



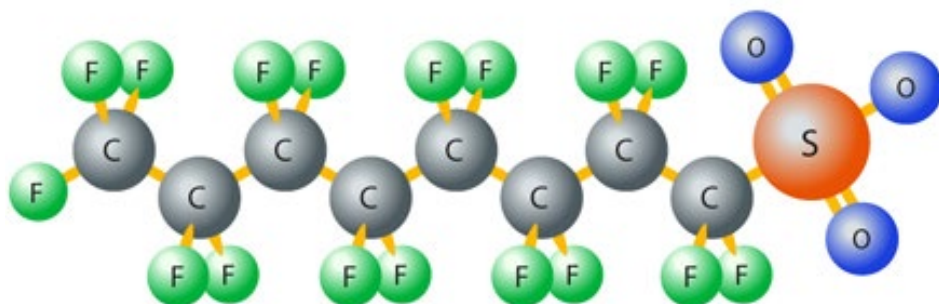
PFAS Impacted Residential Wells Near a Closed Municipal Landfill in Central Maine

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MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION

Protecting Maine's Air, Land and Water

PFAS in Maine



- Maine DEP initially followed the EPA Health Advisory for ingestion of drinking water that should not exceed 70 ppt PFOA, PFOS, or the sum of both.
- On June 21, 2021, Resolve 2021, Chapter 82 required the Maine Drinking Water Program to establish MCLs for PFAS compounds, and adopt an Interim Drinking Water Standard* for the sum of PFDA (10), PFNA (9), PFOA (8), PFHpA (7), PFOS (8) and PFHxS (6) not to exceed 20 ppt.

*<https://www1.maine.gov/dep/spills/topics/pfas/Maine-PFAS-Screening-Levels-Rev-6.28.21.pdf>





Site History and Details

- Unlined landfill that accepted household waste, WWTP sludge, and woolen mill industrial waste beginning in 1960s
- Ceased operation in 1991 and closed in 1996 with engineered cover consisting of 12" gas collection layer, 40-mil HDPE geomembrane, 12" 1e-6 clay and 12" vegetation layer
- Groundwater near landfill significantly impacted with VOCs (toluene/chlorobenzene) and metals (chromium/arsenic) – closest and deepest bedrock MWs have highest levels of contaminants – bottom of waste “teabagged” in groundwater
- Residential wells have historically shown no impacts from standard landfill parameters (gen chem, metals, VOCs)
- Maine DEP PFAS investigation began Spring 2018, so far nine impacted residential wells with PFAS above interim sum of six “SOS” > 20 ppt have been identified
- Municipality took over GAC O&M and residential sampling from Maine DEP in Fall 2021





Conceptual Site Model

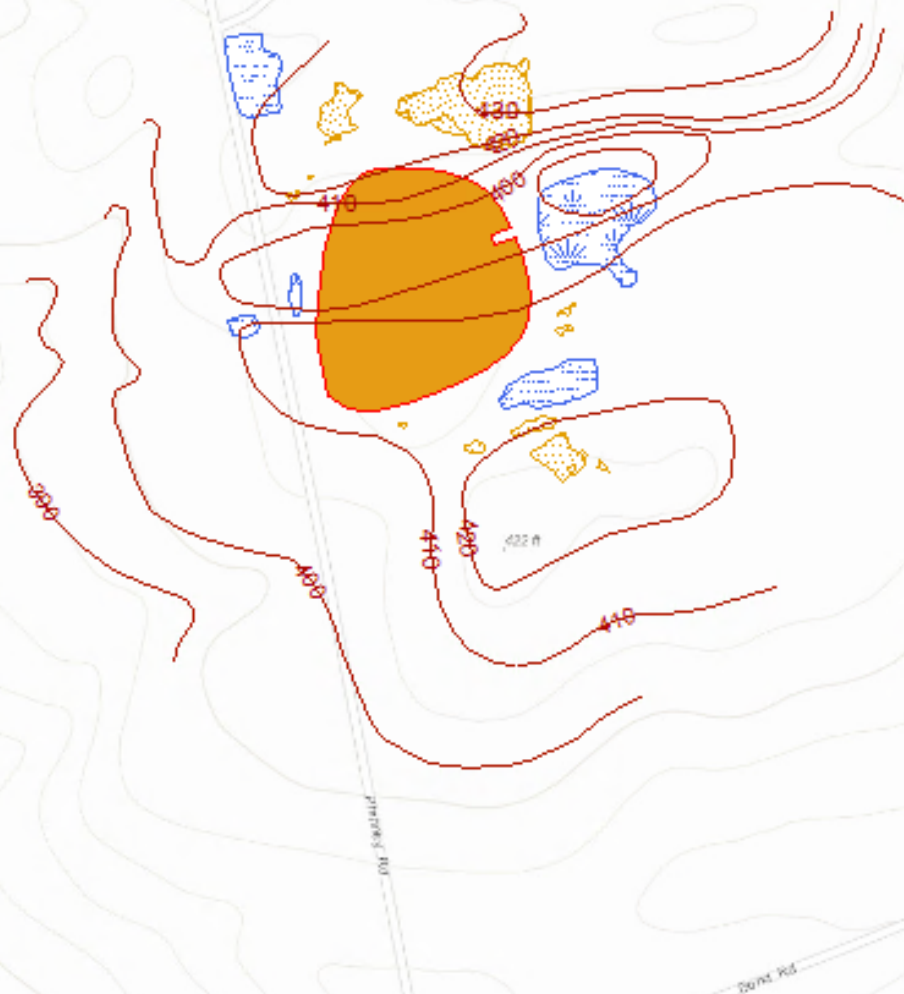
- Landfill sited within a bedrock trough aligned with NE-SW strike with topo highs to the north and south
- Bedrock structure fine grained metasedimentary unit with laminar bedding (foliation) planes, NE-SW strike and dipping SE 45-75 degrees
- Leachate impacted groundwater primarily limited to along-strike monitoring wells within 800-900 ft of the landfill, indicating along-strike groundwater flow as a primary pathway for leachate migration
- Residential wells located along bedrock strike and down dip of the landfill considered most likely to be at risk given PFAS persistence and mobility
- PFAS risk drivers to residential wells here are PFOA (8), PFHpA (7), and to a lesser extent PFNA (9) and PFOS (8)



