

Mapping and investigation of PFAS suspected sites in Flanders

Outline of the presentation



Introduction

1. Temporary legal framework for PFAS
2. Inventory of PFAS suspected sites
3. Investigation of PFAS suspected sites
4. Outlook towards the future



Introduction

Legislation on soil contamination

Aims:

Remediate historical soil contamination

before 1995

remediate over a period of 40 years, starting in 1996

remediate in case of risk

Prevent and clean up new soil contamination

after 1995

immediate remediation when concentrations are higher than soil remediation values

+ Rules on the re-use of soil and sediments



Legislation on soil contamination



Preliminary soil investigation



obligation on land with **risk activities**, periodically & upon transfer of land

a list of activities is provided

limited investigation of past history & limited sampling

Inventory of all 'risk locations':
each **municipality** has an
inventory

Descriptive soil investigation

further characterization & delineation

risk assessment (human health, ecotox, spreading)

→ Is there a need for remediation?

Soil remediation project + Remediation works



⇒ By operator or owner, according to the '*polluter pays*'-principle

⇒ Soil experts - guidelines

PFAS measuring campaign 2016-2018



Exploratory measuring campaign on PFAS



Inventory of risk activities

→ 24 sites were selected; soil and groundwater were analyzed for 21 PFASs

[www:](#) 'PFAS in soil and groundwater around risk activities in Flanders'

Conclusions:

- Especially on **fire fighting training grounds** soil & groundwater are contaminated with PFAS
- PFAS must be included as a suspect substance in soil investigations

These actions were started:

- ✓ **preventive actions** in collaboration with fire brigade organizations
- ✓ development of **limit values** for PFAS in soil & groundwater
- ✓ identification and **inventory of PFAS contaminated sites**
- ✓ development of **guidelines** for soil investigation

Accelerated by the crisis !



1. Temporary legal framework for PFAS

Soil remediation values PFOS & PFOA – soil



Applicable since April 19, 2022

Soil remediation criteria Land use type	I/II nature / agriculture	III residence	IV recreation	V industry
PFOS (µg/kg dm)	3,8*	3,8** / 18	110	110
PFOA (µg/kg dm)	4,3	4,3* / 89	643	643

* adjusted for background value & target value

** for residential area with vegetable garden / free range chicken coop

► Implementation in legal documents

Approved by Flemish government, but has not yet come into force

Soil remediation criteria Land use type	I/II nature / agriculture	III residence	IV recreation	V industry
PFOS (µg/kg dm)	3,8*	4,9	110	268
PFOA (µg/kg dm)	2,5*	7,9	632	303

* adjusted for background value & target value

Soil remediation criterium - groundwater



Soil remediation criterium for groundwater is set at the European limit for drinking water:

0,1 $\mu\text{g}/\text{l}$ for the sum of **20 PFAS** (Drinking Water Directive)

&

0,5 $\mu\text{g}/\text{l}$ for the sum of all quantitative measurable **PFAS**

Applicable since April 19, 2022

Same values in temporary legal framework

Approved by the Flemish government, but has not yet come into force

Background values – Target values



Soil

	Background values ($\mu\text{g}/\text{kg dm}$)	Target value ($\mu\text{g}/\text{kg dm}$)
PFOS	1,5	3
PFOA	1,0	3/2
Sum PFAS (quantitative measurable)		8

Groundwater

no values in legal framework,

but proposed values for 'anthropogenic' background based on observations in nature & rural areas, away from PFAS suspected sites



	proposed values (P90) (ng/l)
PFBA	21,0
PFBS	9,4
PFOA	8,0
PFOS	5,0



2. Inventory of PFAS suspected sites

Two calls for inventory to local authorities



First call (July, 2021): Use of fire extinguishing foam

- Fire fighting training site
- Fire fighting facilities (industry)
- Fire extinguishing calamities
- Military training areas and airports
- Civil airports

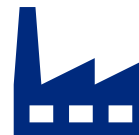


→ **826** locations (fire fighting training sites & calamities)

Second call: PFAS processing or producing industry



Risk activities as determined in the study of 2018:
textile industry, paper industry, galvanic industry, ...



→ more than **4000** locations

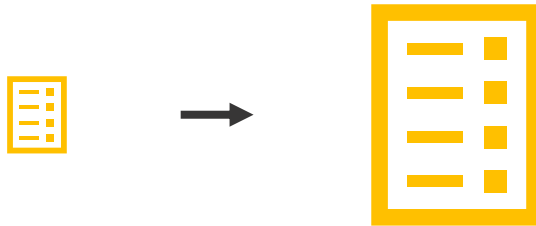
Screening and prioritisation in ongoing

PFAS risk activities



Update of list of risk activities is ongoing

→ **52** (2018) to **>300** categories:





3. Investigation of PFAS suspected sites

Investigation of fire fighting related sites



In July 2021 OVAM appointed soil experts (+/- 40 sites/month)

‘Preliminary’ soil investigations (according to **a specific protocol**):

Focused on PFAS

Limited sampling in source area

Sampling near the edge of the site (to estimate risks surroundings)

