WHITE PAPER

Rapid PFAS Sensor:
A Novel and Critical Tool in Rapid Site Characterization and PFAS Remediation

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Per- and polyfluoroalkyl substances (PFAS) have been widely used in industrial and commercial applications for over six decades. Due to their unique chemical properties, these compounds are highly resistant to degradation, leading to persistent environmental contamination. The widespread contamination of PFAS poses significant challenges for site characterization and subsequent remediation efforts that are critical in the mitigation of PFAS impacts on the environment and human health.

Site characterization utilizes advanced analytical tools to identify the presence of PFAS compounds, their concentrations and how they are spread across different sources, including soil, groundwater, surface water and leachate. Site characterization works directly with remediation efforts to discern which remediation tools and processes are needed at a specific site and to monitor ongoing remediation progress.

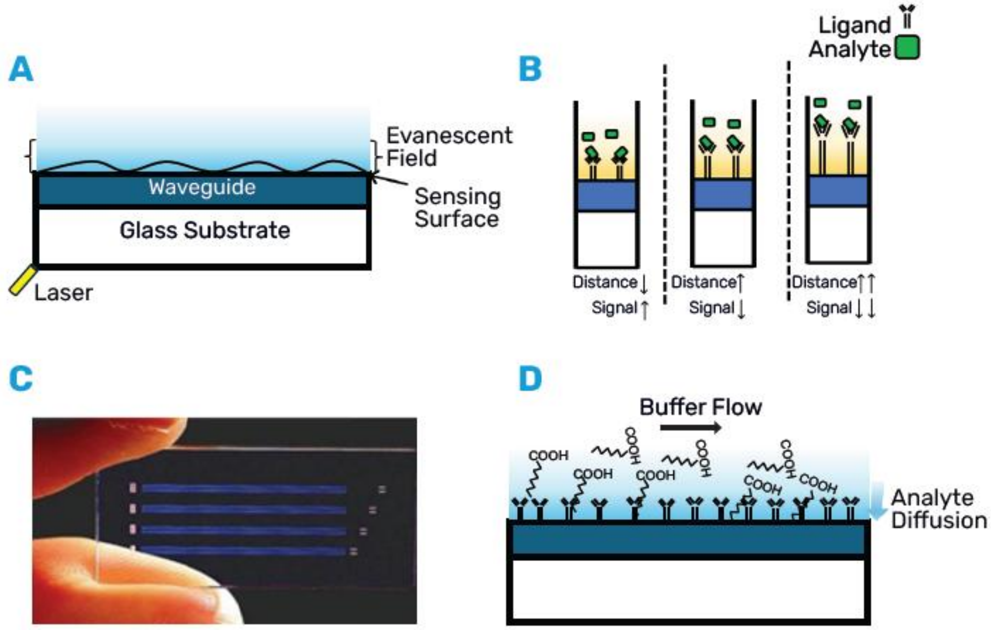
Current hurdles and limitations exist in both site characterization and remediation as current detection methods require the testing of samples in offsite laboratories that result in lengthy turnaround time, are costly and create uncertainty around sample integrity. For a problem that requires swift decisions and actions to identify, contain and remediate contamination sites, these limitations create a critical gap in PFAS management.

The Salvus Interferometric Sensing Technology

To meet the critical demand for rapid, onsite PFAS detection, Salvus is developing a polymer-based sensor integrated into a portable detection system (**Figure 1**). Leveraging an interferometry detection platform licensed from Georgia Tech Research Institute, this innovative system is designed to reliably screen total PFAS concentration, rather than focusing on individual compounds. The sensor is being developed using PFOA as a model compound, with initial findings indicating that the polymer is not specific to PFOA but demonstrates sensitivity to other PFAS compounds of similar carbon chain lengths (**Figure 2**).

Figure 1: Salvus handheld platform showing positive test result for PFAS detection.

Figure 2. Salvus sensing waveguide.



