Annual Report and Project Quarter 9

Upper South and Appalachia Citizen Air Monitoring Project (USACAMP)

Appalachian Voices

Upper South and Appalachia Citizen Air Monitoring Project (USACAMP)

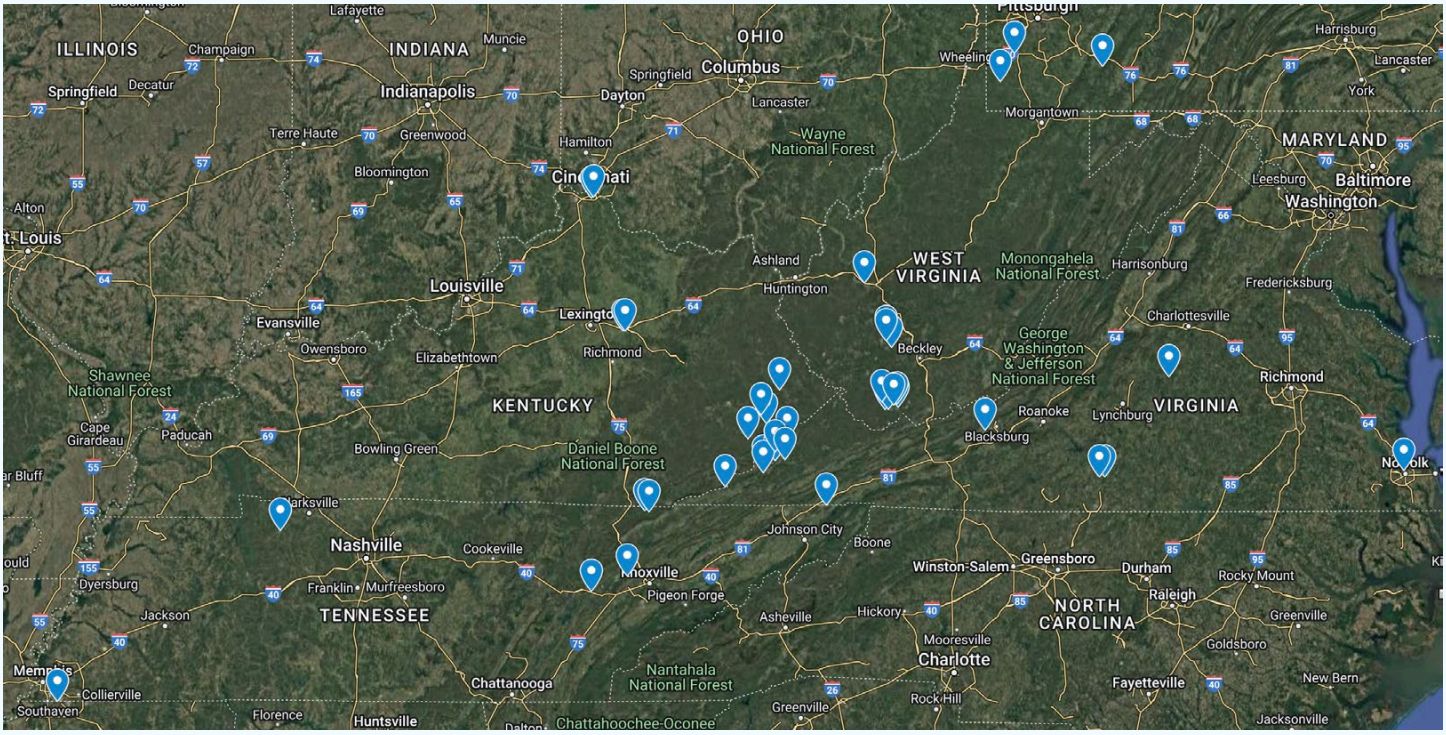
January 2026

In pursuit of a better understanding of air quality within our region, we are pleased to present the annual report for the Upper South and Appalachia Citizen Air Monitoring Project (USACAMP). Funded by an Environmental Protection Agency Enhanced Air Quality Monitoring for Communities grant, USACAMP focuses on the collection and analysis of air quality data through the use of PurpleAir monitors and other electronic monitoring devices.

This initiative engages communities across portions of Kentucky, Pennsylvania, Tennessee, Virginia, and West Virginia, deploying low-cost monitoring devices to facilitate the collection and dissemination of air quality data. The project aims to empower local residents, encourage dialogue around public health and policy, and promote clean air and healthy communities through data transparency and community science.

The primary focus of the project is particulate matter (PM), particularly PM2.5 (fine particles) and PM10 (coarse particles), due to their well-documented health impacts, especially for vulnerable populations such as children, the elderly, and individuals with pre-existing conditions. Data collected in 2025 was analyzed against existing and revised National Ambient Air Quality Standards (NAAQS), with additional attention paid to pollutant spikes, long-term averages, and potential exceedances.

Community Partner Locations



About PurpleAir and Data Adjustments

PurpleAir monitors use laser-based sensors to estimate the size and concentration of airborne particulate matter. These affordable, Internet-connected devices make air quality data more accessible, especially in underserved areas.

However, raw PurpleAir data is known to overestimate PM2.5 concentrations. As a result, USACAMP has adopted a correction formula developed by Barkjohn et al. (2021), applying it uniformly to all PM2.5 data for improved alignment with Federal Reference Monitors (FRMs).

Corrected PM2.5 = 0.38 × PA + 2.94

In this equation, PA refers to the PM2.5 concentration reported directly by the PurpleAir sensor.

Particulate Matter Regulatory Overview

This report references the following EPA National Ambient Air Quality Standards for particulate matter:

- **24-hour PM10: 150 $\mu g/m^3$**
- **24-hour PM2.5: 35 $\mu g/m^3$ (based on the 98th percentile average**
- **Annual PM2.5: 9 $\mu g/m^3$ (updated in 2024 from 12 $\mu g/m^3$)**

Due to the multi-year nature of NAAQS compliance calculations, direct exceedance determination is not always possible. Instead, this report provides metrics and visuals that mimic NAAQS methodologies to give insight into likely patterns of exposure.

EPA Administrator Lee Zeldin has announced that the agency will reconsider the standards for PM 2.5 as part of a broad deregulatory agenda. At this time, the applicable standards are as they appear above, but in the coming months, EPA is likely to commence rule-making procedures to change the annual and/or 24-hour standards for this pollutant, making these standards less stringent.

Low-cost air quality sensors, such as those produced by PurpleAir, have expanded access to fine particulate matter (PM2.5) monitoring, particularly in underserved or rural areas. However, the raw measurements produced by these sensors often require adjustment to ensure comparability with reference-grade monitors used by regulatory agencies, such as the EPA's Federal Reference Method (FRM) and Federal Equivalent Method (FEM) instruments.

The first model tested applies a linear transformation developed by Barkjohn et al. (2021), which adjusts for the typical overestimation of PM2.5 by PurpleAir sensors. This approach is expressed by the formula:

CPM2.5-transformed = 0.38 × Raw PM2.5 + 2.94

Our 2024 annual report noted that this model performs well in the region and is competitive with other popular PurpleAir transformation models.

A PurpleAir air-quality monitoring device.

Community Spotlight: Black Lung Disease Clinics

Helping miners navigate the system and receive necessary medical care

Coal has been mined in our region for over a century, and in that time, the largest and most easily accessible deposits of coal have been mined out. In order to extract the leftover coal seams, which are generally smaller and more difficult to access, miners are required to cut through large amounts of sandstone rock. This creates fine, respirable silica dust, which miners then inhale on the job.

Black lung occurs when mine workers inhale coal and silica dust, and this dust accumulates within the lungs, forming concretized masses and scar tissue, and reducing overall lung function. Silica dust is more toxic than coal dust, and causes the disease to advance more rapidly and severely than if it were caused by coal dust alone.The increased exposure to silica faced by today's miners is a leading cause behind the current surge in black lung.

In southern West Virginia, Southwest Virginia, and Eastern Kentucky, black lung disease is at epidemic levels. The most severe form of the disease, called progressive massive fibrosis or "complicated black lung," is more common than ever, and it is affecting miners younger than ever. Today, according to medical providers, there are miners as young as 30 who may have only worked in the industry for ten years and are already disabled due to black lung disease. Much like the increased overall rates of the disease, these increased occurrences in younger miners are largely the result of silica exposure.

For miners with black lung, everyday tasks can be difficult. Many coal miners report finding it difficult to mow the lawn, walk up a flight of stairs, or play with their kids or grandkids. Elevated levels of fine particulates in the ambient air in these miners' communities may exacerbate the issue. While high levels of particulates present a nuisance and health hazards to everybody, certain populations – such as individuals who are already afflicted with black lung or other respiratory and pulmonary conditions – may be more susceptible.

The National Institute for Occupational Safety and Health (NIOSH) operates mobile screening units, like this one, where miners can undergo diagnostic tests for signs of black lung disease anonymously and at no charge. Photo: CDC

While many of the PurpleAir sensors maintained by Appalachian Voices and our partners as part of the Upper South and Appalachia Citizen Air Monitoring Project are located in areas where coal miners live, we made a point to install four PurpleAir sensors in locations that are particularly relevant to the mining community in order to generate a rough sketch of exposure to fine, respirable particulates at these specific locations. These include the home of a miner with black lung in Beckley, West Virginia, two black lung clinics – one in Gary, West Virginia, and one in St. Charles, Virginia, and a third medical clinic that is not home to a dedicated black lung program located in Northfork, West Virginia.

Drew Harris is a pulmonologist and associate professor of medicine at the University of Virginia who also directs Stone Mountain Health Services' black lung clinics in Southwest Virginia.

“I like connecting with coal miners and their families, and I think it’s a group that doesn’t have a lot of advocates,” says Harris. “They spent their life doing hard work and powering our country and supporting their families. And I think it’s really a tragedy that literally thousands of them are contracting an incurable, progressive disease just from showing up to work and doing their job.”

Harris estimates that Stone Mountain serves between 1,500 and 2,000 miners with black lung annually, helping miners navigate the federal black lung benefits process while also providing medical services such as pulmonary rehabilitation. Harris notes that local air quality has a definite effect on those suffering from black lung and other pulmonary diseases.

“Particulate matter at high levels can lead to things like exacerbations of COPD or asthma or other chronic lung disease,” Harris says. “It’s not healthy to breathe in polluted air, and that includes most forms of small particle dust. And I think one of our common recommendations when someone develops a lung disease like black lung is to avoid breathing in things that can trigger more inflammation and lead to worsening disease.”

Data collected from the monitors at the clinic locations and at the miner’s home provide important context for the air quality conditions experienced by this vulnerable population. While average fine particulate matter levels (PM2.5) generally fall within current federal standards, the data show clear variability, including periodic spikes that approach or exceed short-term health thresholds. For individuals living with black lung and other respiratory illnesses, these fluctuations are not abstract — they can translate directly into worsened symptoms, reduced mobility, and diminished quality of life.

These findings underscore a broader gap in how air quality is regulated. Standards based on annual averages can obscure the real-world impacts of short-term pollution events, particularly for communities already burdened by chronic respiratory disease. The U.S. Environmental Protection Agency notes that individuals with existing heart or lung disease are more likely to experience severe effects from particulate pollution, including worsened symptoms and reduced lung function. In regions where black lung is prevalent, even “compliant” air quality may not be truly protective. The data point to the need for air quality approaches that more fully account for how exposure occurs in the real world, including both long-term conditions and short-term fluctuations.

As we discuss elsewhere in this report, the National Ambient Air Quality Standard for fine particulate matter is set at 9 micrograms per cubic meter measured annually, and 35 micrograms per cubic meter measured over one 24-hour period. Exposure levels in an active coal-mining environment are much higher.

In 2024, the Mine Safety and Health Administration finalized a rule that would lower the limit on fine silica dust in the mines from 100 micrograms per cubic meter to just 50 micrograms per cubic meter. But mining industry representatives sued the federal government over this limit. In response, the Trump administration chose to not implement the 50 microgram standard, instead opting to rewrite the rule entirely. As miners and those who care about them await the day when stronger protections will be in place, black lung remains an epidemic in our region.

VOC and Gas Pollutant Monitoring

In addition to measuring particulate matter, USACAMP's air quality efforts in 2025 included monitoring a range of gas-phase pollutants. Two SENSIT RAMP monitors—located in Bristol, Virginia, (unit 1145) and Bristol, Tennessee, (unit 1144)—captured hourly concentrations of **sulfur dioxide (SO_2), volatile organic compounds (VOCs), ammonia (NH_3), hydrogen sulfide (H_2S), and carbon monoxide (CO).**

These sensors use electrochemical cells and a photo-ionization detector to identify and quantify low-concentration gases. Data was evaluated using public health and occupational exposure standards from multiple agencies, including the EPA's National Ambient Air Quality Standards (NAAQS), the Occupational Safety and Health Administration (OSHA), and the Mine Safety and Health Administration (MSHA).

Measurements from both sites show that most pollutants remained within generally acceptable levels throughout the year. However, **the Bristol, Virginia, monitor recorded SO_2 concentrations that exceeded the one-hour NAAQS limit of 75 parts per billion (ppb).**

All other pollutants—NH_3, H_2S, and CO—remained well below their respective regulatory thresholds at both monitoring locations. VOC readings were assessed against OSHA's benzene exposure limit, which serves as a conservative benchmark for potential health concern. In this quarter both sensors for VOC were down for maintenance, one has been replaced and the other is in the process of being replaced

This year's data provides a strong baseline for identifying future outliers and evaluating pollutant behavior under specific environmental conditions. Continued monitoring will help track trends and support responsive community engagement in areas where concentrations approach regulatory limits.

A description of the measured gases and table of relevant standards is included below.

- **Volatile organic compounds (VOCs)** are a category of organic chemicals characterized by high vapor pressures at room temperature; these compounds easily transition into gaseous states under normal atmospheric conditions. Exposure to high levels of some VOCs can irritate the eyes and throat, cause nausea and trouble breathing, and is associated with damage to the central nervous system and other organs, according to the American Lung Association. Being a category of gases, they can not be directly compared to any one standard. For the purpose of this project, the performance of the SENSIT RAMP VOC sensor is specifically compared to OSHA's exposure limits for benzene.
- **Carbon Monoxide (CO)** is a colorless, odorless gas produced by burning fossil fuels. It is harmful because it can prevent the blood from carrying oxygen to cells, tissues, and organs.
- **Ammonia (NH3)** is a colorless gas with a pungent odor, commonly used in industrial and cleaning products. It is a common toxicant that originates from wastes, fertilizers, and natural processes.
- **Sulfur Dioxide (SO2)** is a gas produced by industrial processes, especially the burning of fossil fuels containing sulfur. It can cause respiratory problems and contribute to the formation of acid rain.
- **Hydrogen Sulfide (H2S)** is a colorless gas known for its characteristic foul odor of rotten eggs. It is toxic and can cause respiratory distress and other health issues at high concentrations.

Chemical Concentration Limits

Ammonia	NH_3	OSHA sets a permissible exposure limit (PEL) of 50 parts per million (ppm) as an 8-hour time-weighted average (TWA).
Volatile organic compounds	VOCs (benzene)	OSHA sets a PEL for benzene of 1 ppm as an 8-hour TWA.
Sulfur dioxide	SO_2	The EPA NAAQS for SO2 specifies that the highest observed 1-hour SO2 concentration should not exceed 75 parts per billion (ppb) more than once per year.*
Carbon monoxide	CO	The EPA NAAQS limits CO to 9 ppm over an 8-hour period and 35 ppm over a 1-hour period.
Hydrogen sulfide	H_2S	MSHA imposes a ceiling of 20 ppm to prevent chronic effects, and a short-term exposure limit (STEL) of 50 ppm for up to 10 minutes to allow for brief peak exposures without severe health risks.

VOC and Other Pollutant Data

All SENSIT RAMP data was compared against the relevant standards. No exceedances were indicated for any of the parameters measured. The table and graphs below show the highest concentrations detected by each of the SENSIT RAMP devices, utilizing calculations as described in the regulations. Sulfur dioxide is shown with the second-highest max value for the quarter, as the regulations require the highest values to be excluded from calculations.

SENSIT RAMP Data

Parameter	Metric Type	Standard	1144	1145
Ammonia (NH3)	Max 8-Hour Weighted Avg	50 ppm (8-hr TWA OSHA)	0.69	0.592
Carbon Monoxide (CO)	Max 1-Hour Avg	35 ppm (1-hr NAAQS)	0.741	0.475
Carbon Monoxide (CO)	Max 8-Hour Avg	9 ppm (8-hr NAAQS)	0.501	0.446
Hydrogen Sulfide (H2S)	Max Concentration	50 ppm (10-min MSHA)	0.160	0.144
Sulfur Dioxide (SO2)	Max Hourly Avg	0.075 ppm (1-hr NAAQS)	0.049	0.057
Volatile Organic Compounds (VOC)	Max 8-Hour Avg	1 ppm (8-hr TWA OSHA)	0.00	0.026

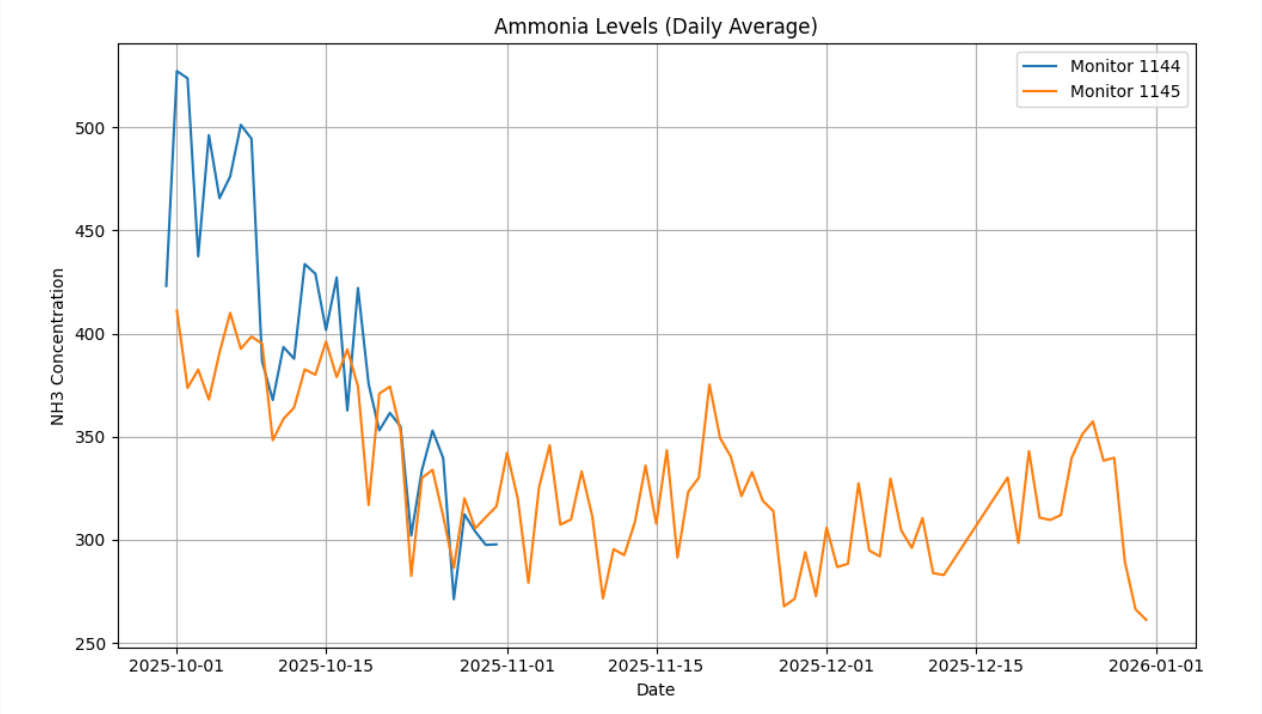
All results reported in parts per million (ppm)

*National primary ambient air quality standards require three years' worth of data for calculations used to determine an exceedance. That said, we do expect exceedances of SO2 will be likely, given the data we have thus far. But this data will also be averaged with data for other years, so it is possible that the average value could remain in compliance.

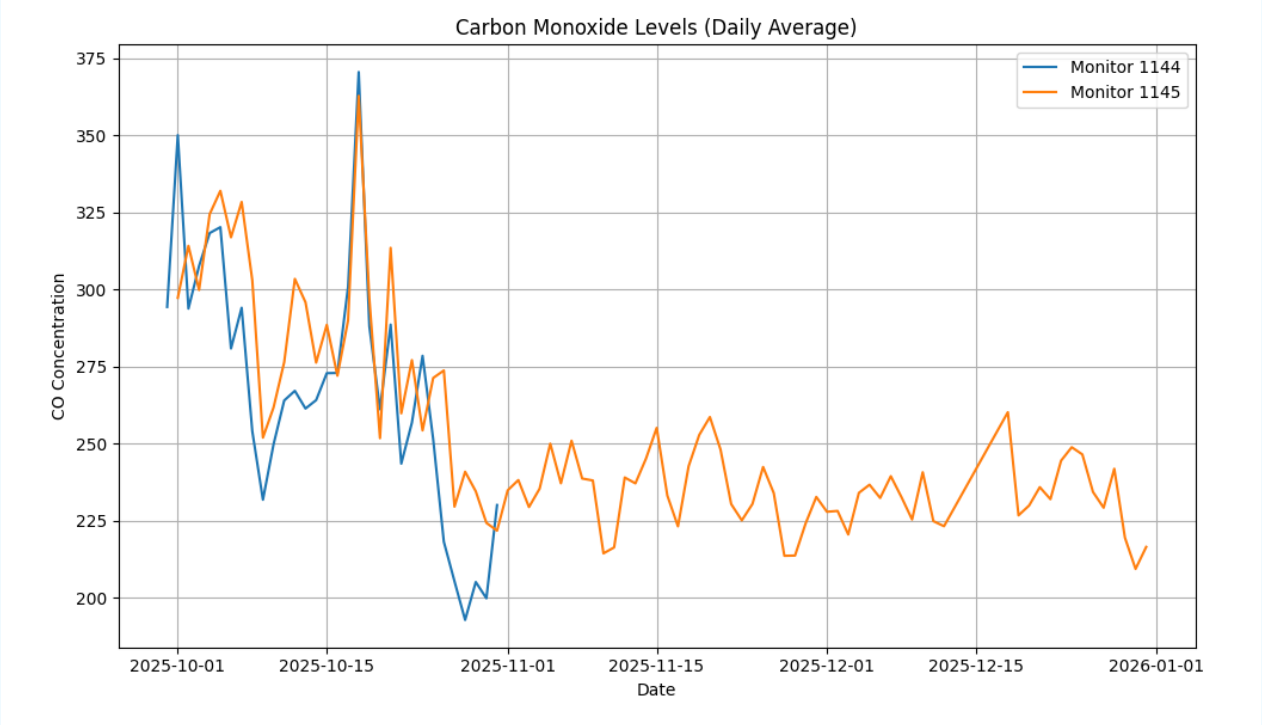
Graphs of data from the SENSIT RAMPs are shown on the following pages.

This report includes both quarterly (Appendix A) and annual (Appendix B) graphs and data, wind roses and comparisons with a local NOAA station.

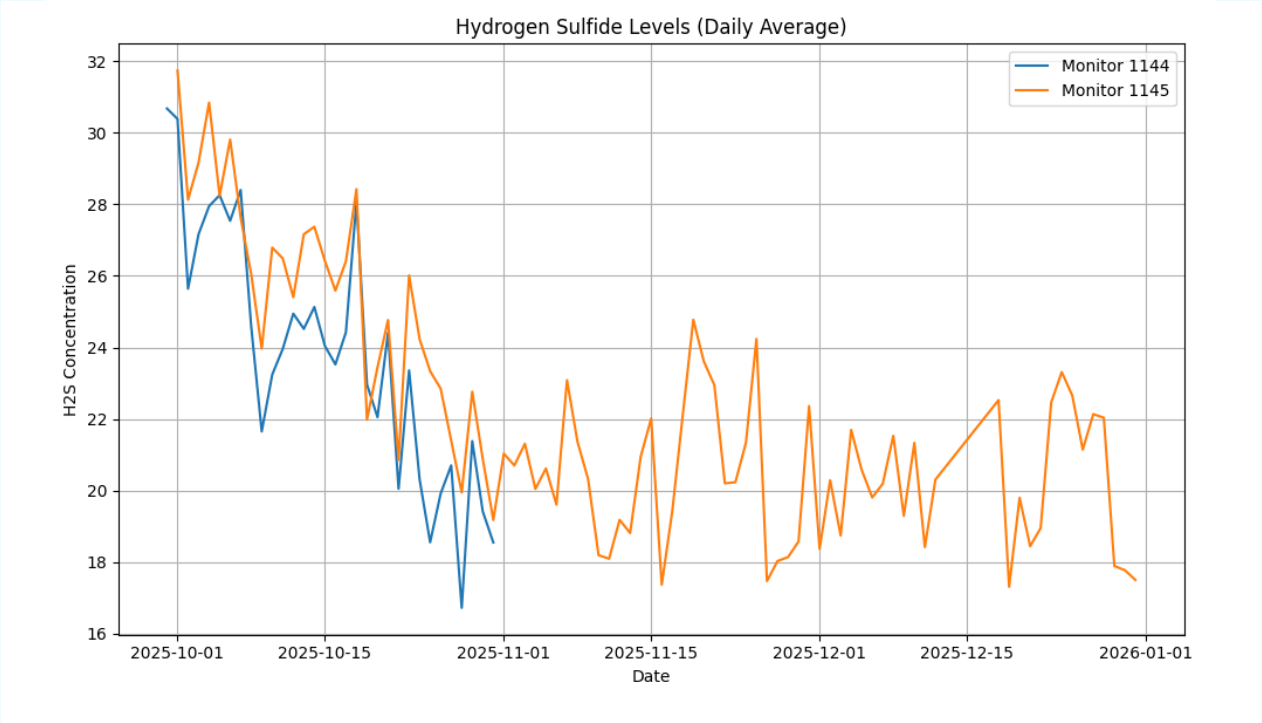
Ammonia: Bristol Virginia and Tennessee



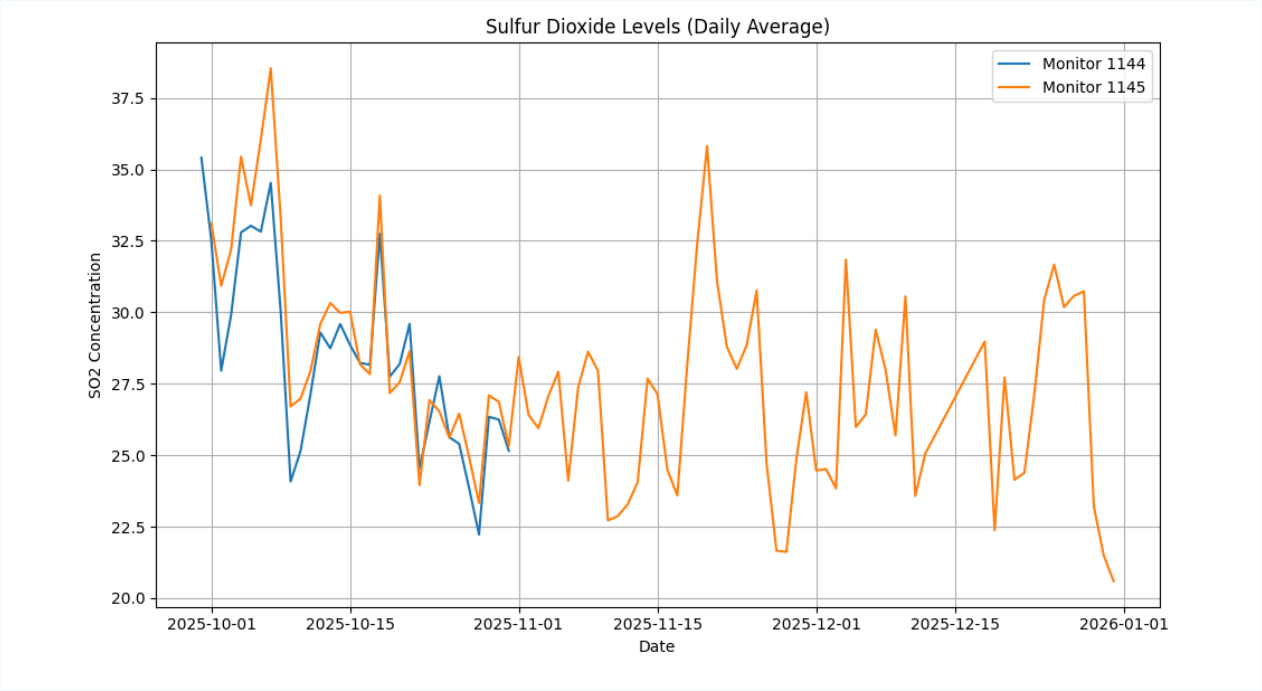
Carbon Monoxide: Bristol Virginia and Tennessee



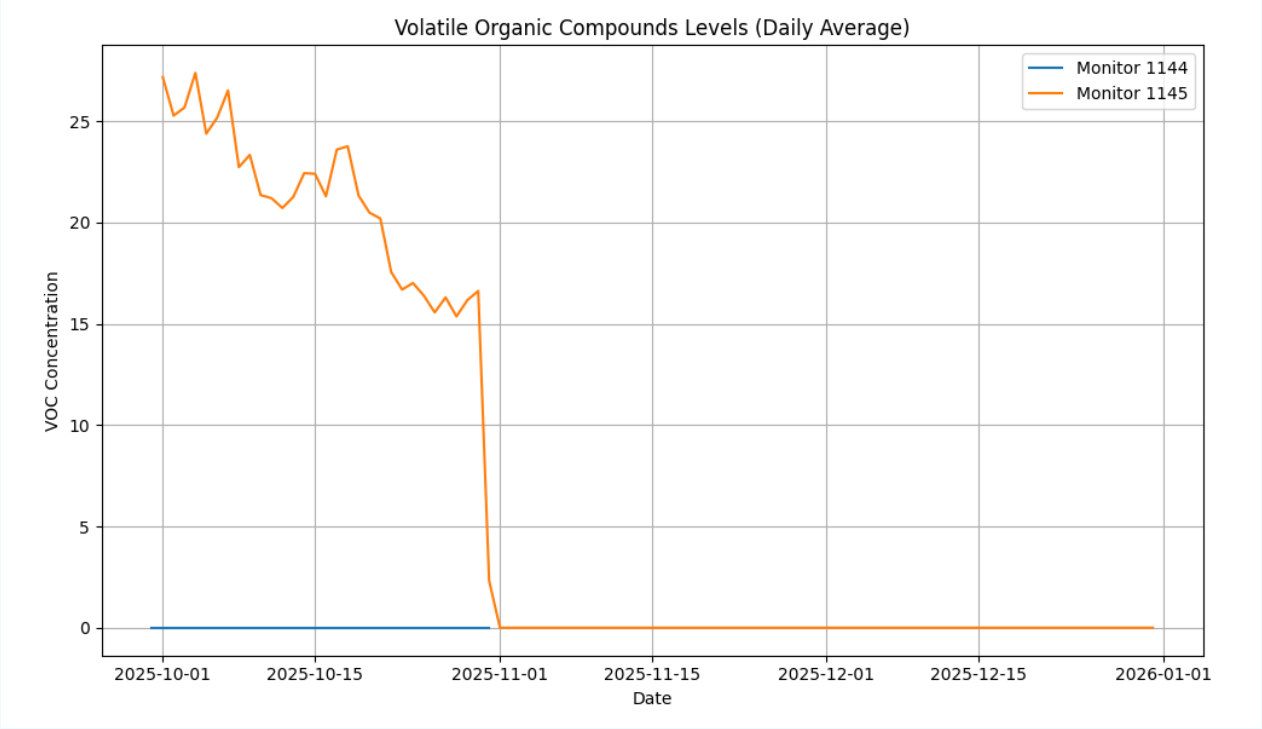
Hydrogen Sulfide: Bristol Virginia and Tennessee



Sulfur Dioxide: Bristol Virginia and Tennessee



Volatile Organic Compounds: Bristol Virginia and Tennessee



Note: Monitor 1144 and 1145 sensors are failing to report VOC data. The sensors are being replaced.

