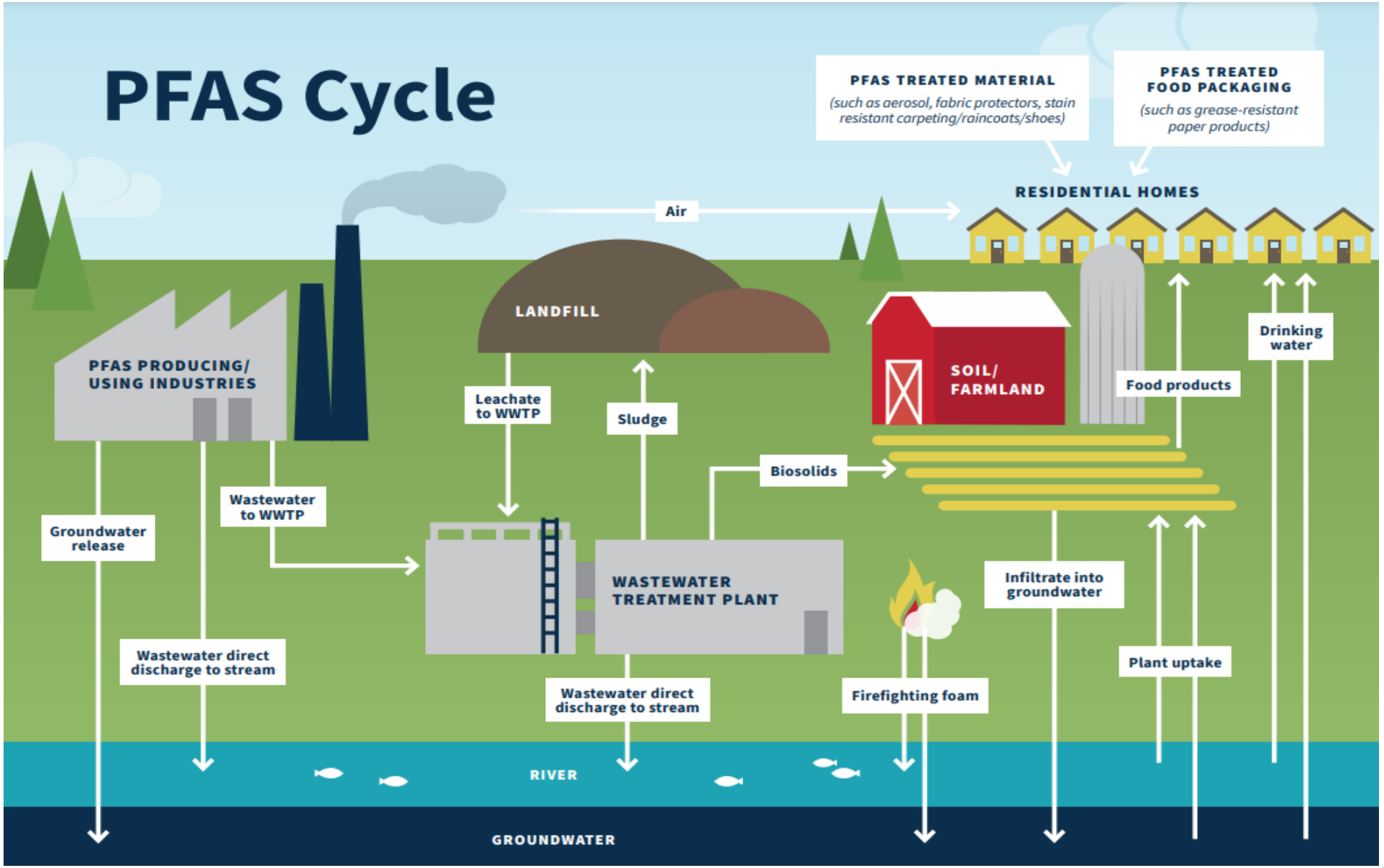
MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

# Source Identification & PFAS Reduction at Municipal WWTPs and Land Applied Biosolids

Christian Smith
Emerging Pollutants Section
Water Resources Division
517-257-0251 | SmithC186@Michigan.gov


PFAS Cycle
PFAS TREATED MATERIAL
(such as aerosol, fabric protectors, stain resistant carpeting/raincoats/shoes)
PFAS TREATED FOOD PACKAGING
(such as grease-resistant paper products)
RESIDENTIAL HOMES
Air
LANDFILL
PFAS PRODUCING/ USING INDUSTRIES
SOIL/ FARMLAND
Drinking water
Food products
Leachate to WWTP
Sludge
Biosolids
Wastewater to WWTP
Groundwater release
WASTEWATER TREATMENT PLANT
Infiltrate into groundwater
Plant uptake
Wastewater direct discharge to stream
Wastewater direct discharge to stream
Firefighting foam
RIVER
GROUNDWATER

# Michigan PFAS Criteria: Surface Water

Rule 57 Toxic Substances of the Part 4 Water Quality Standards

Natural Resources & Environmental Protection Act (NREPA) – Part 31, Water Resources Protection

| PFAS | HNV* (drinking) (ppt) | HNV* (nondrinking) (ppt) |
|---|---|---|
| PFOS | 11 | 12 |
| PFOA | 66 | 170 |
| PFBS | 8,300 | 670,000 |
| PFHxS** | 59 | 210 |
| PFNA** | 19 | 30 |

*Human Noncancer Value (HNV) ** New Water Quality Values



EGLE

**2018**: IPP PFAS Initiative

February 2018, 95 WWTPs required to screen Industrial Users for sources of PFAS

**2018** Statewide Study

42 WWTPs sampled influent, effluent, and residuals

**2021** Biosolids Interim Strategy

Utilizing Results of 2018 Statewide study, implemented Land Application of Biosolids Containing PFAS Interim Strategy

