

How to take samples for PFAS analysis

PFAS nätverksmöte

2021-11-17



The importance of correct sampling

Introduction to sampling strategy

- **A study can never be better than the samples taken!**
- Before deciding on the samples, be clear on what **the question** is
- To evaluate the results from sampling and analysis the **hydrogeological context** of the samples is of great importance
- The relatively higher **water solubility** of PFAS, as compared to other organic contaminants renders a larger focus on water sampling
- The water solubility gives PFAS possibilities to **faster and longer transport**

Introduction to sampling strategy

- Geographical scale
- Conceptual model – placement of sampling points
- Choice of matrixes for sampling
 - Groundwater
 - Surface water
 - Storm water
 - Soil
 - Sediment

Geographical scale of the investigated area

Challenges

- One of the major differences in investigations of PFAS is the large scale investigation area
- The PFAS plume can extend several kilometers
- How do know where to place your ground water wells?



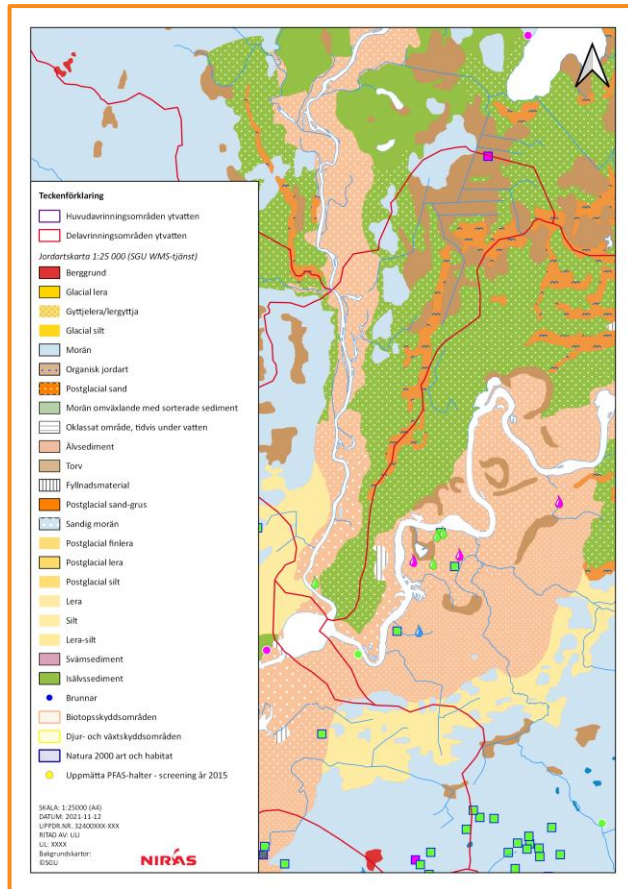
Create a conceptual model

- Difficult terrain
- Remote areas
- Long distances



Conceptual model

Simple model (open source data)



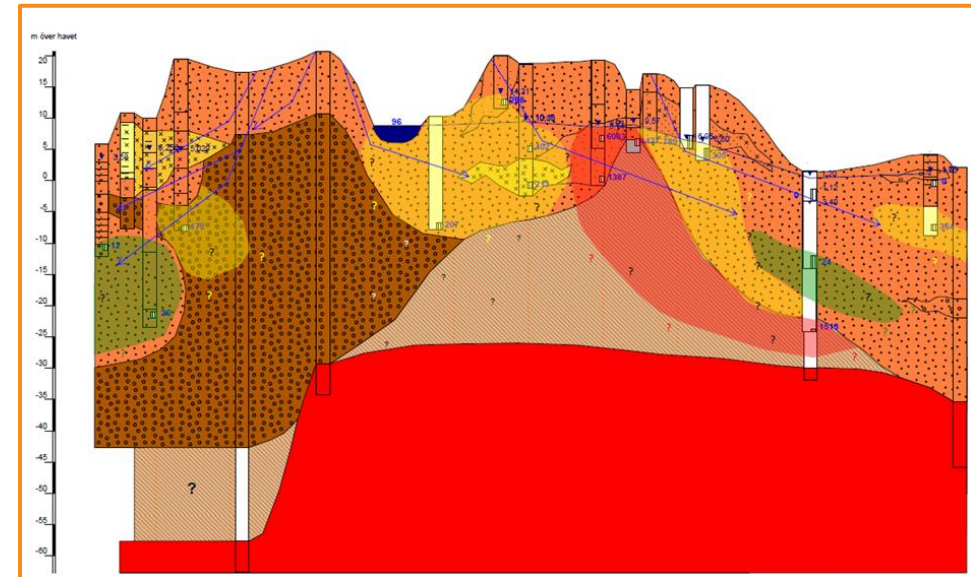
For example:

- SGU
- SMHI
- Naturvårdsverket

Simple model that helps us answer:

- Most important pathway for contaminant transport?
- Likely to transport far?

Advanced model



Advanced model that helps us answer:

- Where in the soil profile should we collect our samples?
- What does our sample represent? High/low concentration?
- Where is the contaminant being transported to?

Choice of matrixes for sampling

- Larger focus on water with PFAS than with other organic contaminants
- Common sampling media include:
 - Soil (hot spot)
 - Groundwater (hotspot and plume, human exposure)
 - Storm water (transport media)
 - Surface water (lakes, streams and trenches; recipients and transport media)
 - Sediment (recipient and secondary source)
 - Biota (recipient and human exposure)



Choice of matrixes for sampling

Soil

- Can be difficult to find if you don't know where to look
 - Can be very local
 - May be overgrown
 - **Cannot visually see or smell the contaminant – no possibility to sample dynamically.**
- Different soils interact with PFAS in different ways
 - Surface charge
 - Organic carbon content
 - Exchange capacity
 - Mineralogy
- Secondary sources – wetlands with high organic content and peat

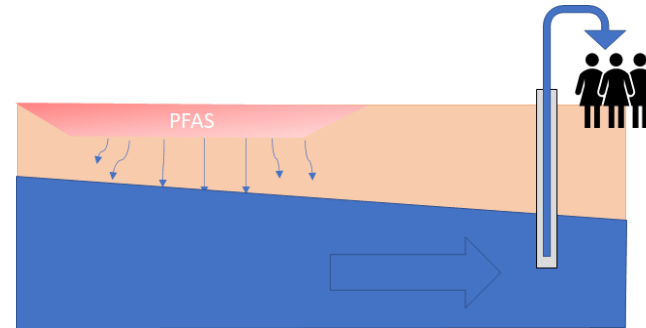


Choice of matrixes for sampling

Groundwater

Groundwater: Transport media, exposure pathway but also something we want to protect?

- At suspected hotspot: good way of determining whether we have a PFAS contamination or not
- At hotspot: can be easy to sample at the top of the aquifer to confirm or write off a PFAS contamination
- BUT PFAS contamination can extend to large depths -> to fully understand the plume, wells at different depths might be needed
- A challenge to install and sample deep groundwater wells



Choice of matrixes for sampling

Surface water


Surface waters are important both as recipients of PFAS contaminants but also as transport media.

