Nordic-Baltic Drinking Water Conference
Reykjavik October 22-24. 2025

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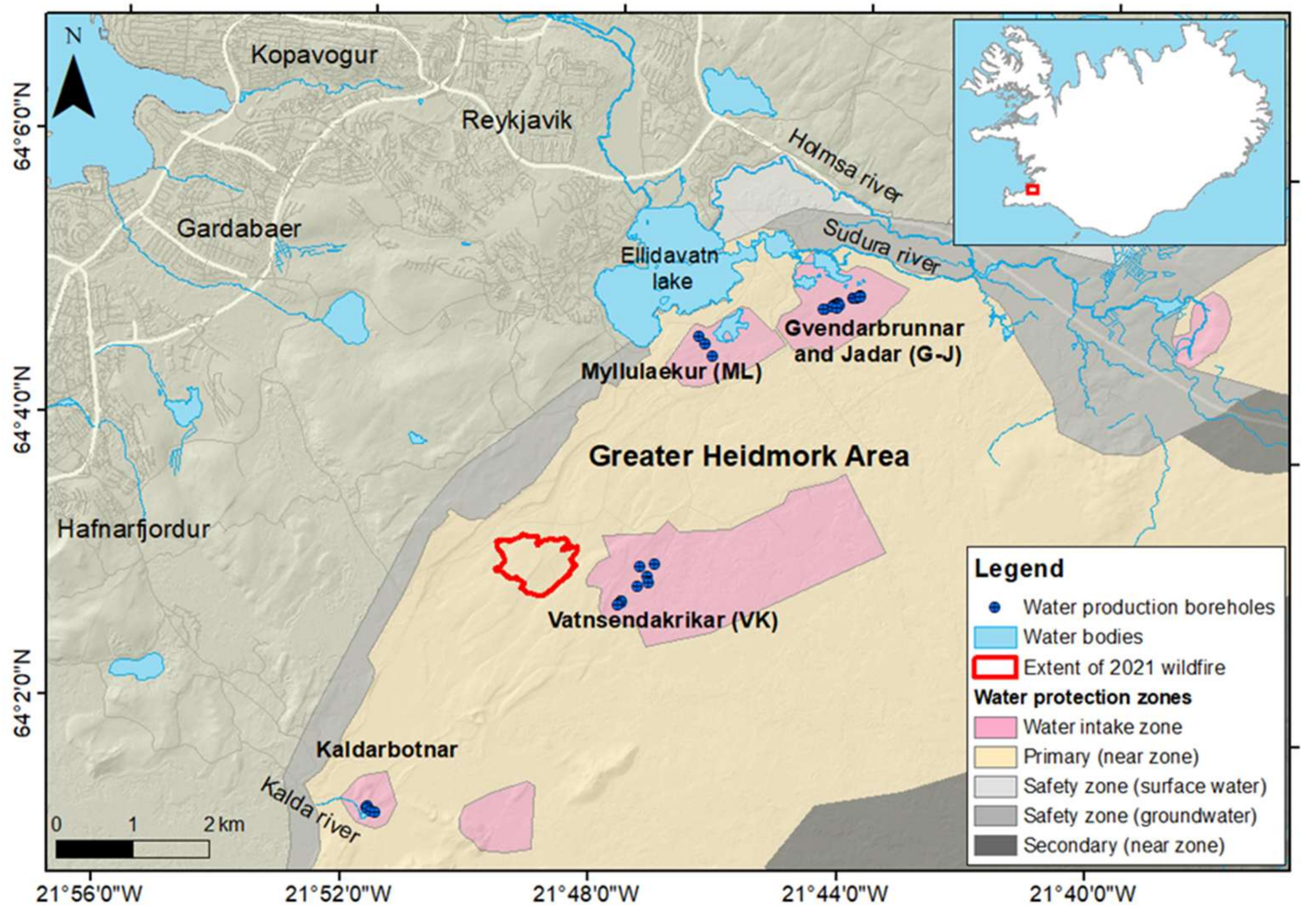
Impact of Wildfire on the Drinking Water Catchment for the Capital Area of Iceland – A Case Study and lessons learned

Maria J. Gunnarsdottir[1], Sigrún Tómasdóttir[2], Olgeir Örlygsson[2], Hrund Ó. Andradóttir[1], Sigurdur M. Gardarsson[1]

1) University of Iceland, 2) Veitur Utilities

Water protection zone for the capital area

- Heiðmörk is the primary water protection area for the capital area – in all 250 km^2
- Supplies six municipalities and 64% of the population of Iceland with drinking water
- Porous basaltic lava with thin volcanic strata and limited surface water
- Veitur Utility harness water from18 boreholes in Heiðmörk some with groundwater level close to surface (0-10m)



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Wildfire and test site for the study

Wildfire 4 May 2021

- 56,5 hectares of land burned
- Main vegetation pine, lupin and birch

Test site is Veitur Utility with 47 samples from three zones

- 28 monitoring results before the fire (2011-2020)
- 19 monitoring results after the fire (2021-2023)

Monthly rainfall in Reykjavik Oct 2020 Sept 2021

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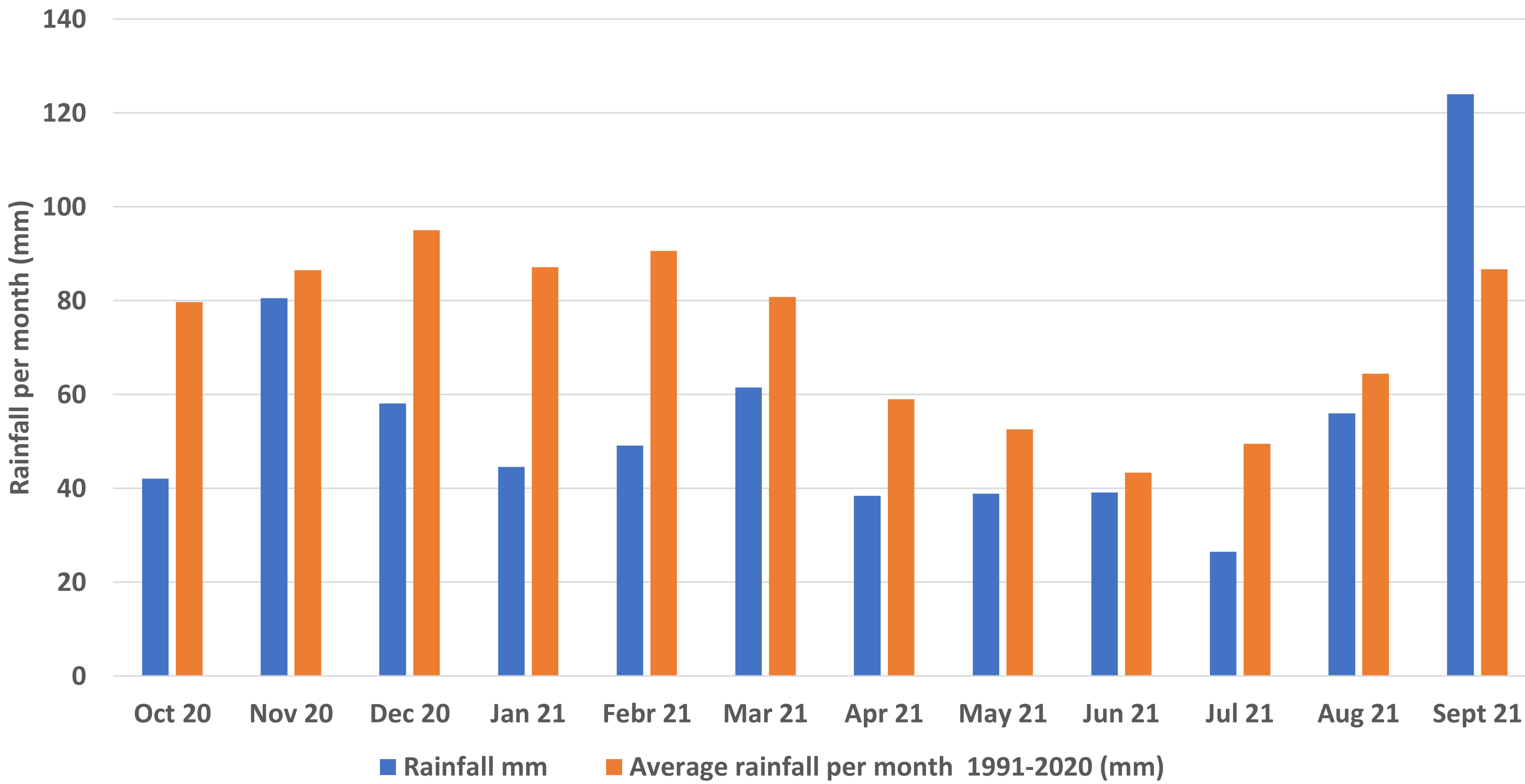
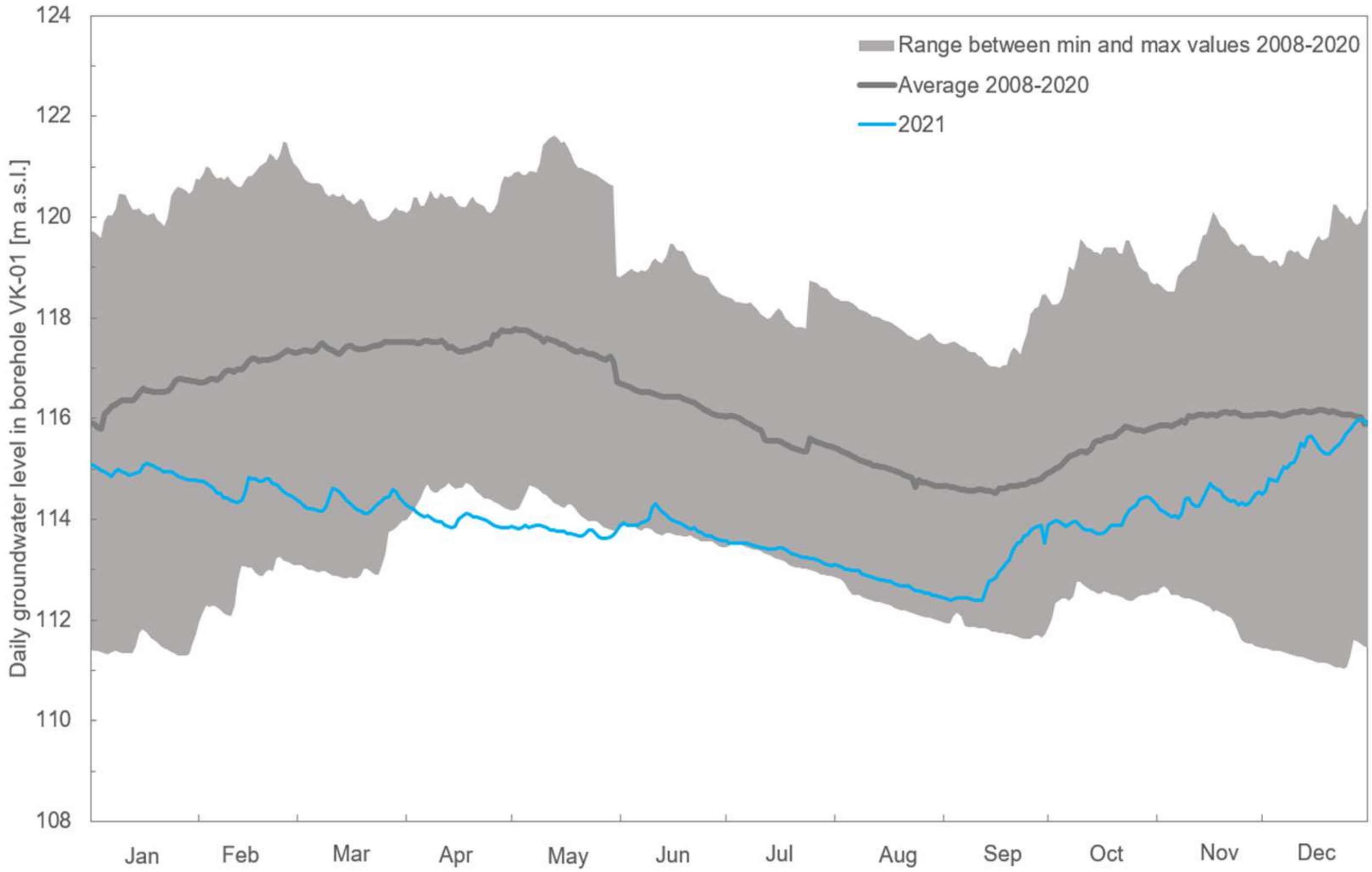


Average groundwater level in borehole at VK



Results from sampling

- **Five** PAHs (Polyaromatic Hydrocarbons) detected post-fire and one (NAP) was detected up to five months
- **Six** VOCs (Volatile Organic Compounds) post-fire and three were detected up to 18 months
- **Six** metals were measured in two to nearly six-fold higher post-fire (Ba, Co, Li, Mo, Mg and Sr) compared to median value before. Some short lived except Ba and Sr.
- Increase more frequent in the low laying area G-J
- Note that parametric value were all well below health limit

PAHs and VOCs ng/l in drinking water samples after the wildfire

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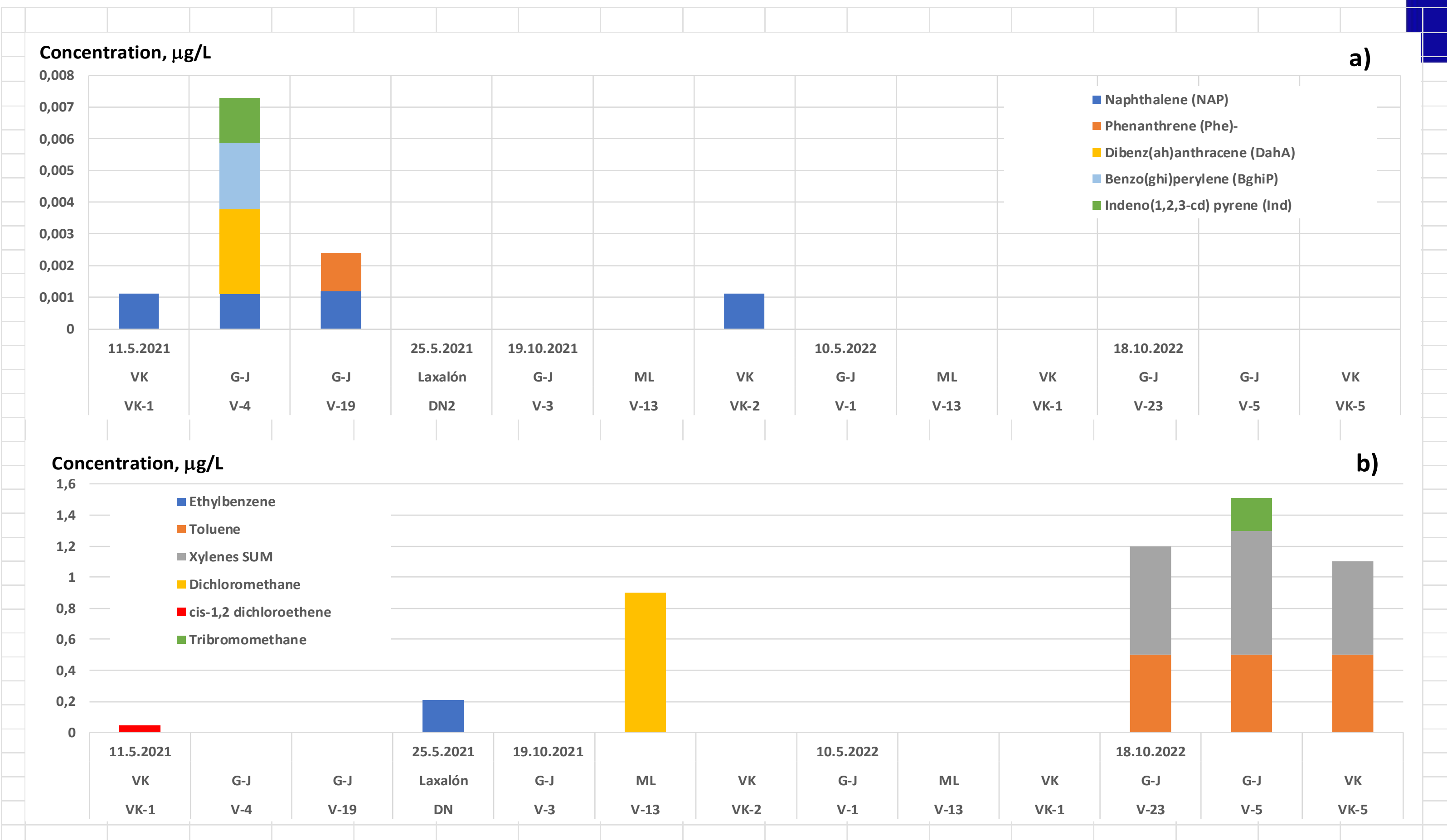
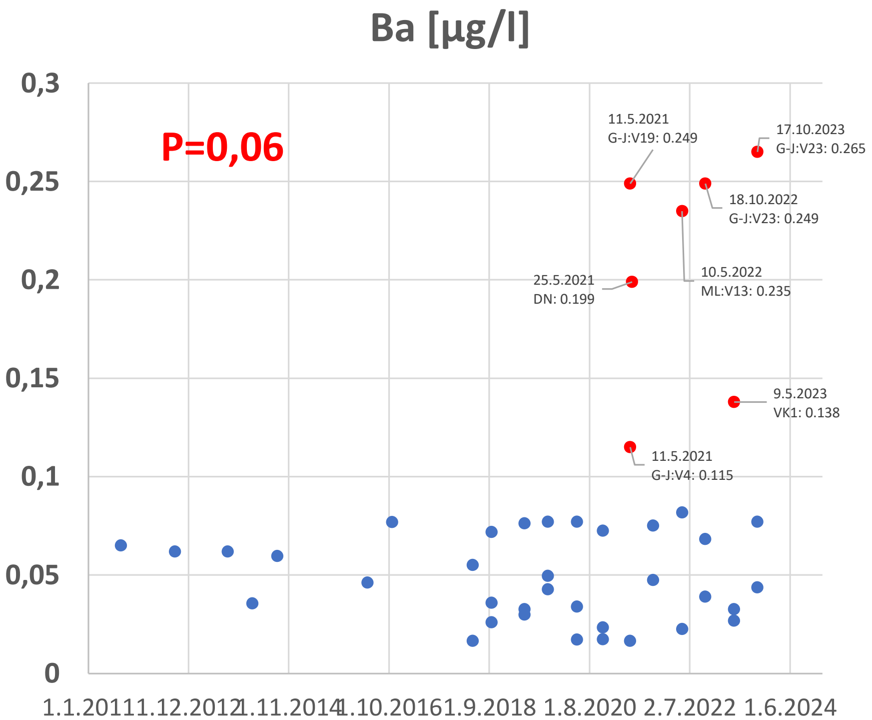
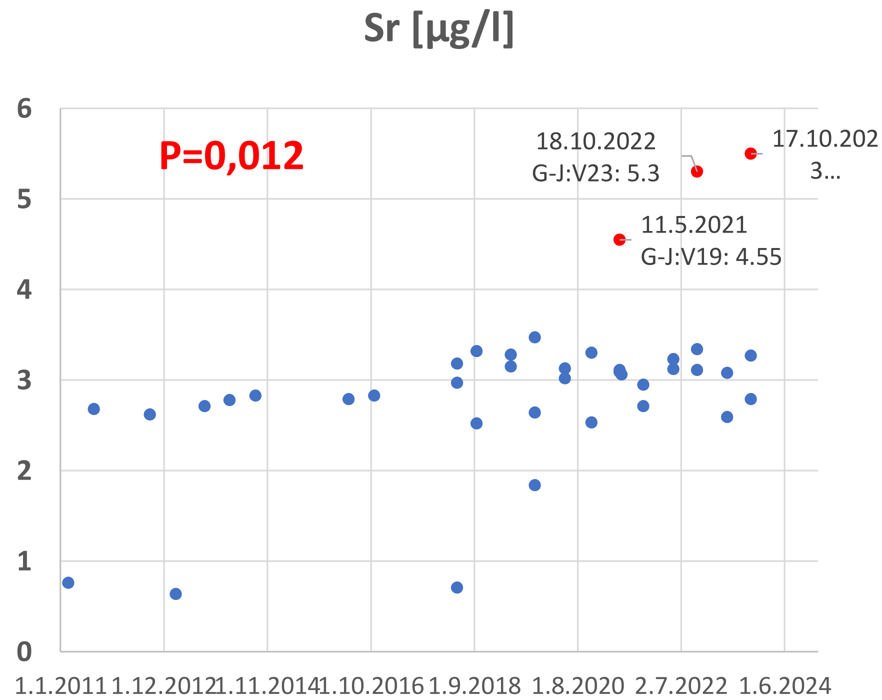


Barium and Strontium concentration increased significantly





Lessons learned for wildfire mitigation – water supply

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Working group

- Establish a working group that has the responsibility to incorporate wildfire into preventive management and produce an emergency response plan in case of a wildfire.
- The risk management plan should include both improvement to infrastructure and regular control measures. The response plan should be regularly rehearsed.
- Special precautions should be taken when using large equipment on the water protection areas during fire or rehearsal, due to risk of oil pollution.

Collaboration and knowledge

- Collaborate with the local fire brigade and other stakeholders such as the local rescue team, neighbouring water supplies, landowner in the area, and with the general public.
- Increase knowledge and research of impact from wildfire on water supply, water quality and the natural environmental.
- Work with the authorities and stakeholders to restrict land use on watershed, e.g. forestry and open fire.

Lessons learned for wildfire mitigation – water supply

Improvements of infrastructure

- Replace wooden structure with fire resistant building materials.
- Create a buffer zone around the area.
- Install water faucet and fire claps for firefighting at critical location.
- Clear vegetation around infrastructure and replace soil with gravel.
- Build access roads for firefighting that can also be used as escape roads.
- Invest in suitable equipment and spare parts for preparedness, e.g. electrical equipment.

Regular control measures

- Vegetation management as clear vegetation away from infrastructure and replace soil with gravel on regular bases.
- Monitor available hydrometeorological data to use in risk management.
- Regular patrols when warning of wildfire is issued.
- Develop a sampling plan to monitor water quality following a wildfire to register infiltration of contaminants into groundwater.

Lessons learned for wildfire mitigation – Local Fire Brigade

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- Staffing and equipment must be secured for large incidents.
- Use only water on water catchment areas
- Secure collaboration and dialog between stakeholders.
- Increase knowledge and increase public awareness of the vulnerability of water sources.
- Update and rehearse emergency plan in cooperation with stakeholders.
- Restrict access on protection zones for water supplies as most wildfires are man-made e.g., from open fires, grill, or smoking.
- Ensure access for firefighting and patrolling as part of regional land planning.
- Survey weather related data and warn the municipalities and the public of the risk.
- Restrict forestry on the watershed as it is food for fire, especially pine trees, as the pine needles contain resin which is fuel for fire.

Main conclusions

- Aquifers are vulnerable to wildfires and especially porous postglacial lava fields
- Polyaromatic hydrocarbons PAHs and Volatile Organic VOCs compounds were detected in groundwater after the fire
- Concentration of some metals increased, though mostly temporarily
- Important to have long-time emergency preparedness plan in place and include wildfire in risk assessment
- Improve infrastructure with fire-resistant material
- Vegetation maintenance plans to limit growth and provide access to the area
- Need of long-time plan to protect groundwater used for drinking water

Impact from climate change on water supplies

- Extreme weather events as heavy rain and drought
  - Flooding
  - Landslides (earth & mudslides)
  - Wildfire
  - Algae blooms
- Ice and permafrost melting
  - Changes in cold climate hydrology
  - Sea level rise
- Algea blooms

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The forever chemicals PFAS in drinking water, wastewater and surface water in Reykjavik, Iceland

Maria J. Gunnarsdóttir[1], Hrund Ó. Andradóttir[1], Kristin Ólafsdóttir[2], Asta Ósk Hlödversdóttir[3], Roland Kallenborn[4], Erik Magnus Ræder[4], Jan Ludvig Lyche[4], Rainer Lohmann[5]

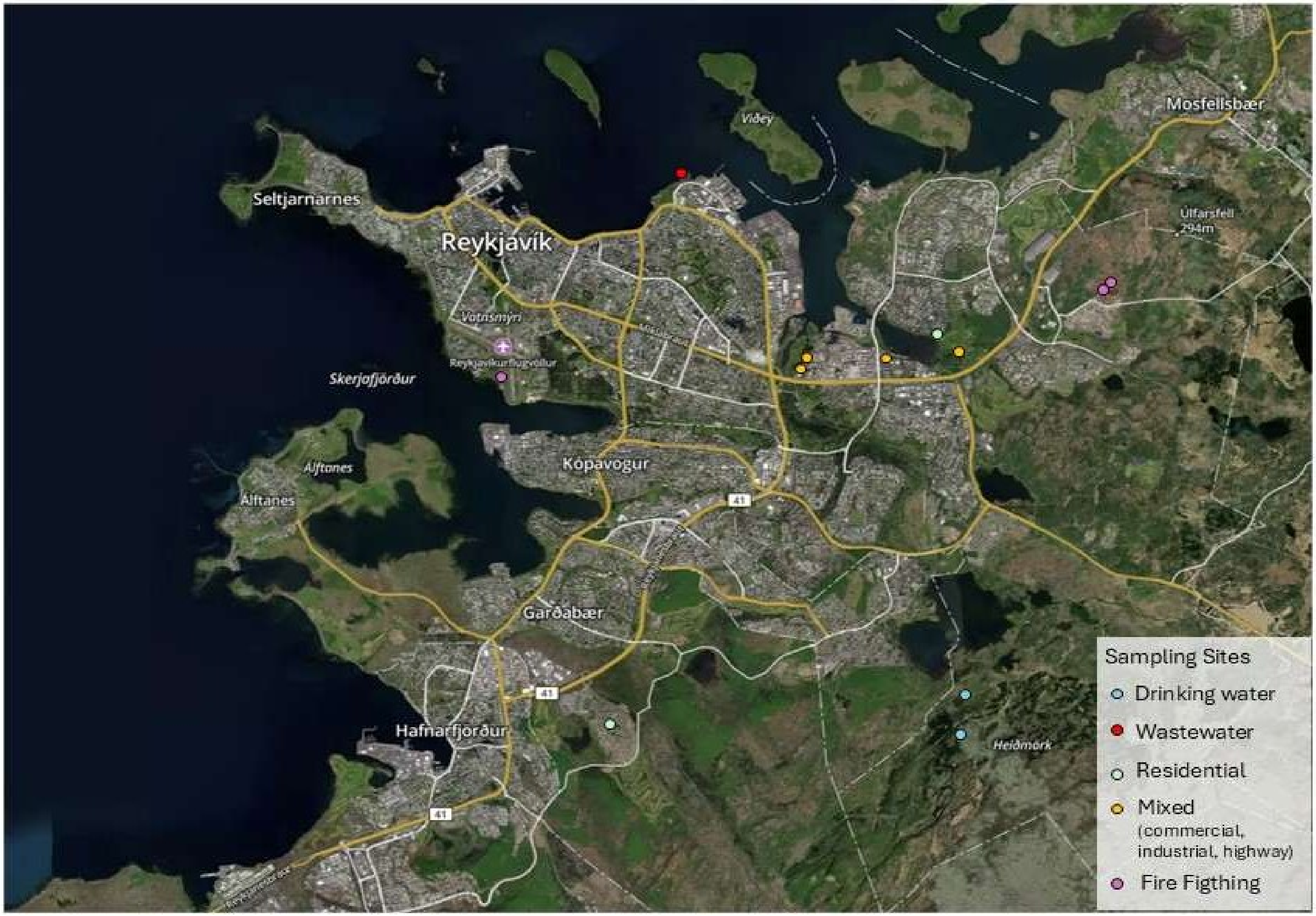
1) Faculty of Civil and Environmental Engineering, University of Iceland, 2) Dept. Pharmacology and Toxicology, University of Iceland, 3) VSB Consulting Engineers Ltd, 4) Norwegian University of Life Sciences (NMBU), 5) University of Rhode Island (URI).

Study scope and methods

- 33 water samples across matrices: groundwater (drinking water), wastewater effluent, and urban/surface runoff
- Up to 54 PFAS analytes; analyses performed by NMBU (NO) and URI (US) laboratories
- Compared concentrations against EU Drinking Water Directive (EU DWD) and health-based PFAS-4 (PFHxS, PFOA, PFNA, PFOS) limits (DK, SE)

Regulatory context

- EU DWD: 100 ng/L for Σ20 PFAS
- Health-based PFAS-4 limits: Denmark 2 ng/L; Sweden 4 ng/L
- Stockholm Convention: PFOS, PFOA, PFHxS controlled; ongoing proposals to broaden restrictions


Mosfellsbær
Viðey
Seltjarnarnes
Reykjavík
Úlfarsfell
294m
Vatnsmýri
Reykjavíkurflugvöllur
Skerjafjörður
Álftanes
Álftanes
Kópavogur
41
Garðabær
41
Hafnarfjörður
Heiðmörk
41
Sampling Sites
Drinking water
Wastewater
Residential
Mixed
(commercial, industrial, highway)
Fire Figthing

Results

Drinking water in Heiðmörk

- Very low PFAS compared to other countries; most compounds below detection limits
- ΣPFAS and PFAS-4 far below EU DWD (100 ng/L) and the Danish PFAS-4 health limit (2 ng/L)

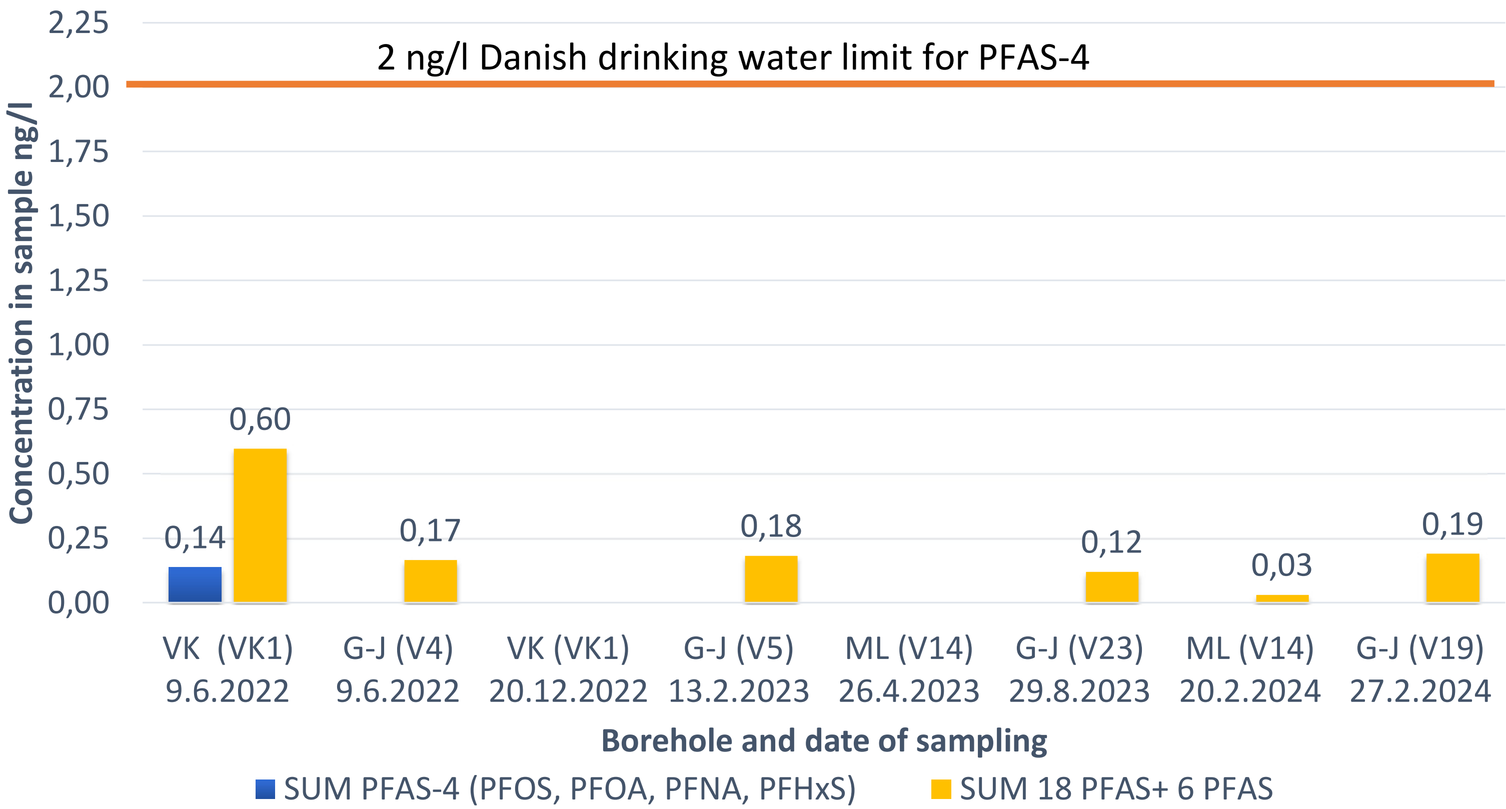
Wastewater WWT Klettagardar

- Frequent detections with moderate concentrations relative to Nordic/European comparators. Median Σ18 PFAS ≈ 9 ng/L
- Composition includes PFBA, PFHxA, PFPeA; return geothermal water likely dilutes concentrations seasonally.

Surface runoff & AFFF sites

- Residential & light industrial runoff: Σ18 PFAS typically 3–7 ng/L
- Firefighting foam (AFFF) hotspots identified
- Reykjavík Airport (Skeljanes): ΣPFAS is 2,650–3,500 ng/L

Drinking water in Heiðmörk



Conclusion and recommendation

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- Drinking water resource at Heiðmörk is currently well protected and shows minimal PFAS.
- Urban runoff and WWTP effluent exhibit low–moderate PFAS levels consistent with other Nordic sites.
- AFFF-related hotspots exist; the airport training area is the dominant PFAS source observed and up to 500 time higher than the urban runoff sites

- Recommended to map and prioritize PFAS hotspots nationwide, especially active and former fire-training sites near water resources.