

# *PFAS screening in France and source identification for human exposure assessment*

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## 2009 – National screening study on 10 PFAS (3 PFSA and 7 PFCA)

Who requested it and why?

- ❑ French Ministry of Health
- ❑ Finding of a huge PFAS contamination in Germany (Ruhr river and Moehne river) – Industrial waste in a soil improver spread on agricultural land [1]

What is a national screening study?

30,000 surface  
and groundwater  
resources



27,000  
drinking  
water  
networks



# NATIONAL SCREENING STUDY ON 10 PFAS

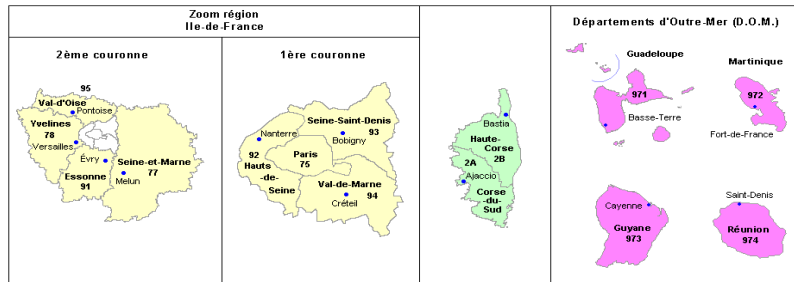
3 sites investigated per department



1) Resource producing the greatest flow

2) Resource randomly selected

3) Resource possibly affected by human activities



In total, 300 raw water samples + 300 treated water samples ~ 20% national water supply flow

## Results in raw water [2]:

	PFBS	PFHxS	PFOS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA
F %	8	37	35	6	8	19	11	39	6	0.6
C max	6	32	62	8	40	28	39	12	14	1

F %: frequency of detection (LOD = 1 ng/L); C max: Maximum concentration (ng/L)

Tracking of points sources : specific profile pattern and highest PFAS sum.

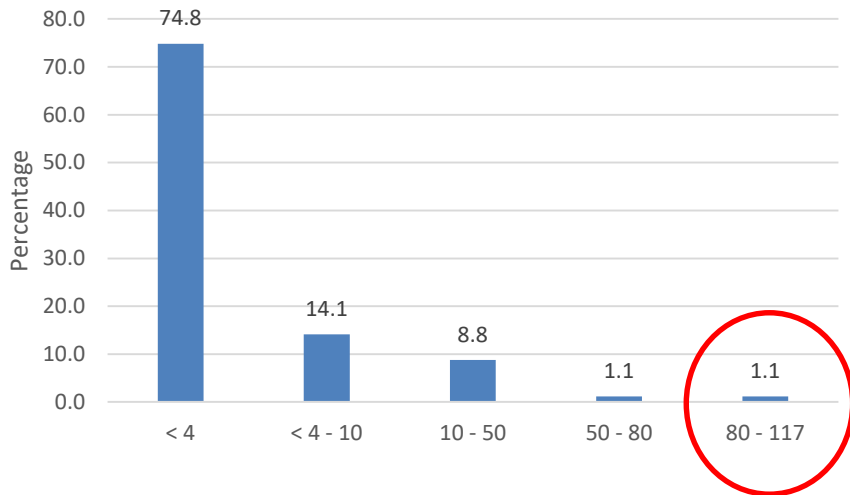
Rhône River : Profile pattern PFHxA > PFNA > PFOA at 6 sampling sites spread over 200 km along the river. Industrial site involved in the fluorotelomer production and the manufacture of fluoropolymers and fluoroelastomers from the beginning of the '60s. 15 km downstream from this site, sum of PFASs above the parametric value of the next EU Directive (0.1 µg/L) in treated water. [3, 4].

Mix of short chain PFCAs (PFPeA, PFHxA, PFBA and PFHpA) with or without PFSA (PFHxS, PFOS and PFBS) comes likely from a firefighting foam use.



## TRACKING OF THE MAIN POINT SOURCES

Distribution of PFAS sum (ng/L) in raw water

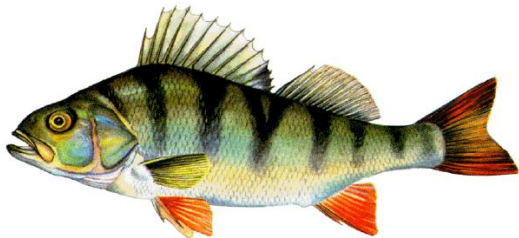


Highest PFAS sum (3 sites - from 90 to 117 ng/L)

Oise river : Highest PFAS sum (117 ng/L). Industrial site involved in the fluorotelomer production. Fluorotelomer mass loadings discharged into the river ranged from 1.6 to 7 kg/day. 3 closest drinking water treatment plants were contaminated by PFAS, but concentration in treated water < 0.1µg/L [5-7].

Two firefighter training areas: this finding led to few investigations around sites where PFAS foams are or were used. Closure of a well supplying a medium-sized city in drinking water (total PFAS sum = 360 ng/L in the raw water – 170 ng/l in treated water) [8, 9].

We also tried to use data of another study to locate point sources:



Fish: freshwater fish (387 fish collected in 18 rivers / 23 different locations). Sampling of water and sediment from 2 sites where fish had high PFAS concentrations.

## SOME SUGGESTIONS AND PERSPECTIVES

PFAA determinations are useful but insufficient to identify some point sources and accurately assess the PFAS concentration in water and the subsequent exposure.

- ❑ Specific determination of former and new PFASs (6:2 FTSA, 6:2 FTAB, GenX, ADONA, SamPAP, ...):
  - Rhône river: Initial profile pattern PFHxA>PFNA>PFOA. Discharge in the river PFHxA (4300 kg), **6:2 FTSA** (1500 kg), PFNA (970 kg), **PFUnDA** (310 kg) and PFOA only 15 kg, in 2013.
  - Well contaminated by firefighting foams : PFCA sum = 350 ng/L, **6:2 FTSA = 830 ng/L** and **6:2 FTAB = 5 000 ng/L**.
- ❑ Surrogate parameters: AOF (Adsorbable Organic Fluorine), TOP (Total Oxidizable Precursor) assay (sensitivity, specificity):
  - River downstream from a training center for firefighters: TOP assay: only 35% could be attributed to targeted PFASs.
  - Raw effluent of a fluorochemical manufacturing facility: percentages attributed to targeted PFASs ranged from 11% to 106% (AOF determination and TOP assay).
- ❑ High resolution mass spectrometry (suspect screening/ non-target screening). [10]



- ❑ In the USA, hundreds of sites where firefighting foams were used (especially military bases) are under investigations. Surely a smart move to follow.
- ❑ Former facilities, which used or produced PFASs in the '60s, '70s and '80s, are now really hard to locate, but their environmental burden is still present.
- ❑ Some industrial activities using PFASs, less known and less investigated such as electronic industries and facilities involved in surface protection applications (carpet, paper, fabric, ...). The PFAS emissions are likely lower than those observed in the case of fluoropolymer plants, but they could have significant local burdens [11-13].
- ❑ Tons of solid waste disposed of on site or shipped away (sometimes abroad). Dumped at often unlined landfills.




# ENVIRONMENTAL Science & Technology

Feature

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## A Never-Ending Story of Per- and Polyfluoroalkyl Substances (PFASs)?

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*Many thanks for  
your attention*

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