# Industrial Pretreatment Program PFAS Initiative

- February 2018 – 95 WWTPs required to screen Industrial Users
  - Evaluate Industrial Users for potential sources of PFAS
  - Follow-up sampling of sources
  - Sample WWTP effluent if sources > screening criteria (**12 ppt** PFOS)
  - Sample biosolids if WWTP effluent ≥ 50 ppt PFOS
  - Reduce/Control/Eliminate PFAS discharge **at source**
  - Ongoing monitoring & reporting for WWTPs with sources



EGLE

# Sources of PFAS to WWTPs

Municipal WWTPs are passive receivers of PFAS from users of sewer system

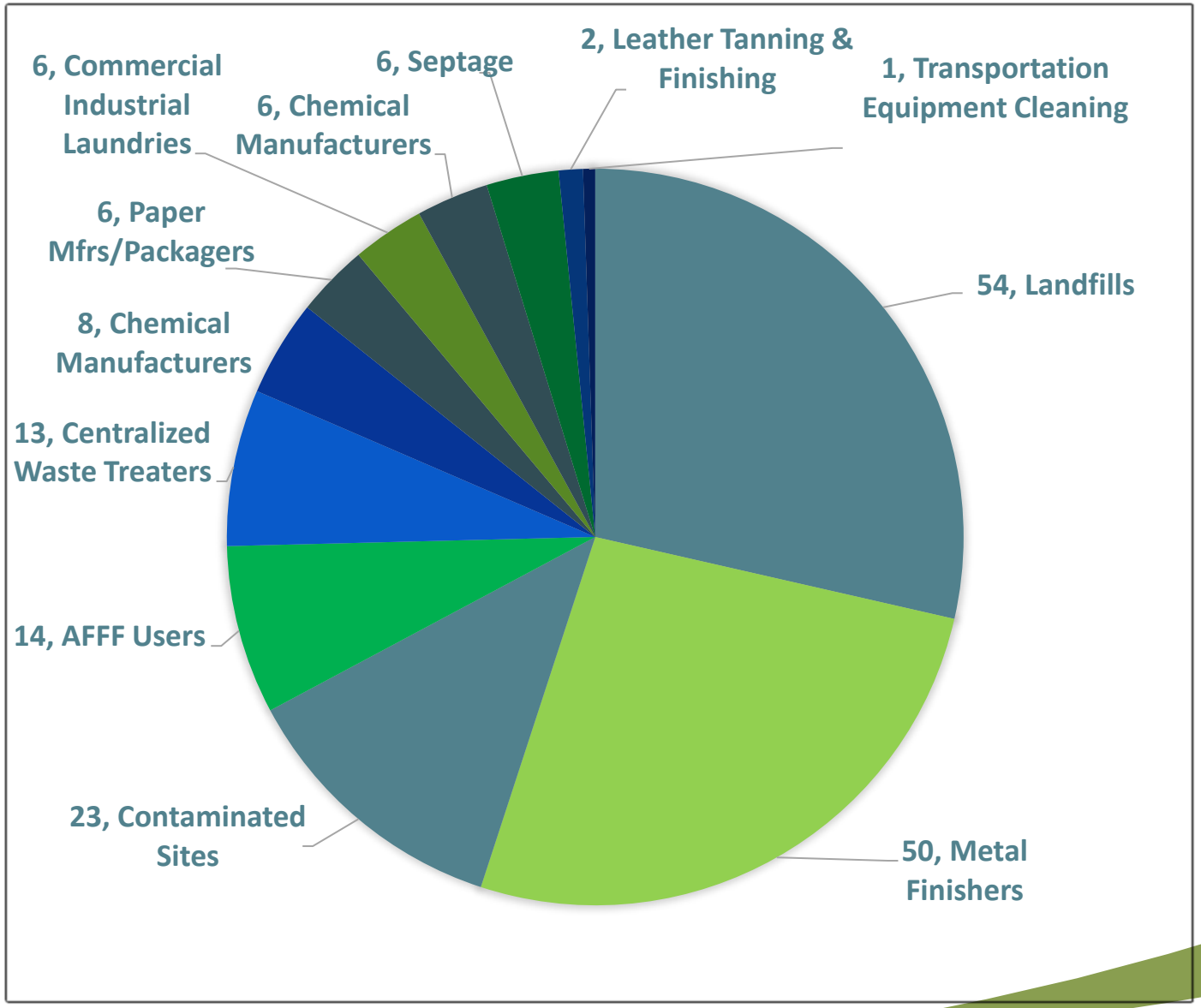
Industrial, commercial, and residential users can all contribute PFAS.

Depending on size of WWTP and process water flow, some industrial sources can contribute significant loading of PFAS (PFOS) to municipal wastewater plants

Significant sources identified in MI

Conventional municipal treatment systems do not remove PFAS.

