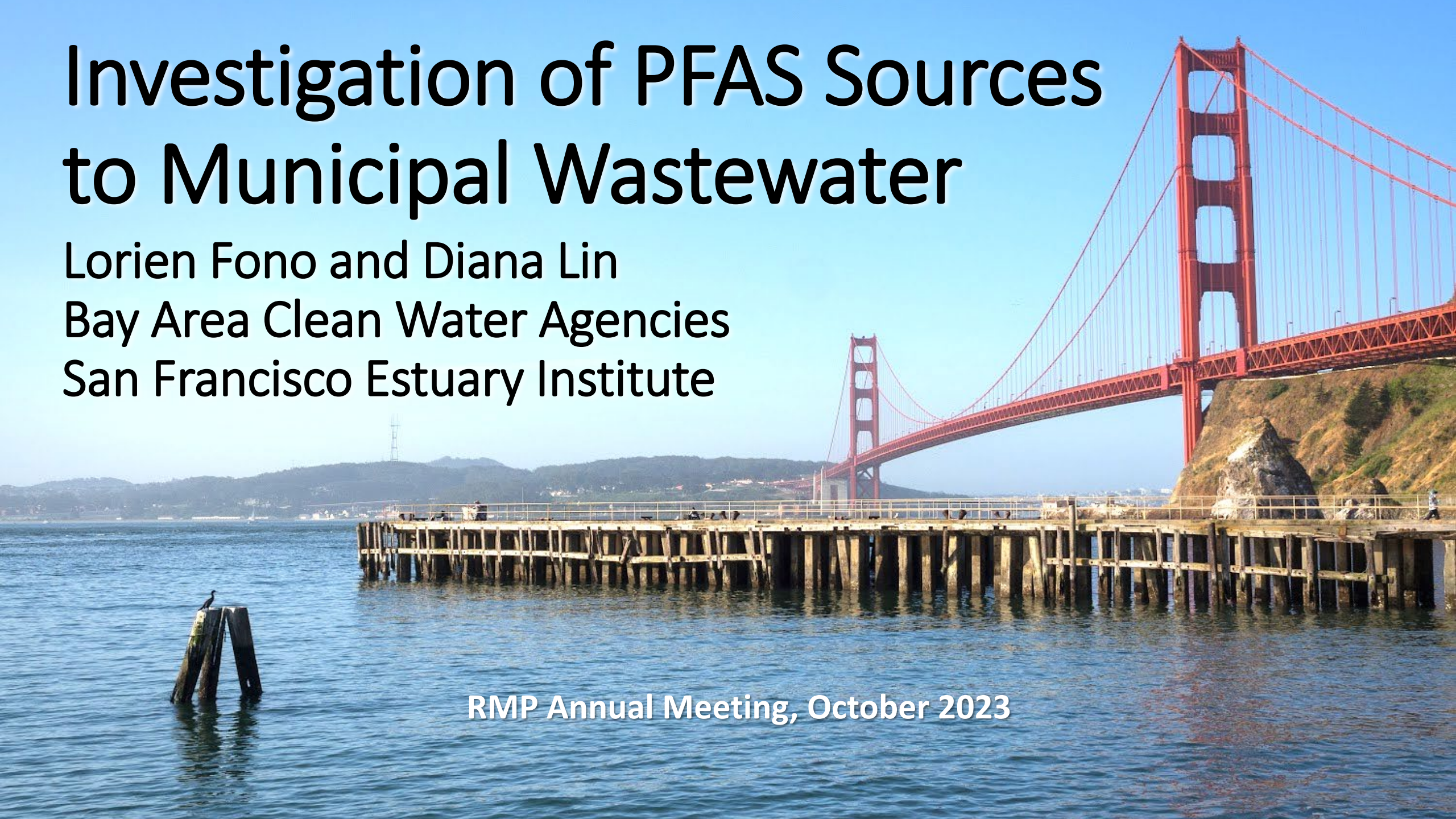
Investigation of PFAS Sources to Municipal Wastewater

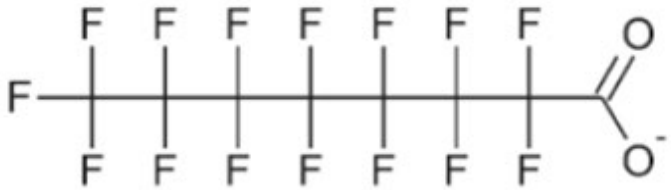
Lorien Fono and Diana Lin
Bay Area Clean Water Agencies
San Francisco Estuary Institute



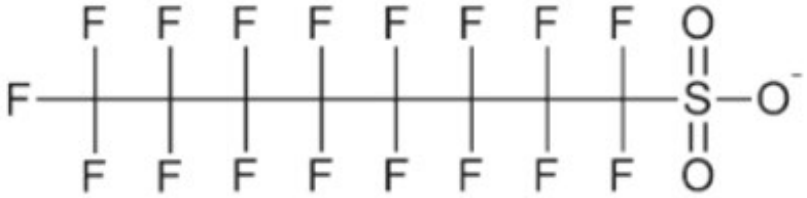
RMP Annual Meeting, October 2023

Poly- and Perfluoroalkyl Substances (PFAS)

PFOA



PFOS



To control PFAS, we must first turn off the tap

SF Bay Regional Study

BACWA
BAY AREA
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SFEI | AQUATIC SCIENCE CENTER
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CALIFORNIA
Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

RMP

Project Overview

Phase 1

Consistent approach to Statewide Investigation Order

- Monitor representative subset (n=15) of facilities
- Q4 2020

Phase 2

Investigate PFAS sources in sewershed

- Conduct more in-depth investigations (n=7)
- Summer of 2022

Project Team

Diana Lin
(she/her)

Miguel Mendez
(he/him)

Kayli Paterson
(she/her)

