Community meeting:
Results of hyperlocal monitoring pilot project

November 16, 2023

Photo: Buzzard Point

Agenda

1. Introduction and background on DOEE's air quality monitoring (DOEE)
2. Introduction to Aclima (Aclima)
3. Overview of 2023 2-week pilot results (Aclima & DOEE)
4. Q & A (All)
5. Community-specific breakouts (All)
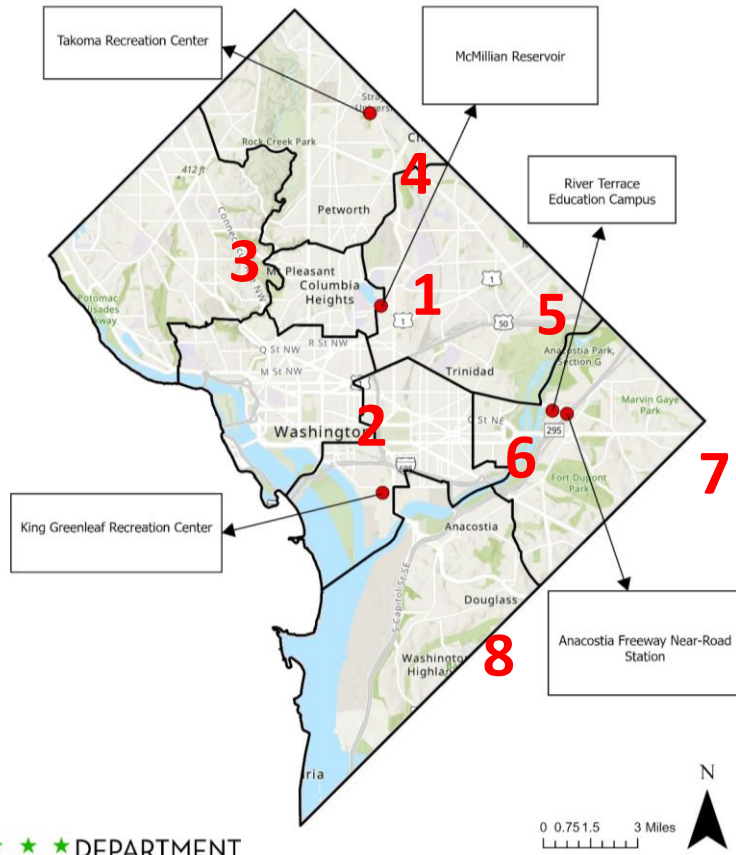6. Wrap-up (All)

Photo: Ivy City

Why Monitor Ambient Air Quality?

- Protecting public health
  - air quality levels vs. national standards
- Identifying air pollution sources
- Developing air pollution controls
- Science and research
- Public outreach and education

Washington DC's Ambient Air Monitoring Network

Site Location	Address	Location Setting*
Takoma Rec Center	301 Van Buren St NW	
McMillan Reservoir	2500 First St NW	
River Terrace Education Campus	405 Anacostia Ave NE	Historically overburdened community
Anacostia Freeway Near-Road Station	Benning Rd NE @ I-295 On-ramp	Historically overburdened community
King Greenleaf Rec Center	201 N St SW	Historically overburdened community
Ward 8 Site	TBD	Historically overburdened community

*All stations considered urban

Federal Method Monitors vs. Emerging Technology Low-Cost Air Sensors

EPA Approved Federal Method PM2.5 Air Monitor

Low-cost PM2.5 Air Sensor

Emerging technology sensors
- Not EPA-approved
- Can be less accurate in high humidity environments

Air Monitoring Stations

What is DOEE doing to Assess Air Quality in Overburdened Communities?

- Reorienting and expanding the regulatory network
  - Currently 3 (of 5) stations in overburdened communities
  - Another station in Ward 8 this fiscal year
- Community-scale hyper-local air monitoring to identify hot-spots
  - Mobile platform monitoring- Aclima Pilot Study
  - Emerging technology low-cost sensors
  - 3 park bench emerging technology air monitoring stations
- Community Involvement
  - Stakeholder engagement on Ward 8 location
  - Shared Governance for 3 park-bench monitoring
  - Training "Air Ambassadors" to understand local air quality issues
  - Examining Air Ambassadors as an avenue for low-cost-sensor network

Aclima's approach: mobile mapping & analysis

How we work: we measure, map, and analyze air pollution and greenhouse gases block by block

We provide: science and data-backed information about air pollution and GHGs at the hyperlocal level — illuminating each neighborhood block's unique air.

We're committed to informing action by leaders that reduces emissions and collectively working towards an equitable, clean air future for all.

We are a mission-driven Public Benefit Corporation:
- Atmospheric, climate, & data scientists
- Software, hardware, user experience, & systems engineers
- Community organizers & urban planning specialists
- Advisors from non-profits, government, & more

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Introduction to Aclima mobile monitoring

Aclima uses mobile mapping and analysis to generate maps that show typical pollution concentrations with high spatial resolution (**hyperlocal maps)**

These maps highlight typical concentrations over a defined measurement period, in this case two weeks for the DC Pilot, illustrating high and low pollution concentrations at the street level.

