influence groundwater flow):

1 – SFWD Plant 6 Wells and NYAW Wells: Groundwater modeling is being conducted to determine their ability to recover OU2 contamination – completion of the groundwater modeling is expected in Fall of 2018

2 – Testing of Recovery Well RE137 (within the RE108 Hotspot north of Hempstead Turnpike)– extensive aquifer testing has been completed, which gives us an understanding of the Long Island Aquifer for the purpose of groundwater cleanup.

SOUTH FARMINGDALE WATER DISTRICT & NEW YORK AMERICAN WATER WELL RECOVERY ANALYSIS

- Purpose of work is to identify the well recovery zones of the South Farmingdale Water District (SFWD) Plant 6 wells and the New York American Water (NYAW) wells
- Pumping data from these wells has been received from the New York State Department of Environmental Conservation (NYSDEC);
- February 2017 – May 2017 - water level changes were recorded in key wells south of Hempstead Turnpike to correlate with the received pumping data;
- Groundwater modeling is being conducted using this pumping data and will be completed in Fall of 2018;
- Results will be used to determine how these wells can be used for the for recovery of offsite groundwater.

GM38 AREA HOTSPOT TREATMENT SYSTEM - RECHARGE BASIN REHABILITATION AND INJECTION WELL TESTING

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GM38 AREA HOTSPOT TREATMENT SYSTEM

- GM38 Area Hotspot Treatment System has been operating since 2009.
- Extracts, treats, and discharges approximately 1.4 million gallons per day (MGD) of groundwater
- Since start up, approximately 11,000 pound of solvents have been removed from the groundwater
- The groundwater is treated with air stripping and granular activated carbon prior to discharge to NC Basin 495
- The off gas is treated with granular activated carbon prior to discharge
- In support of the Phase I RE108 Area Hotspot extraction system:
  - NC Basin 495 was scraped to improve infiltration
  - Injection Well - IW 01 was evaluated during the Basin scraping outage

GM38 AREA HOTSPOT
TREATMENT SYSTEM BASIN SCRAPING

- Treatment system was shutdown on January 11, 2018
- Basin was allowed to drain and the sediments to dry
- Soil testing was conducted in January 2018 to determine reuse/disposal requirements
- Cleanup and dredging activities were conducted from January 19, 2018 to March 9, 2018

