

Air Toxics Trends in Tacoma & Seattle

Preliminary Results

National Air Monitoring Conference 2022, Pittsburgh PA

AUGUST 2022



EPA Grant

EPA grant XA-01J87901-0/1 provided \$657,840

PSCAA contribution \$114,389

Assessment to Identify trends in air toxic risk drivers in Tacoma and Seattle Environmental Justice communities by monitoring:

- VOCs including EtO
- Aldehydes, and other risk drivers
- Community Monitoring



Outline

- Provide background and context on the grant work
- Discuss QAPP in a community-led project
- Collaborate on community fundamentals
- Share Analysis tools and methods, open the door to continuous improvement
- Analysis challenges that lie ahead
- Share next steps



Where?

Seattle & Tacoma Air Toxics

2 core sites in Seattle

(Near Road and Industrial)

3 core sites in Tacoma

(Near Road, Industrial, and Residential)

Historically Disadvantaged Communities

We will estimate potential cancer risk and non-cancer health risk from the air toxics risk drivers (HAP's).

minary Results



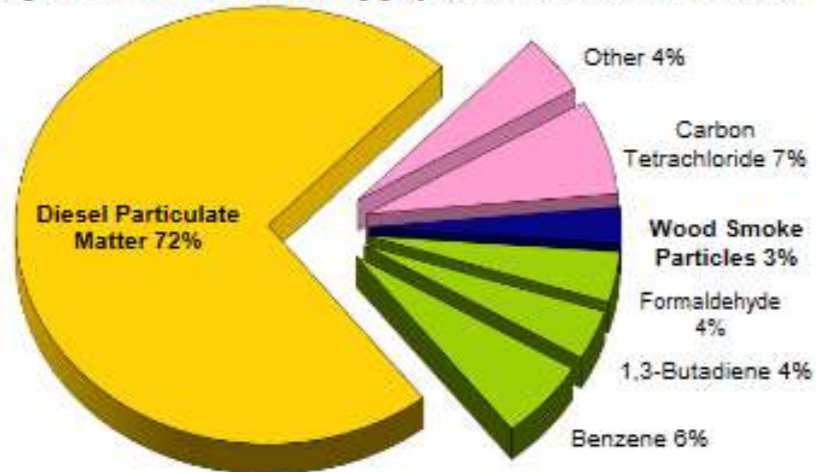
PUGET SOUND
Clean Air Agency



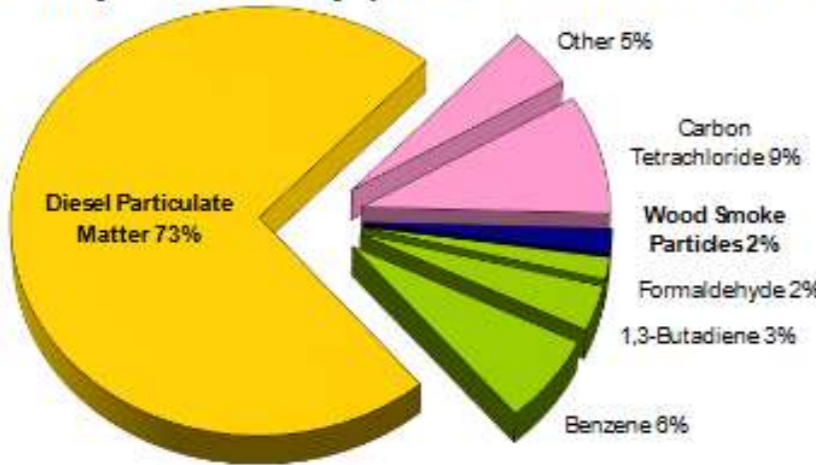
Contributors to Overall Risk

- Air Toxics Source:
- Mobile Sources- Cars, Trucks, Ships, etc
 - Wood Combustion
 - Both Mobile Source and Wood Combustion
 - Other

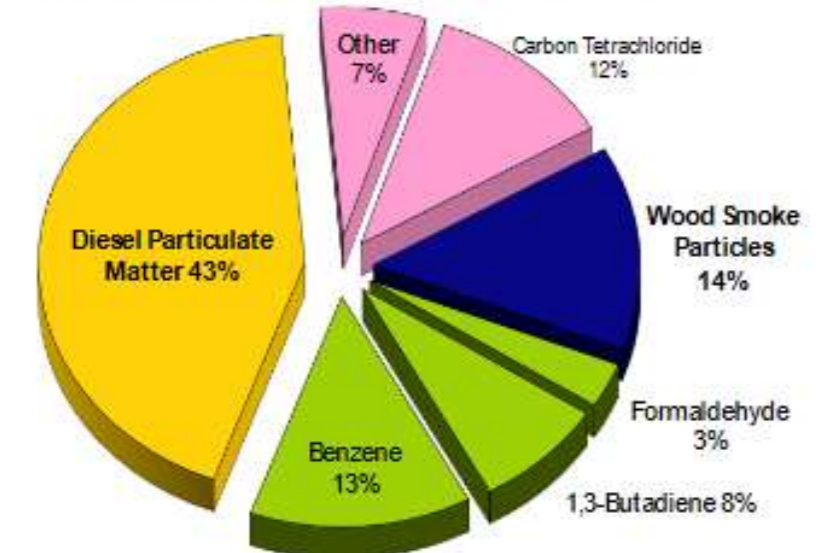
Seattle Industrial Site (Duwamish Valley) (Total Potential Cancer Risk of 450 per million):



Seattle Residential Site (Beacon Hill) (Total Potential Cancer Risk of 360 per million):



Tacoma Residential Site (South End) (Total Potential Cancer Risk of 270 per million):



What got us here?

2003 Seattle Air Toxics Study

- Identified **diesel exhaust as the most important** contributor – led to 'Diesel Solutions' projects and program

2010 Seattle and Tacoma Air Toxics Study

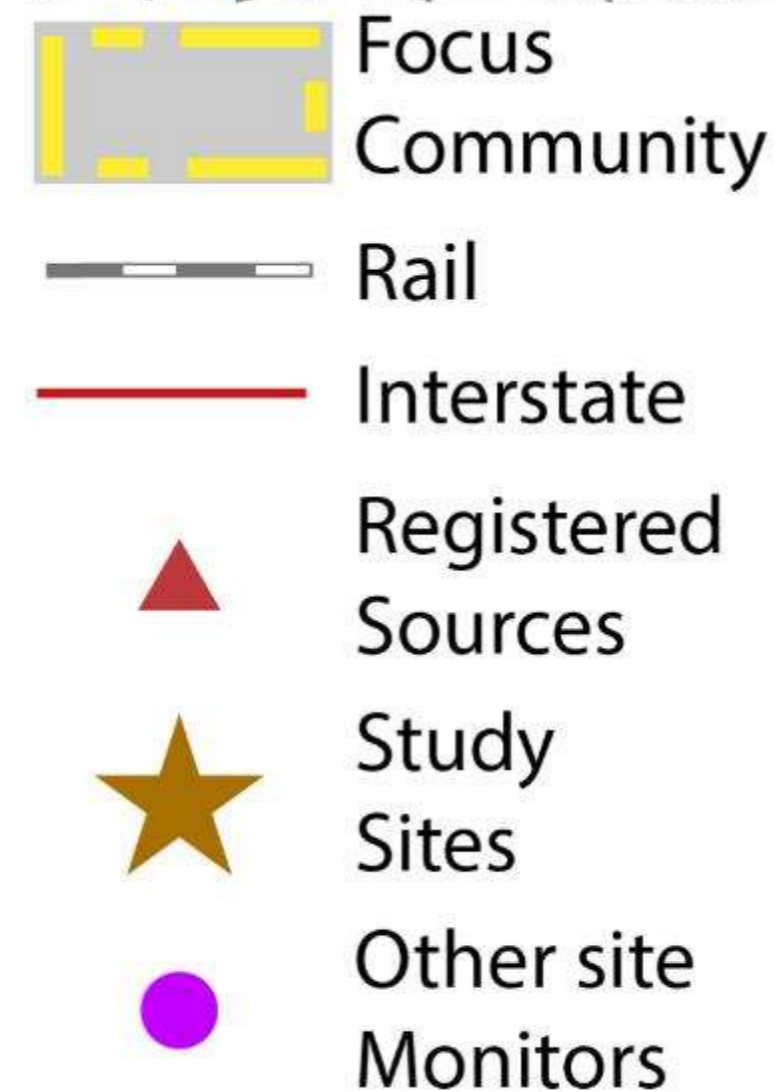
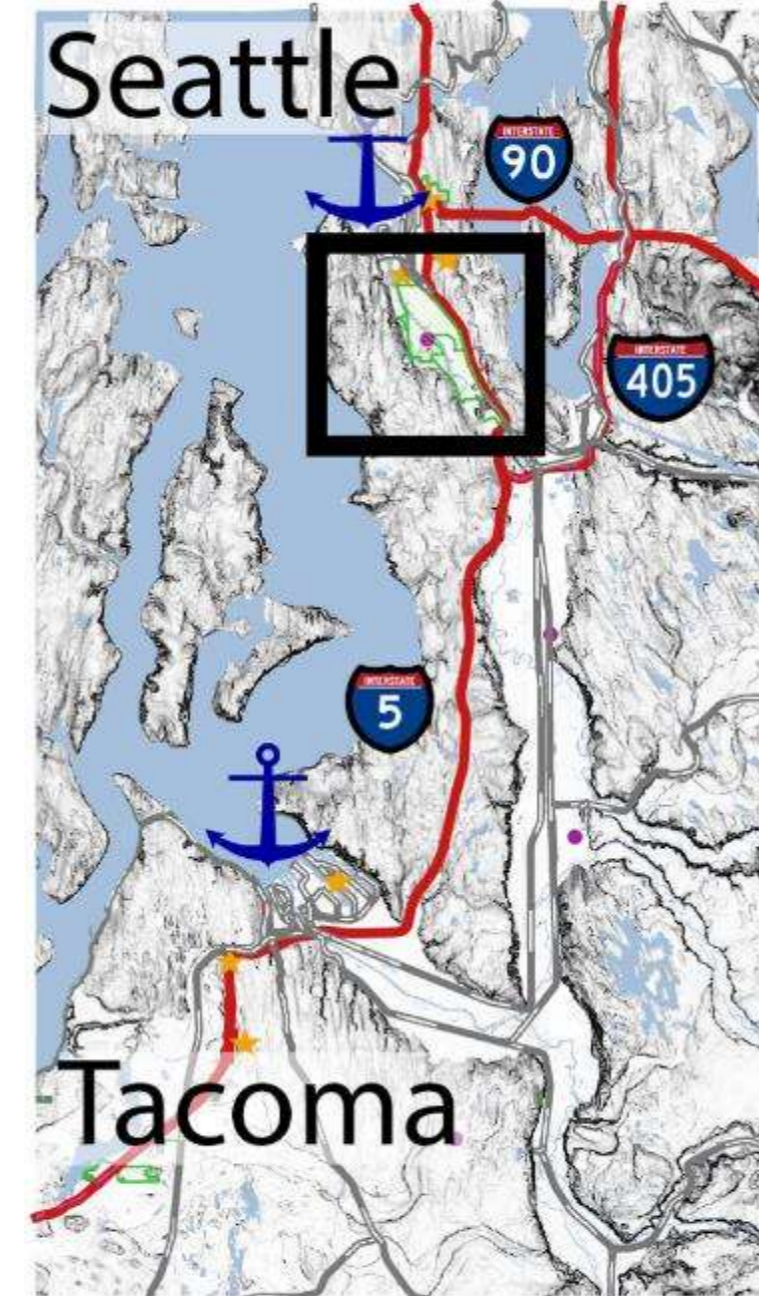
- Provided better baseline understanding of potential cancer risks in the Puget Sound region
- Confirmed **diesel exhaust as the most important** contributor
- Also found wood smoke to be important as well

2016 Seattle Chinatown-International District Study

- Better identified near-road diesel exhaust risks
- Included community-directed monitoring to investigate community concerns

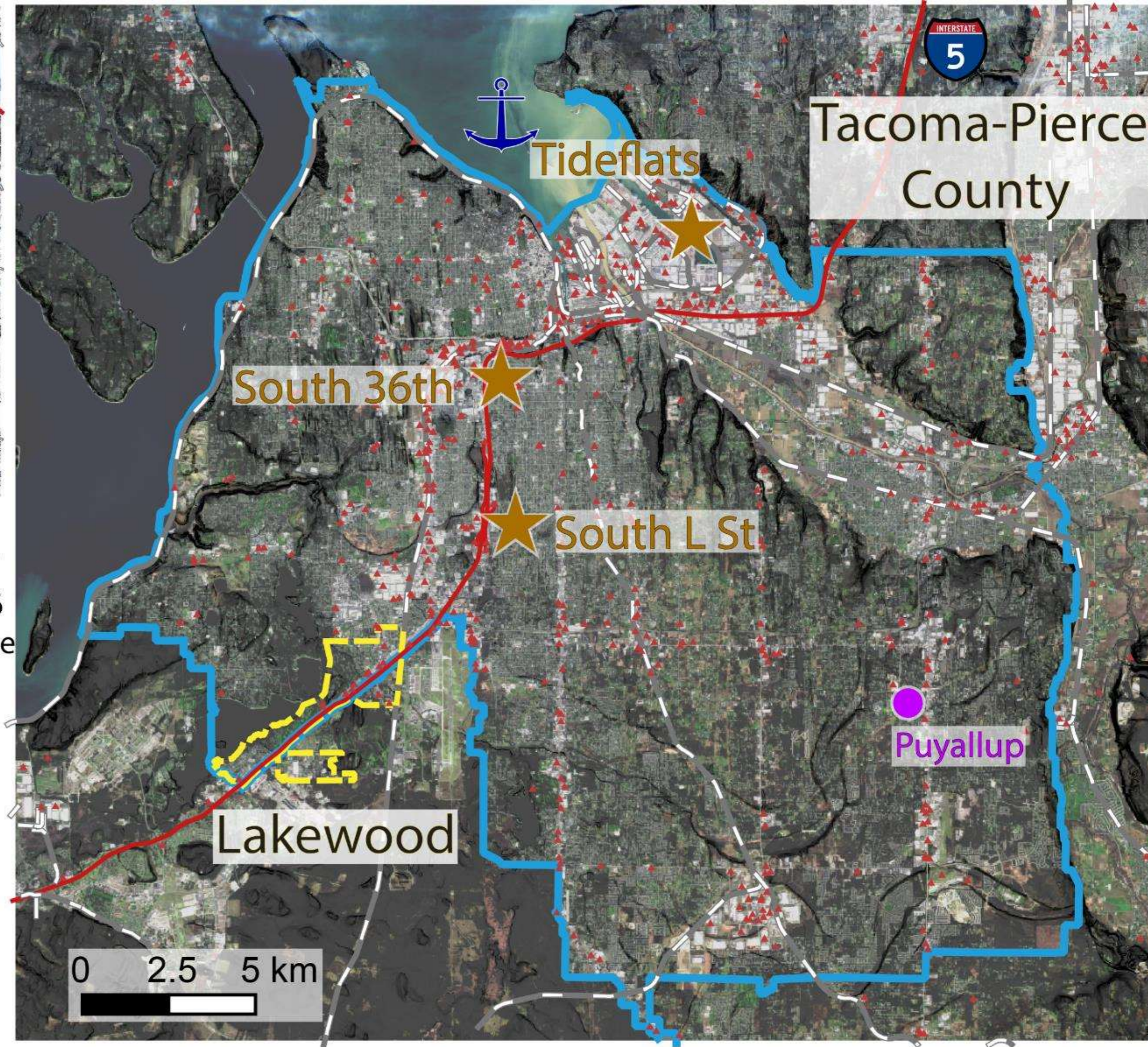
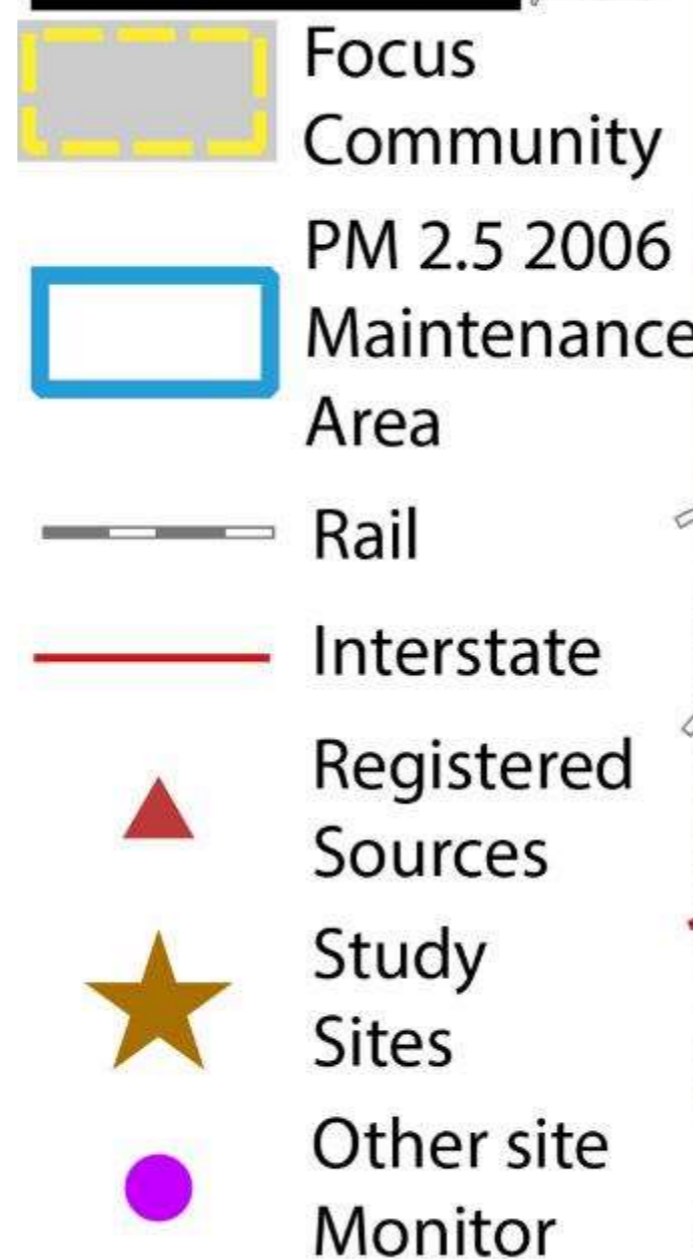
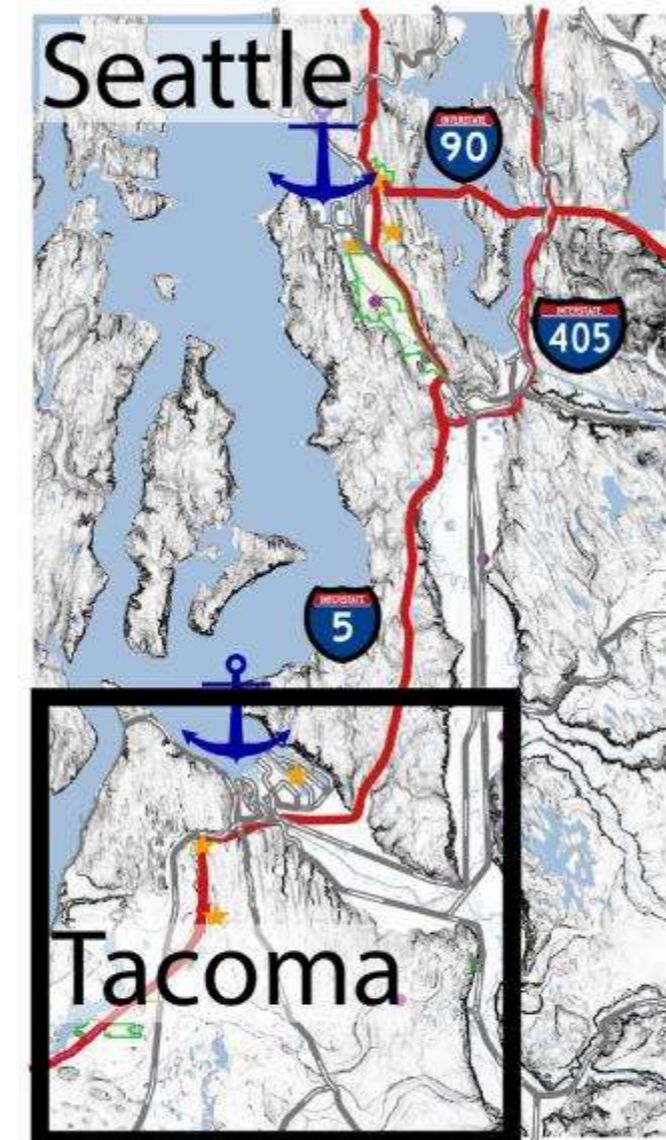
Duwamish Valley