All 1-second measurements are averaged to a ~100m **road segment** based on the location (latitude and longitude) of the data point.
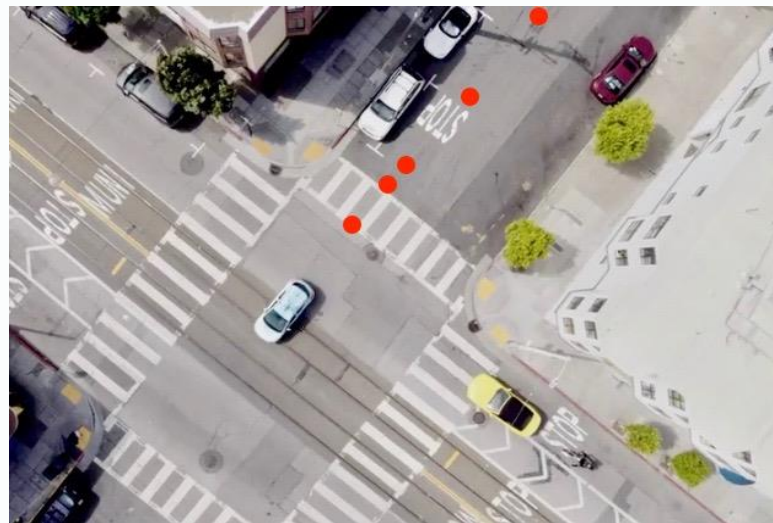
1 second data points as red dots aligned to the route of the car.

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EPA's National Ambient Air Quality Standards (NAAQS)

Criteria Air Pollutants (in **bold** are pollutants measured by Aclima)

- ☑ **Ozone (O_3)** — 70 ppb (8 hour)

- ☑ **Nitrogen dioxide (NO_2)** — 100 ppb (1 hour); 53 ppb (annual average)

- ☑ **Fine particulate matter ($PM_{2.5}$)** — 35 $\mu g/m^3$ (24 hour); 12 ug/m3 (annual average)*

- ☑ Coarse particulate matter (PM_{10}) — 150 $\mu g/m^3$ (24 hour)

- ☑ **Carbon monoxide (CO)** — 35 ppm (1 hour), 9 ppm (8 hour)

- ☑ Sulfur dioxide (SO_2) — 75 ppb (1 hour)

- ☑ Lead (Pb) — 0.15 $\mu g/m3$ (3 month average)

*Currently under review by EPA to strengthen standard

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PILOT OVERVIEW

In June 2023, Aclima conducted two weeks of hyperlocal mobile air quality measurement across 3 neighborhoods specified by DC-DOEE:

Mayfair, Ivy City/Brentwood, and Buzzard Point (5 census tracts total).

Measurement included:
Carbon dioxide, fine particulate matter, nitrogen dioxide, carbon monoxide, ozone, black carbon, methane, and TVOCs.

DC Pilot Pollutant Maps

How to interpret the following maps:

Measurements collected June 15 – 28, 2023

Pollutant and units

CO [ppm]
- 0.31 - 0.36 ← Bottom 20th percentile
- 0.36 - 0.38
- 0.38 - 0.43
- 0.43 - 0.48
- 0.48 - 0.89 ← Top 20th percentile

Measurement area bounds
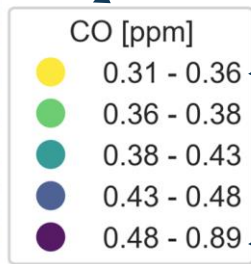
Median concentration color scale grouped by 20th percentile intervals

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Key pollutants:
Fine particulate matter (PM$_{2.5}$)

Sources:

- Combustion
- Photochemistry (sunlight)

Health Effects:

- Respiratory damage
- Asthma
- Increased mortality

PM$_{2.5}$ (Fine particulate matter)

Standard: 35 μg/m^3 (24 hr); 12 μg/m^3 (annual)

