



PFAS 101

PER AND POLY-FLUOROALKYL SUBSTANCES (PFAS)

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Take-Home Messages

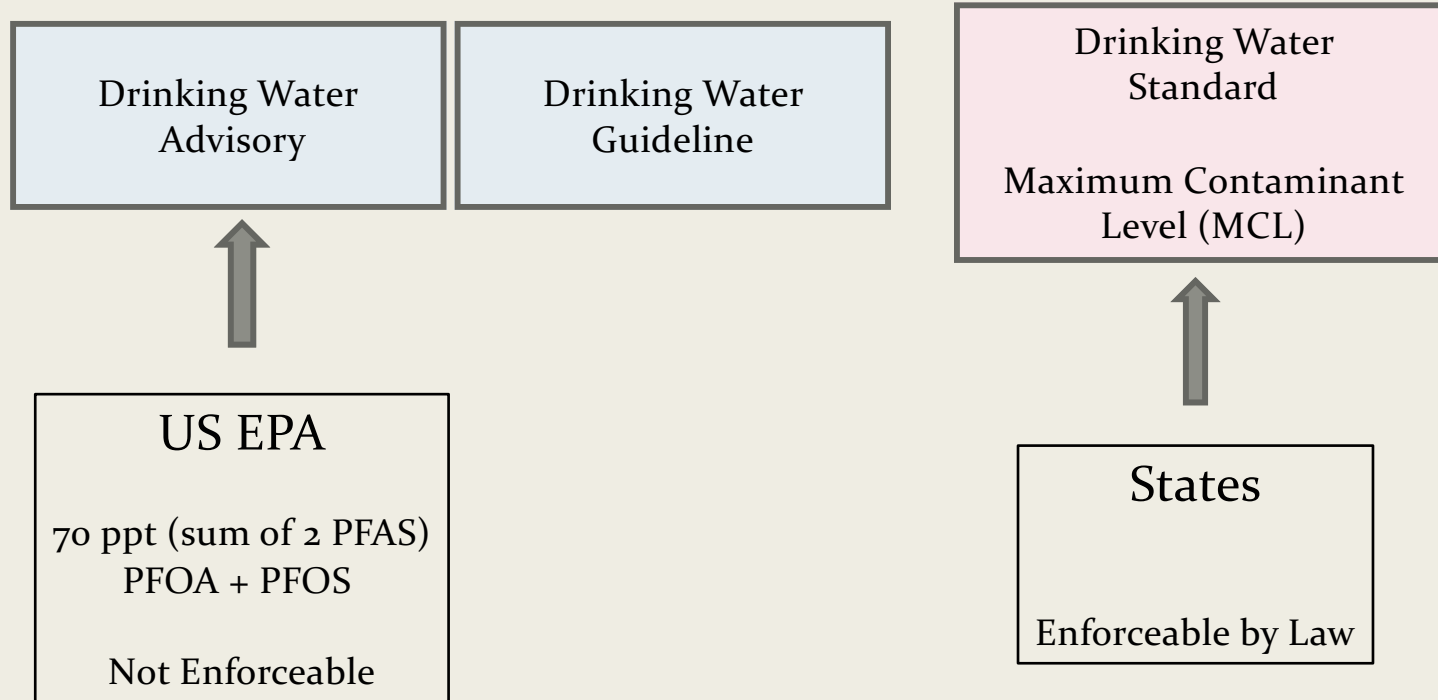
1. Because of the prevalence and toxicity of PFAS, MA has the **PFAS6 drinking water standard**.
2. PFAS are a large class of chemicals that are ubiquitous and do not break down = **Forever Chemicals**;
3. PFAS are used in industrial and consumer products.
4. PFAS are toxic at very low amounts –**immune (Ab generation in response to vaccine)**, reproductive, developmental, metabolic diseases and cancers; **[which is why the concern]**;

