



Rijksinstituut voor Volksgezondheid  
en Milieu  
*Ministerie van Volksgezondheid,  
Welzijn en Sport*

# PFAS background levels and risk assessment in soil and sediments

ENSOR May 2020



# Introduction – PFAS in soil and groundwater in The Netherlands

Until recently main attention focused on larger 'point sources'

Activity	Example/type
Practicing and incidents involving AFFF	Schiphol (2008)
PFAS producing industry	Chemours Dordrecht
Landfills	PFAS in waste material
Industrial applications/processing	E.g. drying of products. metal plating
Other industrial sites	Smaller locations

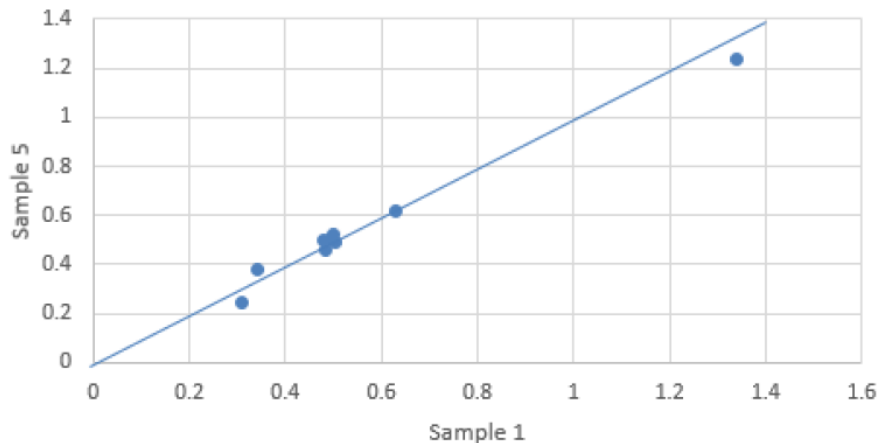




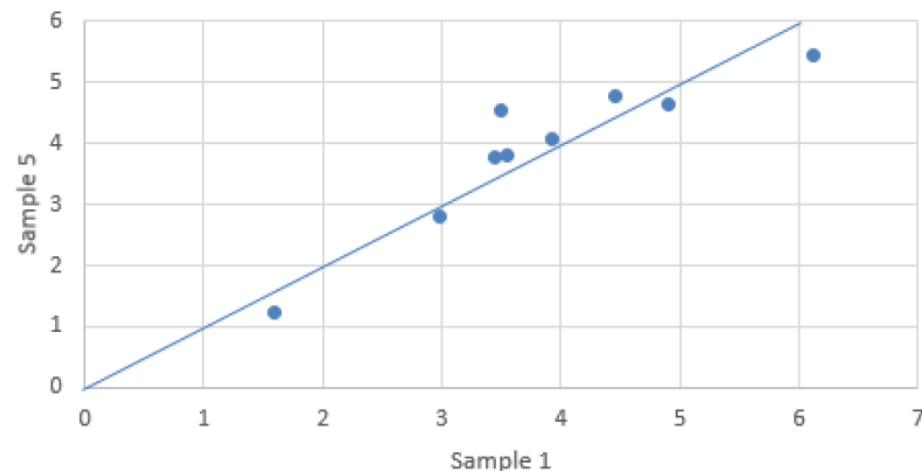
## Round robin test PFAS in soil

- 9 laboratories: 6 NL, 2 BE, 1 SE
- 9 (sediment) samples, 1 blind duplicate, all samples analyzed in duplicate
- Intra laboratory reproducibility is good
- Inter laboratory reproducibility is comparable to e.g. PCB's – room for improvement with individual participants
- Performance alkylacids > sulphonic acids

sum PFOA (0.7 factor)