**PFAS will pass through in effluent discharges and accumulate in biosolids**



## Reductions in PFOS, WWTP Effluent and Biosolids (Industrially Impacted)

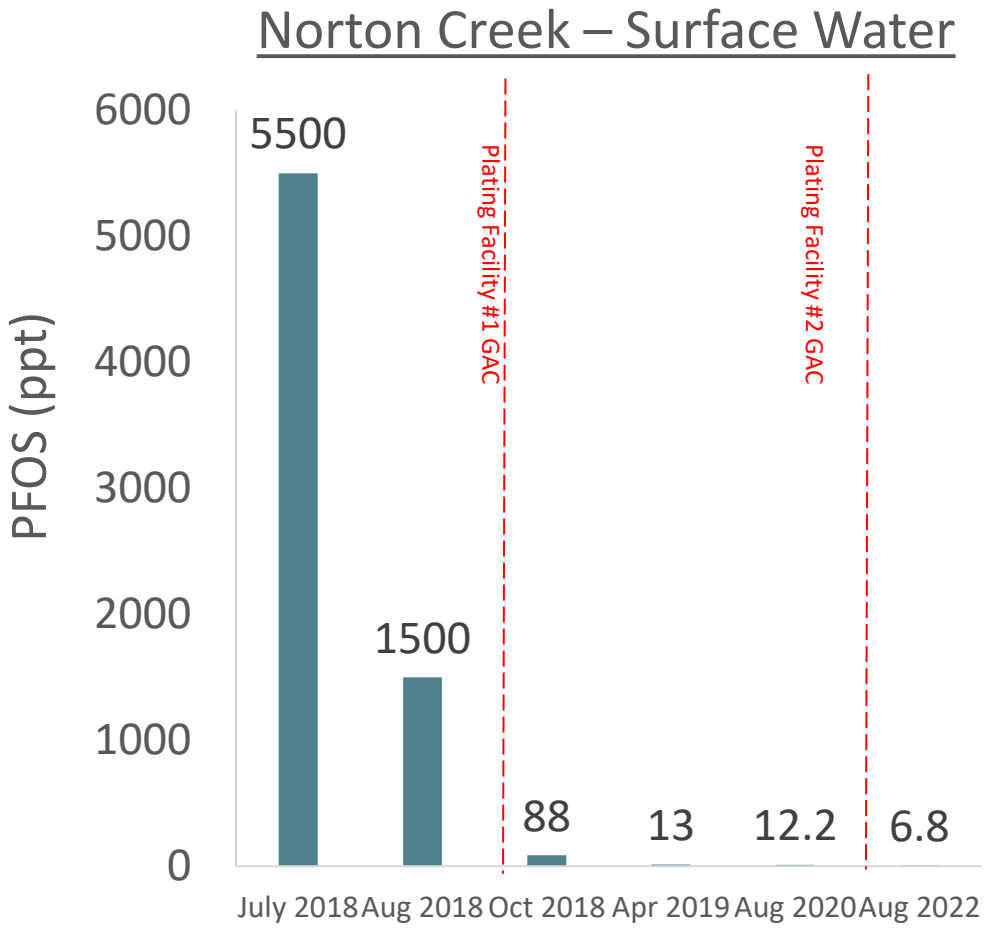
| Municipal WWTP | Highest Effluent PFOS (ppt) | Most Recent* Effluent PFOS (ppt) | PFOS Reduction in Effluent | 2018 Biosolids PFOS (ppb) | Most Recent* PFOS (ppb) | PFOS Reduction in Biosolids |
|---|---|---|---|---|---|---|
| WWTP #50 | 540 | <1.9 | 99% | 983 | 18 | 98% |
| WWTP #14 | 360 | 4.56 | 99% | 1060 | 27 | 97% |
| WWTP #57 | 2000 | 7.5 | 99% | 1680 | 31 | 98% |
| WWTP #54 | 240 | 3.4 | 93% | 387 | 57 | 85% |
| WWTP #92 | 4800 | 3.6 | 99% | 2150 | 17 | 99% |