BACWA
BAY AREA
CLEAN WATER
AGENCIES

CENTRAL SAN
CENTRAL CONTRA COSTA
SANITARY DISTRICT

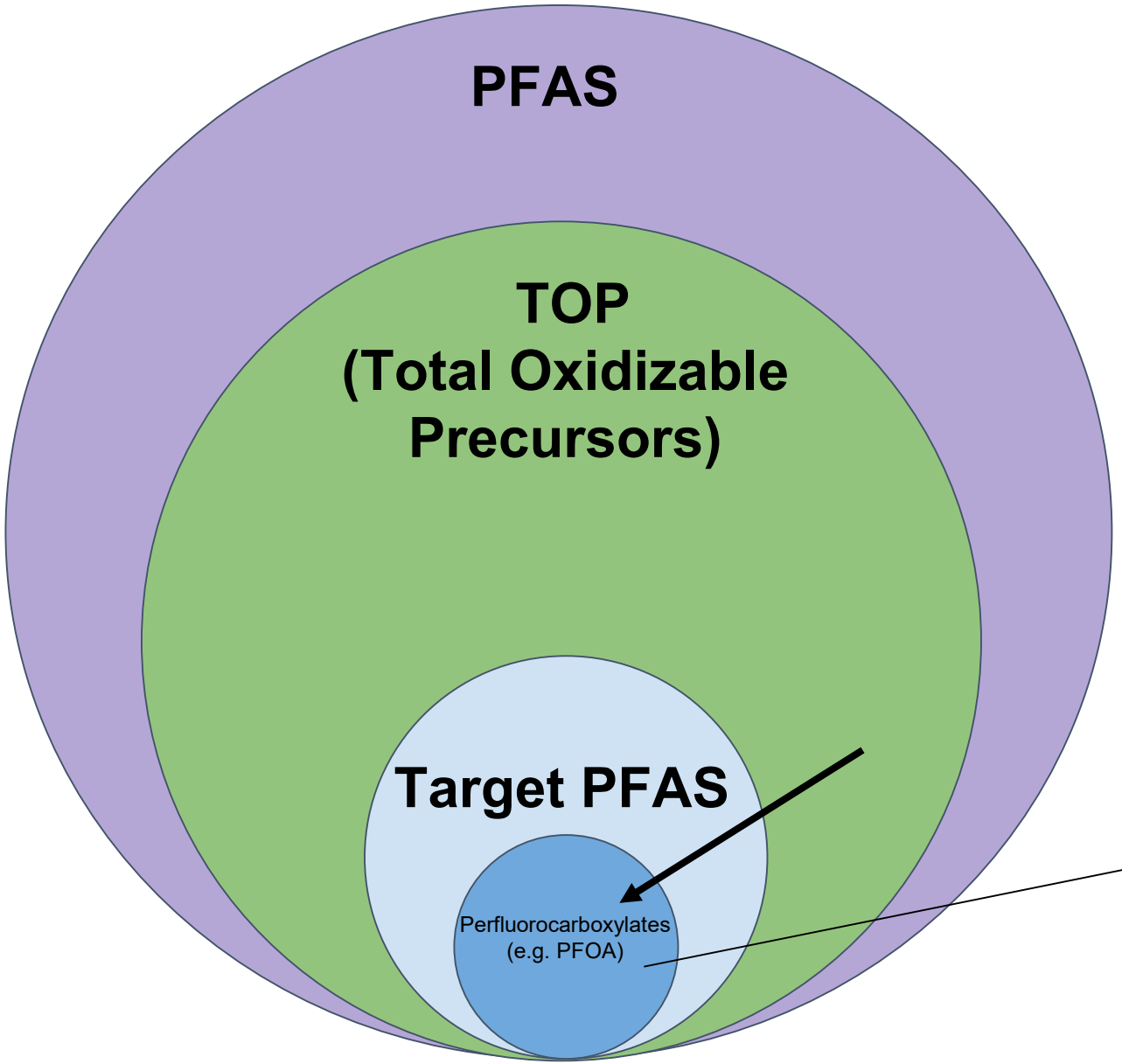
EBMUD

Dublin San Ramon
Services District
Water, wastewater, recycled water

CITY OF
SAN JOSE
CAPITAL OF SILICON VALLEY

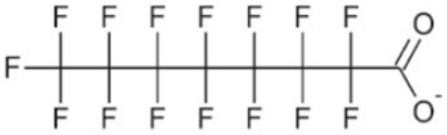
CITY OF SAN MATEO
CALIFORNIA

PFAS Analytical Methods

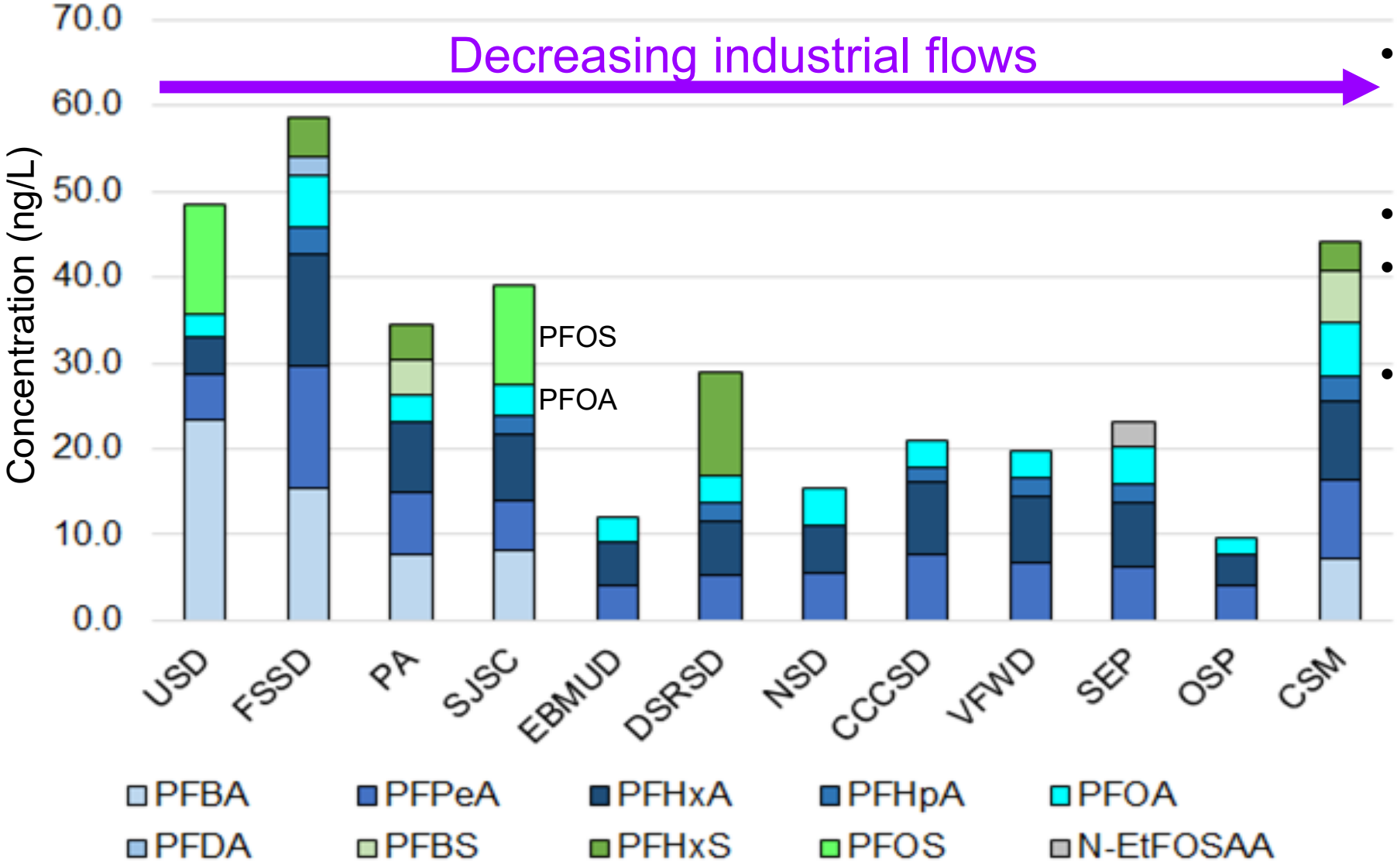


PFOA

Perfluorooctanoic acid

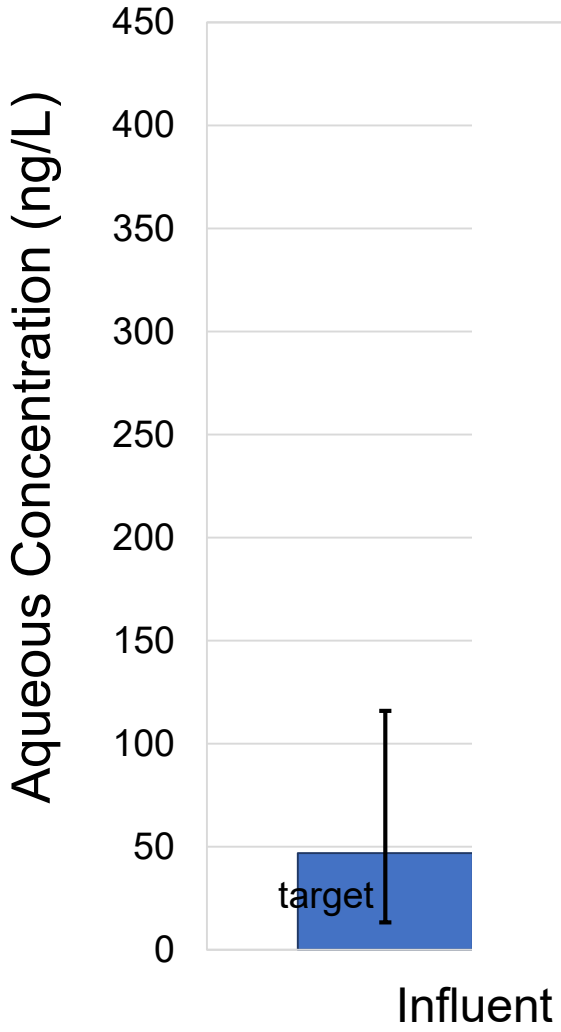


Influent Concentration (Target)



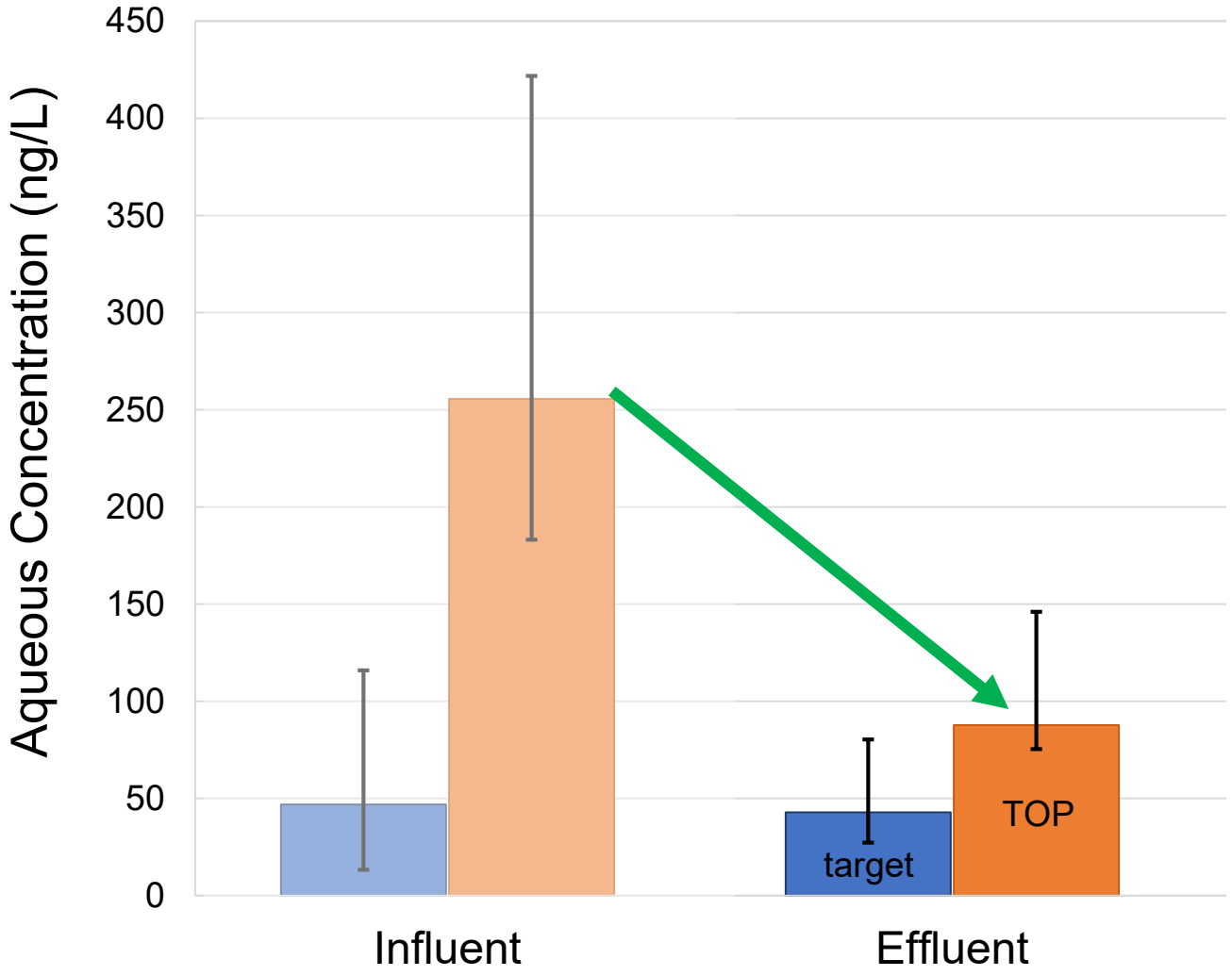
- PFAS levels comparable among sites
- PFOS and PFOA
- Comparable to other municipal wastewater
- No clear trend from industrial discharges

