Local PFAS pollutions in soil and groundwater: Feedbacks from Belgium (Wallonia)

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Data base Contaminants of Emerging Concern (CEC)

- Access Database: ± 500 CECs
- Trigger values, toxicological and physicochemical parameters, analytical methods
- Specific guidelines for PFAS

Base de données relative aux polluants non normés (BD PNN)

Une base de données est mise à disposition des experts agréés dans le cadre de la réalisation des études de sols en Région wallonne. Les données reprises dans cette base de données ont été élaborées conformément à l'Art 9 du décret sols, sur base des avis des organes désignés par le Gouvernement wallon, à savoir la SPAQuE et l'ISSeP.

Une mise à jour est prévue régulièrement. Il est donc important pour l'utilisateur de toujours consulter la dernière version à jour, disponible sur ce site Internet, et de référencer dans son étude la version de la base de données utilisée.

Nous attirons votre attention sur les recommandations de bonne utilisation reprises dans cette base de données.

Attention, depuis la version 4 de la BD PNN, il s'agit d'un document ACCESS. Si vous ne possédez pas de licence, la base de données est utilisable avec ACCESS RUNTIME.

Base de données PNN - V7 - avril 2024

Base de données PNN - V6 - octobre 2022

Base de données PNN – v5 – décembre 2020

Base de données PNN – v4 – janvier 2020

Base de données PNN – v3 – juin 2018

Base de données PNN – v2 – septembre 2017

Base de données PNN – v1 – mars 2017

Next expected update: end of 2025

PFAS guidelines for soil studies

- 1st version: October 2022
- 2nd version: December 2023
- 3rd version: March 2025

Next expected update: end 2025

Contents of the PFAS guidelines

1) Definitions
2) PFAS risk activities
3) Analytical methods
4) Trigger values in soil, groundwater and surface water
5) Investigation strategies and risk analysis
6) Toxicological and physicochemical properties : PFOA, PFOS, PFDA, PFNA and PFHxS

Trigger values

Groundwater

- Sum PFAS (20) : 0,1 µg/l
- Sum targeted PFAS : 0,5 µg/l (expect for TFA)
- Temporary value for TFA: 2,2 µg/l

New European Directive for surface waters and groundwater will be taken into account in 2026 !!!

Surface water

- Sum PFAS (24) : 0,1µg/l

Soil

- No value for PFAS sum
- Separate trigger values for 42 different PFAS
- Minimum value between VLH (health protection) and VLN (leaching risk)
- Work in progress…

Soil trigger values : examples

Unit : [µg/kg dry weight]

	VLH Unrestricted land use	VLH Type I (natural use)	VLH Type II (agricultural use)	VLH Type III (residential use)	VLH Type IV (commercial use)	VLH Type V (industrial use)	VLN	VL soil
PFNA	-	315.8	**0.1**	3.4	315.8	1818	**0.6**	0.6 0.5 (type II)
PFBA	4800	-	-	-	-	-	**99**	99
PFDoDA	**8.4**	-	-	-	-	-	1.0E+09	8.4