GM38 AREA HOTSPOT
TREATMENT SYSTEM BASIN SCRAPING

- Initial scraping of the basin in February 2018

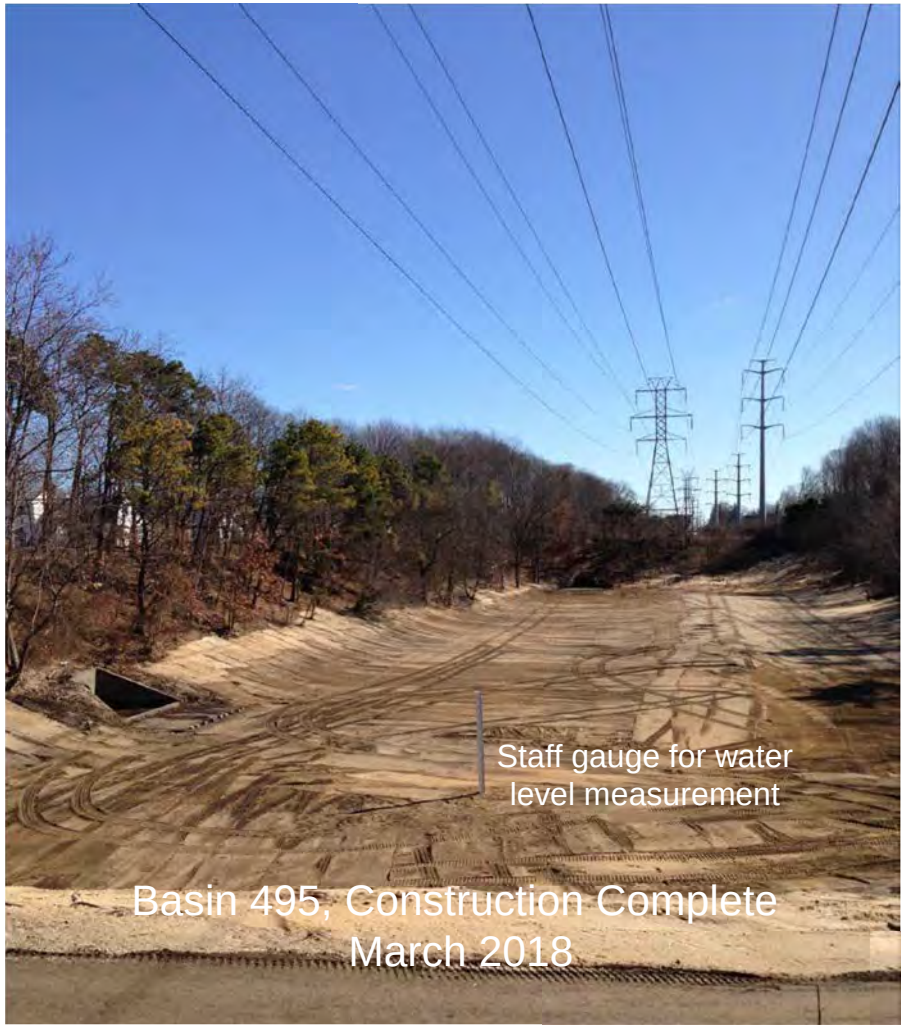

Basin 495, February 2018


Basin 495, February 2018

GM38 AREA HOTSPOT
TREATMENT SYSTEM BASIN SCRAPING

- Final construction of basin inlet with new stone and staff gauge

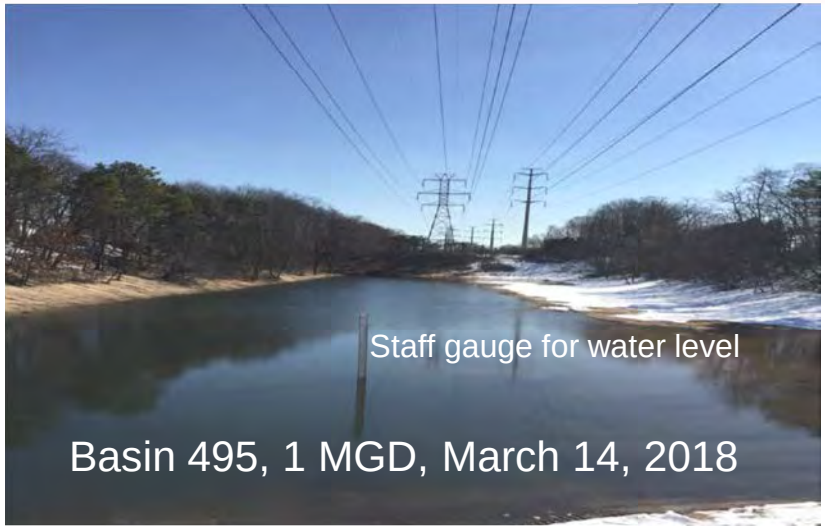
Basin 495, GM38 Inlet, March 2018



Basin 495, Construction Complete March 2018

GM38 AREA HOTSPOT
TREATMENT SYSTEM BASIN SCRAPING

- Basin water level after re-start of the GM38 Area Groundwater Treatment System
- Tracking water level in basin to help determine when maintenance may be required in the future