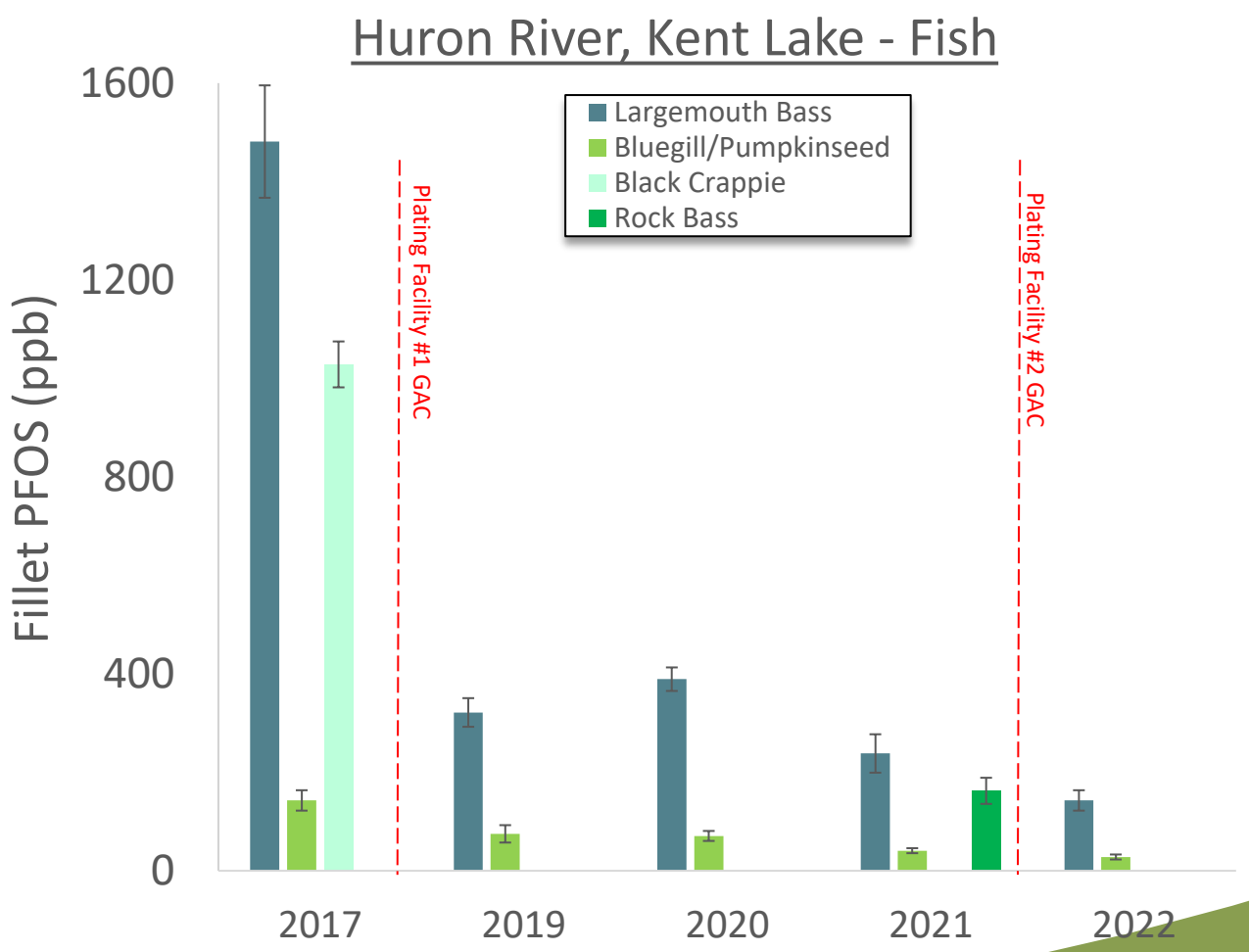
*Data received by October 31, 2024



EGLE

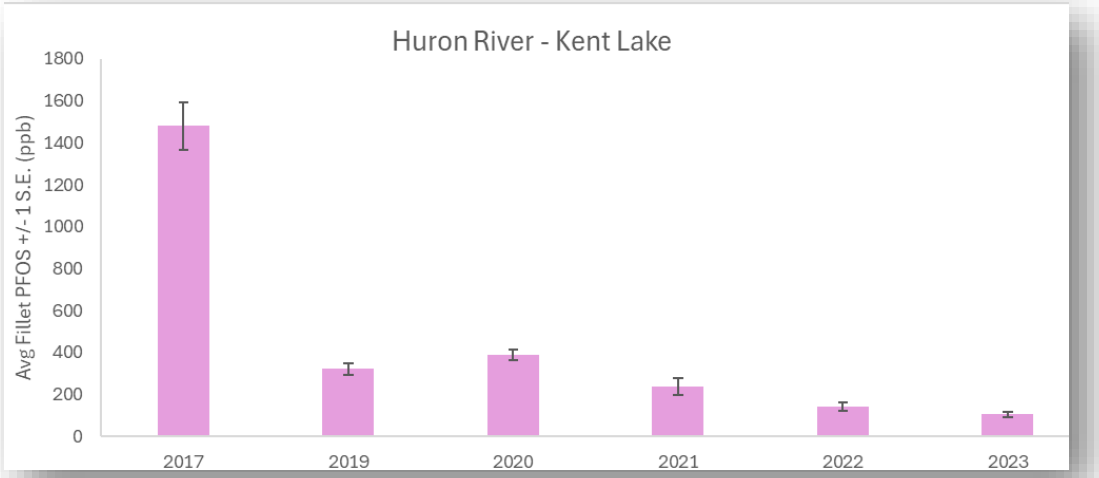
# “Quick” response in fish and surface water after source control



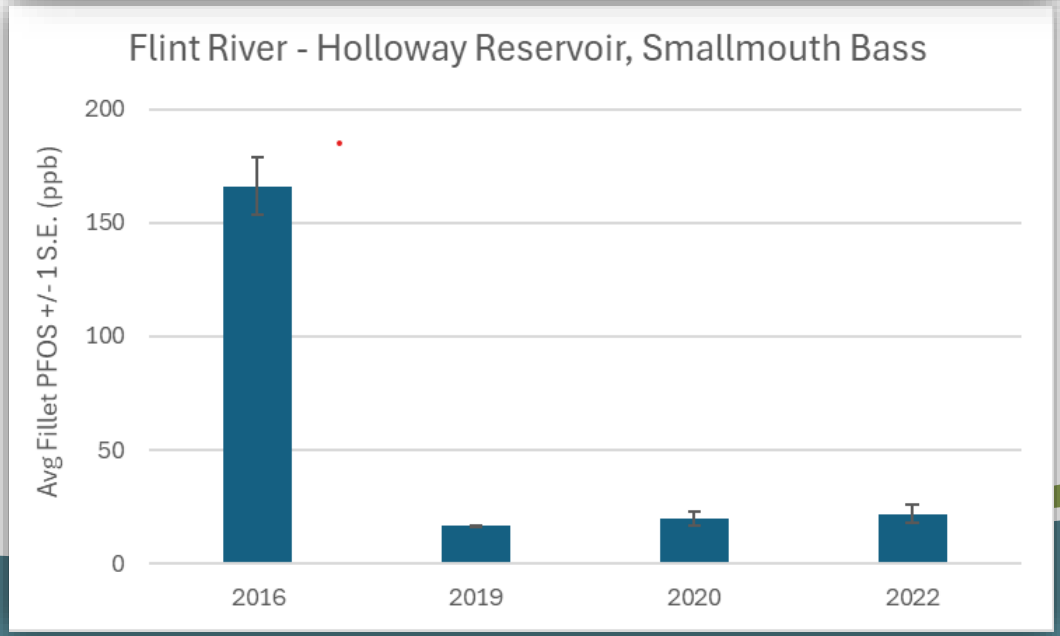



# Corresponding reductions observed in fish downgradient of industrially impacted discharges from WWTPs once source control was implemented