- One of our focus communities
- Neighborhoods rooted in industrial settings
- Bounded by rail, major airport (Boeing Field), industrial sources and roadways
- A century of industrial pollution
- Recent metals-in-moss study completed by youth and community with the USFS
- Existing partnership with this community



Tacoma

- Wood smoke reduction zone
- Tideflats with heavy industry and busy port and railyards
- Tideflats has seen higher levels of metal deposition
- Lakewood focus community with large industry footprint and major military base nearby



Timeline

We Are Here

Table 2: Timeline of the proposed work for: monitoring/analysis (dark grey), assessment (light grey) and reporting (black)

Timing:	Year 1: 2020-2021				Year 2: 2021-2022				Year 3: 2022-2023			
Milestones:	Fall	Win.	Spr.	Sum.	Fall	Win.	Spr.	Sum.	Fall	Win.	Spr.	Sum.
Community engagement												
Input from communities on project and timeline												
Finalize study design												
Generate QAPP, SOPs												
Setup contract with analytical laboratory												
Install monitors												
Progress reports to EPA												
Fixed-site sampling												
Community-led sampling												
Outreach events												
Data analysis												
Draft report												
Inform communities on findings												
Final report												
Final outreach events												
Community "next steps" plan												

Priority Air Toxics

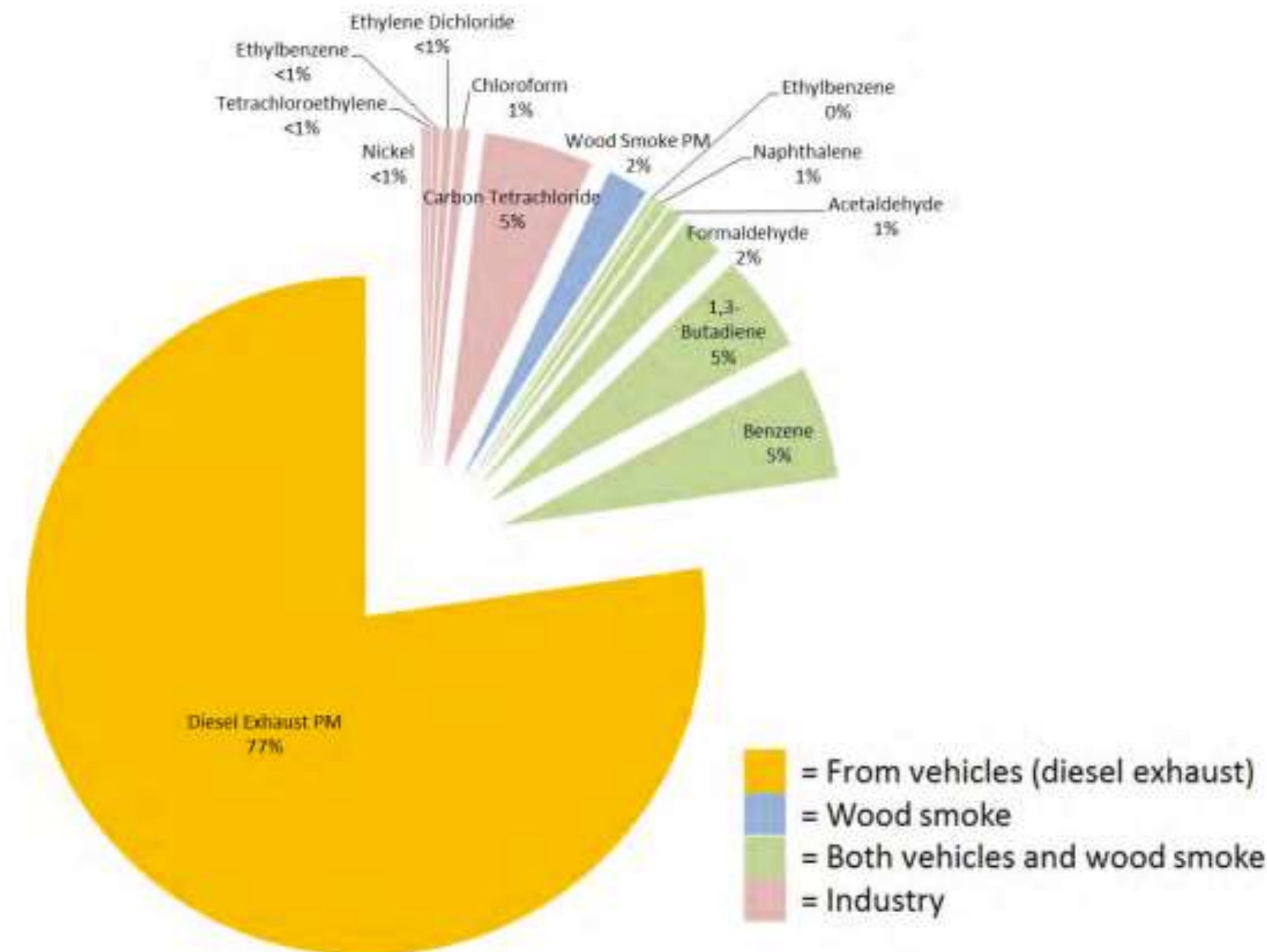
We already know some things:

- Diesel Particulate matter
- Carbon Tet, Benzene and 1,3 Butadiene
- Formaldehyde and Acetaldehyde

We don't know enough yet:

- EtO Ethylene Oxide levels
- Toxic Metals in context with Moss study

Figure 45. Pie chart attributing potential cancer risk at 10th & Weller to types of air pollution and color coded by type of source



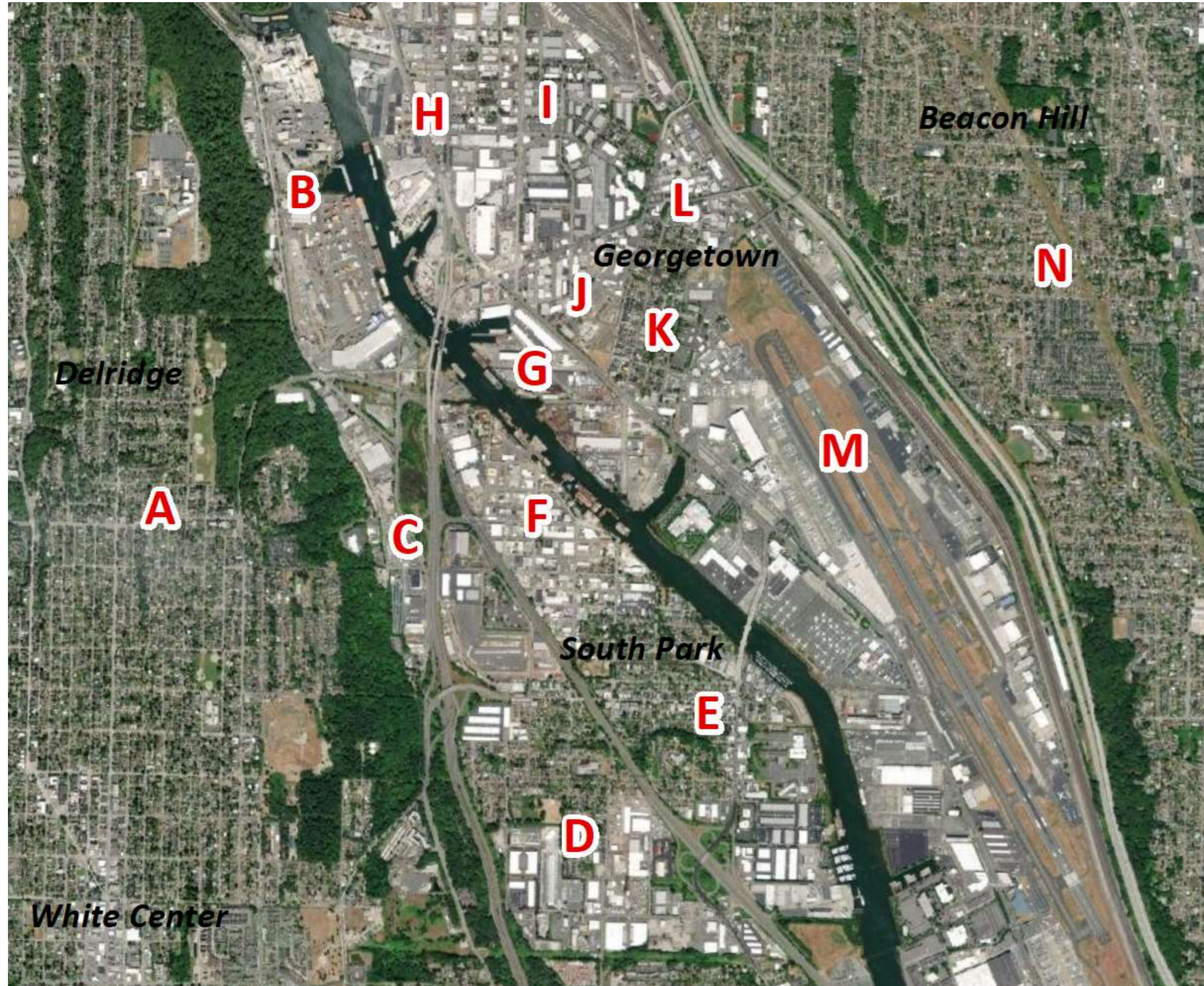
Community Involvement Principles

Our vision is for everyone, everywhere to breathe clean, healthy air all the time – regardless of who they are or where they live.

We reach out and listen to community concerns and make room to work with issues new to us. Our commitment to equity and environmental justice means taking the time to build and invest in relationships with a range of constituents, from partner institutions to academic, and grassroots organizations.



Rank the top 3 zones of interest for you (webmap)



A = West Seattle

B = NW Industrial Area

C = West Industrial Area

D = South Industrial Area

E = South Park Residential Area

F = South Park Industrial Area

G = Central E Marginal Way Industrial Area

H = North Industrial Area

I = NE Industrial Area

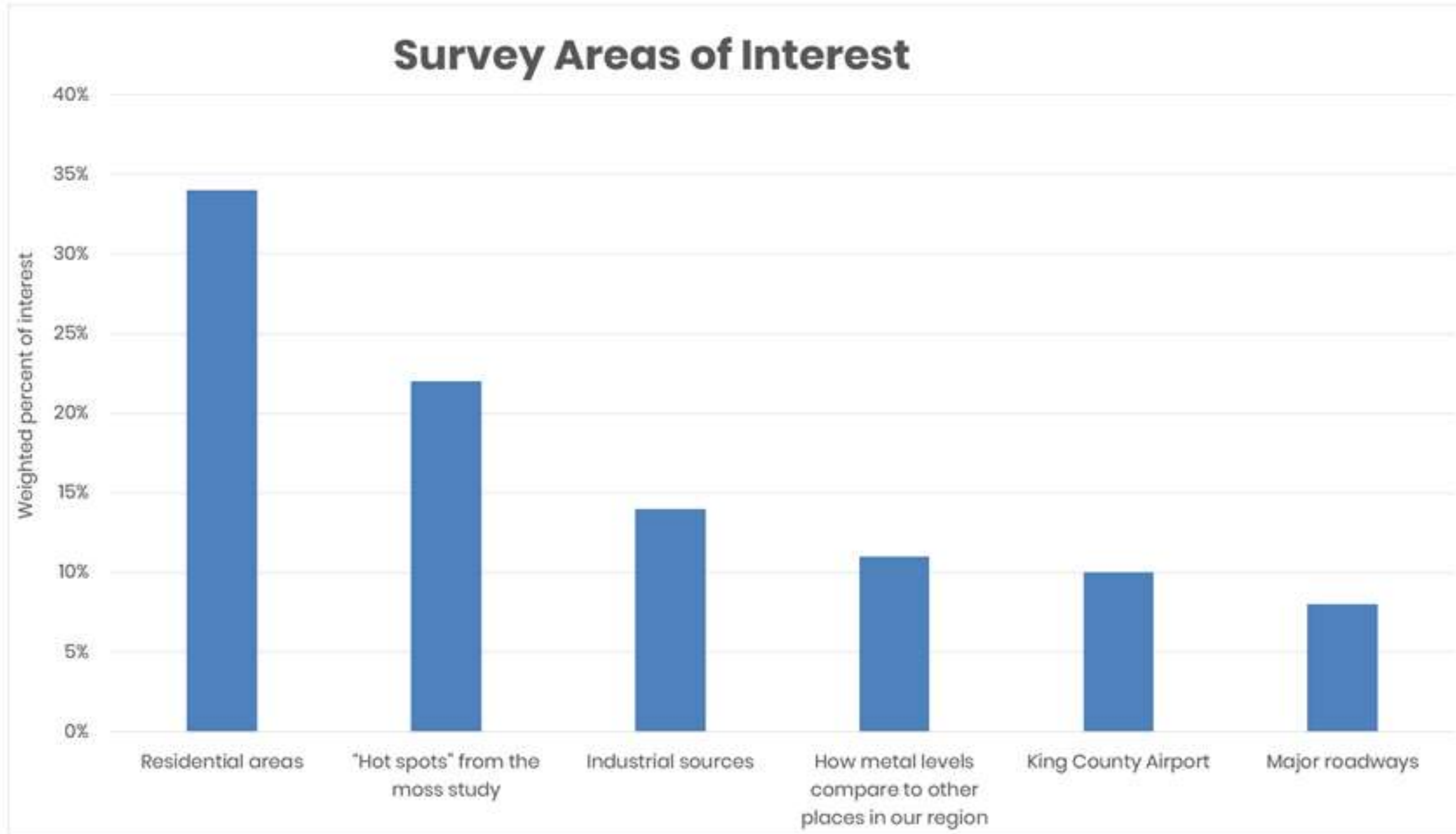
J = The "Triangle" hotspot from metals in moss study

K = South Georgetown Residential Area

L = North Georgetown Residential Area

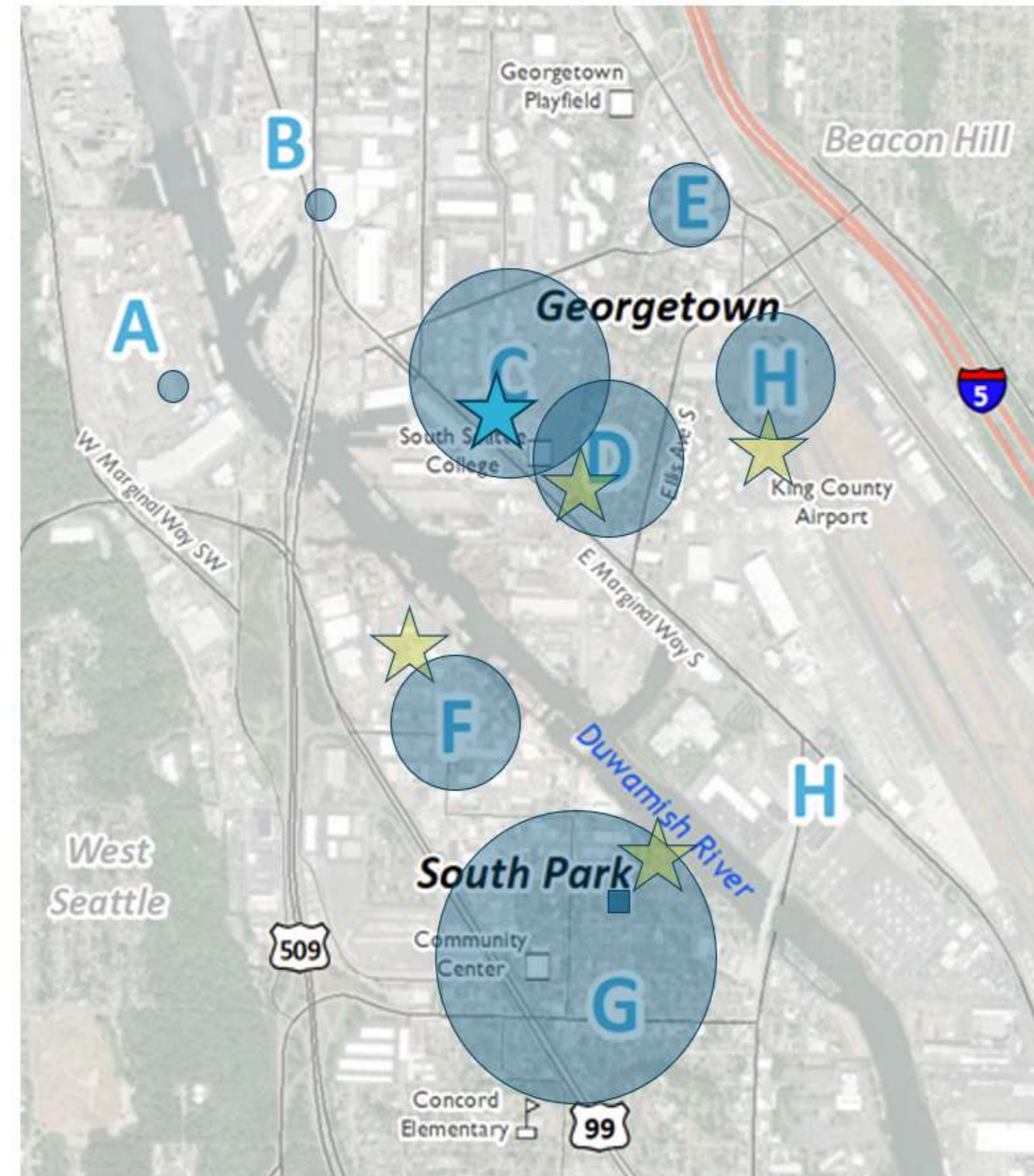
M = King County Airport

N = Beacon Hill



Community Engagement

- Community members were included.
- We conducted an online survey and learned what the community members wanted.
- We hosted public workshops, attended standing meetings with Duwamish River Valley Cleanup Coalition, and we have benefitted from community consultation.