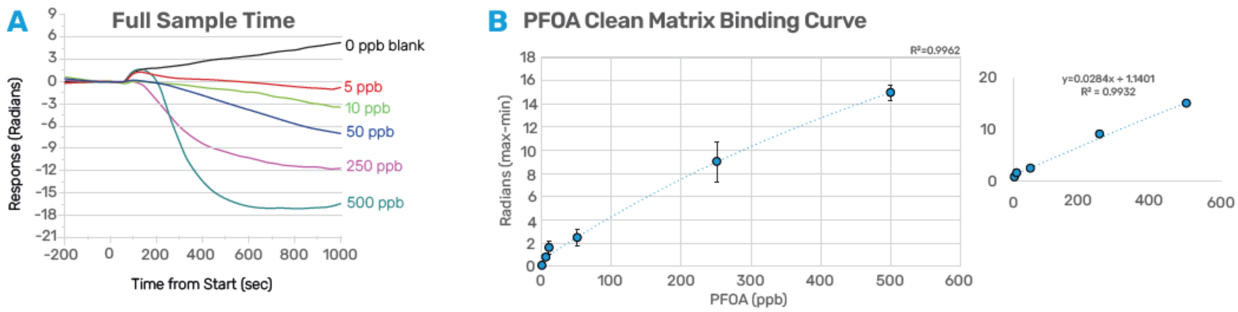
A) Glass substrate with waveguide material coated with a receptor sensing layer for target analyte. B) Relationship between receptor location in evanescent field and signal. C) Layout showing input gratings on the left, four sets of two channels (one is etched and is coated in the target-sensitive receptor layer, and one is a "buried" reference). D) PFAS diffusion and binding to polymer receptor that is specific to perfluorinated compounds.

Progressing Field Detection Levels to Address Regulatory Requirements

In May 2025, the Environmental Protection Agency (EPA) confirmed it will maintain the current National Primary Drinking Water Regulations (NPDWR) for perfluorooctanoic acid (PFOA) and perfluoro octane sulfonic acid (PFOS) at 4 parts per trillion (ppt)[1], which it had originally established in April 2024.

Our Salvus Detection Platform provides results down to low parts-per-billion (ppb) levels (**Figure 3**) within one hour. To address the various environments in which PFAS are found, our Salvus technology is capable of detecting PFAS concentration across various environmental media, such as groundwater and leachate (**Figure 4**). Additionally, a streamlined sample preparation method enhances detection capabilities, achieving parts-per-trillion (ppt) sensitivity even in complex matrices (**Figure 5**).

Figure 3. Field detection to ppb, progressing to ppt levels.



C Technology Sensitivity

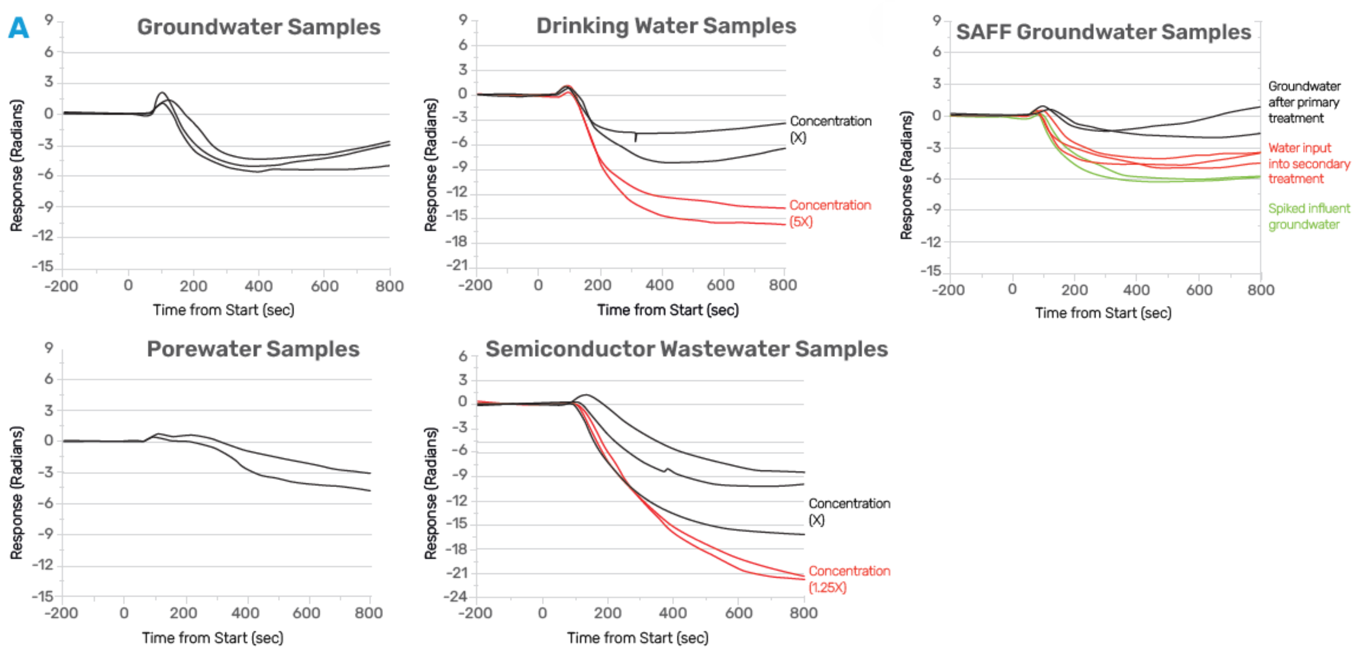
[Propylene Glycol] %	Radian Response	Standard Deviation	Coeffecient of Variation (CoV)
0.05	1.87	0.047	2.5
0.1	3.56	0.038	1.1
0.2	7.1	0.044	0.6
0.4	14.11	0.21	1.6