90% reduction in average PFOS concentrations in largemouth bass in Kent Lake (Huron River) – WWTP #92




87% reduction in PFOS concentrations in smallmouth bass in the Holloway Reservoir (Flint River) – WWTP #57



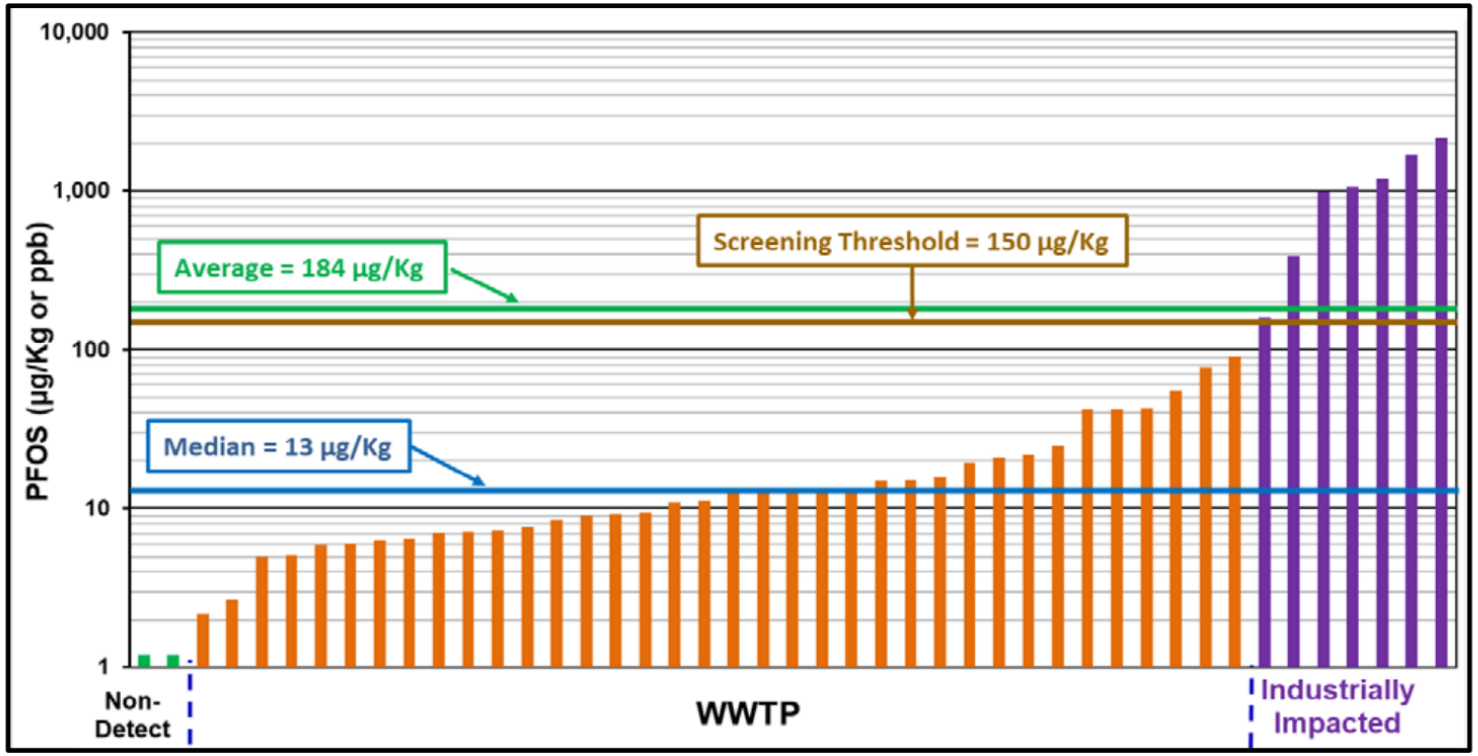
# Michigan's Approach: PFAS in Biosolids Interim Strategy

**2018**: Conducted statewide municipal WWTP study of influent, effluent, and biosolids and an evaluation of land application sites.

**2021**: Implemented the Interim Strategy for the Land Application of Biosolids containing PFAS via written notification to (300+) facilities amending their approved residual management programs.

Subsequent updates in 2022 and 2024.

**Figure 33. Final Treated Solids (Sludge and Biosolids) PFOS Concentrations for 42 WWTPs**




**Authority:** Part 24, Land Application of Biosolids, Rule 4*:*

*"On a case-by-case basis, the permitting authority may impose requirements for the use of biosolids in addition to, or more stringent than, the requirements in these rules if necessary to protect the public health and the environment from any adverse effect of a pollutant in the biosolids."*