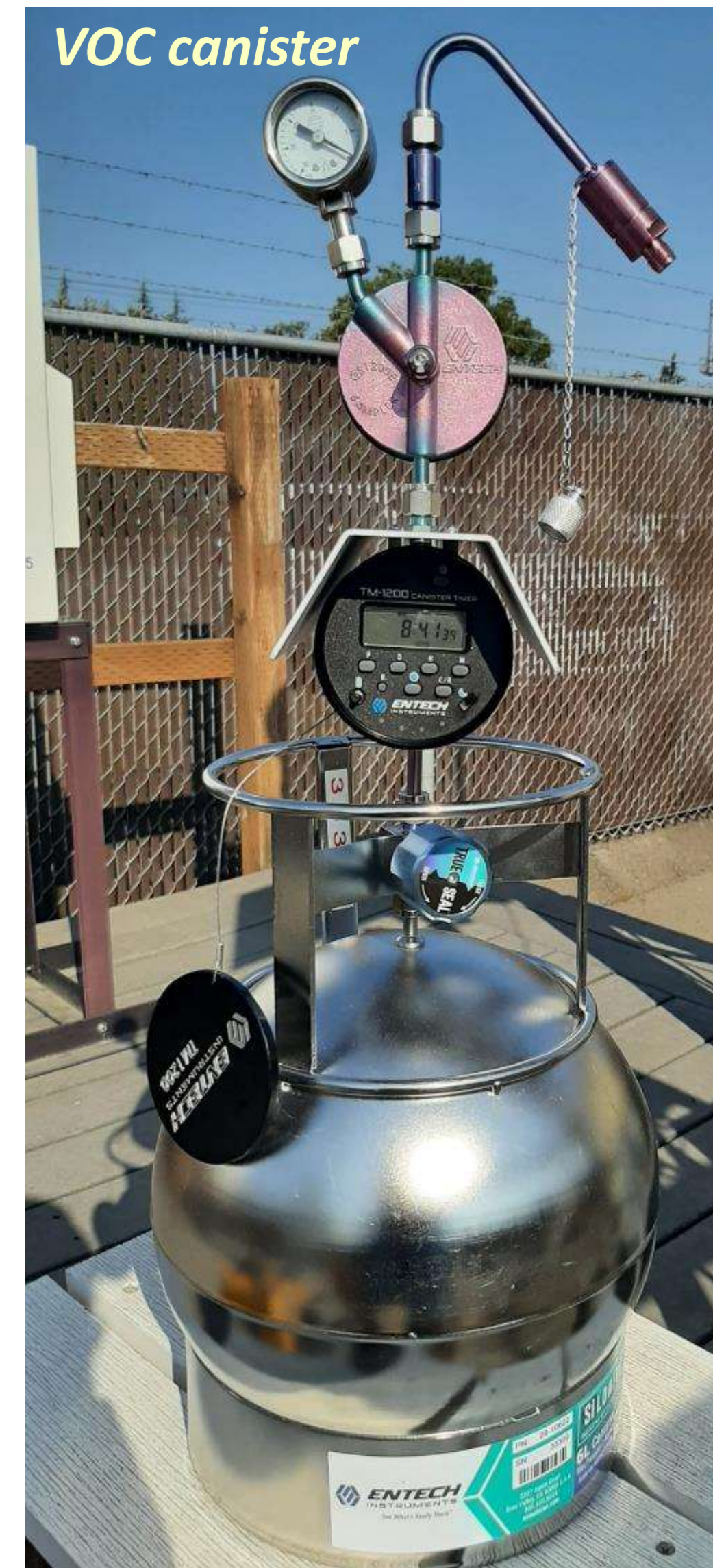


Locations identified for monitoring

- ★ = Currently sampling through the end of summer
- ★ = Locations identified for monitoring
- = Level of community interest
- = Agency permanent fine particle monitor
- A = West industries**
- B = North industries**
- C = The “Triangle”**
Hot spot from metals-in-moss study
- D = Georgetown residences**
- E = North Georgetown**
- F = South Park industrial area**
Included some hotspots from metals-in-moss study
- G = South Park residences**
- H = Near King County Airport**

Sampling Tasks and Equipment

- 1 site - Polycyclic aromatic hydrocarbon (PUF sampler)
- 5 sites - Select Aldehydes (carbonyl ATEC samplers)
- 7 sites - PM₁₀ Metals (Partisol 1025 and N-FRMs)
- 5 sites - Black Carbon (AE-33 Aethalometer)
- 5 sites - Select VOCs (canisters)



N-FRM sampler

Small pump sampler – individual PM-10 filters. Programmable. Contains a module with a continuous fine PM particle counter.

Community Sites.

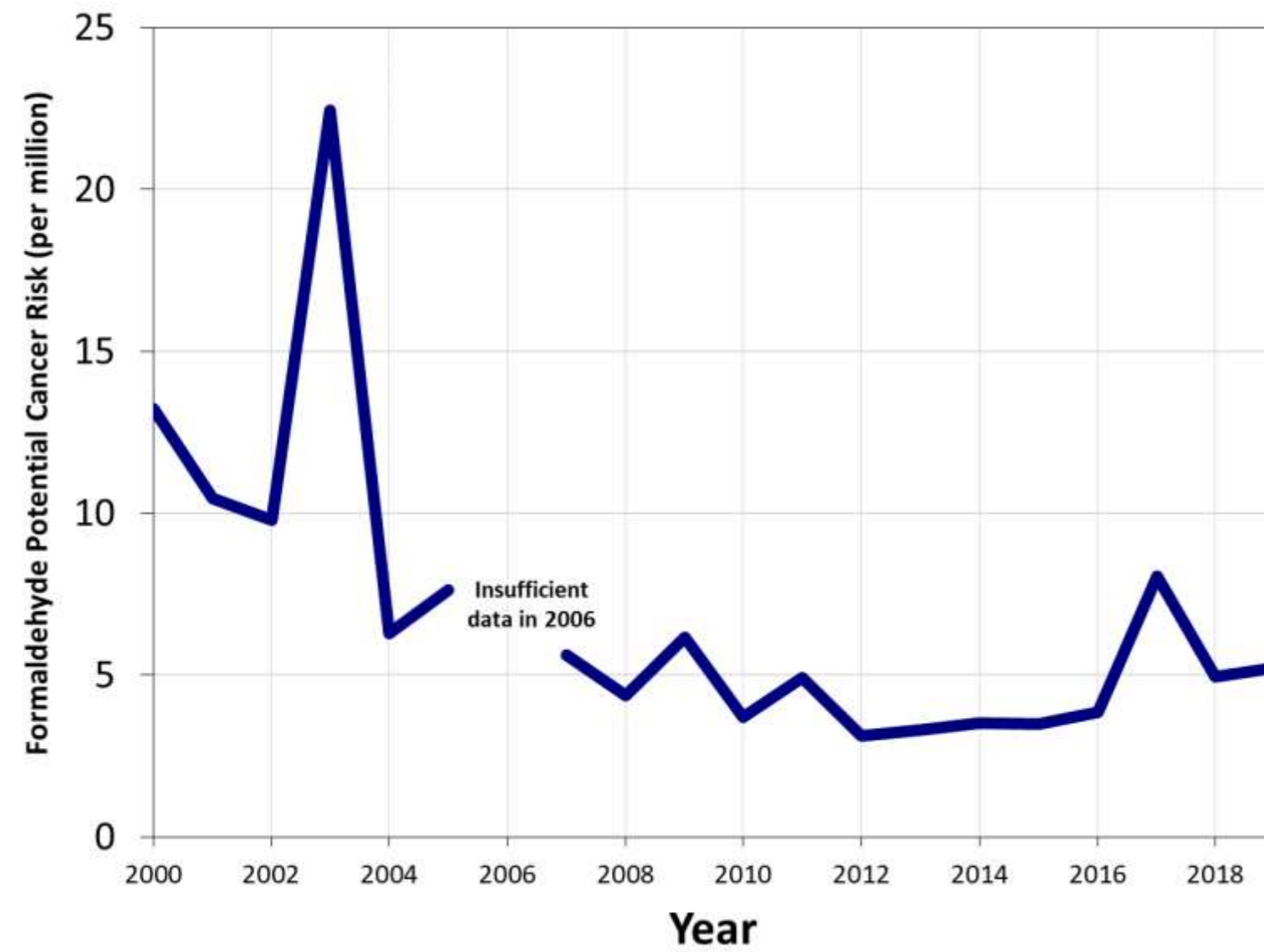
PM-10 Duplicates.