SENSIT RAMP monitors.

Conclusion and Future Directions

The 2025 USACAMP dataset provides another valuable year of air quality data from rural and underserved communities across Appalachia and the Upper South. With growing sensor coverage, expanded analysis methods, and strong community partnerships, we look forward to improving our technical evaluations and continuing this work into 2026.

Questions and data requests can be directed to Willie Dodson at willie@appvoices.org or Matt Hepler at matt.hepler@appvoices.org.

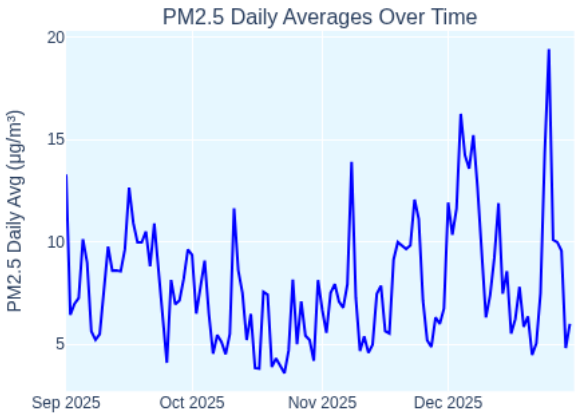
Photo: Michael Swensen for EarthJustice

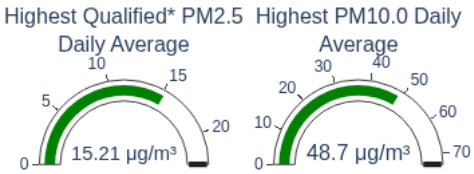
Appendix A

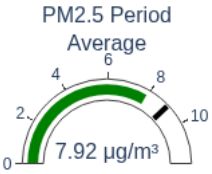
Quarterly PM2.5 and PM10 Trends

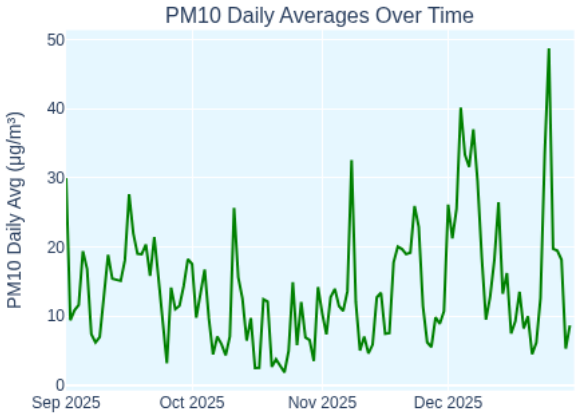
KENTUCKY

2025-09-01 to 2025-12-31 Report for Sensor 184505: AV-40, Clark_County, KY









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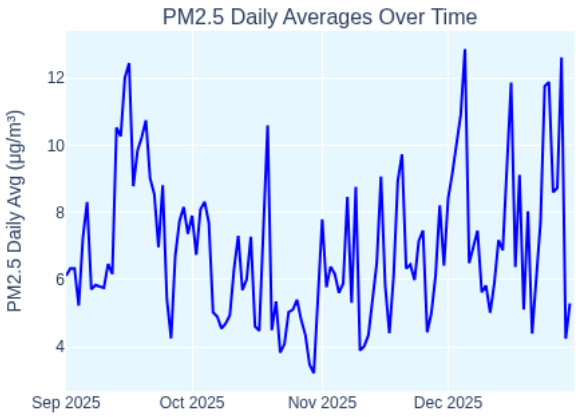

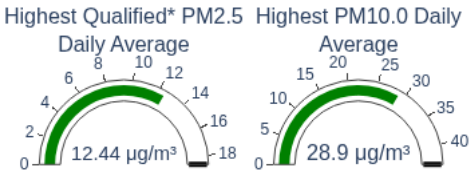

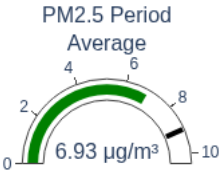

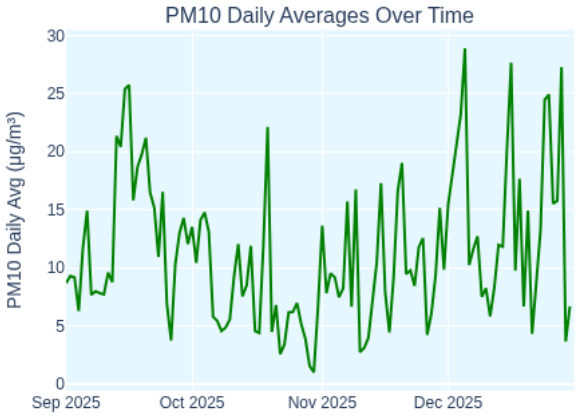

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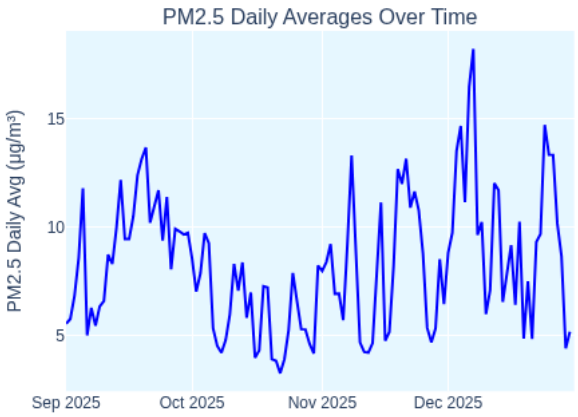

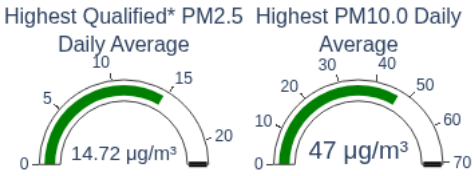

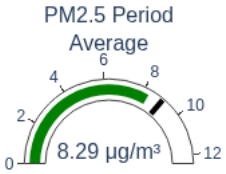

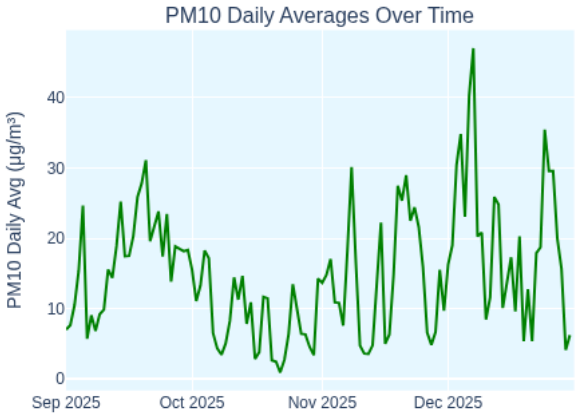

PENNSYLVANIA

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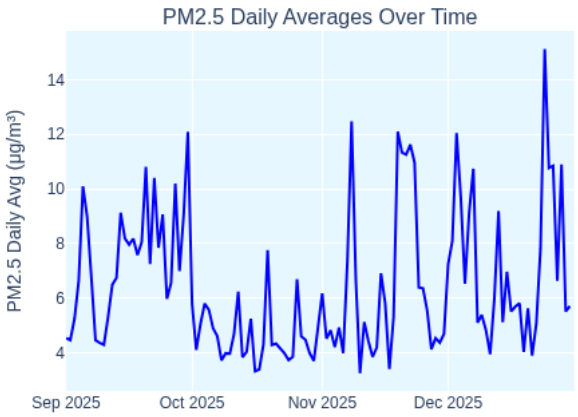

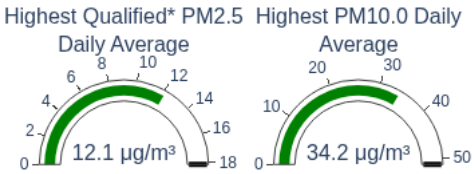

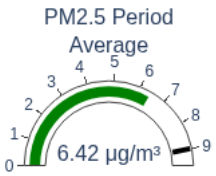

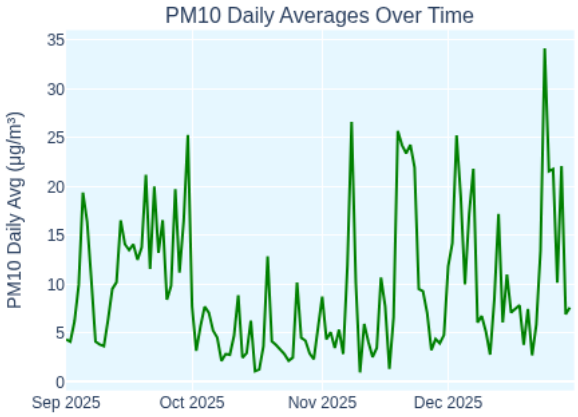

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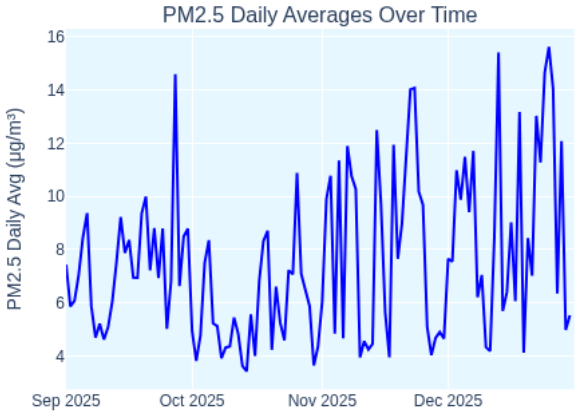

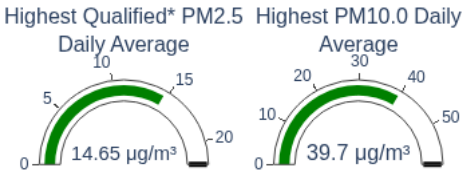

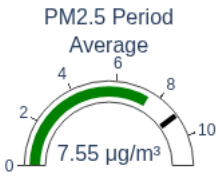

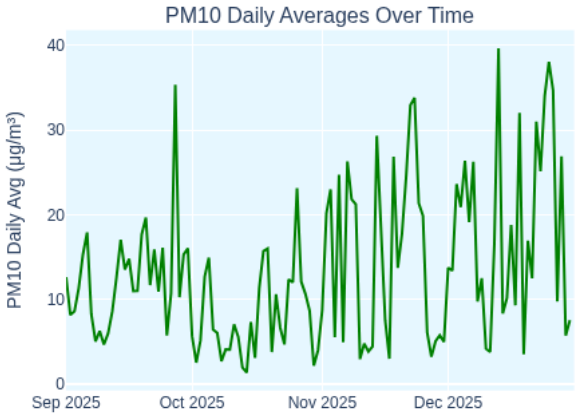

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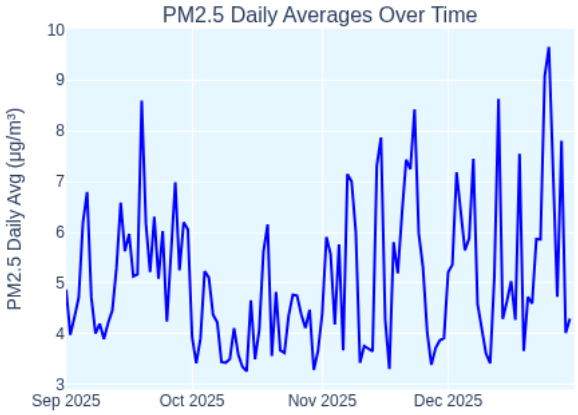

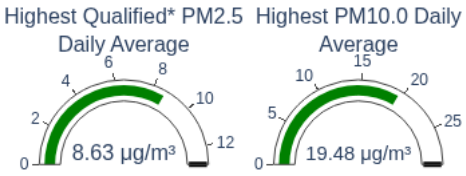

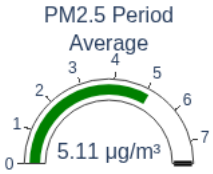

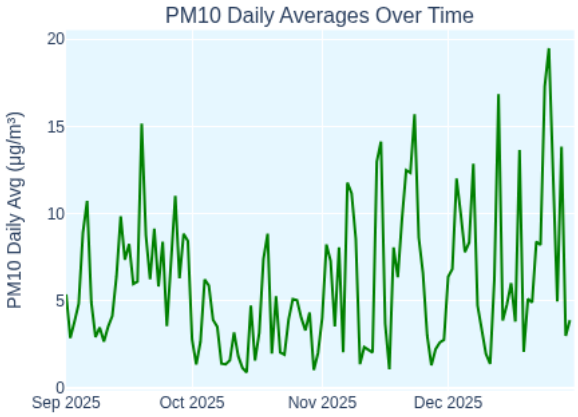

TENNESSEE

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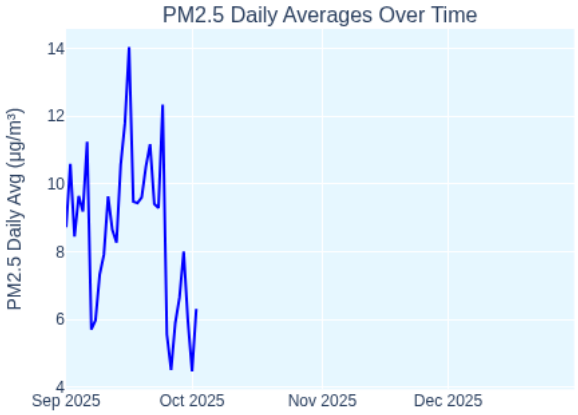
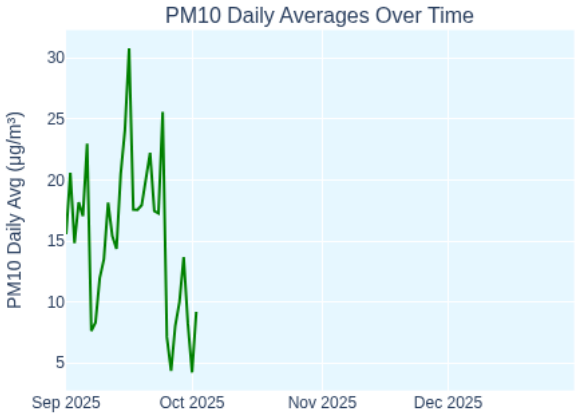
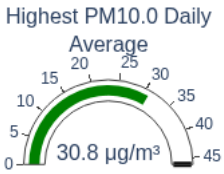
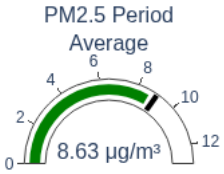
Note: This report has been flagged as possibly returning insufficient data.

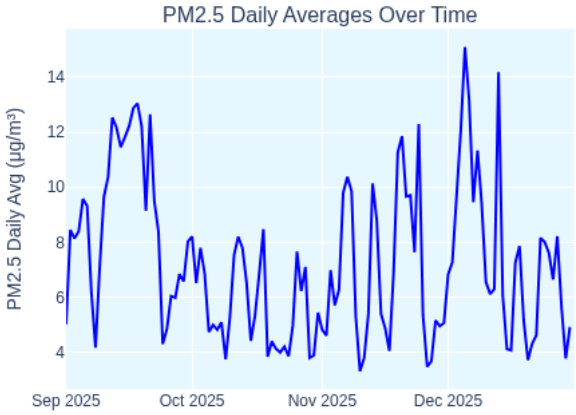


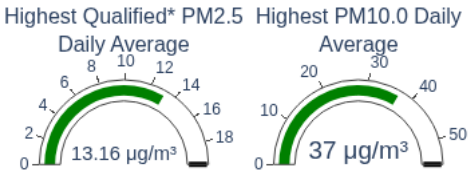


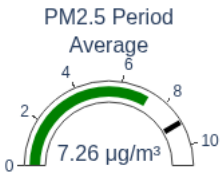


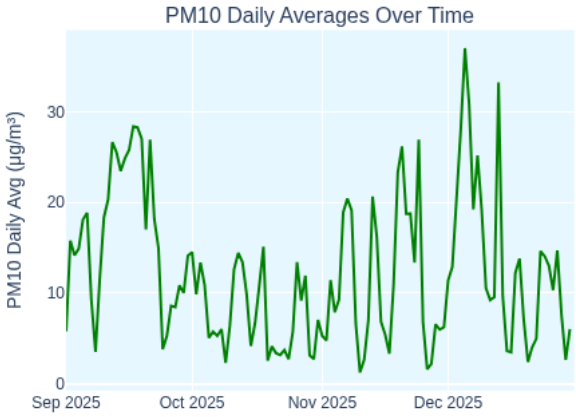


2025-09-01 to 2025-12-31 Report for Sensor 198253: AV-53, Memphis, TN

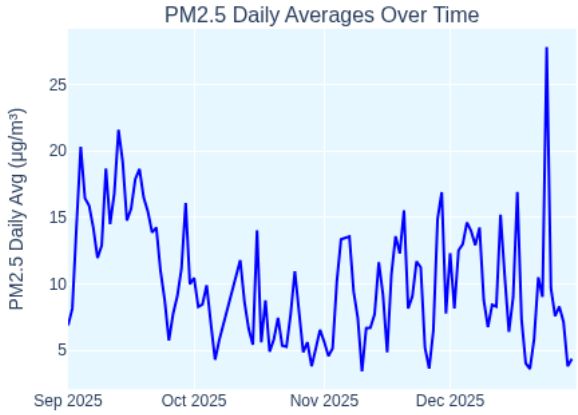


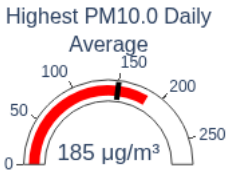


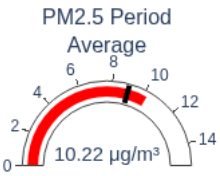


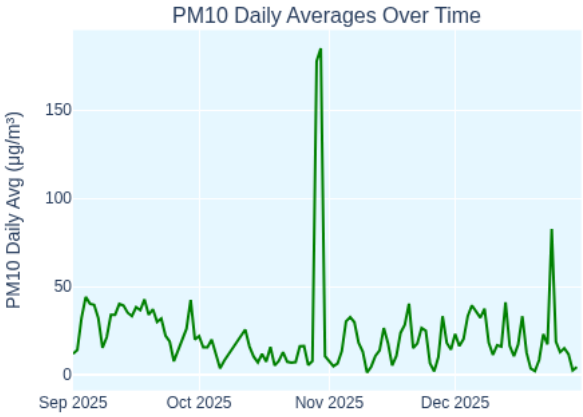


2025-09-01 to 2025-12-31 Report for Sensor 184531: AV-29, Montgomery_County, TN



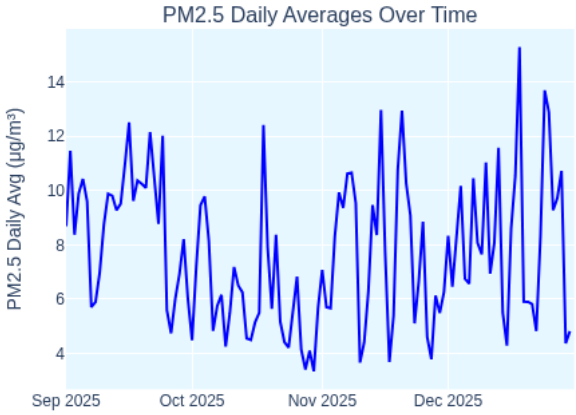


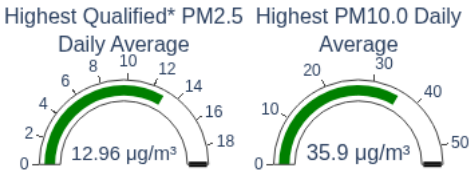


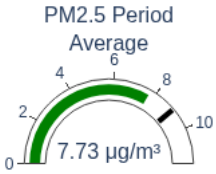


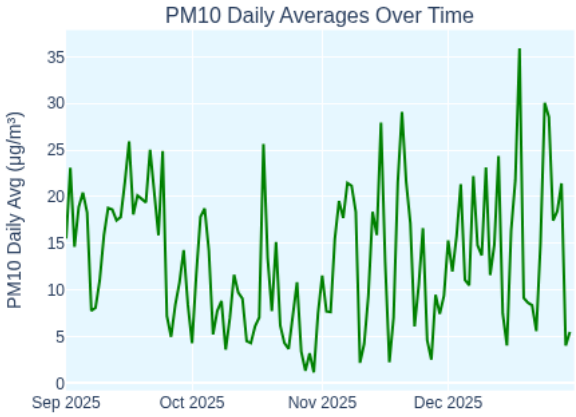
Days PM2.5 Exceeded	Days PM10.0 Exceeded
	2025-10-29
	2025-10-30

2025-09-01 to 2025-12-31 Report for Sensor 184349: AV-30, Roane_County, TN

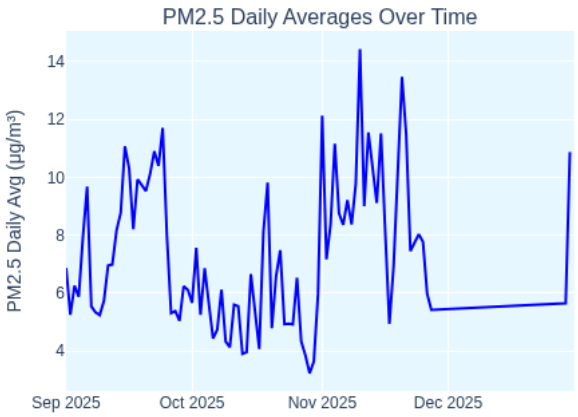


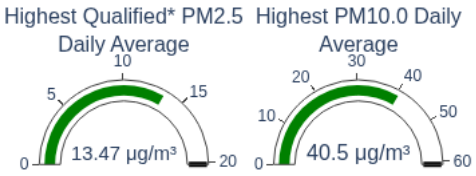


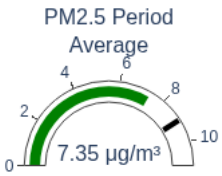


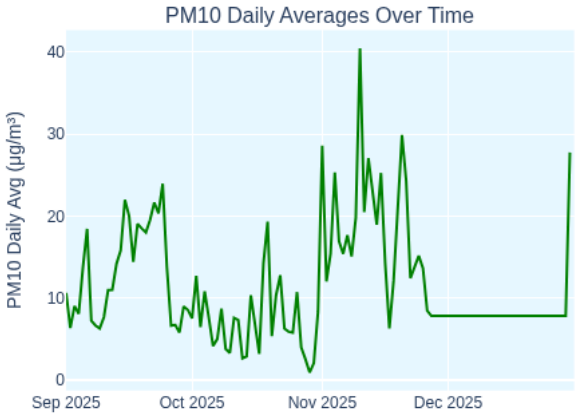


2025-09-01 to 2025-12-31 Report for Sensor 199001: AV-59, Sullivan_County, TN

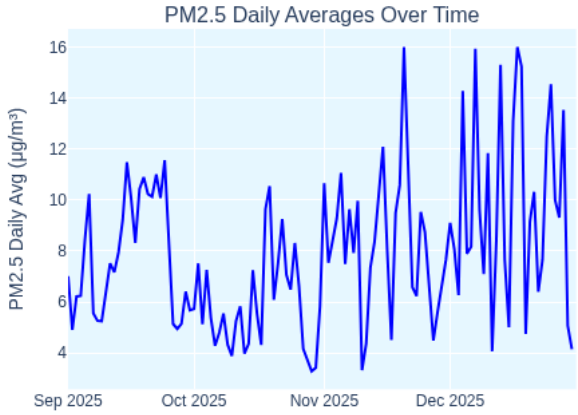


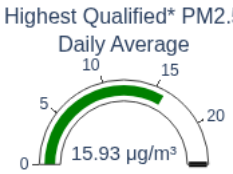


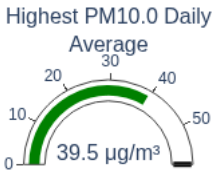


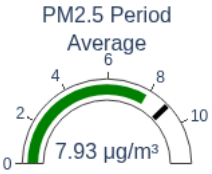


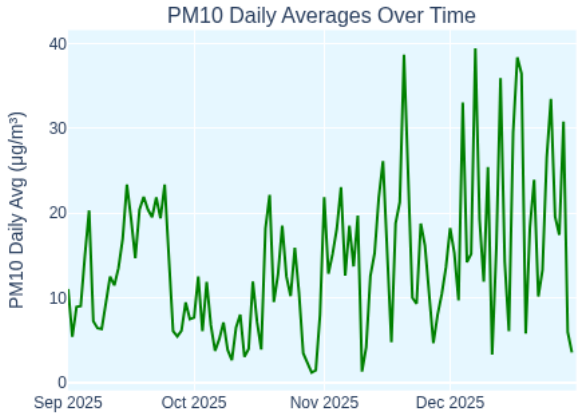
2025-09-01 to 2025-12-31 Report for Sensor 198979: AV-60, Sullivan_County, TN







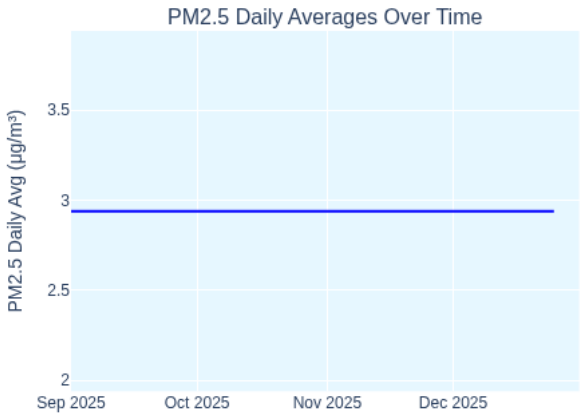


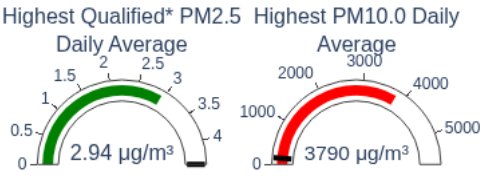


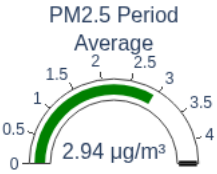
VIRGINIA

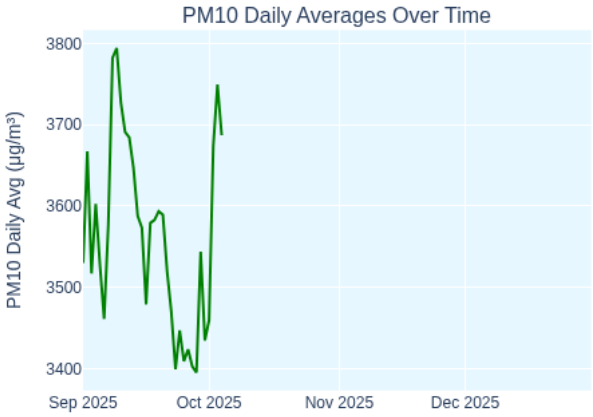
2025-09-01 to 2025-12-31 Report for Sensor 198969: AV-55, Buchanan_County, VA

Note: This report has been flagged as possibly returning insufficient data.