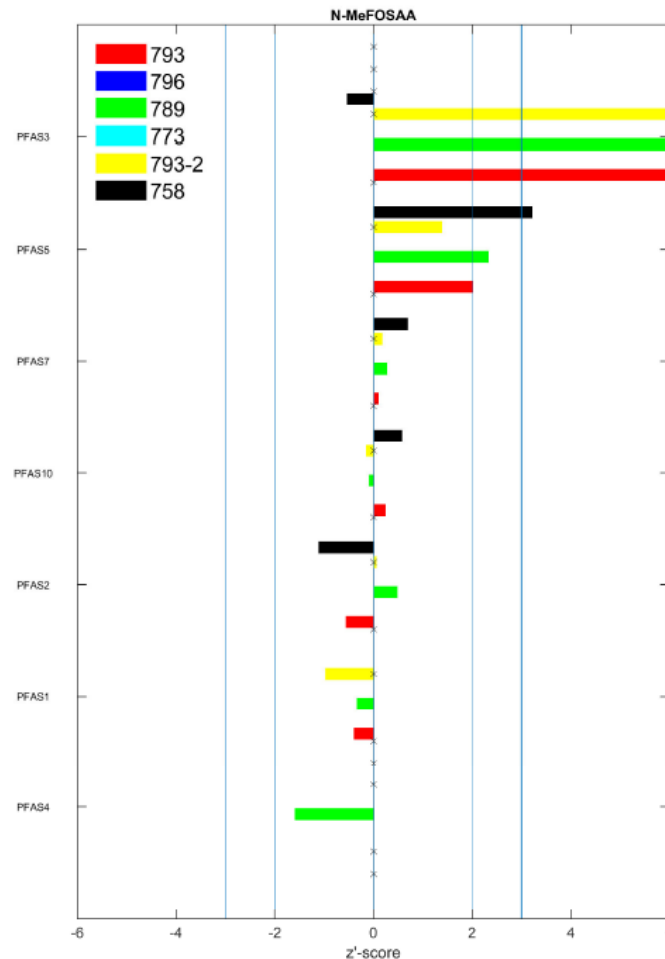
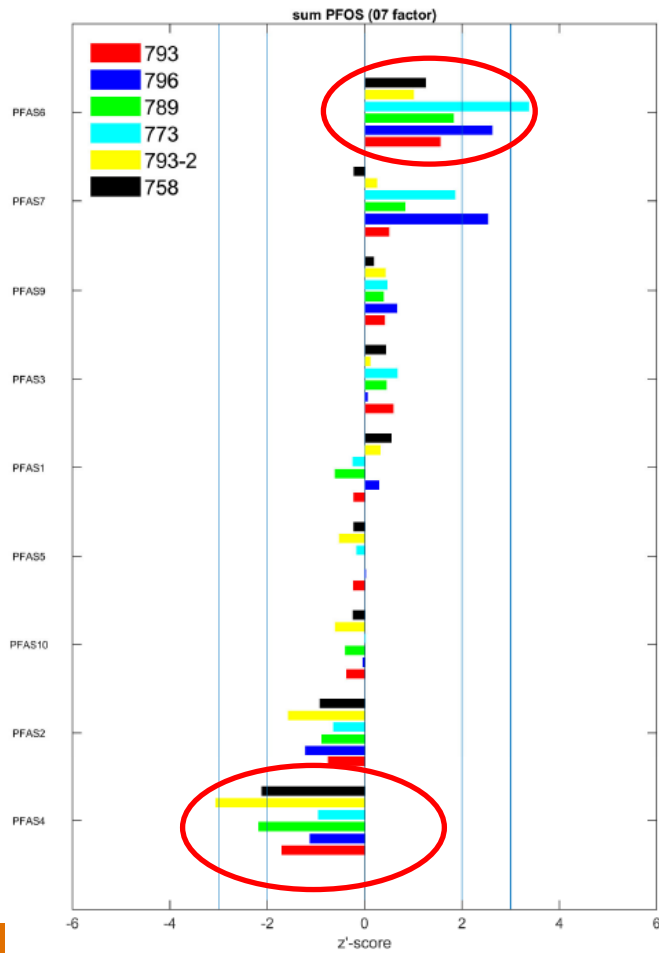


PFOS (linear)





# Round robin test





## Round robin conclusions

- Analytical performance overall at acceptable level
- Comparable or better to e.g. PCB's
- Methodological improvement or even repairs in individual instances necessary
- Reproducibility even at low concentrations ( $\sim 0,1$  ug/kg) = good
- Accreditation of soil sampling and analysis is underway
- No accreditation for round robin testing in soil yet (?)