Comparable to PM-10 Filter Samplers like the R&P 2025

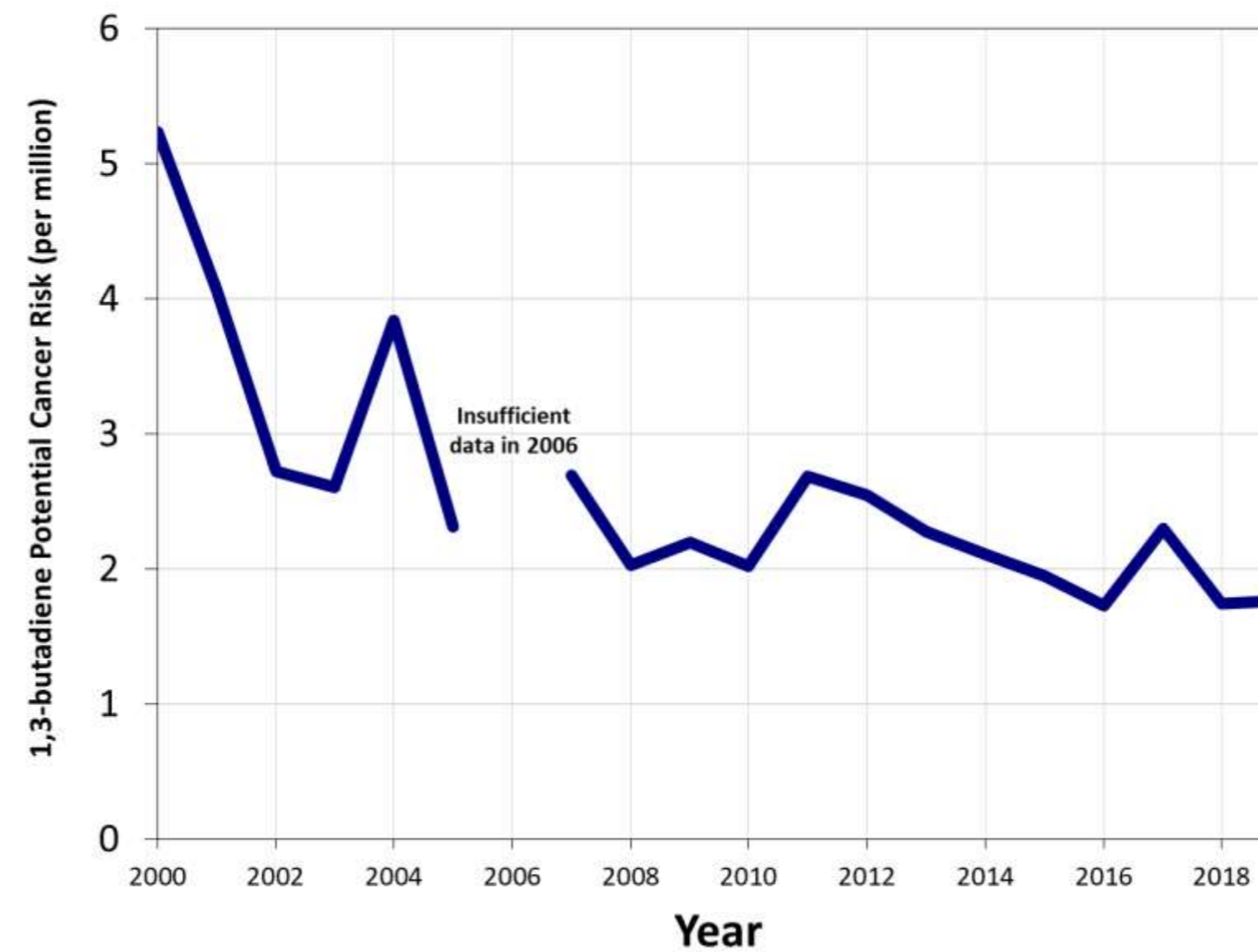


Air Toxics Trend at Seattle Beacon Hill

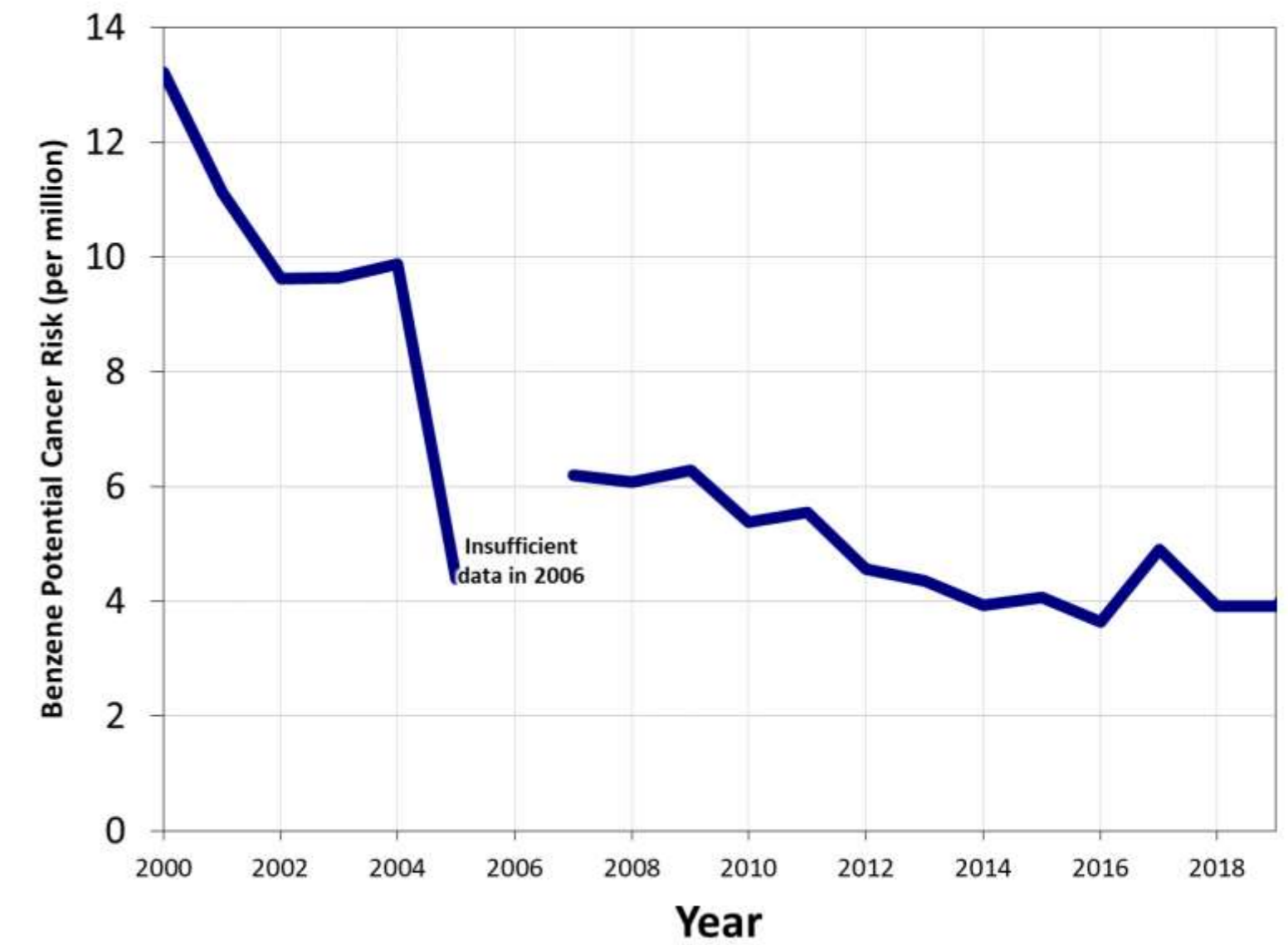
Formaldehyde



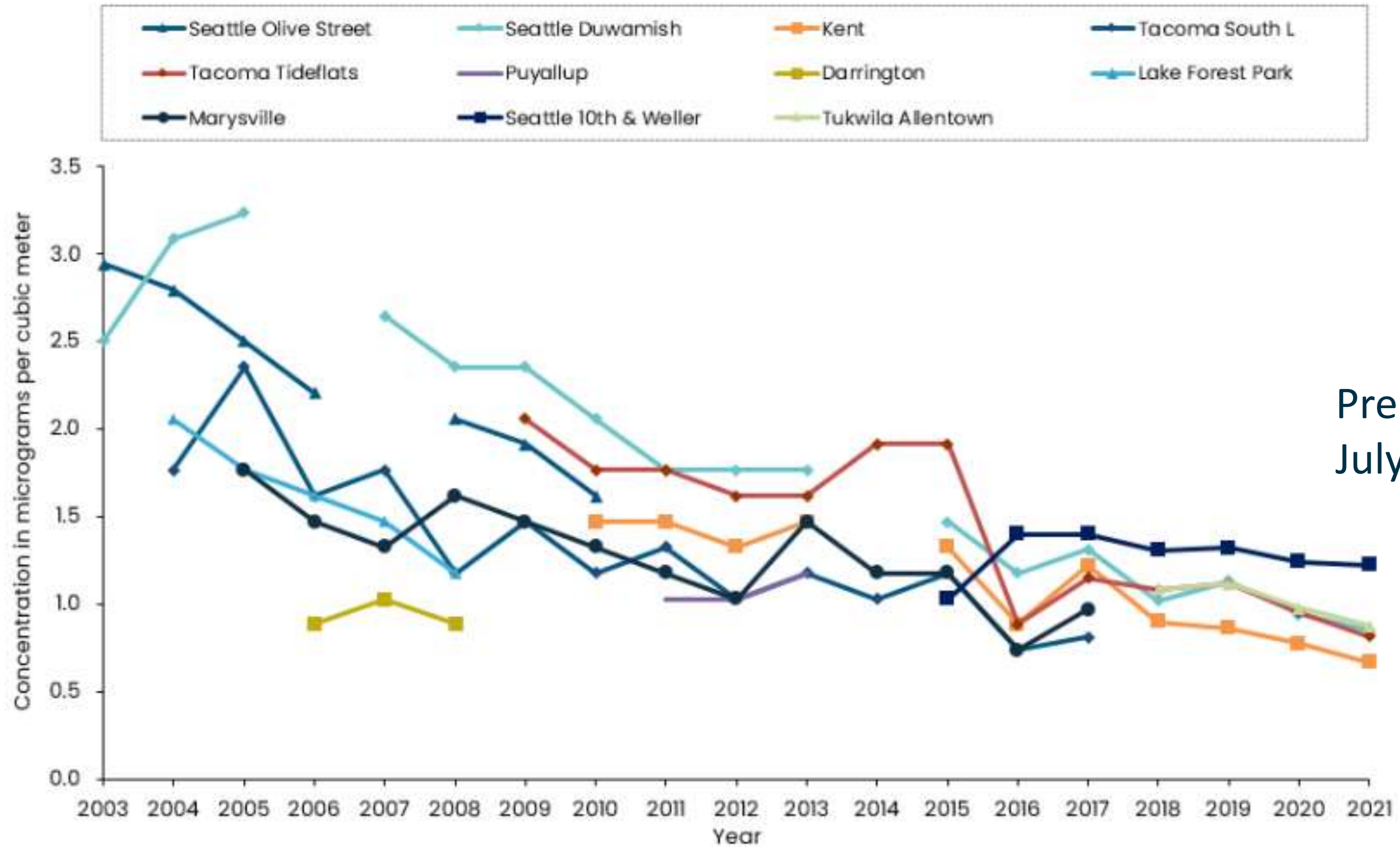
1,3-butadiene



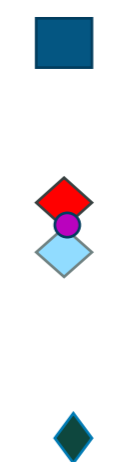
Benzene



Black Carbon Annual Mean Concentrations

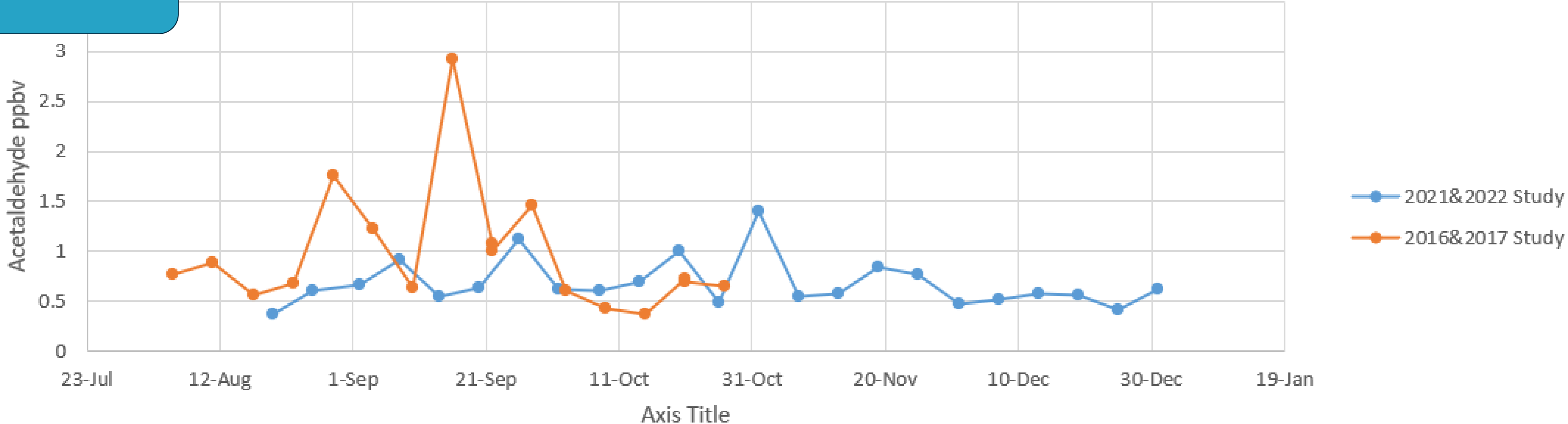


Preliminary Values for
July 1, 2021 – June 30, 2022

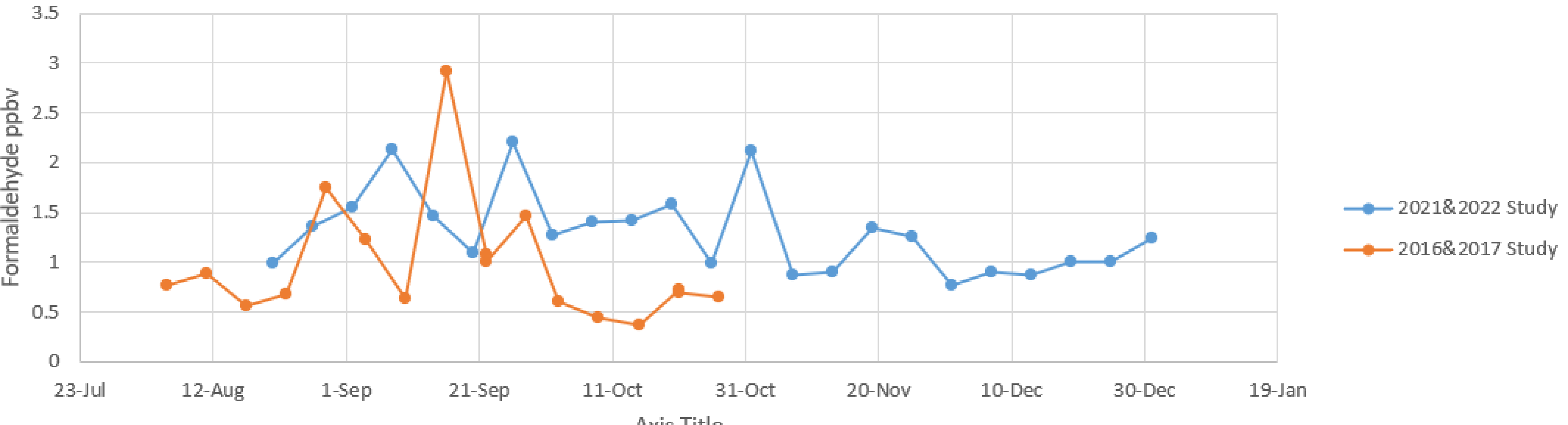


Key Carbonyl's

BKWA Seattle 10th & Weller (Aug, Sep & Oct)



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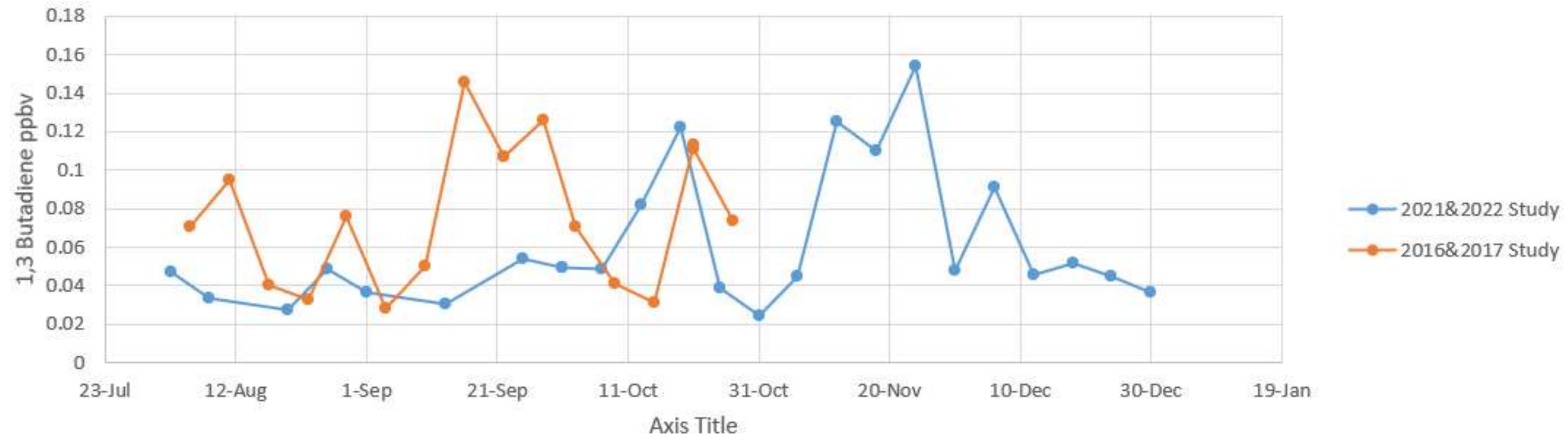


Air Tox
August

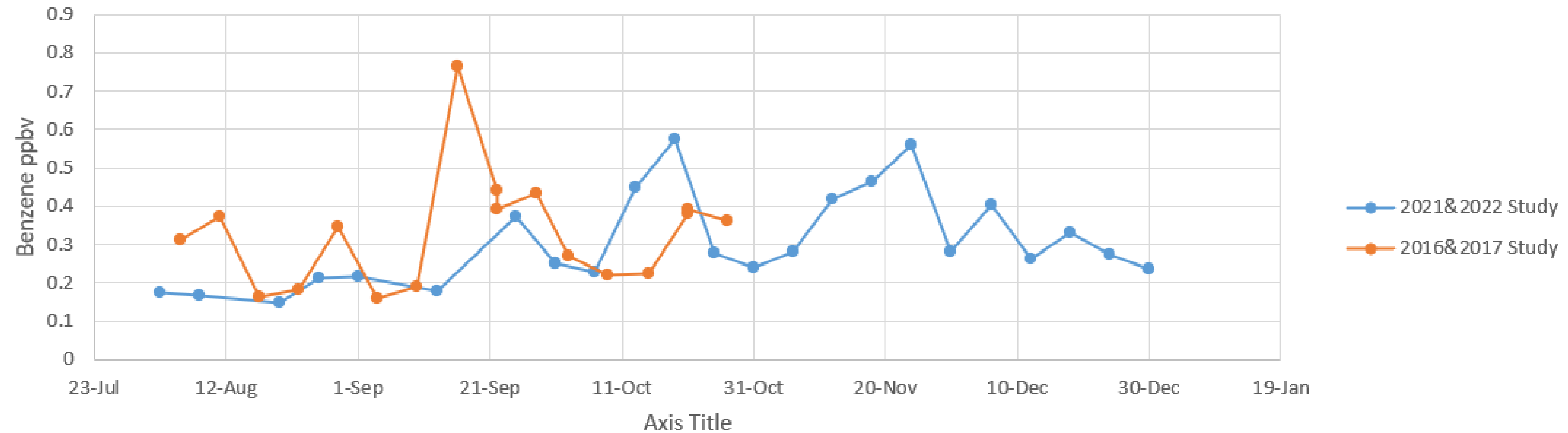


Key VOC's

BKWA Seattle 10th & Weller (Aug, Sep & Oct)



BKWA Seattle 10th & Weller (Aug, Sep & Oct)

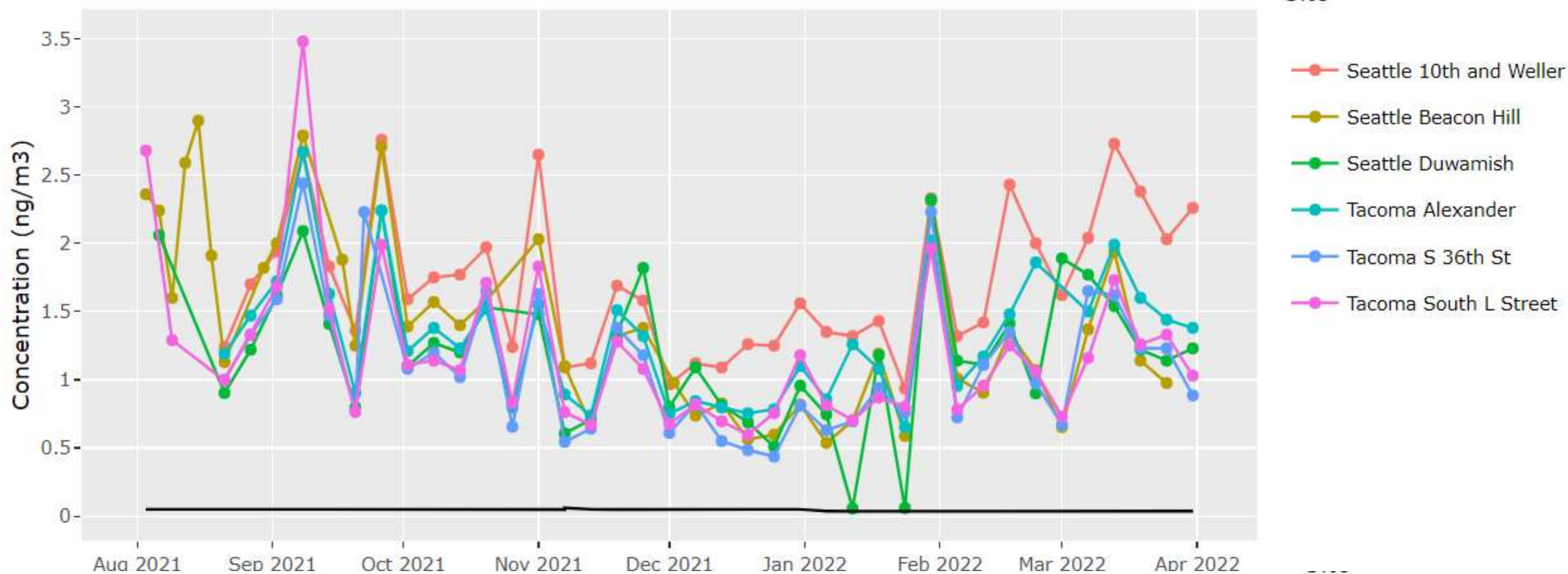


Select Compound

Formaldehyde

Select Date Range:

2021-08-01 to 2022-06-01

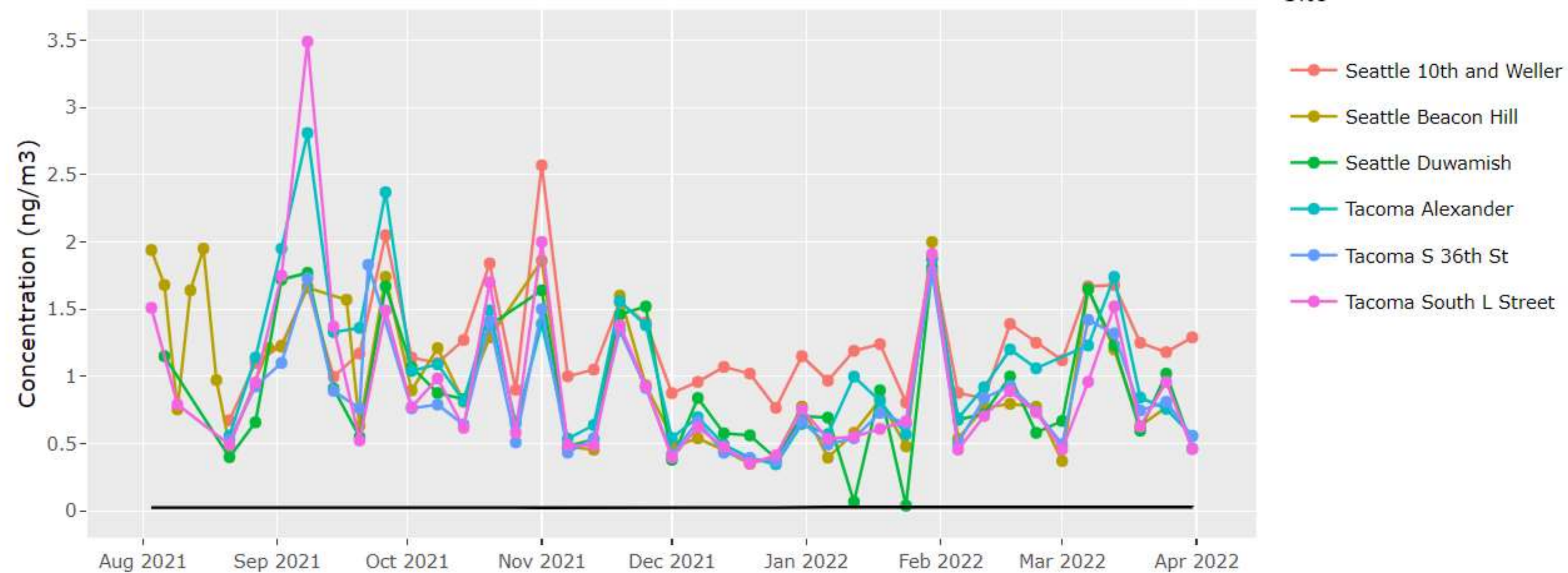


Select Compound

Acetaldehyde

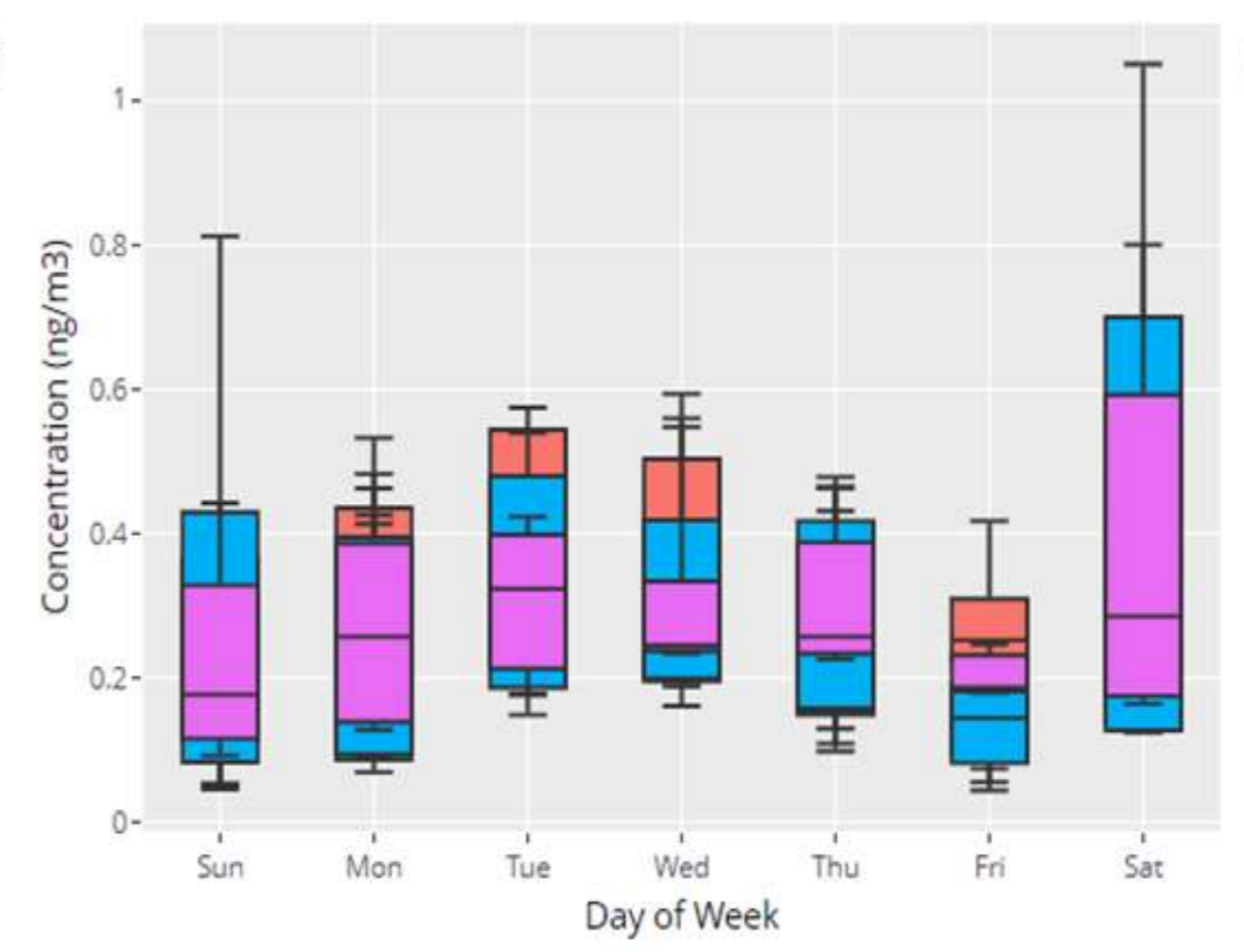
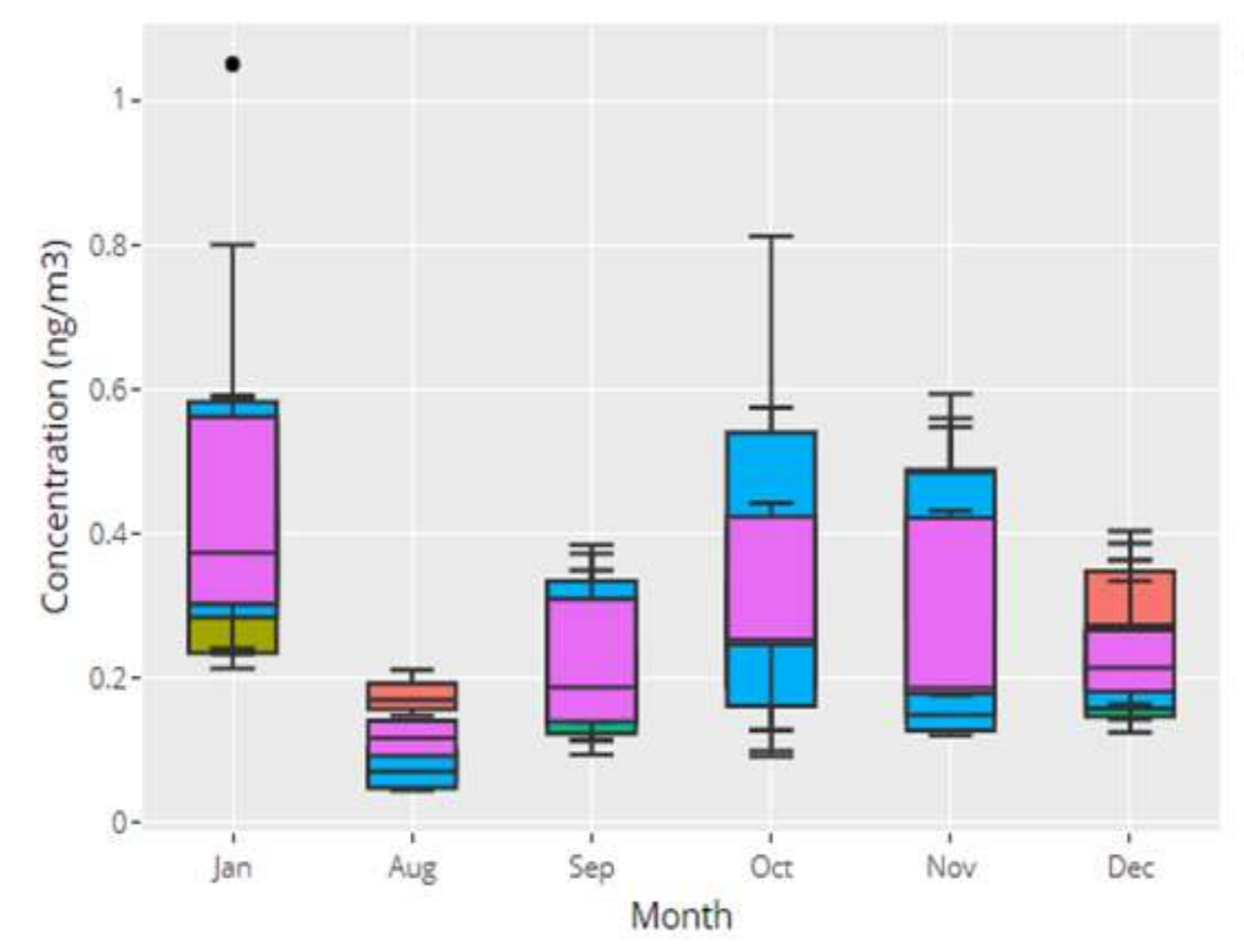
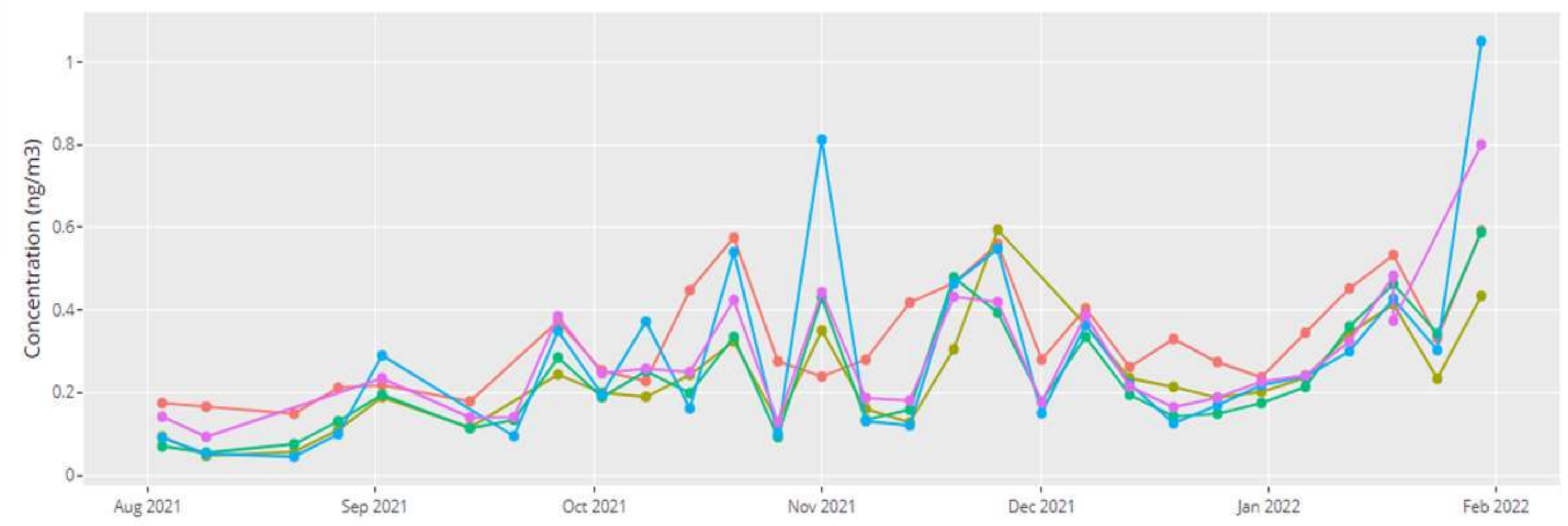
Select Date Range:

2021-08-01 to 2022-06-01



Select Compound
Benzene

Select Date Range:
2021-08-01 to 2022-03-13

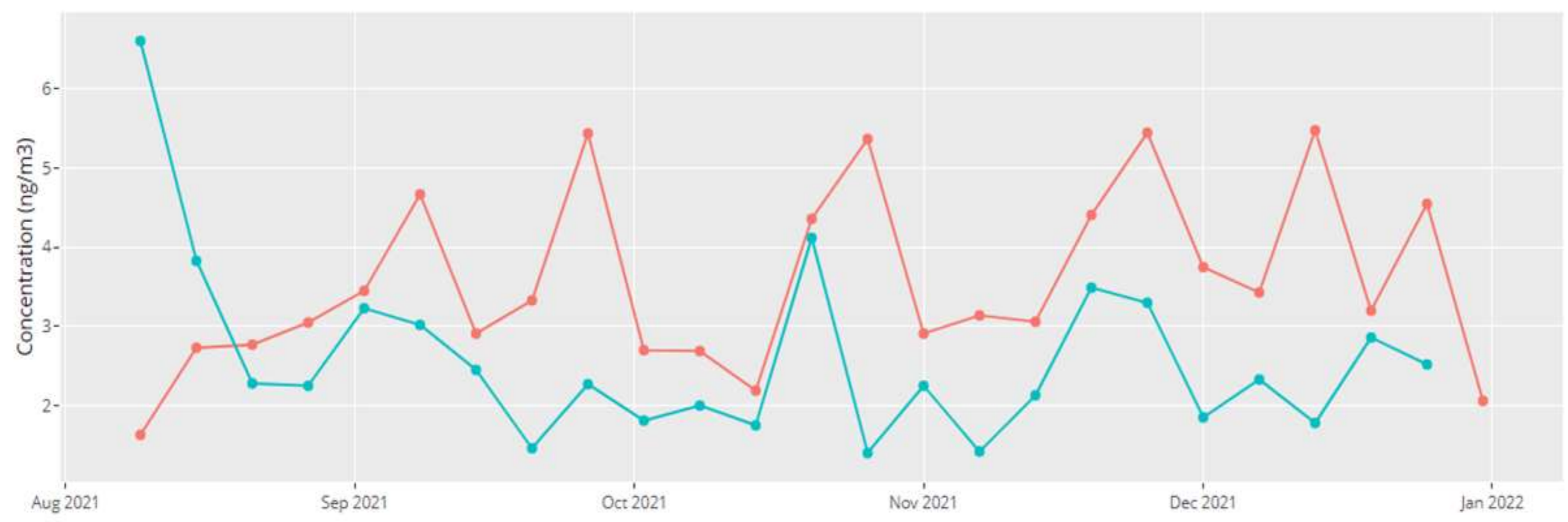


BKWA Seattle 10th & Weller Near Rd
CEWA Seattle Duwamish Industrial
EQWA Tacoma Alexander Industrial
YFWA Tacoma S 36th St Near Rd
ESWA Tacoma So L St Residential

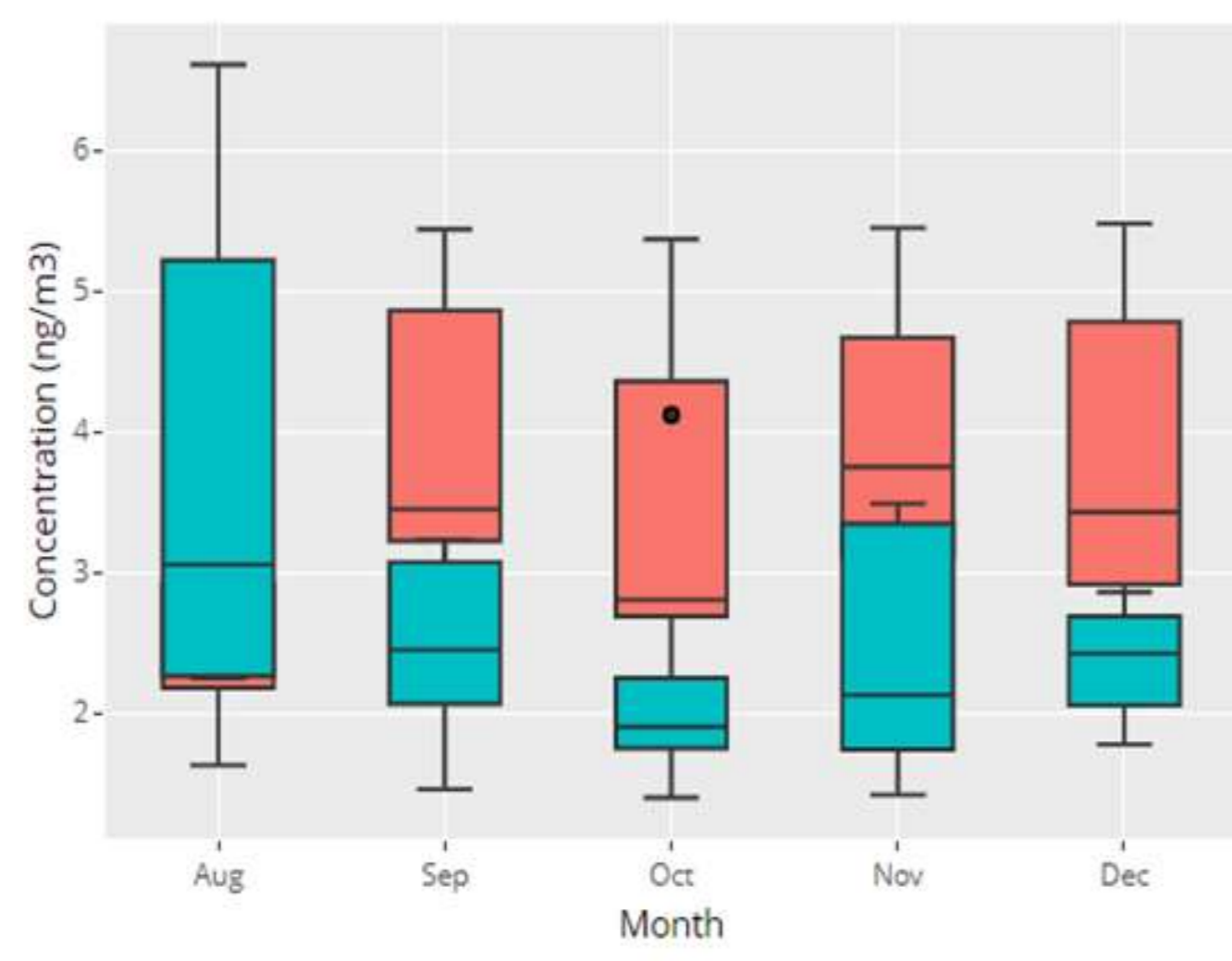
Clean Air Agency
PUGET SOUND

Select Compound
Chromium

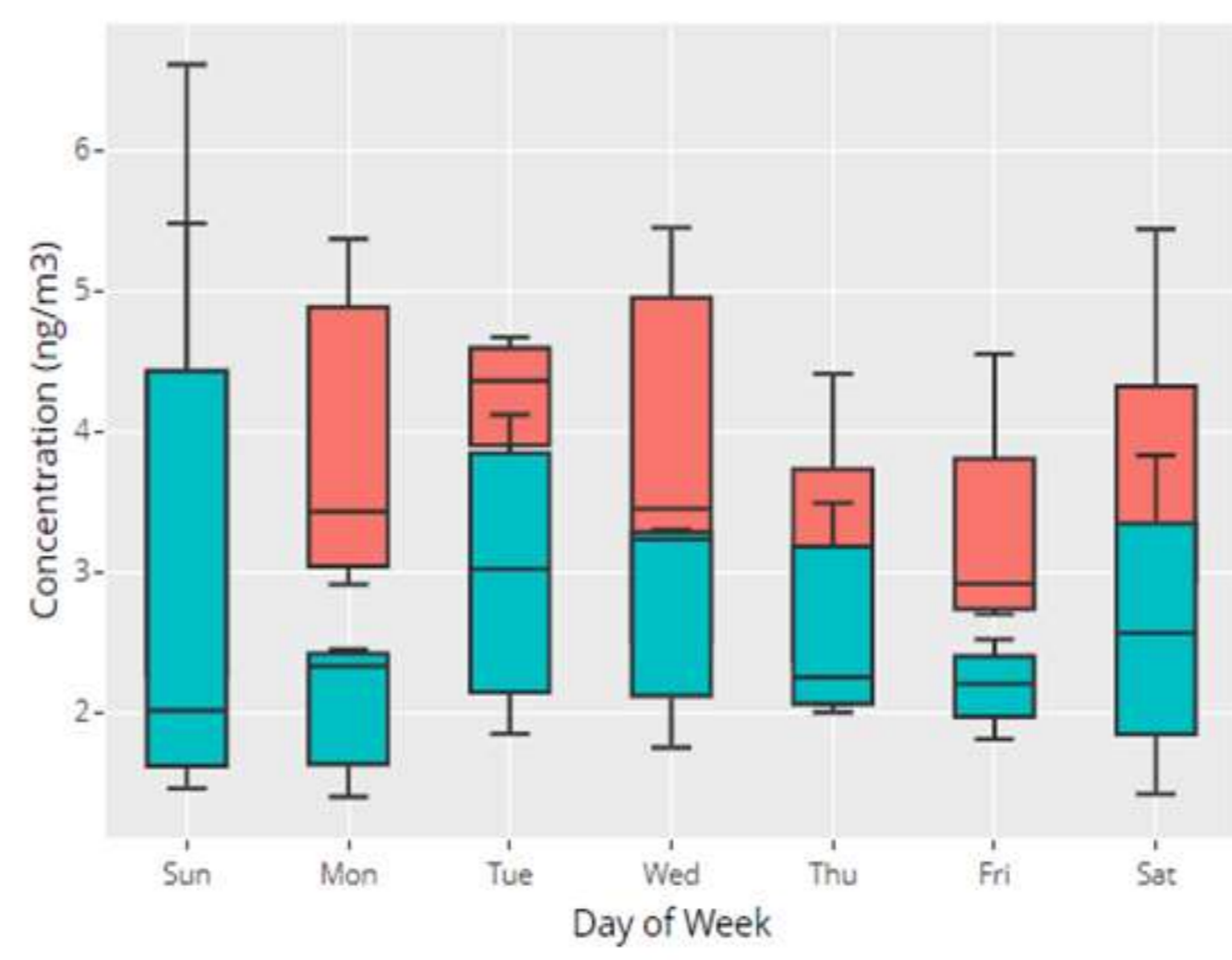
Select Date Range:
2021-08-01 to 2022-03-13