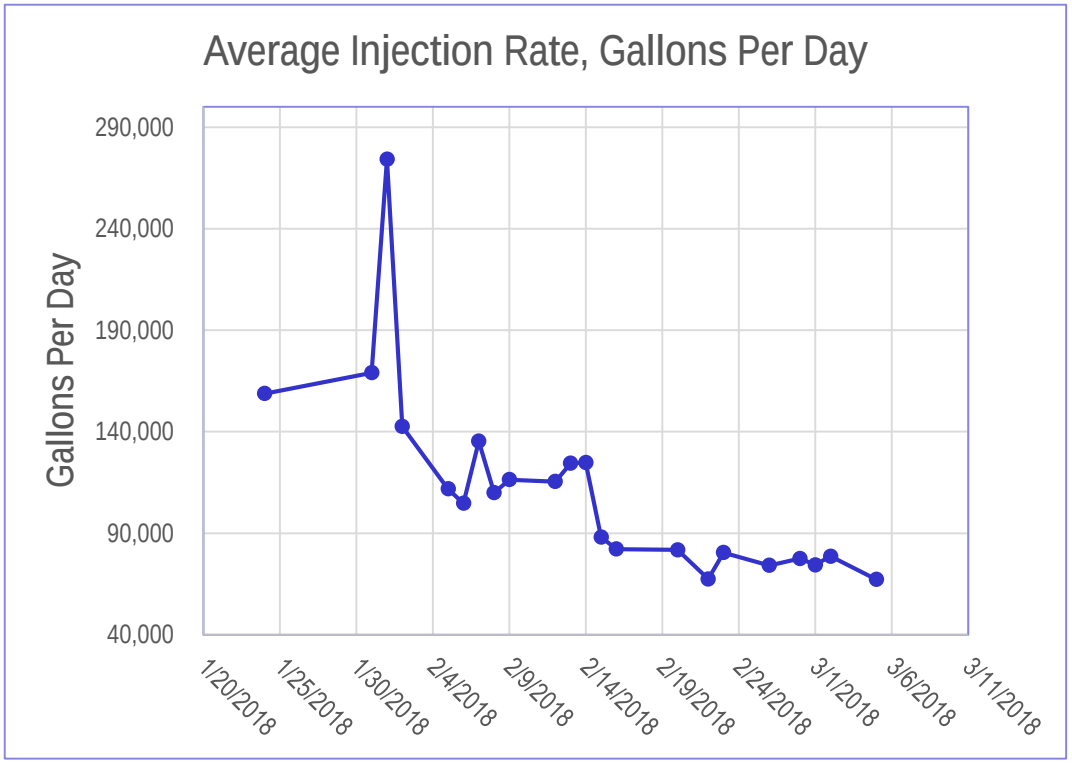
Basin 495, 1 MGD, March 14, 2018


Basin 495, 0.5 MGD, March 12, 2018


Basin 495, 1.4 MGD, March 23, 2018

GM38 AREA HOTSPOT
TREATMENT SYSTEM INJECTION WELL TESTING

- During the outage while the basin was being scraped, the Navy evaluated the use of an existing Injection Well - IW 01 for discharge of treated water
- IW 01 is a 12-inch diameter well screened from 80 to 180 feet below ground surface
- Injection testing was conducted from January 24, 2018 to March 6, 2018
- 11 million gallons of treated water water was injected
- Due to fouling, average injection rate decreased from approximately 160,000 gallons per day to 75,000 gallons per day
- The design target long-term discharge rate is 500,000 gallons per day



GM38 AREA HOTSPOT TREATMENT SYSTEM INJECTION WELL TESTING SCHEDULE

- Path Forward:
  - –Re-develop injection well – Spring 2018
  - –Conduct injection testing – Spring 2018

