

The District Department of Energy and Environment Low-Cost Air Sensor Program

MWAQC
September 25, 2024

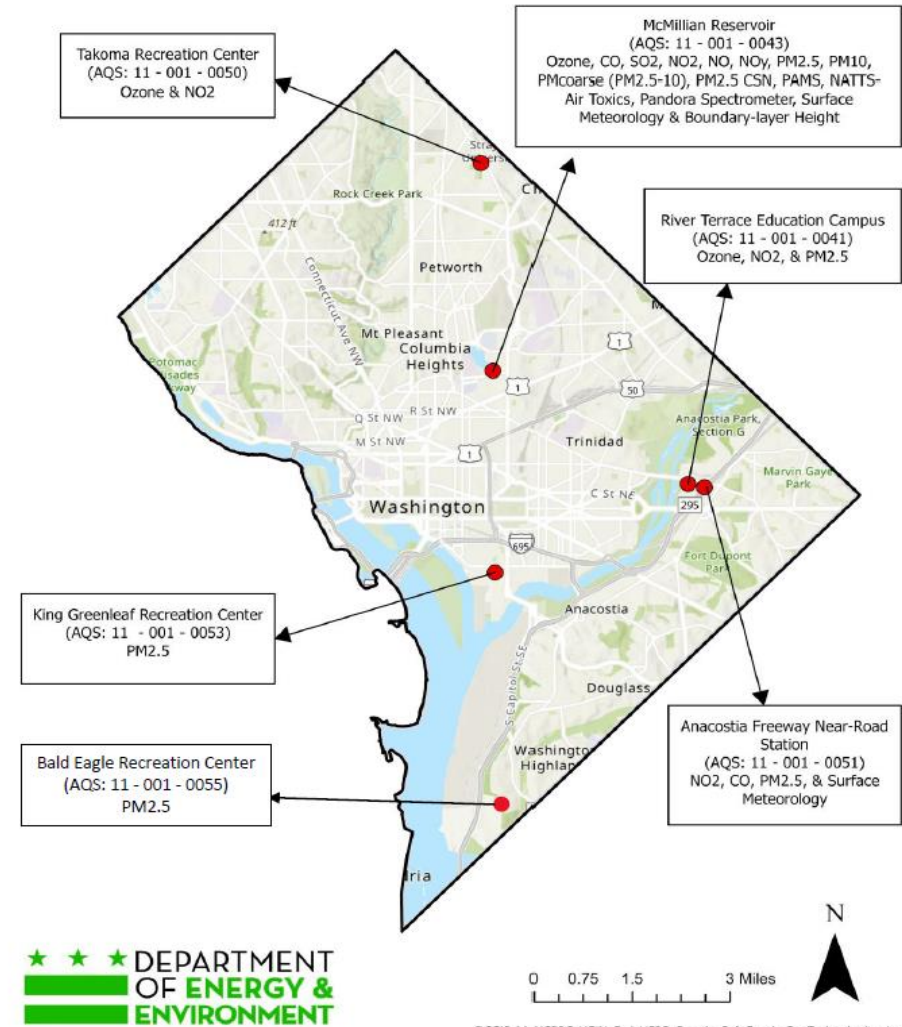
Joseph Jakuta, Interim Associate Director, Air Quality Division
Kane D. Samuel, Environmental Protection Specialist
Air Quality Planning Branch
Department of Energy and Environment



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Monitoring Network Limitations

- First, we have a robust federal air quality network
- Though, it does have limitations:
 - Stationary Instruments
 - High Cost
 - Placement Challenges
 - Limited Neighborhood Representation



High-cost vs Low-cost Sensor



FRM

FEM



- Very high accuracy
- Long operating lifetime

- More expensive (\$15k-\$50k)
- Stationary



- Less expensive
- Can be accessed remotely
- Movable

- Less accurate
- Shorter operating lifetime

Clarity Node

Low-Cost Sensors to Supplement Federal Monitors

Progress to Date

- Recently deployed both Clarity and Purple Air sensors into various communities, following a year of collocation at our McMillan Reservoir site
- Procured 39 additional Purple Air sensors (3 with VOC)
- Beginning procurement of ~50 additional LTE-enabled devices to scale up this initiative
- Developing a Shiny App to collect data from all sensors
- Soon, we will issue a grant for a community air advisory board to recommend approaches to develop a low-cost sensor map that is accessible to the public.