SAMPLENAME
—● CEWA
—● EQWA



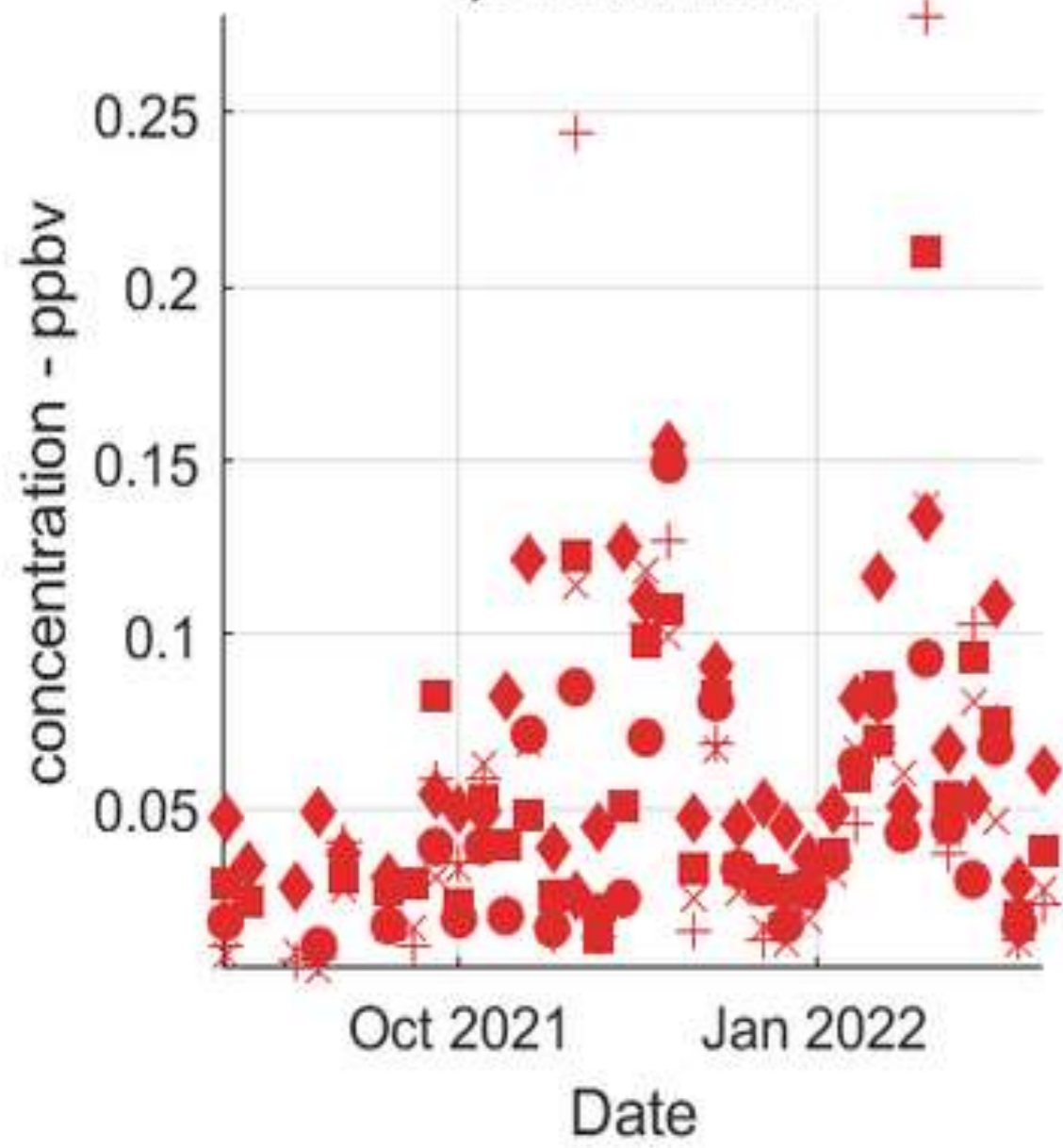
SAMPLENAME
■ CEWA
■ EQWA



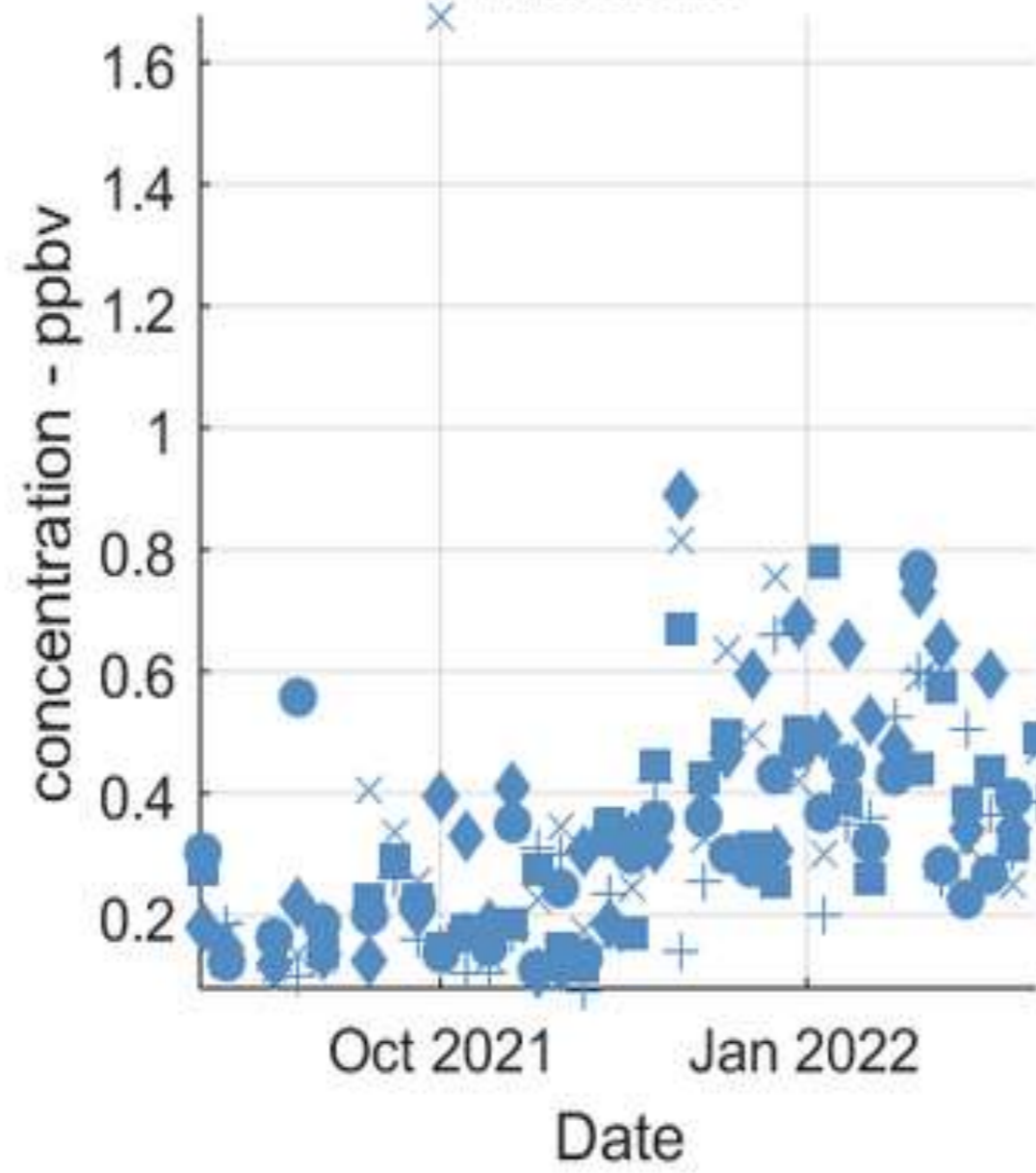
SAMPLENAME
■ CEWA
■ EQWA

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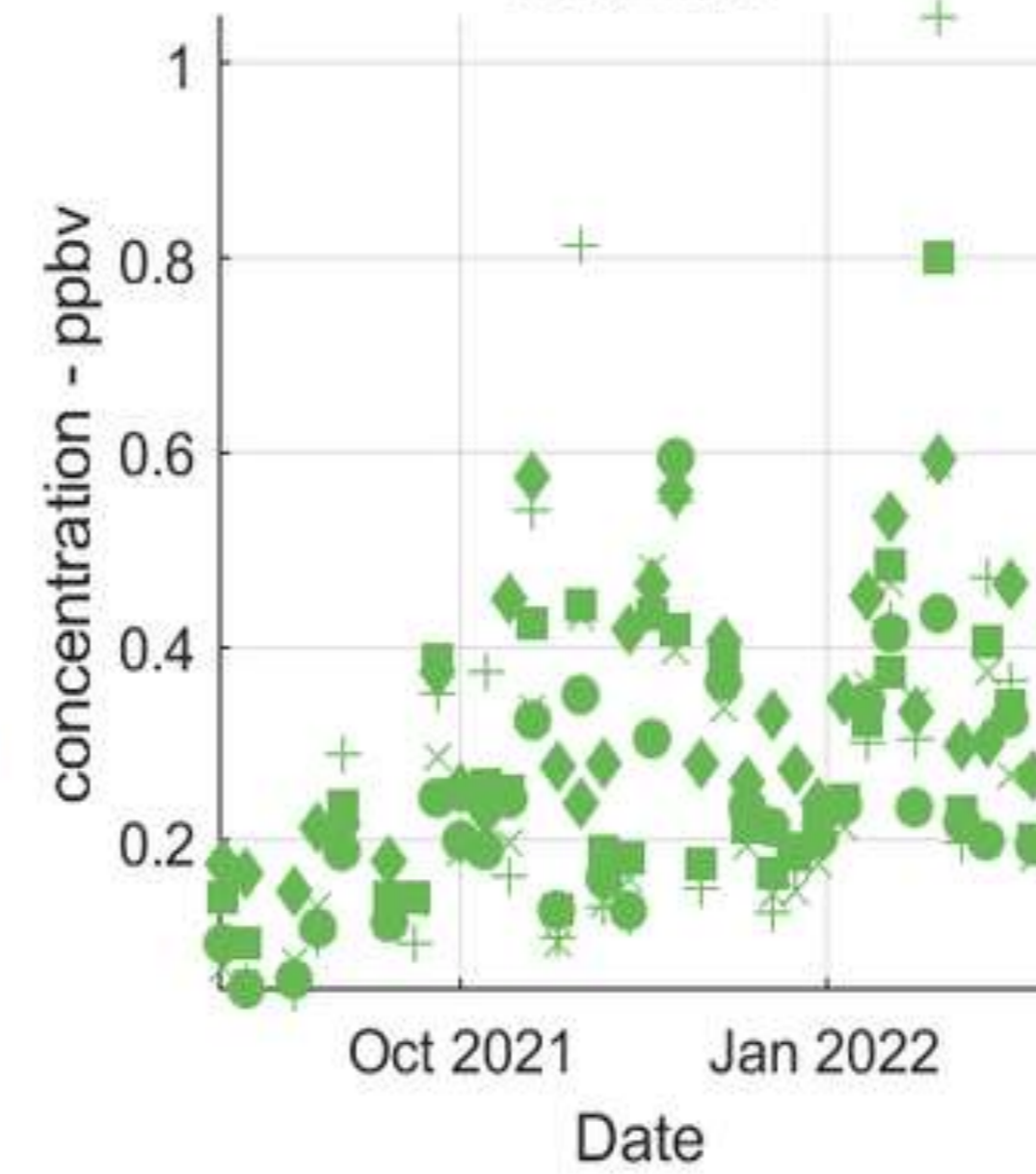
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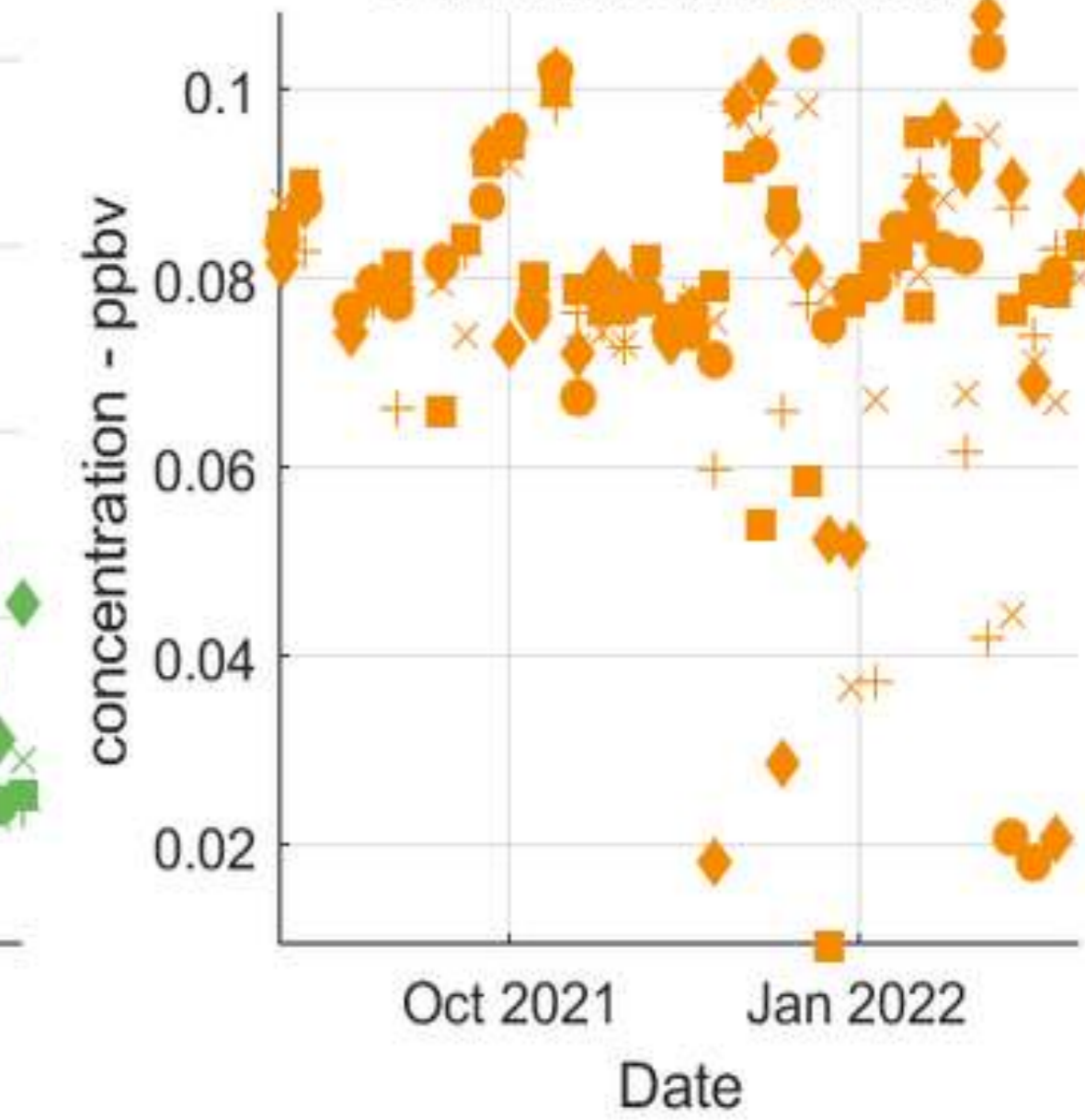
Acrolein