PFAS Concentrations in Wastewater Matrices



- Sum of PFAS via TOP ~6Xs greater than target influent

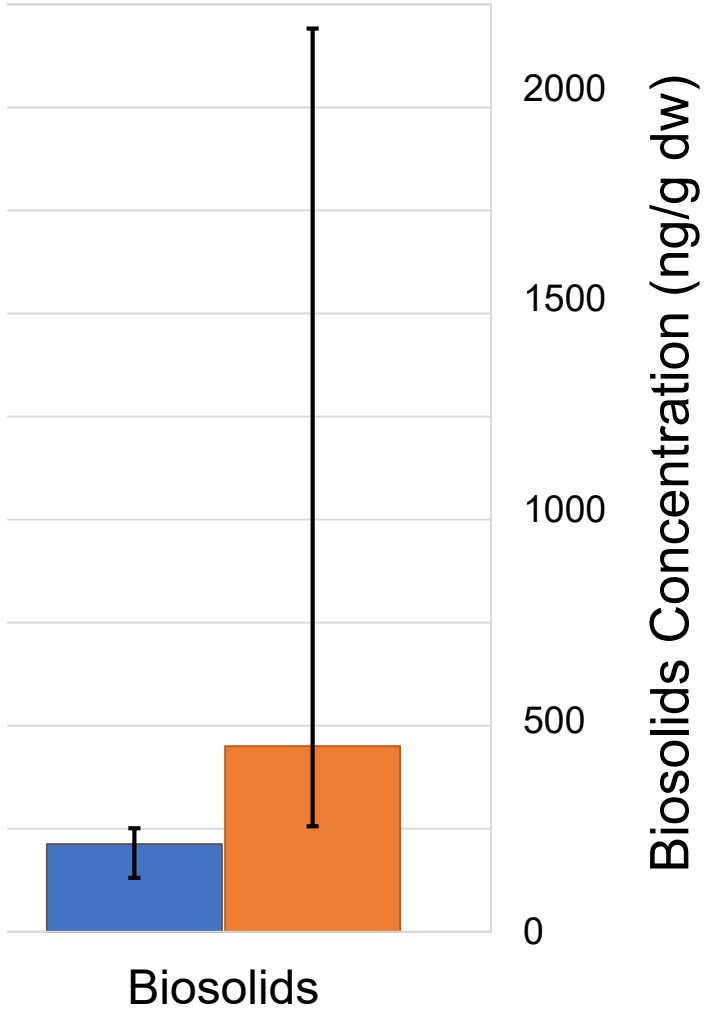
PFAS Concentrations in Wastewater Matrices



- Comparable with other studies
- 50% reduction in sum of PFAS quantified via TOP between 2014 and 2022
  - Reduction in PFOA and PFOS

PFAS Concentrations in Wastewater Matrices

- Biosolids treated through anaerobic digestion comparable
- Levels comparable to PFAS content in consumer products, including cosmetics, food packaging, textiles



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Sewershed Monitoring

Residential

Sample

?

Industrial

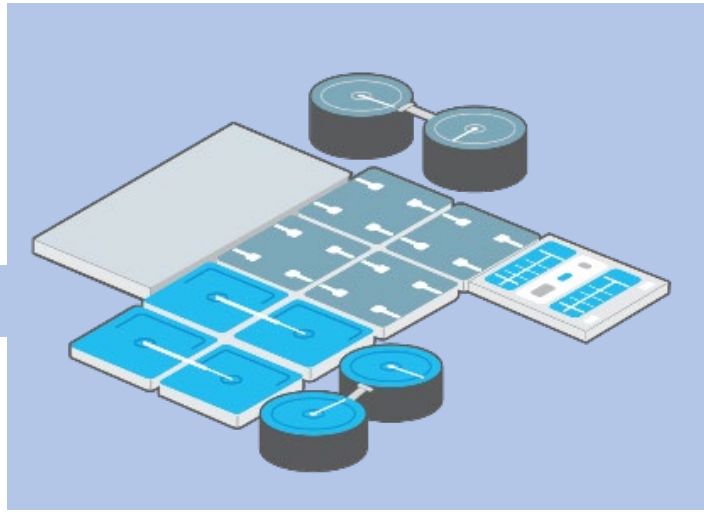
Sample

?

Commercial

Sample

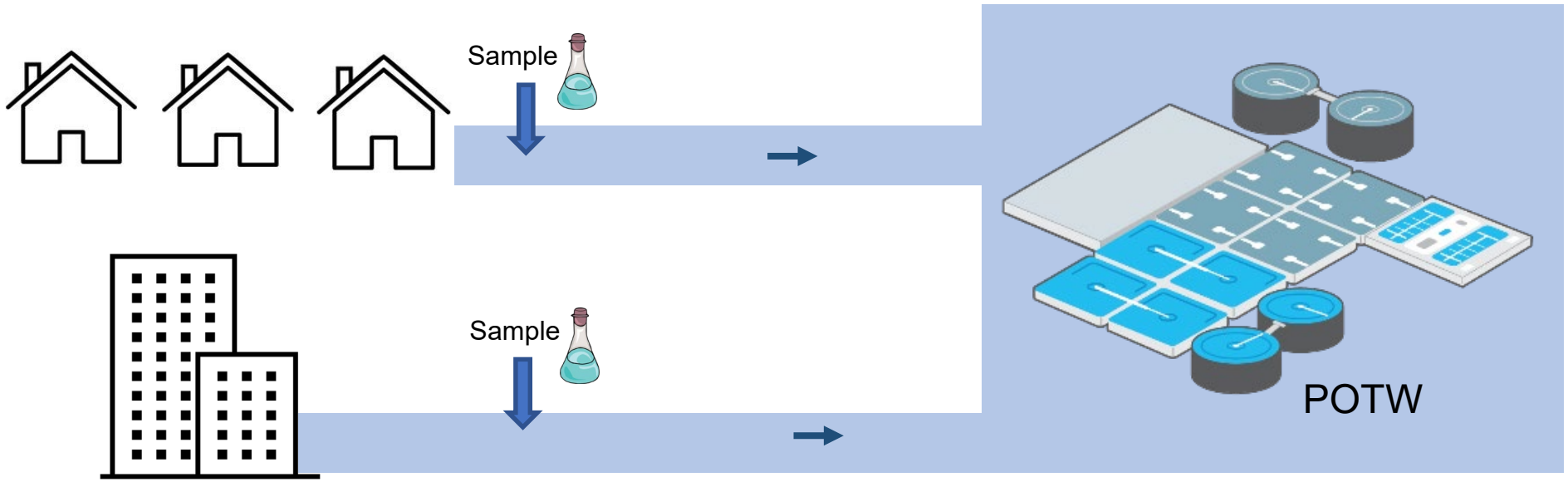
?