RE108 AREA HOTSPOT TREATMENT SYSTEM

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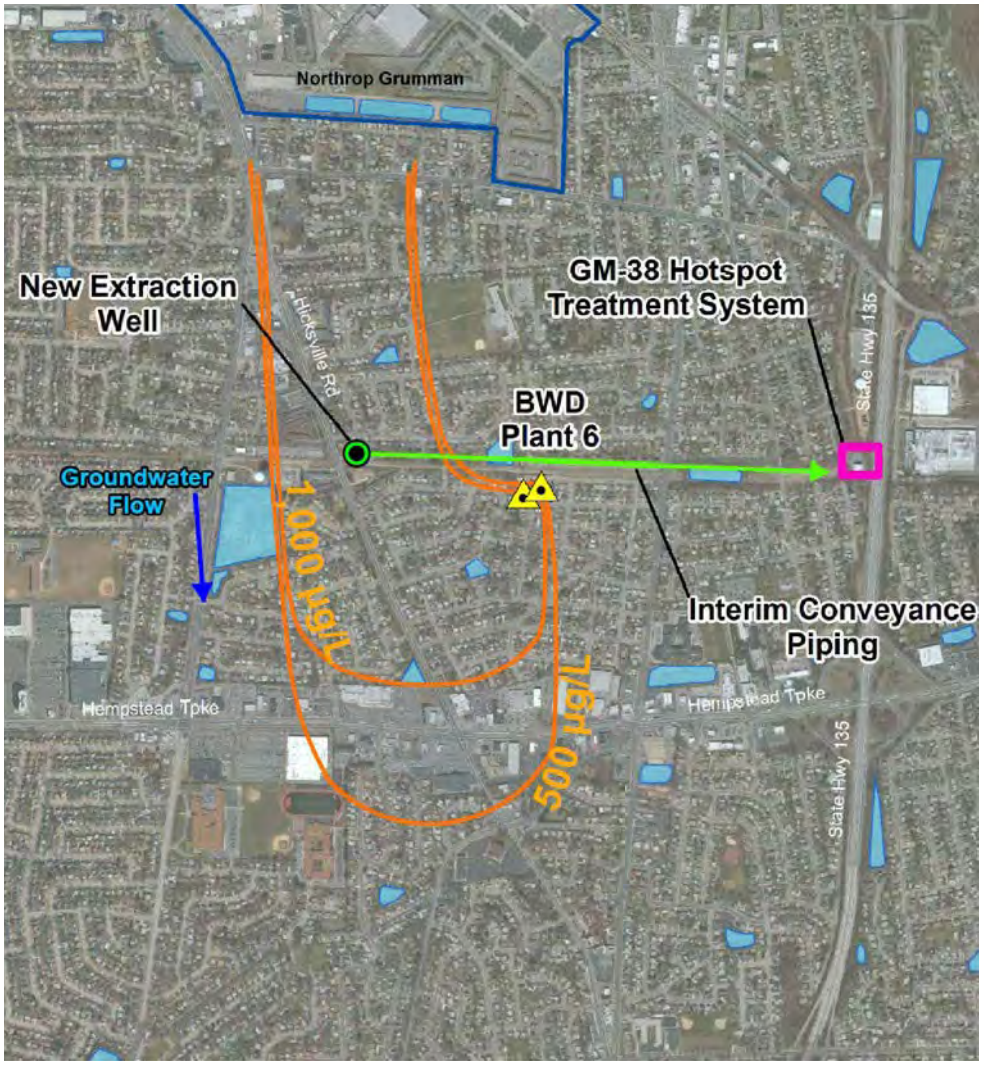
PHASE I RE108 AREA HOTSPOT TREATMENT SYSTEM

Phase I Status

- 30 Percent Design was completed in October 2017
- Phase I System will consist of an extraction well and double wall piping to the Navy's existing GM38 Area Hotspot Treatment System
- Extraction well will operate at 0.3 to 0.6 million gallons per day (MGD)
- Based on property access requirements, design and construction should be completed in 2018
- Extraction will reduce RE108 Area Hotspot groundwater migration rate and remove significant solvent mass from the groundwater
- Well operation will also accelerate overall groundwater cleanup



PHASE I RE108 AREA HOTSPOT TREATMENT SYSTEM


Utility Corridor, looking east


GM38 Area Hotspot Treatment System, looking southeast


GM38 Area Hotspot Treatment System, Air stripping tower, and liquid and vapor phase carbon

