

# First feedback: Monitoring the crucial choice of the PFAS compounds analyzed

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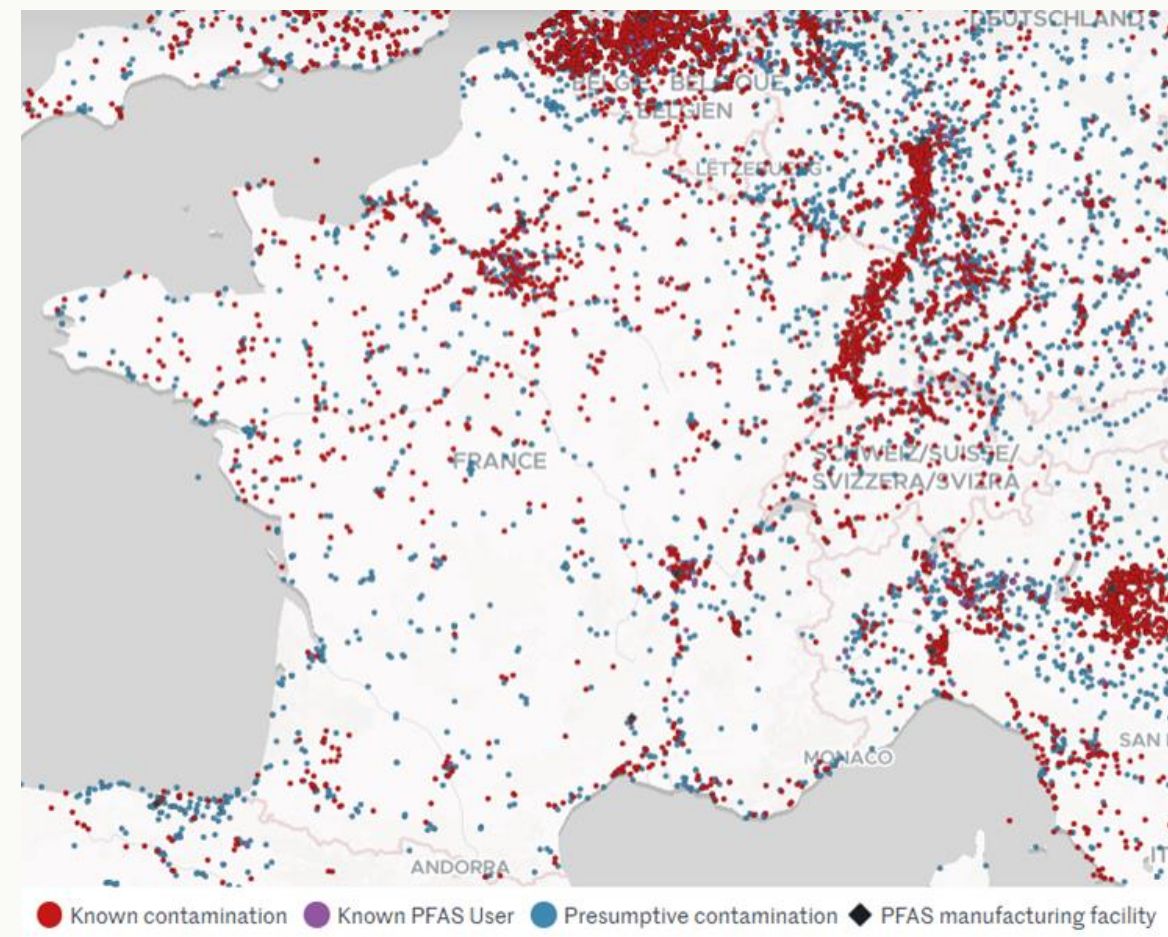
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## Context

- **PFAS: A vast family of chemicals, more than 10,000 compounds, characterized by carbon-fluorine bond:**
- Uses: emulsifiers, firefighting foam, surface treatments...
- Public health concerns: carcinogenic, hepatotoxic, endocrine disruptors...
- No or limited natural degradation process:

➤ « Forever Chemicals »

- **Global pollution in Europe**



# Global regulatory framework

## International

- Three PFAS (PFOS, PFOA, and PFHxS) are regulated as Persistent Organic Pollutants (POPs) : restriction of production and usage

## European Union

- **Directive on the quality of water for human consumption**
  - In 2026, a threshold value of **0.1 µg/L for the sum of 20 PFAS** or 0.5 µg/L for total PFAS.
- **REACH Regulation**
  - PFOA and PFOS limited in firefighting foams
  - Restriction of C9–C14 PFAS since 2023 and PFHxA since 2024
  - Proposal under review to restrict more than 10,000 PFAS