Bedrock Depth Contours from Resistivity Profiles

Top of landfill
+430' elevation

North + South
landfill flanks waste
is very close to or
directly on bedrock





Site Bedrock



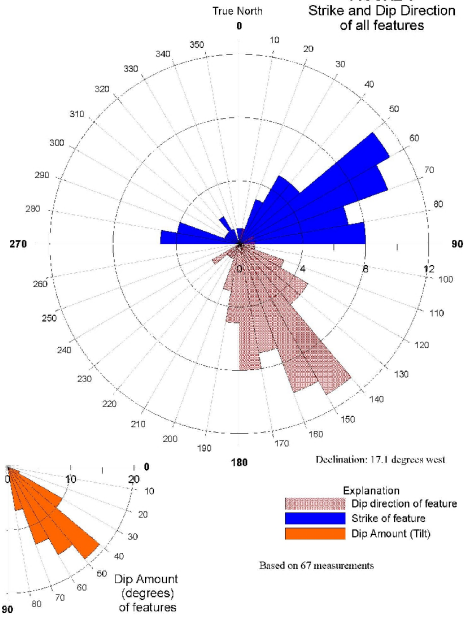


Sampling Methods

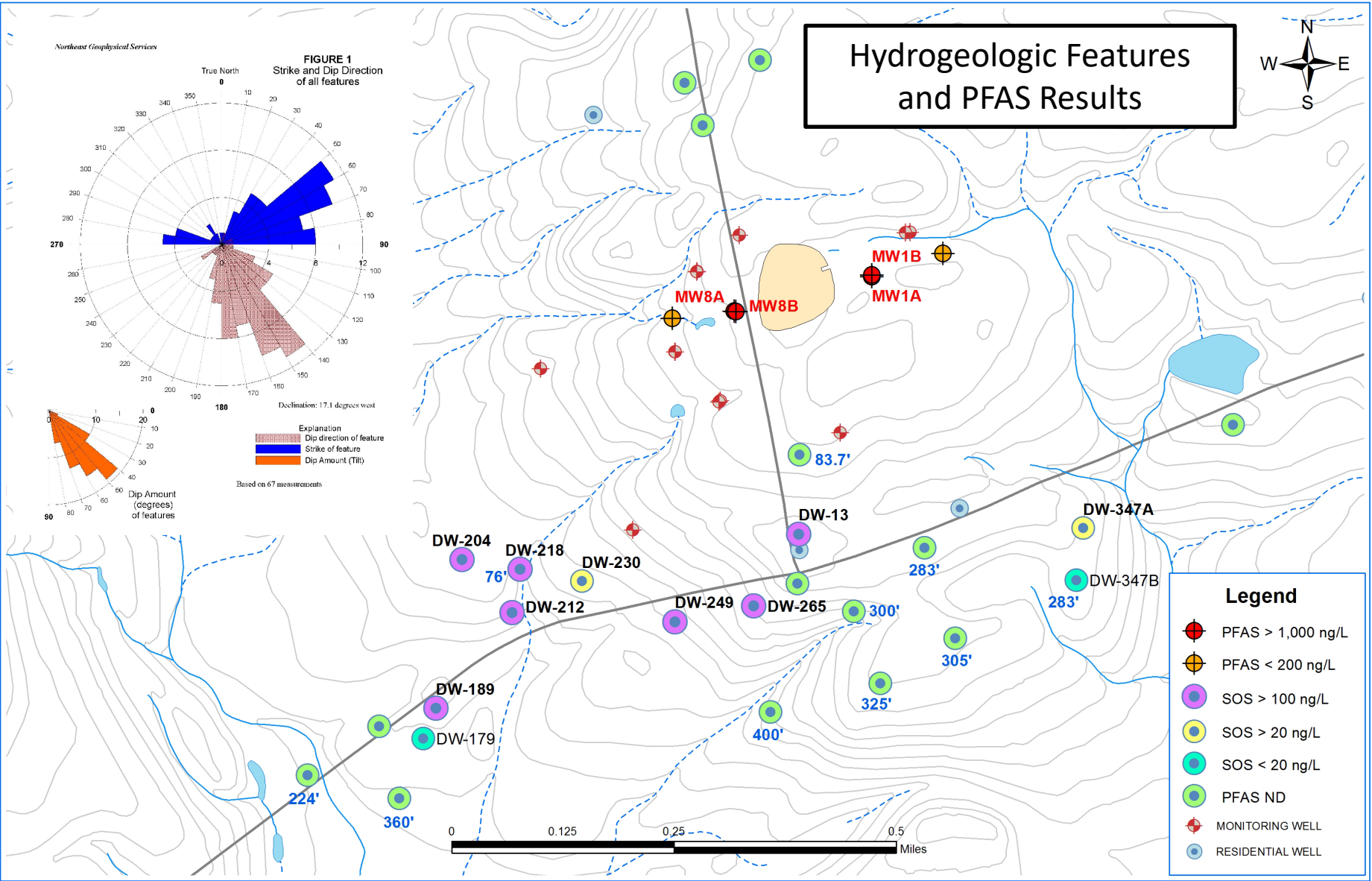
- All samples analyzed by EPA 537 modified with isotope dilution reporting 24 to 28 PFAS compounds
- Landfill MWs sampled via low flow
- Residential wells purged at least 10 minutes prior to sample collection
- GAC systems collect treated sample first
- Collect one field rinsate blank per sample event