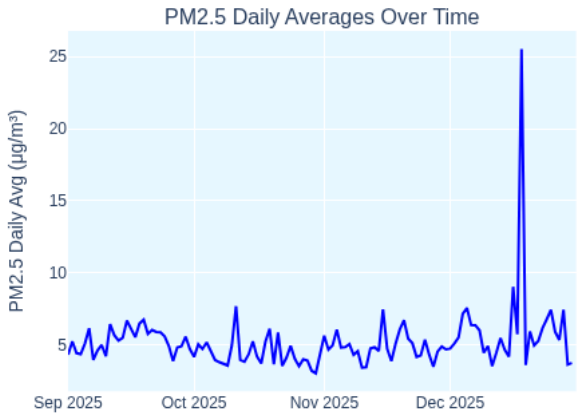


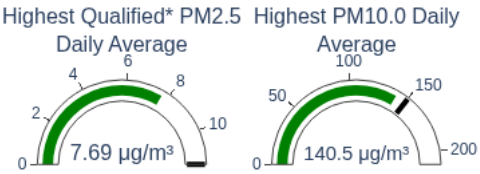


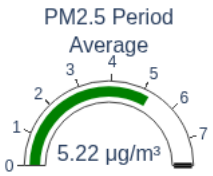


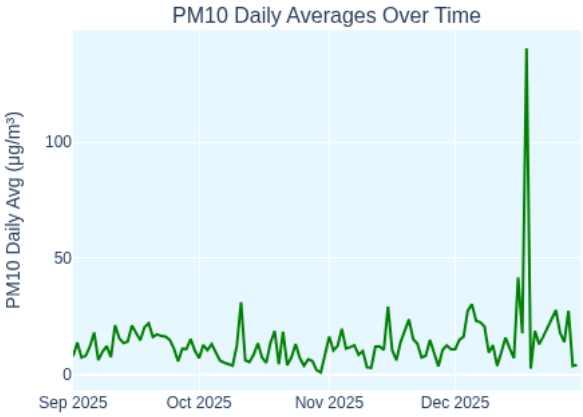
Days PM2.5 Exceeded	Days PM10.0 Exceeded
	2025-09-01
	2025-09-02
	2025-09-03
	2025-09-04
	2025-09-05
	2025-09-06
	2025-09-07
	2025-09-08
	2025-09-09
	2025-09-10
	2025-09-11
	2025-09-12

2025-09-01 to 2025-12-31 Report for Sensor 198281: AV-57, Buchanan_County, VA

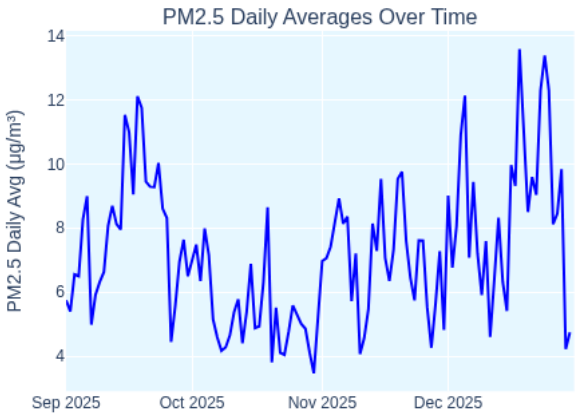


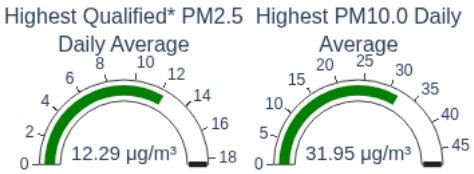


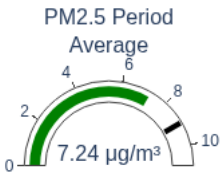


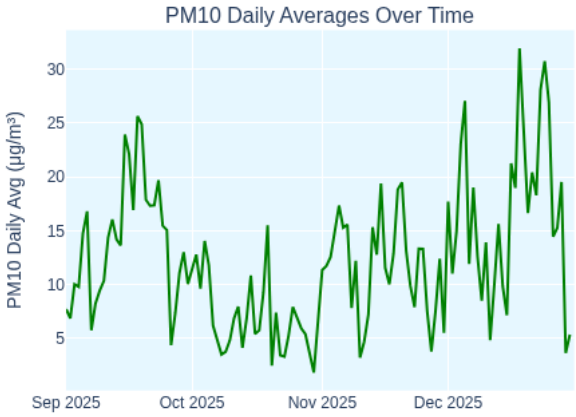


2025-09-01 to 2025-12-31 Report for Sensor 211973: AV-64, Buchanan_County, VA

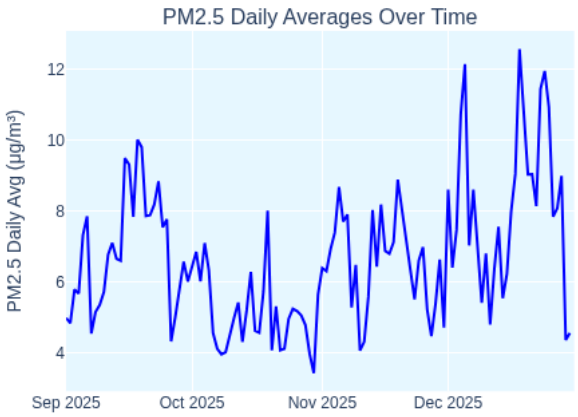


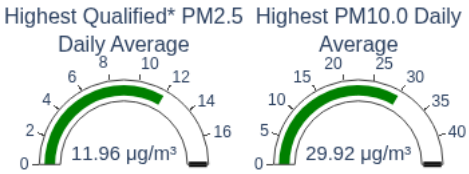


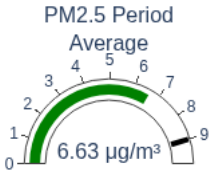


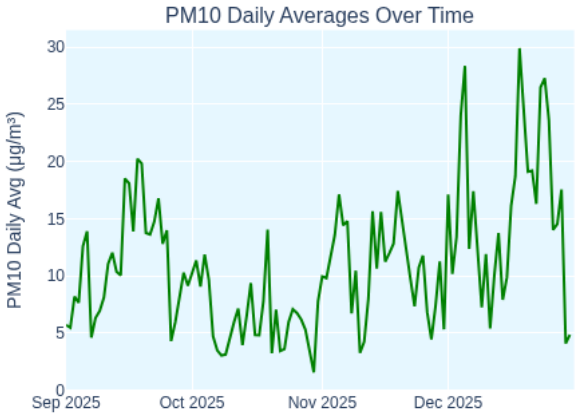


2025-09-01 to 2025-12-31 Report for Sensor 211937: AV-65, Buchanan_County, VA



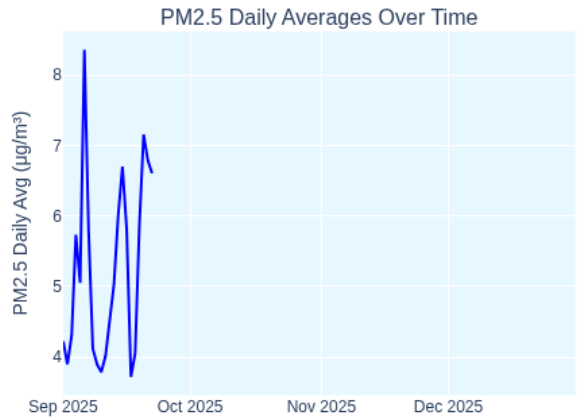


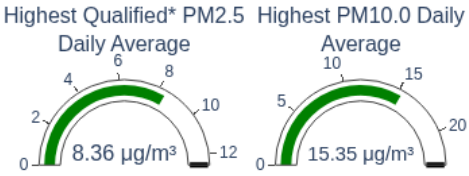


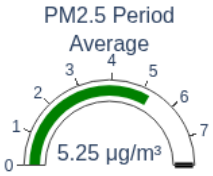


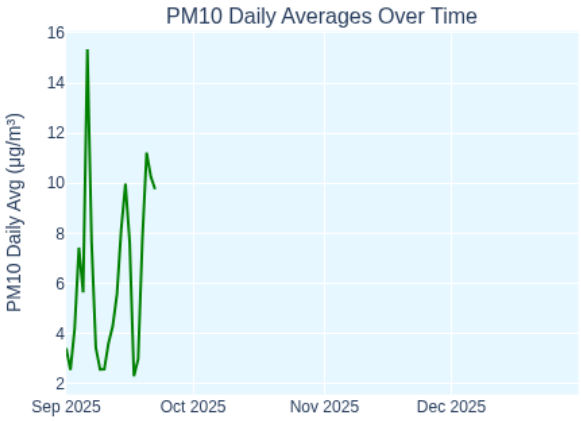
2025-09-01 to 2025-12-31 Report for Sensor 183737: AV-34, Buckingham_County, VA

Note: This report has been flagged as possibly returning insufficient data.

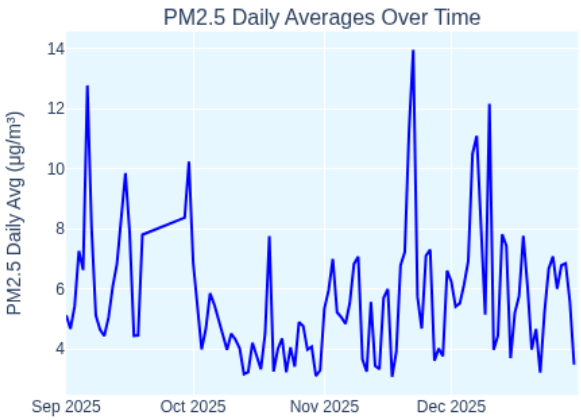


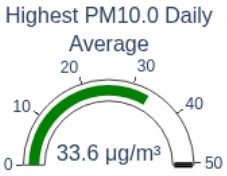


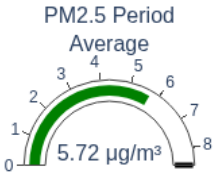


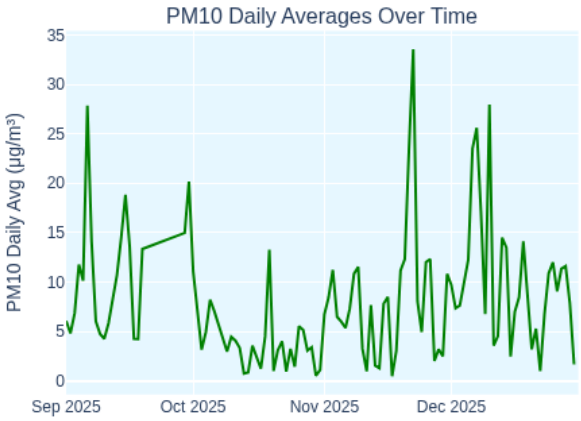


2025-09-01 to 2025-12-31 Report for Sensor 184523: AV-39, Buckingham_County, VA

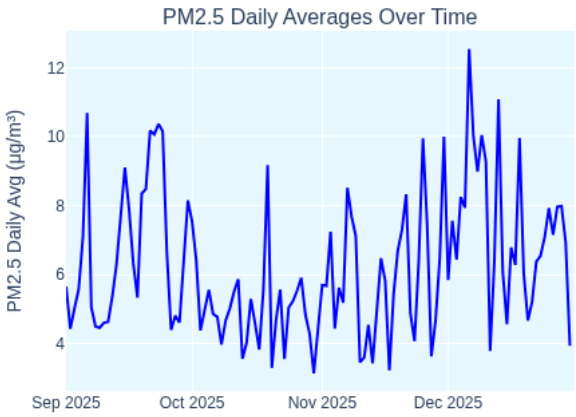


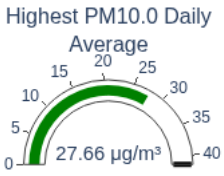


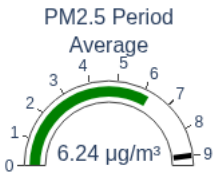


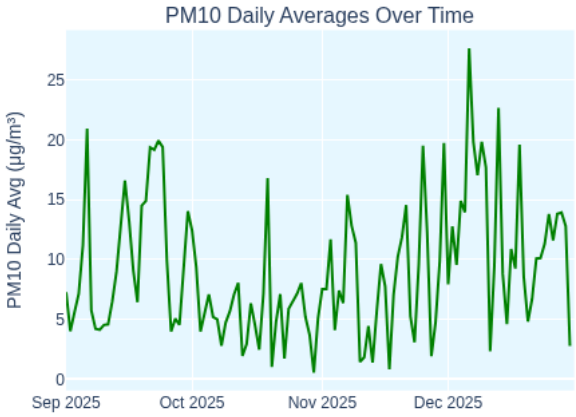


2025-09-01 to 2025-12-31 Report for Sensor 183743: AV-04, Montgomery_County, VA

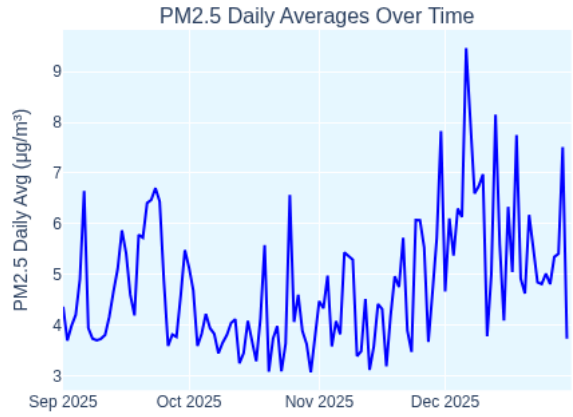


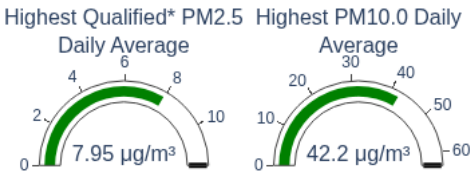


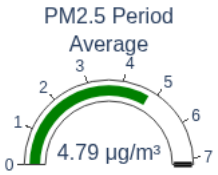


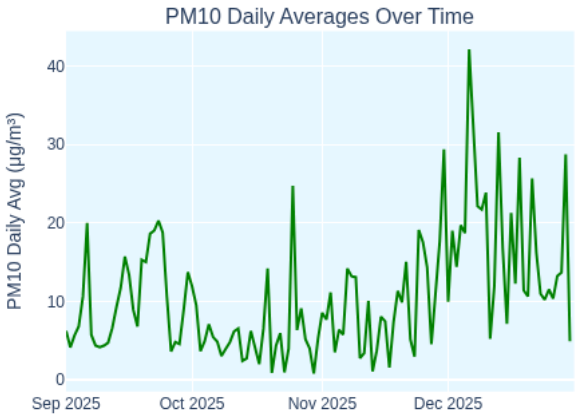


2025-09-01 to 2025-12-31 Report for Sensor 183813: AV-05, Montgomery_County, VA

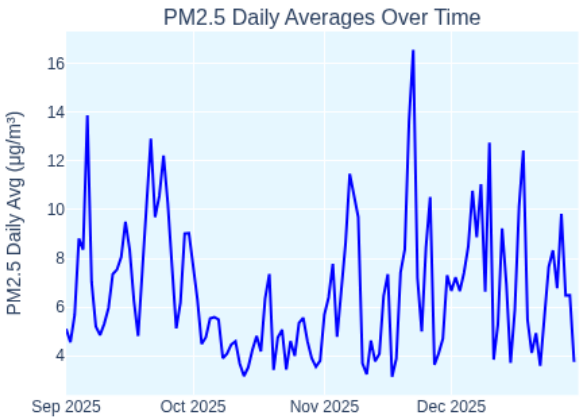


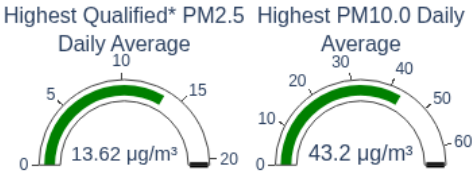


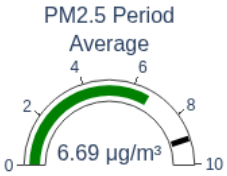


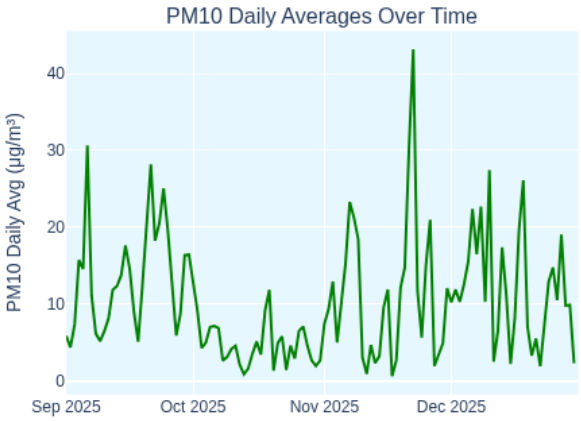


2025-09-01 to 2025-12-31 Report for Sensor 184519: AV-35, Pittsylvania_County, VA

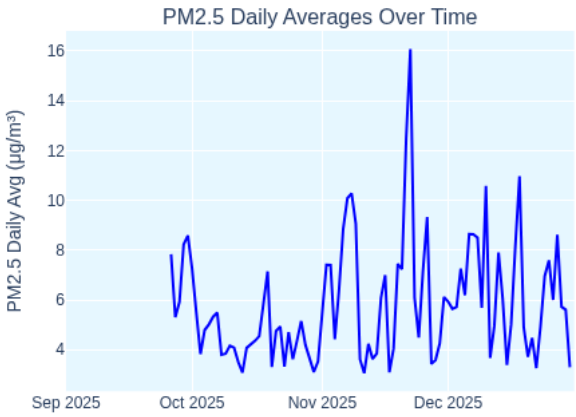


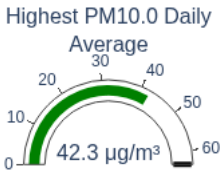


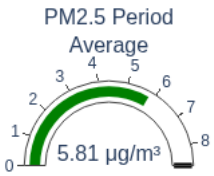


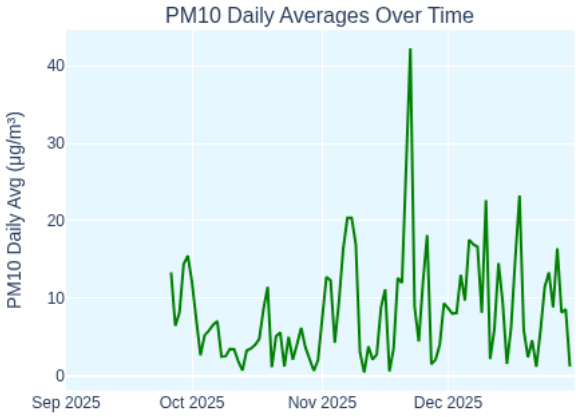


2025-09-01 to 2025-12-31 Report for Sensor 211949: AV-62, Pittsylvania_County, VA

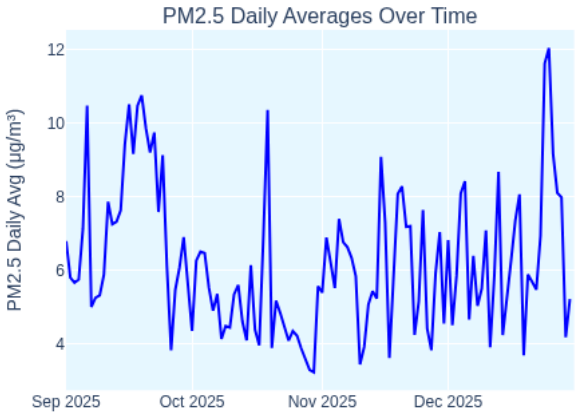


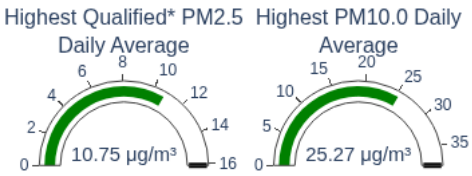


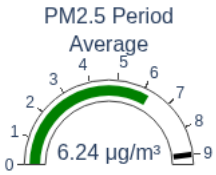


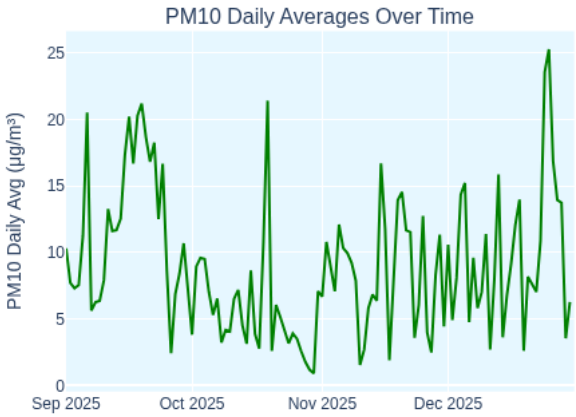


2025-09-01 to 2025-12-31 Report for Sensor 183749: AV-16, Wise_County, VA

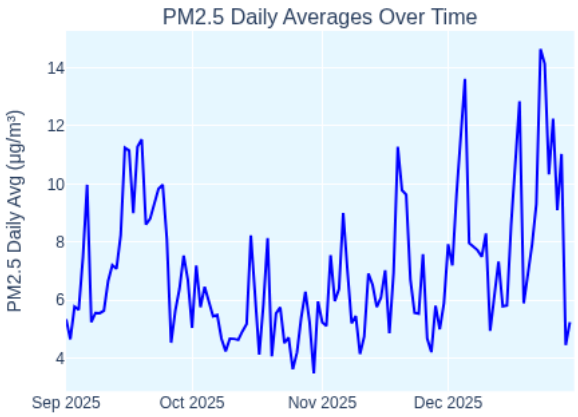


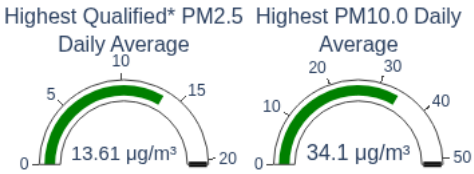


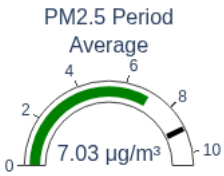


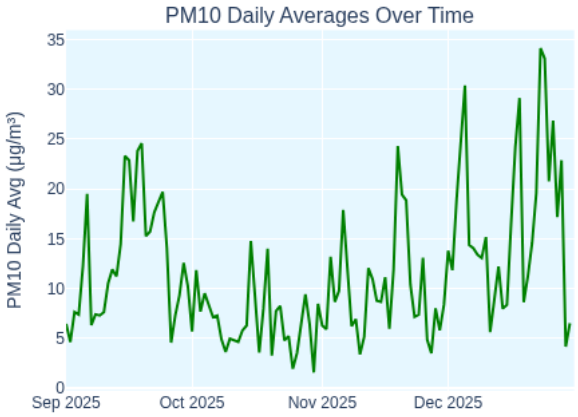


2025-09-01 to 2025-12-31 Report for Sensor 184559: AV-25, Wise_County, VA



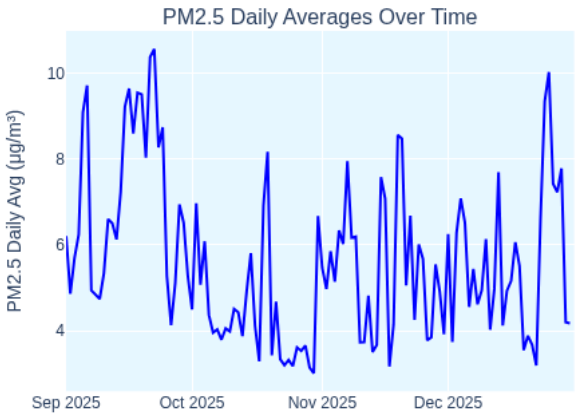


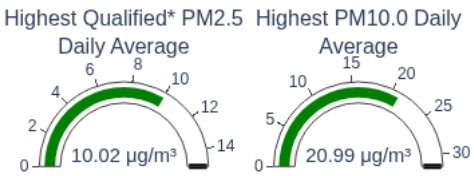


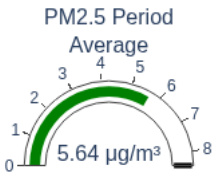


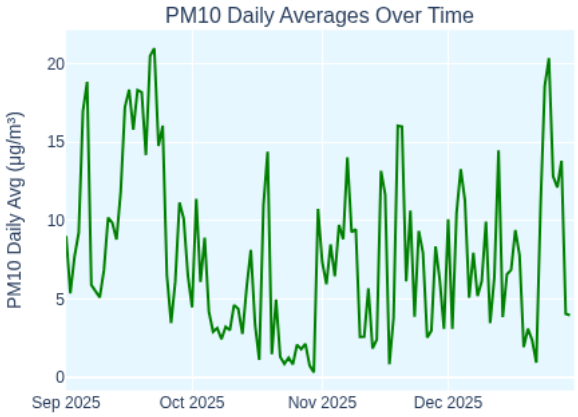
WEST VIRGINIA

2025-09-01 to 2025-12-31 Report for Sensor 199007: AV-52, Boone_County, WV

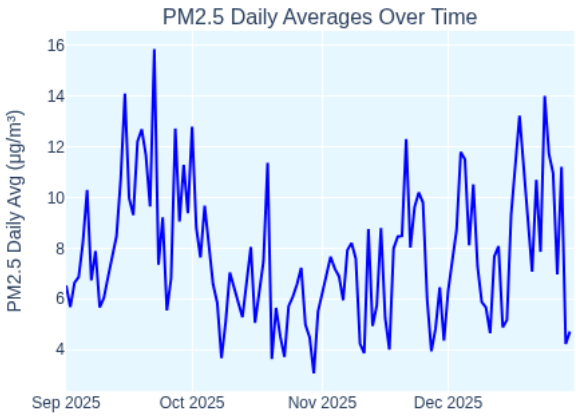


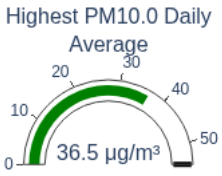


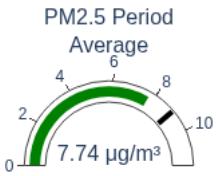


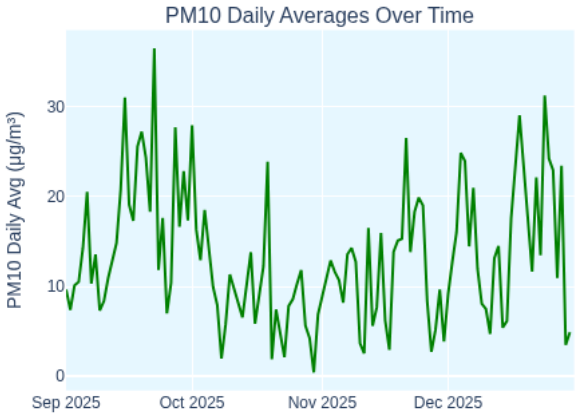


2025-09-01 to 2025-12-31 Report for Sensor 184513: AV-24, Kanawha_County, WV



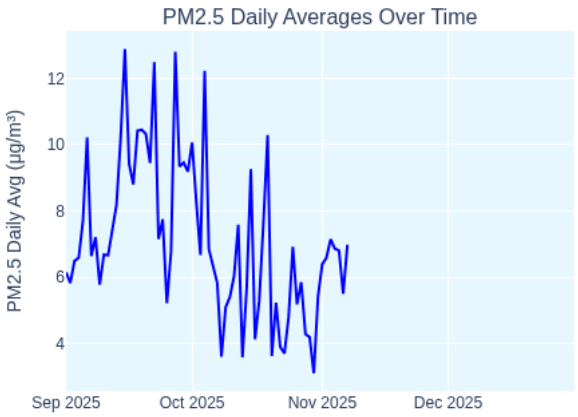


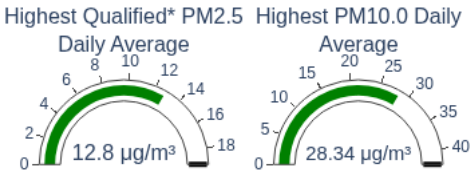


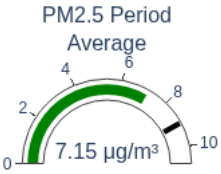


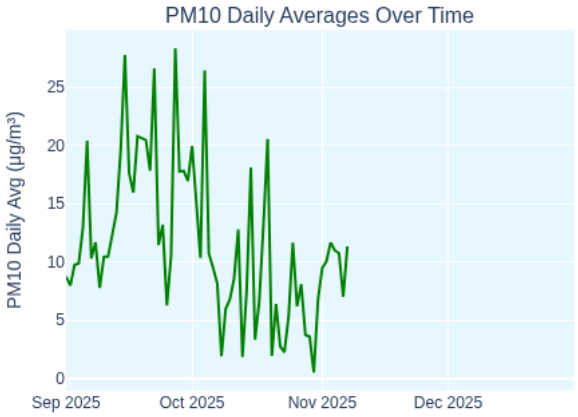
2025-09-01 to 2025-12-31 Report for Sensor 184515: AV-36, Kanawha_County, WV

Note: This report has been flagged as possibly returning insufficient data.