## French Regulation

# French Regulation

## Drinking water

- Effective January 2026, a limit of **0.1 µg/L for the sum of 20 PFAS** and **2 µg/L for raw water**. Starting in 2027, monitoring will be conducted in addition to the 6:2FTSA and TFA

## Industrial Wastewater

- Industrial water emission limit for PFOS: 25 µg/L
- Wastewater monitoring campaign over three consecutive months (inventory of rejected PFAS)
- Monitoring of PFAS in wastewater treatment plants with a capacity of more than 10,000 person equivalents (the 20 PFAS + 6:2 FTSA + 6:2 FTAB)

## Other

- **Law of February 27, 2025:** Effective January 2026: PFAS banned in cosmetics, ski waxes, clothing, footwear...
- => **Goal:** 70% reduction in PFAS emissions by 2030

# PFAS Analysis Issues

## Targeted Analyses

Analytical methods for detecting specific compounds, often required for the list of 20 PFAS.

Challenges: limited analytical methods, high costs

## AOF/EOF

Measurement of the amount of adsorbable or extractable organic fluorine.

Issues: Not quantitative; difficulty tracing back to a source without targeted analyses.

## Advanced analyses: precursors (TOP Assay)

Targeted analyses before and after oxidation to degrade oxidizable precursors

Issues: very expensive, not standardized, degradation pathways poorly understood, total or incomplete degradation

# Application real case

- **Site:**

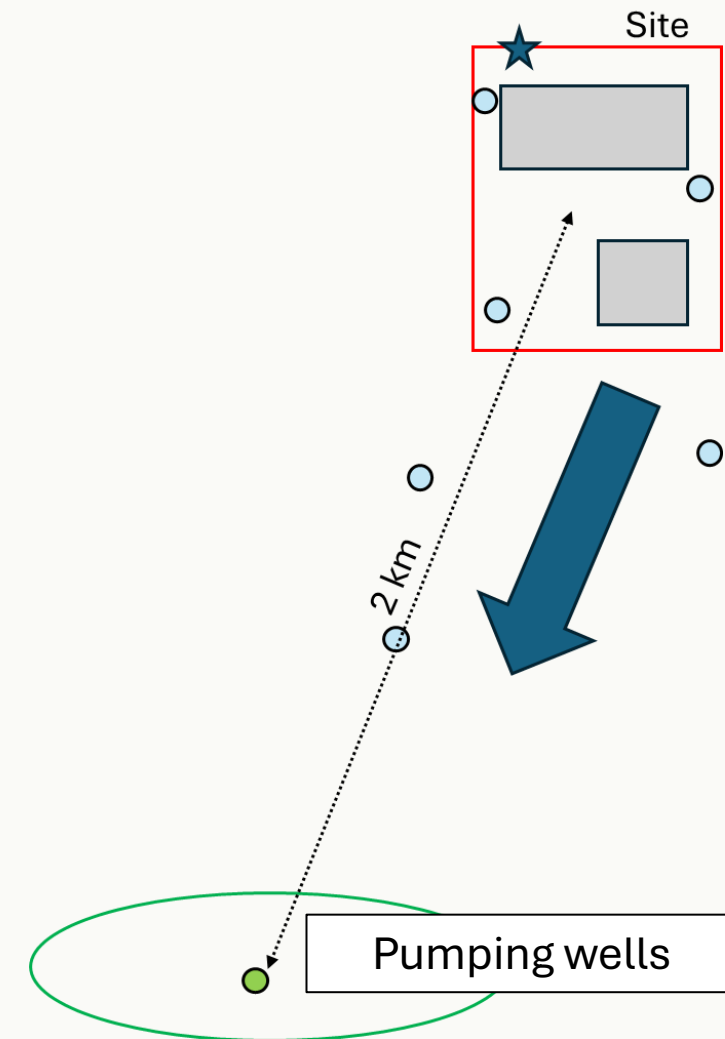
- Industrial not involved in PFAS production or user
- No known incidents
- Firefighting system in place with foams

- **Context:**

- No upstream activity
- Drinking water wells 2 km downstream
- PFAS detected in these wells

- **Investigations to determine the source**

- 3 sampling campaigns on the industrial wastewater
- 1 sampling campaign on groundwater



# Site monitoring

## Initial industrial wastewater monitoring

- Analytical list: the 20 PFAS of drinking water regulation, significant LQ: 100 ng/L
- Results: No PFAS detected in the discharged wastewater

## Initial Groundwater monitoring

- Analytical list: the 20 PFAS of drinking water regulation, significant LQ: 100 ng/L
- Results: some piezometers with low concentration
- What is the source?