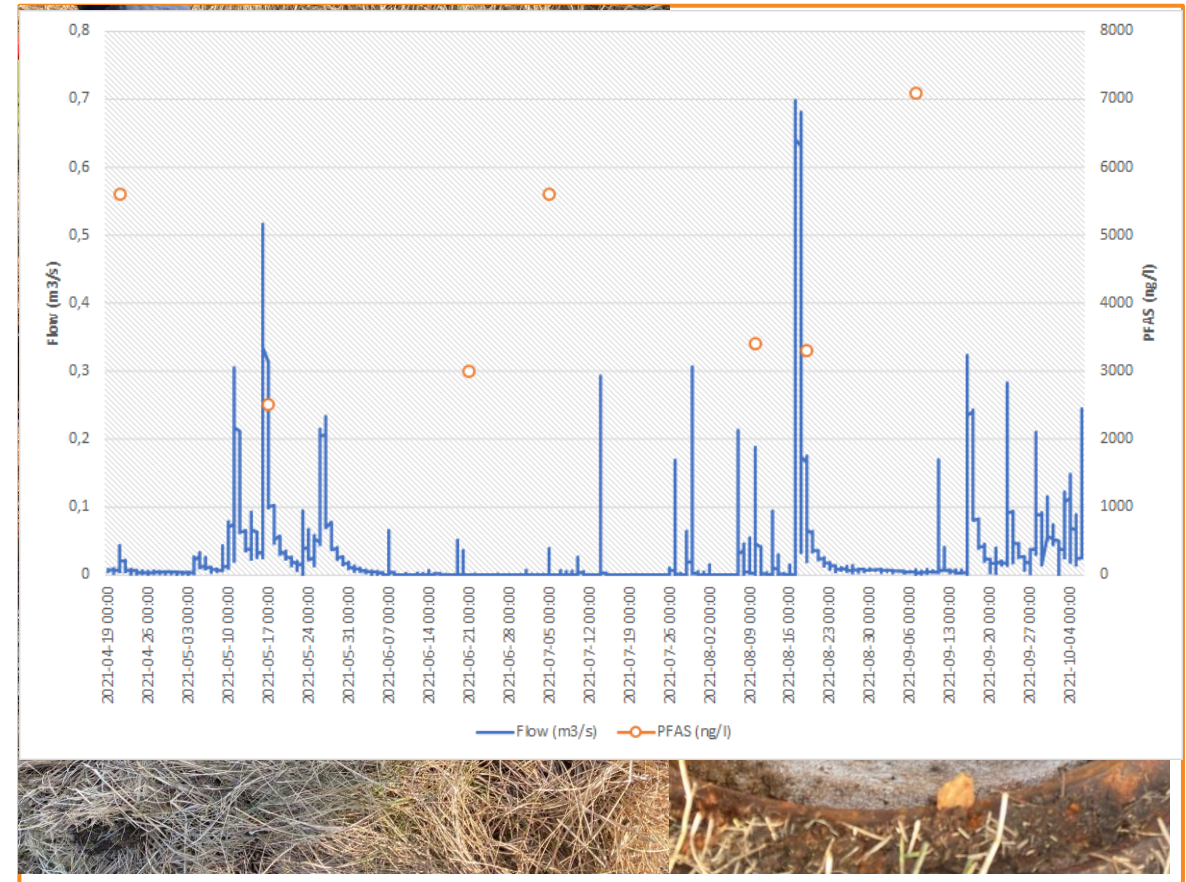
- Lakes - challenge to find a representative point
- Streams and trenches- challenge of changes in water flows (seasonal and weather driven)
- Important to place the sampling point so that you understand what the sample represent