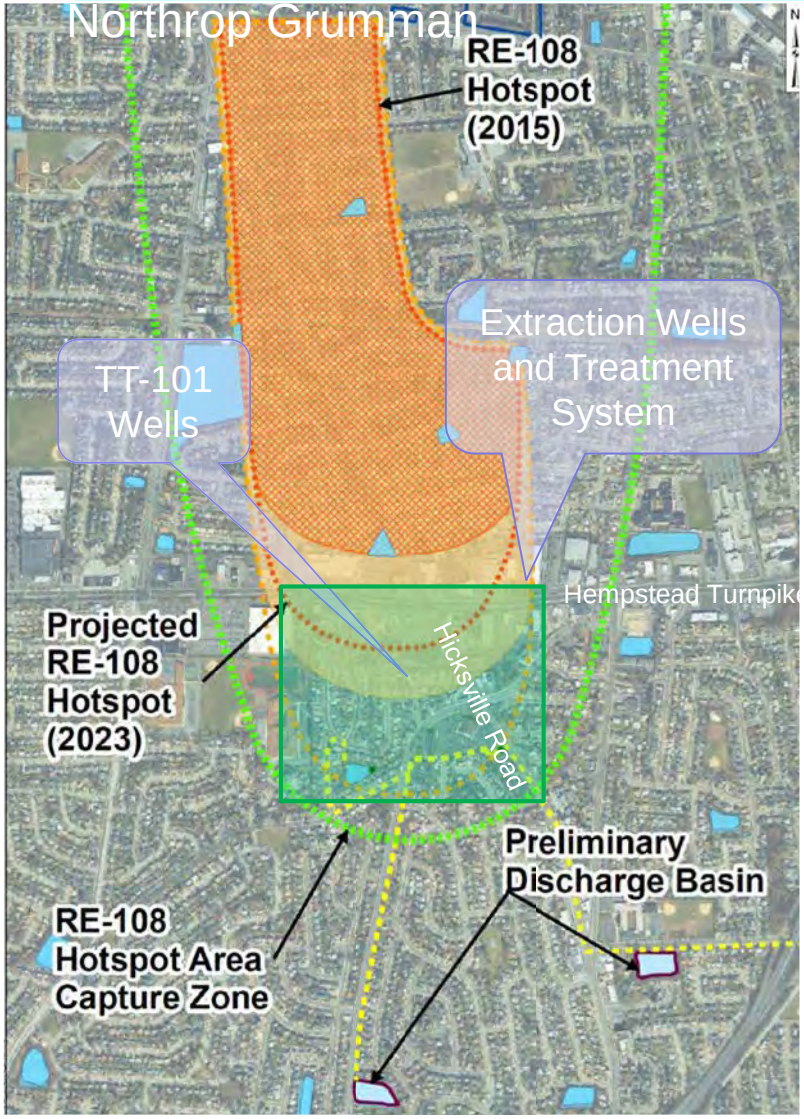
- The new well and piping will use the existing Town and Long Island Railroad utility corridor and GM38 Area Hotspot Treatment System

PHASE I RE108 AREA HOTSPOT TREATMENT SYSTEM SCHEDULE

- Apr 2017 – Initiated evaluation of Phase I System
- May 2017 – Started access discussions with Long Island Railroad (LIRR)
- Oct 2017 – Submitted Phase I 30 Percent Basis of Design Report to NYSDEC
- Nov 2017 – Requested non-intrusive and intrusive access agreements for LIRR
- Jan 2018 – Received NYSDEC comments on Basis of Design Report
- Feb 2018 – Received LIRR non-intrusive access agreement for surveying
- Jun 2018 – Finalize property access agreements
- Jun 2018 – Submit GM38 permit equivalent modification
- Aug 2018 – Finalize construction plans
- Sep 2018 – Start construction
- Dec 2018 – Finalize construction/start operation