PM$_{2.5}$ [μg m^{-3}]
- 2 - 6
- 6 - 7
- 7 - 8
- 8 - 10
- 10 - 24
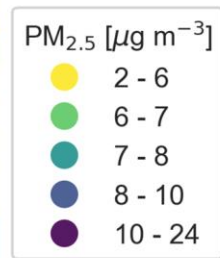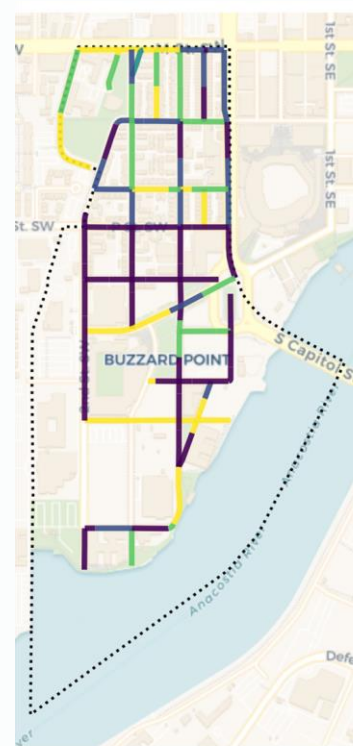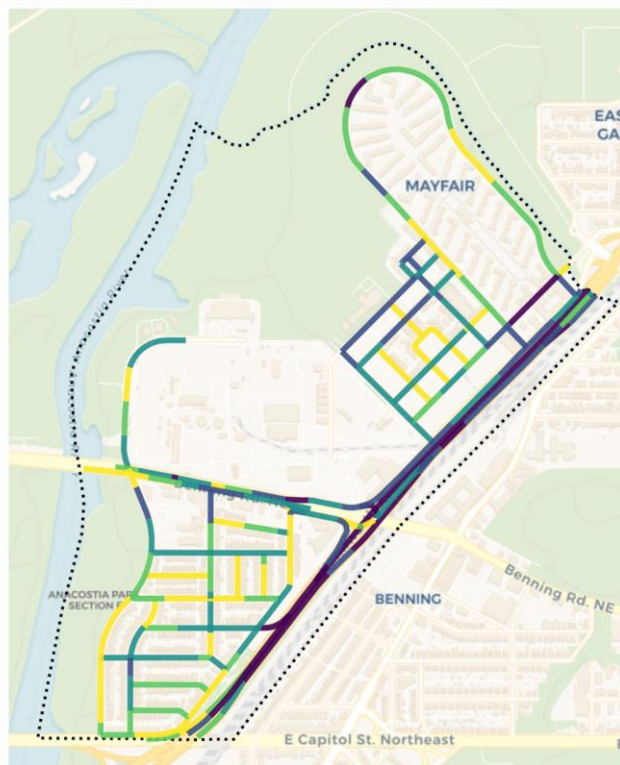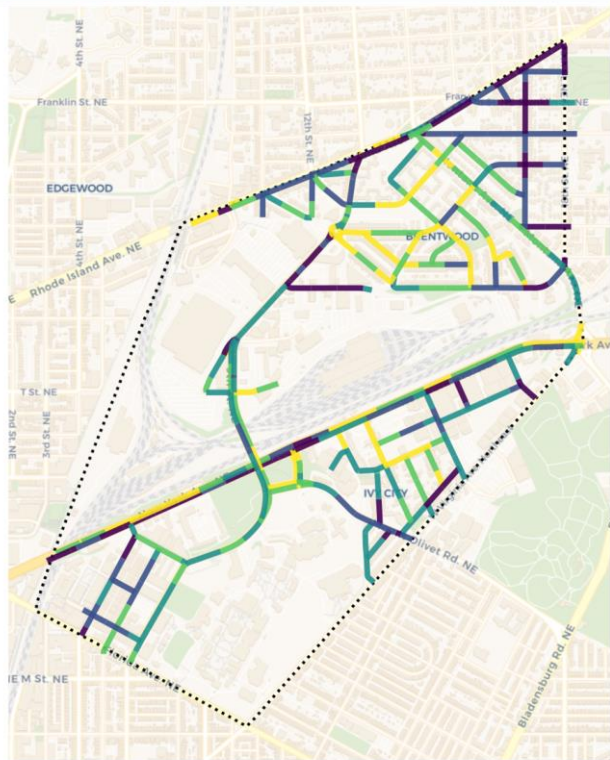
Key pollutants:
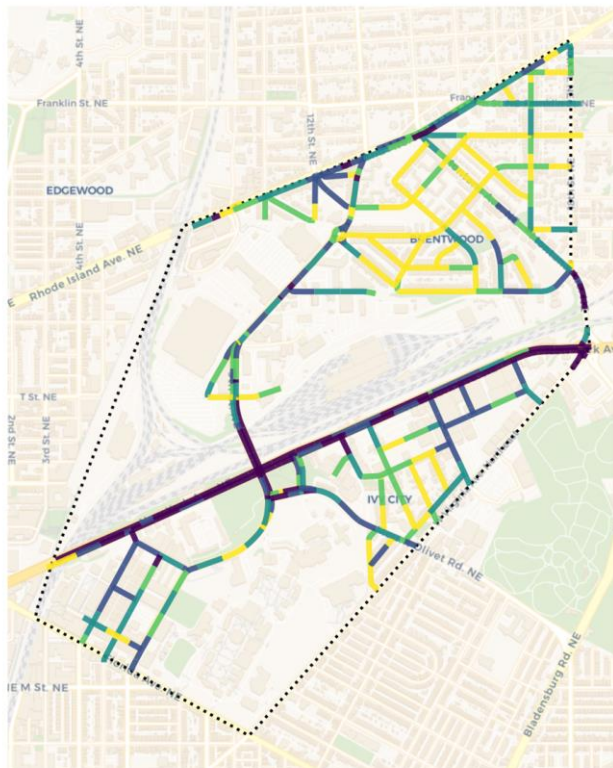# Black Carbon (BC)

Part of PM$_{2.5}$ that is "soot"

Sources:

- Diesel engines
- Wood fires

Health Effects:

- As "diesel particulate matter," classified as a carcinogen (cancer-causing)

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Black Carbon (BC)

BC [$\mu g\ m^{-3}$]
- -0.09 - 0.79
- 0.79 - 0.9
- 0.9 - 1.04
- 1.04 - 1.3
- 1.3 - 4.5
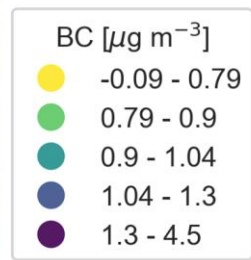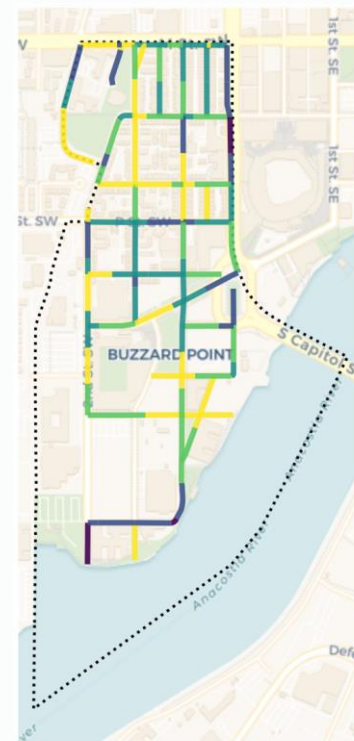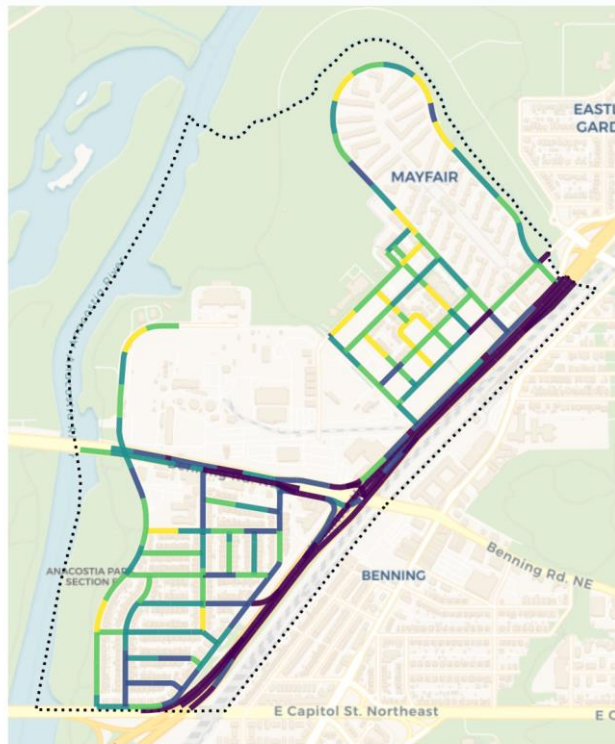
Key pollutants: Nitrogen Dioxide (NO_2)

