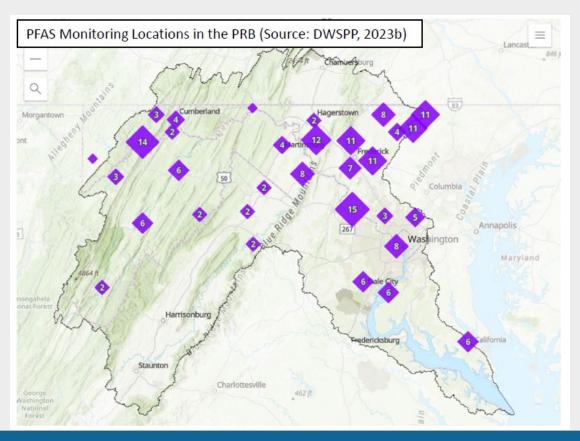


Understanding the Factors
Affecting PFAS Variability in
the Potomac River Watershed

Bradley Schmitz, Ph.D. (Loudoun)



### PFAS in Potomac River



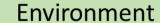


# Proposed MCL Regulations

Analyte	Loudoun Water and VDH Joint Voluntary Sampling Events (parts per trillion or ppt)	EPA Proposed Regulation as of March 14, 2023	
PFOS	Non-detect	4 ppt	
PFOA	non-detect - 4.5 ppt <sup>1</sup>	4 ppt	
PFBS	non-detect	1.0 Hazard Index <sup>2</sup>	
PFHxS	non-detect		
PFNA	non-detect		
HFPO-DA (Gen X)	non-detect		



### **PFAS Variability**





**Flow Conditions** 

Climate

Seasonality

**Water Quality** 

Geography

# Sample Processing





Collection & Handling

**Analysis Procedures** 

Quality Assurance & Quality Control

Replicates

Sensitivity (Limit of Detection)

Sample Quality (i.e., suspended solids)

### **PFAS Sources**





Mainstem Potomac River vs.
Tributaries

**Legacy PFAS** 

Point Sources of Contamination

Non-Point Sources of Contamination

Stormwater

Treated Wastewater Discharge

**PFAA Precursors** 



### Tailored Collaboration

- WRF will provide 1:1 cash match up to \$150,000
- Must be sponsored by a utility WRF subscriber

The Tailored Collaboration (TC) Program is a matching program designed to support utility-specific/regional issues. It provides an opportunity for subscribing utilities to partner with WRF on regional research projects or projects that address issues of interest to a significant subgroup of WRF subscribers. Each year, 20% of WRF's budget is allocated to this program.





# PFAS Proposal Objectives

Prioritize and select sample locations

Collect and process samples over 12-months

Statistical evaluation for variability

Best management practices



# Task 1: Sample Design

Objective: Identify sample locations based on potential PFAS sources

Deliverable: Methods to prioritize PFAS sample across a large geographical area

- WaterSuite
- EPA ECHO PFAS Tool
- Fed/State Agency Data

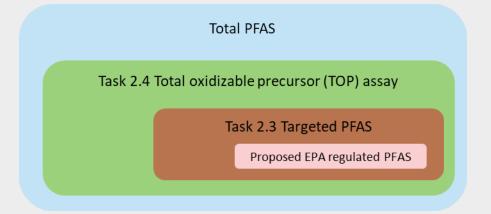
- PFAS Project Lab
- Facility Registry Service
- EWG PFAS Map



# Task 2: Sampling & Analysis

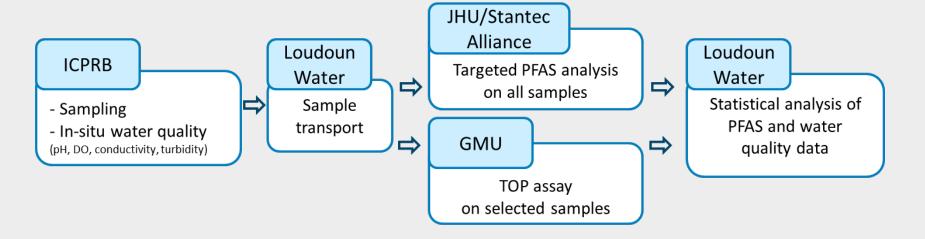
Objective: Measure PFAS and precursor concentrations in the Potomac River