FIGURE 1
Strike and Dip Direction
of all features



Hydrogeologic Features and PFAS Results



Legend

- PFAS > 1,000 ng/L
- PFAS < 200 ng/L
- SOS > 100 ng/L
- SOS > 20 ng/L
- SOS < 20 ng/L
- PFAS ND
- MONITORING WELL
- RESIDENTIAL WELL

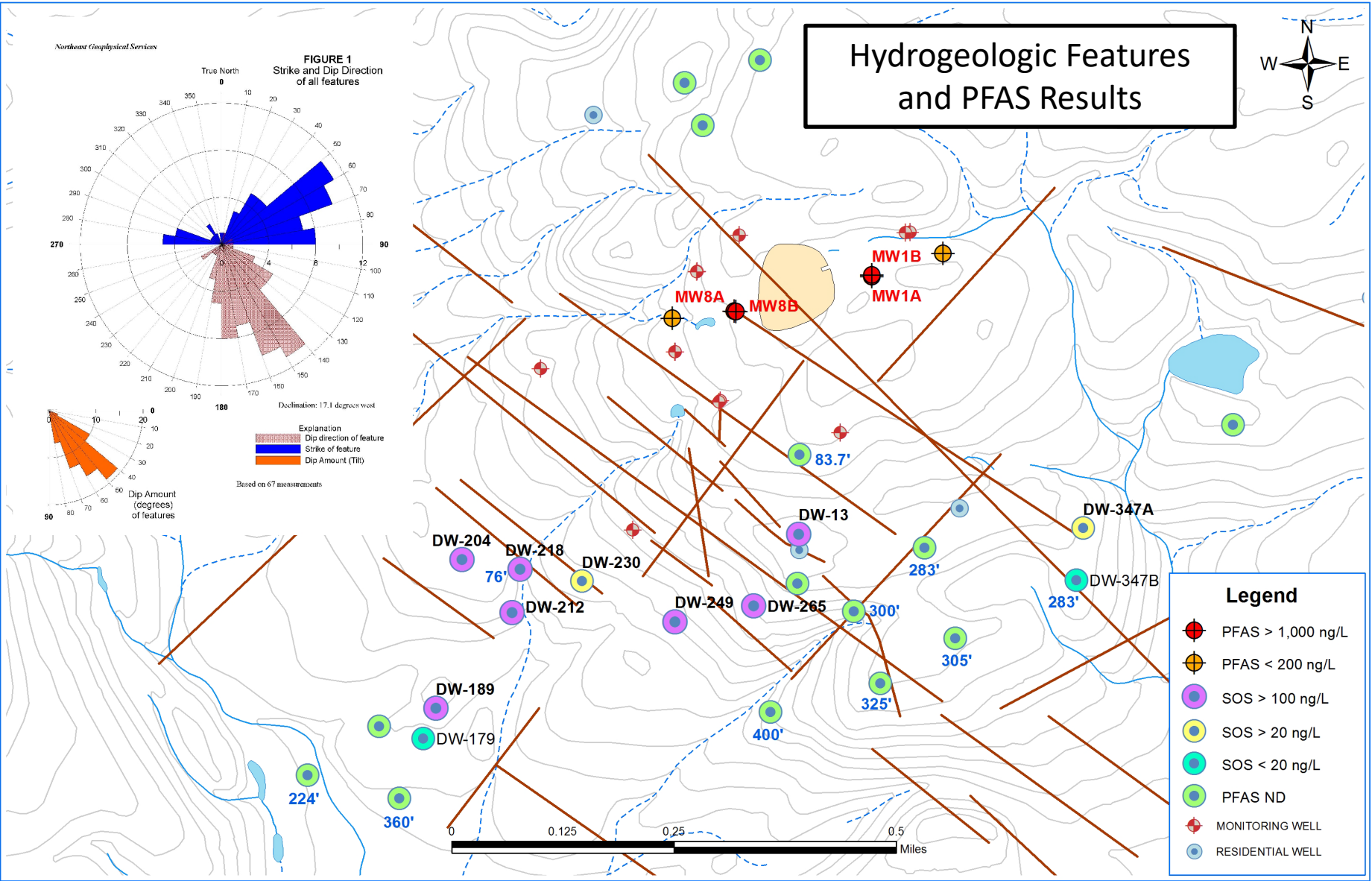
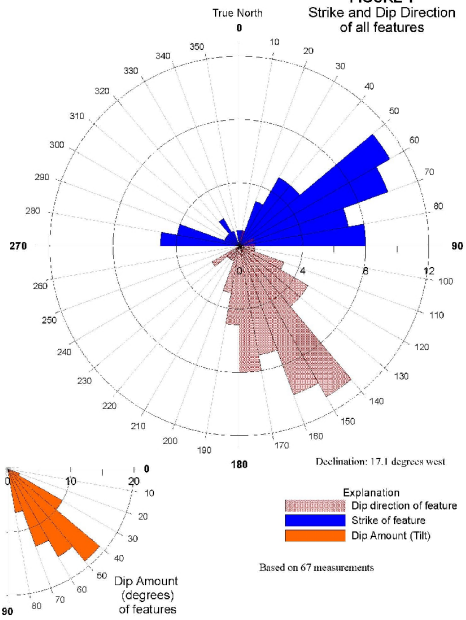