PFOA Sensitivity (Clean Matrix)

[PFOA] ppb	Radian Response	Standard Deviation	Coeffecient of Variation (CoV)
5	0.79	0.21	26.3
10	1.6	0.58	36.3
50	2.5	0.73	29.9
250	9	1.73	19.3
500	14.9	0.67	4.5

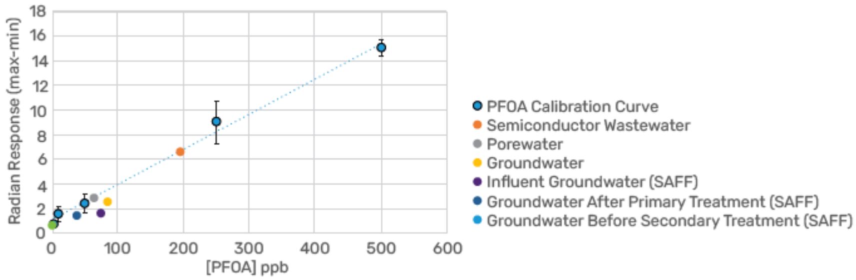
A) Graph displaying responses for PFOA samples in DI water in the dynamic range of sensor from 5 ppb to 500 ppb. B) PFOA calibration curve used to determine concentrations of unknown samples. Graph is plotted both with a hyperbolic function and a linear function to obtain a calibration curve for unknown concentration determination. C) Tables demonstrating the response and CoV (Standard deviation/total response)*100 for both the base sensing technology (Propylene glycol analyte) and clean matrix PFOA detection.

Figure 4. Long-chain PFAS detection in environmental samples.



A) Response graphs for PFAS detection from environmental samples received by Salvus. Samples were run through the Salvus sample preparation process to remove matrix effects and leave behind detectable PFAS without interference.

B Expected Complex Matrix Concentrations and Response



B) PFOA calibration curve used to determine the concentrations of unknown environmental samples from complex matrices. The environmental samples were plotted along the calibration curve using their expected concentration obtained from Georgia Tech using a modified 1633 method.

C

Sample	Salvus [PFAS] sensor runs	Salvus [PFAS] Avg	[PFOA] 1633 method	[Long-chain PFAS] 1633 method
Semiconductor Wastewater	226.3 ppb 183.6 ppb 168.1 ppb	192.6 ppb	10 ppb	195.24 ppb
Groundwater	39.98 ppb 33.57 ppb 80.44 ppb	51.33 ppb	57.86 ppb	84.84 ppb
Porewater "Water between soil, sediment or rock"	38.24 ppb 86.92 ppb	62.59 ppb	66 ppb	64.83 ppb
Influent Groundwater (SAFF)	20.06 ppb 20.22 ppb	20.14 ppb	72.79 ppb	75.16 ppb
Groundwater After Treatment (SAFF)	Under Dynamic Range LoD	Under Dynamic Range LoD	0.098 ppb	0.451 ppb
Groundwater Before Secondary Treatment (SAFF)	Under LoD 34.9 ppb 27.63 ppb	13.56 ppb	9.1 ppb	38.1 ppb

- All samples tested are real environmental samples received from partners in the industry.
- 1633 Method was done by Georgia Tech.
- Optimization of interference and more advanced calibration modeling are underway.

