



Summary of the Evaluation of Literature PFOA & PFOS Bioaccumulation Factors for use in Surface Water Standards Development

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Surface Water Standards

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Protect a variety of surface water uses including:

- Human consumption of fish tissue
- Protection of specified waters for use as public water supplies (Water Supplies)

Standards established from:

- Published EPA Clean Water Act criteria
- Other published EPA regulatory values
- Calculated per 15A NCAC 02B .0208 – Narrative Standard for Toxic Substances

What are Bioaccumulation Factors (BAFs)?

Bioaccumulation Factors (BAFs)

Estimate accumulation in fish tissues from exposure with water & food

Determined by comparing fish tissue concentrations to water column concentrations from samples taken at the same location

$$BAF = \frac{C_{Biota}}{C_{Water}}$$

Where:

C_{Biota} = Concentration in fish tissue

C_{Water} = Concentration in water

BAF units = L/kg-wet weight

How are BAFs used to develop standards?

BAFs used to **determine water column concentrations** that, if met, **prevent accumulation** of a substance in fish tissue **to a level that is potentially harmful to people**

BAF used in the 02B .0208 criteria calculations

$$\text{Fish Tissue Standard} = (RfD \times RSC) \times \frac{BW}{FCR \times \mathbf{BAF}}$$

$$\text{Water Supply Standard} = (RfD \times RSC) \times \frac{BW}{WCR + (FCR \times \mathbf{BAF})}$$

Constants defined in 02B .0208:

BW = Body Weight = 70 kg

WCR = Water Consumption Rate = 2 L/day

FCR = Fish Consumption Rate = 17.5 g/person/day

BAF sources

EPA evaluated literature BAFs as part of their draft criteria documents for Aquatic Life (2022)

[Draft Aquatic Life Ambient Water Quality Criteria for PFOA](#)
(EPA 842-D-22-001)

[Draft Aquatic Life Ambient Water Quality Criteria for PFOS](#)
(EPA 842-D-22-002)

NC-Specific Evaluation of BAFs

NCDEQ staff further evaluated EPA BAFs to identify:

- NC resident fish species
- Shellfish species with related species in NC
- Commonly consumed species
- Fish muscle tissue BAFs
- Whole body (WB) BAFs for shellfish

Dec 2022- Board requested that all species be included in the calculations for comparison.

BAF Comparison

PFAS	Group	Min	Max	GeoMean	Average	Median
PFOS	<i>NC Fish Muscle</i>	<i>537</i>	<i>7943</i>	<i>1962</i>	<i>3081</i>	<i>1585</i>
	<i>NC Fish + Shellfish</i>	<i>122</i>	<i>7943</i>	<i>1645</i>	<i>2635</i>	<i>1585</i>
	All Fish Muscle	9	50234	1555	4574	1585
	All Fish + Shellfish	9	50234	1520	4170	1585
PFOA	<i>NC Fish Muscle</i>	<i>3</i>	<i>213</i>	<i>13</i>	<i>29</i>	<i>10</i>
	<i>NC Fish + Shellfish</i>	<i>3</i>	<i>9680</i>	<i>51</i>	<i>741</i>	<i>32</i>
	All Fish Muscle	0.3	313	15	55	13
	All Fish + Shellfish	0.3	9680	28	390	37

The BAFs listed here are published in the 2022 EPA Draft Aquatic Life Criteria for PFOA; PFOS

(Fish = Fish Muscle Tissue BAFs
Shellfish = Whole Body BAFs)

Request for SSAB

- 1) Does the SAB support for the use of EPA literature for the foundation for BAFs for NC?
- 2) Is the method that DEQ Applied to the EPA's vetted BAF data a scientifically sound approach for NC BAFs?
- 3) Which value is most appropriate - the average, geomean, median, or some other statistic to represent PFOA & PFOS BAFs for NC?