Have also researched handheld devices, such as Plume Lab and Atmotube. We typically use these for science communication and community outreach.

We plan to apply for an EPA *Air Quality Information* grant and will be looking for partners soon. Applications are due 6/26.

Deployable Sensors



Clarity Node Sensors



Purple Air Sensors

Handheld Sensors



Plume lab



Atmotube Pro



QuantAQ
Modulair PM

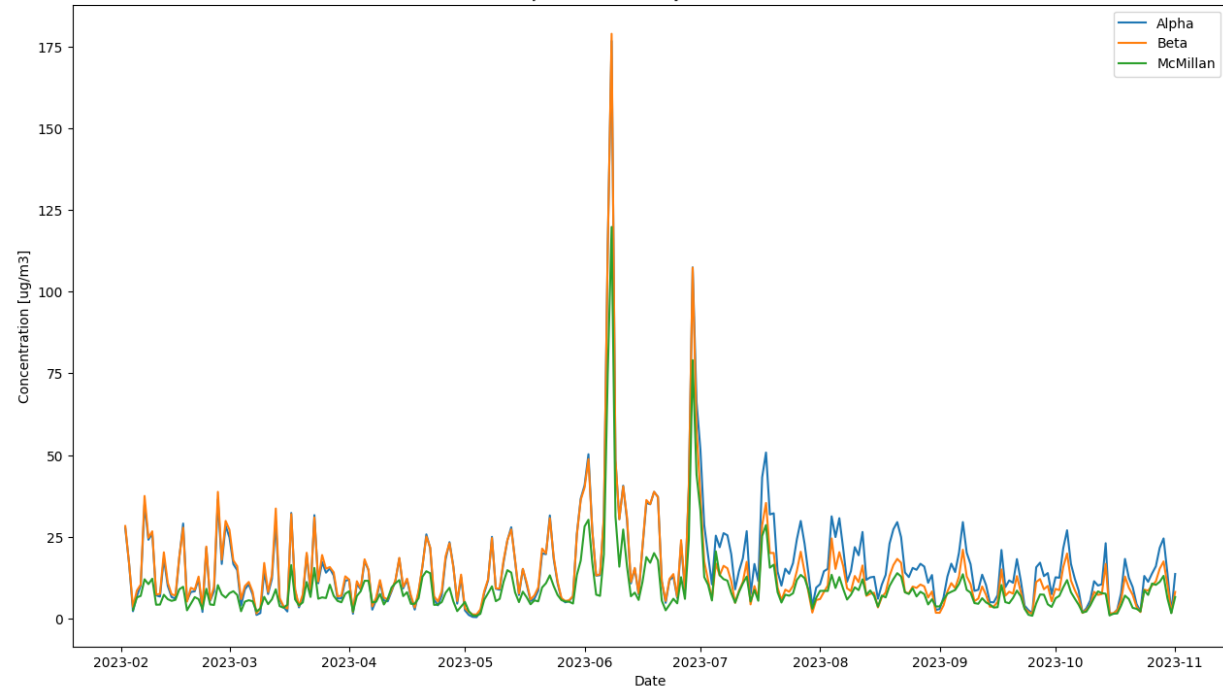
Testing Soon



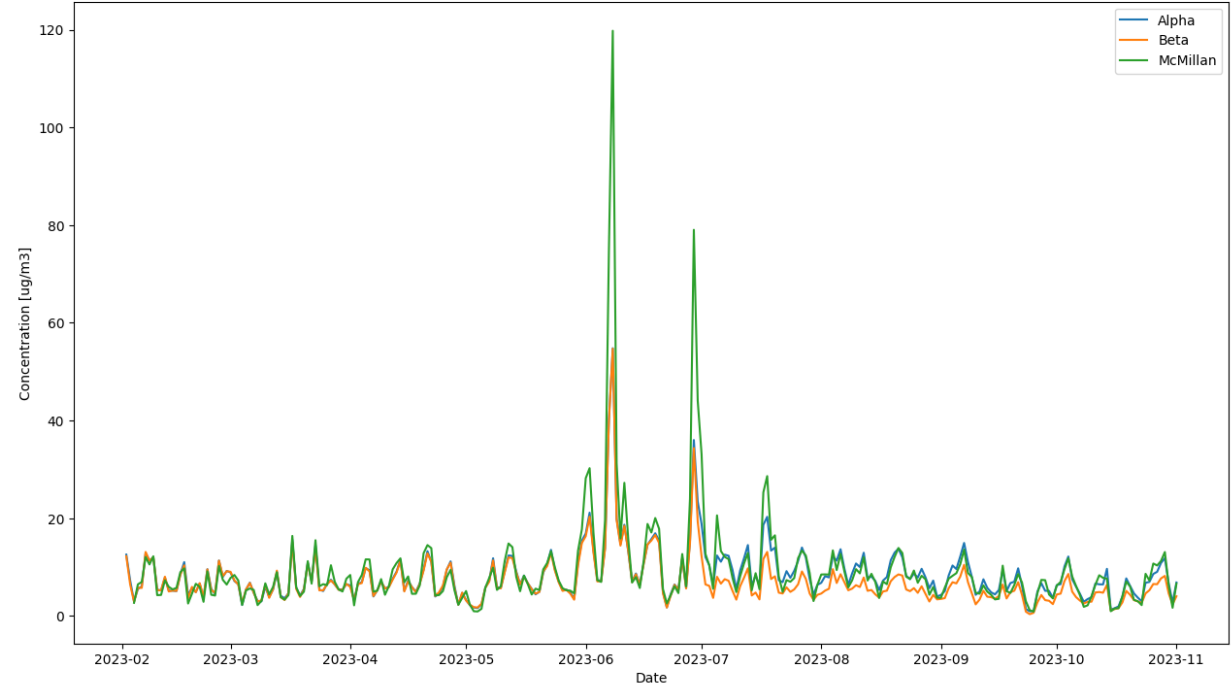
Purple Air Flex
(VOC)