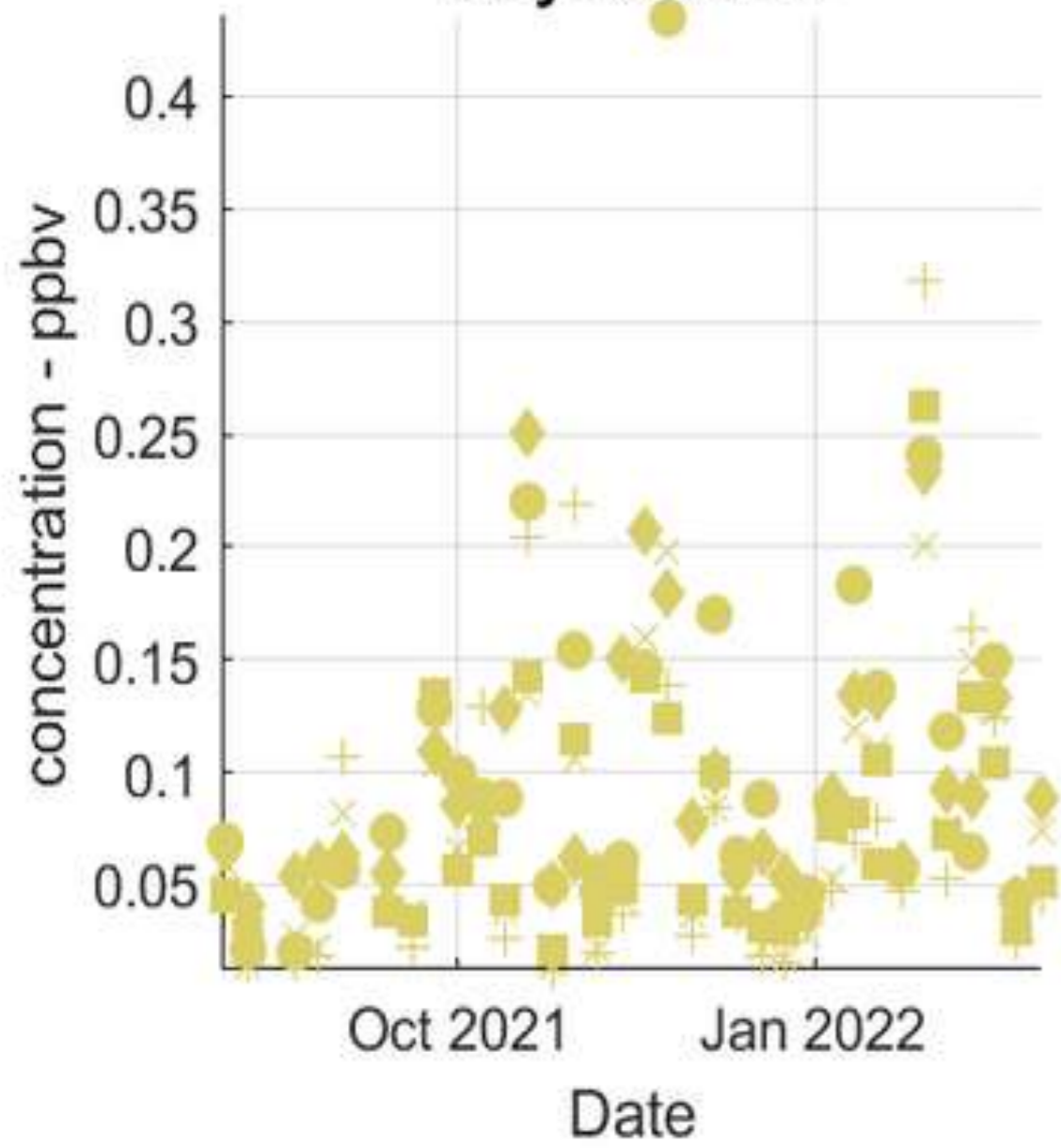
Benzene



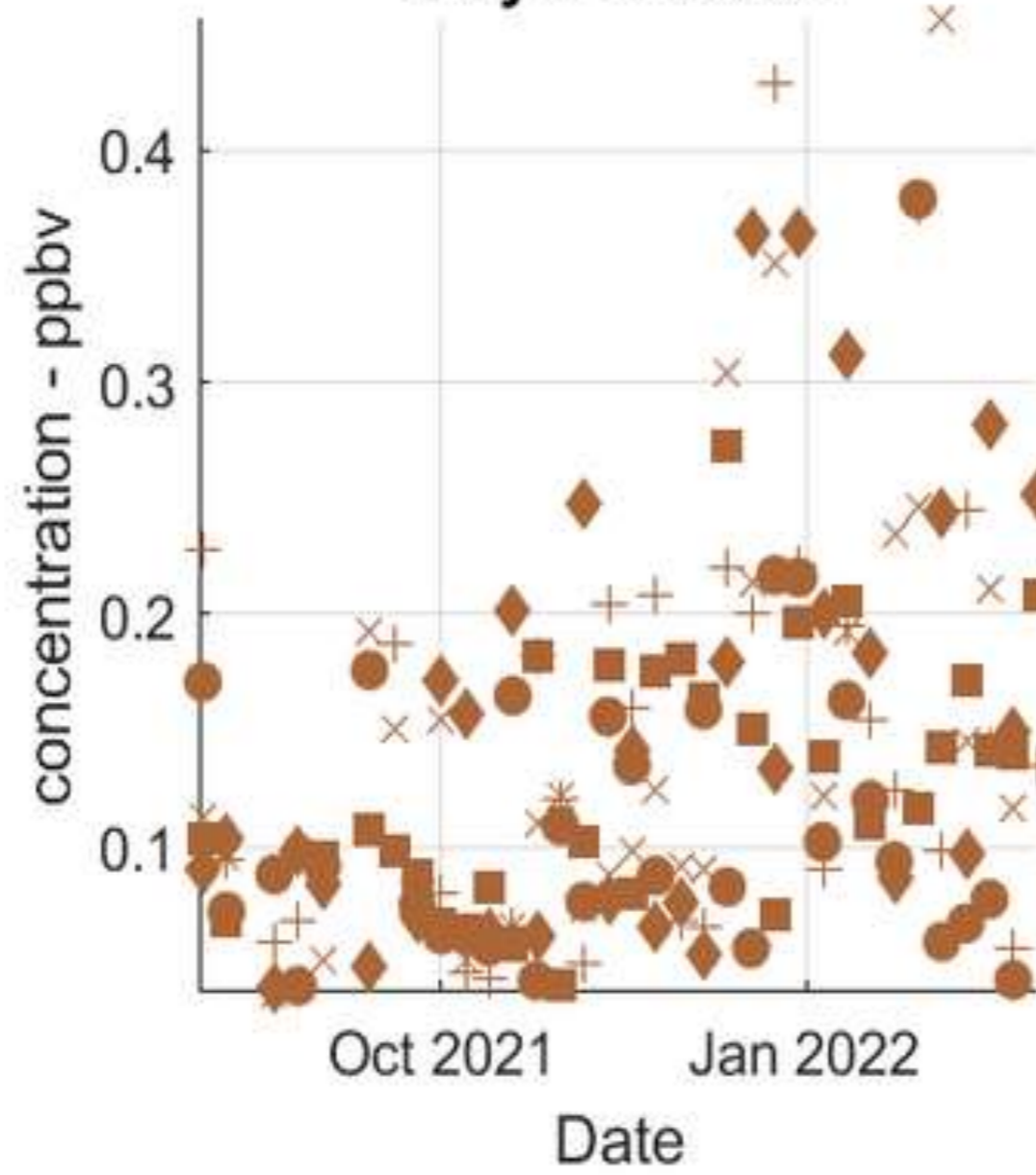
Carbon Tetrachloride



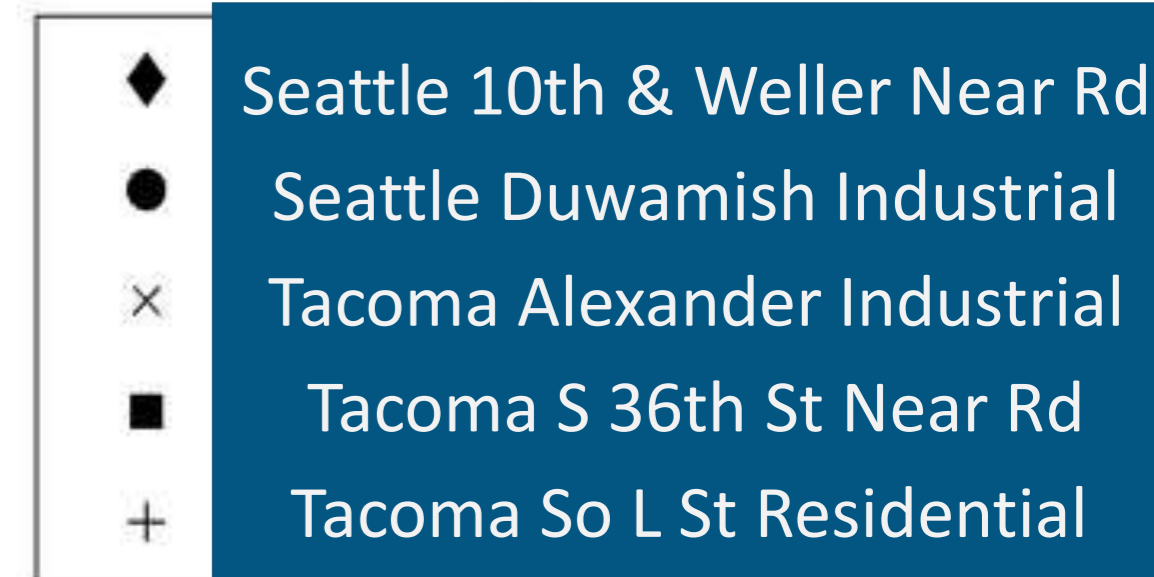
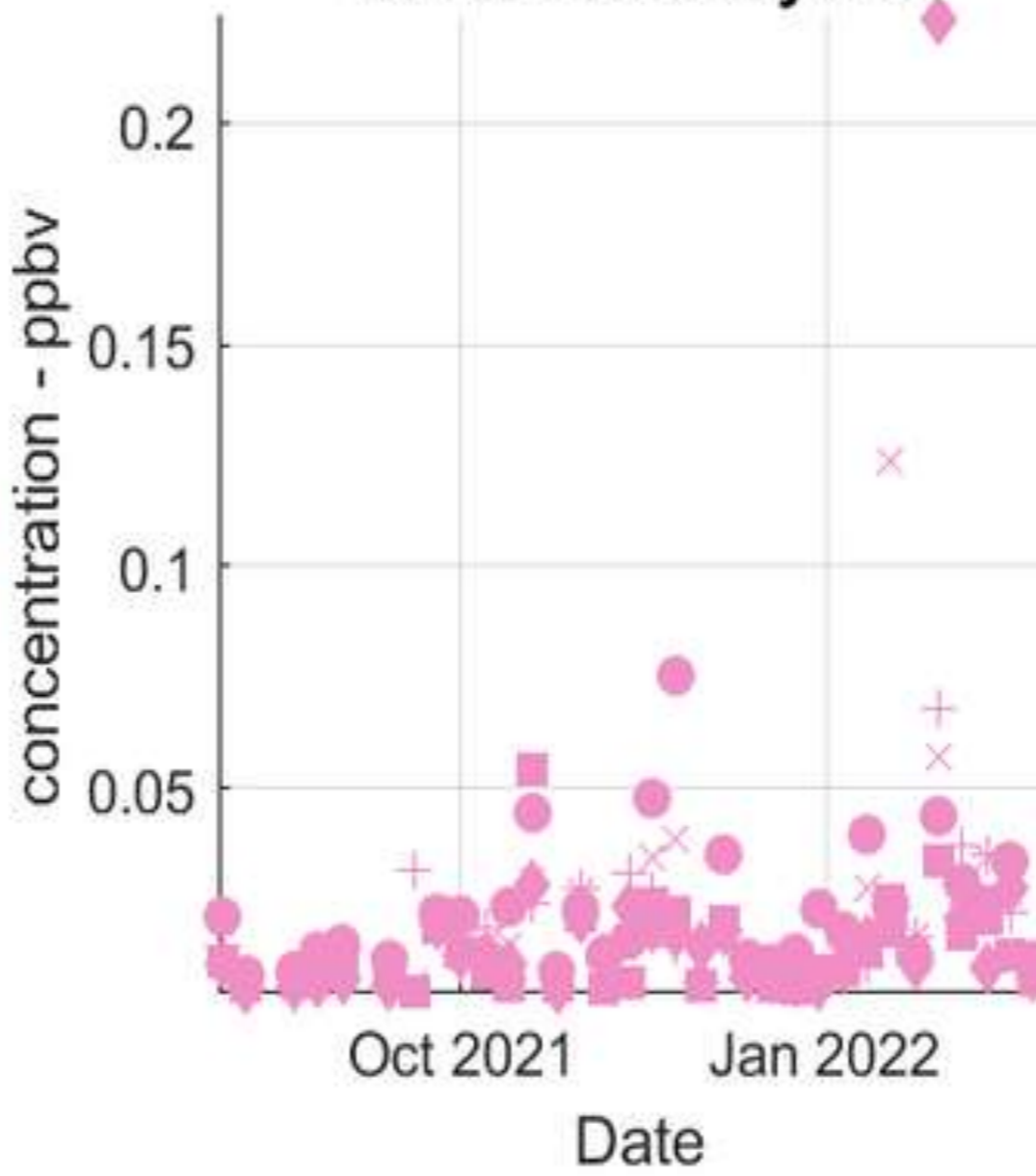
Ethylbenzene

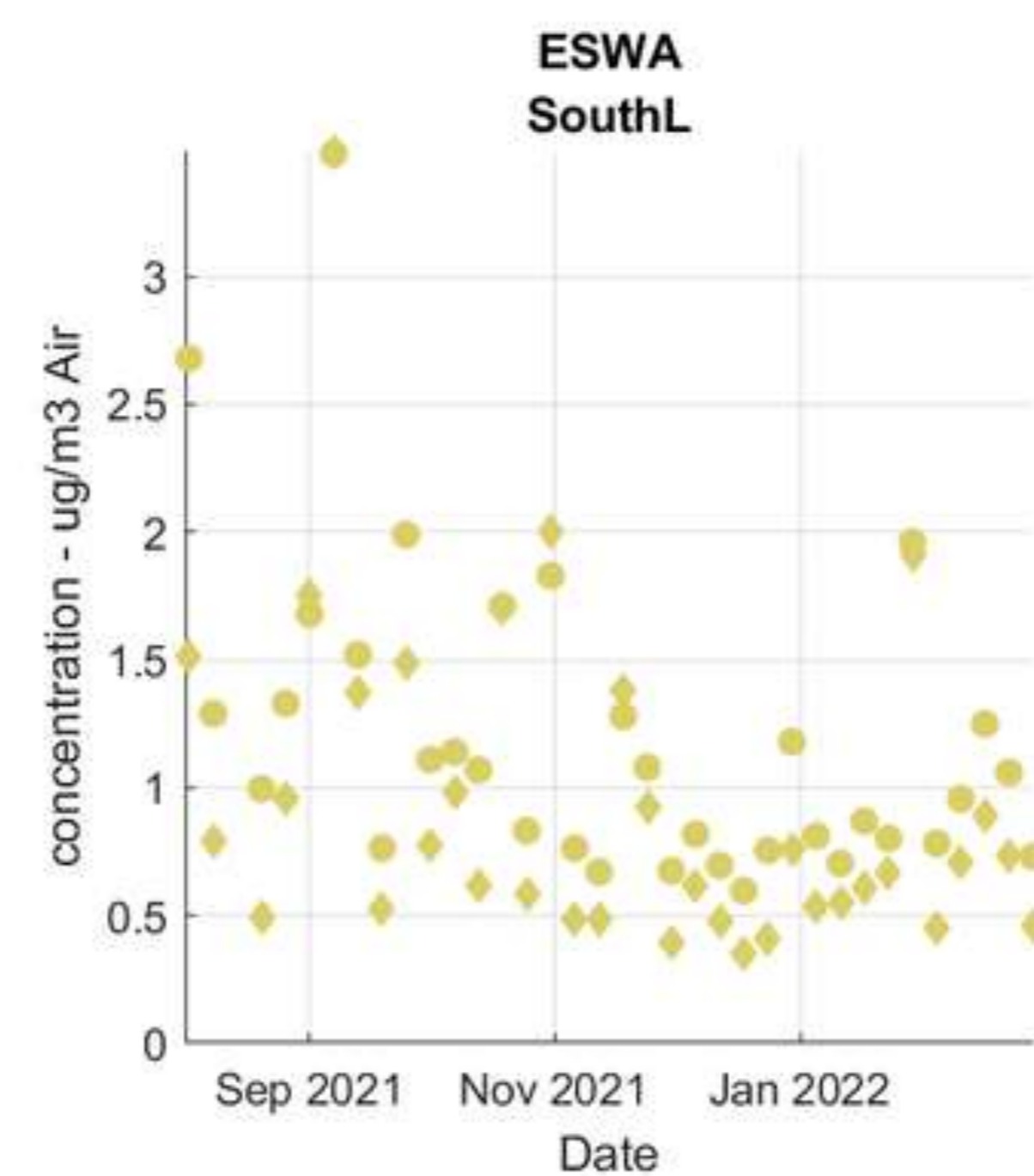
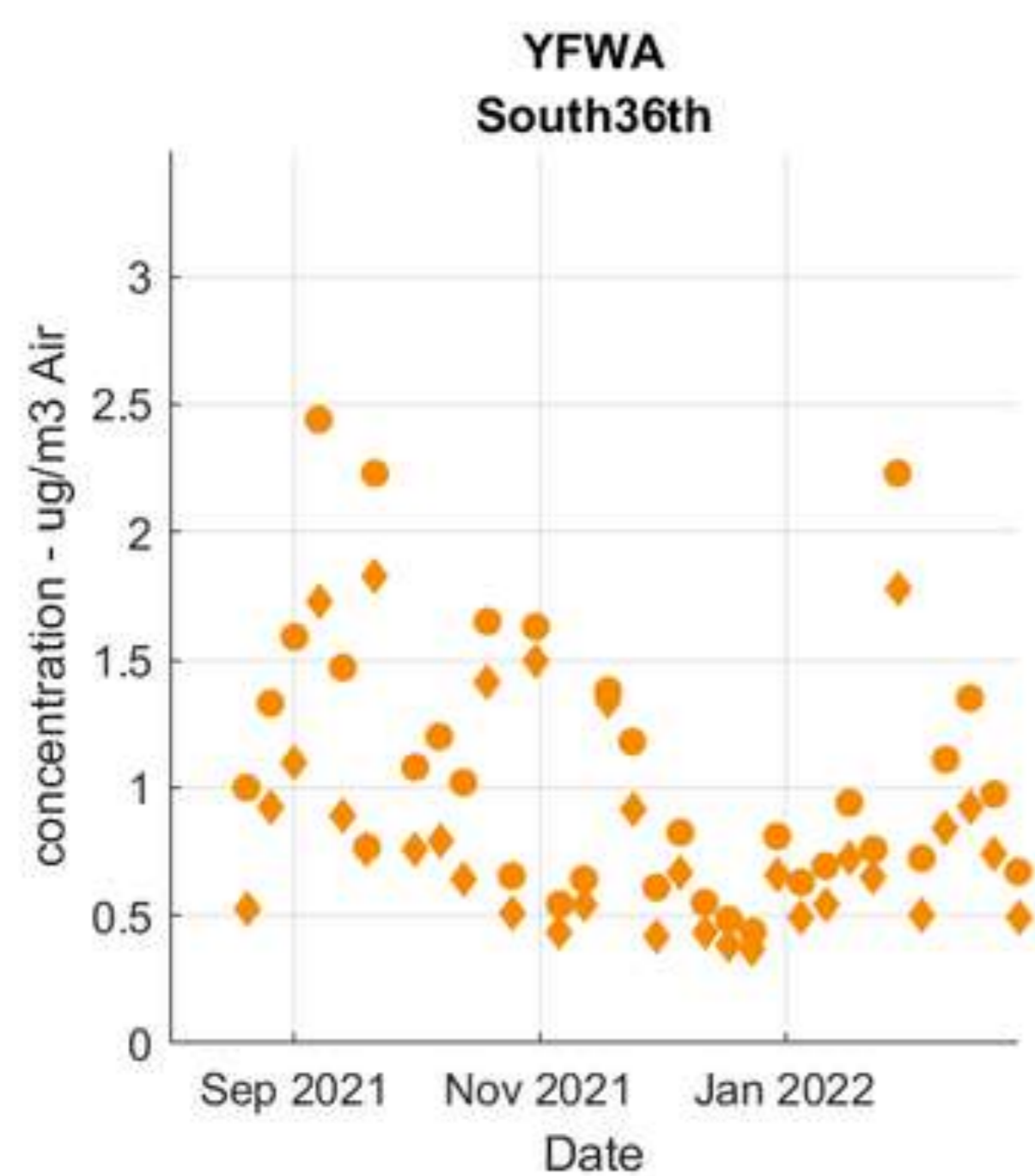
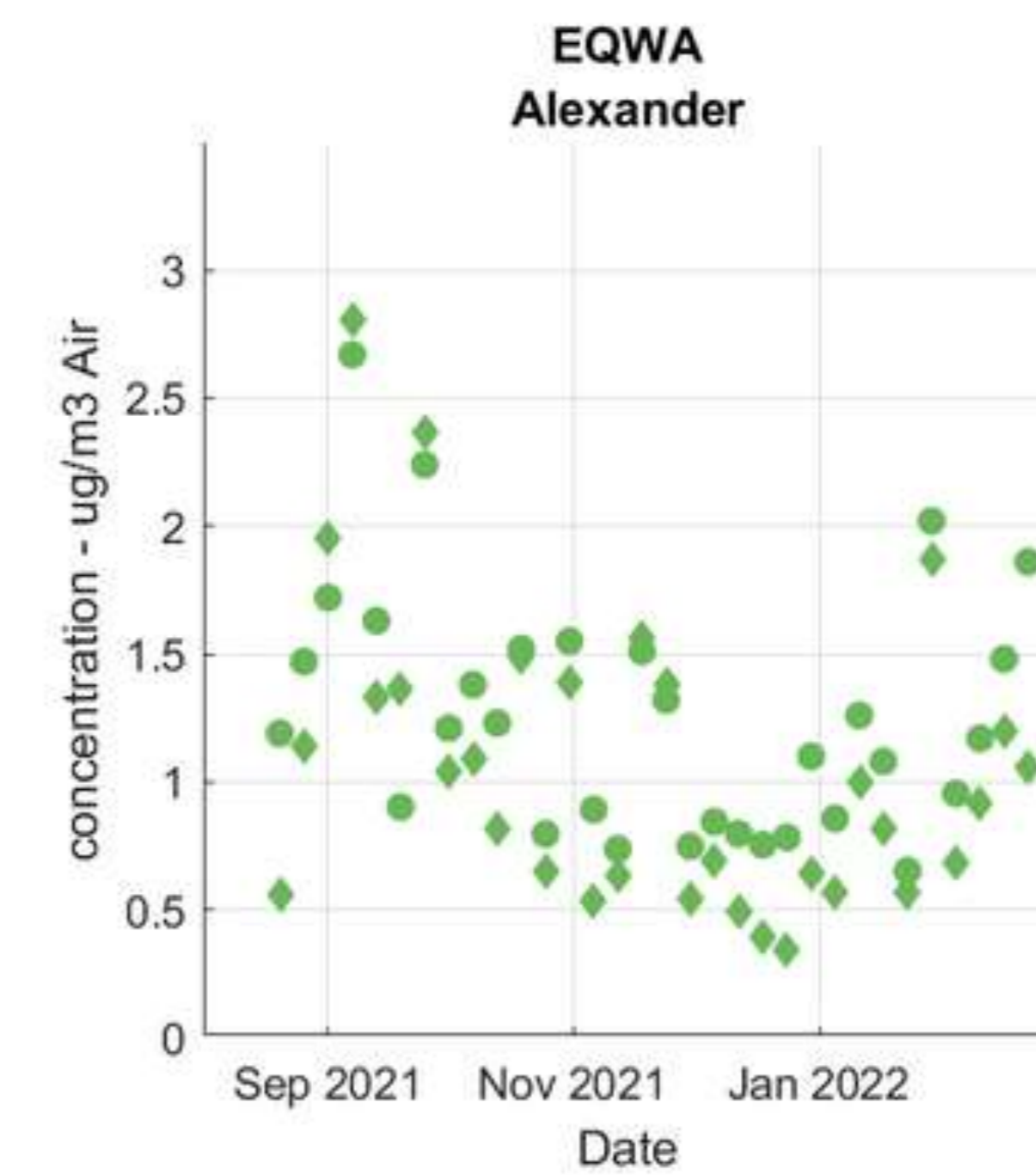
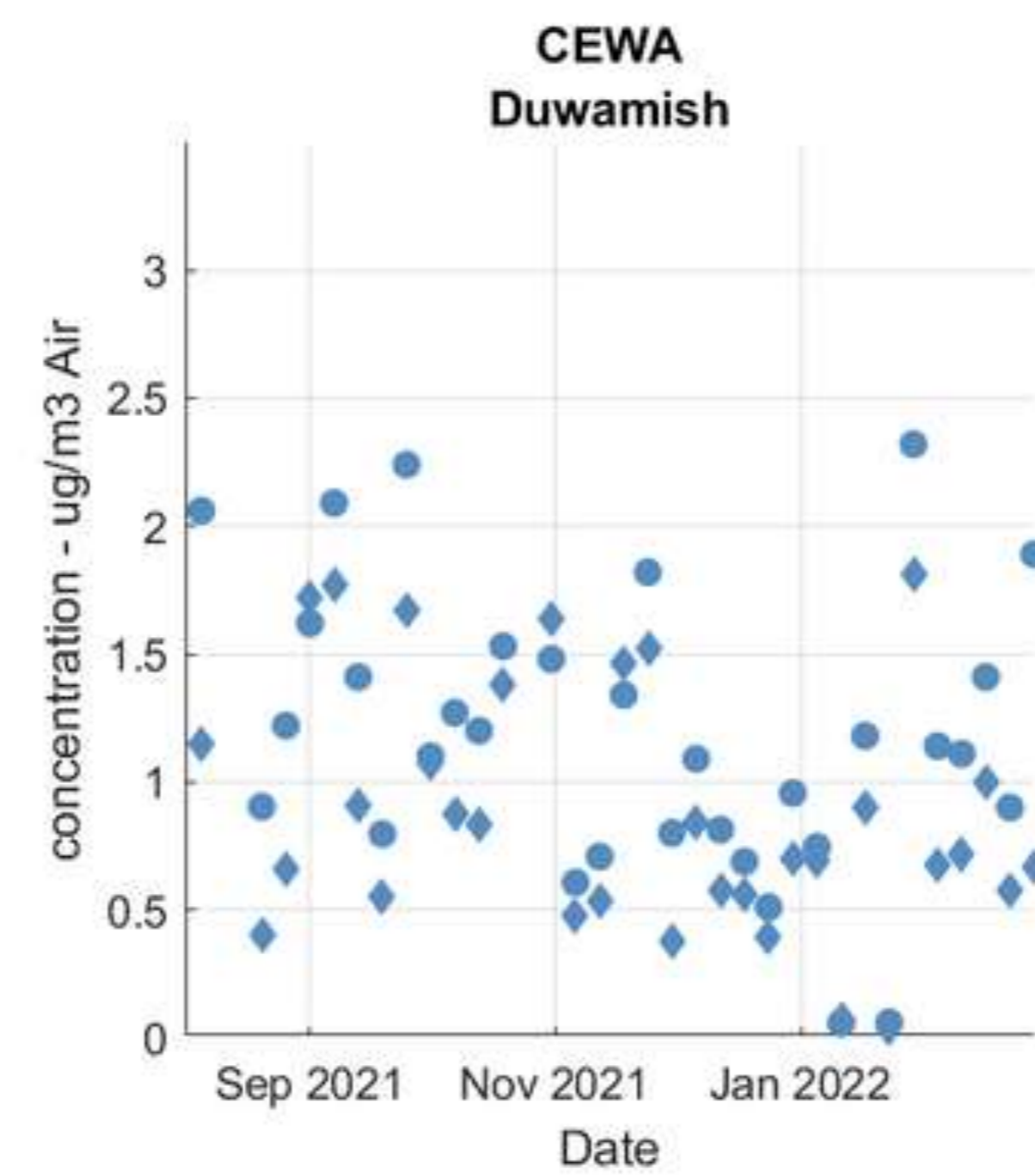
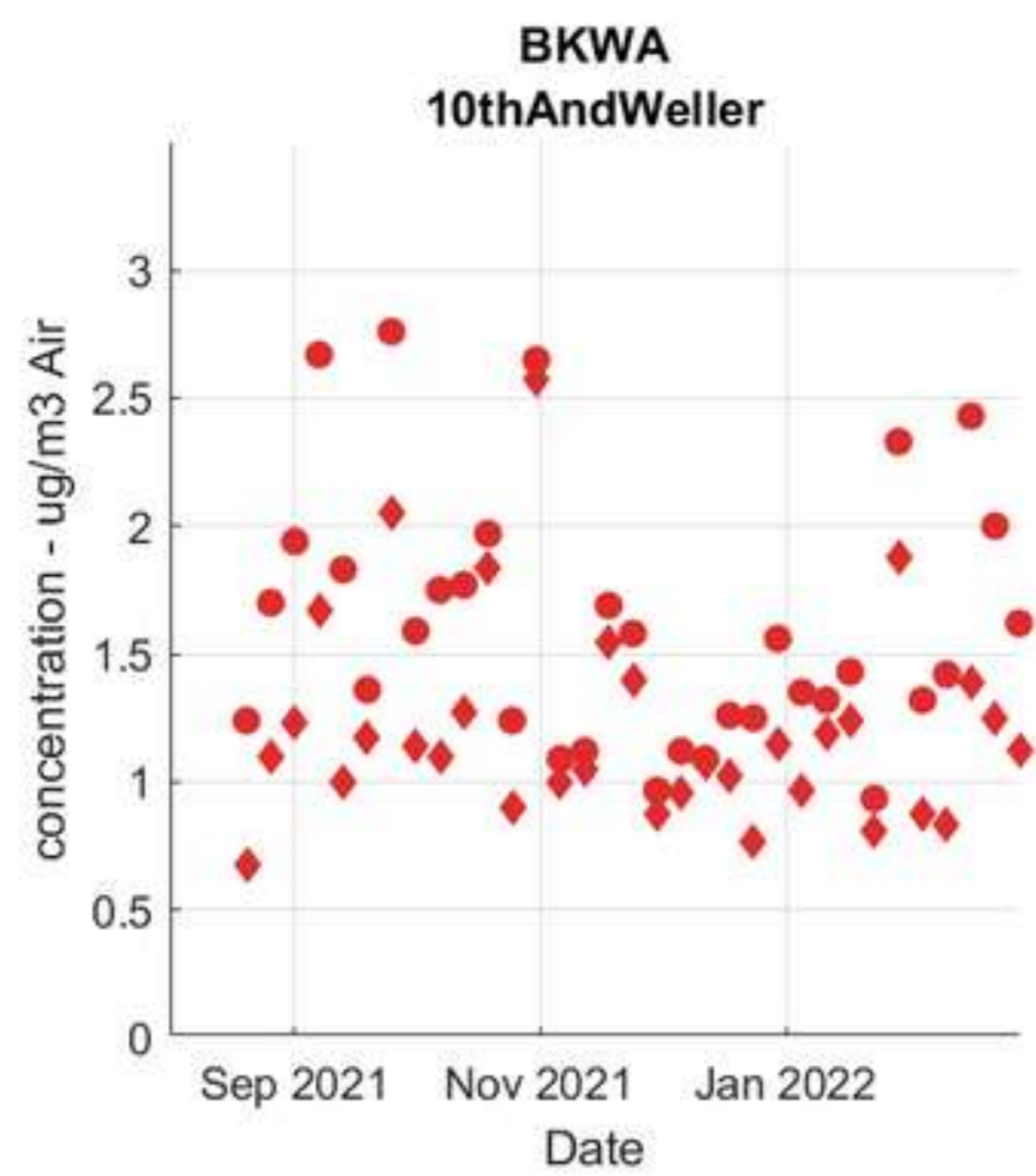