# Limit values for re-use of soils and sediments in The Netherlands

Re-usable

Residential

Industrial/commercial

Not re-usable

BACKGROUND VALUES

UPPER LIMIT  
RESIDENTIAL CLASS

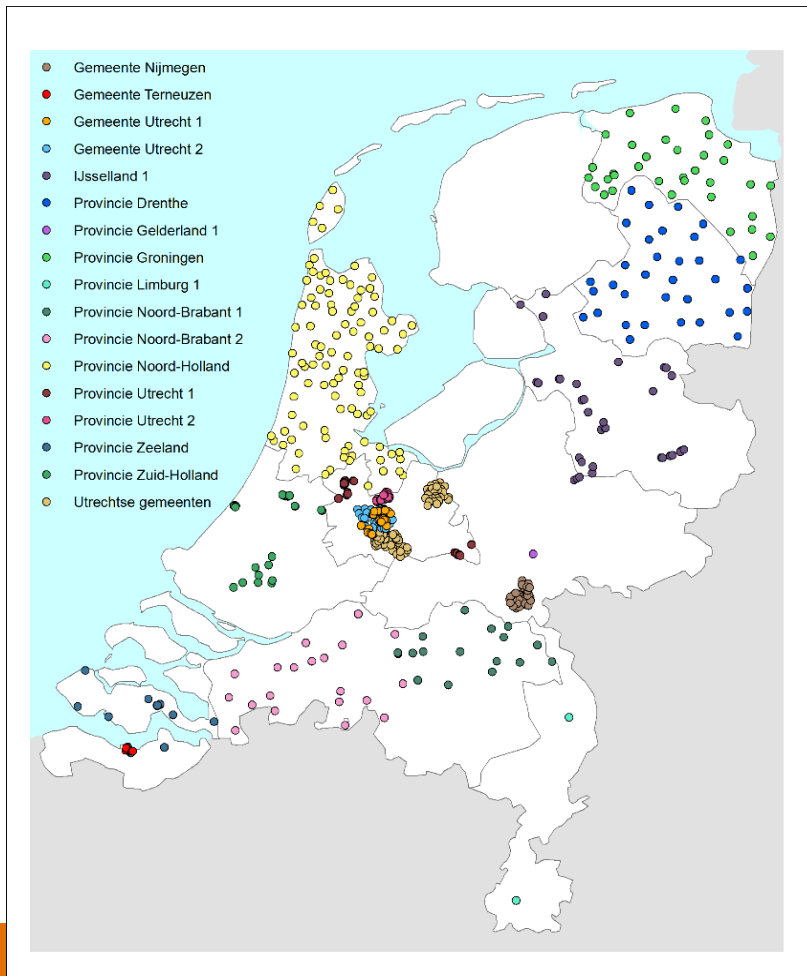
UPPER LIMIT  
INDUSTIAL CLASS

- First preliminary national framework: July 2019
- No background values available yet: LOQ serves as replacement
- Consequently large impact on market for re-usable soil and sediment





