DEPARTMENT OF HEALTH



PFAS Regulations – State Perspective

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PFAS in the United States



Source: ITRC (2017); image reprinted with permission of Jeff Hale, Kleinfelder.

Target analyte lists still evolving

| Analyte Na | ime | Acronym | CAS Number |
|--------------------------------------|----------------|-----------|------------|
| Perfluorotetradecanoic acid* | | PFTreA** | 376-06-7 |
| Perfluorotridecanoic acid* | | PFTriA*** | 72629-94-8 |
| Perfluorododecanoic acid* | | PFDoA | 307-55-1 |
| Perfluoroundecanoic acid* | | PFUnA | 2058-94-8 |
| Perfluorodecanoic acid* | | PFDA | 335-76-2 |
| Perfluorononanoic acid* | | PFNA | 375-95-1 |
| Perfluorooctanoic acid* | | PFOA | 335-67-1 |
| Perfluoroheptanoic acid* | | PFHpA | 375-85-9 |
| Perfluorohexanoic acid* | | PFHxA | 307-24-4 |
| Perfluoropentanoic acid | | PFPeA | 2706-90-3 |
| Perfluorobutanoic acid | | PFBA | 375-22-4 |
| Perfluorodecanesulfonate | | PFDS | 335-77-3 |
| Perfluorononanesulfonate | | PFNS | 68259-12-1 |
| Perfluorooctanesulfonate* | | PFOS | 1763-23-1 |
| Perfluoroheptanesulfonate | | PFHpS | 375-92-8 |
| Perfluorohexanesulfonate* | | PFHxS | 355-46-4 |
| Perfluoropentansulfonate | | PFPeS | 2706-91-4 |
| Perfluorobutanesulfonate* | | PFBS | 375-73-5 |
| Perfluorooctanesulfonamide | | PFOSA | 754-91-6 |
| Fluorotelomer sulfonate 8:2 | | FtS 8:2 | 39108-34-4 |
| Fluorotelomer sulfonate 6:2 | | FtS 6:2 | 27619-97-2 |
| Fluorotelomer sulfonate 4:2 | | FtS 4:2 | NA |
| N-ethyl-N-((heptadecafluorooctyl)sul | onyl)glycine* | NEtFOSAA | 2991-50-6 |
| N-(Heptadecafluorooctylsulfonyl)-N-r | nethylglycine* | NMeFOSAA | 2355-31-9 |

"What's So Special About PFAS?"

Table modified from Ducatman, 2018

| | PFAAs | Dioxins & PCBs | |
|---|-------|-------------------|--|
| Highly water soluble | Yes | No | |
| Bind well to soil & sediments | Νο | Yes | |
| Degrades to some extent in the environment | No | Yes | |
| Bioaccumulate in fish * True for PFAAs with 8 or more fluorinated carbons (PFOS, PFNA, and longer-chain) | Yes* | Yes | |
| Bioaccumulate in lipids Complicates our understanding of | Νο | Yes | |
| "Proteinphilic" bioaccumulation and toxicity ppt in water | r Yes | Νο | |
| Drinking water is major exposure route | Yes | No | |
| Removed by conventional wastewater treatment ppb in serun | No | Maybe (TSS) | |

UCMR3 – Inviting everybody to the PFAS party

- 2013-2015 list included 6 PFAAs (PFOS, PFOA, PFNA, PFHxS, PFHpA, PFBS)
- Municipal systems >10,000 and selected smaller systems
- Detected in ~4%, exceeded EPA LHAs in ~1.3%
- High RLs and sampled only at entry points, not wellheads



State standards and guidance

States are setting their own standards or guidance within available regulatory frameworks:

- Most have adopted EPA LHAs
- Others have set lower values (MN, NJ, VT)
- Driven by the PFAAs being found...and the target analyte list
- Mixtures:
 - Most states adopted EPA additivity of PFOS and PFOA
 - Minnesota has a TEQ-like process for PFOA, PFOS, PFBA, PFBS, and PFHxS
 - Vermont recently announced Σ PFOA+PFOS+PFHxS+PFHpA+PFNA must be <20 ng/L
- North Carolina has a non-promulgated value for GenX in drinking water
- Creates public confusion and makes risk communication very difficult!