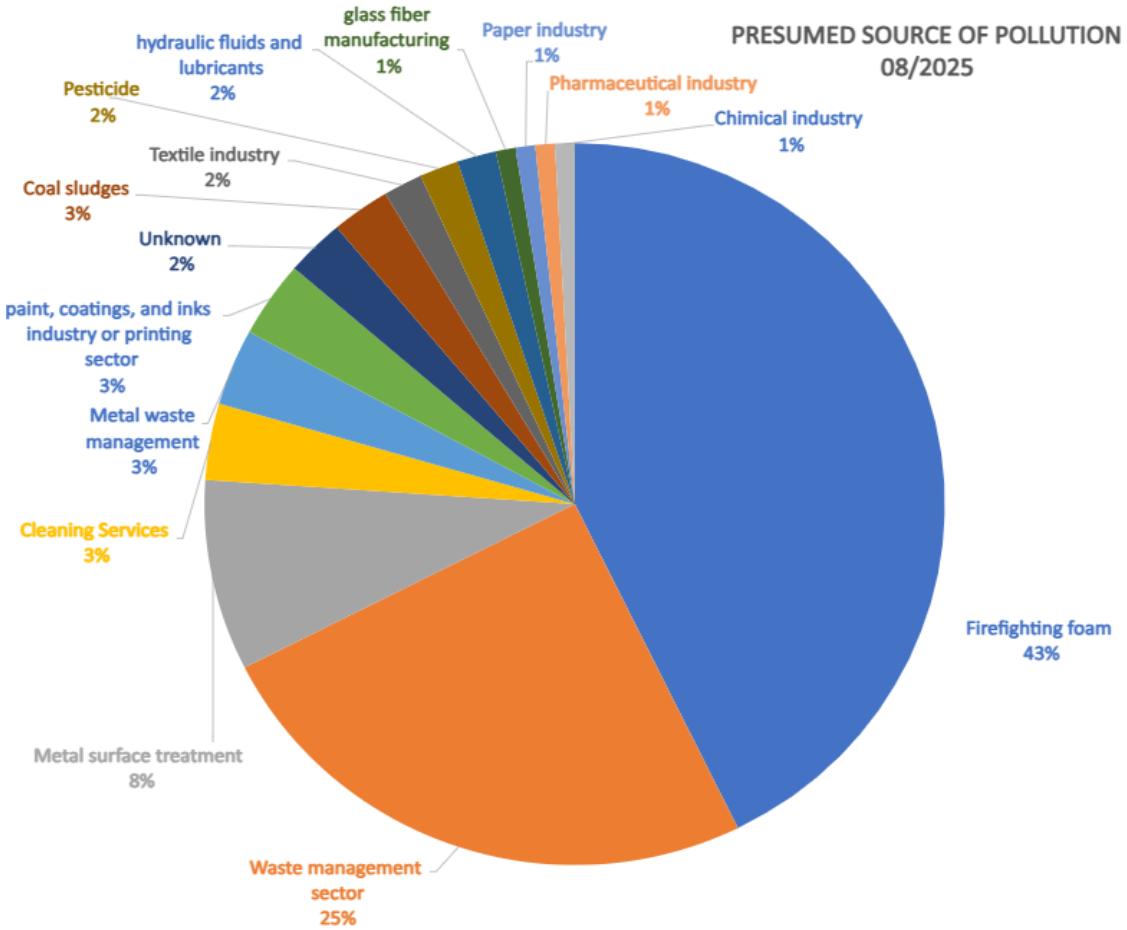
- Specific VLH for 5 different land use for 9 PFAS (calculated with S-Risk© model)
- Unrestricted land use for 15 PFAS (based on international legislations benchmarking)
- « VLsoil » set to the quantification limit (LoQ) when « Vlsoil ≤ LoQ » or when there are no data

PFAS risk activities

117 studies

2 main sources (68%)

- Firefighting foam : fires and exercises
- Waste management



Some highlights and feedbacks

1) Unforeseen activities

1.1) Glass production

High PFAS pollution linked to the use of a specific coating for fiber sizing. This coating contains 6:2 FTOH.

→ PFBA, PFPeA and PFHxA in soil, groundwater, industrial water discharge and waste discharge, but no 6:2 FTOH