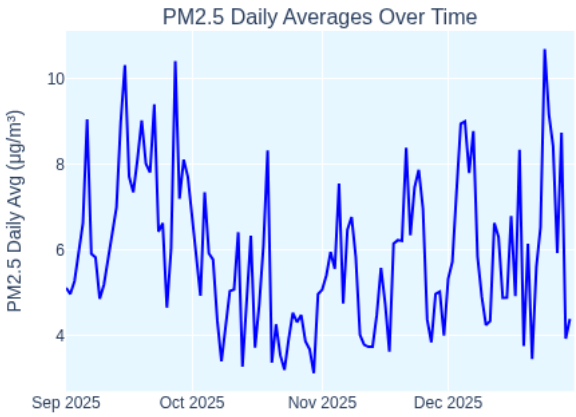


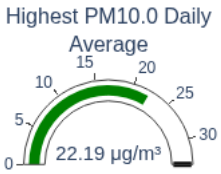


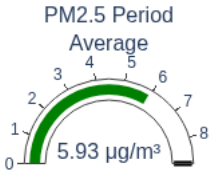


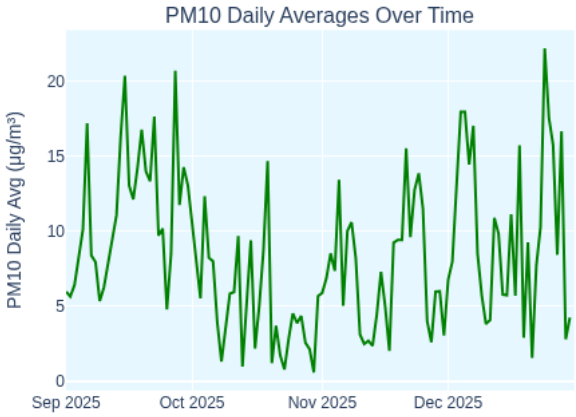


2025-09-01 to 2025-12-31 Report for Sensor 183793: AV-38, Kanawha_County, WV



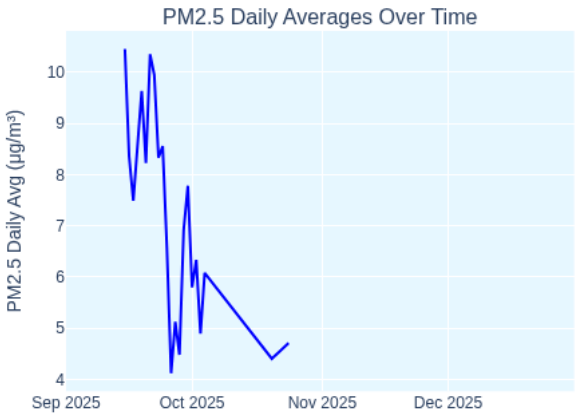


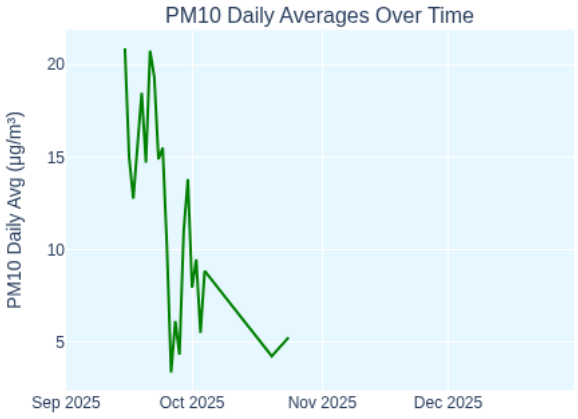


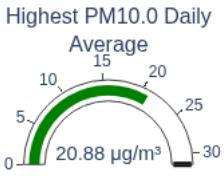


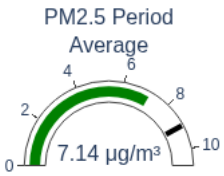
2025-09-01 to 2025-12-31 Report for Sensor 183807: AV-03, McDowell_County, WV

Note: This report has been flagged as possibly returning insufficient data.

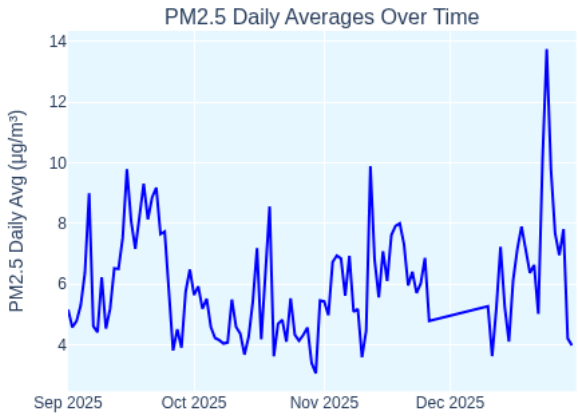


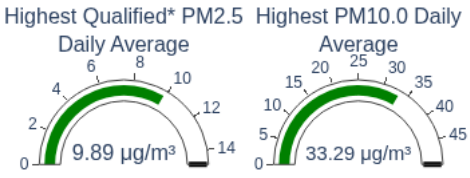


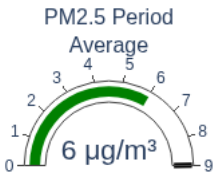


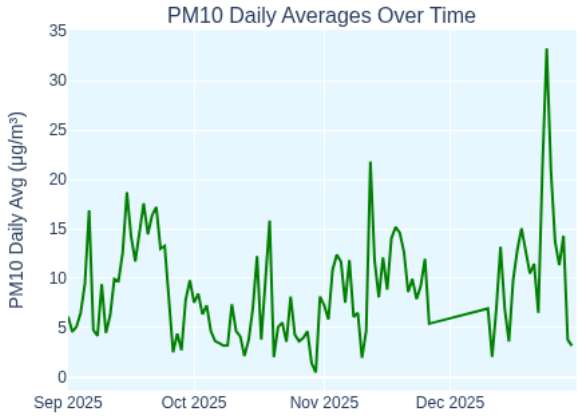


2025-09-01 to 2025-12-31 Report for Sensor 198997: AV-42, McDowell_County, WV

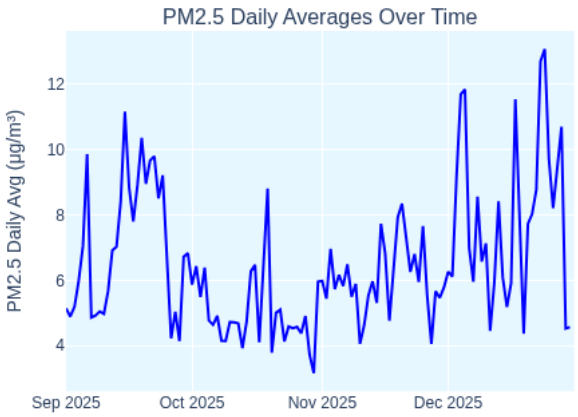


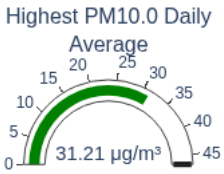


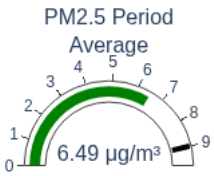


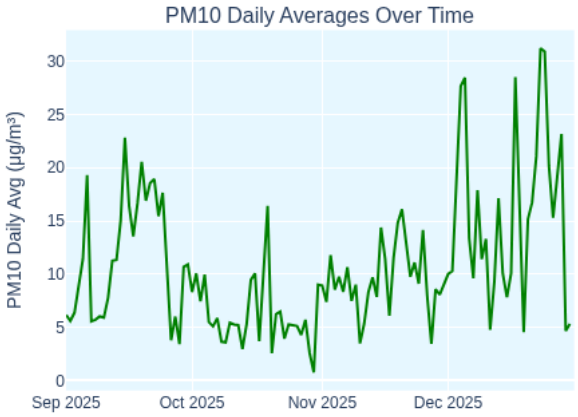


2025-09-01 to 2025-12-31 Report for Sensor 199027: AV-44, McDowell_County, WV

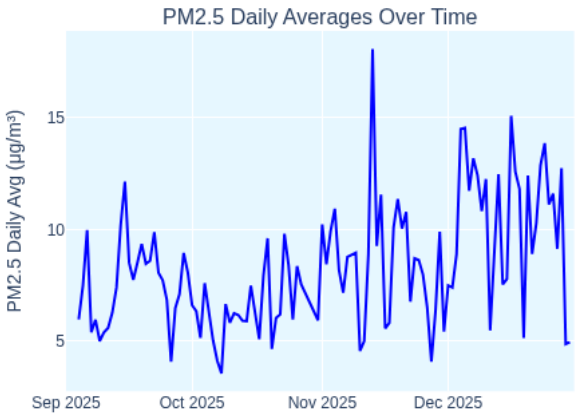


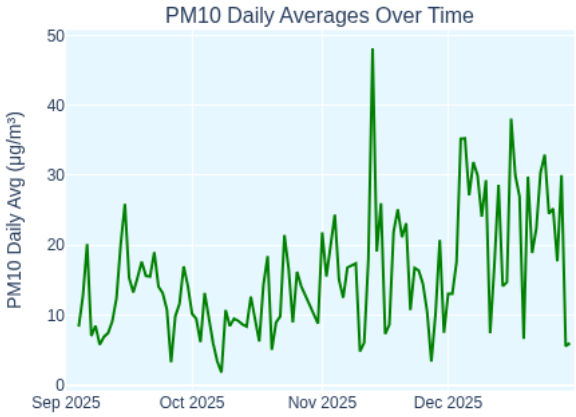


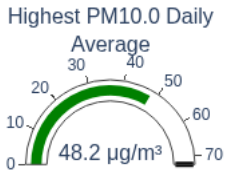


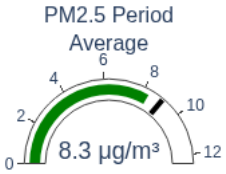


2025-09-01 to 2025-12-31 Report for Sensor 183769: AV-08, Raleigh_County, WV

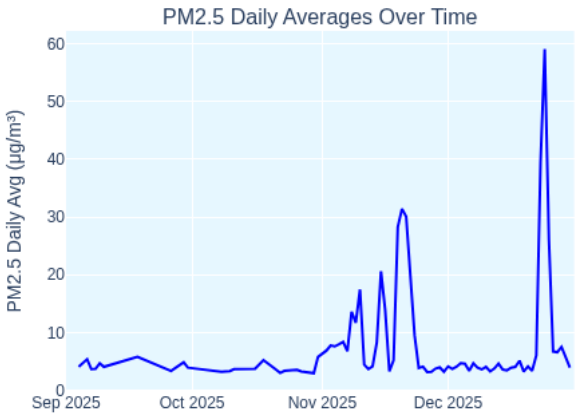


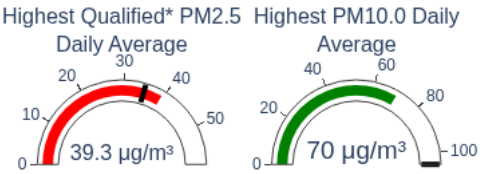


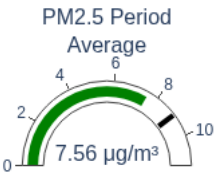


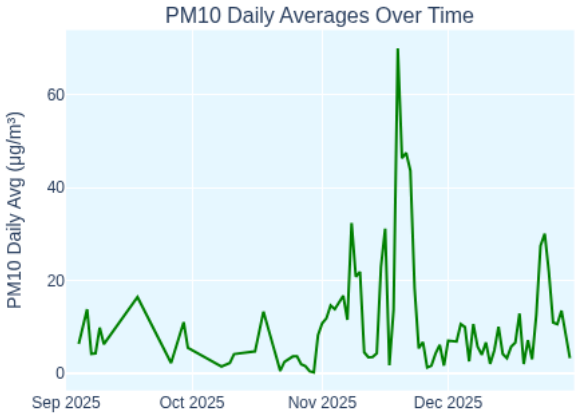


2025-09-01 to 2025-12-31 Report for Sensor 198477: AV-43, Raleigh County, WV





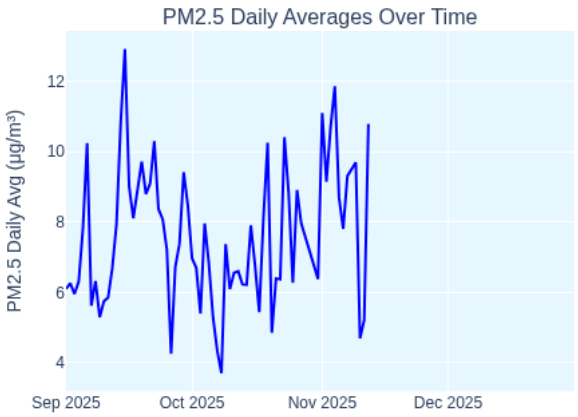


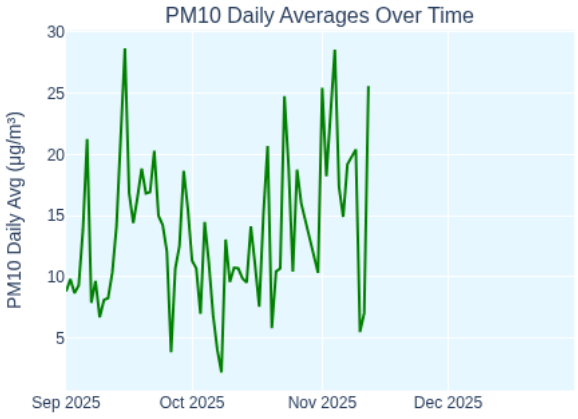


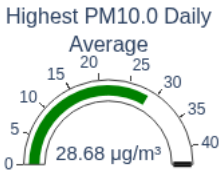
Days PM2.5 Exceeded	Days PM10.0 Exceeded
2025-12-23	
2025-12-24	

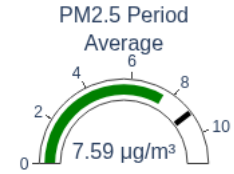
2025-09-01 to 2025-12-31 Report for Sensor 199037: AV-54, Raleigh_County, WV

Note: This report has been flagged as possibly returning insufficient data.

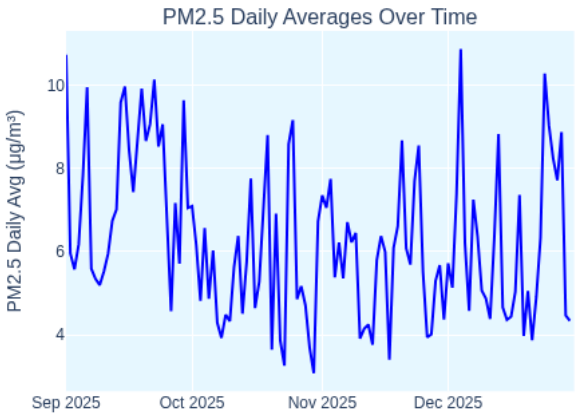


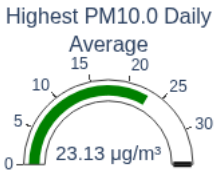


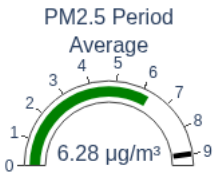


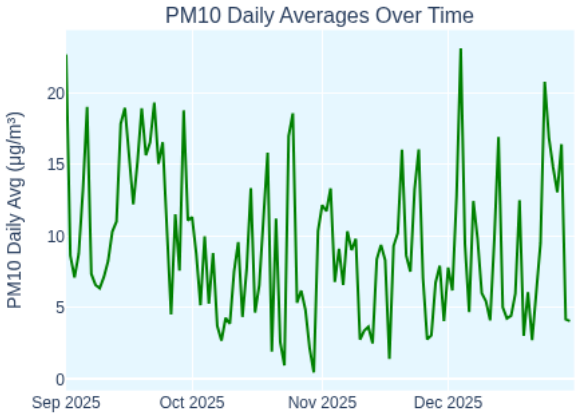


2025-09-01 to 2025-12-31 Report for Sensor 212029: AV-61, Raleigh_County, WV

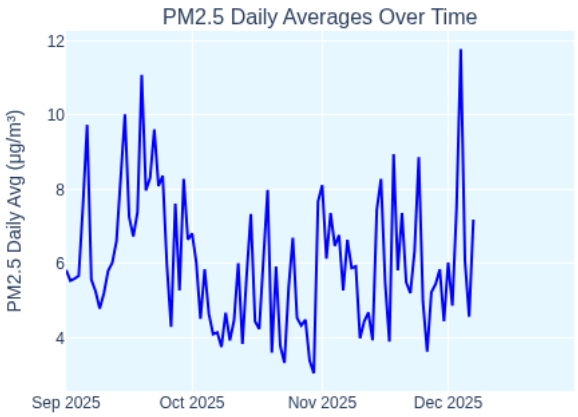


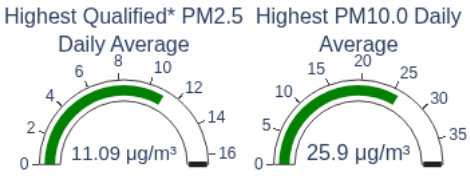


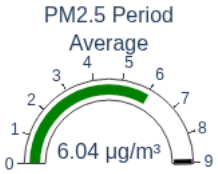


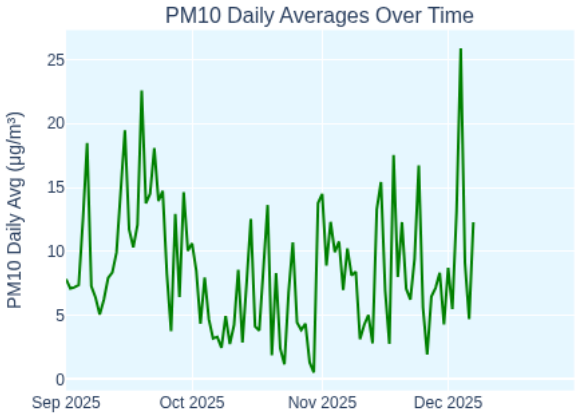


2025-09-01 to 2025-12-31 Report for Sensor 211969: AV-69, Raleigh County, WV









The following monitors are either offline or received insufficient data to include in this quarter's report:

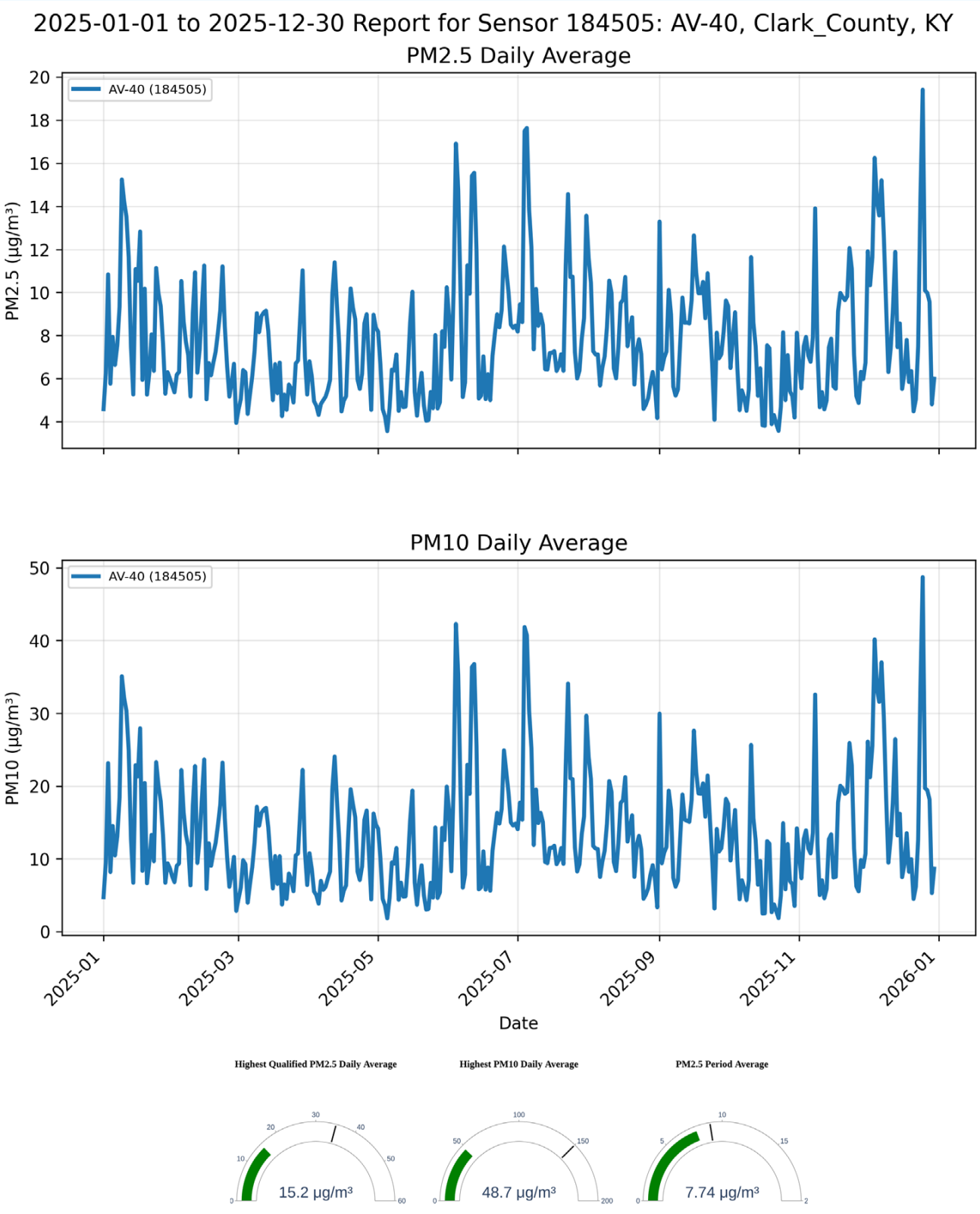
AV-01, sensor 183803 — Test monitor. No longer receiving data.
AV-02, sensor 183791 — Lee County, VA. Replaced.
AV-06, sensor 183739 — Raleigh County, WV.
AV-07, sensor 183755 — Naoma, Raleigh County, WV — No data. Removed.
AV-11, sensor 183781 — Lackawanna, PA — No data. Removed.
AV-13, sensor 183777 — Permanently removed.
AV-14, sensor 183773 — Kenton, KY.
AV-17, sensor 183799 — Wise County, VA — Insufficient data.
AV-18, sensor 183753 — Wise County VA — Removed. Replaced by AV-25.
AV-19, sensor 184351 — Wise County VA — No data.
AV-20, sensor 183741 — McDowell County, WV — No data. Removed.
AV-22, sensor 184511 — Clark County, KY.
AV-23, sensor 184345 — White Oak, Campbell County, TN — No data. Removed.
AV-27, sensor 184537 — Letcher County, KY.
AV-28
AV-31, sensor 184567 — Pittsylvania County, VA.
AV-32, sensor 184561 — Kanawha County, WV.
AV-33, sensor 184553
AV-37, sensor 183783 — Eagan, Claiborne County, TN.
AV-41, sensor 198821 — McDowell County, WV.
AV-45, sensor 198977 — Cocke County, TN.
AV-46, sensor 198999 — Norfolk, VA.
AV-47, sensor 196167 — Norfolk, VA.
AV-48 — Permanently removed.
AV-50, sensor 196153 — Grundy, TN
AV-51, sensor 198479 — Harlan County, KY.
AV-56, sensor 199033 — Raleigh County, WV. Removed. Replaced by AV-06.
AV-58
AV-63, sensor 212013 — Shelby County, TN.
AV-66, sensor 211961 — Buchanan County, VA. Permanently removed.
AV-67, sensor 301657 — VA
AV-68, sensor 211957 — Shelby_County, TN.
AV-70, sensor 211965 — Knott County, KY.

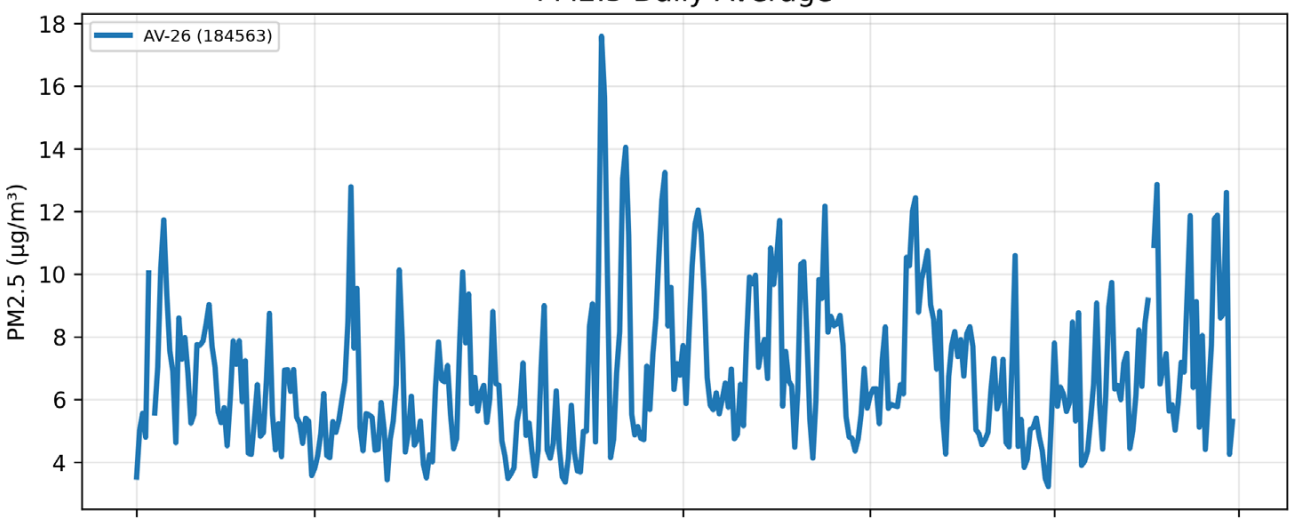
Appendix B

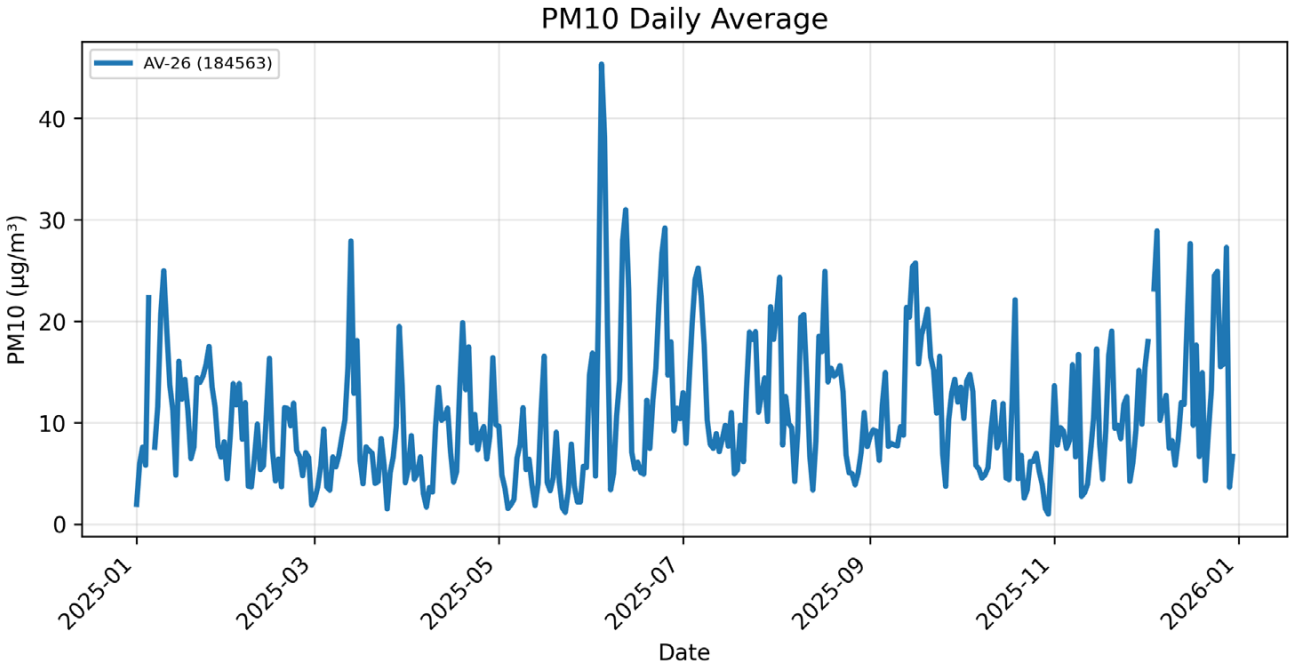
Annual PM2.5 and PM10 Summary

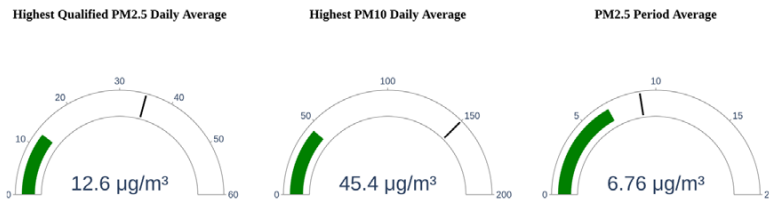
Note: In cases where data from a primary sensor was unavailable or incomplete, data from a co-located or nearby PurpleAir sensor of the same cross-validation group was substituted. Substituted data are clearly flagged in the dataset and included only when quality assurance criteria were met.