# Ubiquitous concentrations of PFAS in soil: establishing preliminary background levels

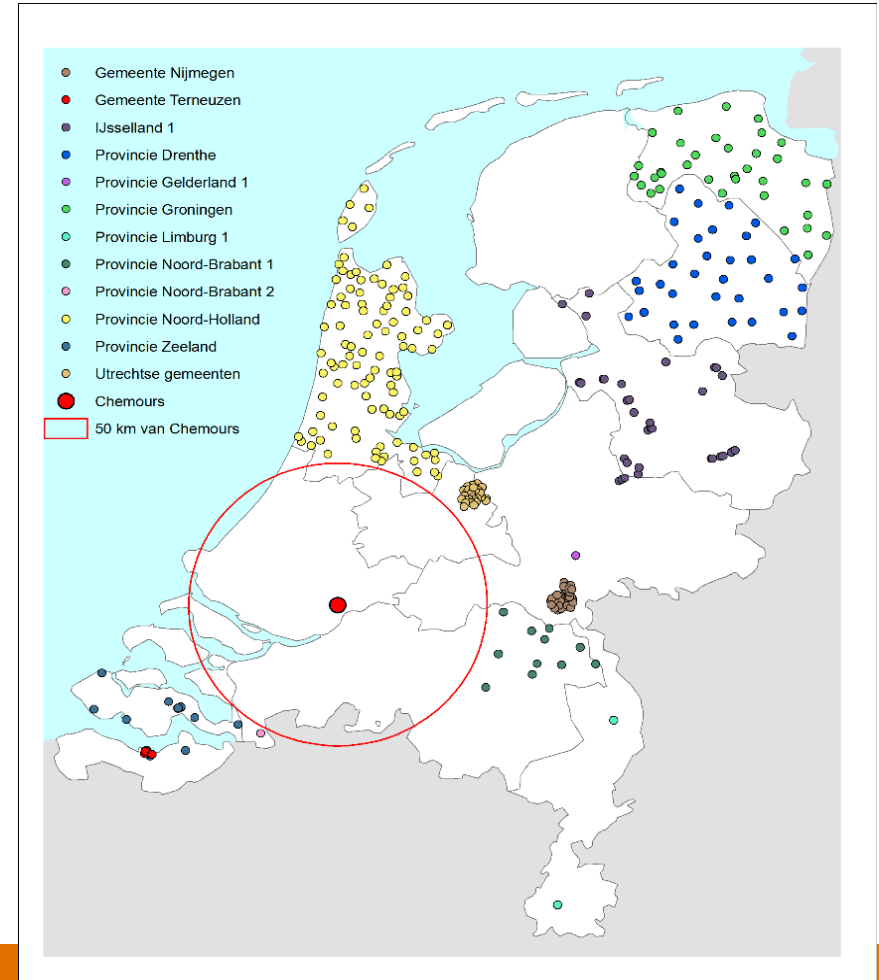
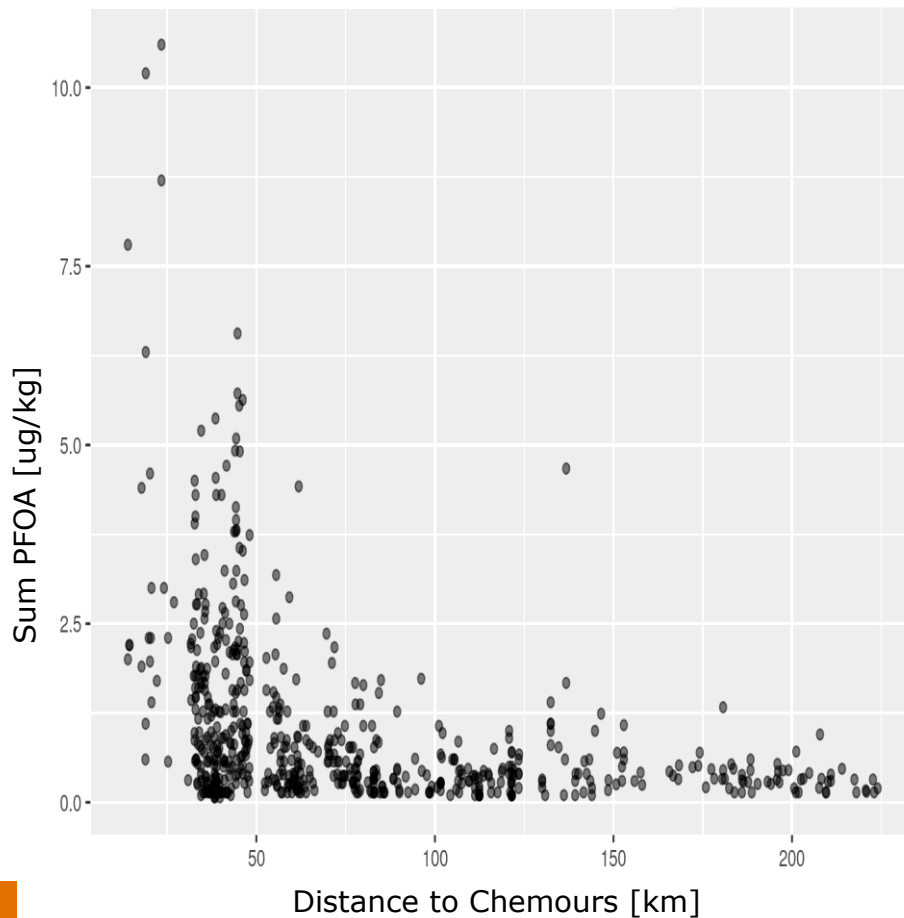