Hydrogeologic Features and PFAS Results



Northeast Geophysical Services

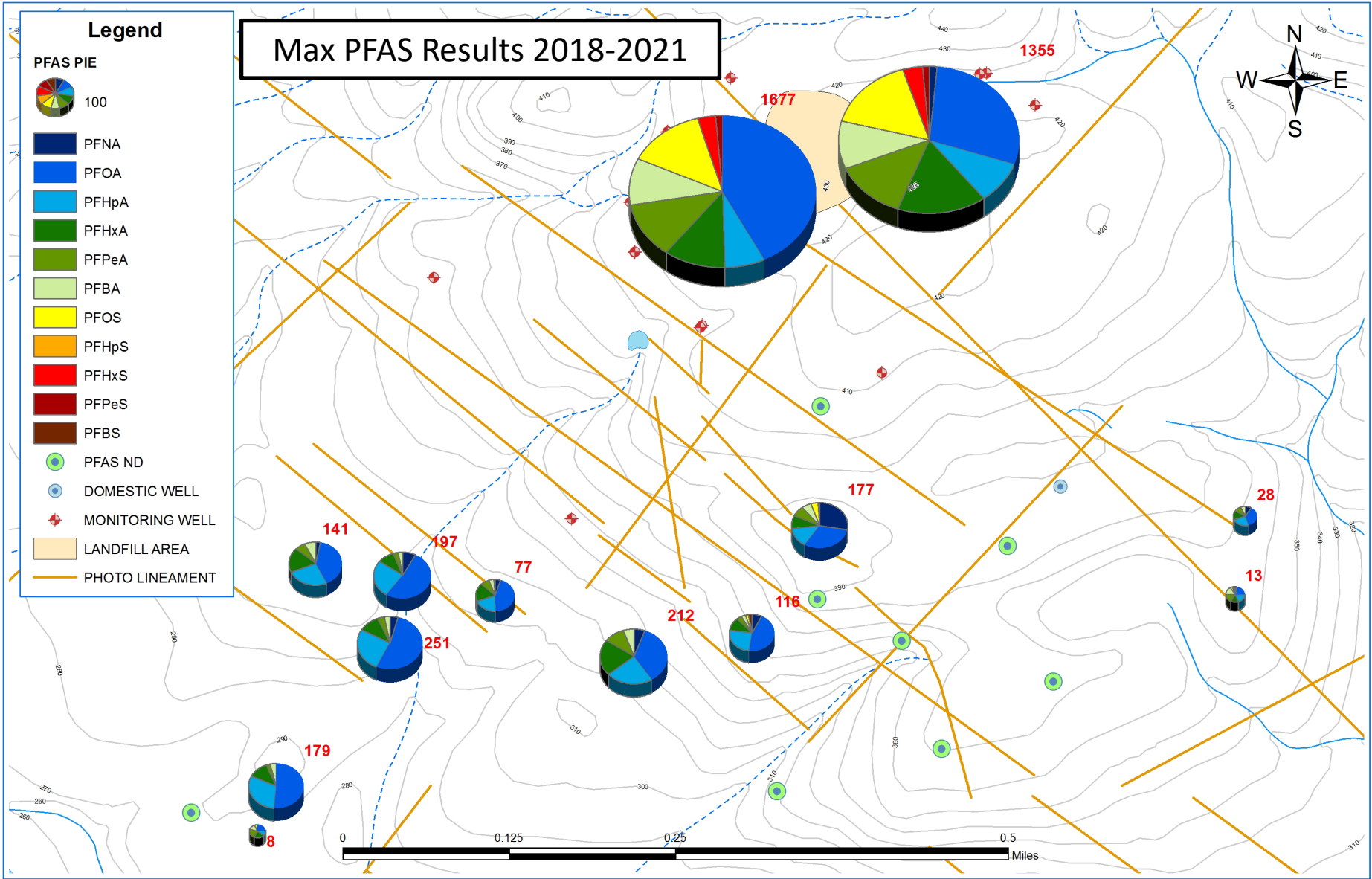
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Strike and Dip Direction
of all features