| | | | | PFAS Analyte Concentration in Water (ug/L) | | | | | | | | | | | | | |
|--|---------------------------------|------------------|--------------|--|-------|---------------------------------------|------|------|-------|---------------------------------------|-------|-------|-------|------|--------------------------------------|---------|-------|
| | Standard / | | Promulgated | | | | | | | | | | | | PFDS, PFUnA, PFDoA, PFTrDA, | | |
| | Guidance | Туре | Rule (Y/N/O) | PFOA | PFOS | PFNA | PFBA | PFBS | PFHxS | PFHxA | PFPeA | PFHpA | PFOSA | PFDA | PFTeDA | 6:2 FTS | Gen-X |
| USEPA | HA | DW | N | 0.07 | 0.07 | | | | | | | | | | | | |
| Charles Contact - March I for some | RSL | GW | N | | | | | 400 | | | | | | | | | |
| | RSL Calculation | GW | N | 0.4 | 0.4 | | | | | | | | | | | | |
| U.S. States | | | | | | | | | | | | | | | | | |
| Alabama (AL) | HA | DW | N | 0.07 | 0.07 | | | | | | | | | | | | |
| Alaska (AK) | CL | GW | Y | 0.40 | 0.40 | | | | | | | | | | | | |
| Arizona (AZ) | HA | DW | N | 0.07 | 0.07 | | | | | | | | | | | | |
| Colorado (CO) | HA | DW | N | 0.07 | 0.07 | | | | | | | 0.07 | | | | | |
| | HA | GW | N | 0.07 | 0.07 | | | | | | | | | | | | 1 |
| Connecticut (CT) | AL | DW/GW | N | 0.07 | 0.07 | 0.07 | | | | 0.07 | | 0.07 | | | | | |
| Delaware (DE) | RL | GW | N | 0.07 | 0.07 | | | | | | | | | | | | |
| Delaware (DE) | SL | GW | N | 0.07 | 0.07 | | | 38 | | | | | | | | | |
| Levie (IA) | Statewide | Protected GW | Y | 0.07 | 0.07 | | | | | | | | | | | | |
| IOWA (IA) | Standards | Non-protected GW | Y | | 1 | | | | | | | | | | | | |
| | Health-based MEG | DW | N | 0.07 | 0.07 | | | | | | | | | | | | |
| Maine (ME) | DAO | GW | N | 0.13 | 0.56 | | | | | | | | | | | | |
| | RAG | RW | N | 0.05 | 1.2 | | | | | | | | | | | | |
| Massachusetts (MA) | Guidance Values | DW | 0 | 0.07 | 0.07 | 0.07 | | 2 | | 0.07 | | 0.07 | | | | | |
| | HNV | SW | Y | 0.42 | 0.011 | · · · · · · · · · · · · · · · · · · · | | | | | | | | | | | |
| wichigan (wi) | GCC | GW | Y | 0.07 | 0.07 | | | | | | | | | | | | |
| | short-term HBV | DW/GW | O/N | 0.035 | 0.027 | | 7 | 3 | 0.027 | | | | | | | | |
| Minnesota (MN) | subchronic HBV | DW/GW | O/N | 0.035 | 0.027 | | 7 | 3 | 0.027 | | | | | | | | |
| | chronic HBV | DW/GW | O/N | 0.035 | 0.027 | | 7 | 2 | 0.027 | | | | | | | | |
| Nevada (NV) | BCL | DW | N | 0.667 | 0.667 | | | 667 | | | | | | | | | |
| New Hampshire (NH) | AGQS | GW | Y | 0.07 | 0.07 | 1 | | | | | | | | | | | |
| | GWQS | GW | Y | | | 0.010 | | | | | | | | | | | |
| | MCL | DW | 0 | | | 0.013 | | | | | | | | | | | |
| New Jersey (NJ) | MCL | DW | 0 | | | 0.013 | | | | | | | | | | | |
| nan an an ann an an an an an an an an an | MCL | DW | 0 | 0.014 | | | | | | | | | | | | | |
| | MCL | DW | 0 | | 0.013 | | | | | | | | | | | | |
| North Carolina (NC) | IMAC | GW | Y | 2 | | Ĩ | | | | · · · · · · · · · · · · · · · · · · · | | | | | | | |
| | | DW | N | | | | | | | | | | | | | | 0.14 |
| Oregon (OR) | IL | SW | Y | 24 | 300 | 1 | | | | | | 300 | 0.2 | | | | |
| Pennsylvania (PA) | | DW | N | 0.07 | 0.07 | | | | | | | | | | | | |
| Rhode Island | Groundwater Quality Standard | DW/GW | Y | 0.07 | 0.07 | | | | | | | | | | | | |
| Texas (TX) | Tier 1 PCL | GW | Y | 0.29 | 0.56 | 0.29 | 71 | 34 | 0.093 | 0.093 | 0.093 | 0.56 | 0.29 | 0.37 | 0.29 | | |
| Vermont (VT) | PGWES | GW/DW | Y | 0.02 | 0.02 | | | | | | | | | | | | |
| West Virginia (WV) | HA | DW | N | 0.07 | 0.07 | | | | | | | | | | | | |

Table modified from ITRC (June 2018) Table 4-1: https://pfas-1.itrcweb.org/factsheets/

Why are some states setting such low values?