# Land Application of Biosolids Containing PFAS
# Interim Strategy Goal

**Reduce**

- Continue source identification and reduction efforts

**Prohibit**

- Prohibit land application of industrially-impacted biosolids

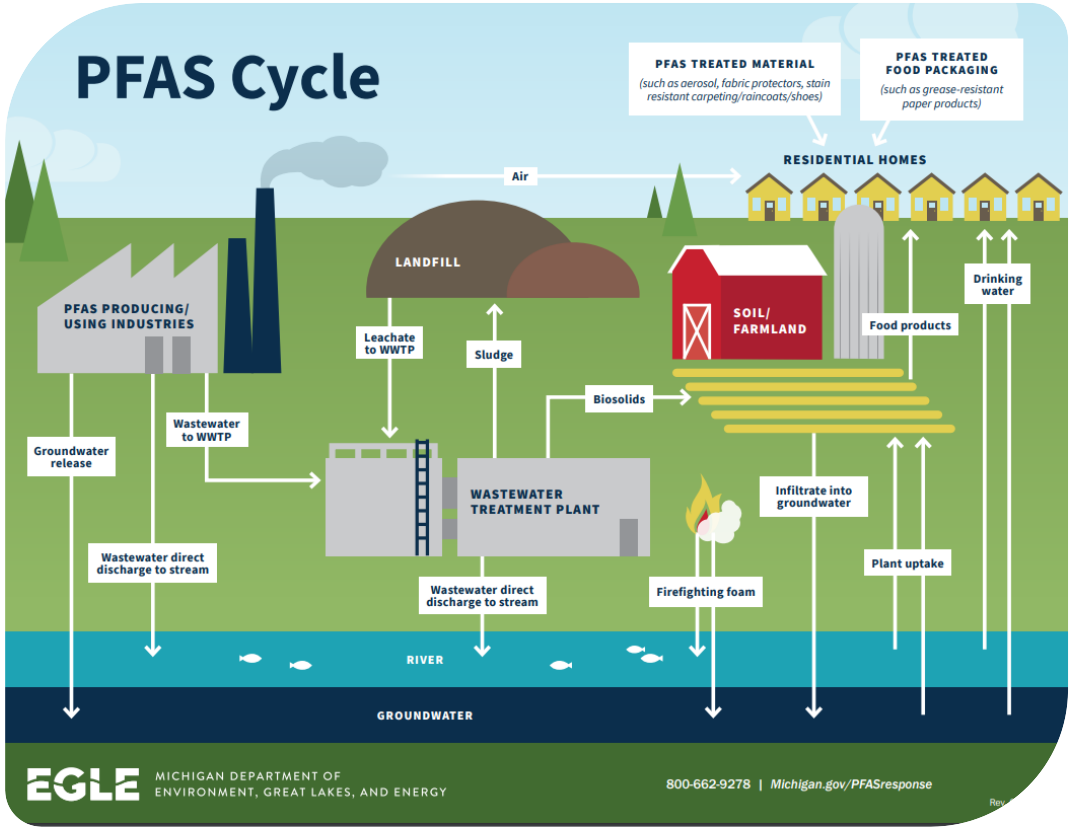
**Mitigate**

- Mitigate (reduce) risks moving forward

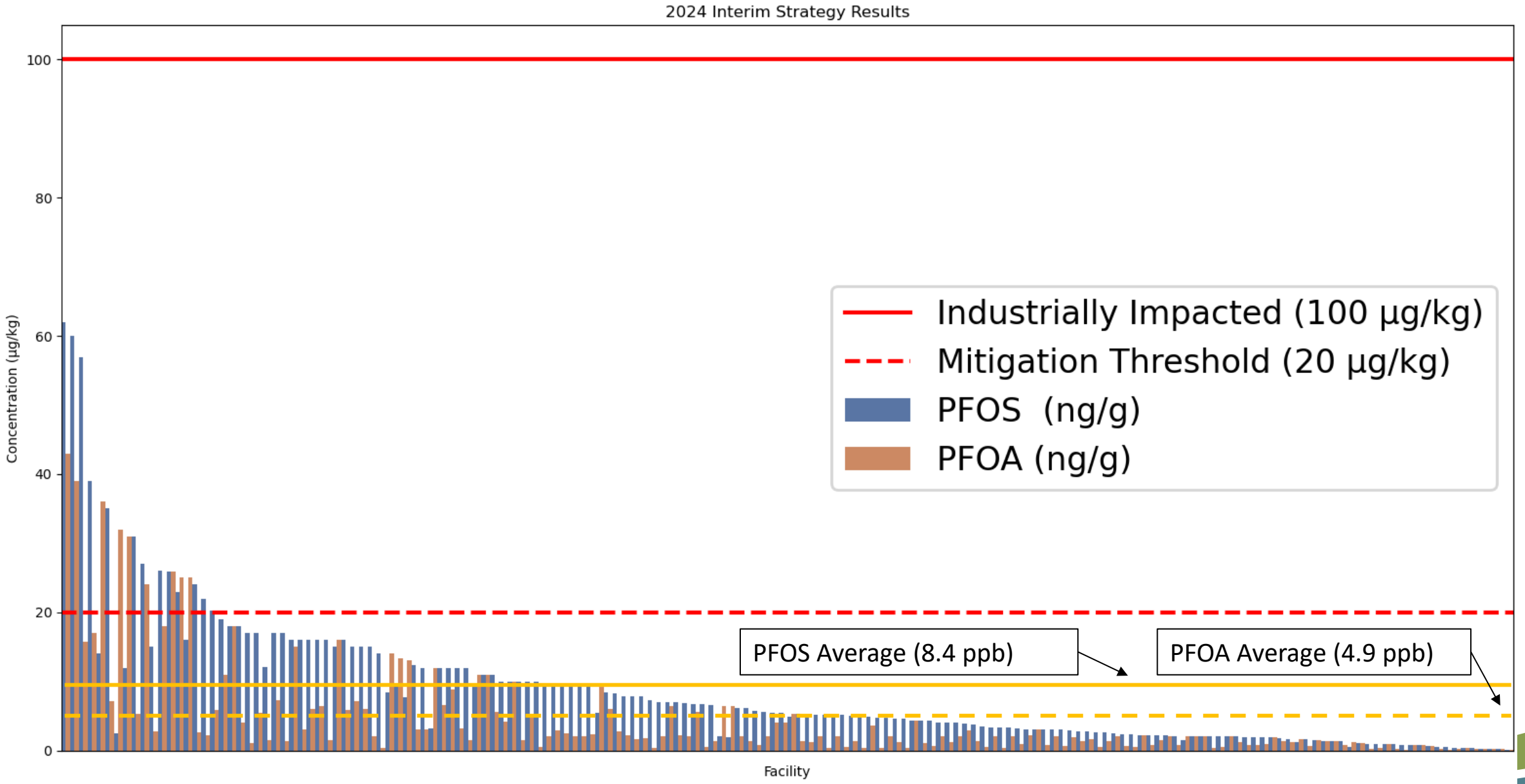
**Inform**

- Inform landowners, farmers, and WWTPs about PFAS
- Create and retain publicly available information