PHASE II RE108 AREA HOTSPOT TREATMENT SYSTEM

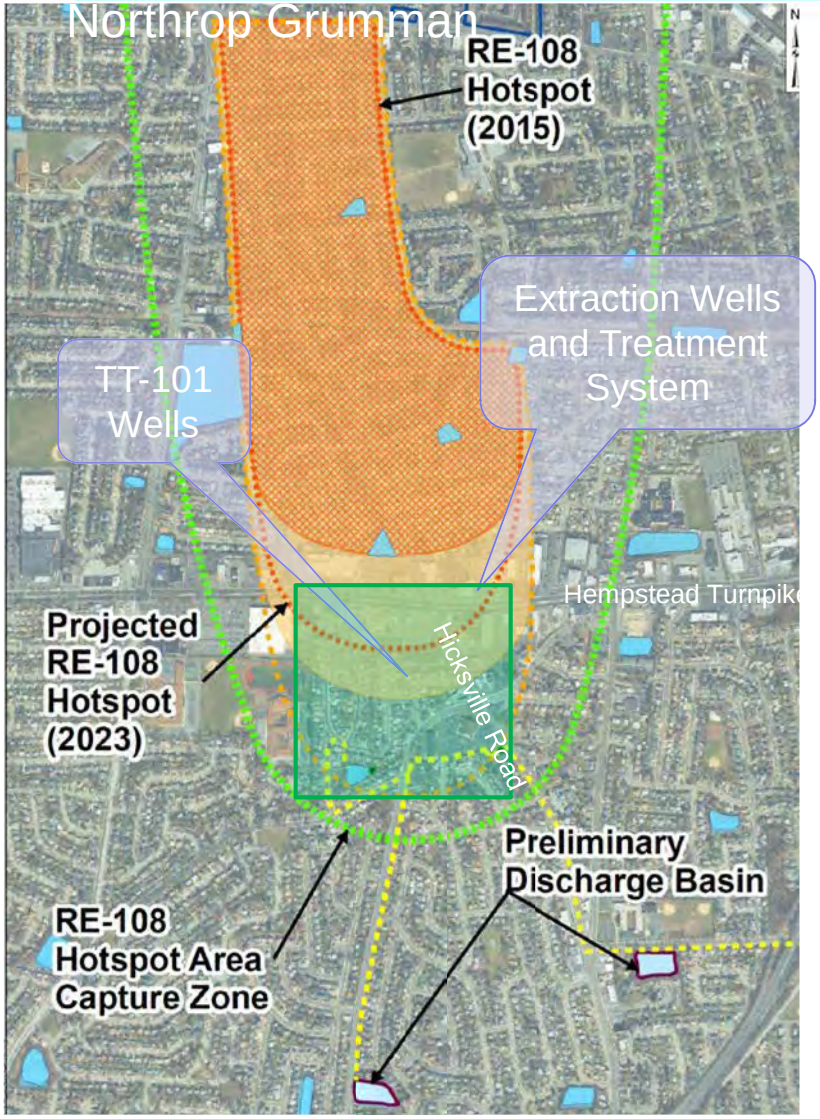
- Navy is designing a groundwater extraction, treatment, and discharge system to capture the RE108 Area Hotspot groundwater near the downgradient edge
- System is expected to extract 1.3 to 1.7 MGD of groundwater
- Air Stripping and Granular Activated Carbon (air and water) will be used
- Water will be treated to Drinking Water Standards
- The equipment and tanks will be enclosed in a building
- Buffers (minimum of 100 feet) to occupied structures will be used, 2 acres is required



PHASE II RE108 AREA HOTSPOT TREATMENT SYSTEM

Phase II Status

- Phase II 30 Percent Design is anticipated for spring 2018
- Other design activities including pilot-scale treatability testing and basin infiltration tests are being conducted
- Initial basin infiltration testing conducted in March 2018, long-term testing is underway
- Navy is actively pursing property access to construct the treatment system
- Property access will also be required for the extraction wells, conveyance piping, and discharge
- Groundwater is slowly moving to the south, therefore the location of the extraction and treatment system is based on the anticipated location of hotspot in 2022



PHASE II RE108 AREA HOTSPOT TREATMENT SYSTEM SCHEDULE

- Spring 2015 – Initiated design activities, including treatment requirements and location of extraction, treatment, and discharge properties
- Dec 2016 – Prepared preliminary design report
- Apr 2017 – Initiated property access requirements
- May 2017 – Conducted RE137 pumping test
- Mar 2018 – Conducted basin infiltration testing
- Apr 2018 – Submit Preliminary Basis of Design Report (BODR) to NYSDEC
- May 2018 – Receive NYSDEC comments on BODR
- Mar 2019 – Finalize property access agreements
- May 2019 – Finalize BODR
- Feb 2020 – Finalize surveying, 30, 60, and 90 percent Design and discharge requirements
- Apr 2020 – Finalize 100 percent design and discharge requirements
- Oct 2020 – Finalize Town, County, and State approvals
- May 2021 – Prepare Construction Remedial Action Work Plan
- Jul 2021 – Obtain construction permits
- Aug 2021 – Start construction
- Nov 2022 – Complete construction
- Dec 2022 – Start operation