Decision whether further soil investigations are needed

Determine priority class (1-5)

→ ‘No regret measures’ by the Health Department

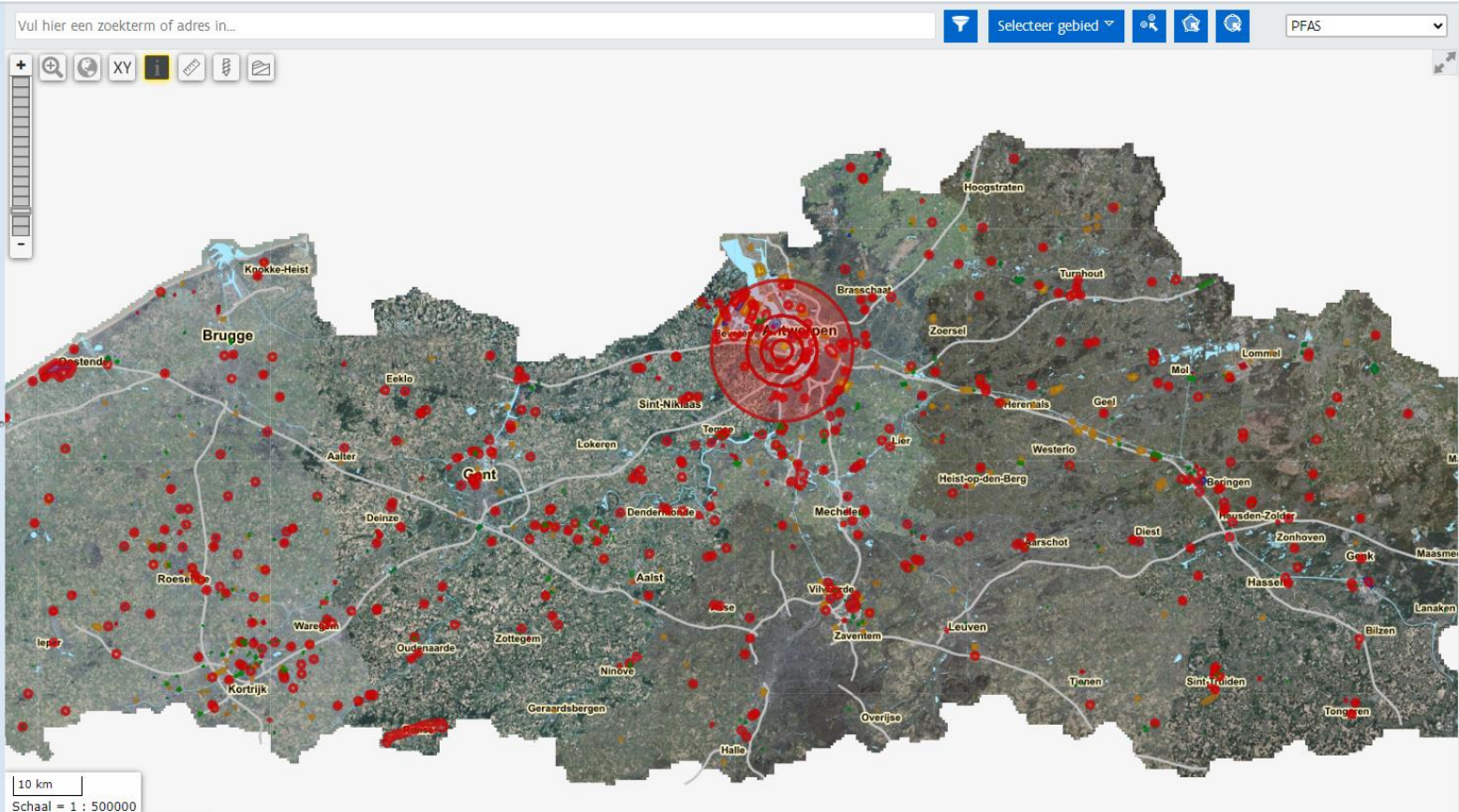
90% of the sites are investigated – further investigation needed for **373** sites