Comparison of Clarity Nodes with Federal Monitor

Unadjusted PM2.5 Daily Concentrations



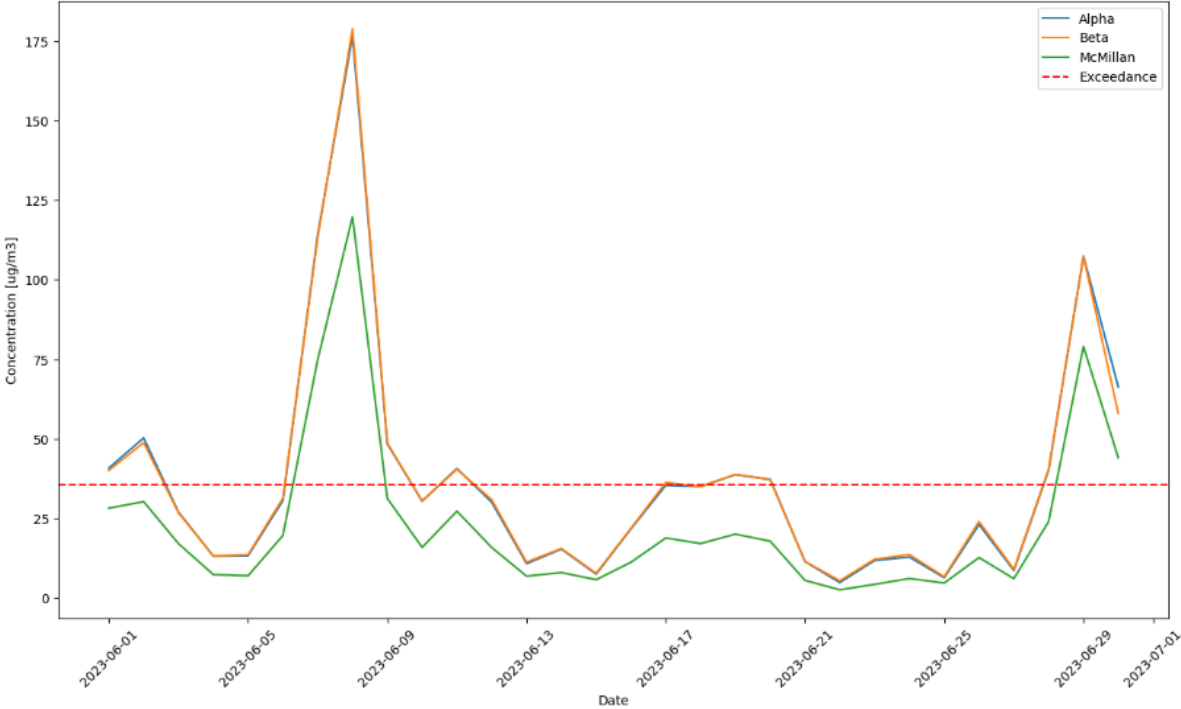
Adjusted PM2.5 Daily Concentrations



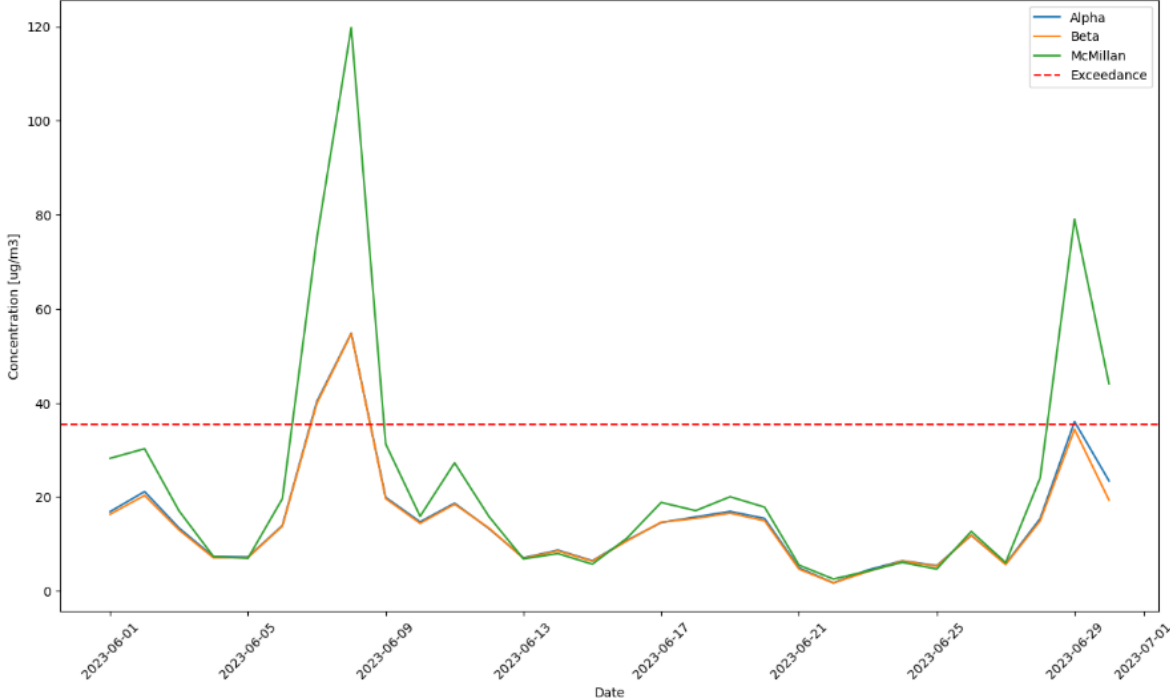
Correction factor used was created by Clarity