Choice of matrixes for sampling

Storm water

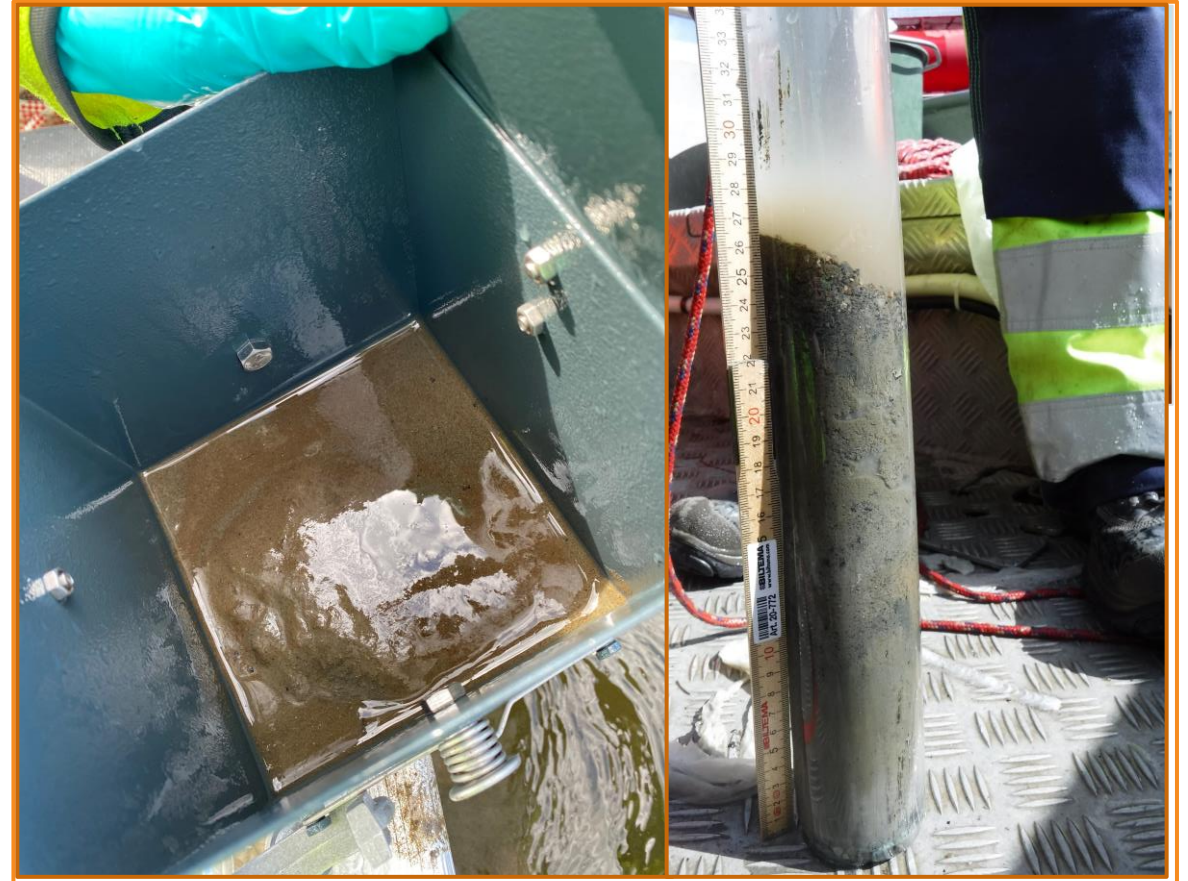
- Can be an important and fast route to the environment
- Contamination can originate from surface runoff, ground water leaking in from contaminated sites, or the material itself
- Permeable materials around the water pipes gives groundwater a fast route
- Knowledge on storm water systems is essential for the understanding of catchment areas
- Understanding of catchment areas is essential for understanding what a sample in a stream or trench represent
- Challenges  changes in water flows (seasonal and weather driven)



Choice of matrixes for sampling

Sediment

- Most important is to find an accumulation area, an area with net sedimentation
- Sediment is not just sediment:
 - Surface sediment
 - sediment cores
 - sediment traps
 - pore water
- Interesting example i Tyrifjorden in Norway, by NGI



Choice of matrixes for sampling

Biota

- Stationary species, and/or common edible fish
- Connection to EQS
- Connection to human health
- Compare to national monitoring programme (perch, NRM)
- Ethical approval needed for fishing, and sometimes also approval from the County Administrative Board (Länsstyrelsen)
- Other biota may also be of interest



Further reading...

Kemikalieinspektionen

<https://www.kemi.se/download/18.3f6f225517c0af779871bc0/1632907246253/PM-1-21-Kunskapssammanst%C3%A4llning-om-PFAS.pdf>



SGU, Naturvårdsverket

<http://www.diva-portal.org/smash/get/diva2:1604725/FULLTEXT01.pdf>



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