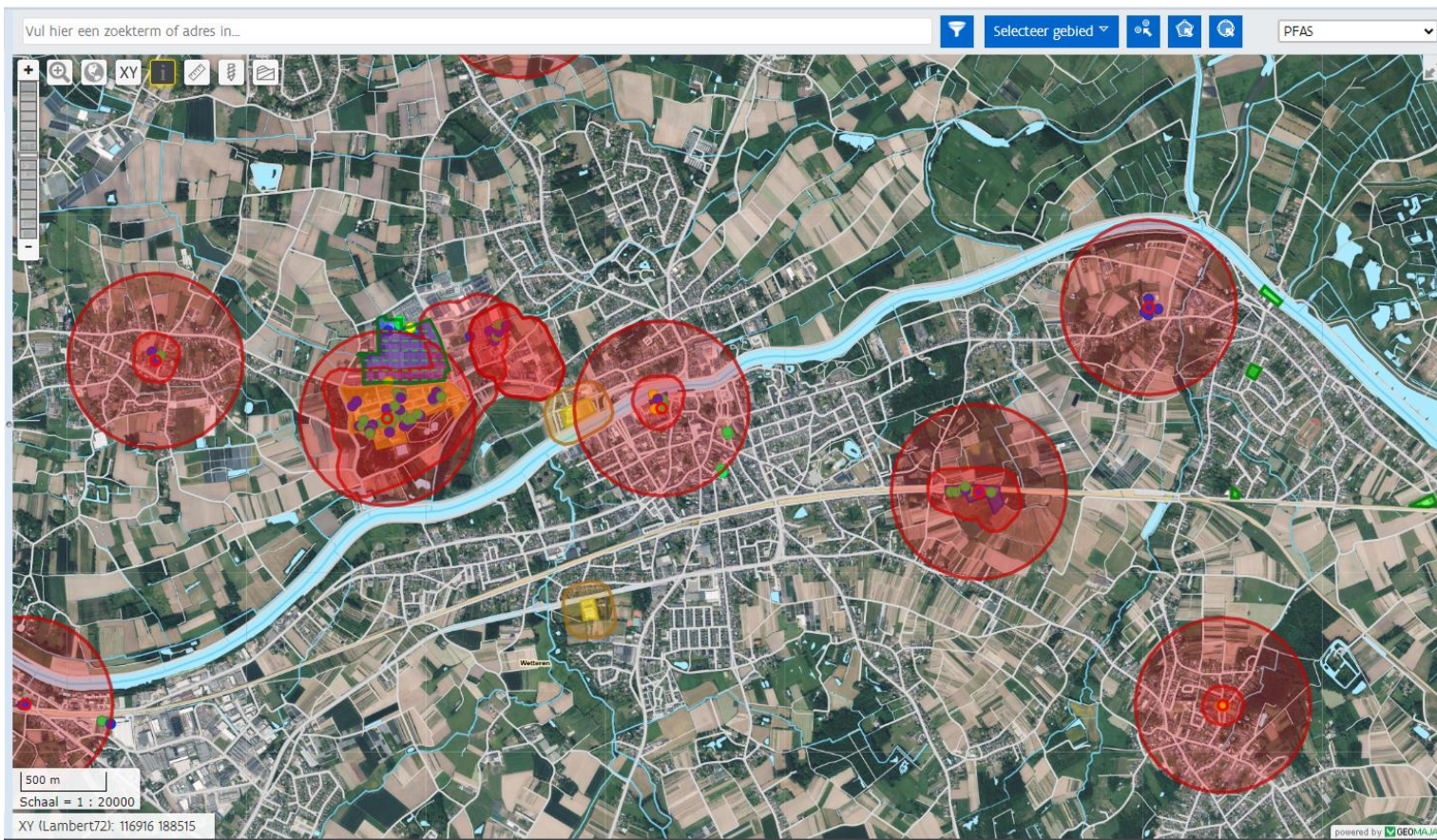
Official request from OVAM to operator/owner (~ ‘polluter pays’-principle)

→ **descriptive soil investigation**

All data publicly available in database DOV



All data publicly available in database DOV



Fire fighting related sites – trends & insights



Frequently found PFAS

in more than 25% of the cases:

max conc > target value

(soil: 3µg/kg dm – groundwater: 100 ng/l)

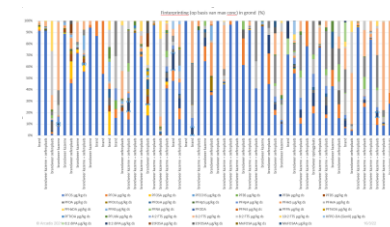
Soil and groundwater	Ground-water	Soil
PFOS	PFBA	8:2 FTS
PFHxS	PFHxA	10:2 FTS
6:2 FTS	PFHpA	
PFPA	PFOA	
	PFPeS	
	PFBS	

High variability in PFAS compounds (fingerprinting)

Old extinguishing foam: PFOS important

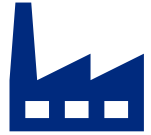
New extinguishing foam: 10:2 FTS, 8:2 FTS and 6:2 FTS

Before / after 2011? – difficult to distinguish



Different composition in soil vs groundwater (complex leaching behaviour)

Investigation of sites with PFAS processing or producing industry



Large sites:

- PFAS producing site in **Zwijndrecht** (3M)
- former paper mill in **Willebroek** (→ see next presentation)

PFAS integrated in existing obligations for soil investigation

more than **4000** locations - preliminary investigations on **745** locaties

Questions: E.g. Many sites have been investigated & remediated before.
How and when to initiate investigation for PFAS?
Who is responsible?

Prioritization !



4. Outlook towards the future

Future perspectives



- **Development of (co-)financing systems**
- **Environmental cost-benefit analysis** - to set priorities
- **Supporting R&D on technical issues:**
 - Remediation technologies (Cfr. KIS)
 - Analytics: Ultra short chain PFAS, precursors, non target analyses, ...
 - ...



Thank you!

Contact: griet.van.gestel@ovam.be