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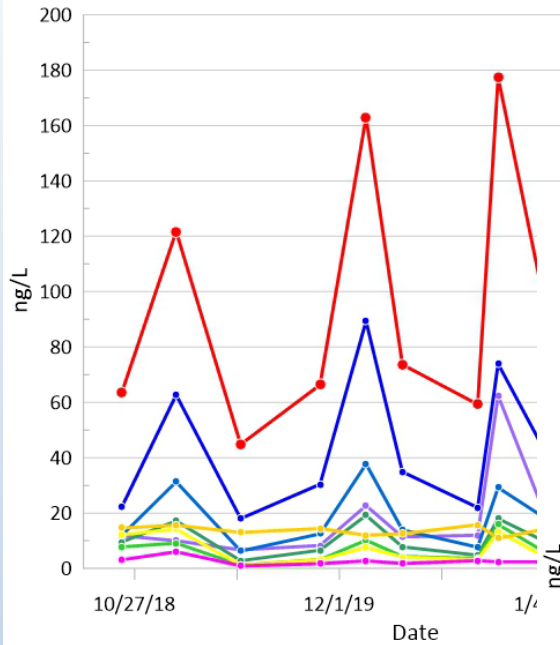
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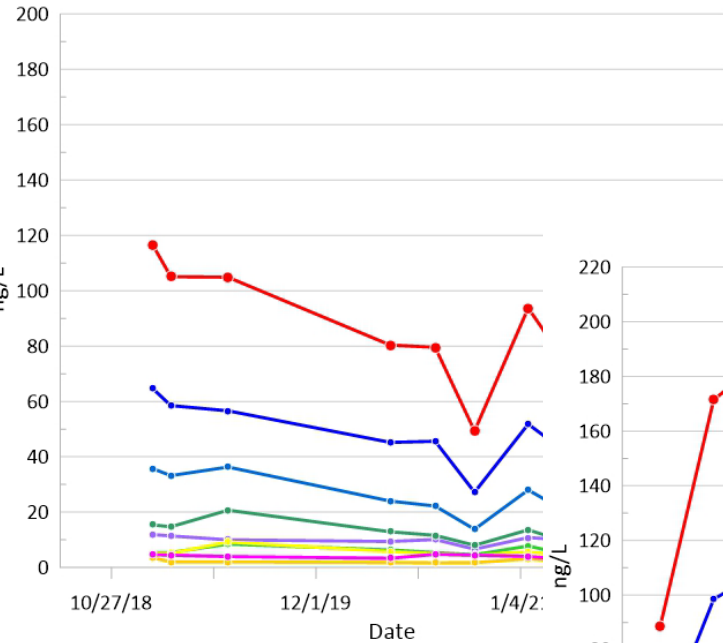


Downdip Residential Wells

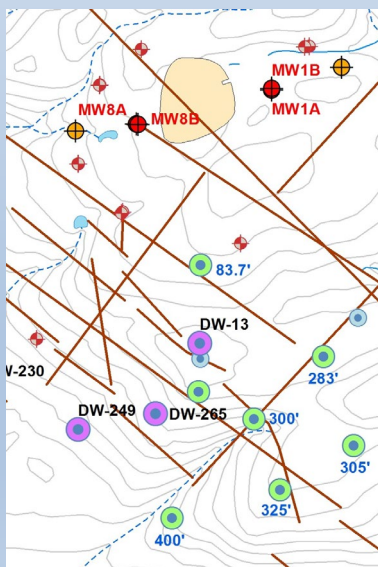
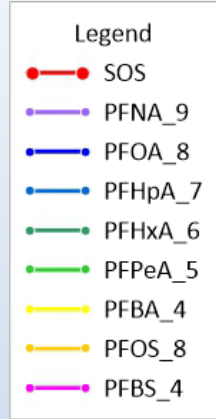
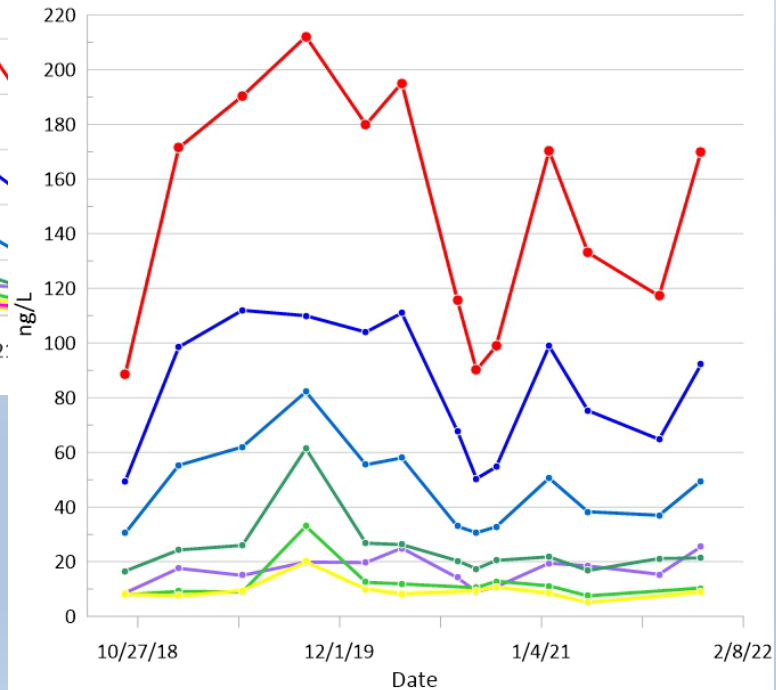
DW-13