Sources:
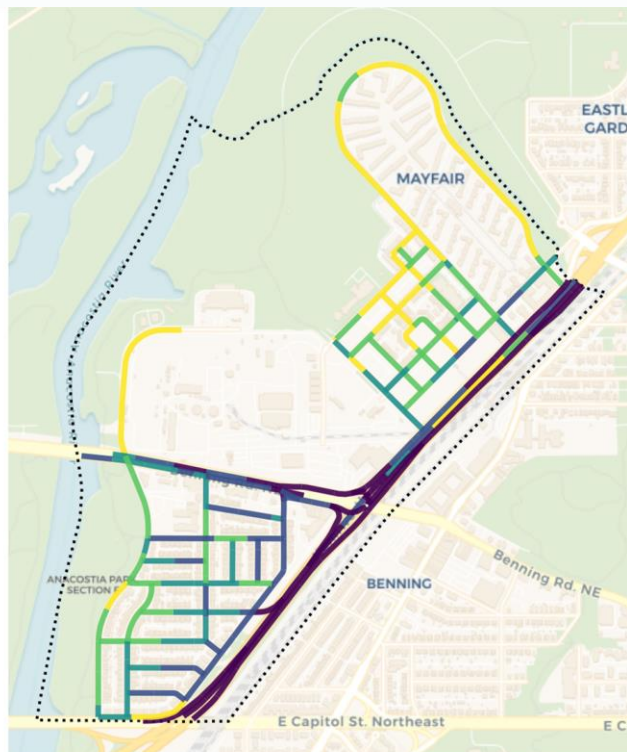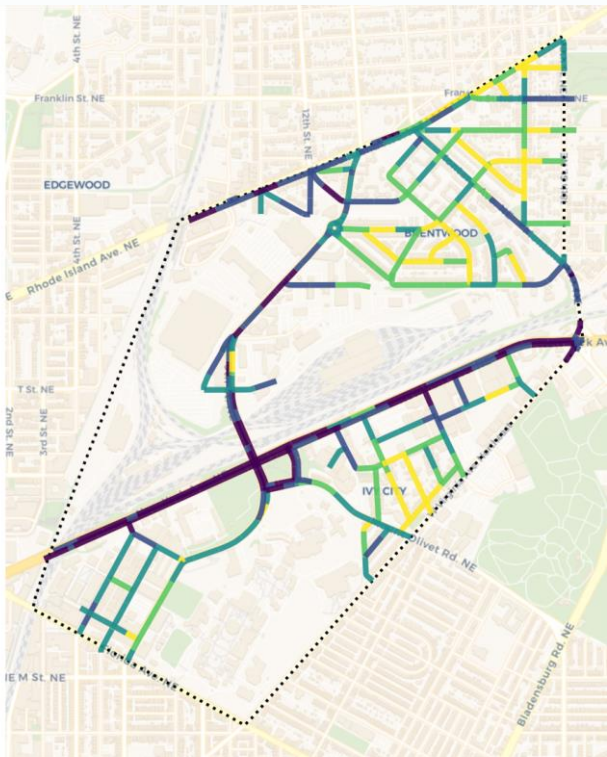
- Emissions + Photochemistry (sunlight)

Health Effects:

- Reduced lung function
- increased asthma attacks
- increased risk of respiratory infections

Denver, Colorado's "Brown Cloud" (source)

Nitrogen Dioxide (NO₂)

Standard: 100 ppb (1 hr); 53 ppb (annual)

NO₂ [ppb]
- 1 - 6.7
- 6.7 - 8.4
- 8.4 - 10.2
- 10.2 - 13.4
- 13.4 - 25.3
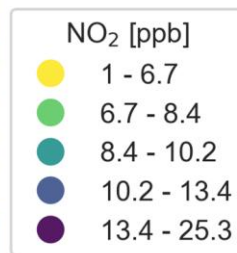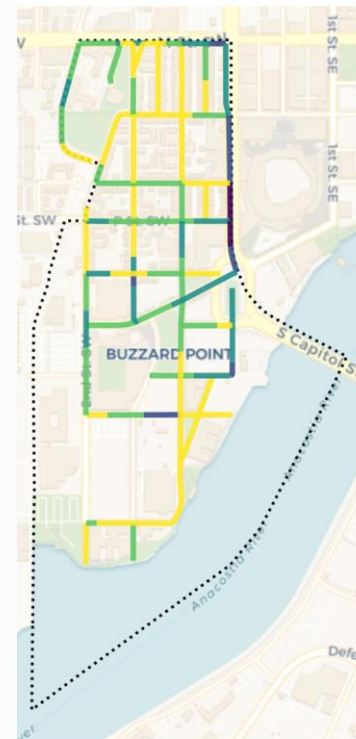
TVOC and Diesel Indicator mapping