KENTUCKY


2025-01-01 to 2025-12-30 Report for Sensor 184505: AV-40, Clark_County, KY
PM2.5 Daily Average
AV-40 (184505)
PM2.5 (µg/m³)
PM10 Daily Average
AV-40 (184505)
PM10 (µg/m³)
2025-01
2025-03
2025-05
2025-07
2025-09
2025-11
2026-01
Date
Highest Qualified PM2.5 Daily Average
15.2 µg/m³
Highest PM10 Daily Average
48.7 µg/m³
PM2.5 Period Average
7.74 µg/m³


2025-01-01 to 2025-12-30 Report for Sensor 184563: AV-26, Floyd_County, KY
PM2.5 Daily Average
AV-26 (184563)
PM2.5 (µg/m³)
18
16
14
12
10
8
6
4

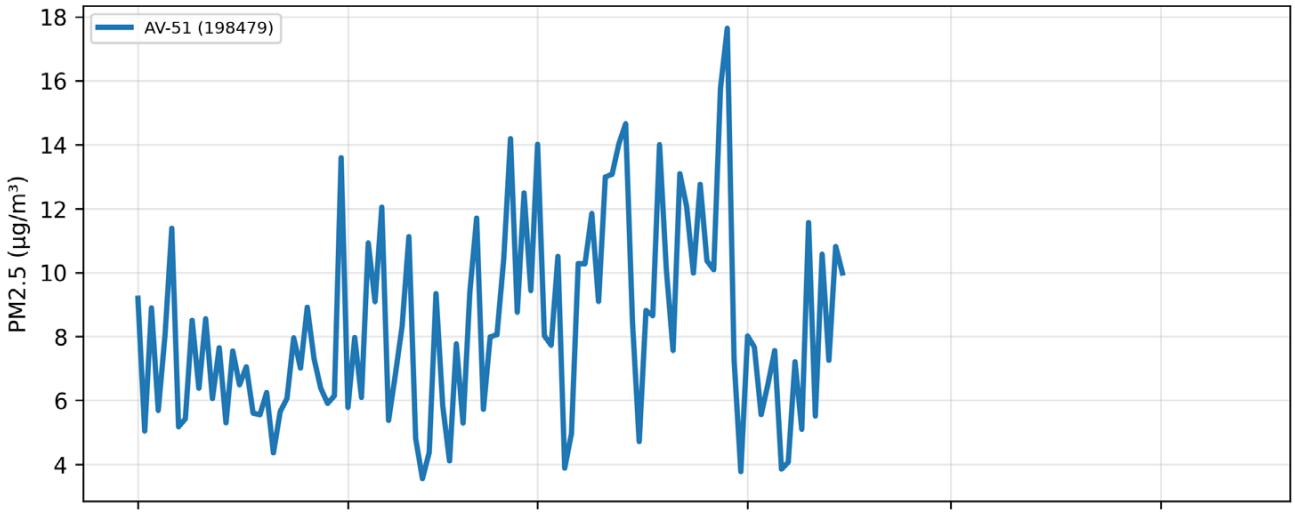

PM10 Daily Average
AV-26 (184563)
PM10 (µg/m³)
40
30
20
10
0
2025-01
2025-03
2025-05
2025-07
2025-09
2025-11
2026-01
Date


Highest Qualified PM2.5 Daily Average
12.6 µg/m³
Highest PM10 Daily Average
45.4 µg/m³
PM2.5 Period Average
6.76 µg/m³

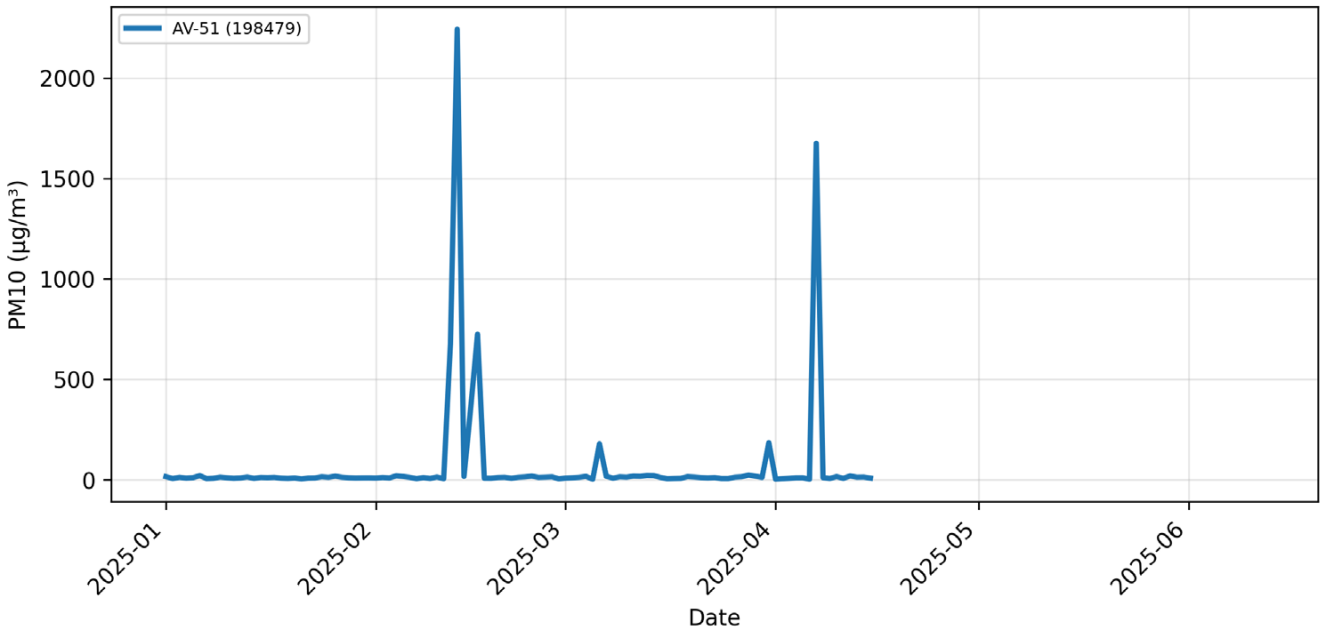
Note: This report has been flagged as possibly returning insufficient data.

2025-01-01 to 2025-12-30 Report for Sensor 198479: AV-51, Harlan_County, KY

PM2.5 Daily Average



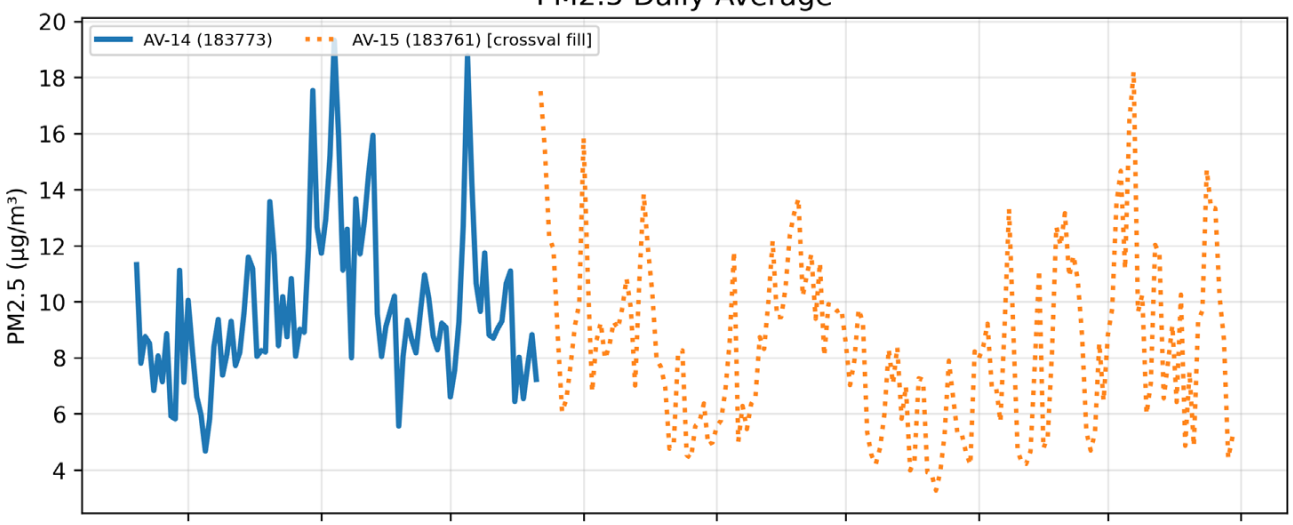
PM10 Daily Average

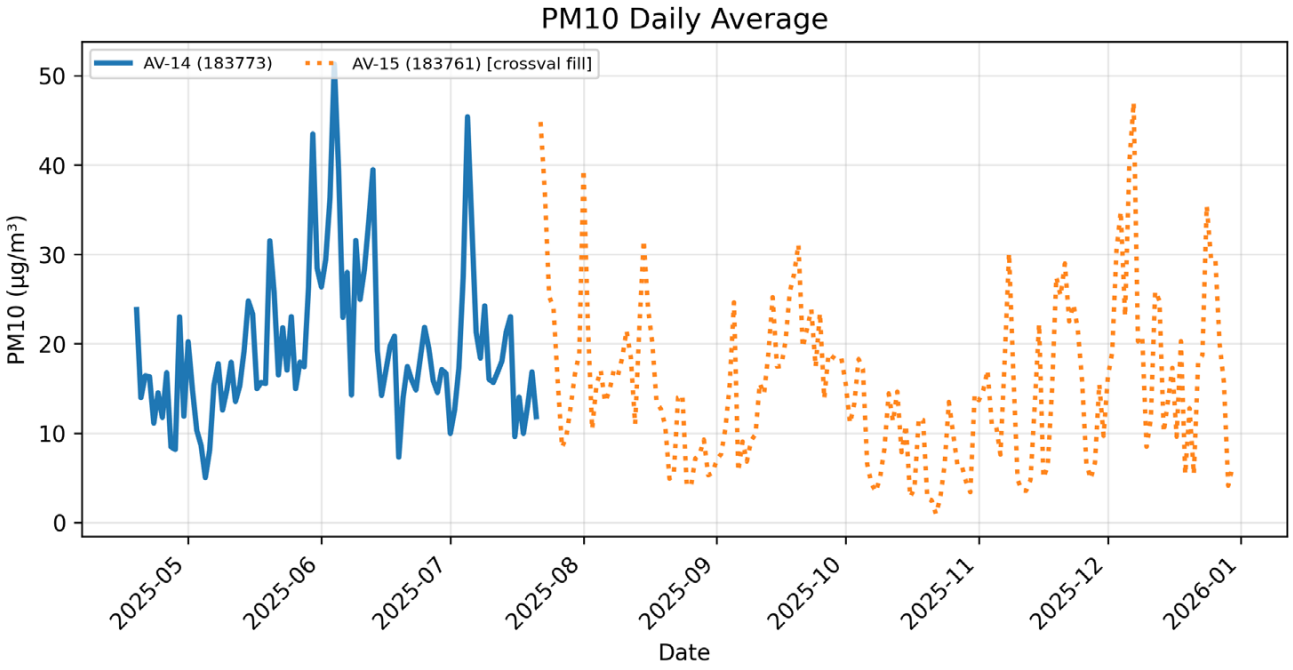


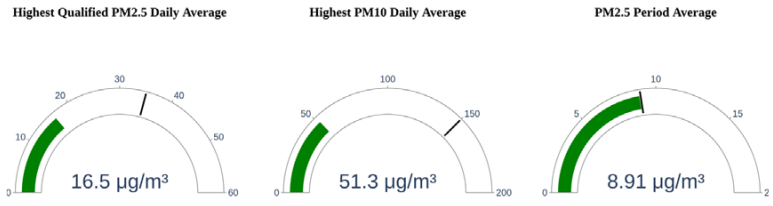
Highest Qualified PM2.5 Daily Average

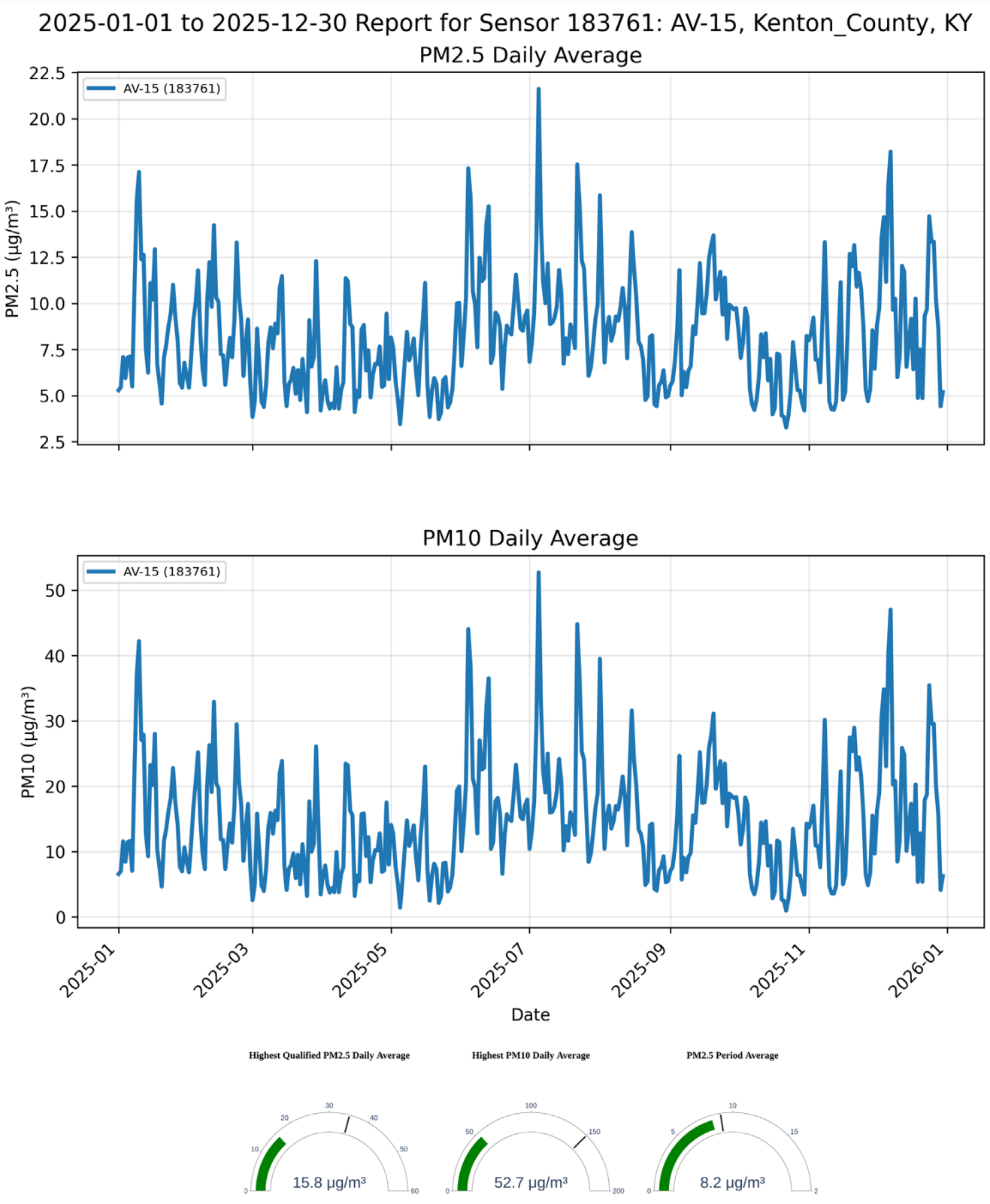
Highest PM10 Daily Average

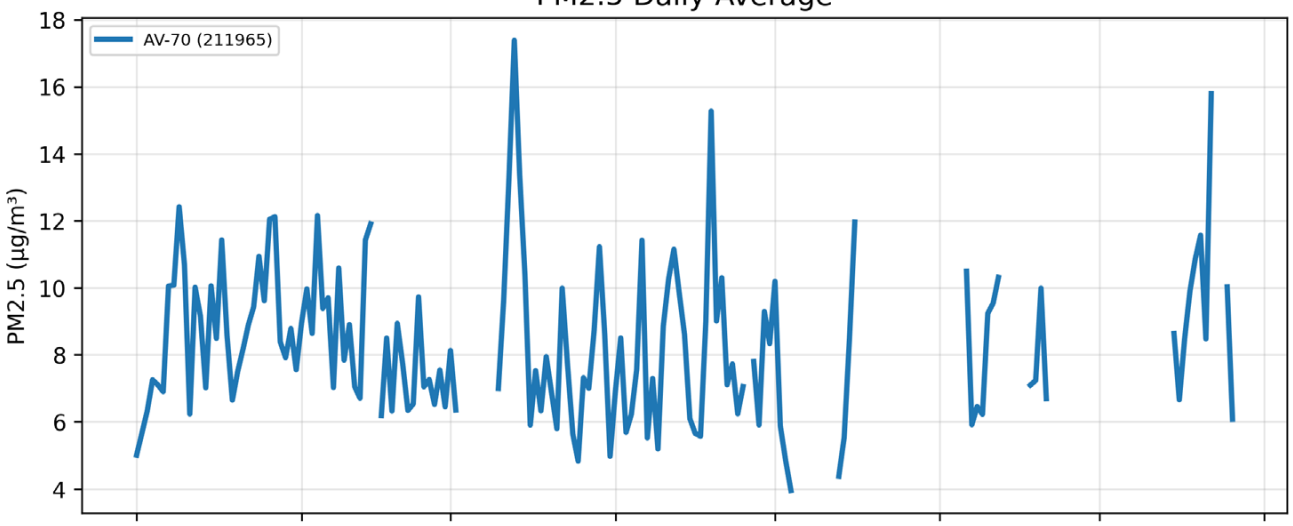
PM2.5 Period Average

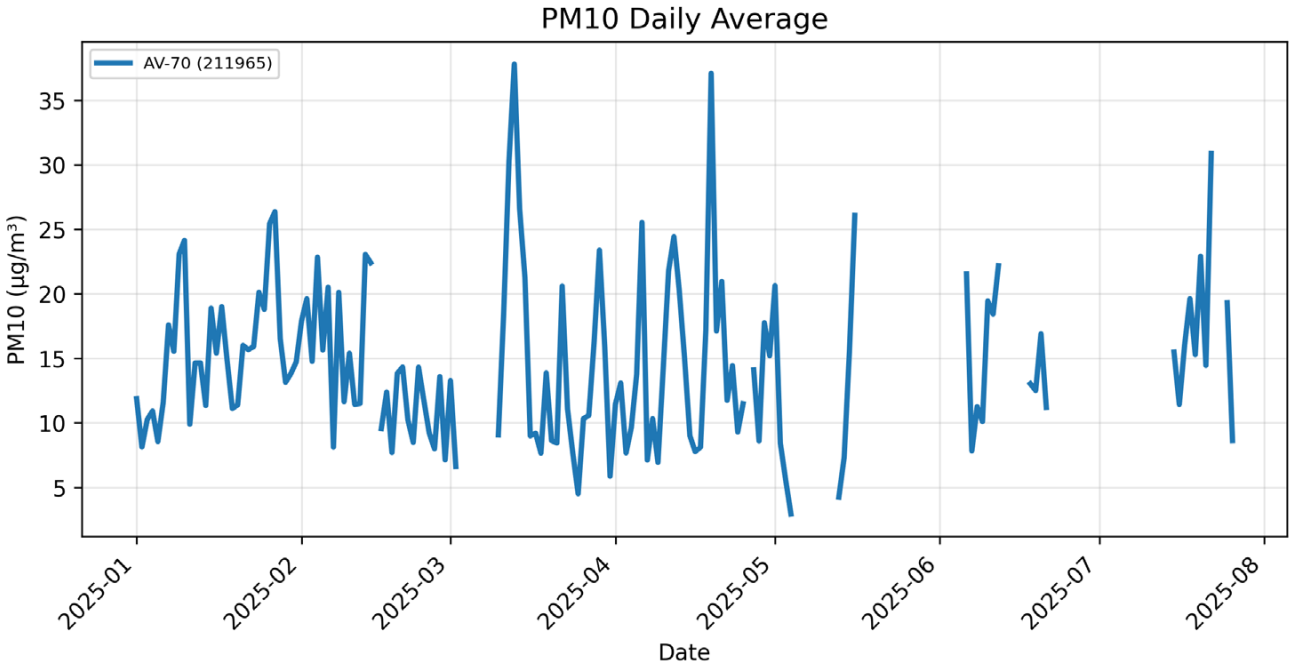

2025-01-01 to 2025-12-30 Report for Sensor 183773: AV-14, Kenton_County, KY
PM2.5 Daily Average
AV-14 (183773)
AV-15 (183761) [crossval fill]
PM2.5 (µg/m³)
20
18
16
14
12
10
8
6
4

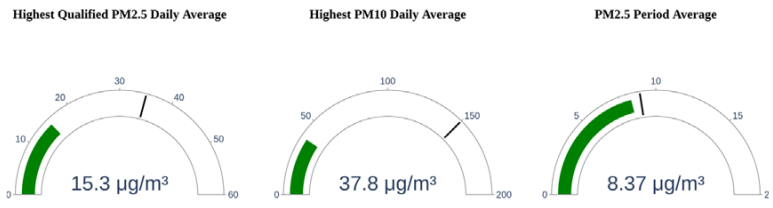

PM10 Daily Average
AV-14 (183773)
AV-15 (183761) [crossval fill]
PM10 (µg/m³)
50
40
30
20
10
0
2025-05
2025-06
2025-07
2025-08
2025-09
2025-10
2025-11
2025-12
2026-01
Date


Highest Qualified PM2.5 Daily Average
16.5 µg/m³
Highest PM10 Daily Average
51.3 µg/m³
PM2.5 Period Average
8.91 µg/m³

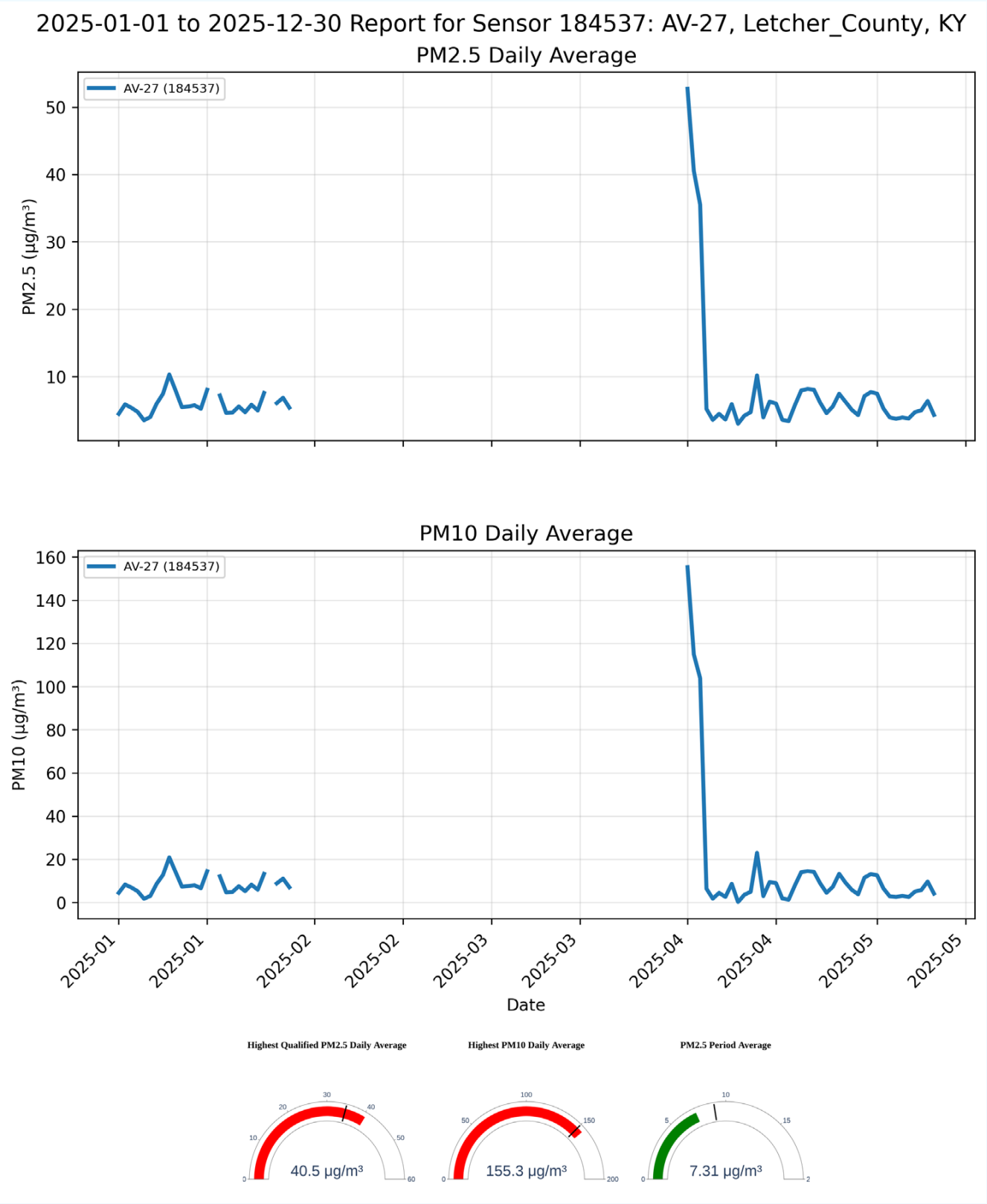

2025-01-01 to 2025-12-30 Report for Sensor 183761: AV-15, Kenton_County, KY
PM2.5 Daily Average
AV-15 (183761)
PM2.5 (µg/m³)
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
PM10 Daily Average
AV-15 (183761)
PM10 (µg/m³)
50
40
30
20
10
0
2025-01
2025-03
2025-05
2025-07
2025-09
2025-11
2026-01
Date
Highest Qualified PM2.5 Daily Average
15.8 µg/m³
Highest PM10 Daily Average
52.7 µg/m³
PM2.5 Period Average
8.2 µg/m³


2025-01-01 to 2025-12-30 Report for Sensor 211965: AV-70, Knott_County, KY
PM2.5 Daily Average
AV-70 (211965)
PM2.5 (µg/m³)
18
16
14
12
10
8
6
4

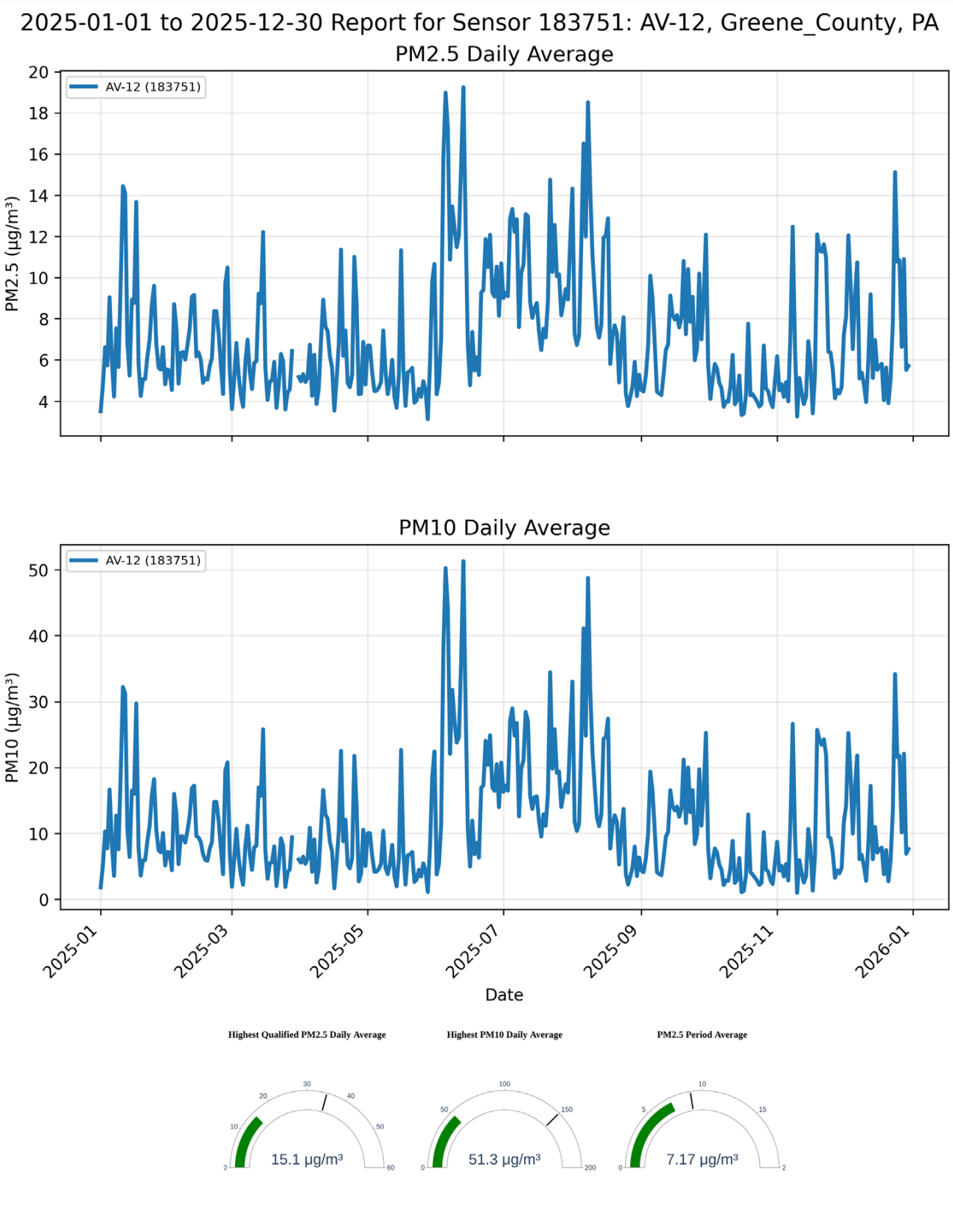

PM10 Daily Average
AV-70 (211965)
PM10 (µg/m³)
35
30
25
20
15
10
5
2025-01
2025-02
2025-03
2025-04
2025-05
2025-06
2025-07
2025-08
Date


Highest Qualified PM2.5 Daily Average
15.3 µg/m³
Highest PM10 Daily Average
37.8 µg/m³
PM2.5 Period Average
8.37 µg/m³

Note: This report has been flagged as possibly returning insufficient data.