# New Updates to Interim Strategy in 2024



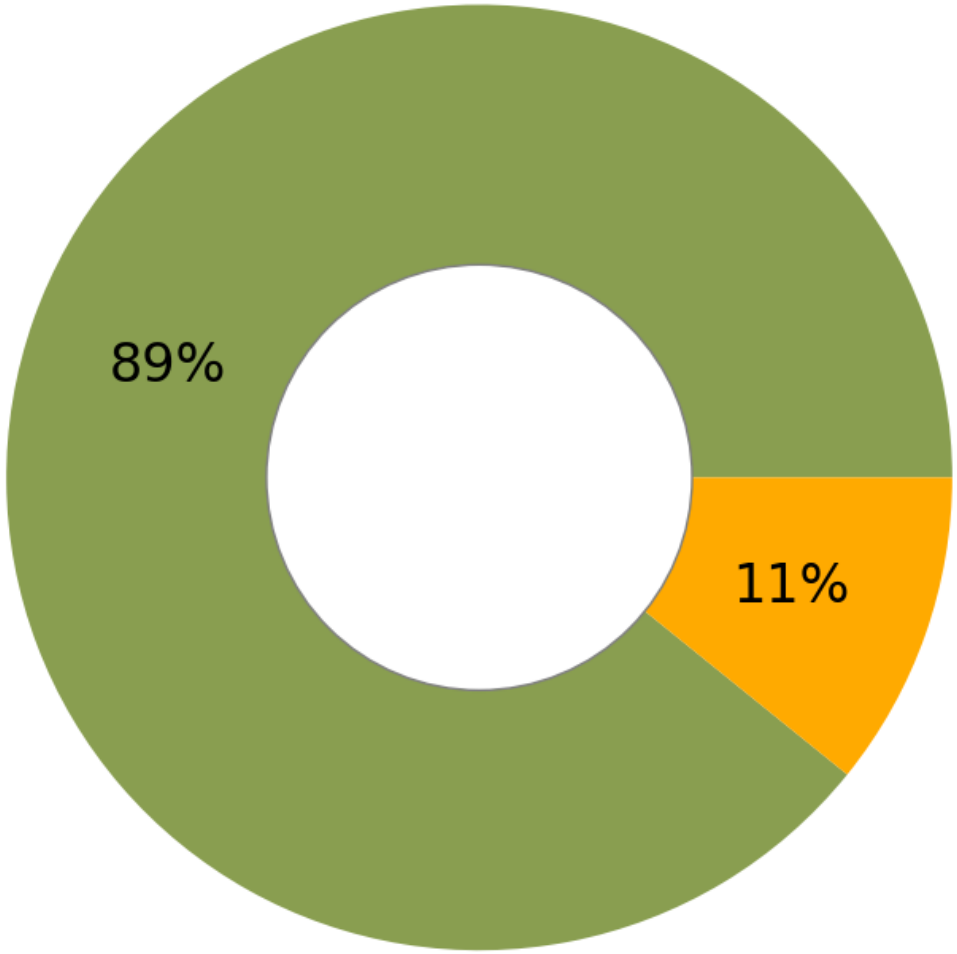

- Based on the PFOS and/or PFOA results:
  - **Below 20 ppb** (updated)
    - *No restrictions*
  - **Equal to or Above 20 ppb – Less than 100 ppb** (updated)
    - ***Required*** to sample effluent and identify sources
    - ***Required*** to mitigate during land application
      - Reduce land application rate to 1.5 dry tons per acre or submit alternative strategy
  - **Equal to or Above 100 ppb** (updated)
    - Deemed industrially impacted and ***land application prohibited***
    - ***Required*** to sample effluent and identify sources


2024 Interim Strategy Results
Concentration (µg/kg)
100
80
60
40
20
0
Facility
Industrially Impacted (100 µg/kg)
Mitigation Threshold (20 µg/kg)
PFOS (ng/g)
PFOA (ng/g)
PFOS Average (8.4 ppb)
PFOA Average (4.9 ppb)