Deliverable: Dataset of FPAS and precursors compounds in the Potomac River





### Sample Collection and Processing













### Task 3: Data Evaluation

Objective: Determine factors affecting variability in PFAS/precursors levels

Deliverable: Statistical relationships between PFAS and factors responsible for variability

Data Sources	Potential Parameters		
In-situ sample collection	Temperature, pH, DO, Conductivity, Turbidity		
USGS	Flow, Temperature, pH, DO, Conductivity, Turbidity, Nitrogen		
NOAA	Temperature, Precipitation, Wind		
Source Water Intakes*	Flow, Temperature, pH, DO, Conductivity, Turbidity, TOC, TSS, PFAS		
Wastewater Effluents*	Flow, Temperature, pH, Turbidity, TSS, Oxygen Demands, Nitrogen, Phosphorous, PFAS, Microplastics		

<sup>\*</sup> Utilities may provide data voluntarily



## Task 4: Perspectives Workshop

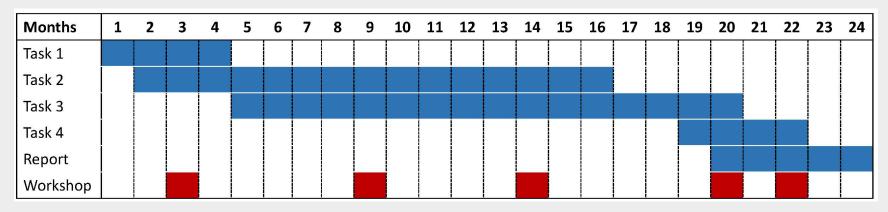
Objective: Document potential mitigation strategies and BMPs

Deliverable: Potential mitigation strategies and BMPs to limit PFAS contamination

- Hear perspectives from various stakeholders
- Brainstorm mitigation & prevention actions
- Document perspectives
- Consider next-steps







- Workshop 1: Determine sample locations
- Workshop 2: Initial results update from JHU/GMU
- Workshop 3: Intermediate results and statistics planning
- Workshop 4: Final results and statistical summary
- Workshop 5: Prioritize strategies & BMPs

Workshops will be held outside of DWSPP meetings, but DWSPP will provide updates



### **Principal Investigators**

- Loudoun Water, VA\*
  - Statec\*

**Johns Hopkins University** 

- George Mason University
  - WSSC Water, MD\*
- Interstate Commission on the Potomac River Basin\*

### **Non-Utility Partner**

- Metropolitan Washington Council of Governments\*

### **Collaborating Utility**

- DC Water, DC\*
- Fairfax Water, VA\*
- Town of Leesburg, VA
- City of Hagerstown, MD

### **Associate Utility**

- Washington Aqueduct, DC\*
  - Frederick County, MD
  - Berkeley County, WV
  - City of Rockville, MD

\* Denotes WRF subscriber



### Leadership & Value Gained

- Region-wide collaboration
- Research 'dream team'



• 'Blueprint' for other regions to establish PFAS collaborations





Phase 1: Understanding the Factors Affecting PFAS Variability in the PRB

Phase 2: Establishing Source Water Monitoring Program Phase 3: Determining relationship of PFAS between source water and treated water

