The Impact of Per- and Polyfluoroalkyl Substances (PFAS) on Ground Water Supply in Southeastern Pennsylvania

Toby J. Kessler, P.G. – Hydrogeologist
Theresa A. Funk, P.E. – Water Resources Engineer

Gilmore & Associates, Inc.
Engineers, Geologists, Surveyors, Landscape Architects
Presentation Outline

- What are PFAS?
- PFAS in the Environment
- Identifying Goals for Water Supplier
- Treatment of Public Supply Wells
- Connection of Private Water Supplies
- Source Water Protection
- Public Relations
PFAS versus PFCs

- Perfluoroalkyls – all hydrogen atoms have been fluorinated
- Polyfluoroalkyls – at least one carbon is not fully fluorinated
- Industry now migrating to “PFAS”
- “PFCs” refers to compounds with all carbon and fluorine.
What are PFAS?

- 6 PFAS were included in UCMR-3 (2012-2014)
- EPA Lifetime Health Advisory (May 2016): PFOS + PFOA = 0.07 μg/L (parts per billion) or 70 ng/L (parts per trillion)

<table>
<thead>
<tr>
<th>Name</th>
<th>Acronym</th>
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<tbody>
<tr>
<td><strong>Perfluoroalkyl Carboxylic Acids</strong></td>
<td>PFCAs</td>
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<tr>
<td>Perfluorooctanoic Acid</td>
<td>PFOA</td>
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<td>Perfluorononanoic Acid</td>
<td>PFNA</td>
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<td><strong>Perfluoroalkyl Sulfonates/Perfluoroalkyl Sulfonic Acids</strong></td>
<td>PFSAs</td>
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<td>Perfluorobutane Sulfonate</td>
<td>PFBS</td>
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<td>Perfluorohexane Sulfonate</td>
<td>PFHxS</td>
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<tr>
<td>Perfluorooctane Sulfonate</td>
<td>PFOS</td>
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PFAS in the Environment

Sources
- Releases from industrial plants
- Disposal of products containing PFAS
- Wastewater and biosolids from manufacturing
- Disposal of coated paper and consumer products
- Washing of stain-repellent fabrics

Aqueous Fire Fighting Foam
- Widely dispersed source areas in Southeast PA
- PFOS solubility 680 mg/L (parts per million)
- PFOA solubility 9,500 mg/L (parts per million)
- EPA Lifetime Health Advisory is 70 parts per trillion combined PFOS/PFOA
PFAS in the Environment

- **Exposure Pathways**
  - Health Advisory assumes drinking water is 20% of the exposure to PFOS and PFOA
  - Additional exposure through dust, diet, air
Identifying Goals for Water Supplier

- Compliance
  - Is Compliance good enough in world of Health Advisory vs. MCL?
  - Is Compliance good enough in communities affected by historic high levels?
  - Conflicting scientific conclusions regarding appropriate levels
  - States with standards stricter than EPA Health Advisory
    - Vermont – 20 ppt - individual or combined PFOS/PFOA
    - New Jersey – 14 ppt - PFOA only
    - Minnesota – Health Based Values - 35 ppt PFOA; 27 ppt PFOS
Identifying Goals for Water Supplier

- Working Towards Solutions
  - Treatment of Public Water Supply
  - Private Well Owners
  - Remediation of Source of Contamination and Protection of Source of Supply
  - Public Relations
Temporary Treatment Systems

- Availability
- Permitting
- Full Scale Pilot Studies
- Establishing Standard Operating Procedures
  - Performance Sampling – frequency, sample locations
  - Backwash trigger
  - Filter media change-out criteria/expected run times
  - Filter media disposal procedure
Temporary GAC System in Separate Container
Permanent Treatment

- Carbon
  - Available/Tested/Readily Permitted
  - Design and Operational considerations
    - Other water quality parameters/raw water quality
    - Backwash – frequency, wastewater implications
    - Sampling – frequency, cost, lab, QA/QC, sample locations on valve rack/piping manifold
    - Filter media change-out/disposal/reactivation
      - Carbon acceptance canister
Permanent GAC System
Permanent GAC System – Building & BW Tank
Treatment of Public Supply Wells

- **Resin**
  - Innovative Treatment
    - Permitting
    - Pilot Testing
  - Design/Operational considerations
    - Reduced footprint/lower EBCT
    - Other water quality parameters
    - Upstream sediment filters – minimize backwash
    - Sampling – frequency, sample locations, cost, lab, standard methods, QA/QC
    - Filter media change-out – longer run times
    - Filter media disposal
Combination GAC/Resin System in Well House with Sediment Filter
Connection of Private Supply Wells

- Private Well Owners with Contaminated Wells
  - Main Extensions where necessary
  - Reluctance to Connect to Public System
  - Point of Use Treatment Systems
  - Well Abandonment
  - Retaining well for non-potable use
Source Water Protection

- Monitoring of Supplies
  - Periodic Monitoring of Wells without Treatment
  - More Frequent Monitoring of Systems with Treatment
Source Water Protection

- Delineate Wellhead Protection Areas
- Identify Potential Sources
- Communicate with responsible parties and regulators
Public Relations

- Informed Consumers/Vocal Population
- Media/Social Media
- Communication
  - Residents/Customers
  - Regulators
  - Local, State and Federal Elected Officials
- Education
Conclusions

- PFAS have been widely dispersed in the environment, and concentrated in particular areas of southeastern PA due to historic use of products containing PFAS.

- Addressing PFAS requires traditional strategies of treatment, providing public water connections where appropriate, and source water protection.

- Emerging and Unregulated Contaminants require additional non-traditional elements regarding treatment decisions, operations, communication and education.
Questions?

This concludes the Presentation