AquaConSoil – Prague Sep 2023

Immobilisation of PFAS – What happens under Stress?

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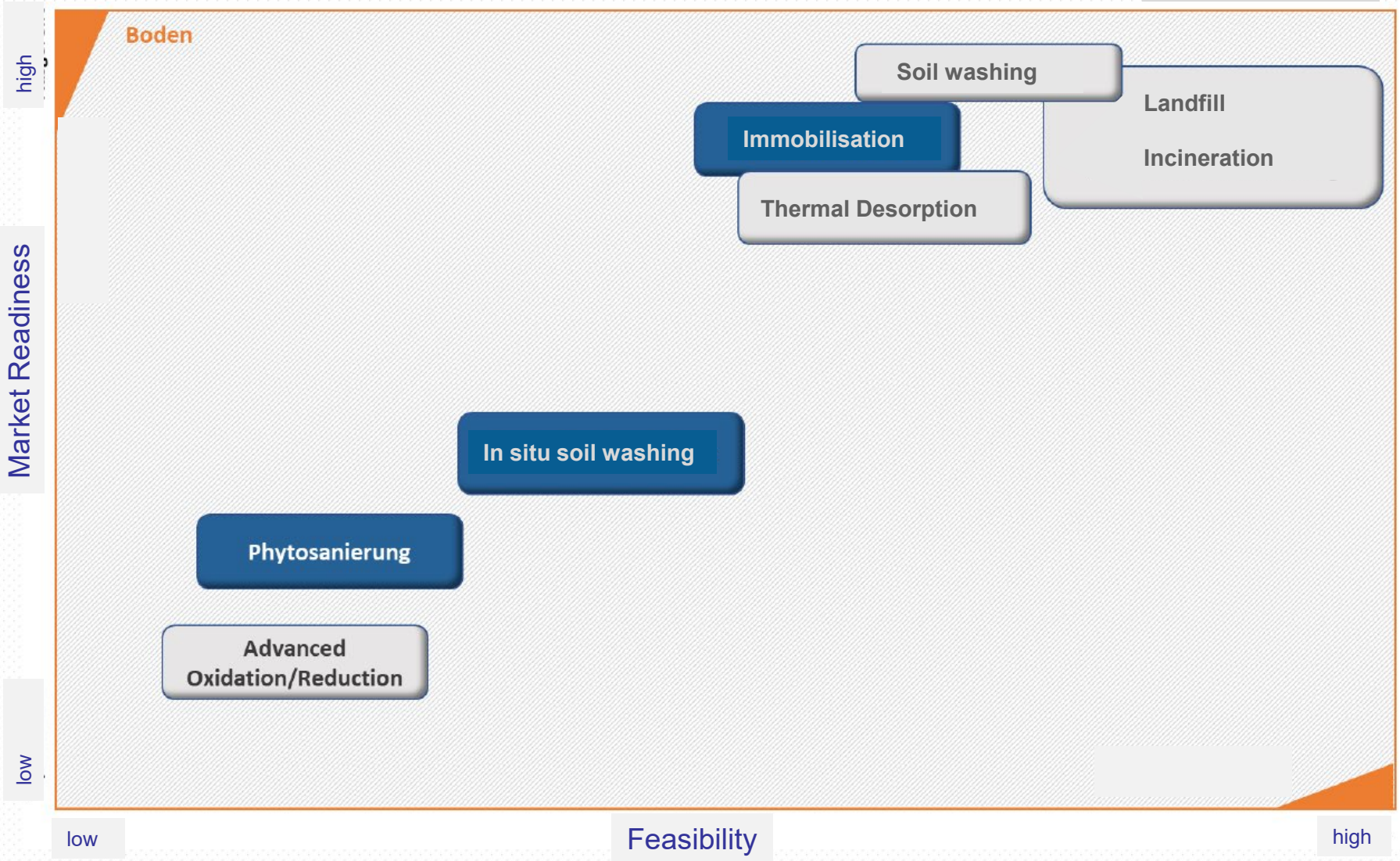
Content

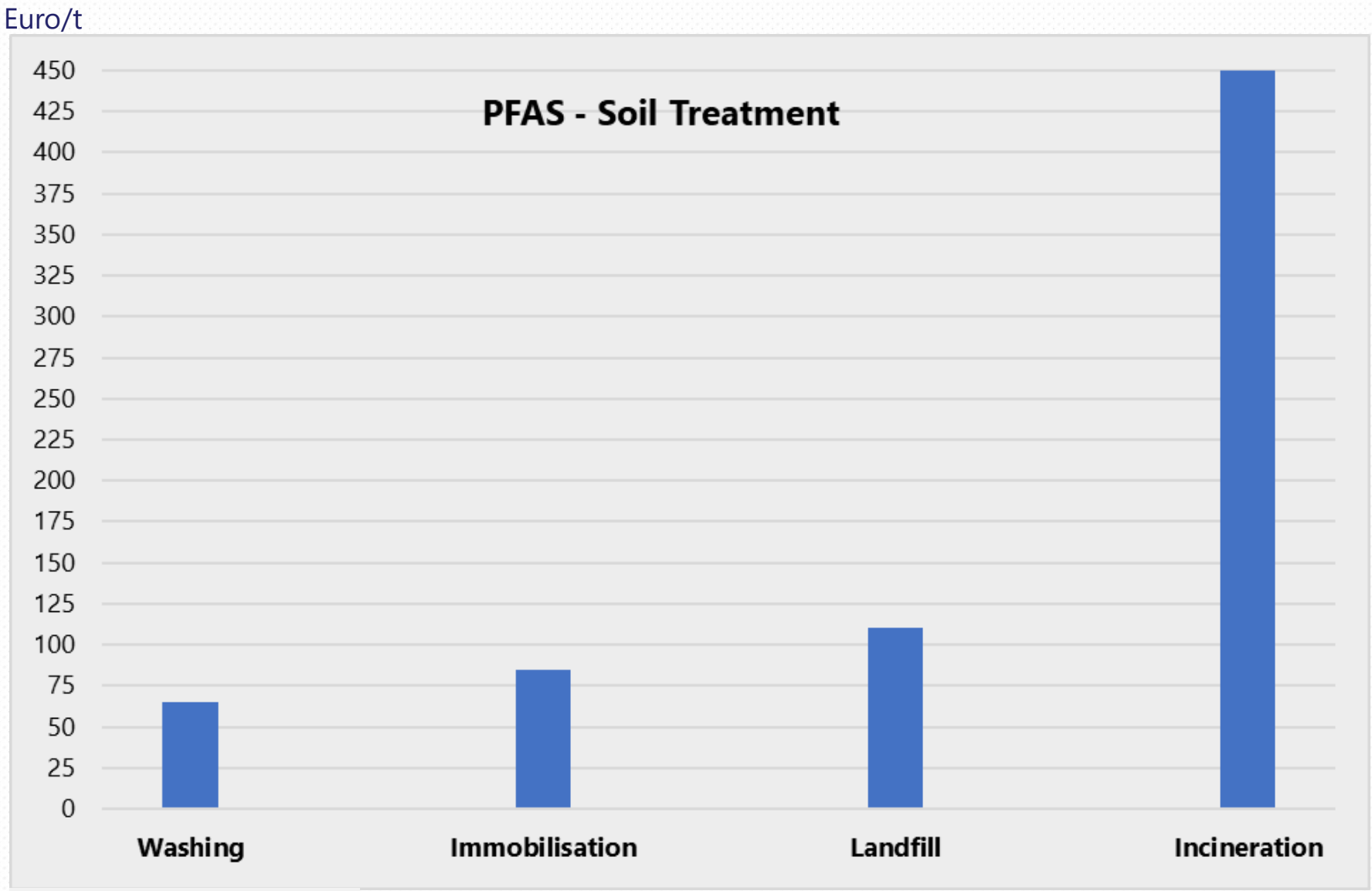
- Techniques
- Alternative
- Results &
- Results of Stress Test
- Conclusion

Treatment Techniques Soil

Source: UBA 2020



Treatment Cost



Price level for Germany in 2021

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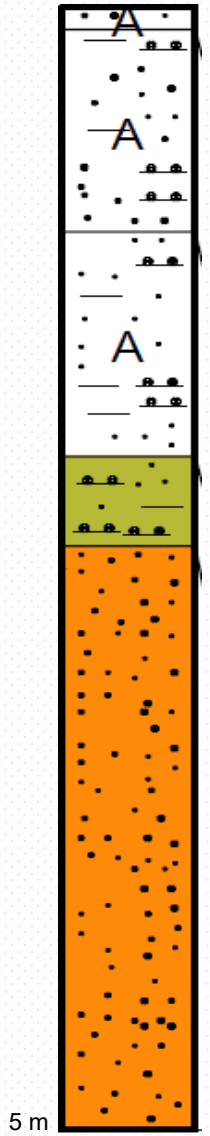
Initial Situation

- Industrial site
- Former fire training pit
- Extension of building planned
- Investigation reveals PFAS
- Predominantly PFOS
- In eluate



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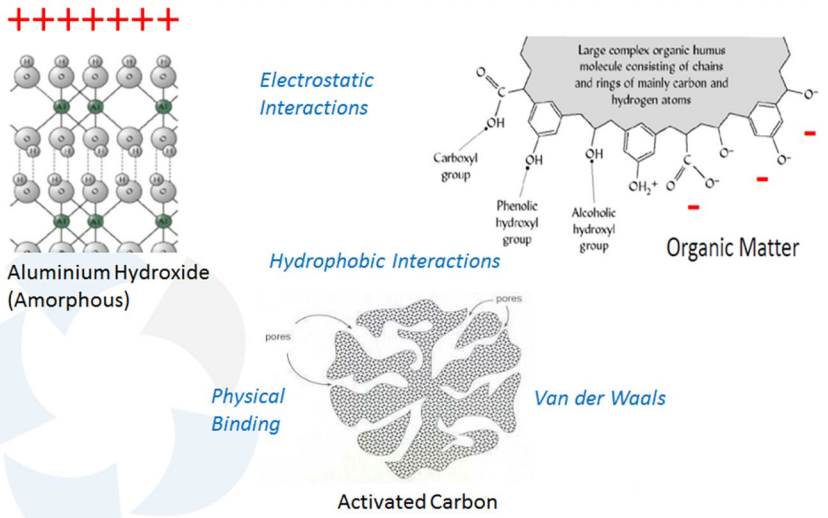
Remediation Approach

- About 3.000 t excavated
- Limited space on site
- Landfill preferred
- Subset of 200 t used for study
  - ✓ Alternative approach: Sorption
  - ✓ Stress Test

Alternative - Ingredients

Powdered adsorbent RemBind

- Activated carbon
- Aluminium hydroxide
- Kaolin
- Additives



Alternative - Application

- Dosing based on mass
- About 1% to 2,5%
- Moisture about 20%
- Proper mixing (contact)
- 24 hrs fixation
- Test in advance

Photo: EnvyTech

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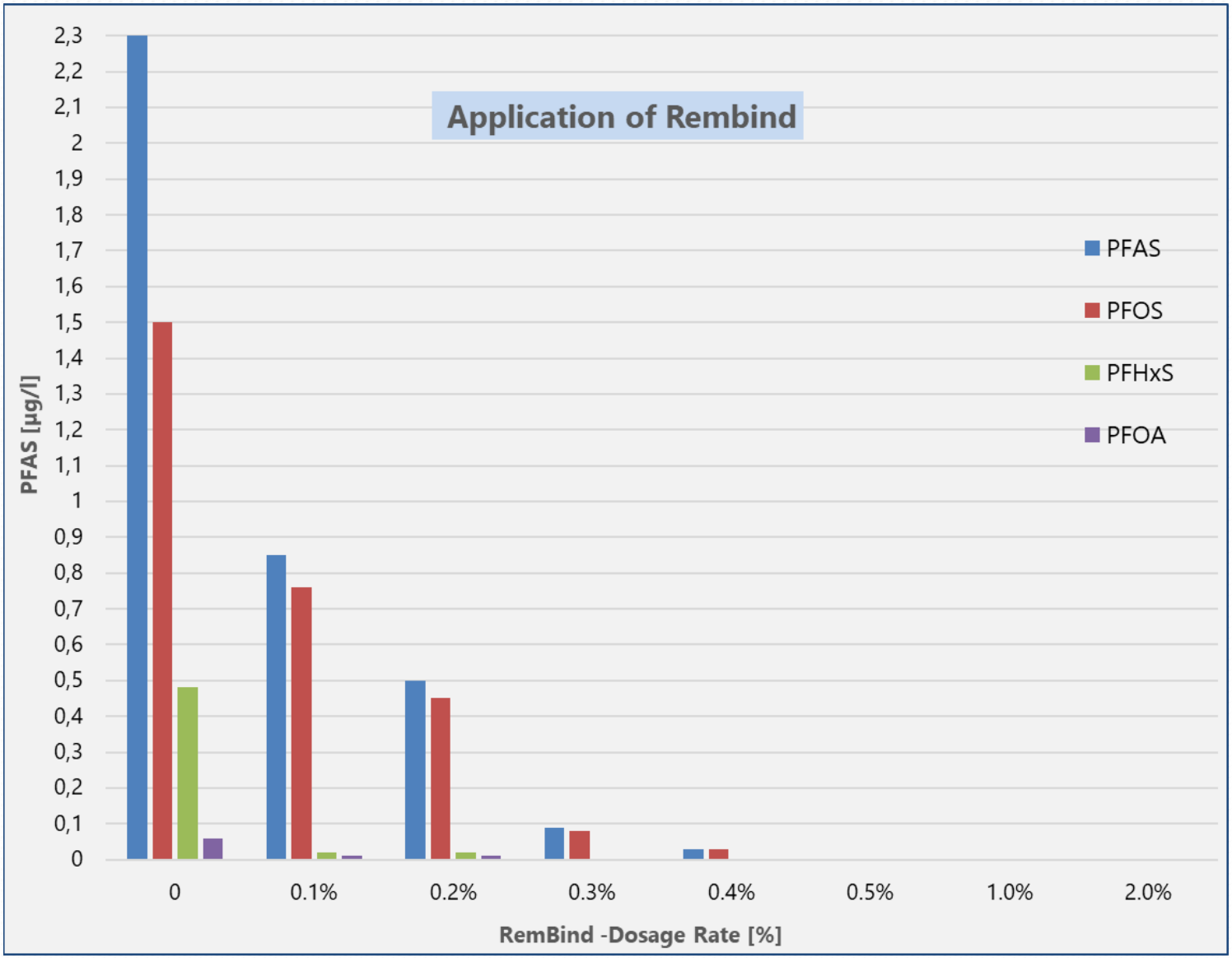
Result of Lab Test



0,05 ppb PFHxA + PFHpS each / 0,04 PFBS / 0,03 PFOSA + PFPeS + 6:2 FTS each / 0,02 PFPeA / 0,01 PFHpA

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Application in the Field

Application in the Field

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Interim Conclusion

- Dosage rate adjustable
- Mixing manageable
- Sorption of PFAS
- utilisation improved
- CO_2-footprint low
- but durable??

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Stress test at Eurofins/D

- Durability of sorption process
- Idea: Weathering / Landfill / Chemical
- Eluate 2:1 & 10:1

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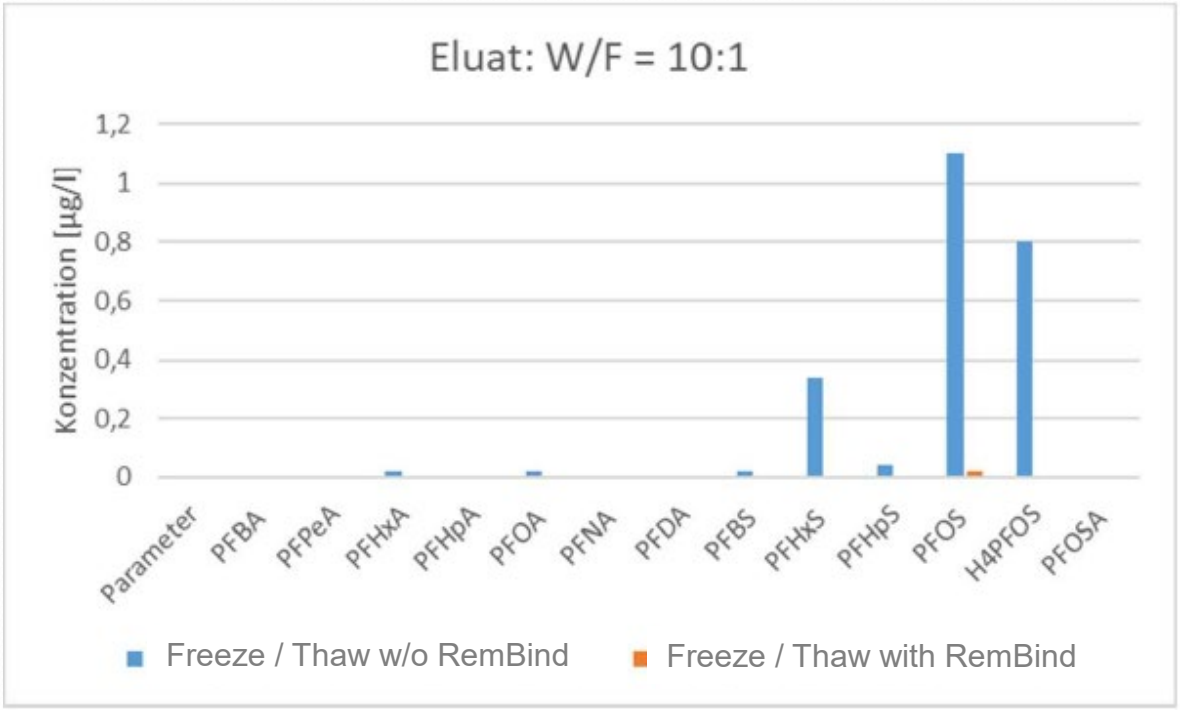
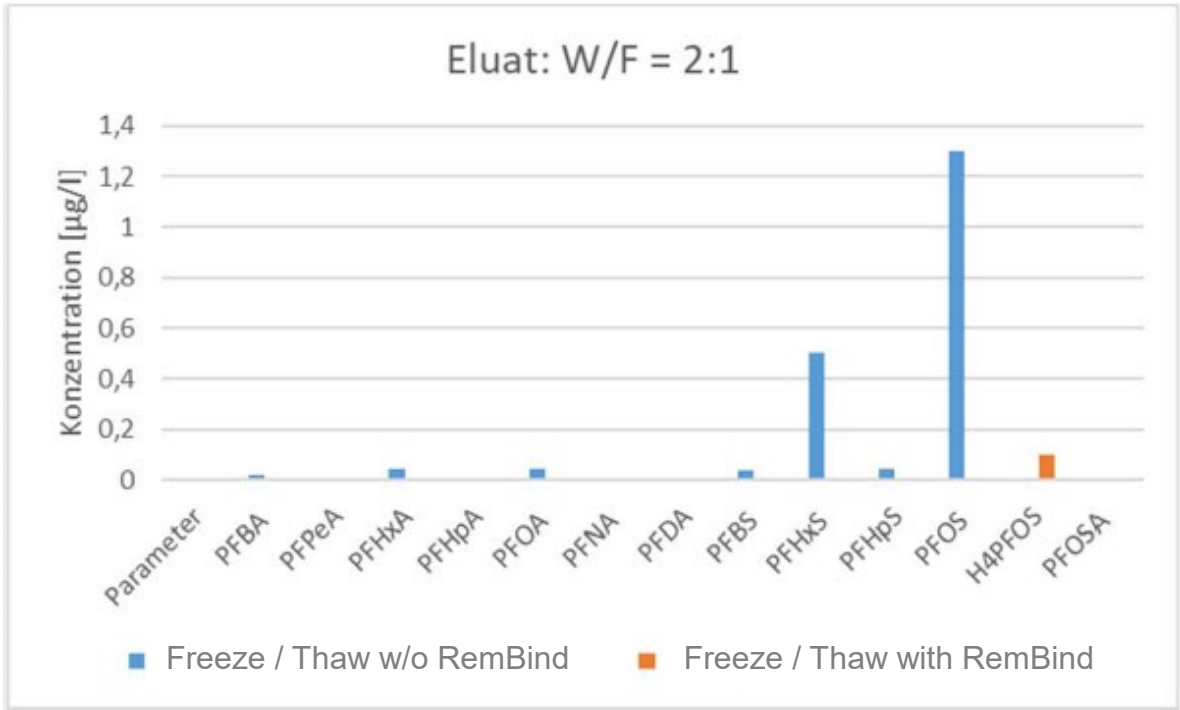
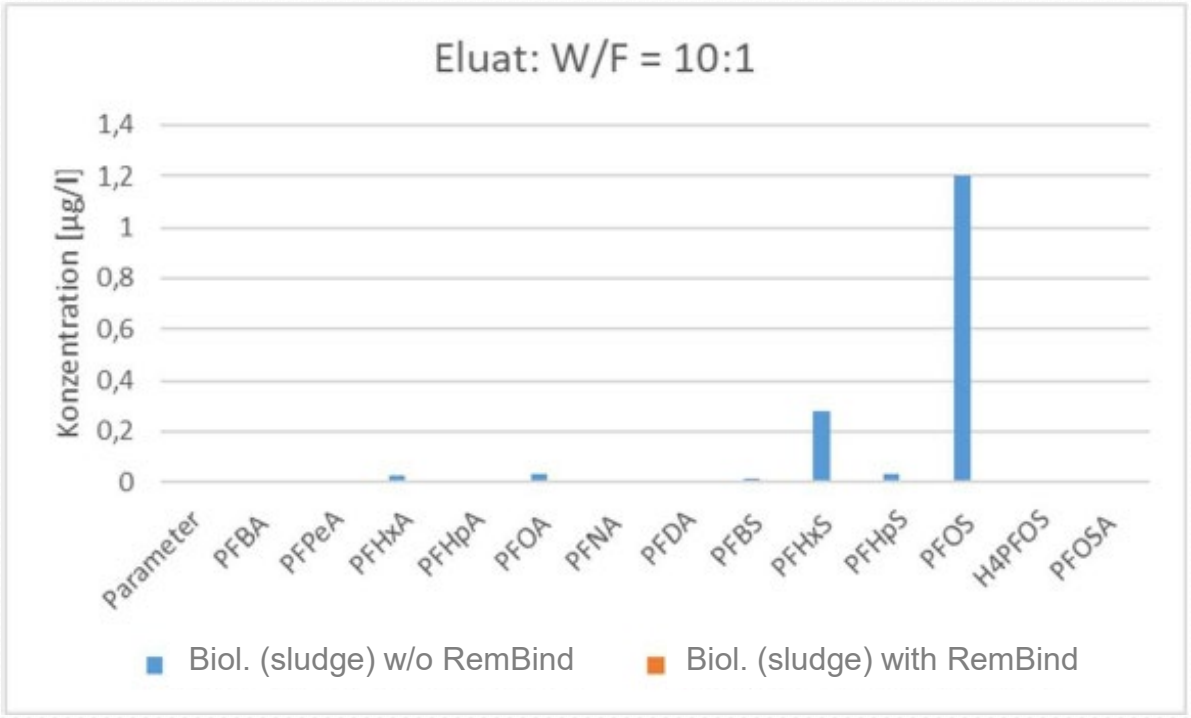
Freeze-Thaw-Changes

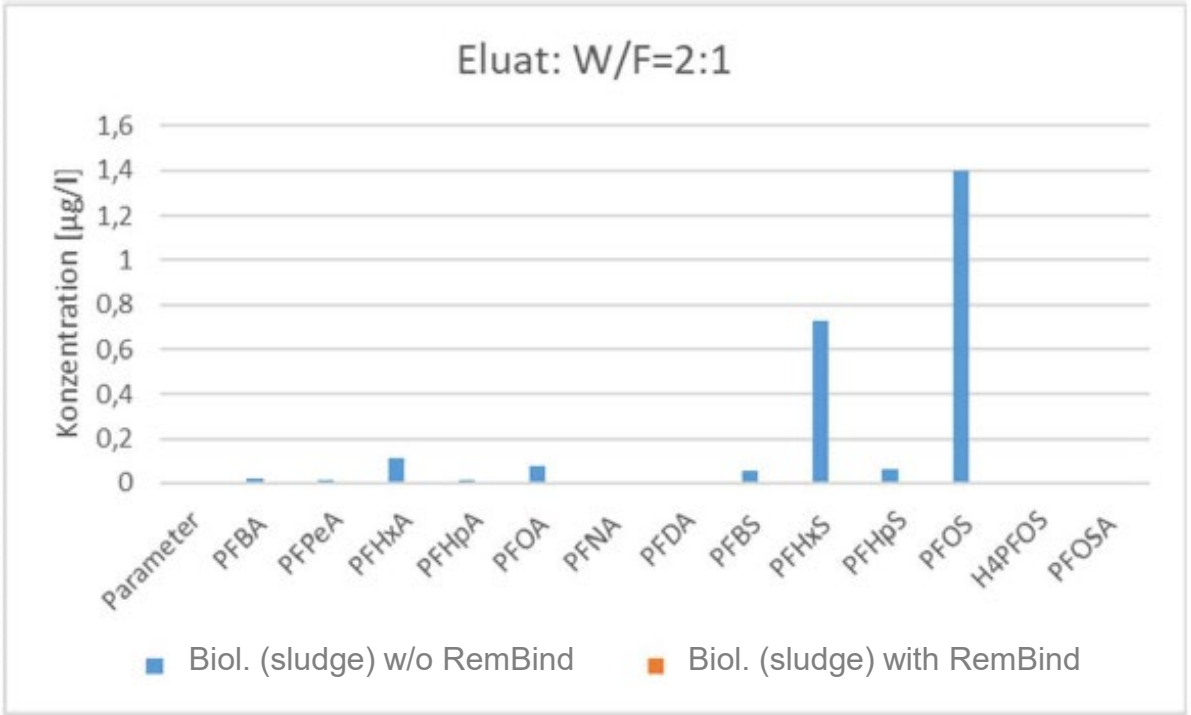




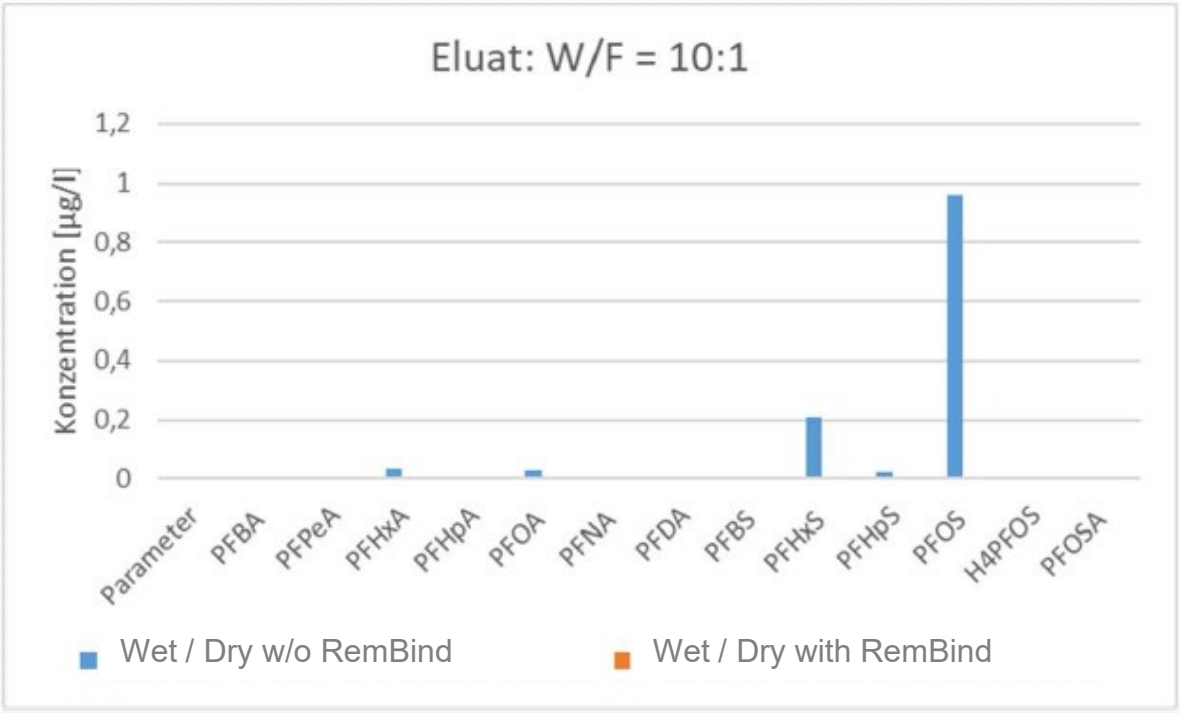
0,01 µg/l

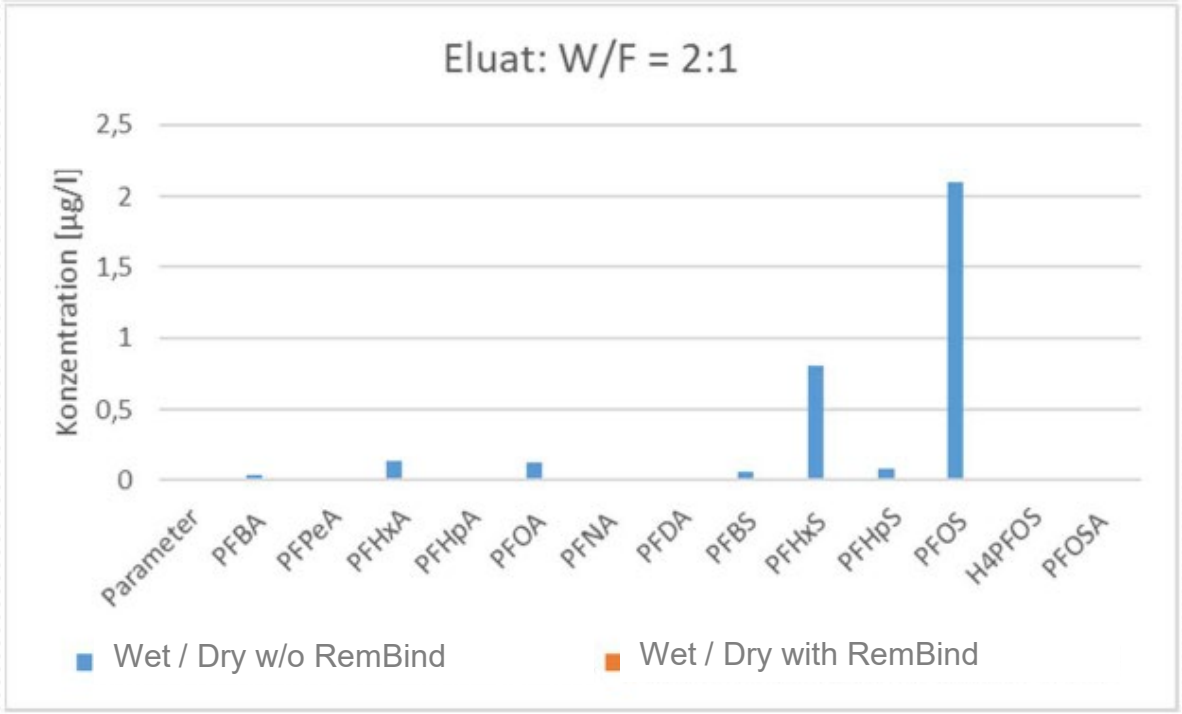
Biol. Stress (Sludge)



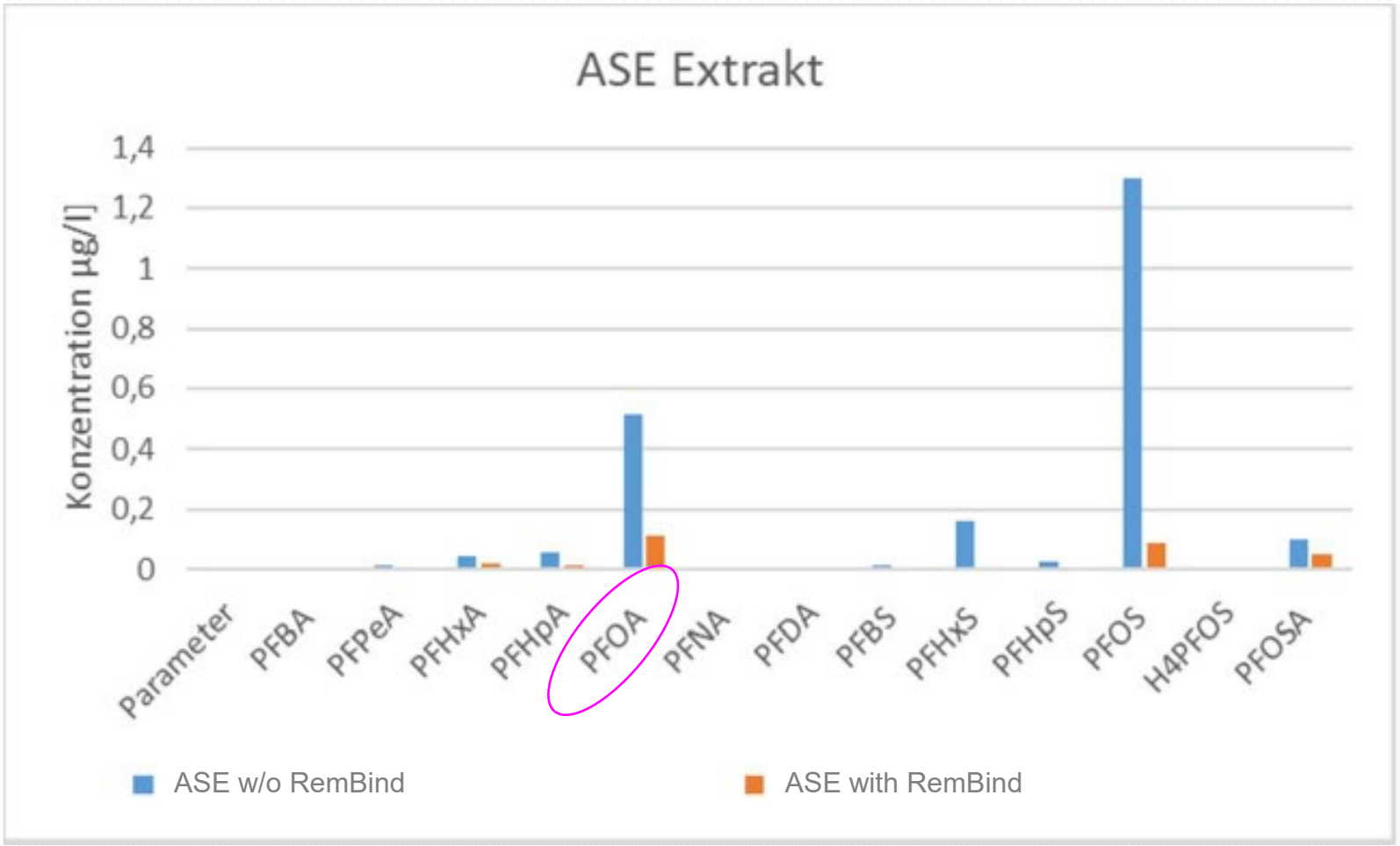


Wet-Dry-Changes





Chemical Attack (ASE)



0,01 µg/l

Acc. Solvent Extraction: organic solvent + 10 bar pressure + 100°C

Conclusions

- RemBind binds PFAS
- Sorption withstands normal exposure
- Simulation confirms papers (2021)
- Lit.[+]: long term, comparison, …

Influence of a commercial adsorbent on the leaching behaviour and bioavailability of selected perfluoroalkyl acids (PFAAs) from soil impacted by AFFFs

Jennifer Bräunig, Christine Baduel and Jochen Mueller

Application of soil amendments for reducing PFAS leachability and bioavailability☆

Albert L. Juhasz[a,*], Farzana Kastury[a], Carina Herde[b], Wayne Tang[a]

Field-Scale Demonstration of PFAS Leachability Following In Situ Soil Stabilization

Jeffrey T. McDonough,* Richard H. Anderson, Johnsie R. Lang, David Liles, Kasey Matteson, and Theresa Olechiw

Stabilization and solidification remediation of soil contaminated with poly- and perfluoroalkyl substances (PFASs)

Mattias Sörengård[a,*], Dan B. Kleja[b], Lutz Ahrens[a]

Durability of sorption of per- and polyfluorinated alkyl substances in soils immobilised using common adsorbents: 1. Effects of perturbations in pH

Shervin Kabiri[a,*], Marc Centner[b], Michael J. McLaughlin[a,*]

Durability of sorption of per- and polyfluorinated alkyl substances in soils immobilized using common adsorbents: 2. Effects of repeated leaching, temperature extremes, ionic strength and competing ions

Shervin Kabiri*, Michael J. McLaughlin*

Both
Apr 2021

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Many Thanks!

- Questions or more information??

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