- Longer chain PFAAs are highly bioaccumulative
 - Parts per trillion in drinking water = parts per billion in blood serum
 - Ongoing exposures = lifetime steady state concentrations
- Relative source contribution (RSC) > default 20%
 - RSC = 50% based on recent biomonitoring data of drinking water exposed pops.
- Variable, age-based intake rates (IR) much higher for infants
- Biological activity at very low exposures = lower "allowable" serum levels
- Significant potential exposure for babies born to exposed mothers
 - Placental transfer: PFOA ~60-200% of drinking water concentrations
 - Breastmilk: PFOA ~2.6-12% of maternal serum concentrations





Sources of Variability in State Standards

| | | Relative | Total | | Method for Administerd | | |
|----------------|--------------------------------------|--------------|----------------|-------------|----------------------------|--|--|
| | | Source | Uncertainty | | Dose conversion to | | |
| State | Receptor | Contribution | | Species | Internal Serum Level | | |
| Alaska | Child | 1 | Based on EPA | | | | |
| | (0-6 years) residential, non-cancer | | | | | | |
| Maine | Adult | 0.6 | 300 | Mice, Rats | NA - used administered | | |
| | | | | and Monkeys | dose | | |
| Minnesota | Infant exposure via breastmilk for 1 | 0.5 | 300 | Mice | EPA Modeled serum | | |
| | year, from mother chronically | | | | concentration | | |
| | exposed via water, followed by | | | | | | |
| | lifetime of exposure via drinking | | | | | | |
| | water | | | | | | |
| New Jersey | Adult | 0.2 | 300 | Mice | Direct serum concentration | | |
| | | | | | | | |
| North Carolina | Adult | 0.2 | 30 | Cynomolgus | Direct serum concentration | | |
| | | | | monkeys | | | |
| Texas | Child | NA | 300 | Mice | NA - used administered | | |
| | (0-6 years) residential, non-cancer | | | | dose | | |
| USEPA | Lactating women | 0.2 | 300 | Mice | Modeled serun | | |
| | | | | | concentration | | |
| Vermont | Infant | 0.2 | 2 Based on EPA | | | | |
| | (0-1 year) | | | | | | |

Table used with permission from Shalene Thomas, Wood Group ⁹

Other state regulatory approaches

- Product labeling and consumer product laws (ex: CA, WA, OR ?)
- Chemical action plans (ex: WA)
- Designation as hazardous waste or substance (ex: CO, NY, VT, NJ, AK)
- AFFF bans, excluding DoD and FAA-regulated facilities (ex: WA)
- AFFF "take back" programs (ex: NY, MA)
- Effluent and surface water standards (ex: CA, MI, MN, OR)
- Risk-based soil and groundwater screening or cleanup values (ex: TX, AK, CT, VT, NH)
- Prioritized source inventories (ex: MN)
- Testing all public water supplies for PFAS (ex: MI)

ITRC PFAS Fact Sheets

- Available online [https://pfas-1.itrcweb.org/fact-sheets]
 - History and Use
 - Naming Conventions & Physical and Chemical Properties
 - Regulations, Guidance and Advisories
 - Guidance values tables updated monthly (US federal & states, international)
 - Environmental Fate & Transport
 - Site Characterization Tools, Sampling Techniques, & Laboratory Analytical Methods
 - Remediation Technologies & Methods
 - AFFF (to be published September 2018)
 - Tailored to the needs of state regulatory program staff concise, current, web-based



Other ITRC PFAS Products – in the works

- Technical-Regulatory Document (Oct.-Nov. 2019)
 - More in-depth exploration of current state of knowledge of PFAS
 - Includes stakeholder perspectives and case studies
- Training Workshops (Oct. 2018 June 2019)
 - 8-10 regional trainings (4-hr or 8-hr)
 - Aimed at state regulatory program staff (but others welcome)
- Risk Communication Toolkit (June 2019)
- Internet Based Training (Oct.-Nov. 2019)



More Information and References

ITRC PFAS documents: https://pfas-1.itrcweb.org/

MDH general PFAS Information and guidance values: <u>http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/index.html</u> <u>http://www.health.state.mn.us/divs/eh/risk/guidance/gw/table.html</u>

MPCA PFAS Investigations:

<u>http://www.pca.state.mn.us/index.php/waste/waste-and-cleanup/cleanup-programs-and-topics/topics/perfluorochemicals-pfc/perfluorochemicals-pfc/perfluorochemicals-pfcs.html?menuid=&redirect=1</u>

ADD SERDP info?

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