Massachusetts Requires Testing of Public Drinking Water Supplies for PFAS6

> 50 of the larger systems have PFAS >20 ppt



Presence of a Hazard in Drinking Water*



* Data from animal and human studies document the adverse health effects, supporting the need and basis for the guideline/standard

Drinking Water Values for PFAS (ppt = ng/L)

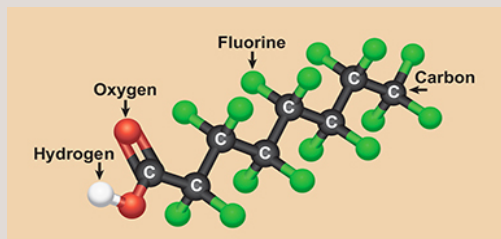
	PFOS	PFOA	PFNA	PFHxS	PFHpA	PFDA
U.S. EPA	70		NA	NA	NA	NA
Health Advisory	Sum of Two					
MA MCL, GW standard	Sum of six PFAS = 20					
	MCL October 2020: Sum of six PFAS = 20					
VT MCL	20 Sum of five					NA
CT Action Levels	70 Sum of five					NA
WI Recommended GW standard	20					
ATSDR Based on draft ATSDR toxicity values and EPA exposure parameters	7	11	10	70	NA	NA
NY MCL	10	10	NA	NA	NA	NA
NJ MCL	13	14	13	NA	NA	NA
CA Notification levels (Response Levels)	6.5 (40)	5.1 (10)	NA	NA	NA	NA
MI MCL	16	8	6	51	NA	PFNA value recommended
MN guidelines	15	35	NA	47	NA	NA
NH MCL	15	12	11	18	NA	NA
Most other states (EPA value by default)	70		NA	NA	NA	NA



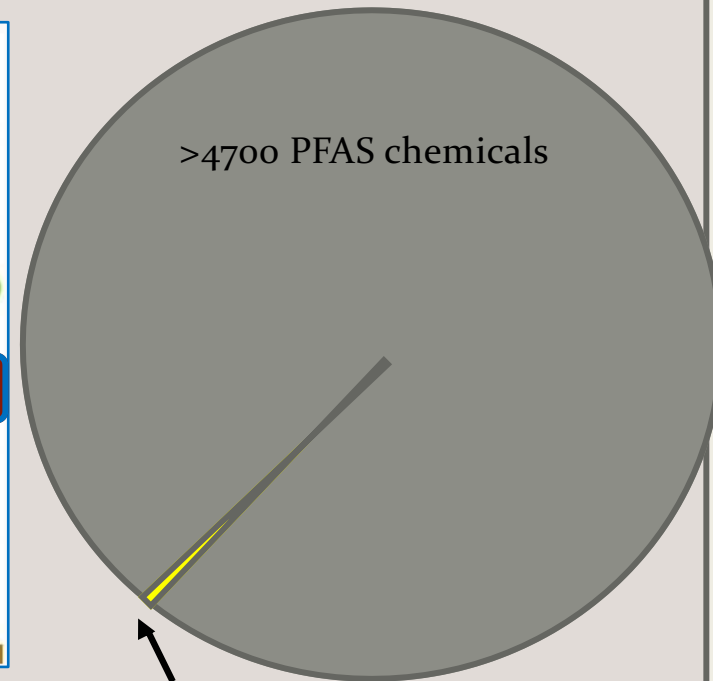
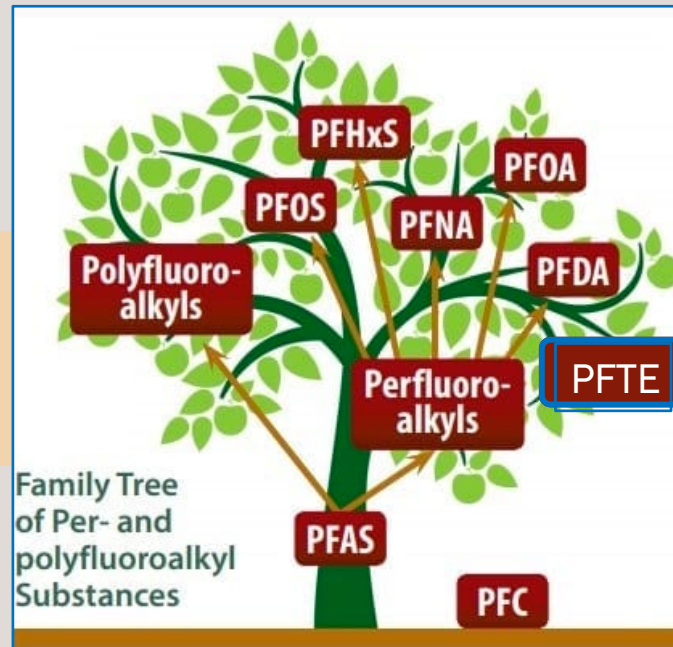
Want to Prevent:

- **Developmental effects in fetus**
- Liver damage
- **Increased cholesterol levels**
- Increased risk of thyroid disease
- **Decreased antibody response to vaccines**
- Decreased breastfeeding
- Increased risk of asthma diagnosis
- Increased risk of decreased fertility
- Various forms of cancer, including testicular and kidney cancer

Per- and Polyfluoroalkyl Substances (PFAS): “Forever Chemicals”



“C8 = PFOA & PFOS



PFAS in water - not single chemicals, but mixtures of individual chemicals

“PFAS6” MCL is **20 ppt** for the sum of six PFAS

- PFOS: perfluorooctane sulfonic acid
- PFOA: perfluorooctanoic acid
- PFHxS: perfluorohexane sulfonic acid
- PFNA: perfluorononanoic acid
- PFHpA: perfluoroheptanoic acid
- PFDA: perfluorodecanoic acid

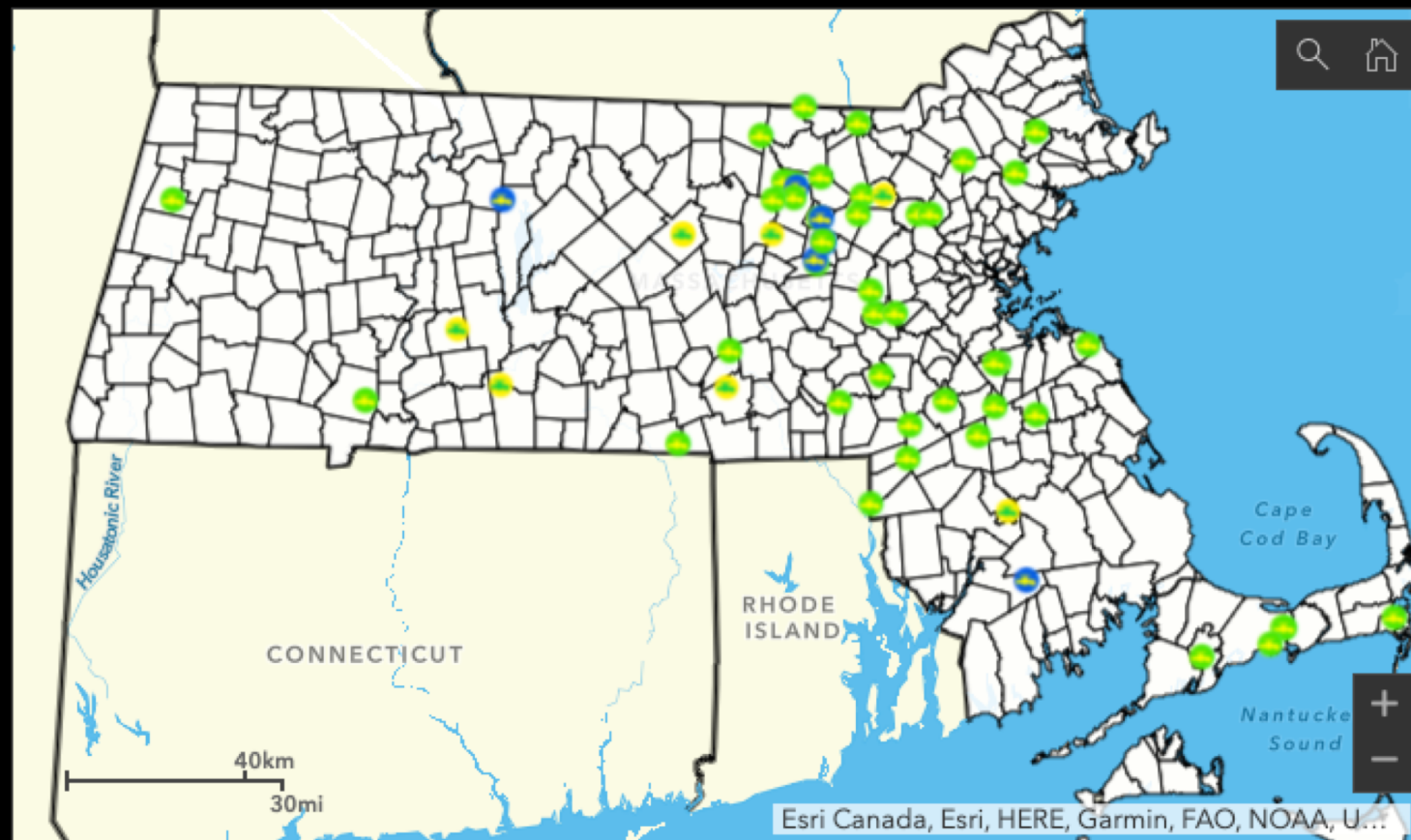
Based on prevention of developmental effects in the human fetus/infant in pregnant and lactating women

Means that effects are not expected to occur at the MCL



Public Water System PFAS Detection and Response Actions

Public Water Systems (PWS) who detected PFAS6 over the Maximum Contaminant Level (MCL) in their finished water and their re...



