PFAS Visualization for Site Characterization, Remedy Performance Monitoring, and Forensic Analysis

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Abstract

The purpose of this study was to compare visualization methods which may be used for **PFAS site characterization, remedial performance monitoring, and forensic assessments**.

PFAS groundwater concentration trends are first visualized in potential AFFF source areas.

A more detailed analysis of trends, including the potential for precursor transformations to PFAAs, was evaluated for a smaller portion of the site where former fire training activities were conducted.

Methodology

1. Compiled several PFAS datasets
   - South Dakota AFB
   - East Coast Navy Base
2. Used **Visual PFAS™** software to prepare radial diagram and stacked bar maps, to assess trends for different sets of chemicals, and the use of concentrations versus ratios.

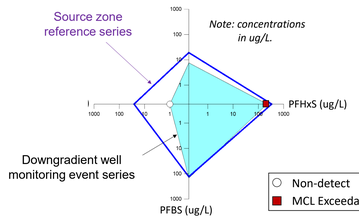
Results

Demonstrated benefits with PFAS visualization:

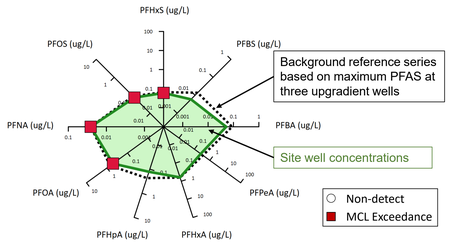
- Using **reference series** such as maximum source or background concentrations to improve the illustration of trends along a flow path
- Including **symbols** on radial diagram maps to illustrate where PFAS are non-detect or are in exceedance of site cleanup criteria, to support PFAS plume delineation
- **Forensic analysis** of the relative contributions of AFFF products derived from ECF versus telomerization manufacturing processes
- Used **PFAS ratios** on radial diagram axes to assess precursor transformation and PFAA attenuation along a flow path
- **Stacked bar maps** were shown to have significant advantages over pie charts for PFAS forensic analyses.

1 Components of a radial diagram

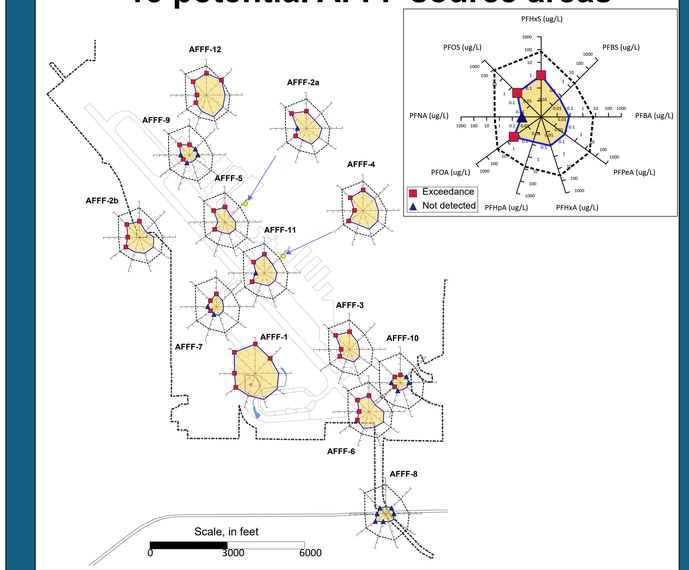
a) PFSA and precursor radial diagram for a downgradient monitoring well with source zone reference series



b) PFAAs radial diagram for a site monitoring well with a background reference series