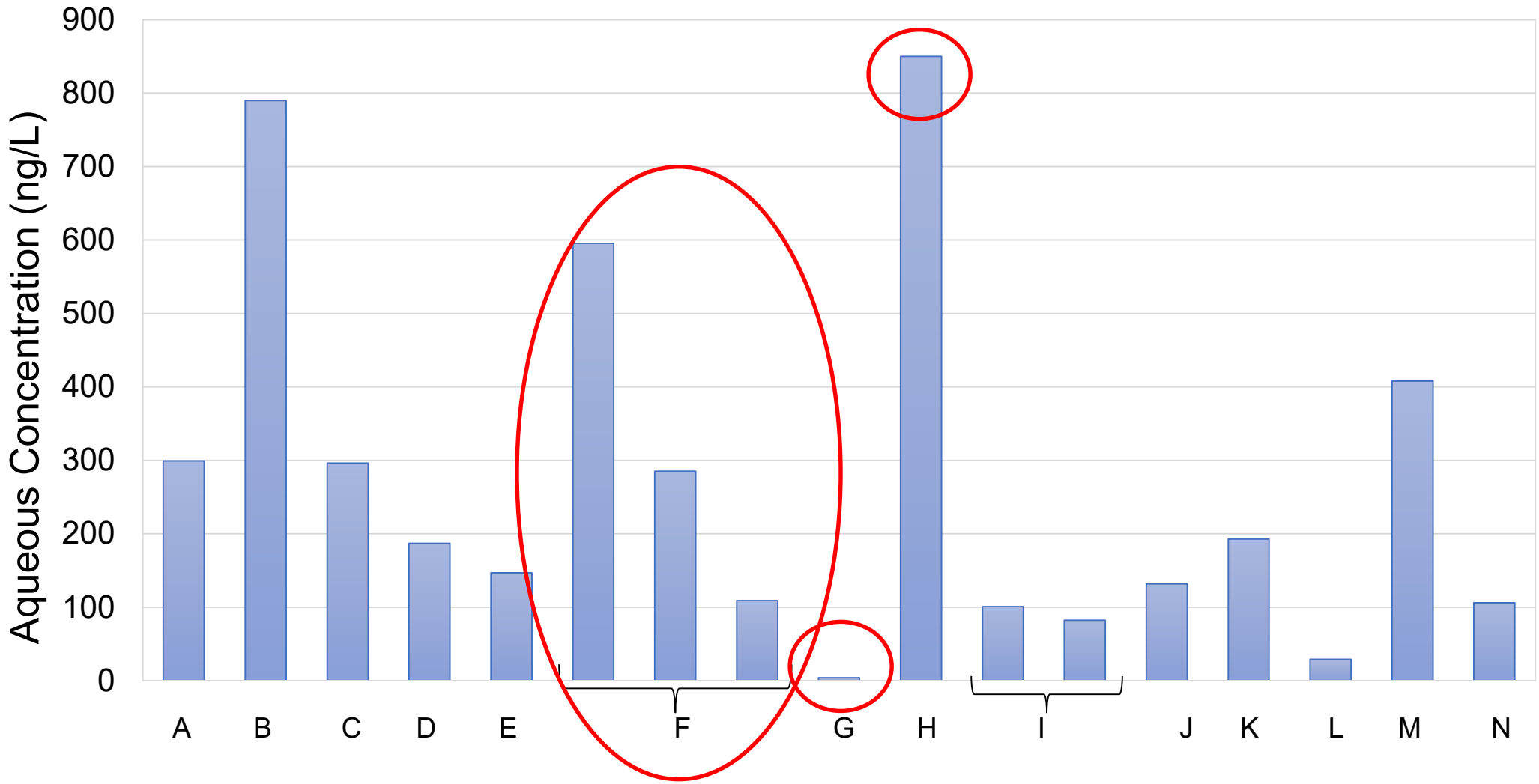
POTW

Residential Sewershed Discharge Sampling

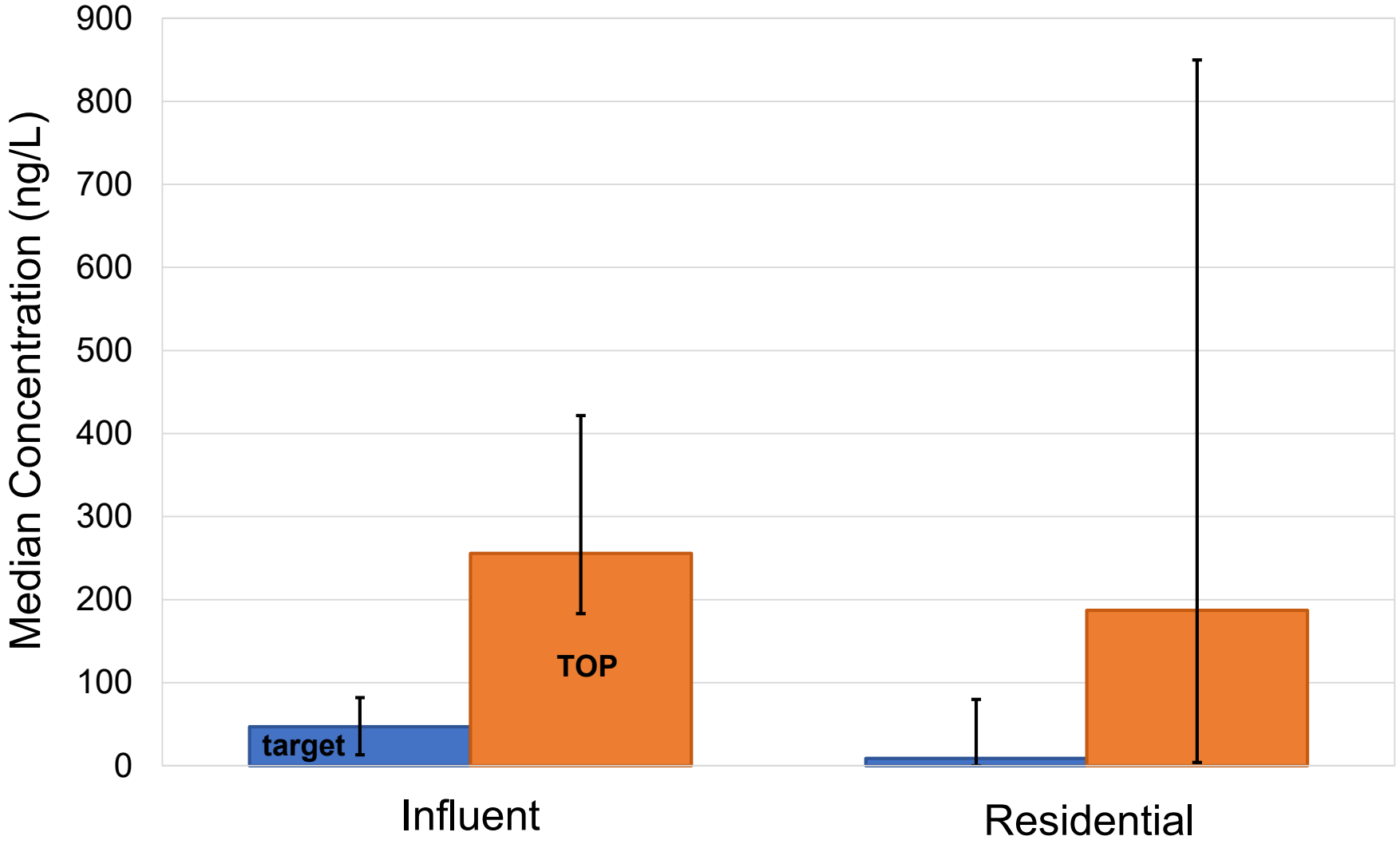
- Diversity in neighborhoods
- Screening approach



Residential Sewershed Discharge (TOP)

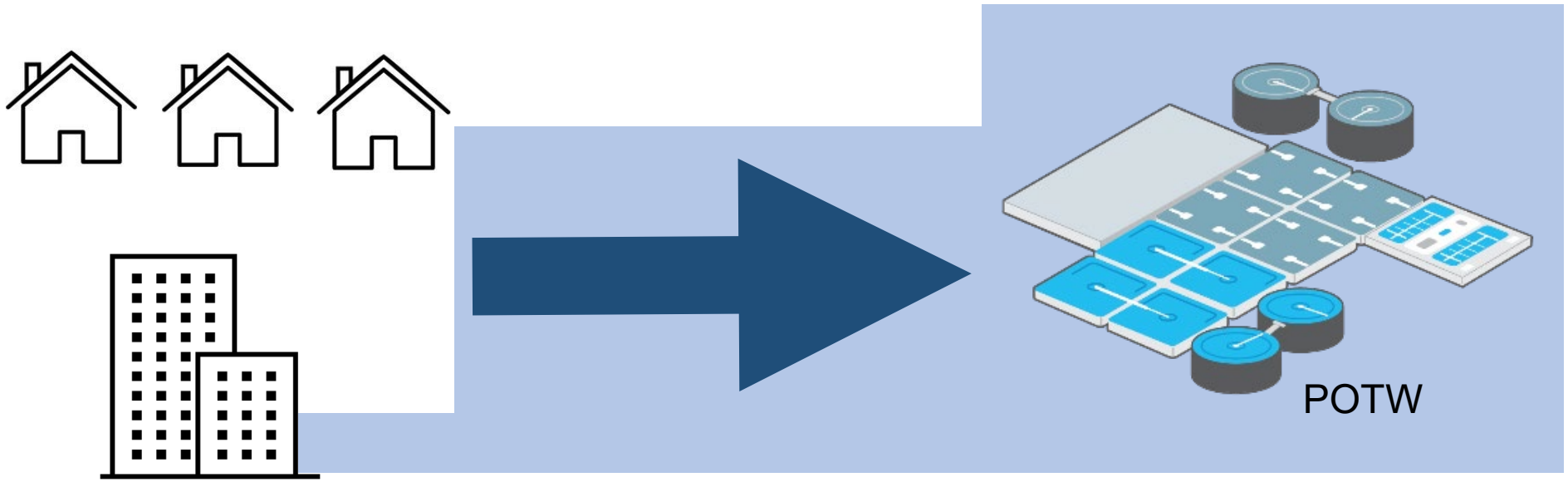


Residential Sewershed Discharge



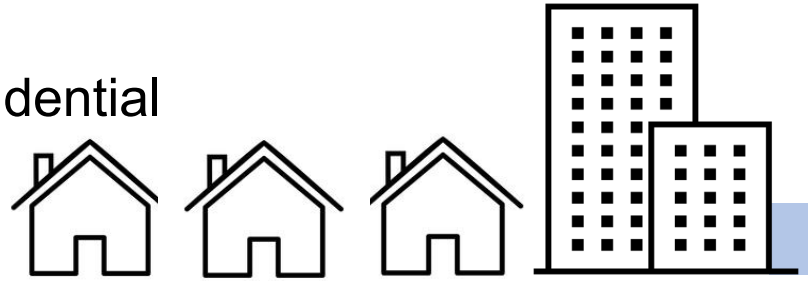
Residential Sewershed

- Residential discharges likely contribute the majority of PFAS loading received by municipal POTWs

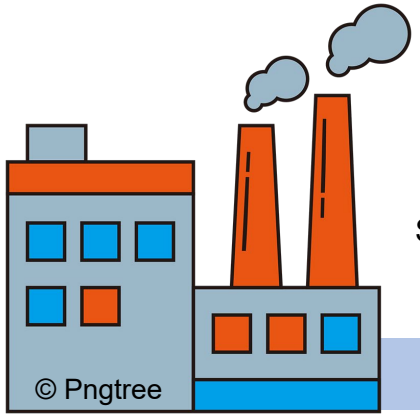


Sewershed Monitoring

Residential



Industrial



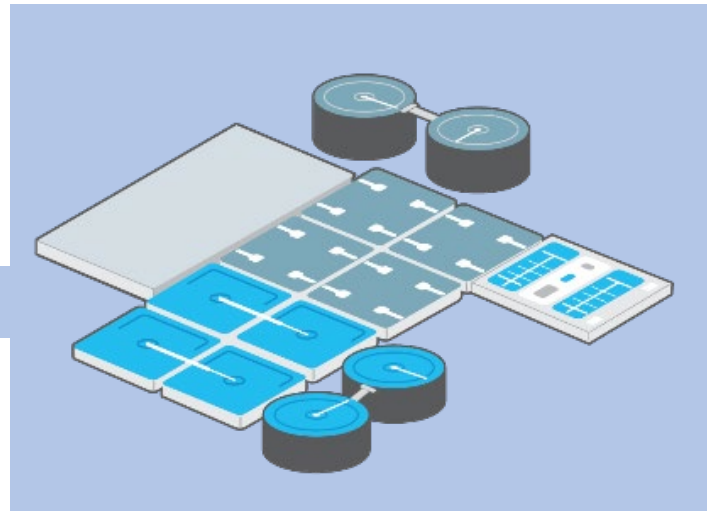
Sample

?