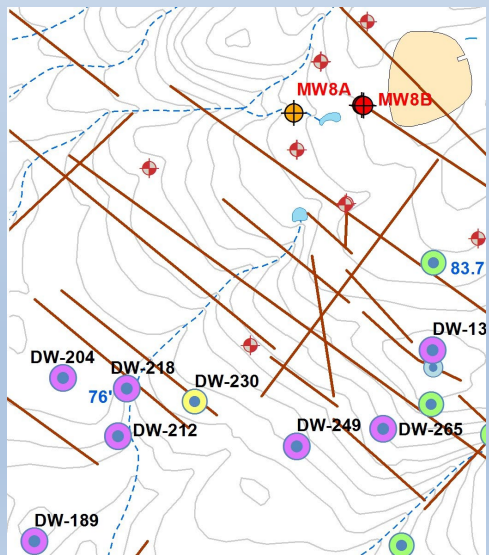
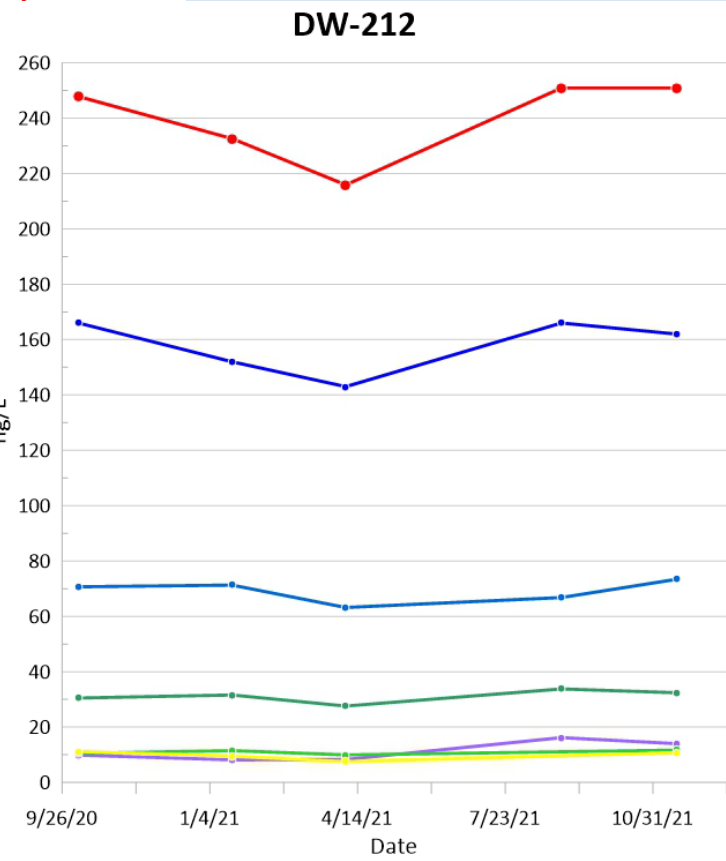
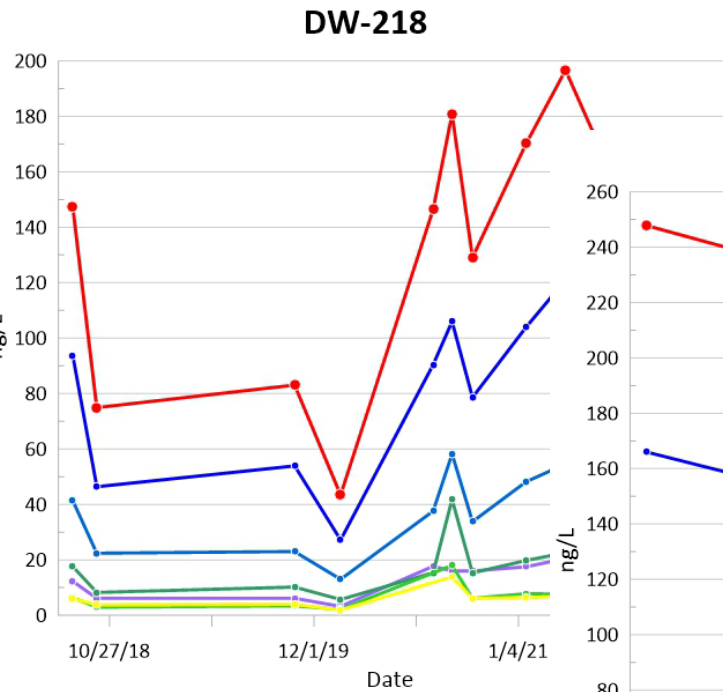
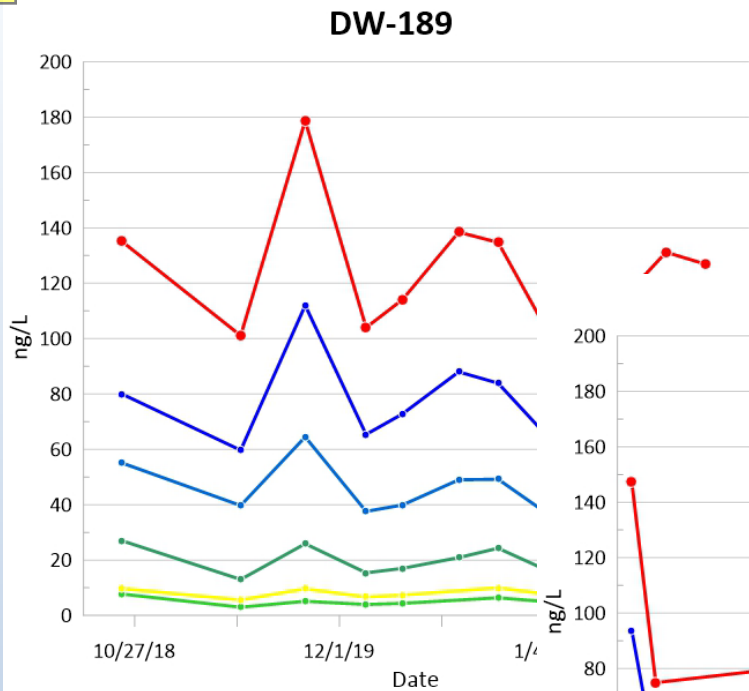
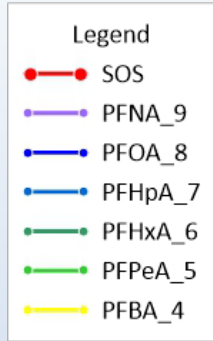
DW-265