PWS detected PFAS6 above 20 ppt

Abington/Rockland Joint
Water Works

Acton Water District

Aquarion Water Company,
Millbury

Ayer DPW Water Division

Ayer Road Properties, LLC

Barnstable Fire District
Water Department

Bedford Water Dept

Bellingham Water Dept

Bolton Orchards

Braintree Water Dept

Brockton Water Department

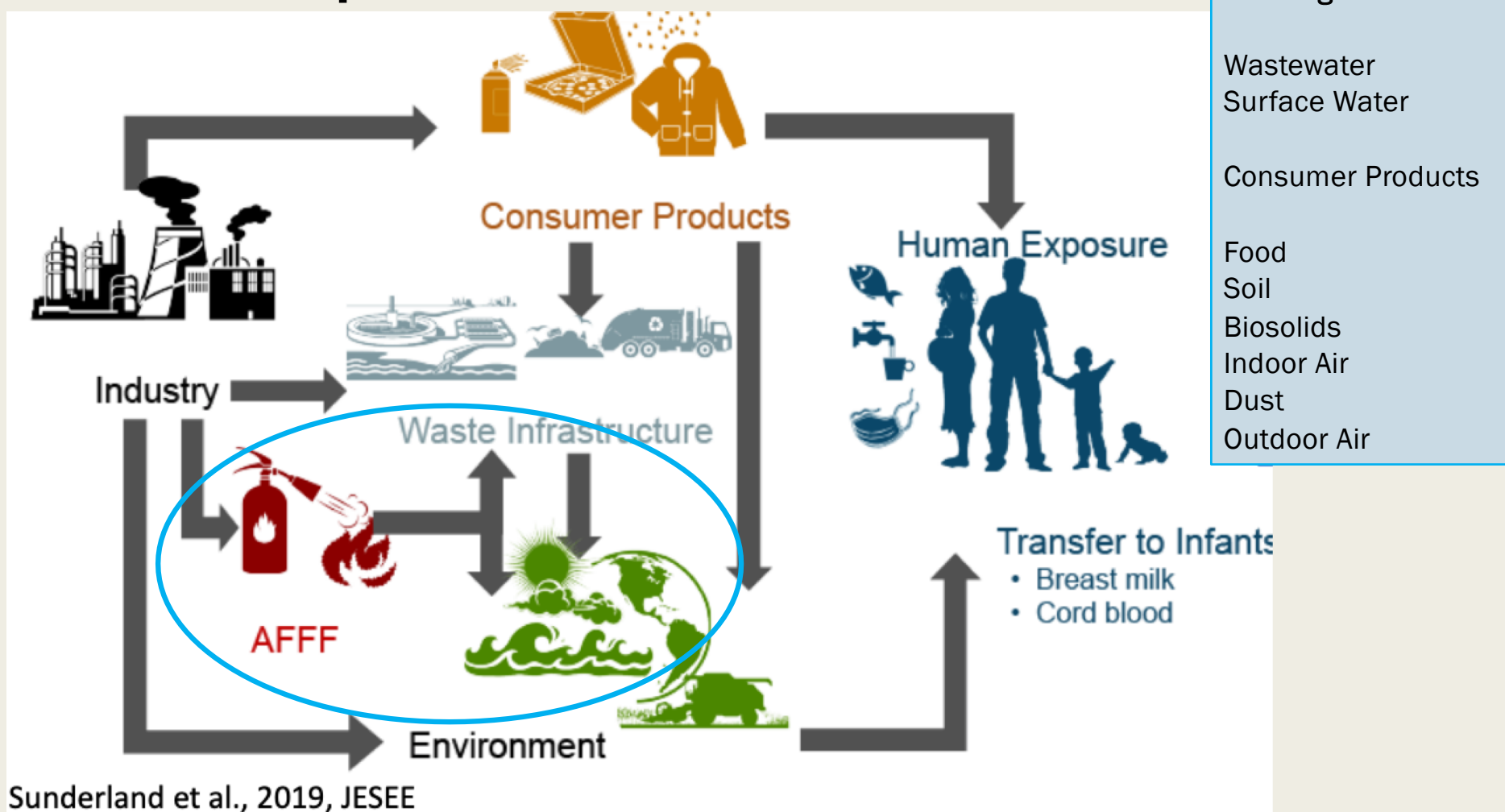
Map

PWS types

More info

<https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas>

Human Exposures to PFAS



Sources – AFFF, Manufacturing, other... Food Packaging, Dental Floss,Food....Cosmetics



<https://www.youtube.com/watch?v=Lc8x-ZB8RXg>

Drinking Water

- Public Water Supplies – defined by # of people served
- Private Water Supplies – privately owned

<https://eeaonline.eea.state.ma.us/portal#!/search/drinking-water>

The derivation of the MassDEP drinking water value based on this RfD is described below:

$$\text{Drinking water value} = \frac{\text{RfD} \times \text{RSC}}{\text{Water consumption rate per kg body weight}}$$

Where:

RfD	= 5×10^{-6} mg/kg-day
Water consumption rate for lactating woman	= 0.054 L/kg-day
Relative Source Contribution Factor (RSC)	= 0.2

$$\begin{aligned}\text{Drinking Water Value} &= \frac{5 \times 10^{-6} \text{ mg/kg-day} \times 0.2}{0.054 \text{ L/kg-day}} \\ &= 0.0000185 \text{ mg/L} \\ &= 0.00002 \text{ mg/L or } 20 \text{ ng/L (20 ppt), rounded to one significant figure}\end{aligned}$$