Commercial

Sample

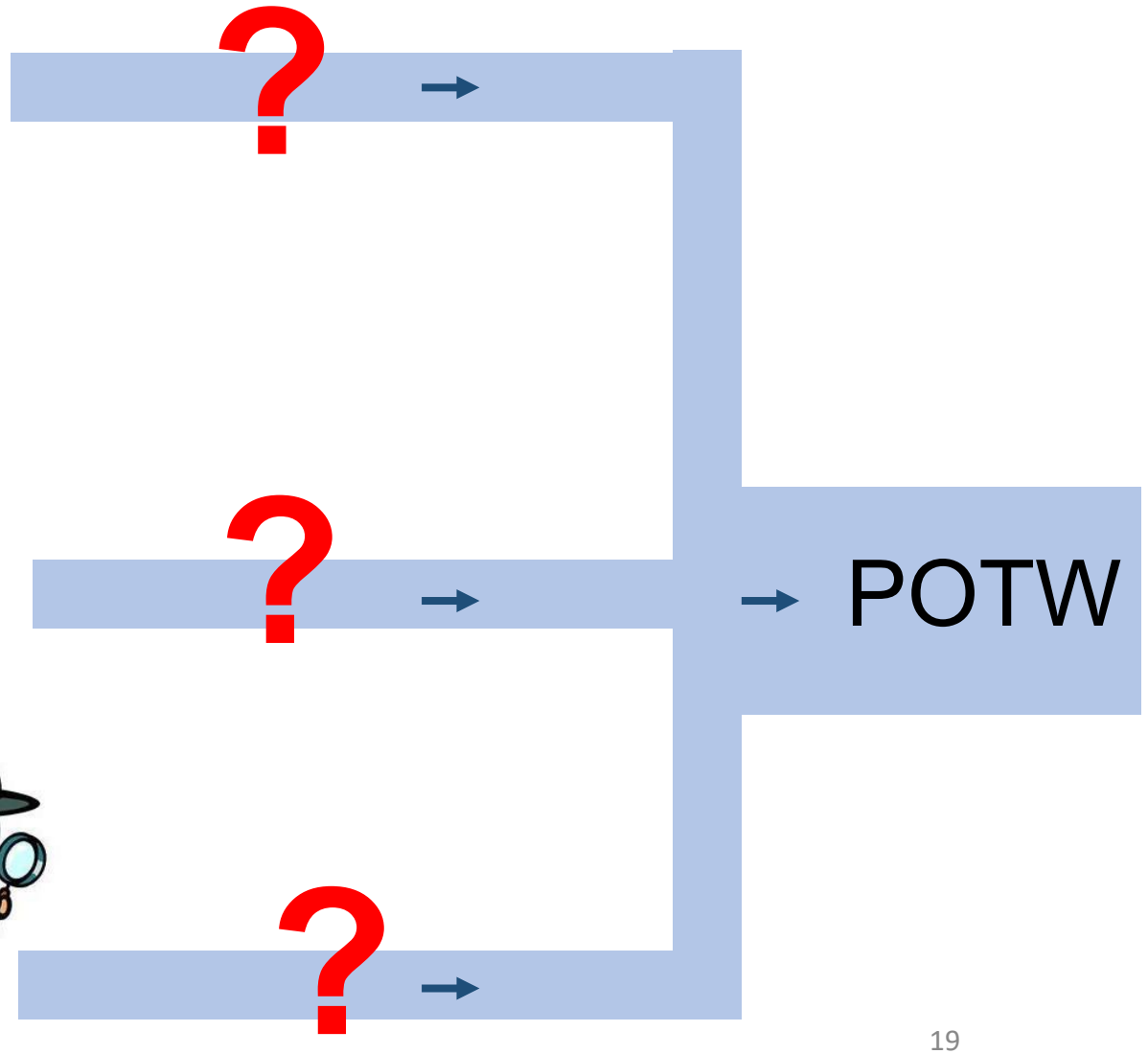
?



POTW

Industrial Discharge Screening Study

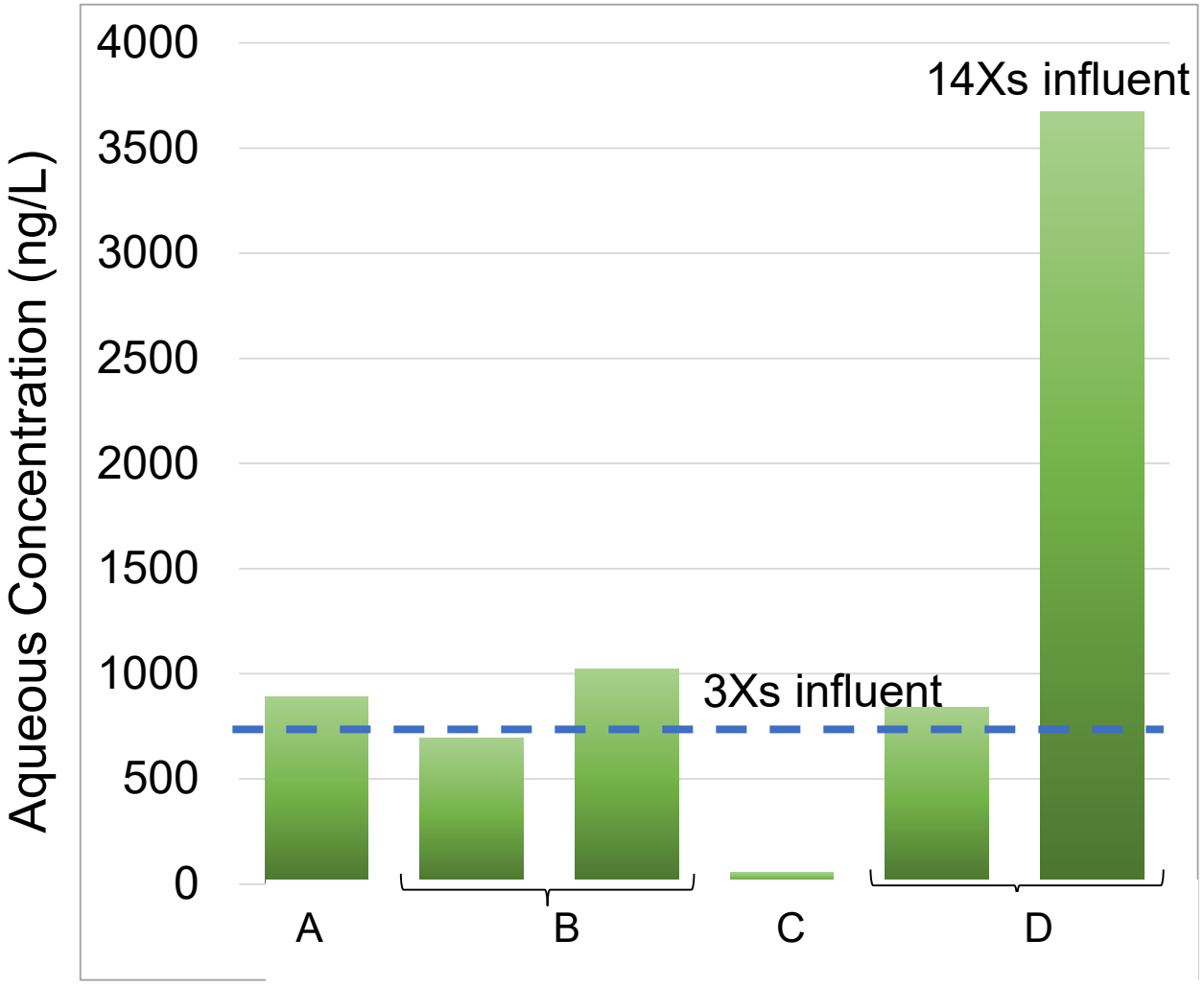
- Industrial laundry (n=5)
- Hospitals (n=4)
- Chrome-plating on-site (n=3)
- Semiconductor manufacturing (n=2)
- Military site (n=1)
- Car wash (n=3)
- Pulp paperboard manufacturing (n=1)