# 2024 Interim Strategy Results

Below 20 ppb

- 152 facilities




Between 20 and 100 ppb

- 18 facilities

# Mean and Median Values of Biosolids/Sludge Concentrations Since 2018

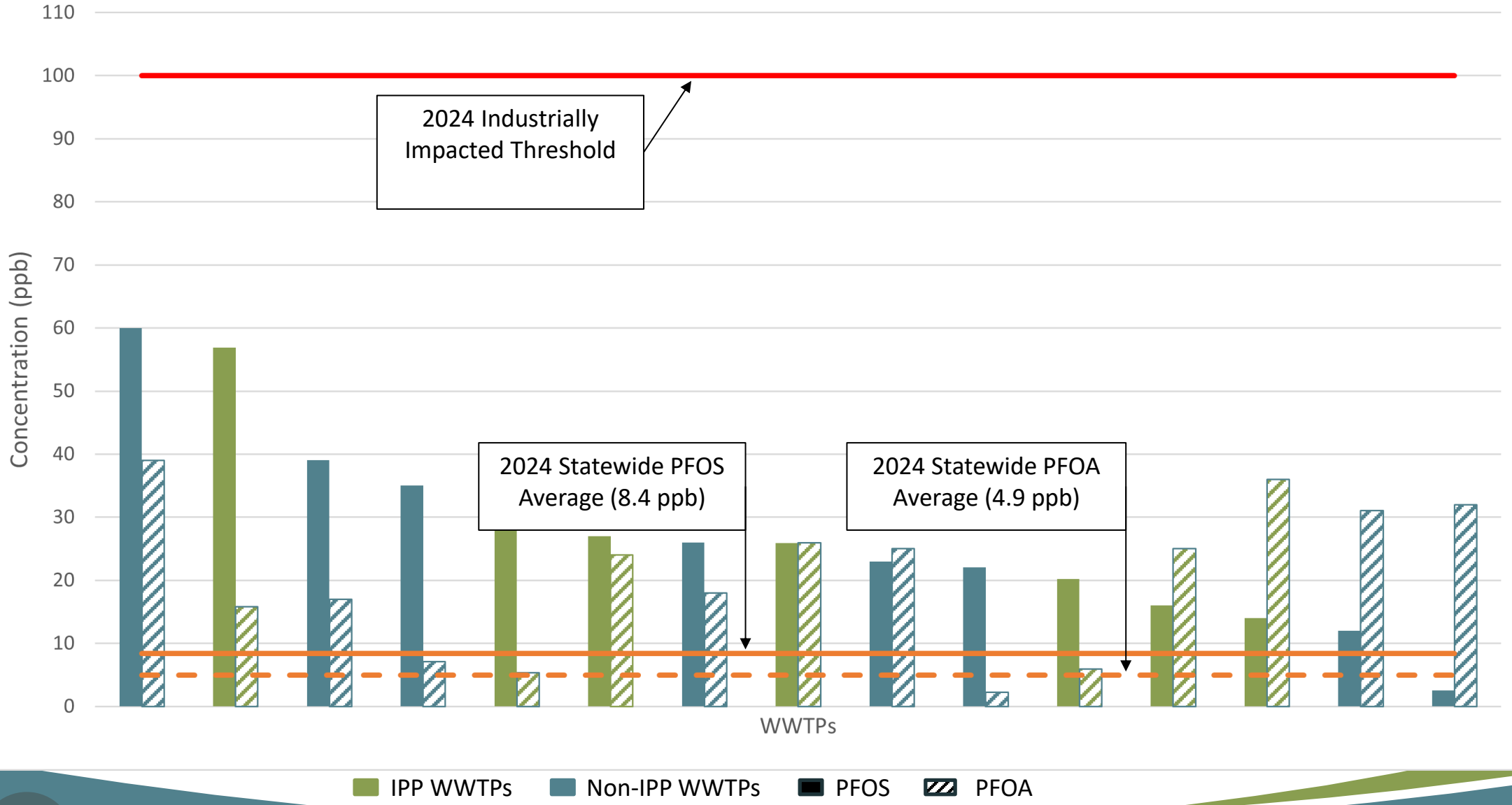
| Year | PFOS (ppb) | | PFOA (ppb) | |
|---|---|---|---|---|
| | Mean | Median | Mean | Median |
| 2018* | 184 | 13 | 25 | 7 |
| 2021 | 21 | 9 | 8 | 4 |
| 2022 | 16 | 10 | 7 | 3 |
| 2023 | 11 | 7 | 6 | 3 |
| 2024** | 8 | 5 | 5 | 2 |

*Includes data from industrially impacted facilities as part of a statewide study

**Calculations based on 170 results received as of 12/17/2024

All values listed are in parts per billion (ppb[µg/kg])

# 2024 Facilities with PFOS and/or PFOA Concentrations Greater than 20 ppb



# Summary

- Results of source investigation/source control efforts under the IPP PFAS Initiative and Biosolids Interim Strategy:
  - Source control is highly effective at reducing elevated concentrations
  - 90% biosolids in Michigan fall below mitigation threshold
  - No Industrially Impacted Biosolids have been land applied in Michigan since 2018.
  - No facilities with biosolids above industrially impacted threshold since 2021.
  - Overall PFOS/PFOA concentrations in **effluent discharges and biosolids are decreasing**.

# Questions?

Christian Smith
Emerging Pollutants Section
Water Resources Division
517-257-0251| SmithC186@Michigan.gov

Michigan Department of

**Environment, Great Lakes, and Energy**

800-662-9278

Michigan.gov/EGLE


Follow us at: Michigan.gov/EGLEConnect



EGLE

- **IPP PFAS Initiative:** IPP PFAS Initiative Webpage
- **PFAS Source Doc**: Industrial Sources of PFOS to Municipal Wastewater Treatment Plants as identified through the Michigan Department of Environment, Great Lakes, and Energy Industrial Pretreatment program Per-and Polyfluoroalkyl Substances Initiative
- **Summary Report**: Initiatives to Evaluate the Presence of PFAS in Municipal Wastewater and Associated Residuals (Sludge/Biosolids) in Michigan
- **Detailed Report**: Evaluation of PFAS in Influent, Effluent, and Residuals of Wastewater Treatment Plants (WWTPs) in Michigan
- **Municipal NPDES Permit Strategy:** Municipal NPDES Permitting Strategy for PFAS
- **Biosolids PFAS Strategy:** EGLE Biosolids PFAS Webpage
- **Groundwater Discharge Strategy:** Compliance Strategy for Addressing PFAS from Public and Private Municipal Groundwater Discharges
- **Fume Suppressant Study:** PFAS in Fume Suppressant Products at Chrome Plating Facilities