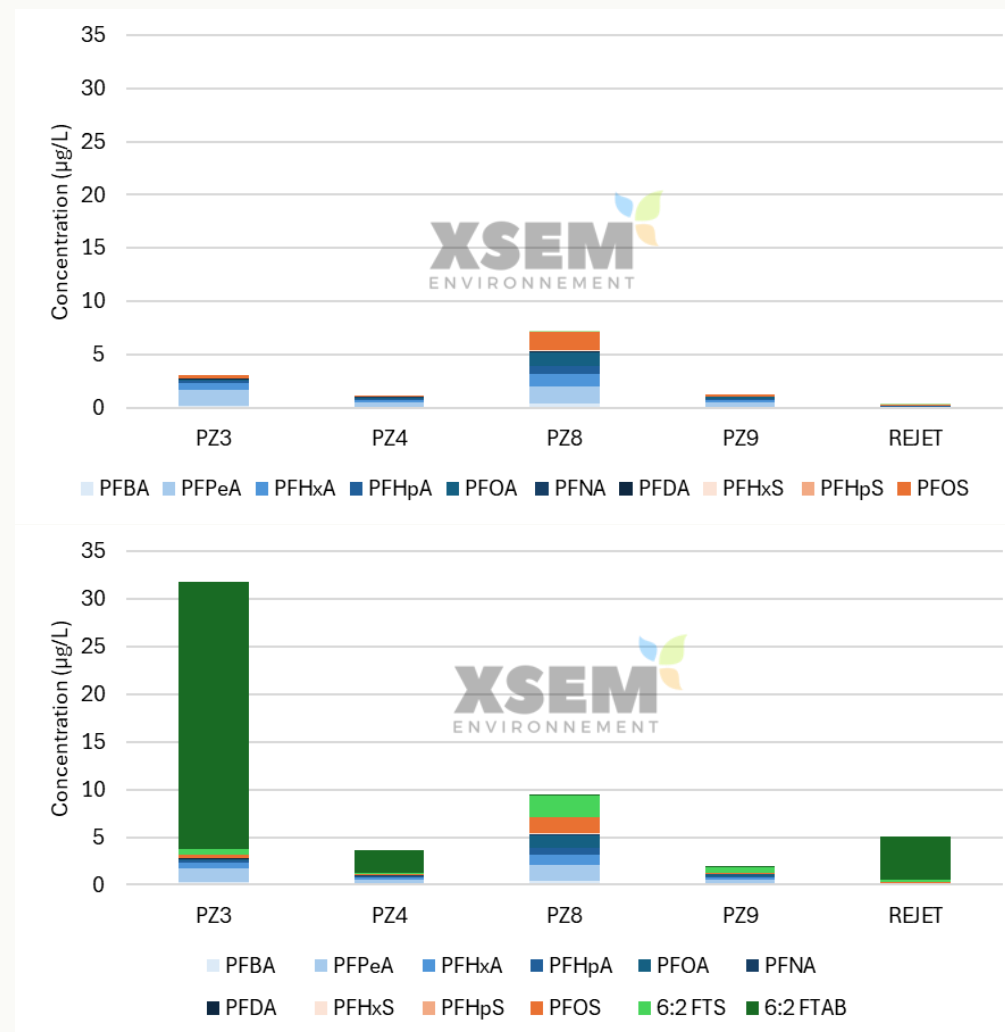
## XSEM

- Extended list of PFAS analyzed (minimum of 48 PFAS)
- Analyses with lower LQ (100 ng/L → 5–10 ng/L)