Intro to TVOCs (Total Volatile Organic Compounds)

- Includes both **combustion**-related (eg. traffic) and **evaporation**-related (eg. paint off-gassing) sources
- Common sources of VOCs
  - Paints and solvents
  - Cleansers and disinfectants
  - Dry cleaners
  - Fuel production and distribution
  - Gasoline, diesel, natural gas combustion

Total Volatile Organic Compounds (TVOC) measurements

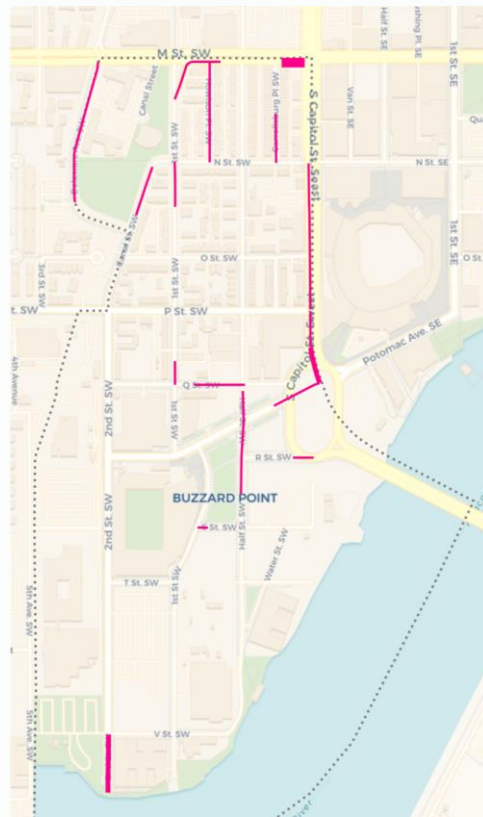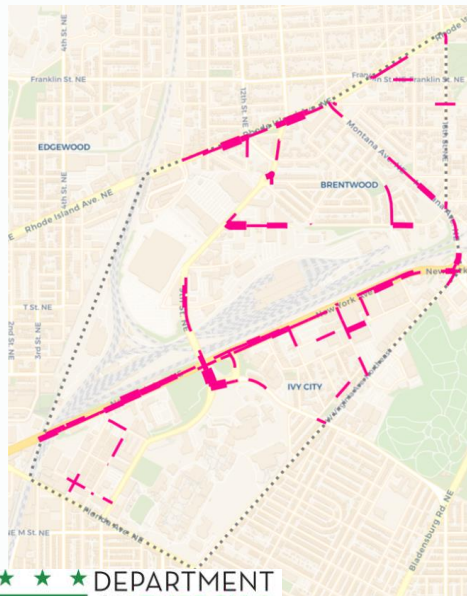Combustion-related (orange), off-gassing-related (purple), and a combination of the two (blue) TVOC enhancements