- In October 2019 data was collected from available soil investigations
- November 2019: processing data:
  - Point sources
  - Land use
  - Soil parameters (OC, clay)
- 1 December: preliminary values operationalized in soil policy by Ministry



# Results background values: PFOA

SUM PFOA







## Results background values

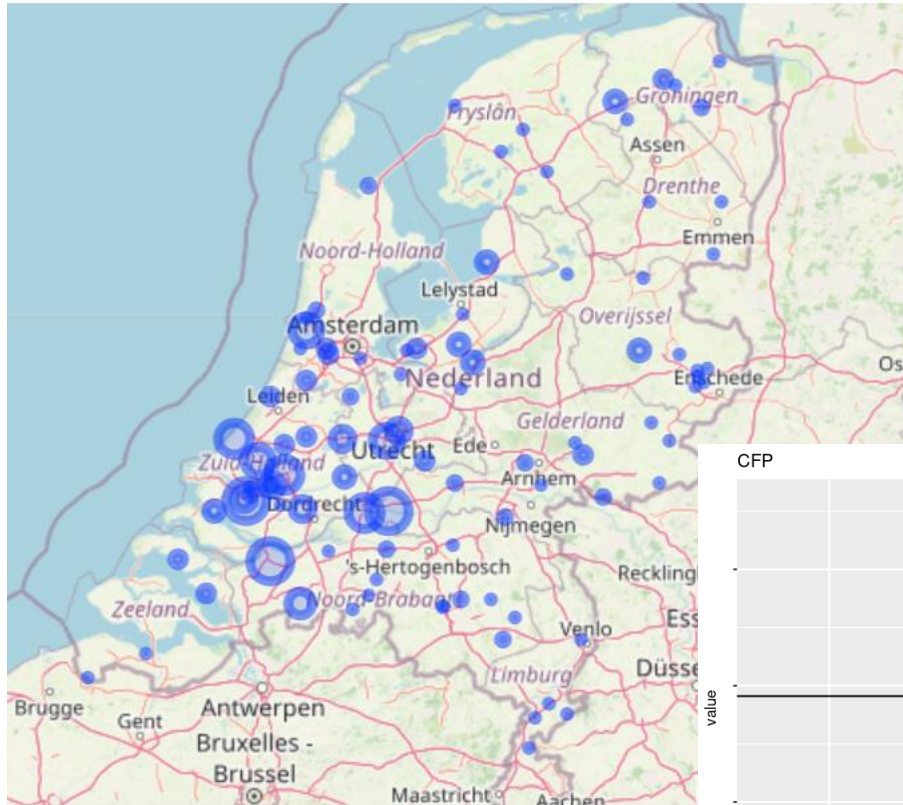
- Based on P80 of concentration distributions of PFOS and PFOA

Subst.	Prelim. bv in ( $\mu\text{g}/\text{kg ds}$ )	Prelim. bv ( $\mu\text{g}/\text{kg ds}$ ) rounded to 1 decimal
<b>PFOS</b>	0.94	<b>0.9</b>
<b>PFOA</b>	0.77	<b>0.8</b>