# XSEM Monitoring

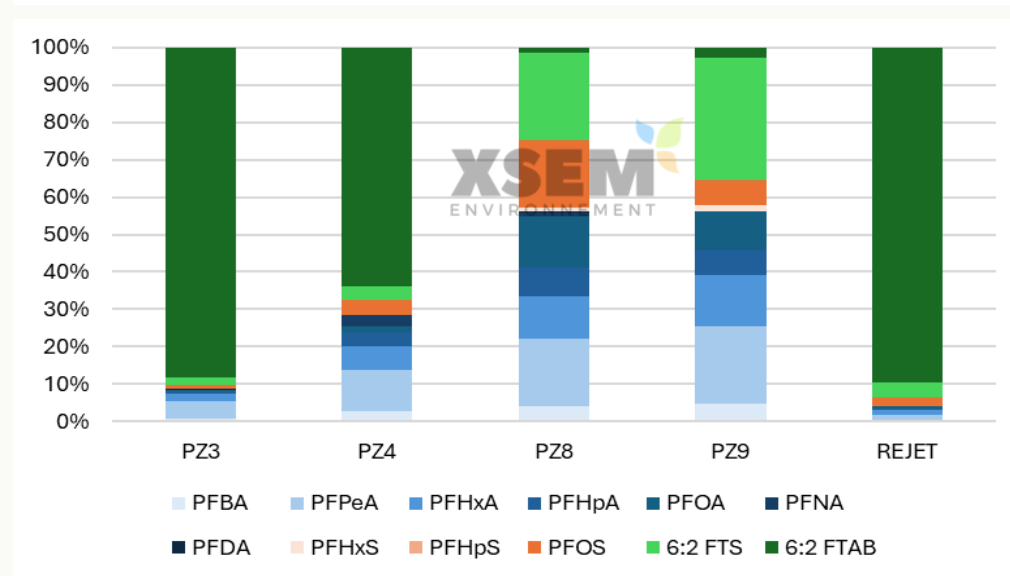
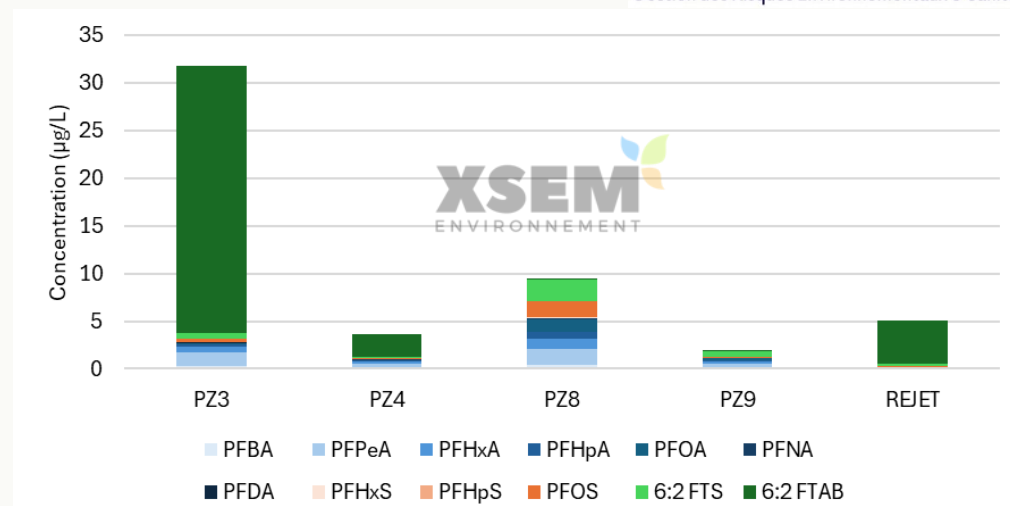
- Considering **only the 20 PFAS**
  - Low concentration in piezometers on site and virtually none in the wastewater
  - PFAS are primarily found off-site (Pz8)
    - Difficult identify transfers and sources
- Including the **48 PFAS**
  - Significant presence of PFAS => 6:2FTAB + 6:2FTS
  - High concentrations at Pz3: 31 µg/L
    - Concentrated pollution => Near source?
  - Concentrations are also high in Wastewater : 5µg/L
  - Concentrations off-site more consistent with a transfer from the site to the external environment