Phase 4: Prioritizing Source Water Control Strategies





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#### **Tasks** Workshops **Deliverables** 1: Sample Design 1: Methodologies to 1: Prioritize & prioritize PFAS 1.1 Identify Presumptive PFAS Sources Select Sample samples across a large 1.2 Prioritize & Finalize Sample Locations & Locations geographical area Logistics 2: Sampling & Analysis 2: Dataset of PFAS and precursors 2: Initial Results 2.1 Initial Demonstration of Capability compounds from 2.2 Sample Collection Update Potomac River 2.3 Targeted PFAS and Background Water Quality Samples 2.4 Measured Total Oxidable Precursor Levels 3: Intermediate 3: Statistical 3: Data Evaluation **Results & Statistics** relationships between Planning PFAS and factors (e.g., flow, seasonality) 4: Final Results & 3.1: Collect Additional Parameter Data responsible for 3.2 Analysis of PFAS Variability Factors Statistical variability Summary **4: Best Management Practices** 4: Potential Mitigation 5: Prioritize Strategies & BMPs to Strategies for limit PFAS **BMPs** contamination in the 4.1 Identify Mitigation Strategies and BMPs Potomac River

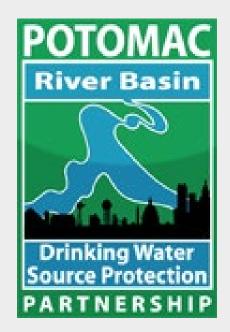
**Final Report** 

LOUDOUN WATER

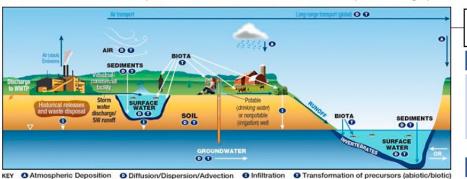


# DWSPP CEC Workgroup

- Utilities, USGS, researchers, citizen groups have all collected PFAS data...inconsistent results
- A cohesive, region-wide approach is necessary
- DWSPP provides an opportunity for collaboration



A CSM shows the relationship between contaminant sources and receptors through potential or actual migration & exposure pathways.



PFAS Monitoring Locations in the PRB (Source: DWSPP, 2023b) Lancast redericksburg Staunton Charlottesville

Example Graphical CSM for industrial site (Source: ITRC, 2022)

#### **Potential Sources**

Industrial Operations Fire Training Areas Landfills & WRRFs Other

#### Exposure Medium

Soil Sediment Surface Water/Drinking water\* Groundwater Air

#### **Exposure Route**

Dermal Contact
Ingestion
Inhalation

### Receptors

#### Humans Biota

\* Surface water is the source of drinking water for the major utilities in the PRB. While PFAS has several exposure pathways, the focus of this study incorporates determination of PFAS variability in surface water. WATER



### JHU Limits of Detection

Compound	MDL (ng/L)	Compound	MDL (ng/L)	Compound	MDL (ng/L)
PFPrA	0.45	PFTreA	0.44	8:2 FTS	0.27
PFBA	0.49	PFPrS	0.11	FBSA	0.54
PFPeA	0.36	PFBS	0.18	FHxSA	0.45
PFHxA	0.30	PFPeS	0.16	PFOSA	0.29
PFHpA	0.13	PFHxS	0.26	N-MeFOSAA	0.54
PFOA	0.17	PFHpS	0.24	N-EtFOSAA	0.89
PFNA	0.21	PFOS	0.41	HFPO-DA	0.11
PFDA	0.24	PFNS	0.47	ADONA	0.14
PFUdA	0.29	PFDS	0.68	9Cl-PF3ONS	0.41
PFDoA	0.43	4:2 FTS	0.20	11Cl-PF3OUdS	1.04
PFTriA	2.82	6:2 FTS	10.31		

Notes: LoDs are for drinking water, using EPA Methods 533/537.1



Organization	Cash co-funding	In-kind	Total
Loudoun Water	\$0	\$40,000	\$40,000
Stantec	\$0	\$10,000	\$10,000
Johns Hopkins	\$0	\$0	\$0
George Mason	\$0	\$10,000	\$10,000
ICPRB	\$0	\$7,500	\$7,500
DWSPP Utilities	\$0	\$49,000	\$49,000
MWCOG	\$150,000	\$10,000	\$160,000
Funds from WRF	\$150,000	-	\$150,000
Total	\$300,000	\$126,500	\$426,500