- Definitive values will be available in July 2020
- Of ~30 PFAS only PFOS and PFOA were structurally elevated in top soil
- Stricter criteria apply for groundwater protection areas



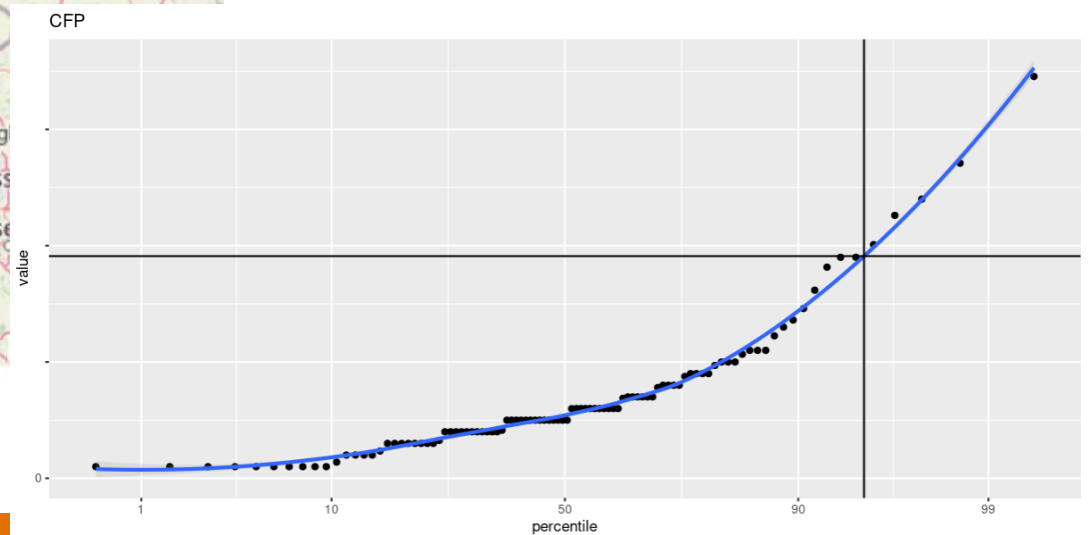
# Definitive background levels



Definitive background levels based on P95 top soil ready July 2020

<-PFOA

TOP ASSAY + GenX





# Environmental risk limits for soil and groundwater

- Currently based on endpoints:
  - Human health
  - Direct ecotoxicity
  - Indirect ecotoxicity
- Risk limits to be (further) developed
  - Agriculture/food (in prep)
  - Leaching to groundwater and surface water (in prep)
  - Waste streams and building materials (in prep)



# Ecological risk limits

## Direct toxicity

<b>Compound</b>	<b>Risk level</b>	<b>Risk Limit (ug/kg)</b>
<b>PFOS</b>	HC5	16
	Intermediate/HC20	380
	HC50	9100
<b>PFOA</b>	HC5	500
	Intermediate/HC20	5000
	HC50	50000

## Indirect toxicity

<b>Compound</b>	<b>Risk level</b>	<b>Risk Limit (ug/kg)</b>
<b>PFOS</b>	HC5	3
	Intermediate/HC20	18
	HC50	110
<b>PFOA</b>	HC5	7
	Intermediate/HC20	89
	HC50	1137
<b>GenX</b>	HC5	3
	Intermediate/HC20	54
	HC50	964



## What do we still want to know?

- Sources and distribution of PFAS in the environment:
  - PFAS in products
  - PFAS in water and waste streams and emissions
  - Background values in groundwater (2021)
  - PFAS in river sediments
- Environmental behavior:
  - Leaching tests from soil and sediment (2020)
  - Risk limits in soil protecting groundwater (for re-use; 2020)
- Substance risks and risk limits:
  - EFSA evaluation 2020
  - Other PFAS/combination toxicity
  - Risk limits for waste streams
- International network: align with international developments