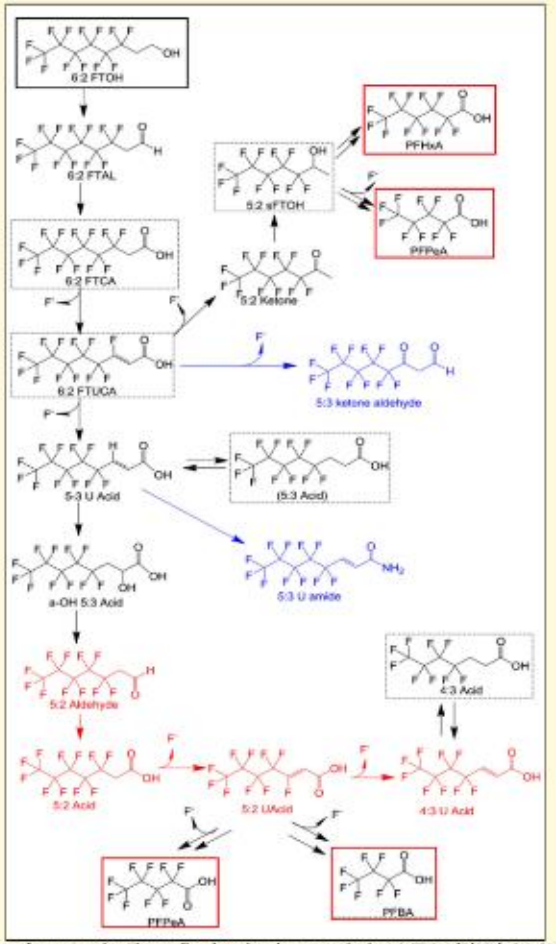


Fig. 4a : Biotransformation des Fluorotélomère alcools ; exemple du 6:2-FTOH ($F(CF_2)_6CH_2CH_2OH$) via des produits intermédiaires vers des PFAS per-fluorés stables, comme par exemple le PFPA (Acide perfluoro-pentanonic) et le PFHxA (Acide perfluoro-hexanonic) . Les voies de biotransformation en flèches rouges et bleues ont été déjà identifiées auparavant. Les molécules entourées en rouge sont des PFAS pérfluorés stables sous forme des acides carboxyliques (J. Liu et al. 2010 & 2013 & S. M. Avendao, 2013 Karg et al. 2021, 2022 & 2023, Trang et al. 2022.

1.2) Textiles sector / use of commercial mixtures

→ Well-known risk for textile production

→ But there is also risk associated to textile maintenance and cleaning

High PFAS concentration in water discharges of 2 laundries (cleaning and re-waterproofing of technical textiles)

→ Highlights the risk associated with the use of commercial mixtures without mention of PFAS

1.3) Backfilling materials

High pollution in groundwater linked to deposits of shlamms (coal slurry)
→ PFAS shlamms pollution is probably linked to the use of flotation agents during the coal washing process

Probably 30 sites in Wallonia, or more, where shlamms were backfilled

Other potentially polluted backfilling materials:
- fly ashes from waste incinerators
- Dredging sludges
- Imported contaminated soil

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2) Soil and groundwater investigations

PFAS investigation is really different from classical pollutants investigations

→ New methodology must be developed based on feedbacks from the field

→ Training of soil experts is essential

Methodology for metals, hydrocarbons, PAHs, …

→ Investigation of the 5 first meters of depth → if no pollution is detected and if the water table is not reached, the investigations are authorized to stop

→ Pollution characterization by triangulation

But for PFAS… → Feedbacks from the field and especially from pollutions with firefighting foams

→ High pollution of groundwater and/or in surface water downstream of the site, even if only traces are found in the soils

→ It appears that only a fraction of PFAS infiltration into the soil is bound to soil particles

→ Finding pollution in soils is sometimes a « treasure hunt », superficial groundwater is a much better indicator

→ Water discharge and surface water are easy to sample and are also good indicators

Preliminary field analysis

- PFAS risk activities ?
- Use of foams (exercises, fire protection devices) ?
- Fire ?

First investigations

- Targeted investigations in superficial groundwater (or in soils if there is no superficial groundwater)
- Downstream water catchments (if any)
- River, water discharge (if any)
- Downstream deep drilling (if exploitable groundwater)

Pollution characterization and risk analysis

- Pollution characterization, with particular attention to potential receptors (residential, agricultural and natural areas in soils ; plume pollution in waters)
- Additional investigations for risk analysis: leaching tests, vegetable and egg (if any), …
- Non targeted analyses (biotransformation risks are not detected by quantitative analyses)

Thank you for your attention !

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