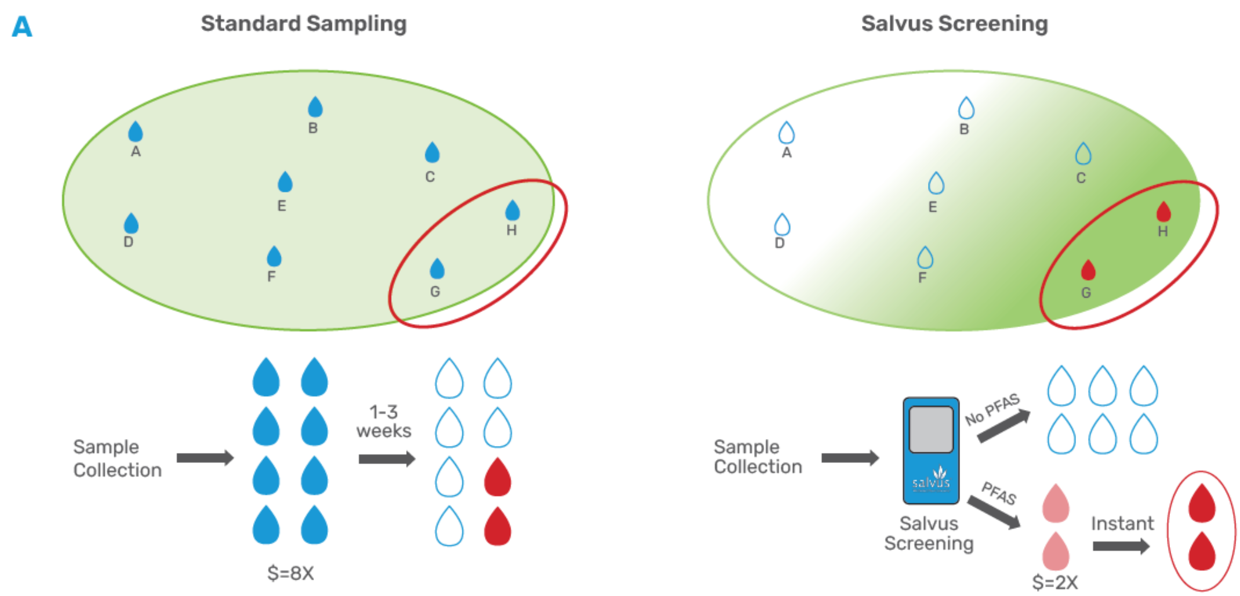
C) Table breaking down the concentration of PFAS determined by the Salvus rapid sensor for each run, along with the average. The average was compared to the results from 1633 method for long-chain PFAS compound concentration.

D Long-Chain PFAS Compounds Detected

PFOA	PFUnDA
PFhpA	PFDoDA
PFHpS	PFDS
PFOS	PFTrDA
PFDA	PFHxDA
PFNA	PFTDA

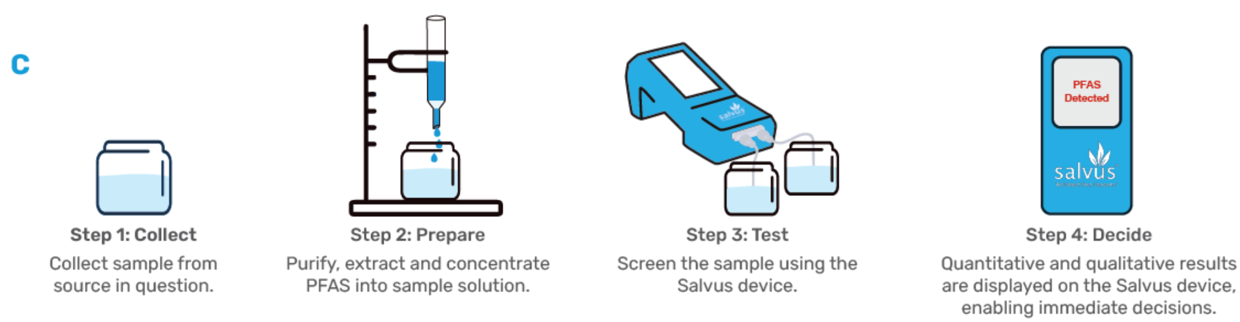
D) Table showing the compounds that make up the long-chain PFAS components that the Salvus sensor detected and were validated through Georgia Tech.

Figure 5. Rapid decisions at the point of sample.



A) Diagram depicting the value of the Salvus rapid sensor for PFAS screening in the field. The Salvus sensor detects PFAS in environmentally relevant matrices down to ppt levels. The rapid and sensitive screening allows for quick decisions to be made at the point-of-concern during the remediation process.

B) Screens depicting different results for a PFAS test both without the presence of PFAS (left) and with a PFAS sample (right).



C) Salvus screening process schematic showing the collection, field extraction and concentration of PFAS from complex environmental samples. Salvus has validated the extraction and concentration of up to 100x using EPA method 1633 through a partnership with Georgia Tech.

References
1. https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas