

PFAS and Schools

Per- and Poly-fluoroalkyl Substances (PFAS)

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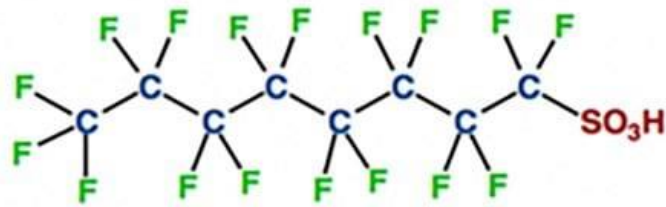
What are PFAS?



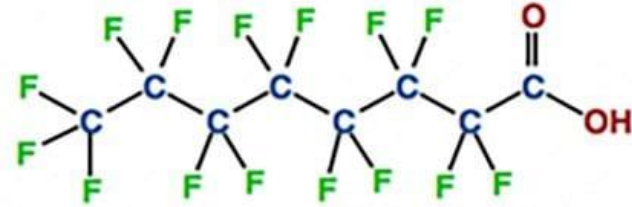
Repel water
Repel grease
Stable in heat
Nonstick
Surfactants

Images courtesy of Green Policy Institute

Per- and polyfluoroalkyl substances (PFAS)



PFOS - perfluorooctanesulfonic acid



PFOA - perfluorooctanoic acid

- Carbon—fluorine bond is extremely stable—**Persistent**
- Fluorinated tail—repels water and oil, head group is water soluble—**mobile in water**
- Some PFAS build up in fish, wildlife, people—**bioaccumulate**

Health Concerns

Toxicity observed in **laboratory animals**



- Liver toxicity
- Developmental toxicity
- Reproductive toxicity
- Immune toxicity
- Endocrine disruption
- Tumors in liver, pancreas, testes

In humans, PFAS exposure is associated with



- ↑ Cholesterol levels
- ↓ Antibody response
- ↓ Birth weight
- ↑ Risk of kidney cancer
- ↑ Liver enzyme levels

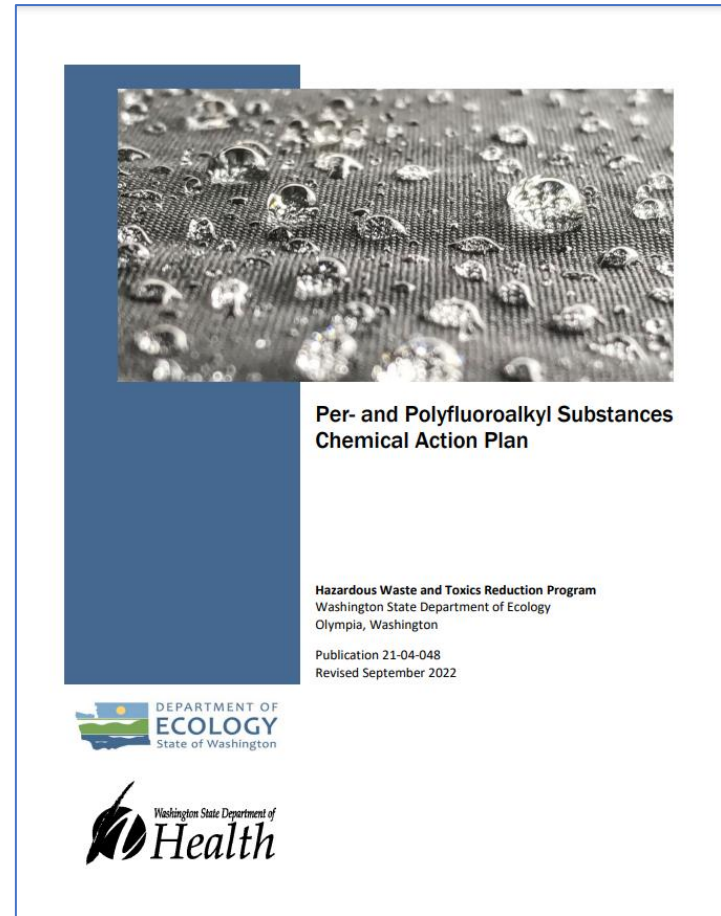
- ↑ Hypertension during pregnancy
- ↑ Risk of thyroid disease
- ↑ Risk of testicular cancer

State Chemical Action Plan for PFAS

Recommendations in 4 areas:

- Ensure drinking water is safe
- Manage environmental contamination
- Reduce PFAS in products
- Understand and manage PFAS in waste

See <https://ecology.wa.gov/Waste-Toxics/Reducing-toxic-chemicals/Addressing-priority-toxic-chemicals/PFAS>



State Action Levels (SALs)



- State Action Levels for 5 PFAS
- Requires PFAS testing by most Group A water systems by December 2025
- Requires notification of customers
- Requires follow-up monitoring

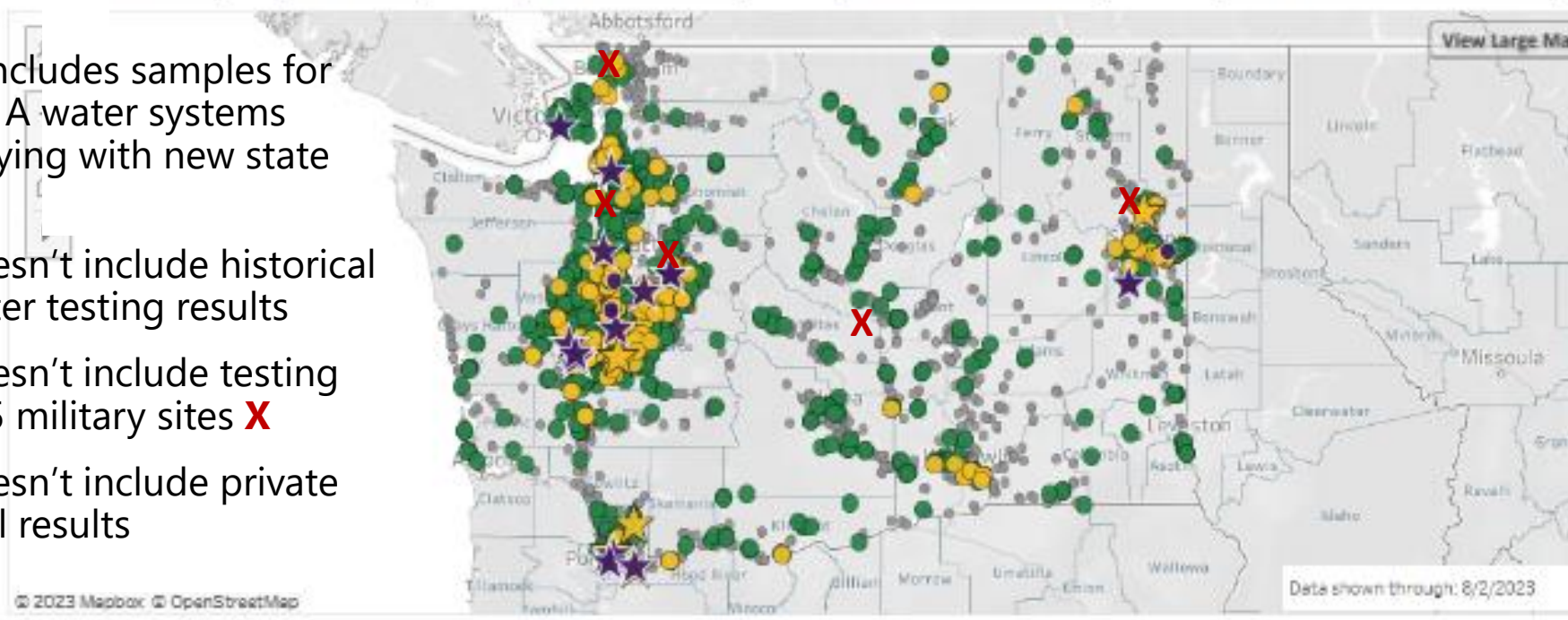
Drinking Water Contaminant	SAL (parts per trillion)
PFOA	10
PFOS	15
PFNA	9
PFHxS	65
PFBS	345

Map of PFAS Drinking Water Testing



Only includes samples for Group A water systems complying with new state rule.

- Doesn't include historical water testing results
- Doesn't include testing at 5 military sites **X**
- Doesn't include private well results



Data dashboard

<https://doh.wa.gov/data-and-statistical-reports/washington-tracking-network-wtn/pfas>

How are we Exposed? *to PFAS in public drinking water*



Water used
for cooking
and drinking



Outside
the
home



Community
exposures

Visit ITRC: <https://pfas-1.itrcweb.org/2-6-pfas-releases-to-the-environment/>



How do PFAS get into groundwater?

Or City or school well

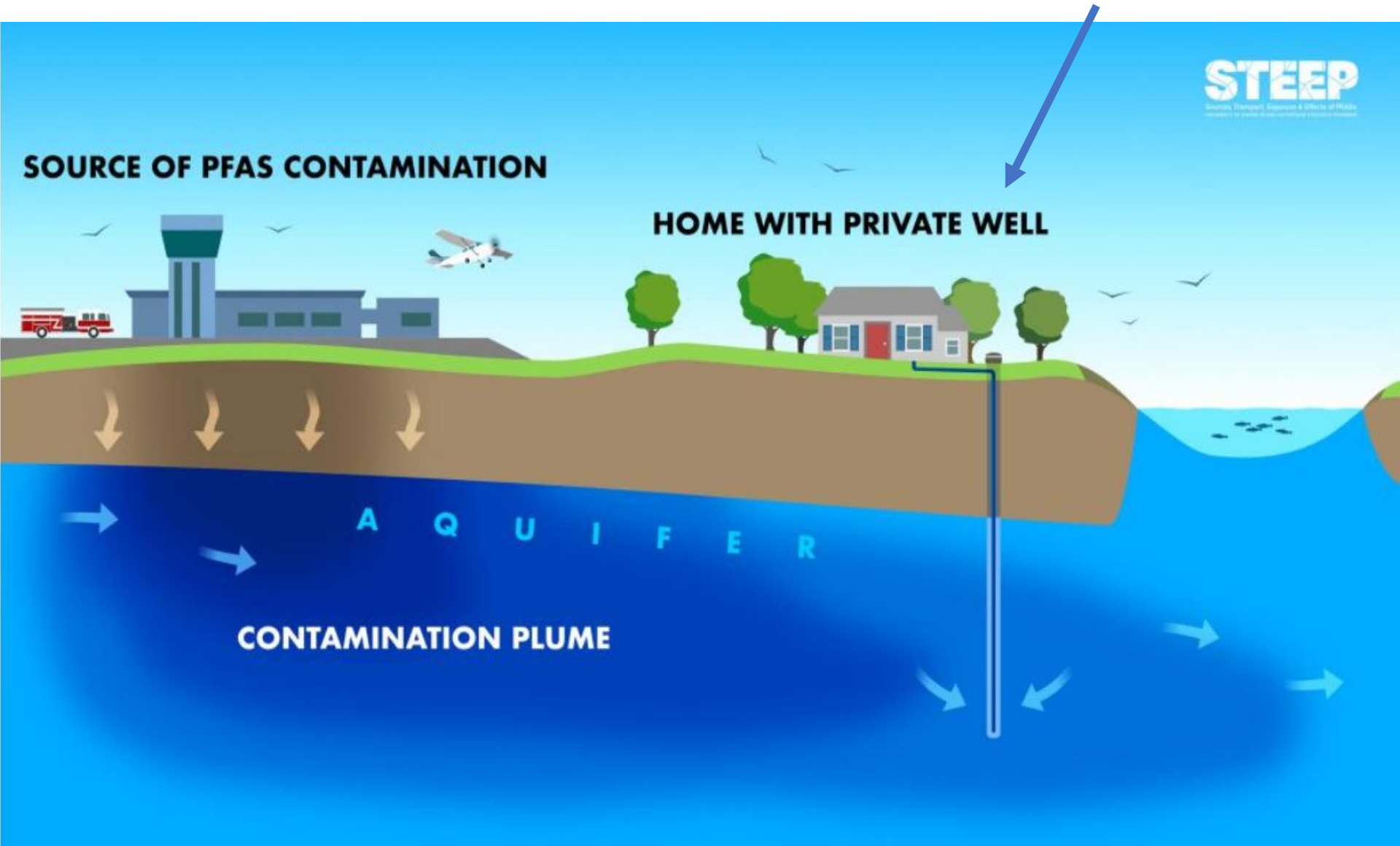
STEEP
Source, Transport, Exposure & Effects of PFAS
University of Waterloo & Environment Canada

SOURCE OF PFAS CONTAMINATION

HOME WITH PRIVATE WELL

A Q U I F E R

CONTAMINATION PLUME



Risk Factors for Schools - Location

School drinking water well is near...

- Airport
- fire station
- military base
- fire training area
- Industrial user: metal plating, electronics manufacturing.

What schools can do

PFAS water test

- Ask PWS about testing.
- Test your own well, especially if you have a risk factor.

- Water testing is only way to know for sure
- You can't see, smell or taste PFAS in drinking water

How to test?

<https://doh.wa.gov/pfas>

How do I test my water for PFAS?



Testing your water involves collecting a water sample and sending it to a laboratory that can measure PFAS in drinking water.

If you choose to test your water, find a lab that has been accredited (verified) by the Washington State Department of Ecology as able to test for PFAS in drinking water. There are two test methods. EPA method 533 tests for 24 PFAS. EPA method 531.7 tests for 18 PFAS. Both will detect the five PFAS with a SAL.

Learn more about [EPA's PFAS Drinking Water Laboratory Methods](#).

- [Accredited Labs that Test Public Drinking Water Samples for PFAS 331-700 \(PDF\)](#)

DOH Website

Need Help?

The screenshot shows the Washington State Department of Health website. The top navigation bar includes links for 'About Us', 'Contact Us', and 'Newsroom', along with a search bar. The main menu has categories like 'You & Your Family', 'Community & Environment', 'Licenses, Permits, & Certificates', 'Data & Statistical Reports', 'Emergencies', and 'Public Health & Provider Resources'. On the left, a sidebar lists various contaminants under the heading 'In this section'. The main content area is titled 'PFAS' and features a paragraph explaining that PFAS are human-made chemicals used since the 1950s. Below the text are three video thumbnails: 'What Are PFAS?', 'Why are PFAS a Health Concern?', and 'Lowering Exposure From Drinking Water'. At the bottom of the PFAS section, there is a list of expandable dropdown menus with the following questions: 'What are PFAS?', 'Why are we concerned about PFAS?', 'What are the health concerns with PFAS?', 'How are people exposed to PFAS?', and 'How can I reduce my exposure?'.

<https://doh.wa.gov/PFAS>

- Common public questions and answers

<https://doh.wa.gov/community-and-environment/drinking-water/contaminants/pfas-drinking-water>

- Resources and advice for water systems

WA State Action on PFAS in products

- 2018 Ban on PFAS in Food contact paper (RCW 70A.222.070)
- 2018 Ban on PFAS in Class B firefighting foam (RCW 70A.400)
- 2023 Ban on PFAS in cosmetics (HB 1047)
- 2023 Safer Products for WA bans
 - Aftermarket stain and water proofing treatments
 - Leather and textile furnishings
 - Carpets and rugs



Additional actions being Considered PFAS in products

2 Types of Action

- Can restrict PFAS if there are safer alternatives that are feasible and available.
- Can require manufactures to report to ECY if their products contain PFAS (reporting requirement).

Product Categories

- Apparel and outdoor gear
- Firefighters gear
- Cleaning products
- Waxes —floor waxes and polishes, car waxes, and ski waxes
- Nonstick cookware and kitchen supplies
- Hard surface sealants for tile, cement, granite, wood floors, etc.

Learn more at Safer Products for Washington Program, Dept of Ecology

https://www.ezview.wa.gov/site/alias_1962/37555/safer_products_for_washington.aspx

Floor stripper and floor wax



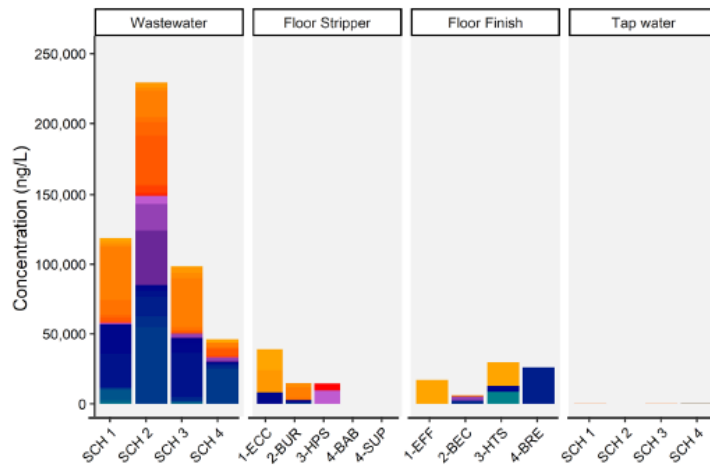
Figure 2-11. Applying Alternative Stripper during Testing at San Francisco City Hall



Figure 2-12. Using Floor Machine on Stripper during Testing at San Francisco City Hall

New Hampshire Investigation- 2023

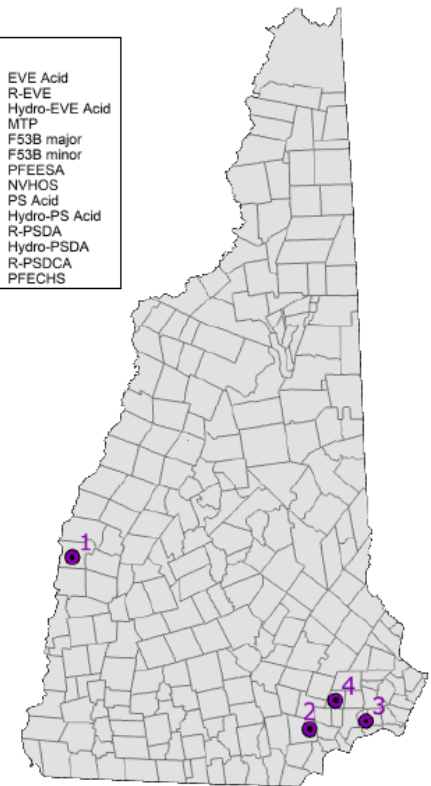
PFAS sampling at groundwater discharge sites – floor stripping/waxing



Compound			
PFPrA	PFPrS	10:2 FTCA	NEtFOSAA
PFBA	PFBS	6:2 FTUCA	HFPO-DA
PFPeA	PFPeS	8:2 FTUCA	ADONA
PFHxA	PFHxS	10:2 FTUCA	PFMOBA
PFHpA	PFHpS	4:2 FTS	NFDHA
PFOA	PFOS	6:2 FTS	PFMOPrA
PFNA	PFNS	8:2 FTS	PFCECA G
PFDA	PFDS	10:2 FTS	PFMOAA
PFUnA	PFDoDS	NMeFOSE	PMPA
PFDoDA	3:3 FTCA	NEtFOSE	PEPA
PFTrDA	5:3 FTCA	PFOSA	PFO2HxA
PFTeDA	6:2 FTCA	NMeFOSA	PFO3OA
PFHxDA	7:3 FTCA	NEtFOSA	PFO4DA
PFODA	8:2 FTCA	NMeFOSAA	PFO5DoDA
			EVE Acid
			R-EVE
			Hydro-EVE Acid
			MTP
			F53B major
			F53B minor
			PFEECA
			NVHOS
			PS Acid
			Hydro-PS Acid
			R-PSDA
			Hydro-PSDA
			R-PSDCA
			PFECHS

Floor stripping/waxing can generate very high levels of PFAS

- Up to 229,000 ng/L PFAS ($\Sigma 70$) in wastewater
- Up to nearly 39,000 ng/L PFAS ($\Sigma 70$) in cleaning products



New Hampshire Investigation- 2023

Findings

- High concentration of PFAS in wastewater from annual floor stripping and waxing at 4 schools.
- PFAS were ingredient in floor stripper and waxes.

Advice

- Contact supplier about alternative products.
- Don't discharge waste water into septic system unless you pretreat.

UNC, Chapel Hill Study 2019

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8654107/>

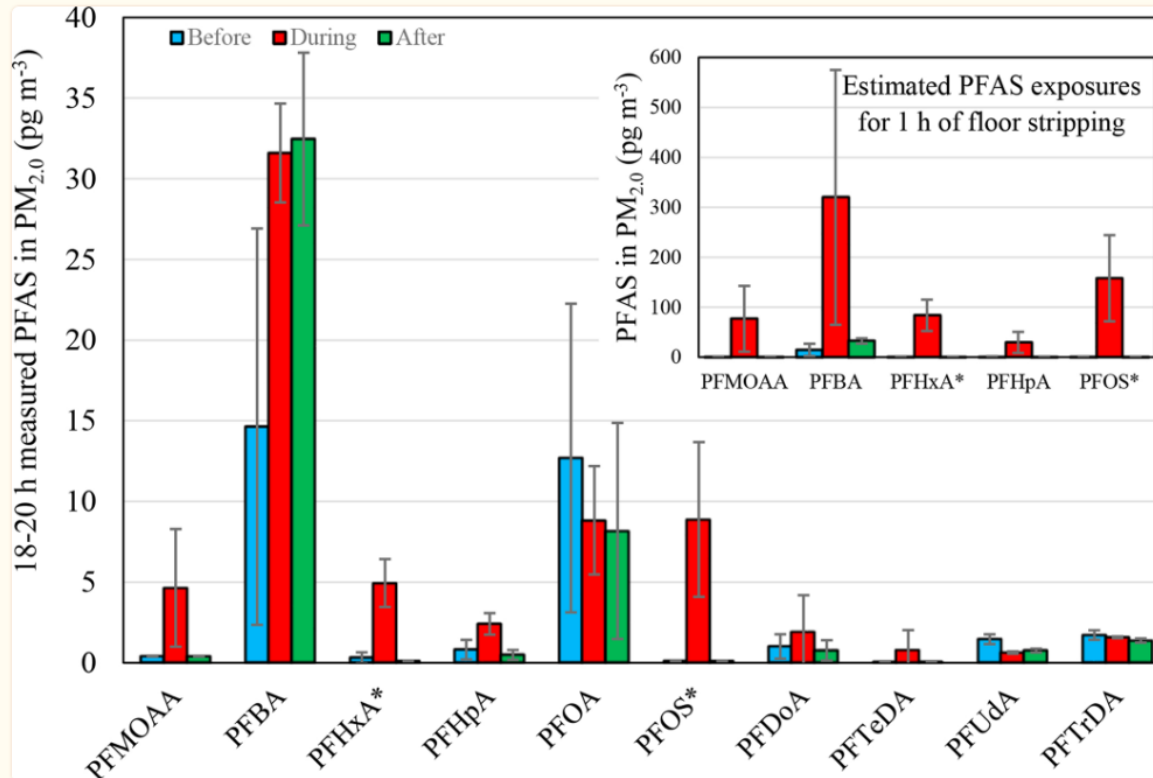


Figure 2.

PFAS concentrations in PM_{2.0} (pg m⁻³) measured before, during and after floor waxing. Mean and standard deviation (error bars) across 3 locations, Lab A, Lab B and Hallway. Field measurement detection limit (MDL) values were plotted as ½ of MDL. Asterisk (*) indicates statistical significance with 95% confidence.

Alternatives to PFAS in Floor Polish Formulations, 2021

<https://bcgc.berkeley.edu/sites/default/files/pfas-in-floor-polish-final-report.pdf>

Appendix B: Complete comparative hazard table

		N-EtFOSAA	PFBS	PFOS	Rhamnolipid	Sodium lauroyl glutamate
CAS #		67584-51-4	375-73-5	1763-23-1	4348-76-9	29923-31-7
Group I endpoints	Carcinogen	3	3	2	5	DG
	Mutagen	LC	LC	3	4	LC
	Repro/Dev	DG	2	1	DG	PC
	Endocrine disruptor	DG	1	1	DG	DG
Group II endpoints	Mammalian Toxicity	4*	2	4	4	5
	Systemic Toxicity	DG	2	1	LC	LC
	Neurotoxicity	DG	3	1	DG	DG
	Respiratory Toxicant	DG	PC	PC	4	LC
	Skin irritation	PC	1	LC	4	2
	Eye irritation	DG	2	2	1	2
Eco toxicity	Aquatic Toxicity	2*	3	2	PC	LC
Fate	Persistence	1*	1	1	5	5
	Bioaccumulation	PC*	PC	1	PC	DG

1	2	3	4	5	LC	PC	DG
Very Hazardous	Hazardous	Moderate	Low	Very Low	Low Concern	Potential Concern	Data gap
<i>Italicized = potential score; * = prediction based on similar compound</i>							
N-EtFOSAA represents a baseline fluorosurfactant in floor polish, and PFBS is its degradant.							

What Schools Can Do

Check inventory

Find PFAS-free (NGO sites)

- <https://pfascentral.org/pfas-free-products/>
- <https://www.ewg.org/without-intentionallyaddedpfaspfc>

Types of products with PFAS

Floor wax/floor stripper

Other cleaners/polishes

Grout and tile sealant

Disposable food paper

Disposable
cups/plates/bowls

Stain –resistant carpets

Stain resistant furniture,
leather

Fabric and carpet care
products



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