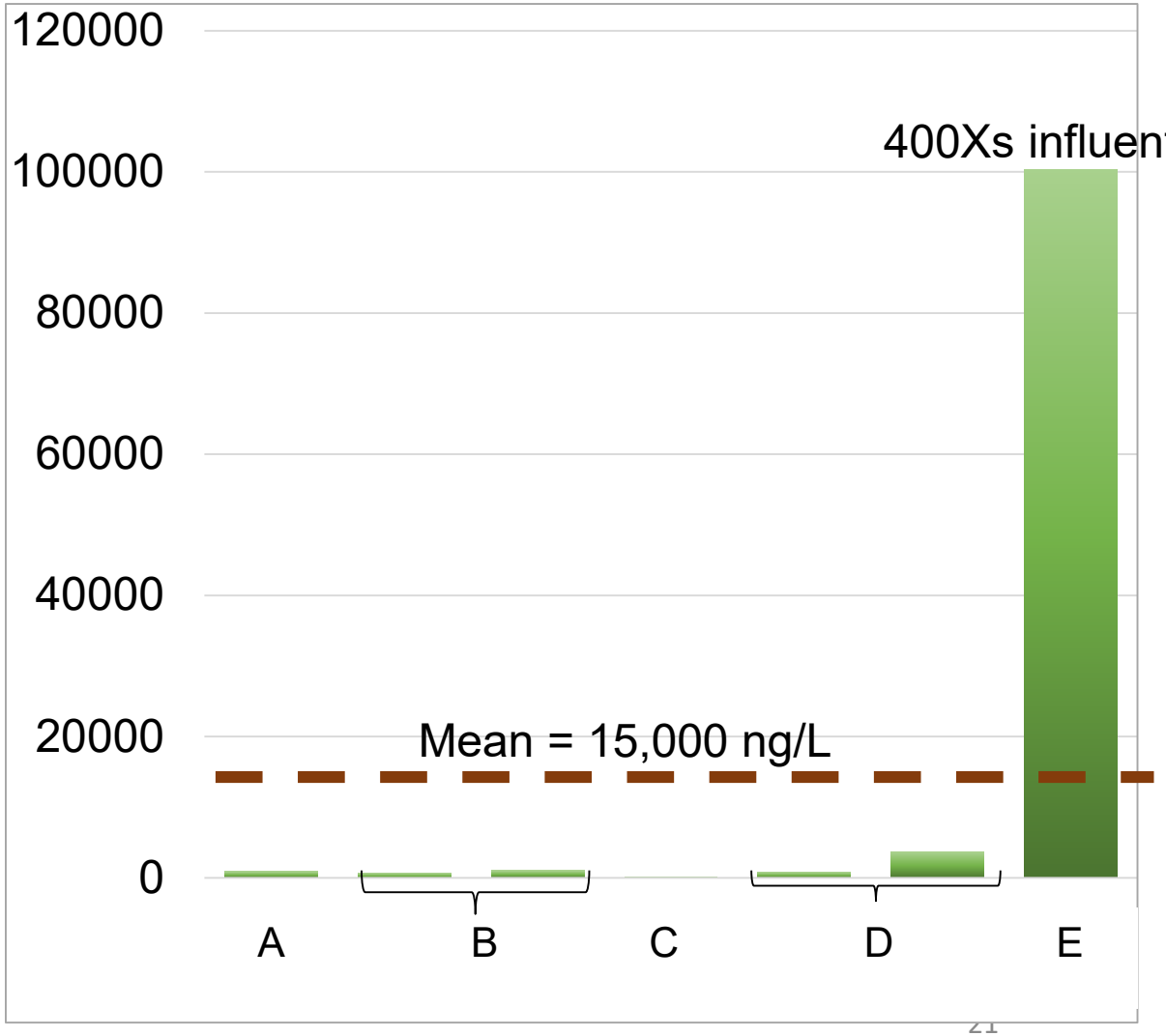


Industrial Laundry Dischargers

- Laundry service other businesses
- Top Laundered textiles
  - Restaurant linens
  - Floor mats
  - Refinery uniforms/rags
  - Medical uniforms and patient gowns, laboratory coats
- Discharge permit ~2.5 MGY
- Pre-treatment

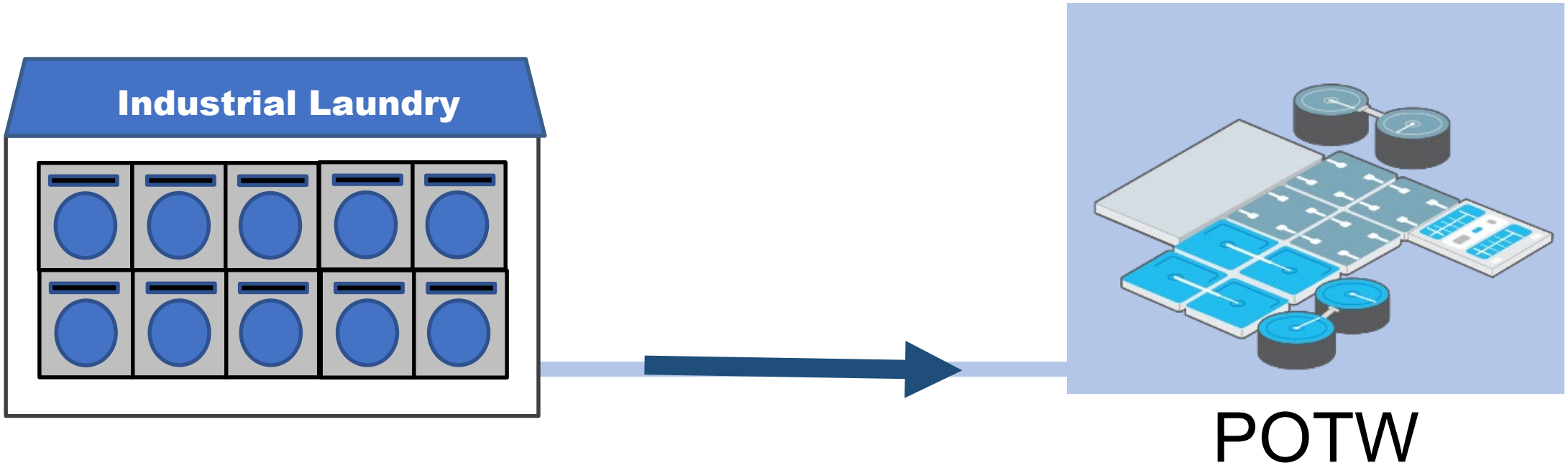
Industrial Laundry Sewershed (TOP)





Industrial Laundry Contribution to PFAS Loading at POTW

- Discharge permit ~2.5 MGY
- Mean = 15,000 ng/L sum of PFAS (TOP)
- One facility discharging 0.01% of flows could contribute 1% of PFAS loadings



Industrial Discharge Screening Study

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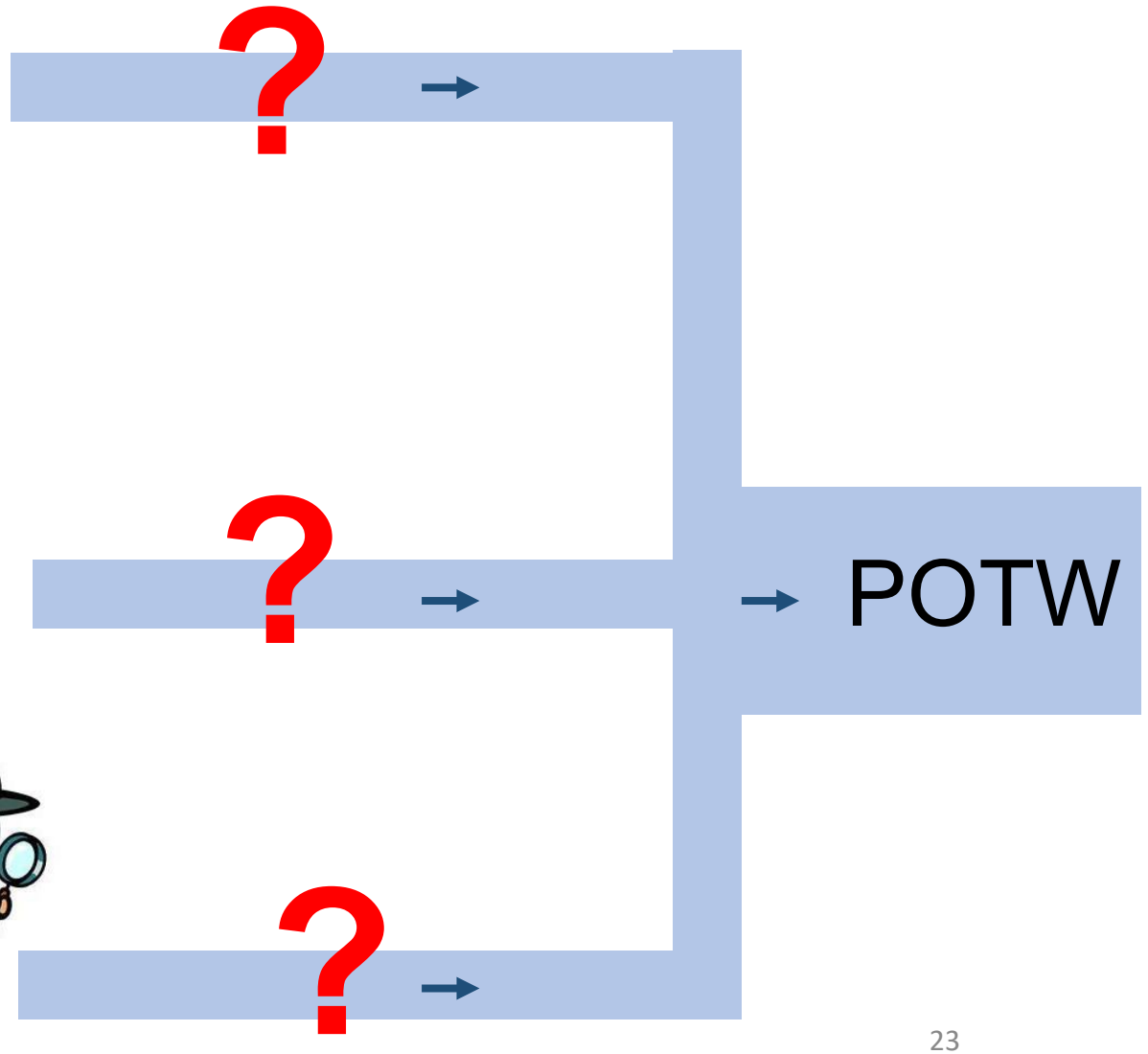
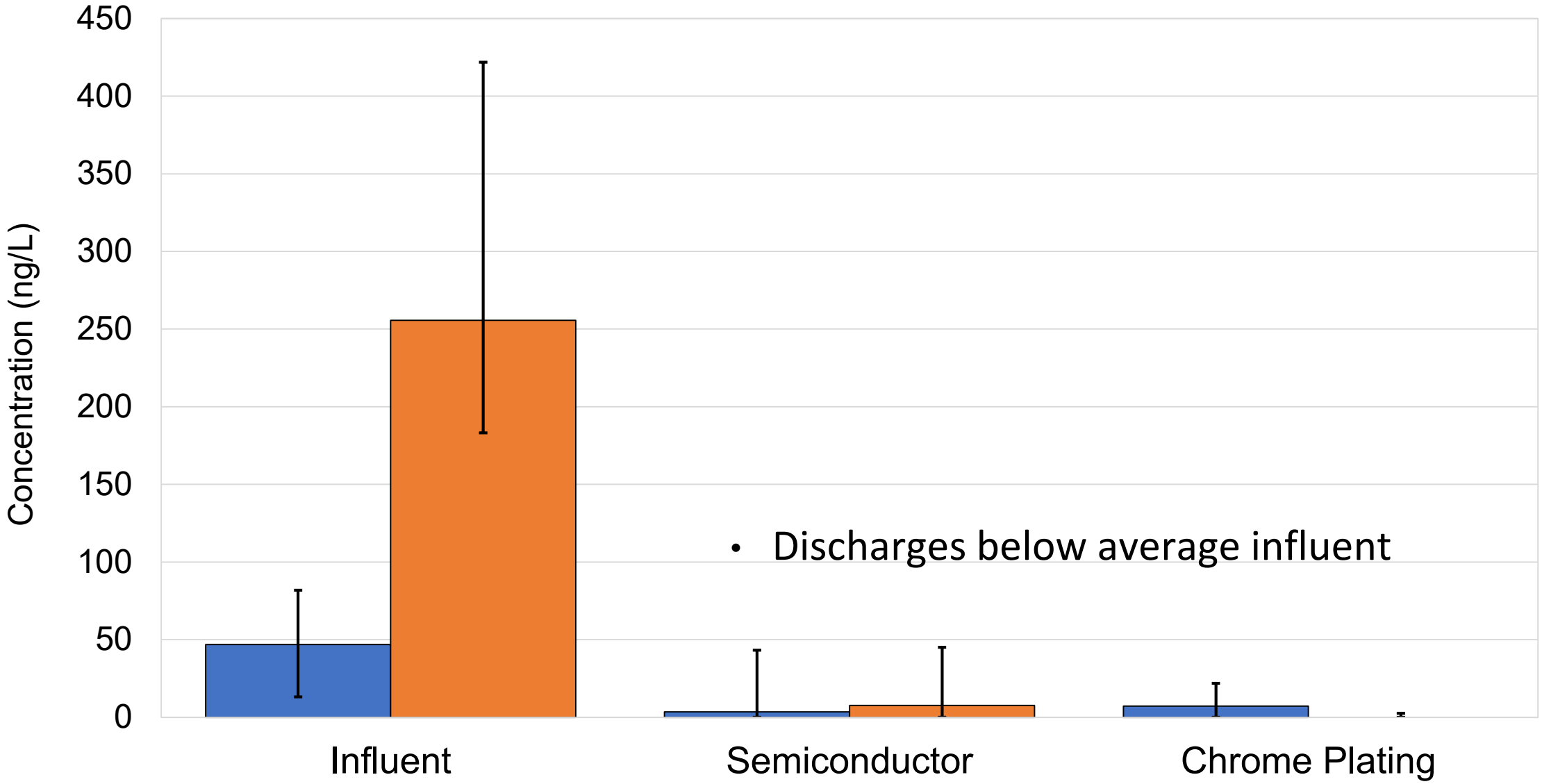