DW-249

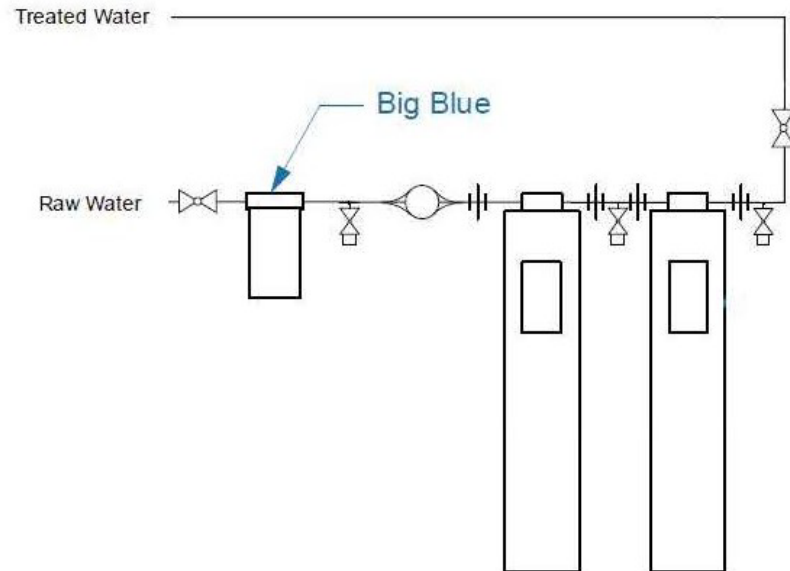


Along Strike Residential Wells



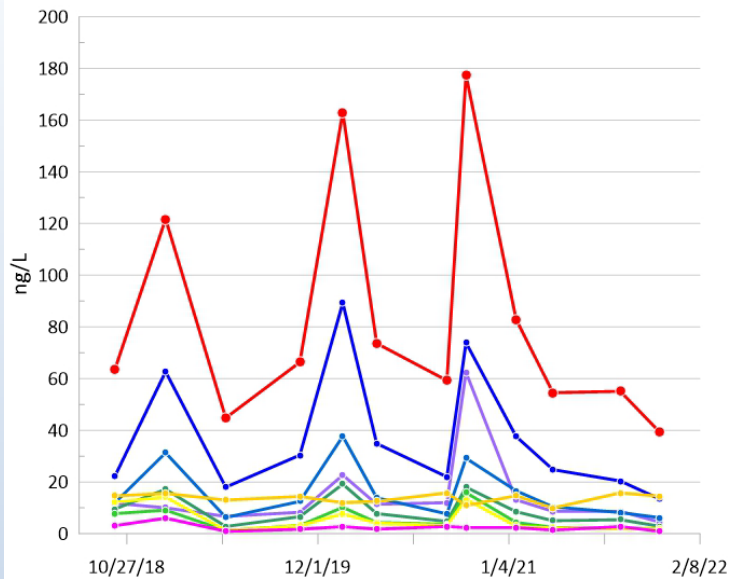
GAC Treatment System

- Point-of-entry GAC filtration
- Big blue to filter sediment
- Two 13" x 54" contact tanks w 2.5 or 3.0 cu ft GAC per tank
- 2 gpm/sq ft loading rate
- Empty bed contact time 10 min
- Samples collected before and between contact tanks