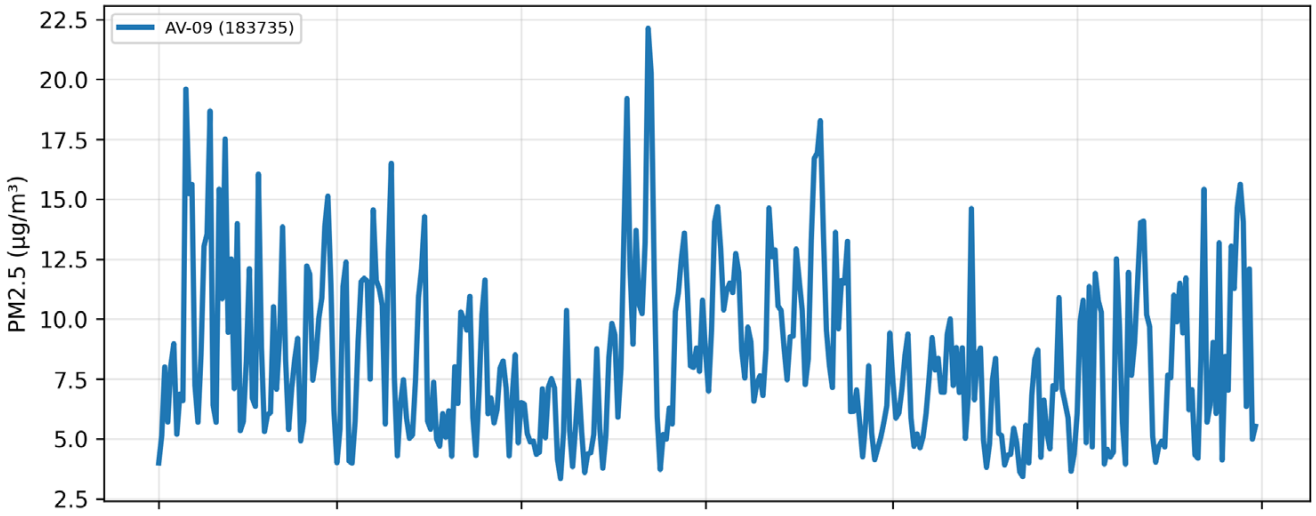


PENNSYLVANIA

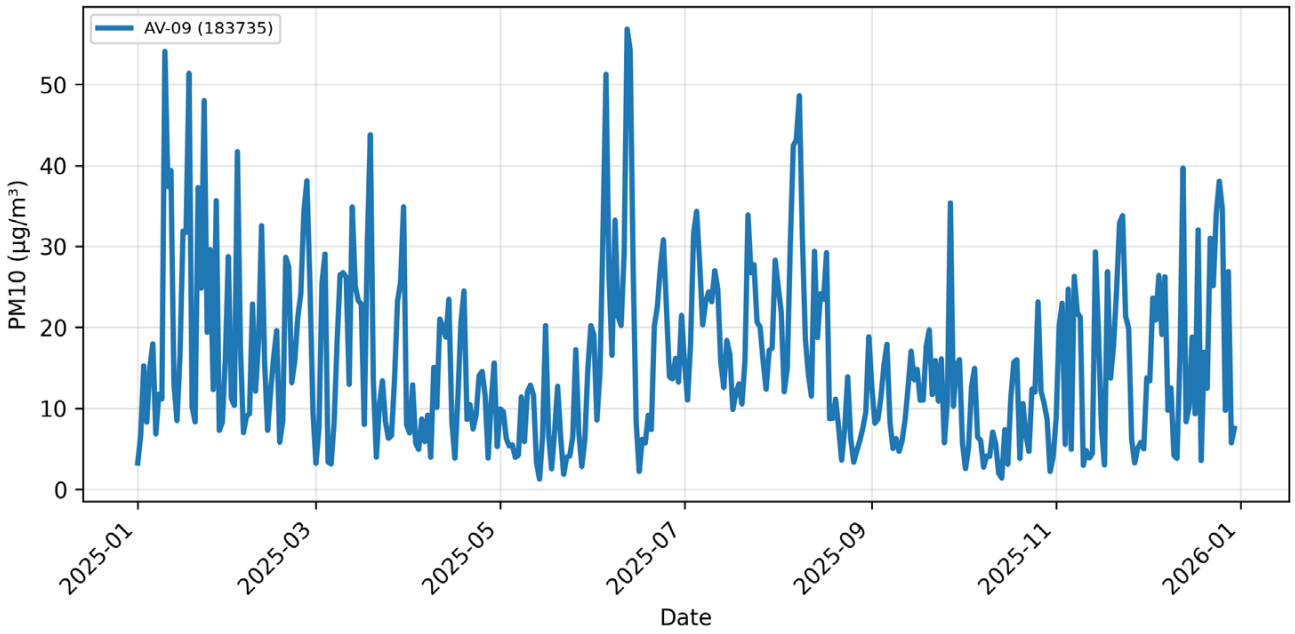

2025-01-01 to 2025-12-30 Report for Sensor 183751: AV-12, Greene_County, PA
PM2.5 Daily Average
AV-12 (183751)
PM2.5 (µg/m³)
PM10 Daily Average
AV-12 (183751)
PM10 (µg/m³)
2025-01
2025-03
2025-05
2025-07
2025-09
2025-11
2026-01
Date
Highest Qualified PM2.5 Daily Average
15.1 µg/m³
Highest PM10 Daily Average
51.3 µg/m³
PM2.5 Period Average
7.17 µg/m³

2025-01-01 to 2025-12-30 Report for Sensor 183735: AV-09, Westmoreland_County, PA

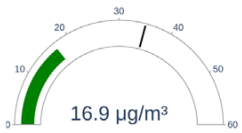
PM2.5 Daily Average



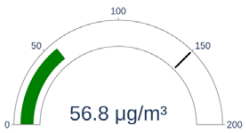
PM10 Daily Average



Highest Qualified PM2.5 Daily Average



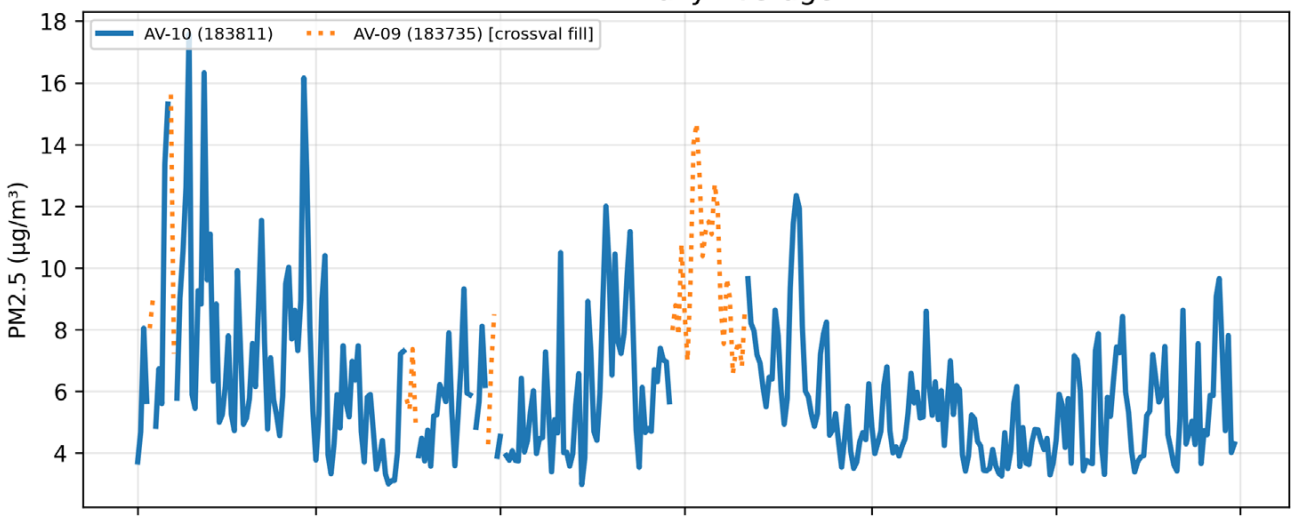
Highest PM10 Daily Average



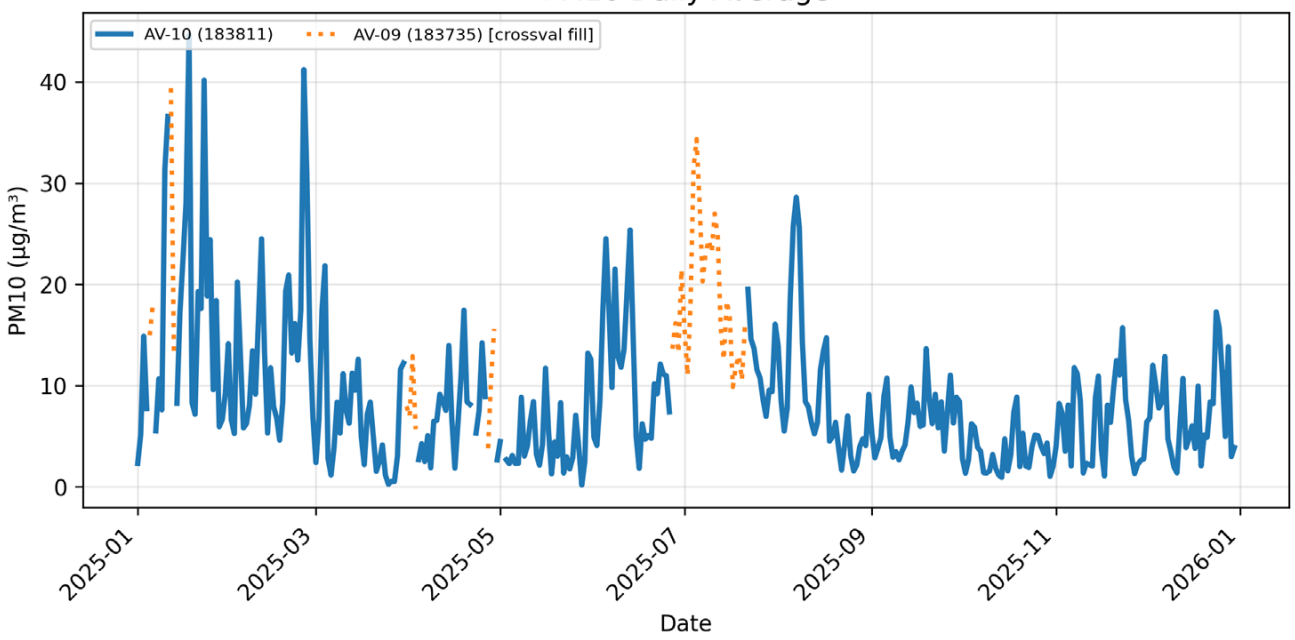
PM2.5 Period Average

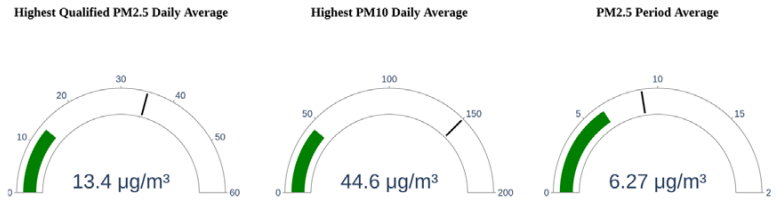
2025-01-01 to 2025-12-30 Report for Sensor 183811: AV-10, Westmoreland_County, PA

PM2.5 Daily Average

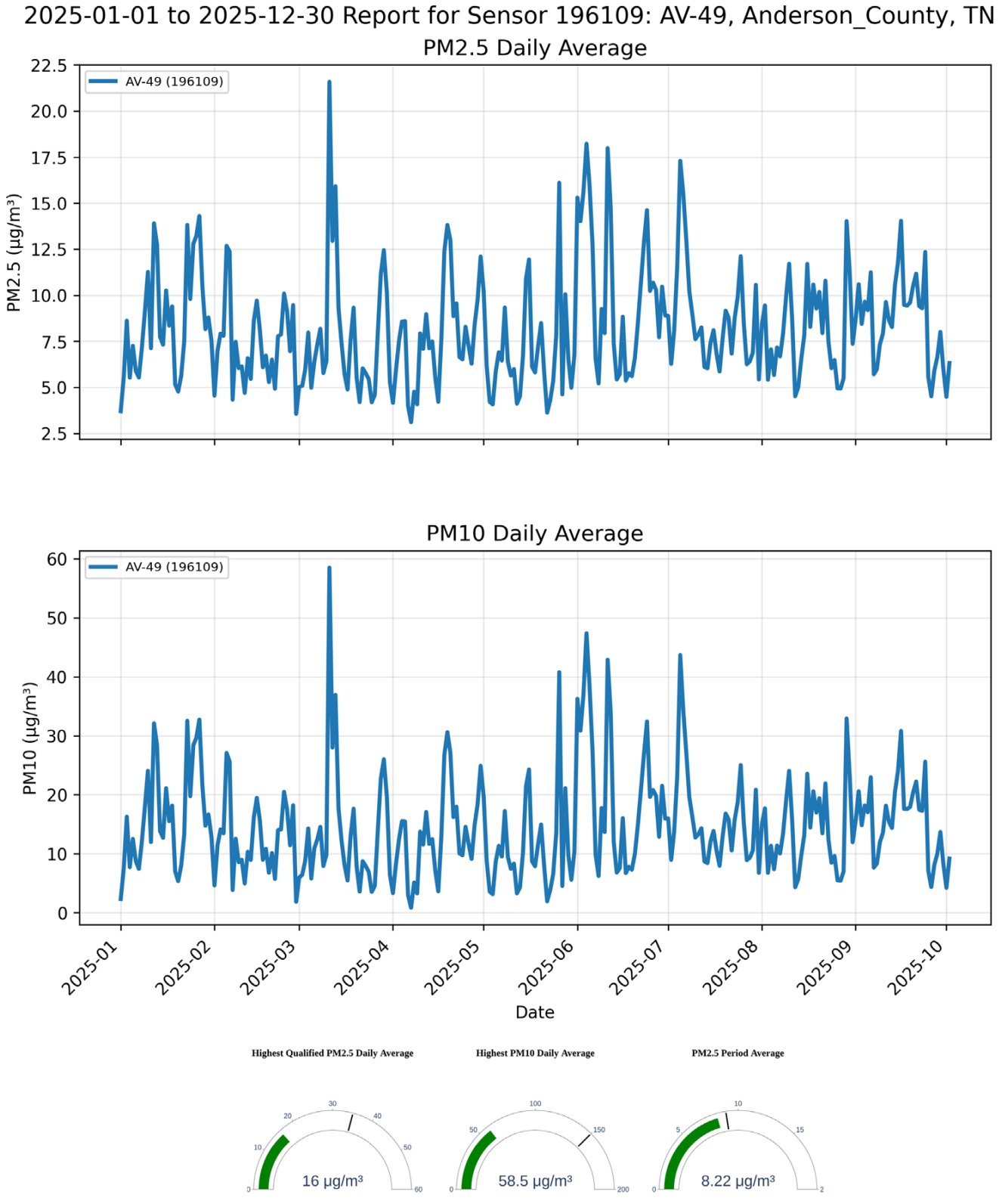


PM10 Daily Average



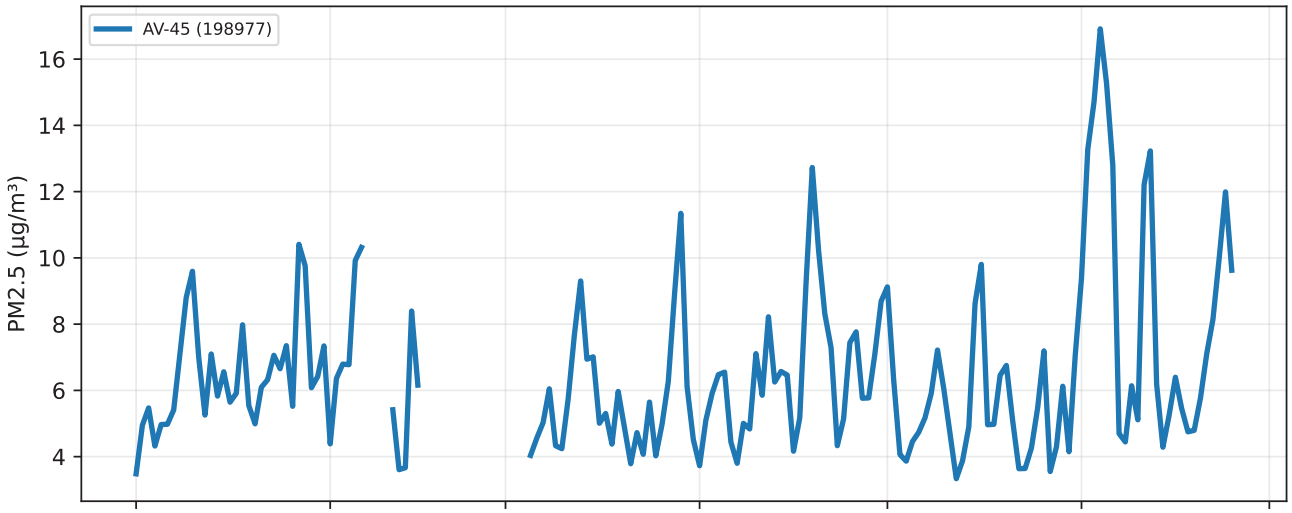


TENNESSEE

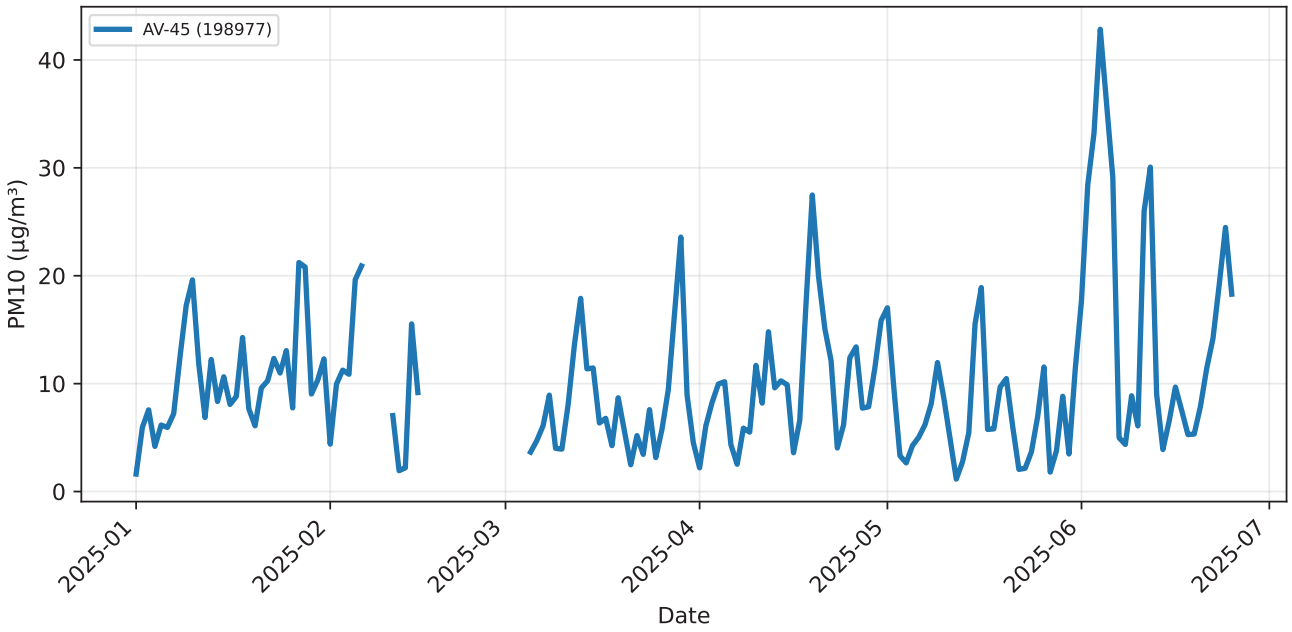

2025-01-01 to 2025-12-30 Report for Sensor 196109: AV-49, Anderson_County, TN
PM2.5 Daily Average
AV-49 (196109)
PM2.5 (µg/m³)
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
PM10 Daily Average
AV-49 (196109)
PM10 (µg/m³)
60
50
40
30
20
10
0
2025-01
2025-02
2025-03
2025-04
2025-05
2025-06
2025-07
2025-08
2025-09
2025-10
Date
Highest Qualified PM2.5 Daily Average
16 µg/m³
Highest PM10 Daily Average
58.5 µg/m³
PM2.5 Period Average
8.22 µg/m³

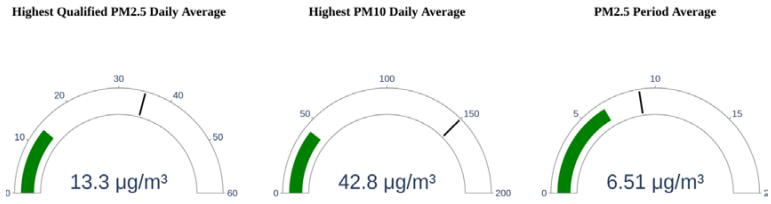
2025-01-01 to 2025-12-30 Report for Sensor 198977: AV-45, Cocke County, TN

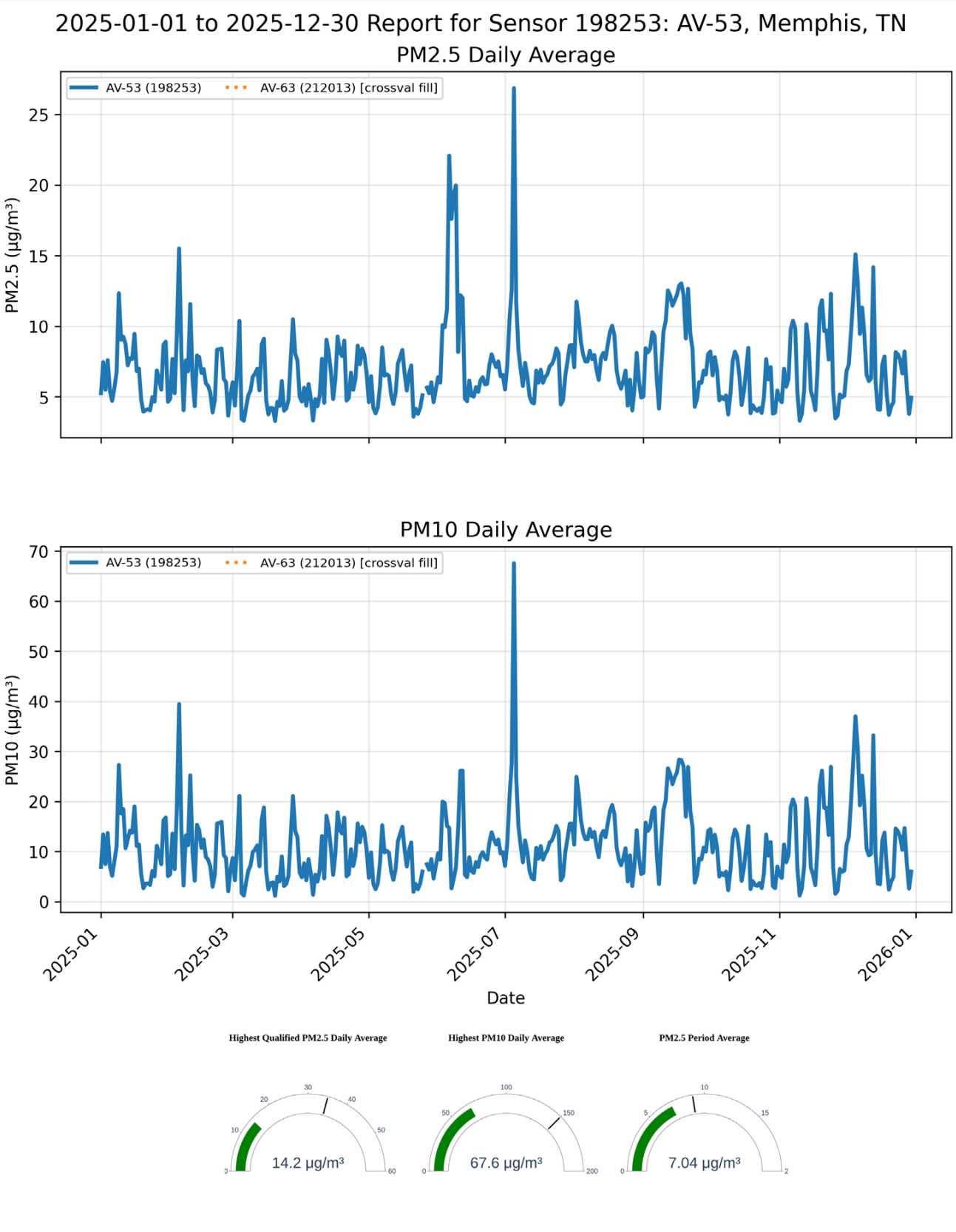
PM2.5 Daily Average



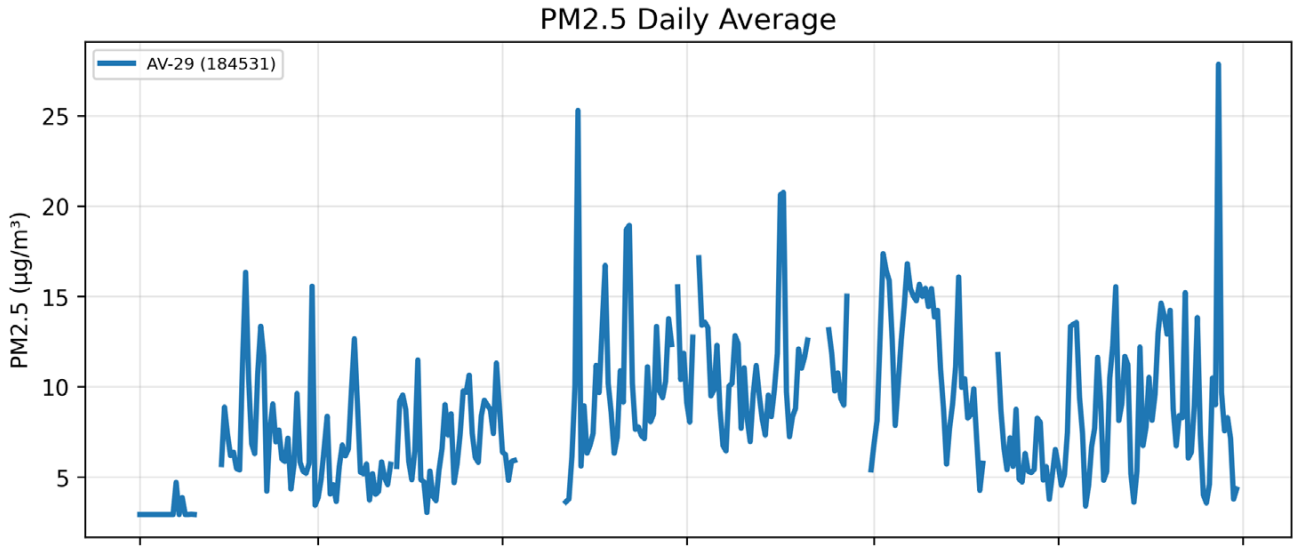
PM10 Daily Average

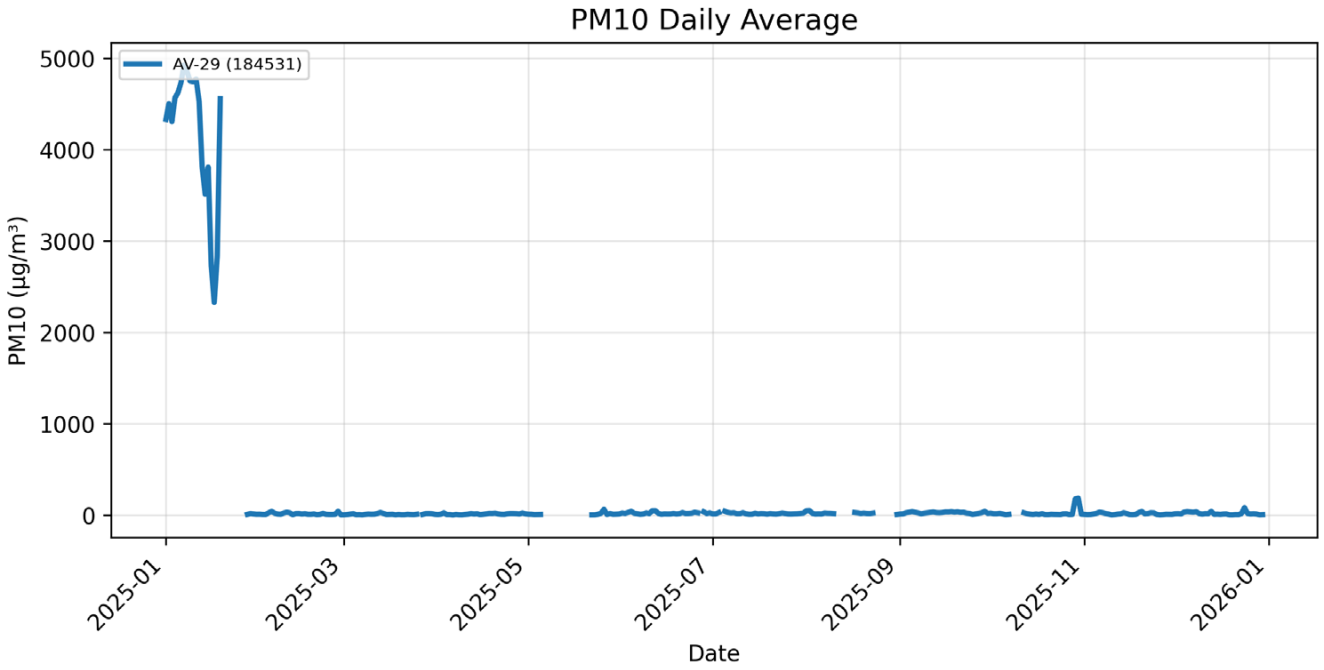


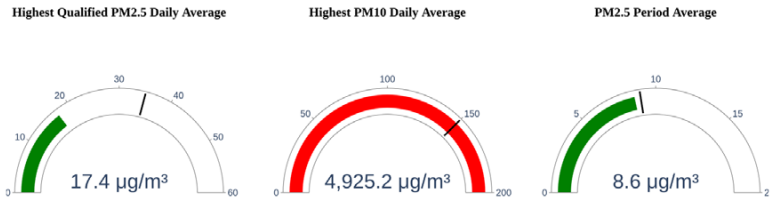



2025-01-01 to 2025-12-30 Report for Sensor 198253: AV-53, Memphis, TN
PM2.5 Daily Average
AV-53 (198253)
AV-63 (212013) [crossval fill]
PM2.5 (µg/m³)
PM10 Daily Average
PM10 (µg/m³)
Date
2025-01
2025-03
2025-05
2025-07
2025-09
2025-11
2026-01
Highest Qualified PM2.5 Daily Average
14.2 µg/m³
Highest PM10 Daily Average
67.6 µg/m³
PM2.5 Period Average
7.04 µg/m³