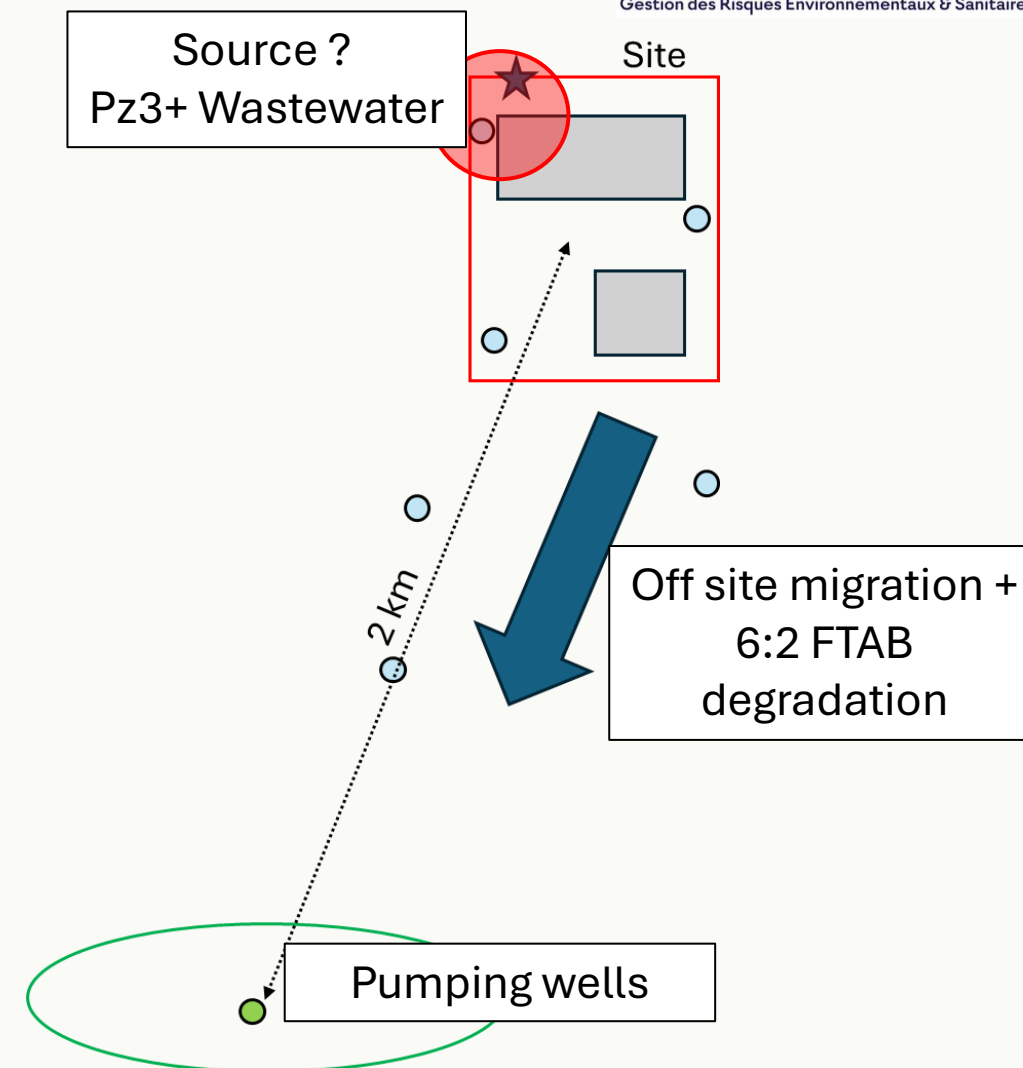
# XSEM Monitoring

- PFAS composition analysis for further investigation
  - On-site:
    - Piezometer and wastewater signatures marked by 6:2FTAB (more 90%)
    - Wastewater composition similar to PZ3
  - Off-site:
    - Piezometer more impacted by 6:2FTS and PFCA
    - Higher concentration of PFHxA, PFPeA, and PFBA
- With the distance from the site to downstream :
- **6:2FTAB decrease and 6:2FTS and PFCA increase**



## Possible source

- **6:2FTAB and 6:2FTS: molecules commonly found in firefighting foams**
- The main PFAS compounds detected are known to be degradation byproducts of 6:2FTAB
- Possible source:
  - Leak from the firefighting system near Pz3
  - Drainage of water from firefighting system to the discharge point (wastewater)
  - Migration of pollutants from the groundwater and degradation of 6:2FTAB => Presence of 6:2FTS and byproducts downstream
  - Enrichment of PFCA byproducts included in the list of the 20 PFAS detected downstream



# Conclusion

- This example illustrates the value of :
  - Continuing research by expanding the lists of analytes
  - Including common PFAS precursors
  - Assessing the potential for degradation and the formation of analyzable byproducts
- **Perspectives**
  - On-site investigation underway to confirm the source
  - **Assess potential stocks and transfers:**
    - **Unsaturated zone modeling**
    - **Saturated zone modeling**
  - Develop recommendations for action based on:
    - **Duration of contamination**
    - **Expected concentrations**
    - **Off-site uses**

# Thank you for your attention!

Questions ?