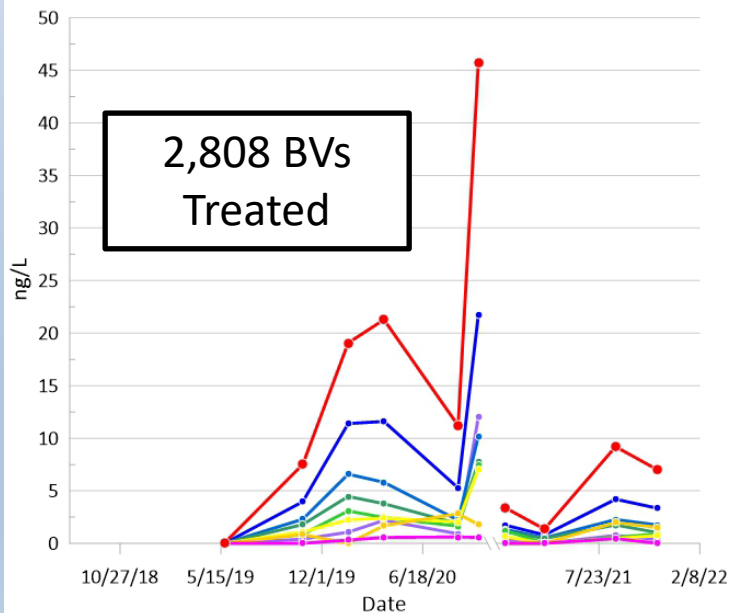


- Changeover when SOS exceeds 20 ppt

DW-13



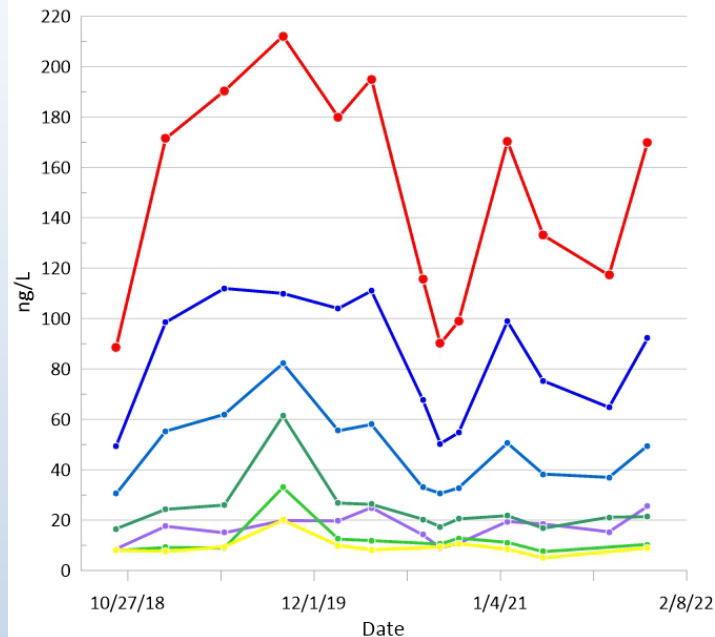
DW-13 GAC



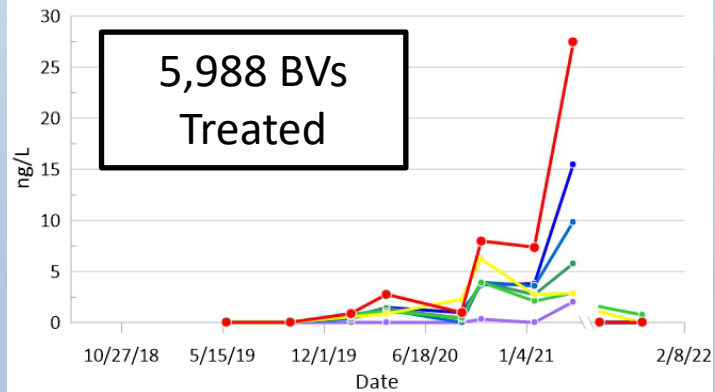
GAC Results

- Legend
- SOS
 - PFNA_9
 - PFOA_8
 - PFHpA_7
 - PFHxA_6
 - PFPeA_5
 - PFBA_4
 - PFOS_8
 - PFBS_4

DW-249



DW-249 GAC



Conclusions Thus Far

- Landfill contains primarily PFCAs and that bears out in residential wells where PFOA and PFHpA are the primary risk drivers
- Impacted residential wells can be downdip, along strike, or a combination thereof
- Structural geology is very important to understand for these types of sites – geophysics and photolineament mapping are crucial
- GAC works but must be monitored to protect human health
- Impacts are dependent upon water bearing fractures with PFAS - devil is in the mostly unknown details





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