2025-01-01 to 2025-12-30 Report for Sensor 184531: AV-29, Montgomery_County, TN

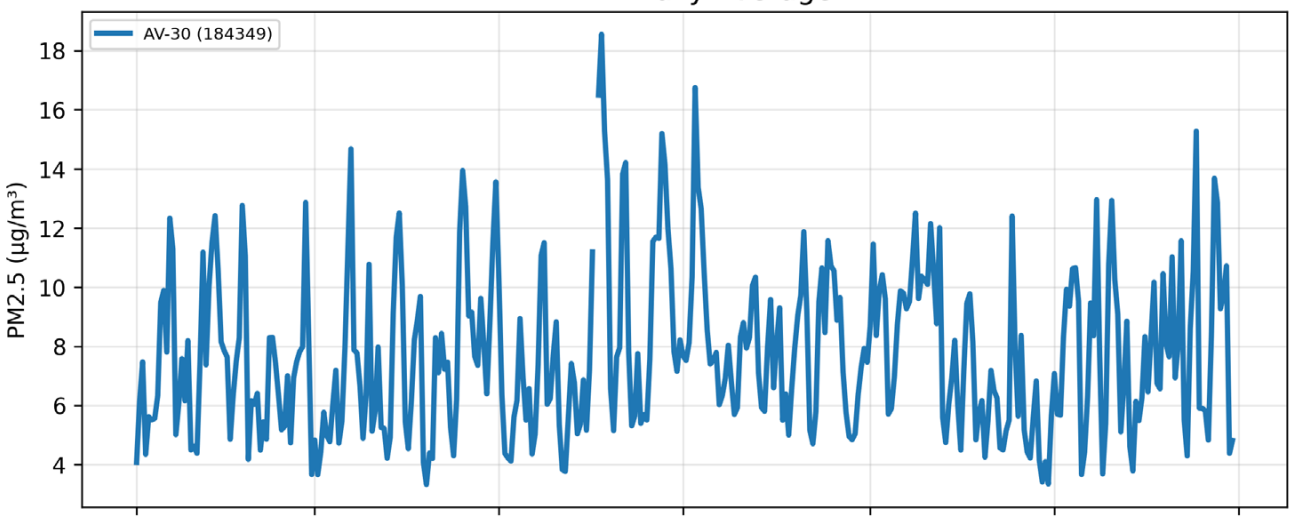




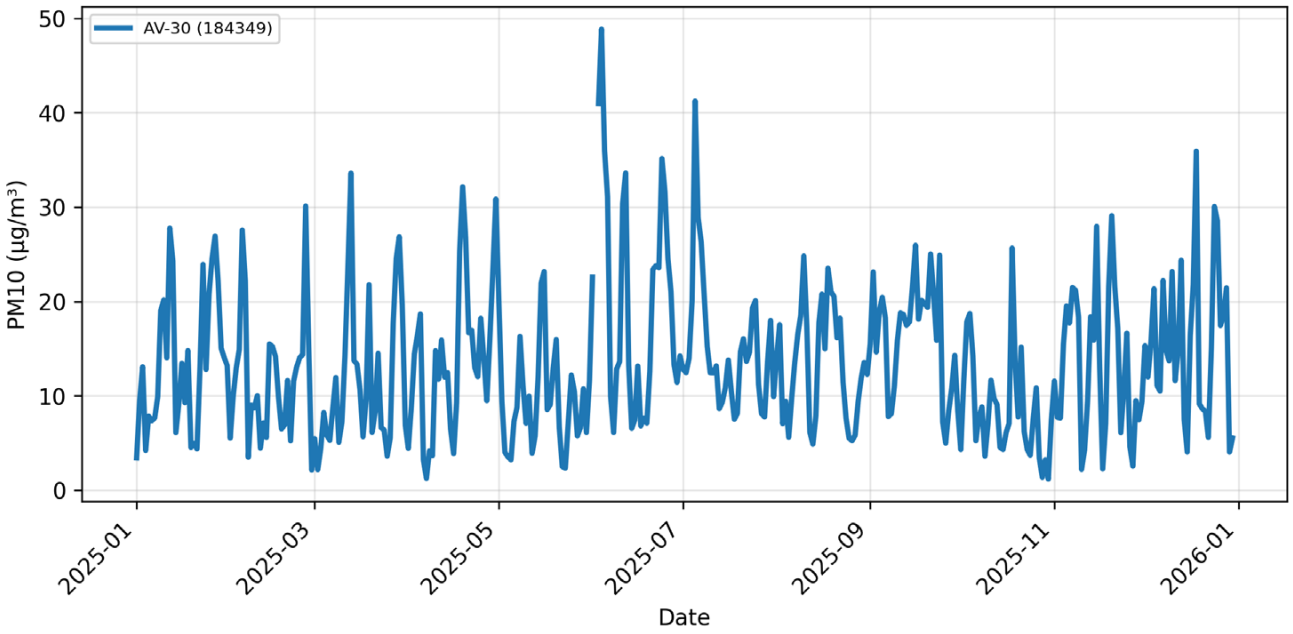


2025-01-01 to 2025-12-30 Report for Sensor 184349: AV-30, Roane_County, TN

PM2.5 Daily Average

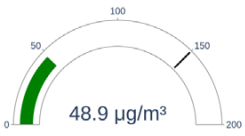


PM10 Daily Average

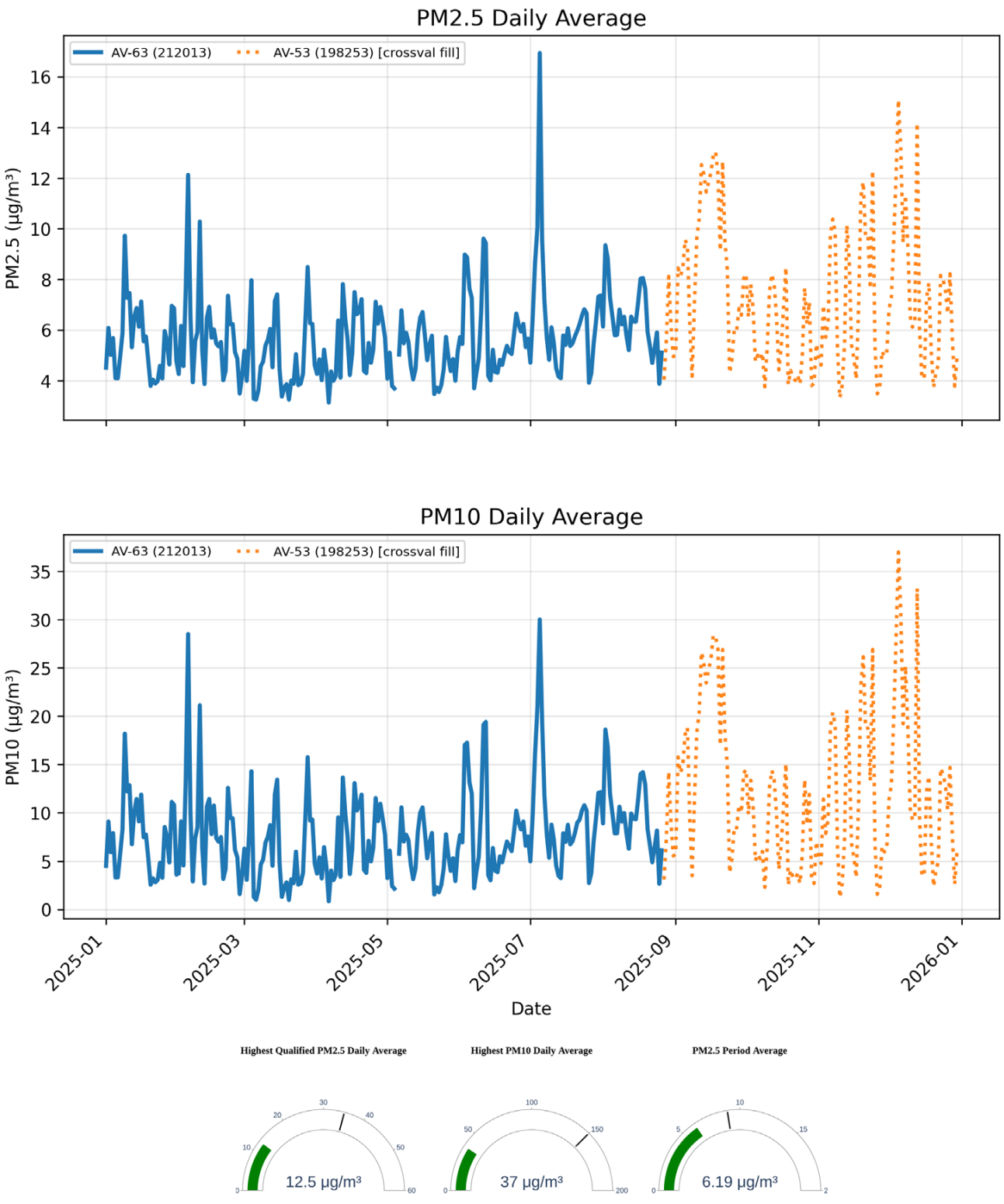


Highest Qualified PM2.5 Daily Average

Highest PM10 Daily Average

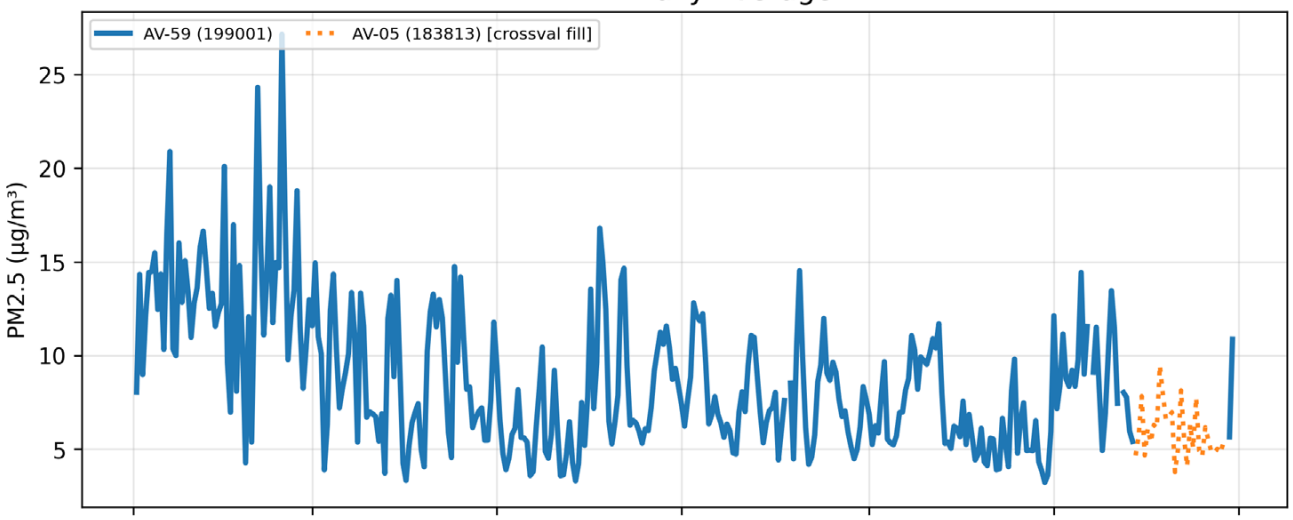


PM2.5 Period Average

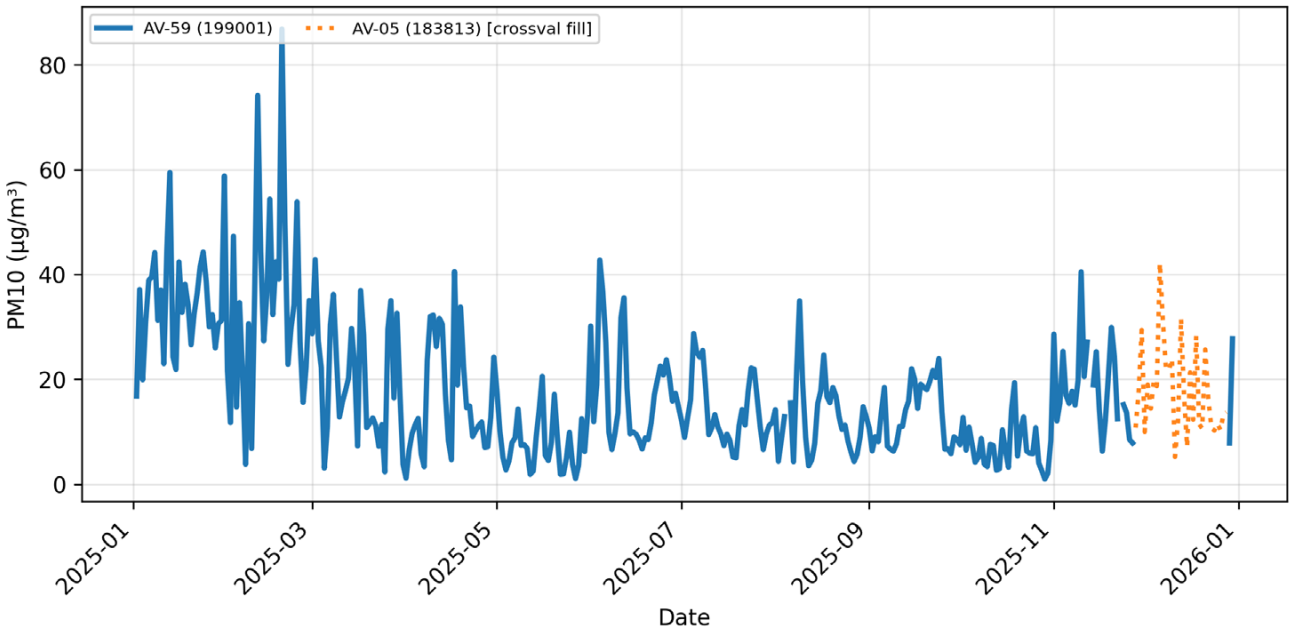

2025-01-01 to 2025-12-30 Report for Sensor 212013: AV-63, Shelby_County, TN
PM2.5 Daily Average
AV-63 (212013)
AV-53 (198253) [crossval fill]
PM2.5 (µg/m³)
PM10 Daily Average
PM10 (µg/m³)
Date
2025-01
2025-03
2025-05
2025-07
2025-09
2025-11
2026-01
Highest Qualified PM2.5 Daily Average
12.5 µg/m³
Highest PM10 Daily Average
37 µg/m³
PM2.5 Period Average
6.19 µg/m³

2025-01-01 to 2025-12-30 Report for Sensor 199001: AV-59, Sullivan_County, TN

PM2.5 Daily Average



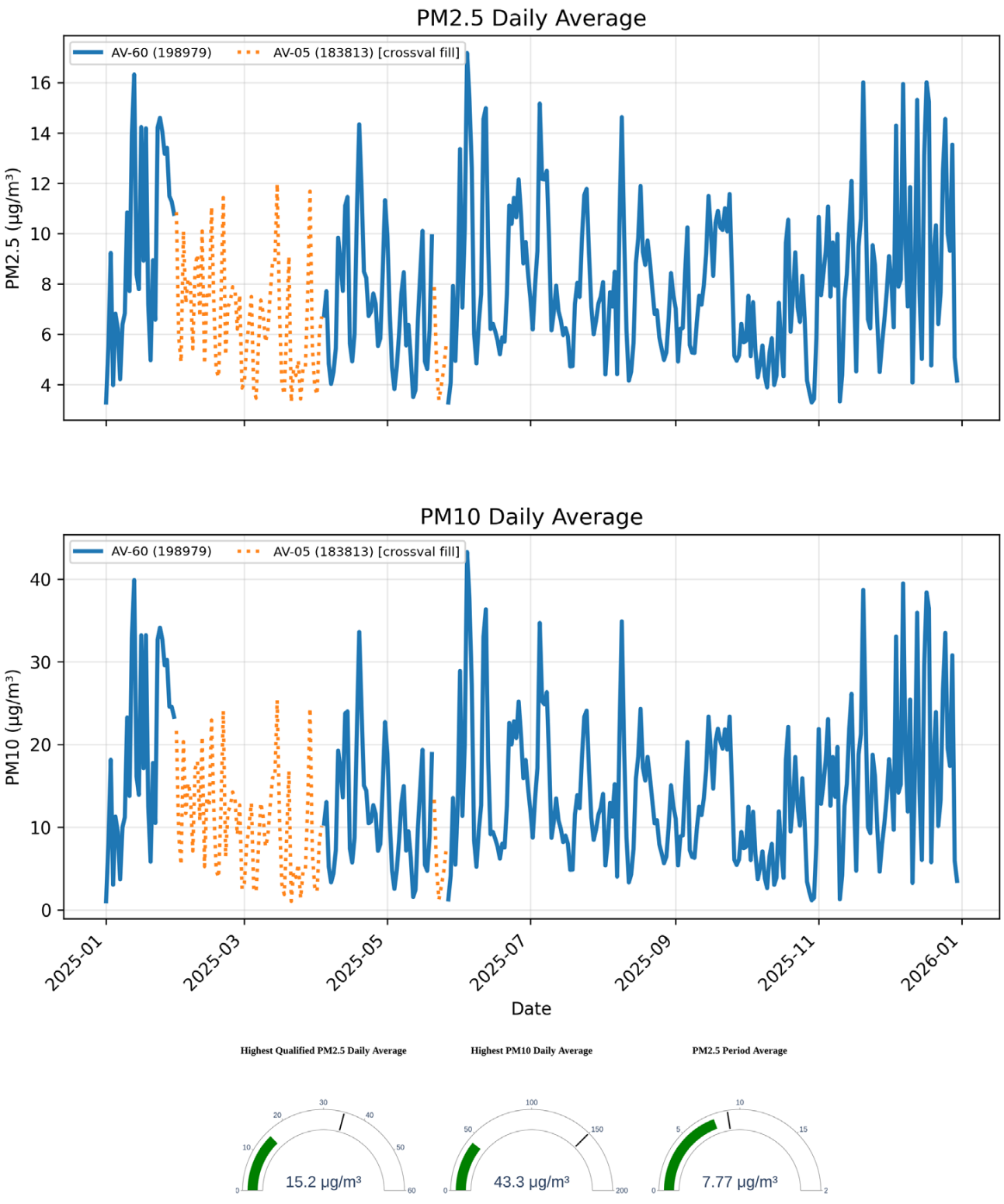
PM10 Daily Average



Highest Qualified PM2.5 Daily Average

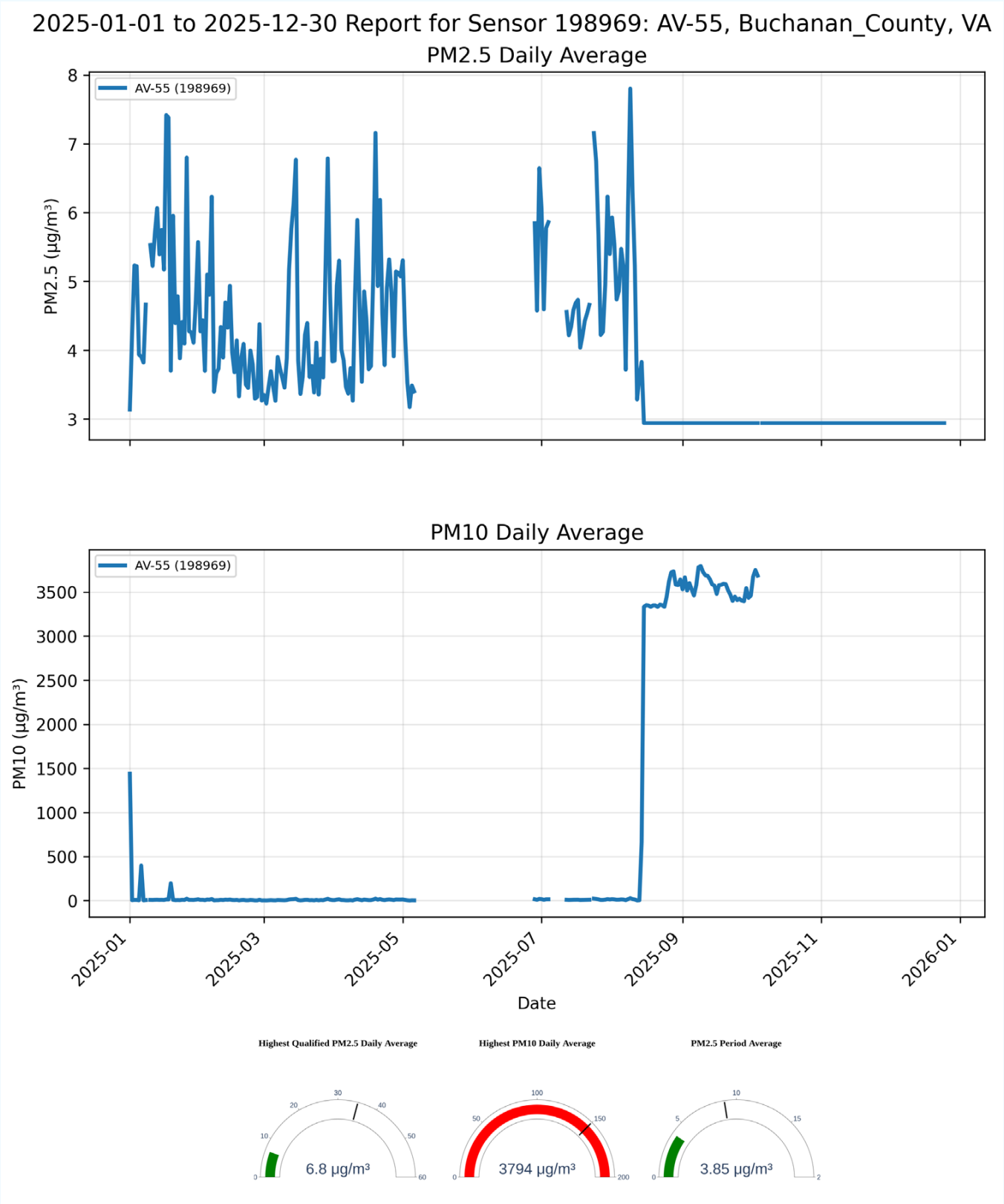
Highest PM10 Daily Average

PM2.5 Period Average


2025-01-01 to 2025-12-30 Report for Sensor 198979: AV-60, Sullivan_County, TN
PM2.5 Daily Average
AV-60 (198979)
AV-05 (183813) [crossval fill]
PM2.5 (µg/m³)
PM10 Daily Average
PM10 (µg/m³)
Date
2025-01
2025-03
2025-05
2025-07
2025-09
2025-11
2026-01
Highest Qualified PM2.5 Daily Average
15.2 µg/m³
Highest PM10 Daily Average
43.3 µg/m³
PM2.5 Period Average
7.77 µg/m³

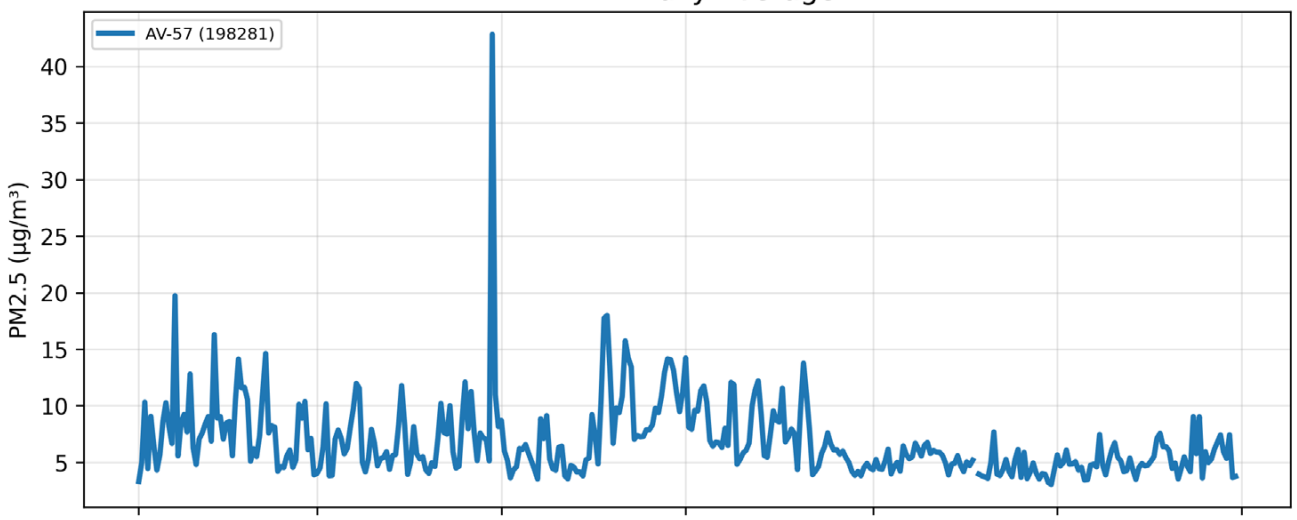
VIRGINIA

Note: This report has been flagged as possibly having a bad sensor reading.