Clarity Performance Canadian Wildfires

PM2.5 Daily Concentrations - June Unadjusted

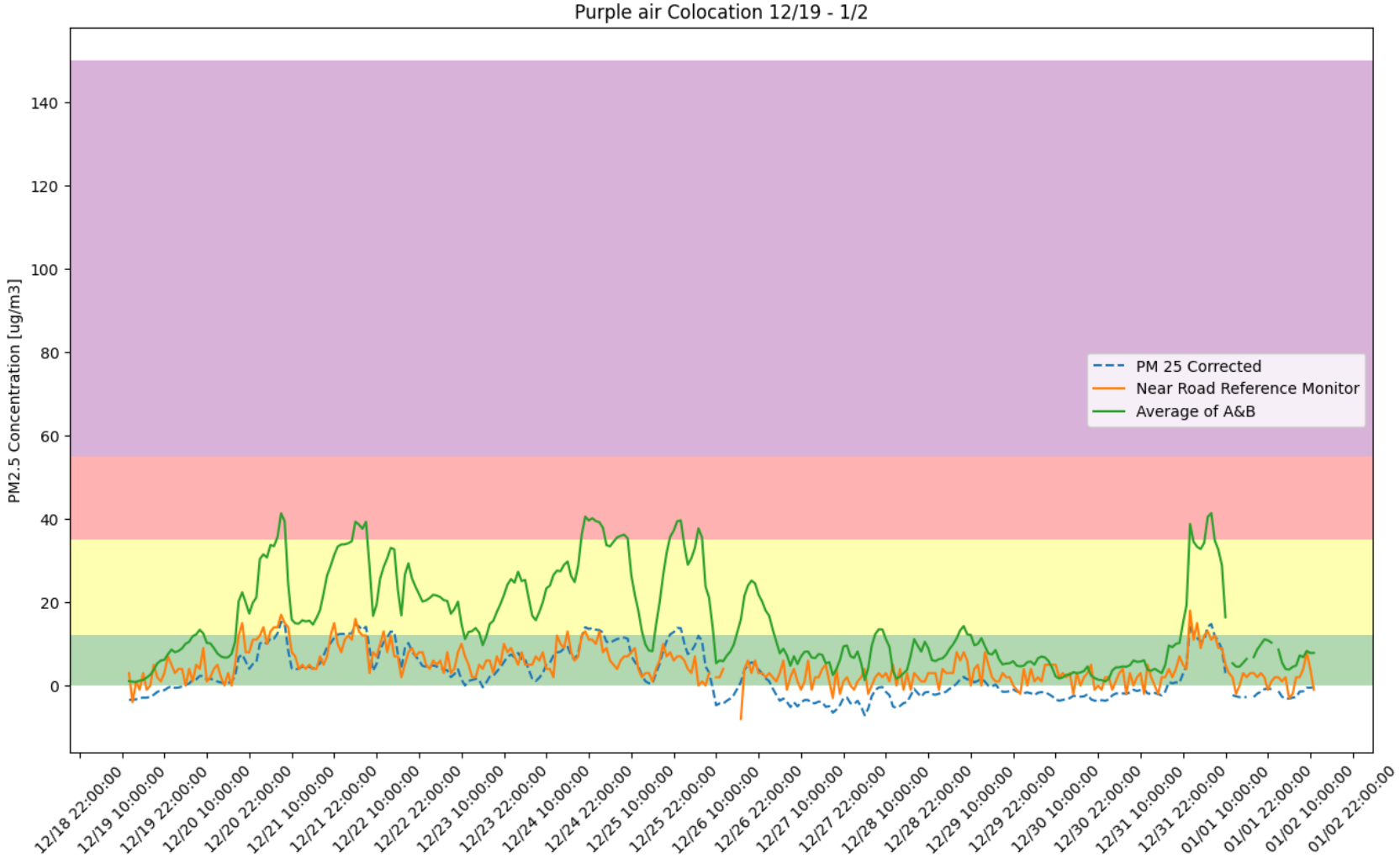


PM2.5 Daily Concentrations - June Adjusted

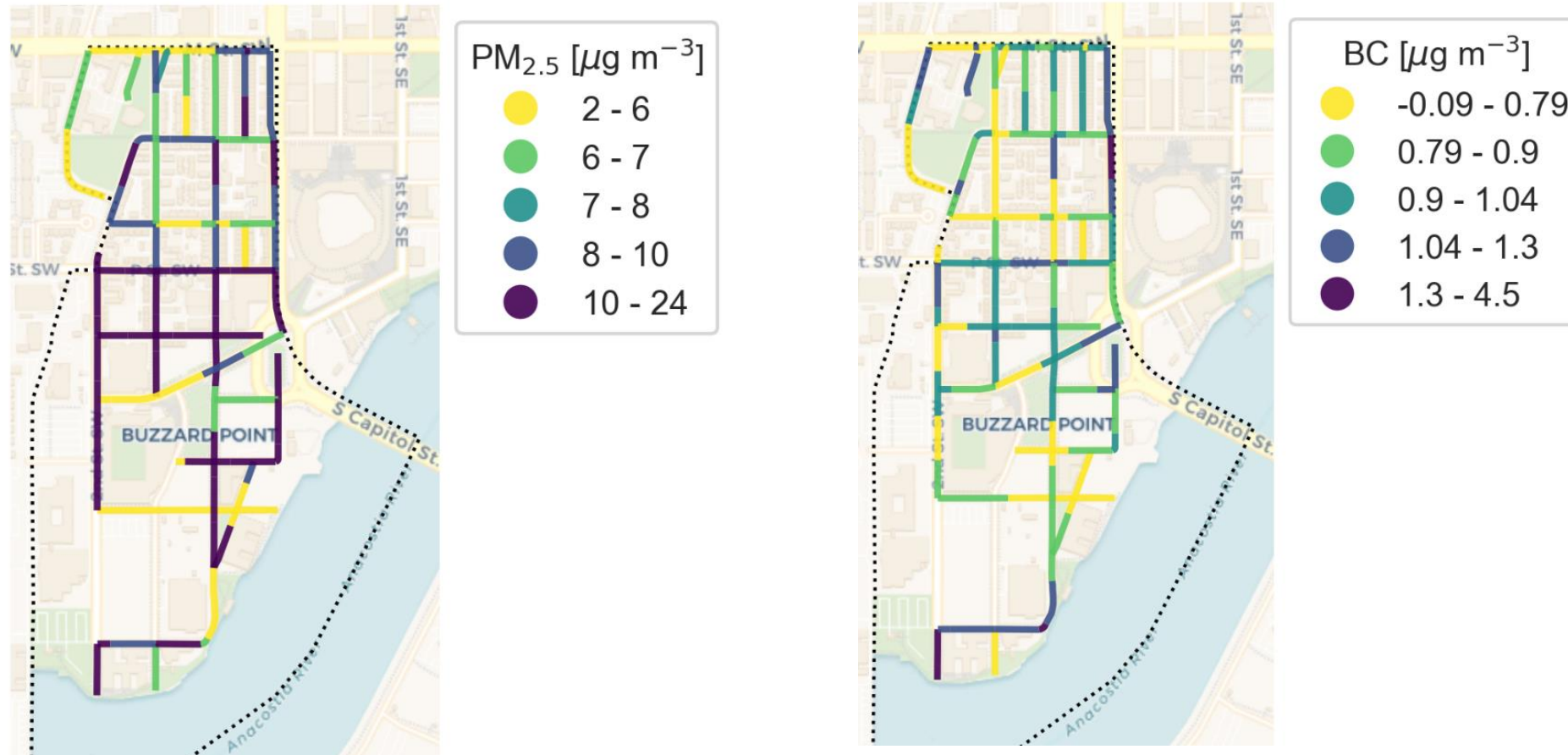


Correction factor used was created by Clarity

Comparison of Purple Air with Federal Monitor



Why Multi-Pollutant? A Lesson from Aclima



Segment medians for PM_{2.5} (left) and Black Carbon (right) in Buzzard Point, with black circles highlighting segments with high PM_{2.5} and low BC.

Understanding AQ at the Neighborhood Level



Deploy sensors in communities, particularly near schools, where there are identifiable gaps in DOEE's network.



The sensors will be used to measure particulate matter, oxides of nitrogen, and diesel indicators.



Create a comprehensive sensor map of the District.



Use collected data to identify pollution sources and pinpoint pollution hotspots.



Work toward building more resilient communities.

Air Sensor Lending Program



What We Ask of Participants

Power Connection

- Ensuring that the sensor is continuously connected to a reliable power source.

Wi-Fi Connection

- Ensuring that the sensor always has a stable Wi-Fi connection, as many devices rely on internet connectivity for data transmission and processing.