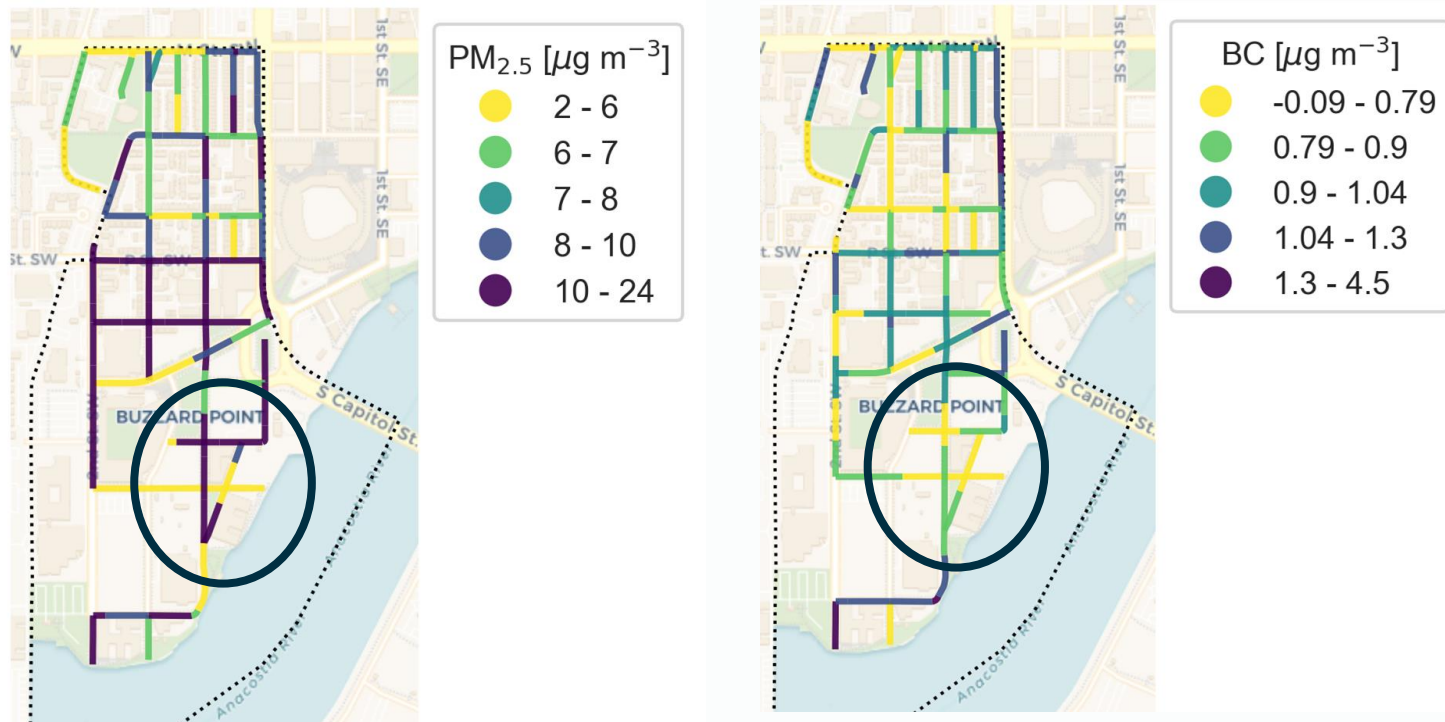Size of the circle increases with concentration
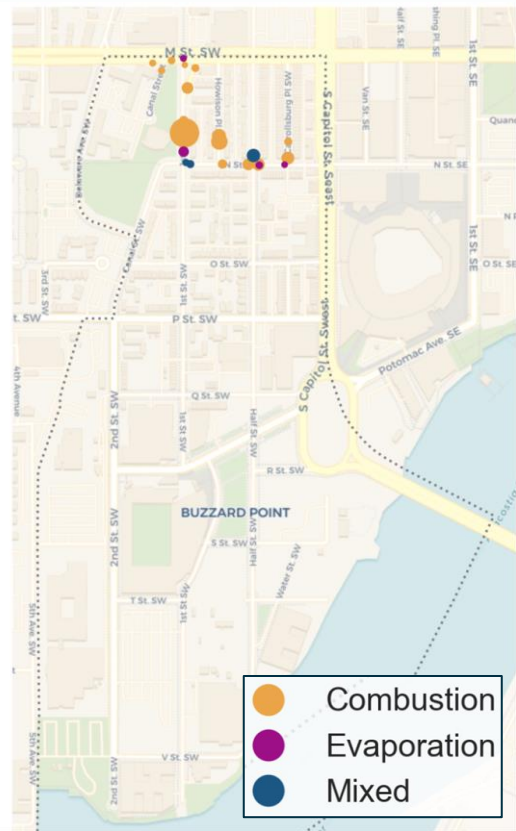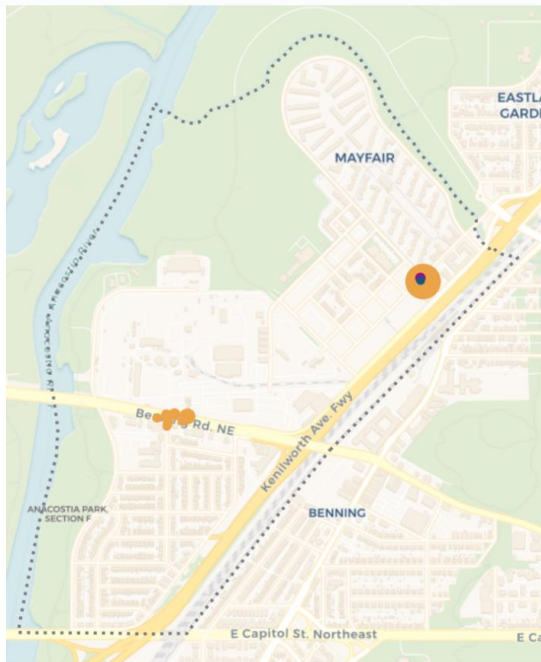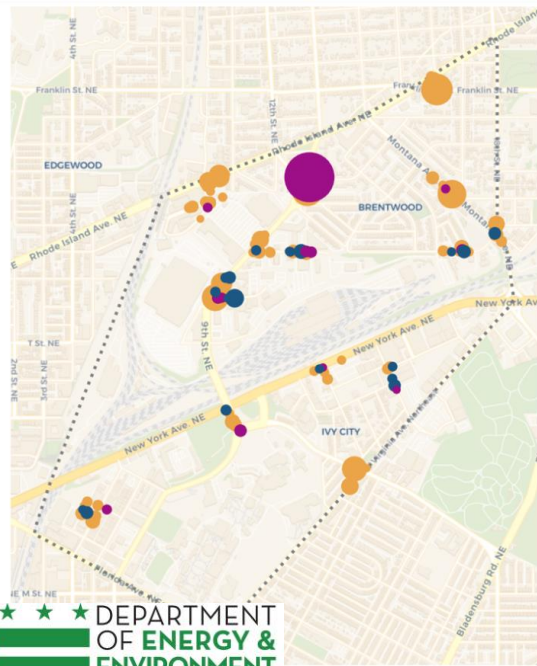
Diesel indications