Ethylene oxide



Tetrachloroethylene



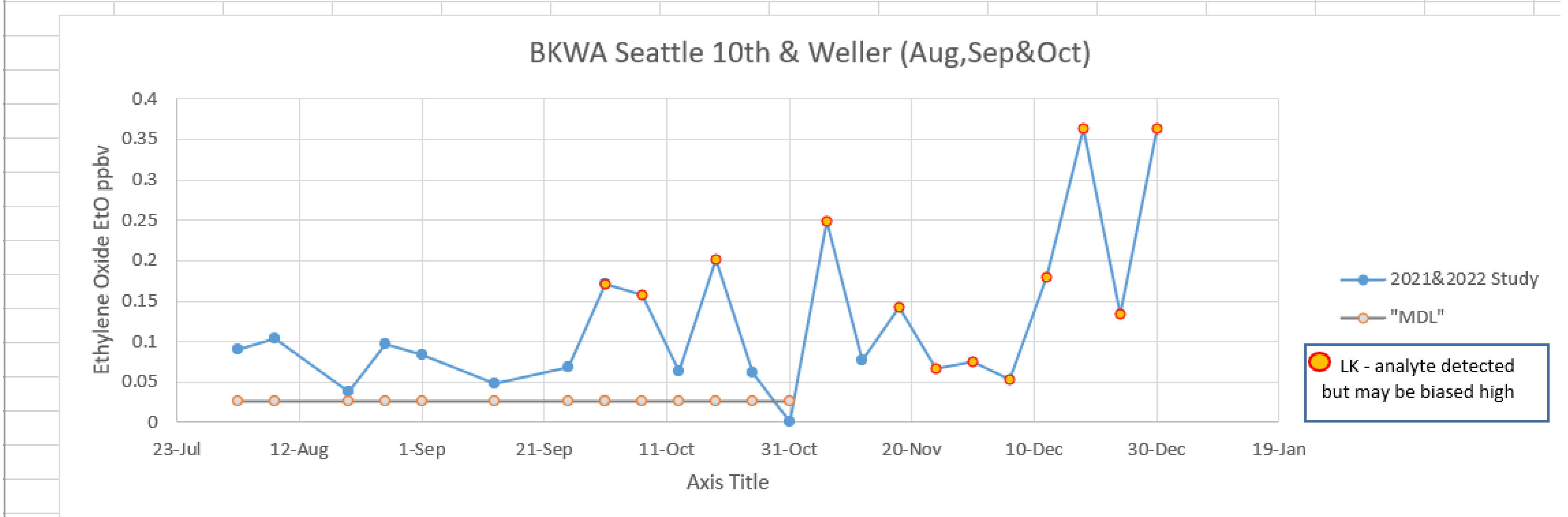


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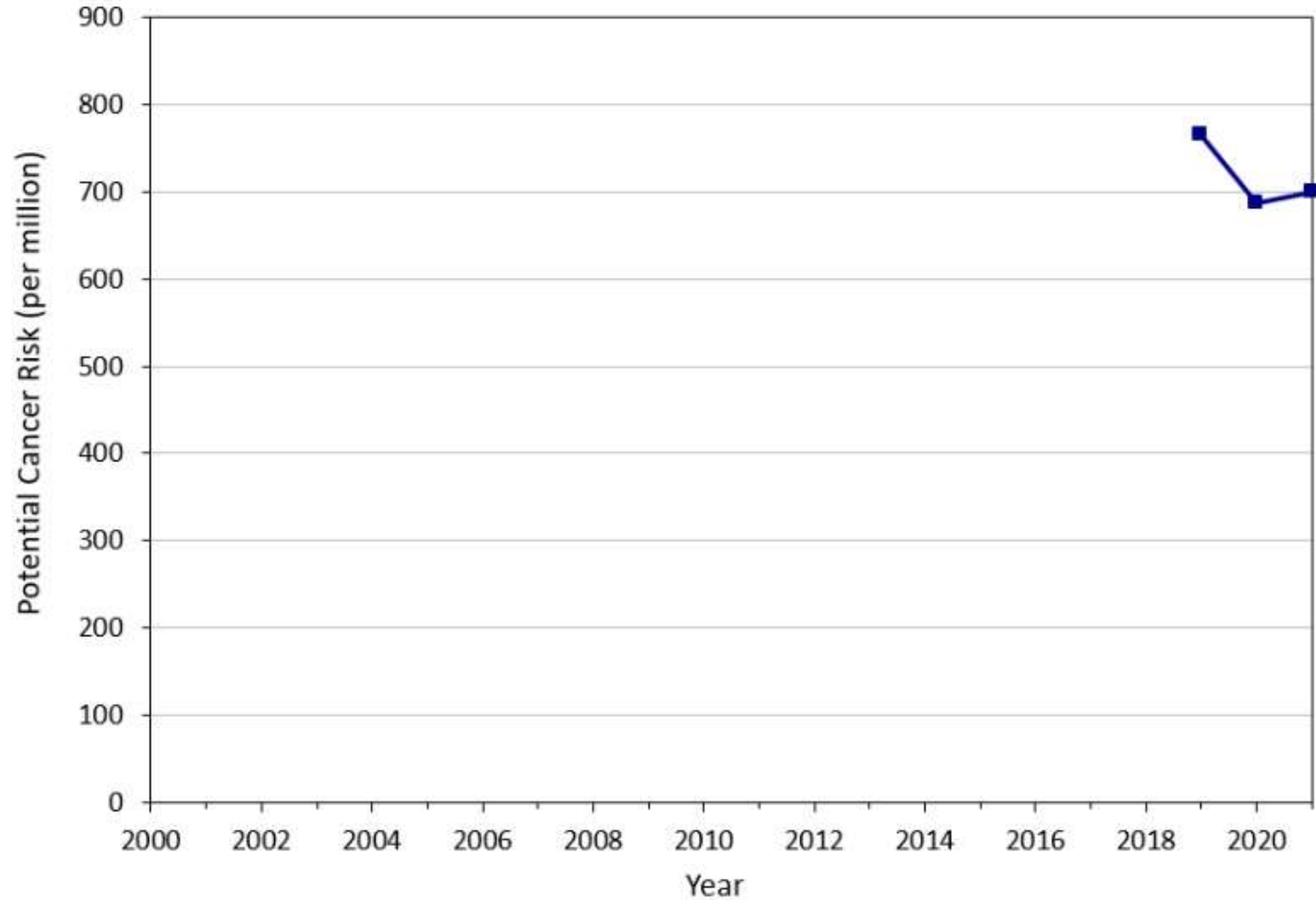
◆ Acetaldehyde
 ● Formaldehyde

Ethylene Oxide and LK flag

Ethylene Oxide - Was not monitored for in 2016-2017 study. Initial values recorded here. Also note Minimum Detectable Levels.



Ethylene Oxide Potential Cancer Risk



Background: Metals-in-Moss Study

Recently, the Duwamish Valley Youth Corps partnered with the US Forest Service, local government and universities, community leaders, and health advocates to look at heavy metals in moss on street trees.

If you'd like to see more detail, you can see a factsheet here:

<https://static1.squarespace.com/static/5d744c68218c867c14aa5531/t/5f10f3cae34eb20502407d57/1594946507283/Duwamish+moss+Fact+Sheet+final.pdf>

Conclusions and Next Steps

- ⑩ Project Planning fundamentals
- ⑩ Community Engagement fundamentals
- ⑩ Sampling until Aug 31 – Results still coming in, Data processing in progress
- ⑩ Data tools – Analysis phase is about to begin – Now through Q1 2023
- ⑩ Ethylene Oxide monitoring – Significant Flags
- ⑩ Report Out to Community Groups – 2023

Questions and Acknowledgements

Acknowledgements:

US EPA Region 10

WA Department of Ecology

Duwamish River Cleanup Coalition

Duwamish Youth Corps

University of Portland

Background Slides (use if needed)

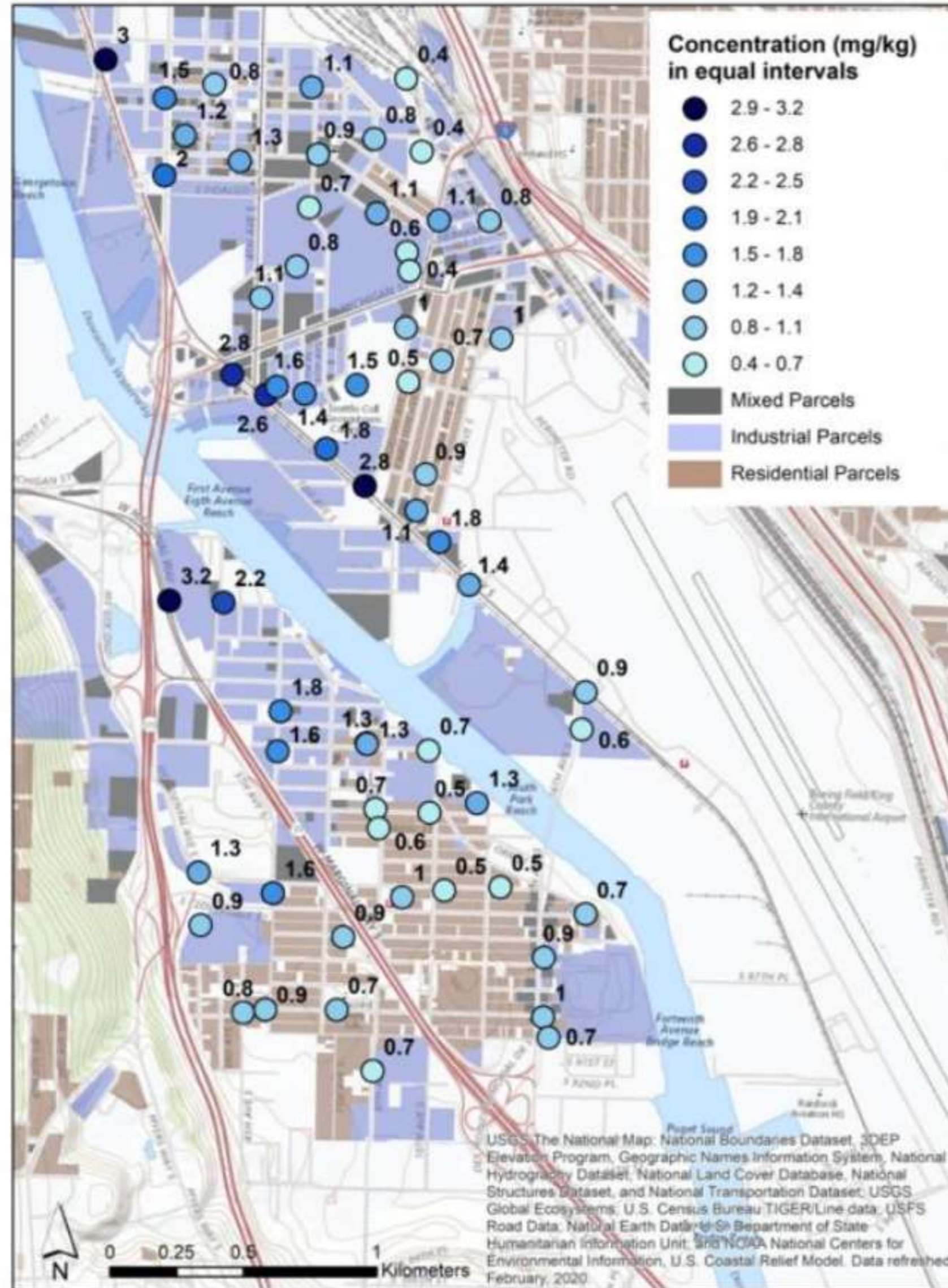
Air Toxics Trends in Tacoma & Seattle – Preliminary Results

August 2002



Metals-in-Moss Study Results

Arsenic concentrations found in moss with residential, industrial & mixed land use



Chromium concentrations found in moss with residential, industrial & mixed land use