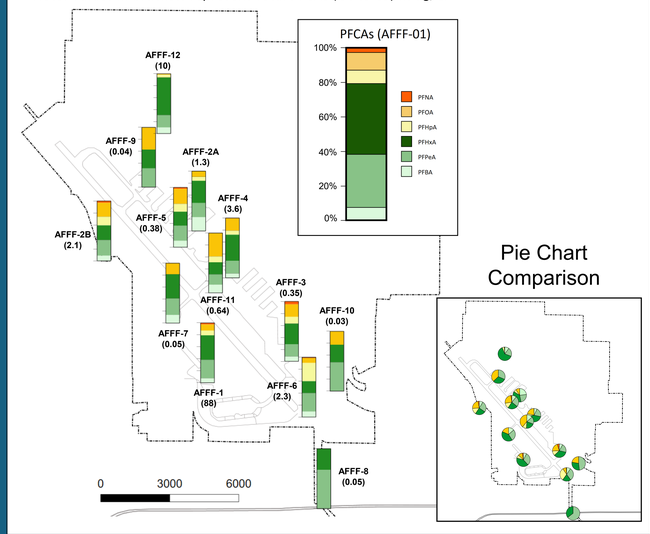


2 Visualizing 9 PFAAs across 13 potential AFFF source areas

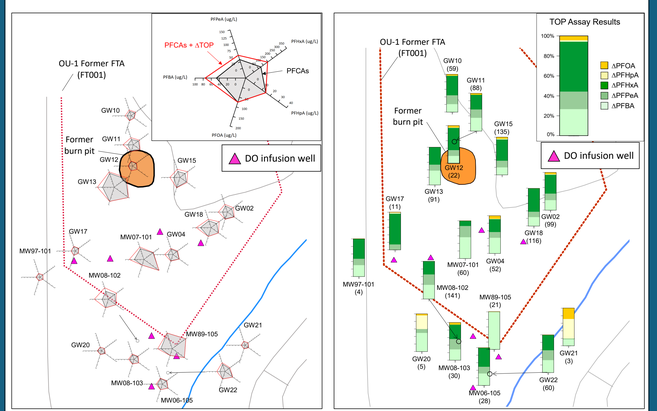


3 Stacked bar maps allow for fingerprinting AFFF signatures

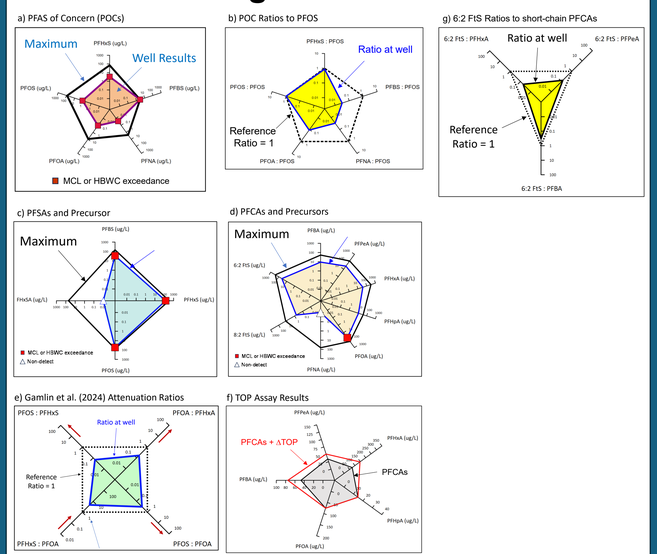
Note: Values in brackets represent Total PFCAs (C4 to C9) in ug/L.



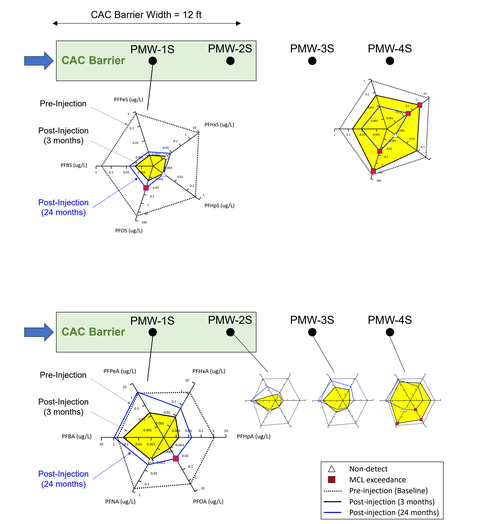
3 Visualizing TOP assays with radial diagram and stacked bar maps at former fire training area (OU-1)



5 Radial diagram options for visualizing concentrations & ratios



6 Evaluating temporal trends for a PlumeStop® barrier at a Navy site



PFAS visualization using radial diagram and stacked bar maps facilitates visualization of 5-10 chemical trends on a single map. These visual aids will improve conceptual site models, and communication with non-technical audiences.

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