Diesel-influenced segments for the three neighborhoods are highlighted in pink

Width of line = frequency of diesel "hits," or persistence of diesel source
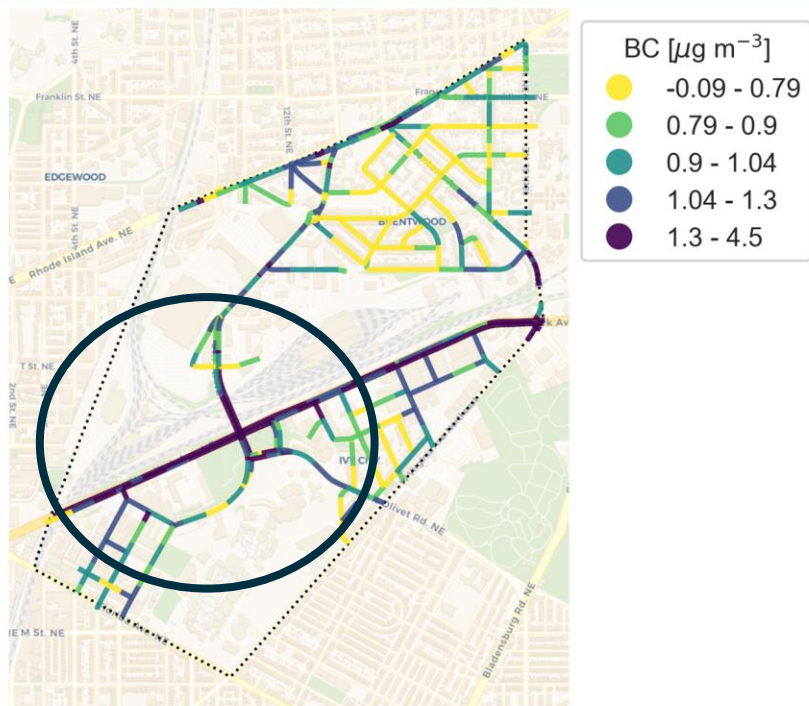
Example of an area of concern: Buzzard Point

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.
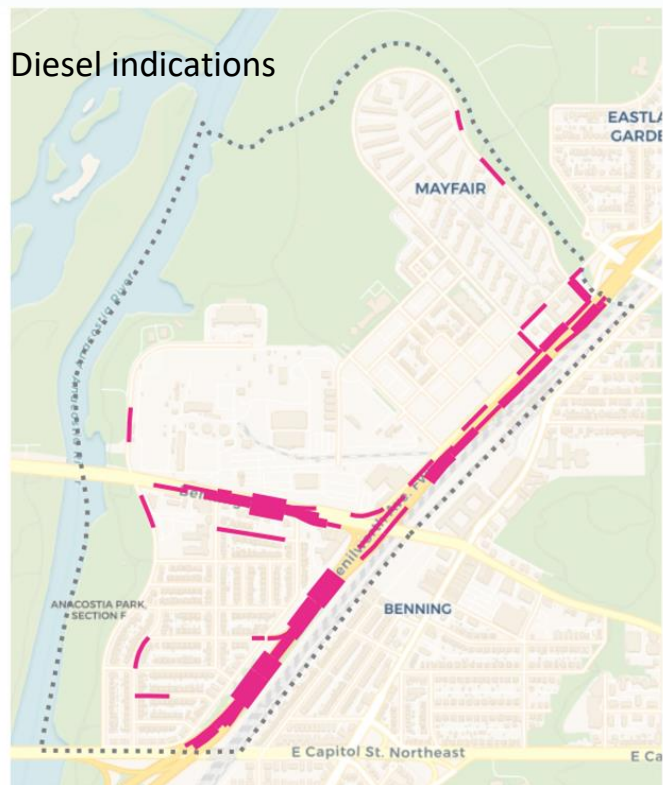
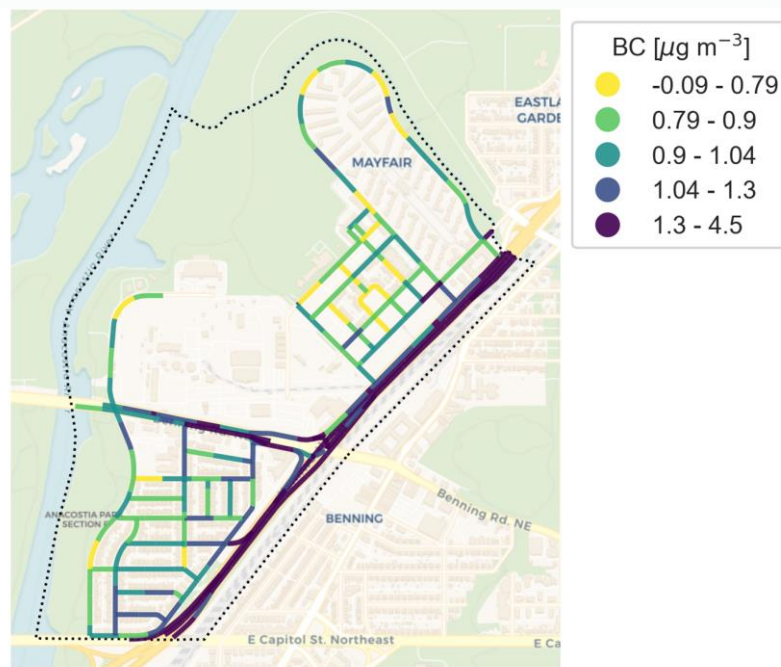# Example of an area of concern: Ivy City and Brentwood

Highest Black Carbon (BC) concentrations measured around the rail yard.