Semiconductor Manufacturing and Chrome-Plating



Industrial Discharge Screening Study

- Industrial laundry (n=5)
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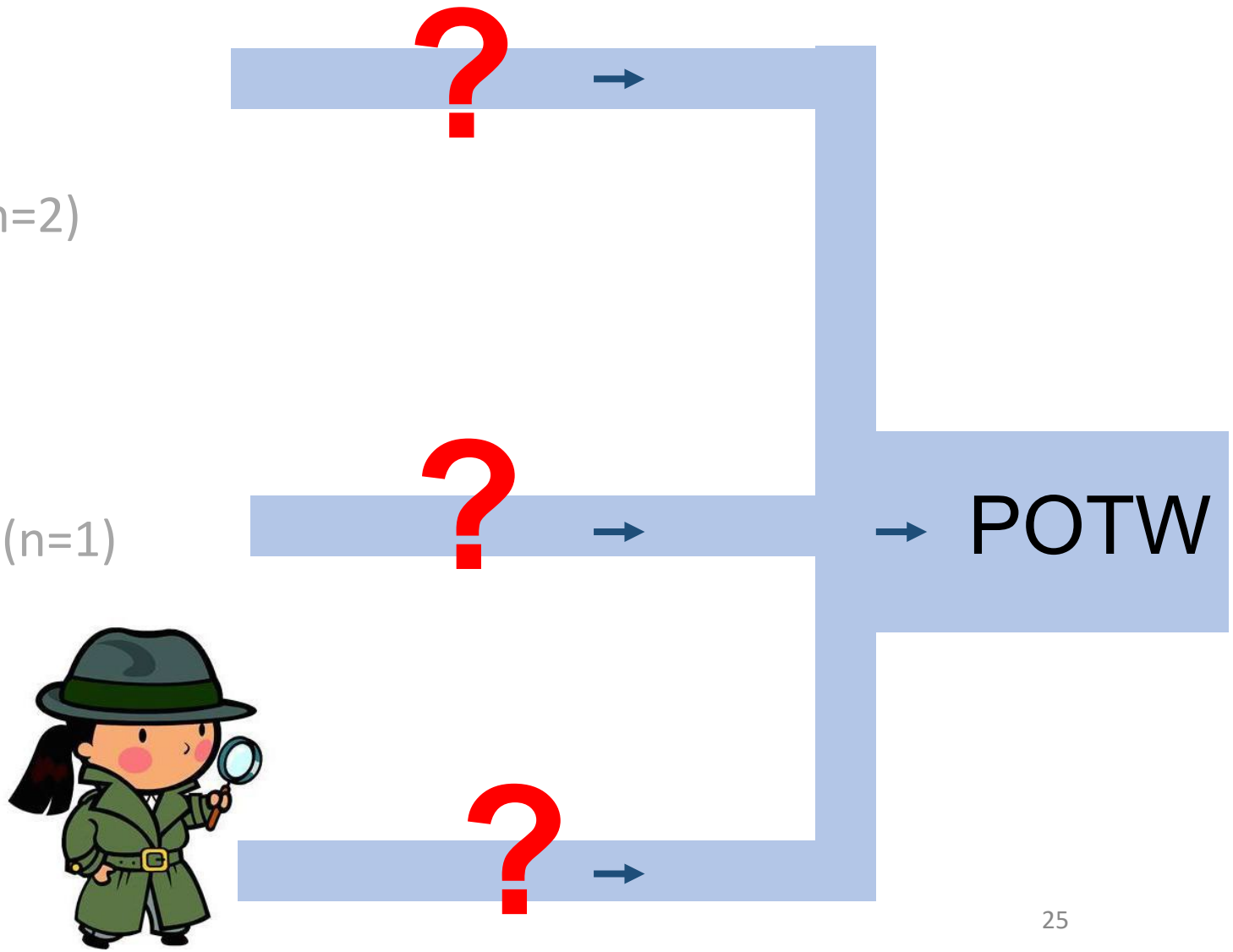
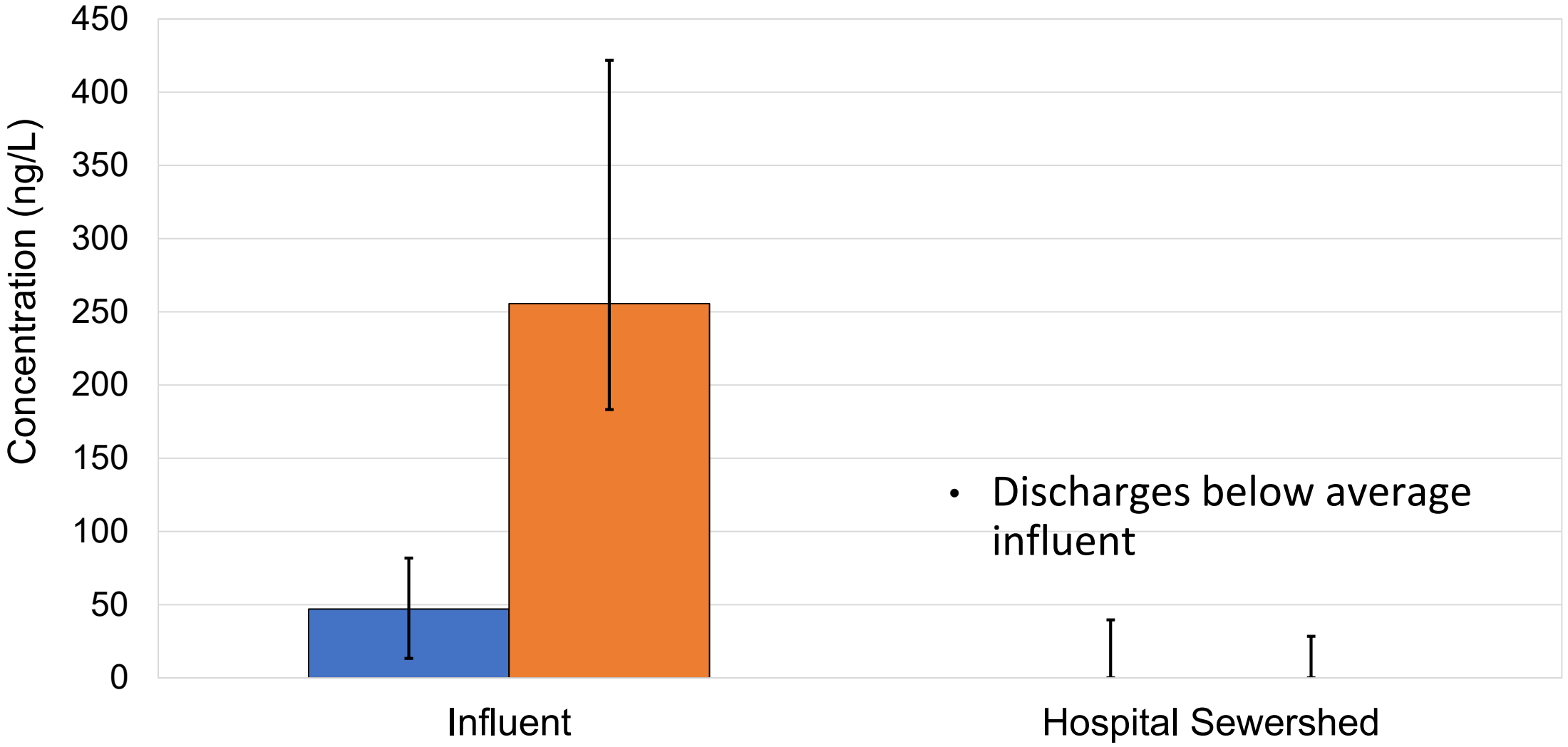