Regular Checks

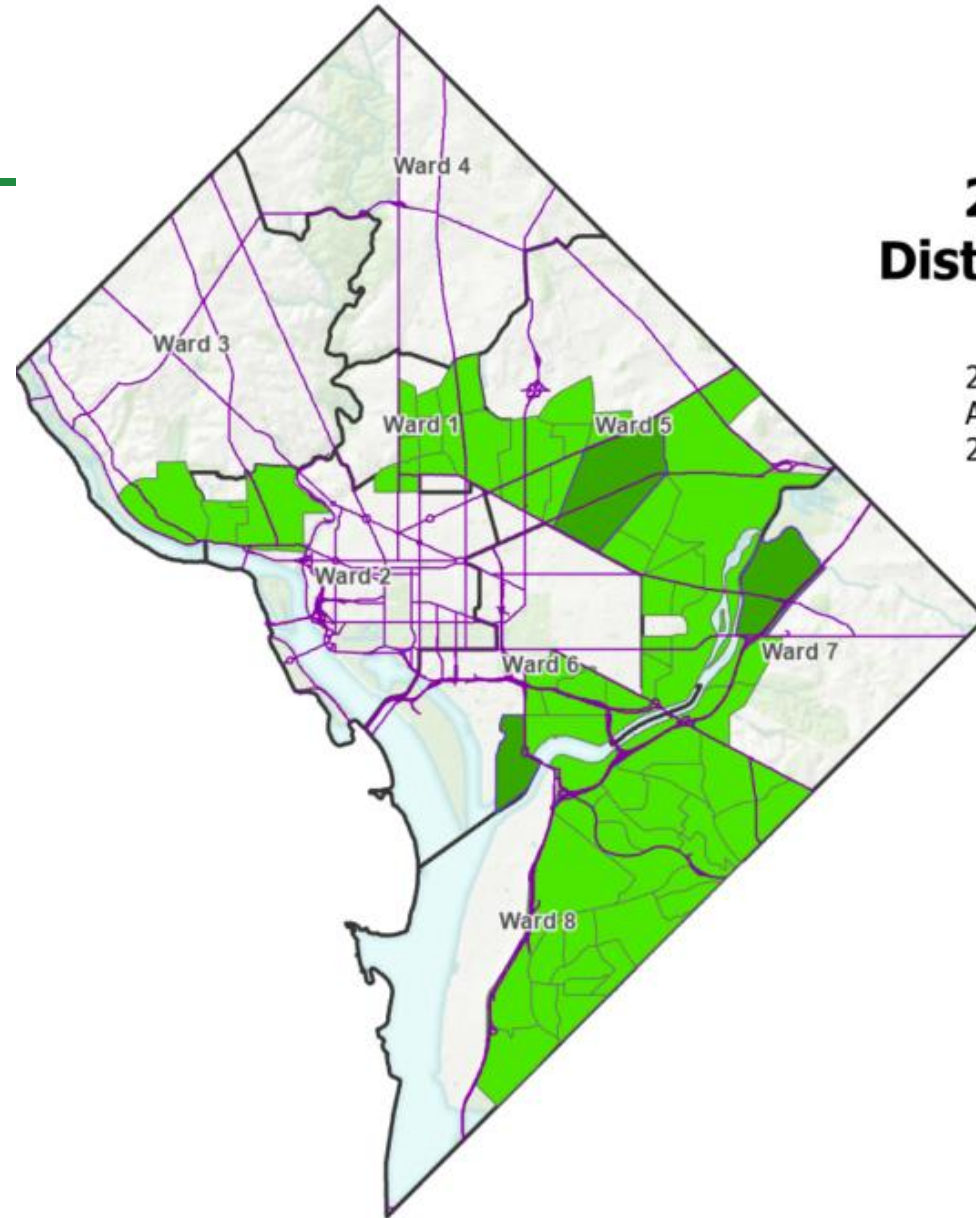
- Periodically checking the sensor to confirm it is functioning properly, such as verifying indicator lights or status notifications.

DOEE's Loan Agreement

- Participants will be required to sign DOEE's loan agreement and follow its terms and conditions.

Aclima Phase Two

- Data collection Aug 12 to Sept 23 (6 instead of 2 weeks)
- Geography expanded from 2.26 to 30.33 sq mi
- Results expected winter 2024-2025
- Additional Questions to be answered:
 - How does collocation compare directly to McMillan
 - What pollution is seen in additional neighborhoods
 - Insights with longer time period
 - Year-on-year comparison (keeping in mind June v Aug-Sep)
 - Comparison with less overburdened community



Aclima 2024 Study Area District of Columbia

2023 Study Area
2.26 Sq Mi

2024 Study Area
30.33 Sq Mi

Legend

- Interstates and Major Roadways
- 2023 Measurement Area
- 2024 Measurement Area
- Ward Boundary - 2022

0 1 2 4 Miles

Why Community Participation Matters

Enhanced Data Coverage

- Your participation helps us collect more comprehensive and accurate data that reflects our community's true air quality.

Local Insights

- Your knowledge of the neighborhood is invaluable in identifying pollution sources and areas that need attention.

Empowerment

- By getting involved, you can raise awareness and empower your community to take action for cleaner air and protect your health.

Questions?

Contact us:

Joseph Jakuta (Interim Associate Director)

joseph.jakuta@dc.gov

Kane D. Samuel (Environmental Protection Specialist)

kane.samuel@dc.gov