OPERABLE UNIT 4 – SITE 1 FORMER DRUM MARSHALLING AREA CONTAMINATED SOIL, SOIL VAPOR, AND GROUNDATER

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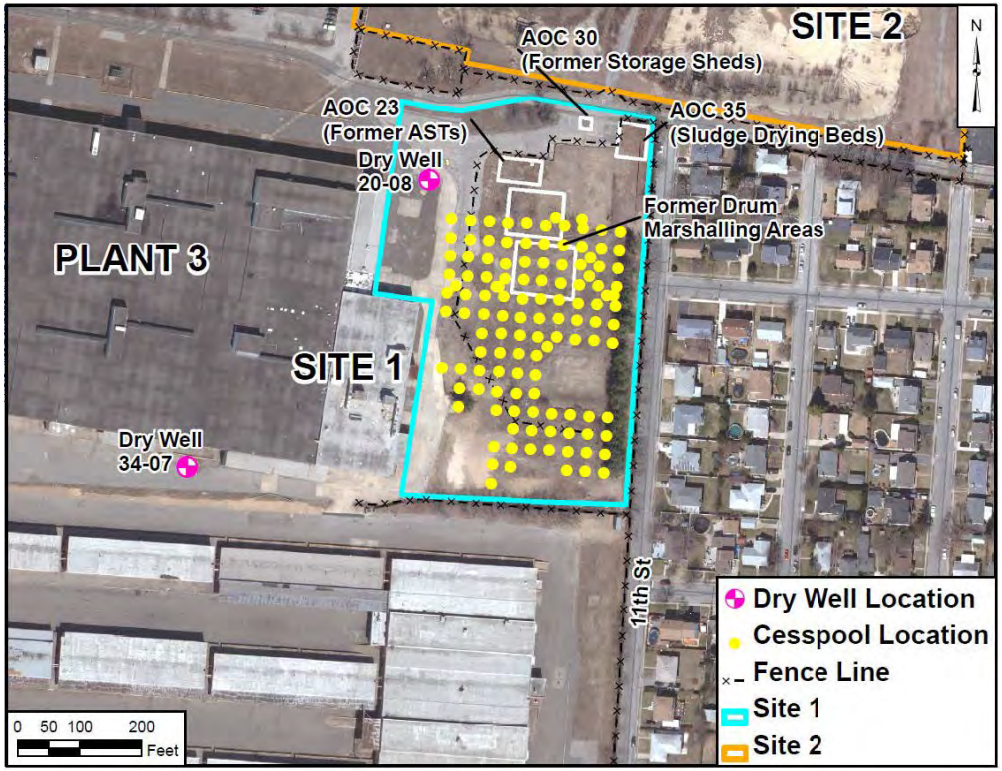
SITE 1 HISTORY

- Two former drum marshalling pads
- 120 abandoned cesspools for sanitary waters from Plant 3

- Drywells – Area of Concern (AOC) 34-07 and AOC 20-08 for storm water
- Soil contaminants: Polychlorinated biphenyls (PCBs), chlordane, polynuclear aromatic hydrocarbons (PAHs), and metals
- Groundwater contaminants: PCBs and chromium
- Soil Vapor (Vapor Intrusion) contaminants: Tetrachloroethene and trichloroethene



SITE 1 HISTORY

- Originally addressed under a 1993 Remedial Investigation, 1994 Feasibility Study, and 1995 Record of Decision
- Subsequent testing found that the extent of PCB-contaminated soil at Site 1 soil was more extensive than originally estimated
- Completed remedial actions include: Site 1 shallow groundwater and soil VOC remediation; and Sites 2 and 3 soil excavation, covering, and land use controls
- 2009/2010 Interim Action to address soil vapor intrusion
- 2012 Underground Storage Tank removal
- 2015 Remedial Investigation Addendum
- 2016/2017 Feasibility Study Addendum
- November 2017 Proposed Plan
- November 22, 2017 to January 22, 2018 Public Comment Period
- December 12, 2017 Public Meeting

SITE 1 HISTORY

- Proposed Remedy consists of soil excavation and offsite disposal and capping, groundwater monitoring, and enhanced soil vapor extraction

SITE 1 SCHEDULE

- 2018 Operable Unit 4 - Record of Decision (Spring)
- 2018 Site 1 Soil Remedial Design (Spring)
- 2018 Construction Planning Documents
- 2019 Start Field Construction