Hospital Sewershed Discharge



Industrial Discharge Screening Study

- Industrial laundry (n=5)
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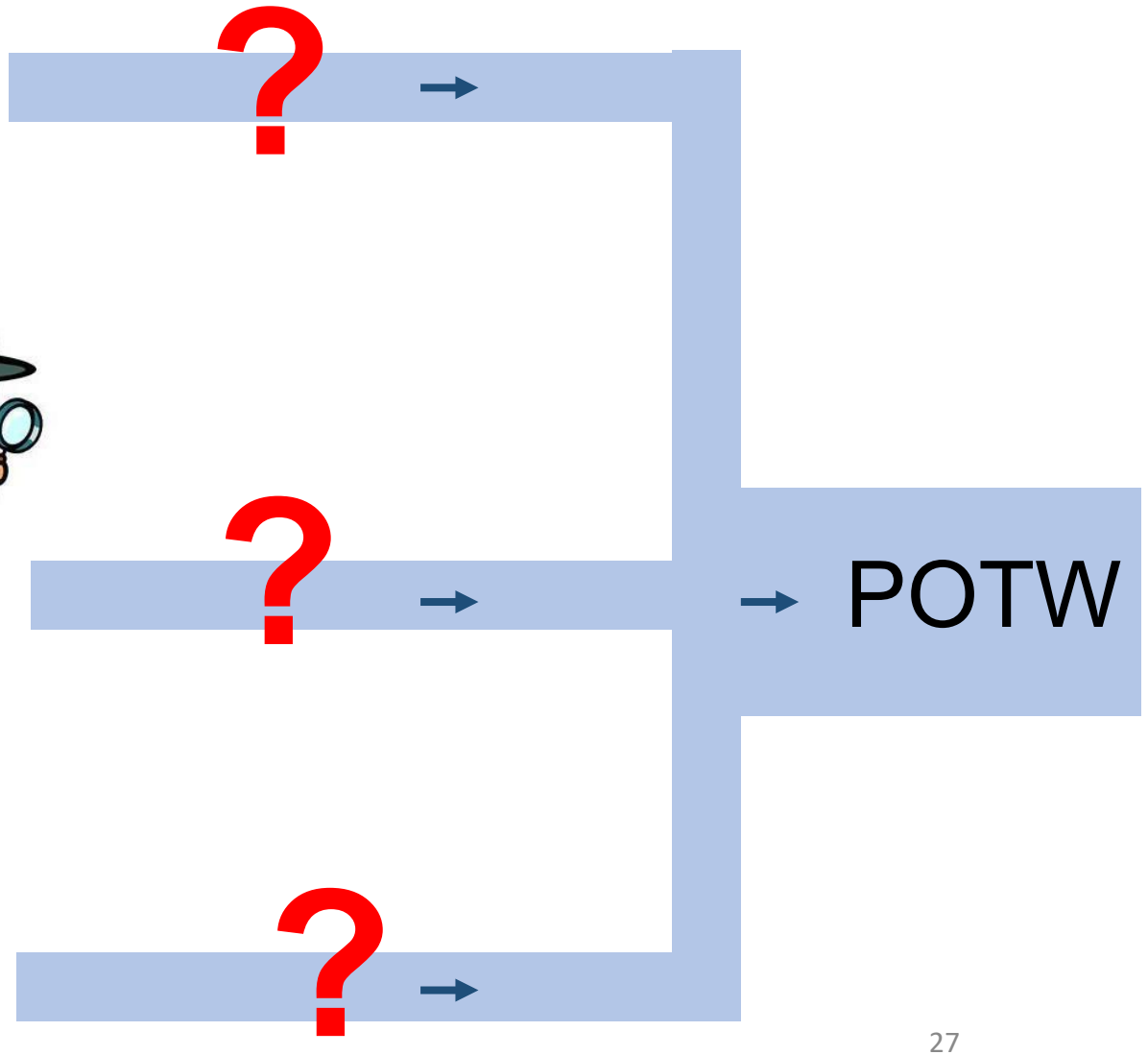
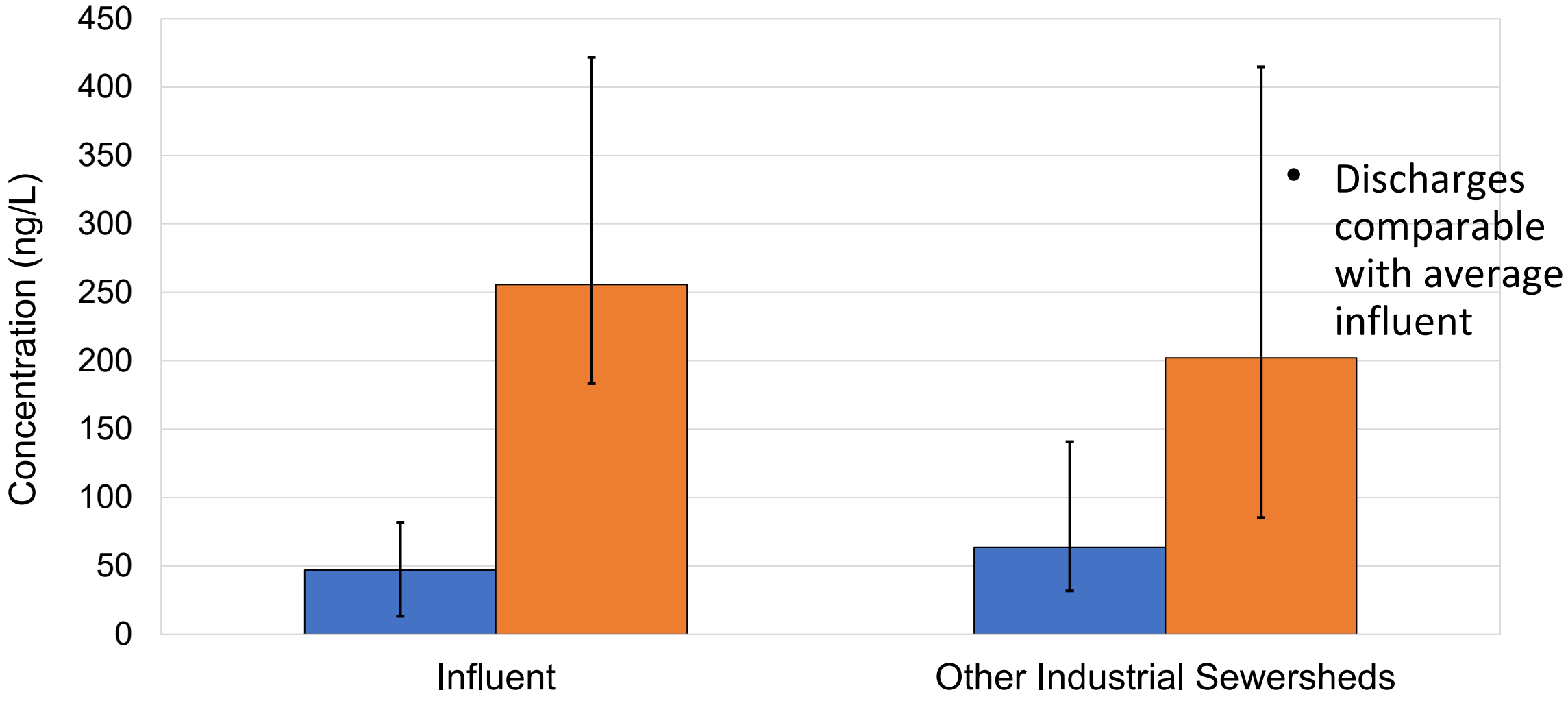
- Semiconductor manufacturing (n=2)
- Hospitals (n=4)
- Military site (n=1)
- Car wash (n=3)
- Jail (n=1)
- Pulp paperboard manufacturing (n=1)

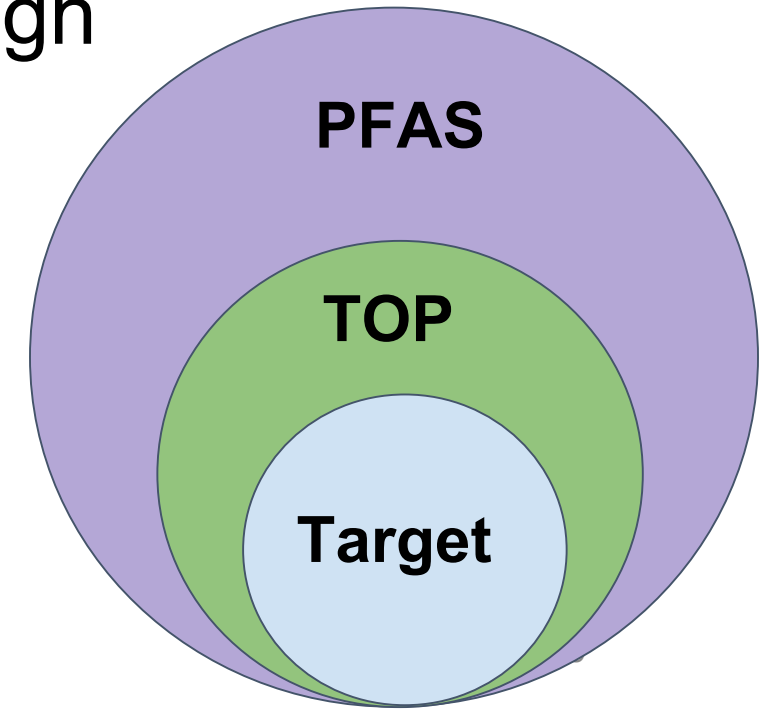


Other Industrial Sewershed Discharges



Findings and Lessons Learned

- Applying different analytical methods is important
- Sewershed monitoring is effective
  - Residential discharges are important
  - Industrial laundry discharges have high PFAS concentrations
- Temporal trends suggest declines
- Remaining analytical challenges
- Next steps



More Information

- Final report
- Website: https://www.sfei.org/projects/pfas

Questions?

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