BC concentrations are elevated on nearby streets.
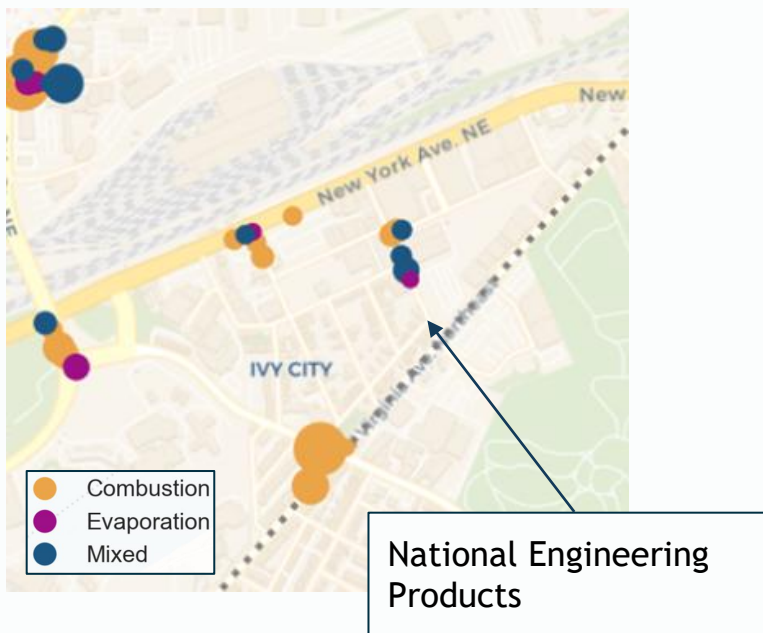
Example of an area of concern: Mayfair

Diesel indications

Significant diesel signatures detected on heavily travelled roads, leading to high concentrations of black carbon (BC) on and around the roads.

BC [μg m⁻³]
- -0.09 - 0.79
- 0.79 - 0.9
- 0.9 - 1.04
- 1.04 - 1.3
- 1.3 - 4.5

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National Engineering Products

Combustion
Evaporation
Mixed

National Engineering Products

Some persistent VOCs were detected north of the facility, but there are many potential sources nearby.

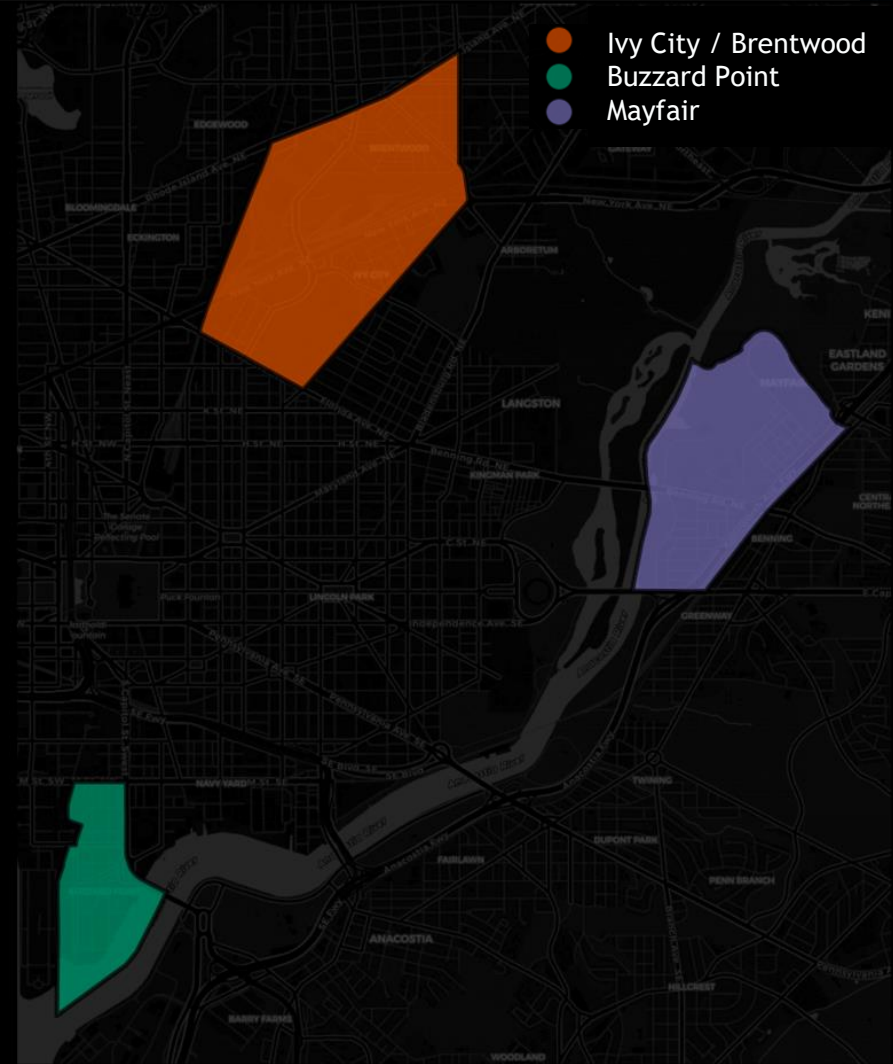Cannot conclusively determine source of the VOCs at this time.

_____

Caveats of the pilot:

- Only two weeks of monitoring
- If emissions are intermittent, monitoring over a short period may not capture them
- Aclima's monitoring platform does not include all possible pollutants relevant to this emissions source type

DOEE takeaways

- Results from the two-week pilot allow DOEE to identify some hot spots of air pollution that require more attention.
- The pilot results only represent exposure over a short period of time, so we cannot extrapolate this out for long-term exposure, nor directly compare the results to the health-based NAAQS.

Ivy City / Brentwood
Buzzard Point
Mayfair

Questions,
discussion

Thank you!

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Photo: Buzzard Point

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air quality.

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