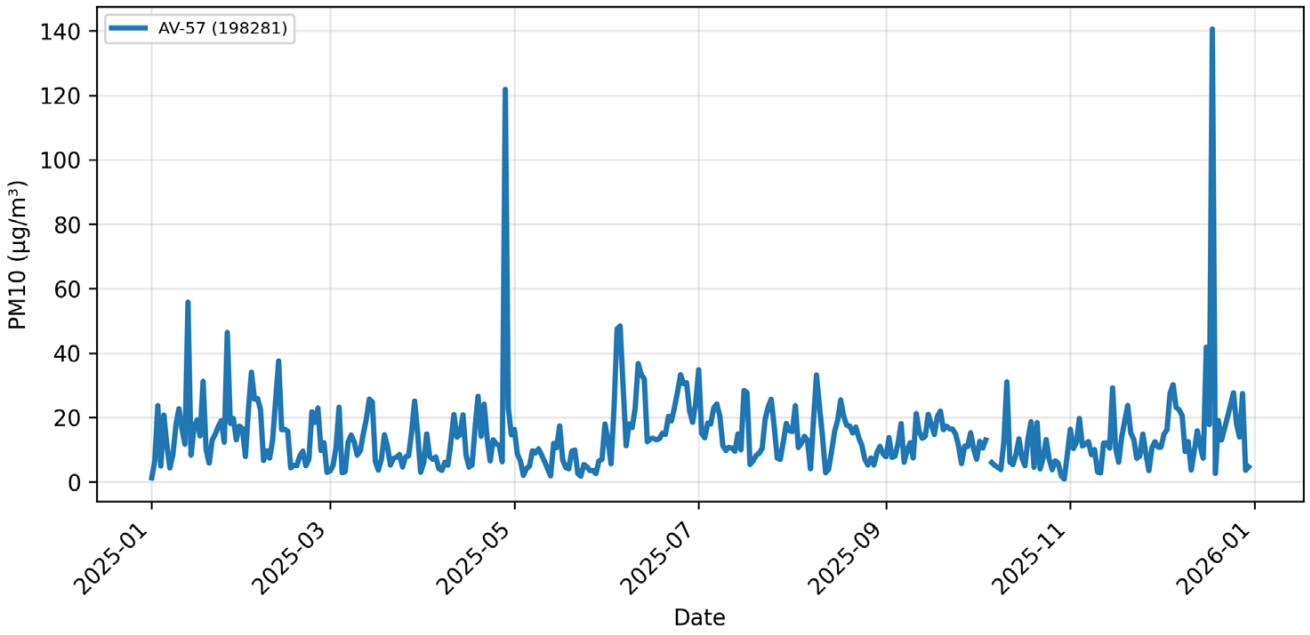


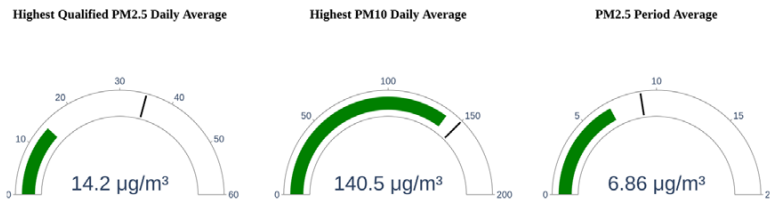
2025-01-01 to 2025-12-30 Report for Sensor 198281: AV-57, Buchanan_County, VA

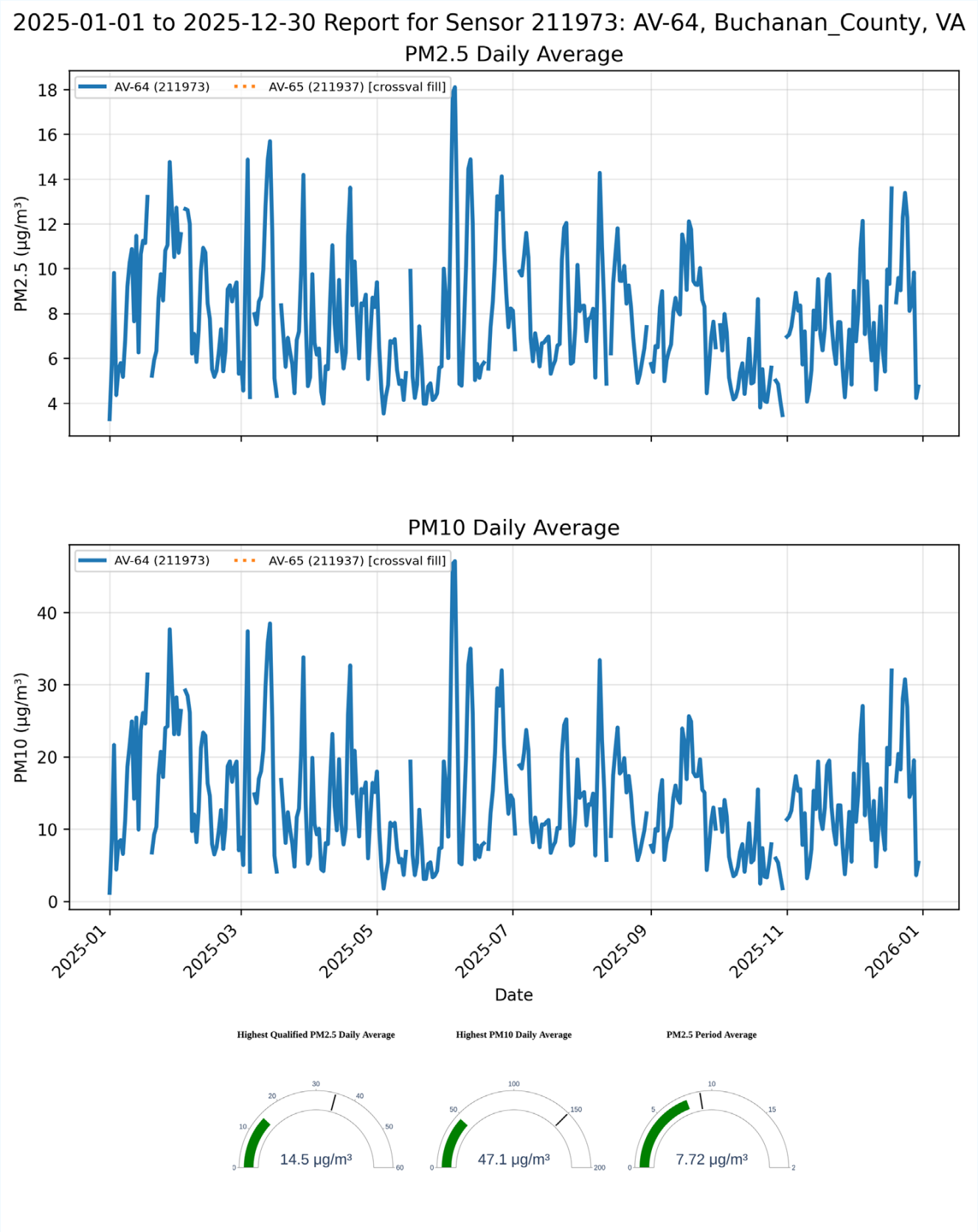
PM2.5 Daily Average



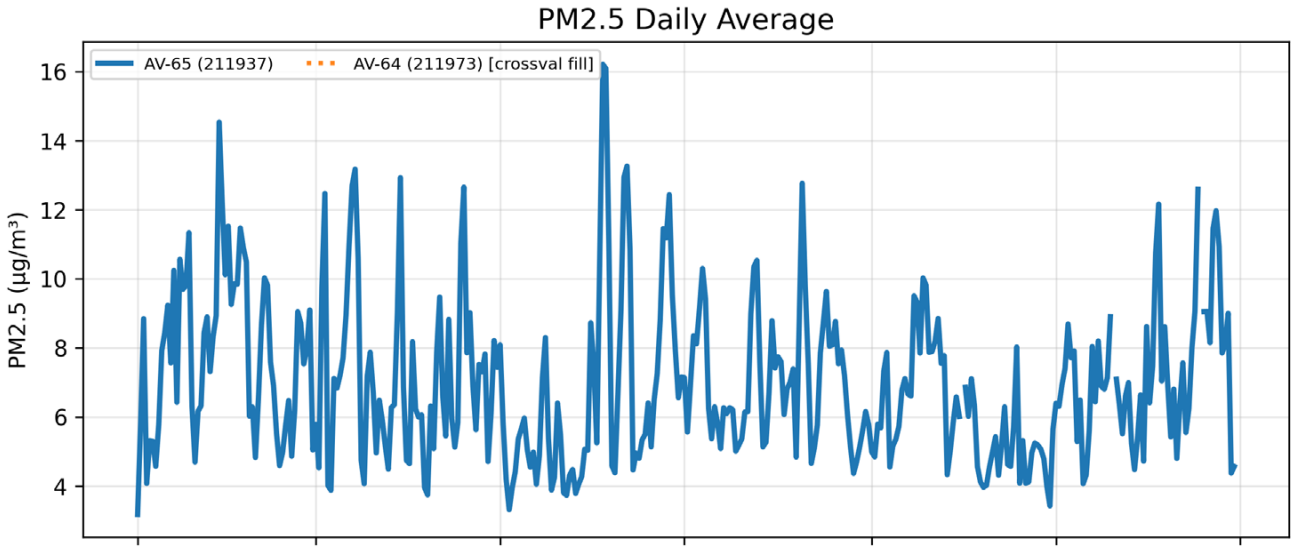
PM10 Daily Average

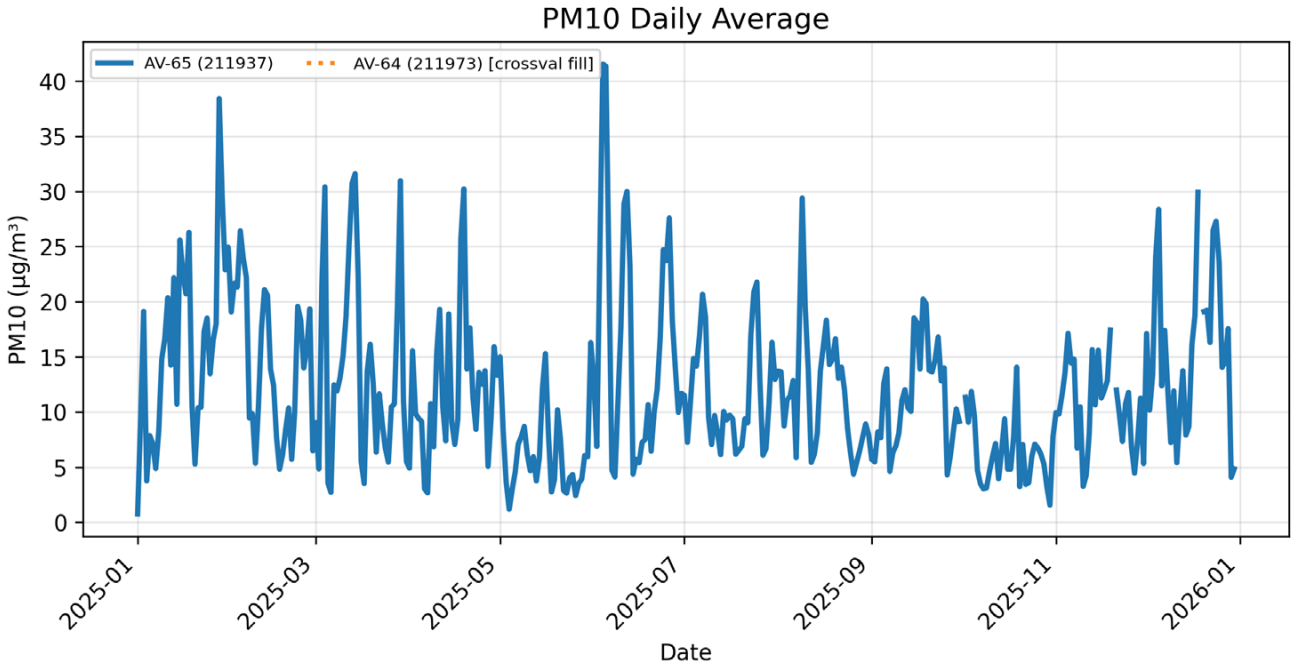


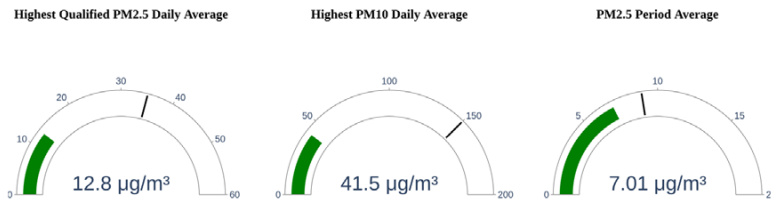



2025-01-01 to 2025-12-30 Report for Sensor 211973: AV-64, Buchanan_County, VA
PM2.5 Daily Average
AV-64 (211973)
AV-65 (211937) [crossval fill]
PM2.5 (µg/m³)
PM10 Daily Average
PM10 (µg/m³)
Date
2025-01
2025-03
2025-05
2025-07
2025-09
2025-11
2026-01
Highest Qualified PM2.5 Daily Average
14.5 µg/m³
Highest PM10 Daily Average
47.1 µg/m³
PM2.5 Period Average
7.72 µg/m³

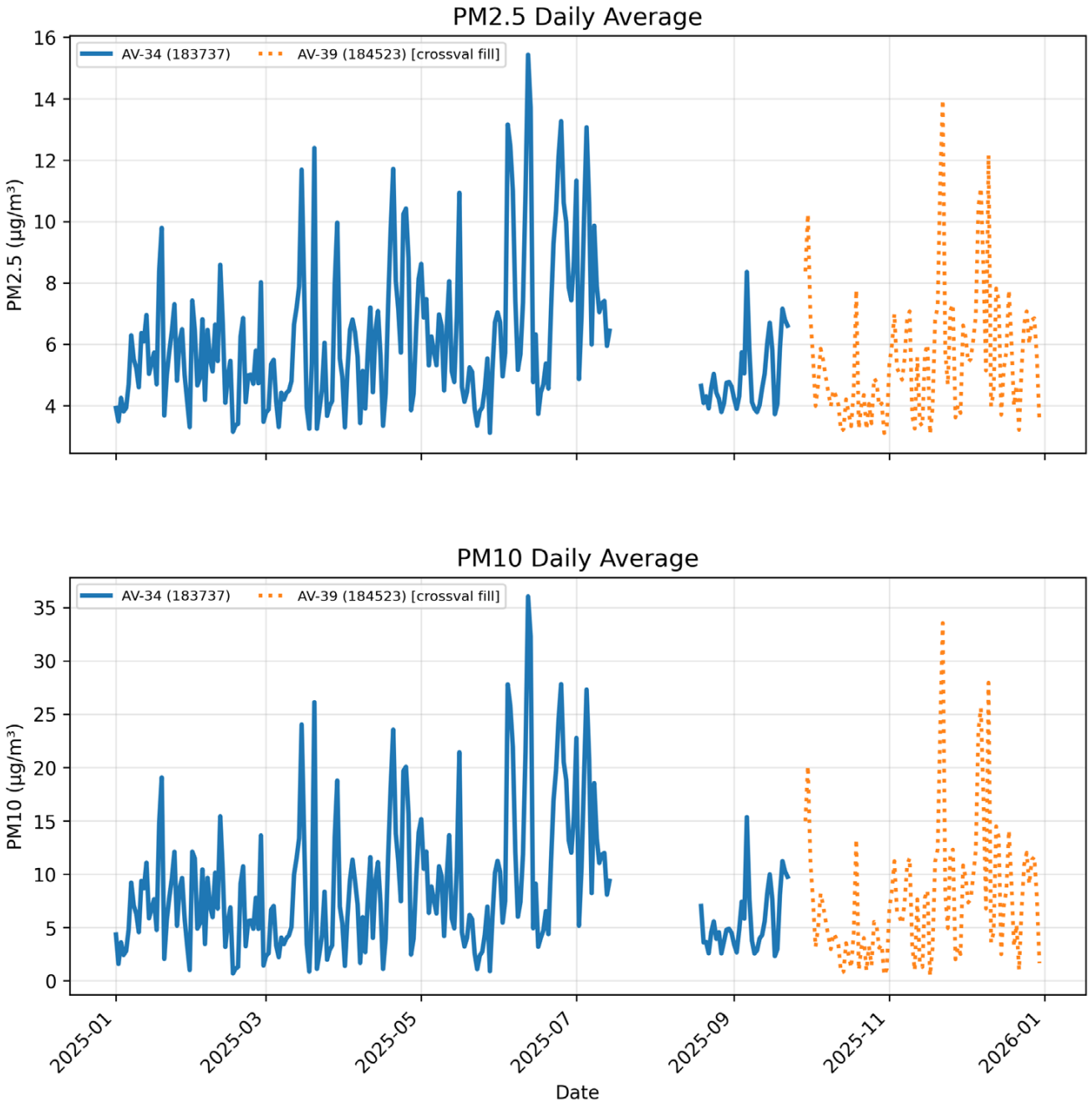
2025-01-01 to 2025-12-30 Report for Sensor 211937: AV-65, Buchanan_County, VA

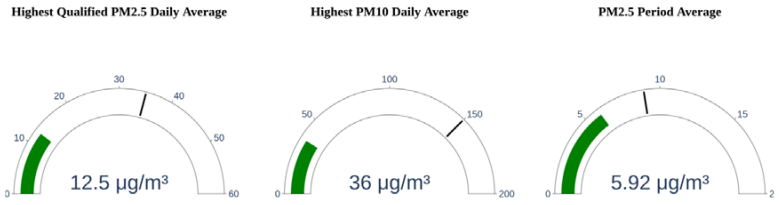






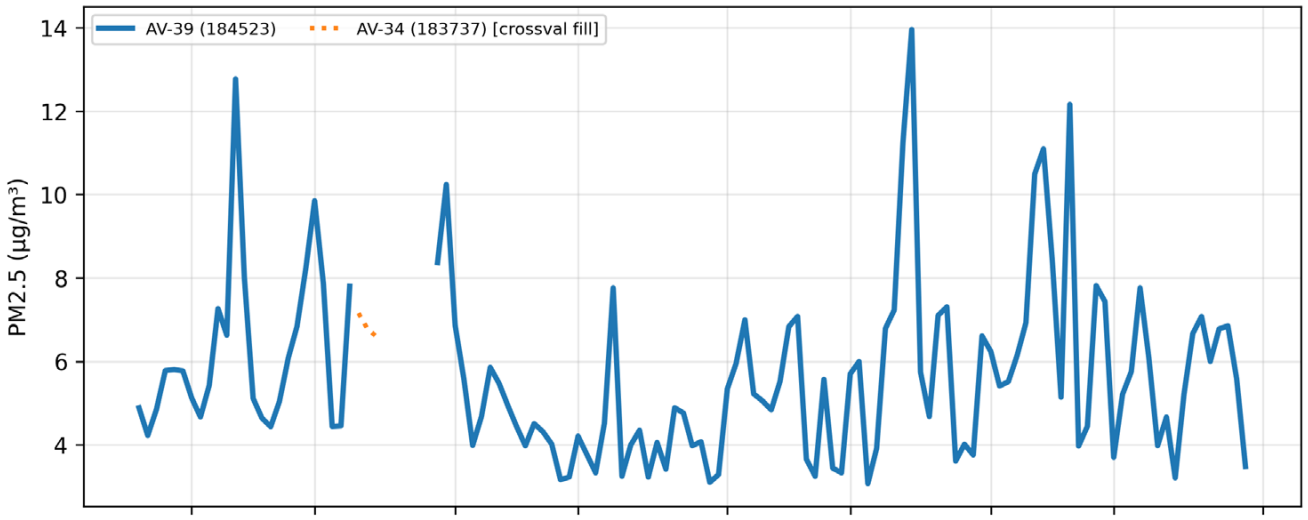
2025-01-01 to 2025-12-30 Report for Sensor 183737: AV-34, Buckingham_County, VA



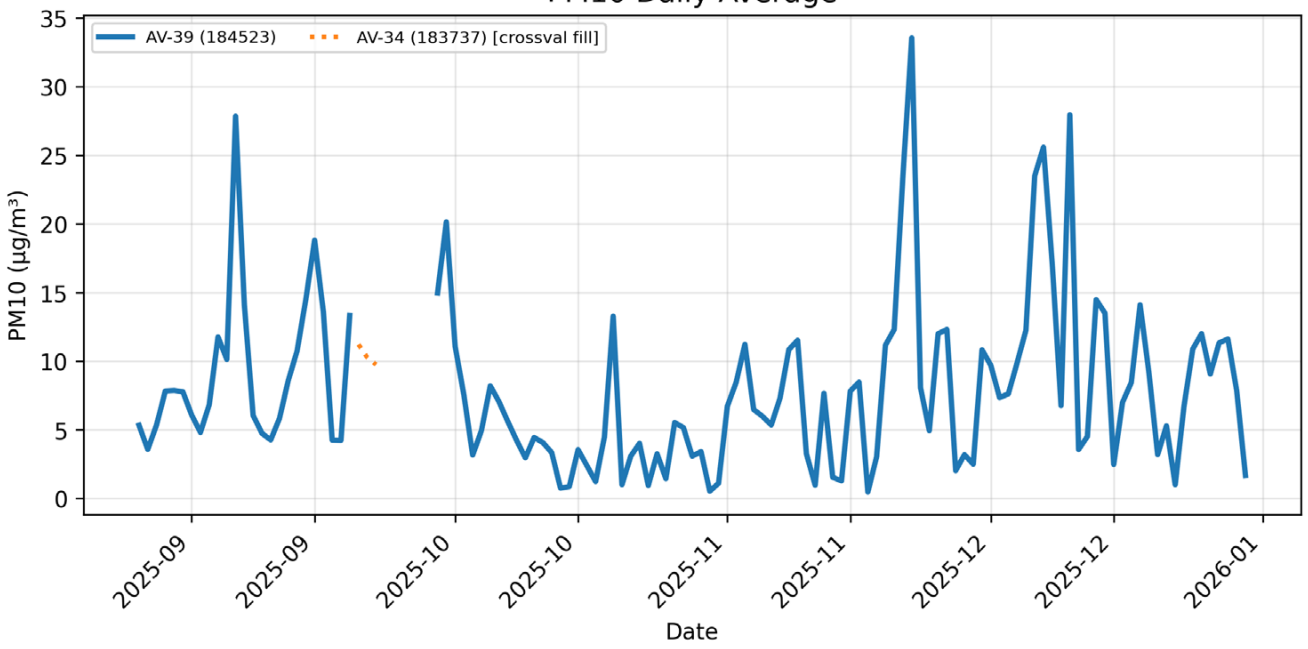


2025-01-01 to 2025-12-30 Report for Sensor 184523: AV-39, Buckingham_County, VA

PM2.5 Daily Average

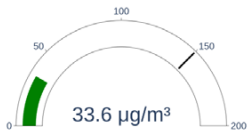


PM10 Daily Average



Highest Qualified PM2.5 Daily Average

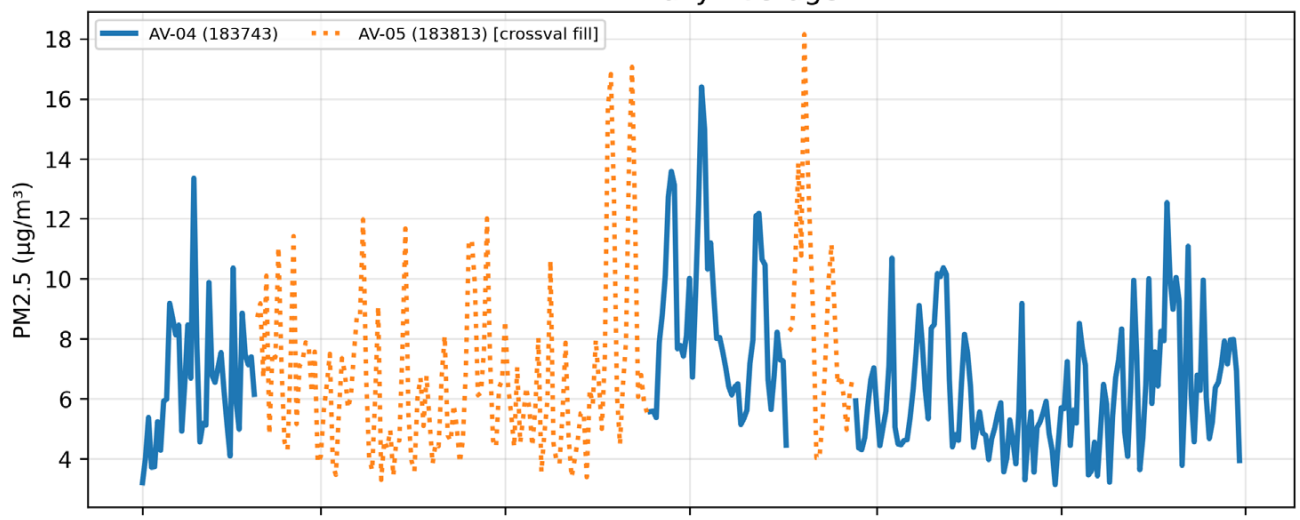
Highest PM10 Daily Average



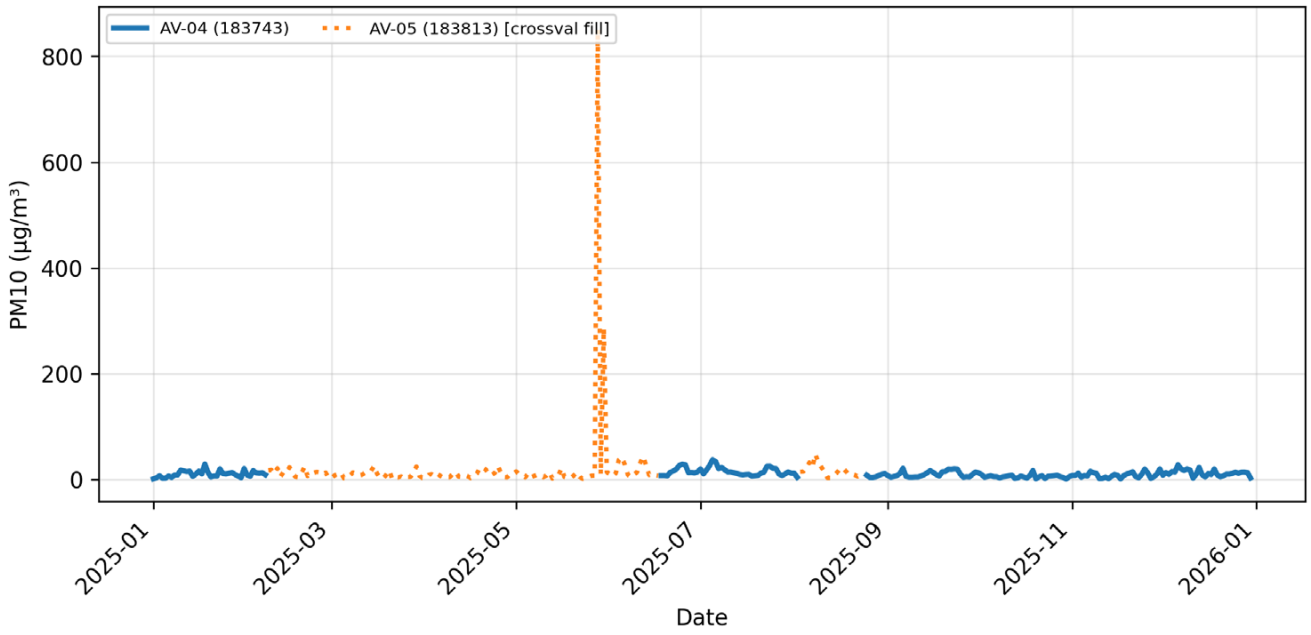
PM2.5 Period Average

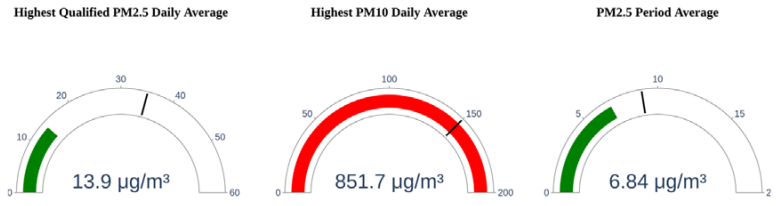
2025-01-01 to 2025-12-30 Report for Sensor 183743: AV-04, Montgomery_County, VA

PM2.5 Daily Average



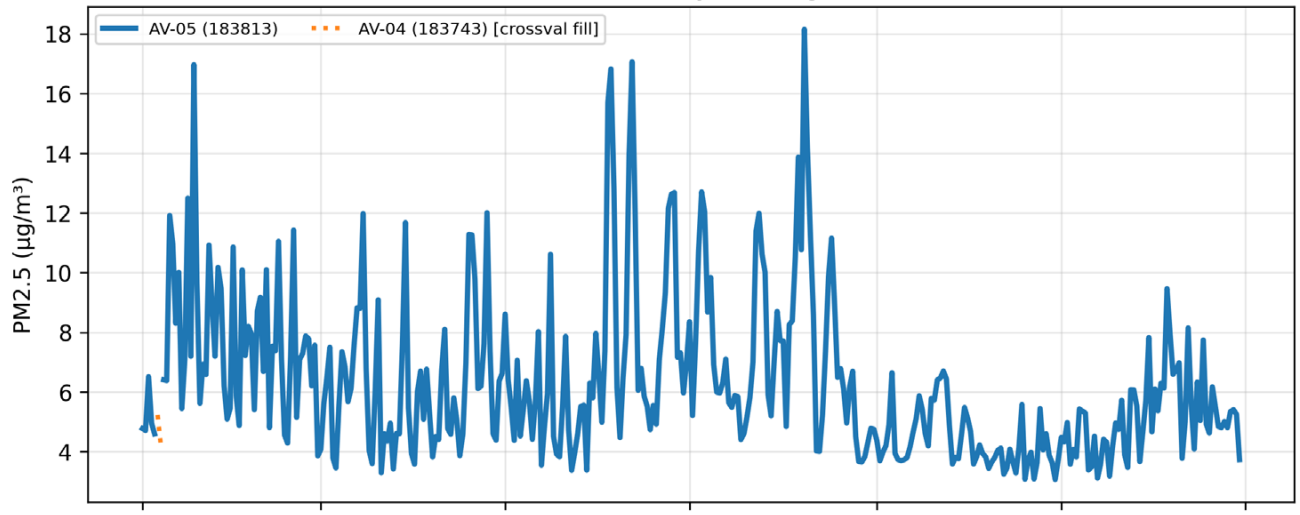
PM10 Daily Average



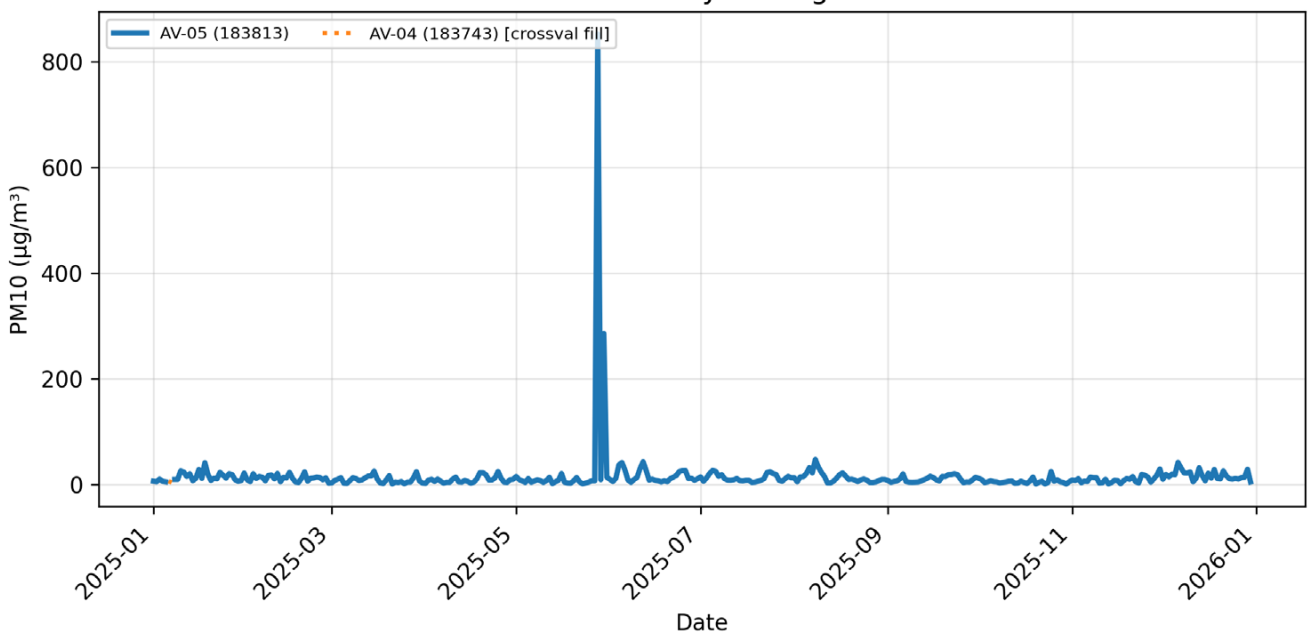


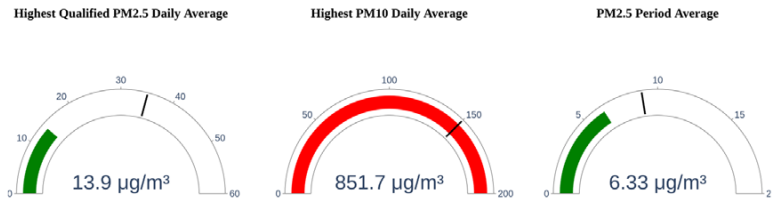
2025-01-01 to 2025-12-30 Report for Sensor 183813: AV-05, Montgomery_County, VA

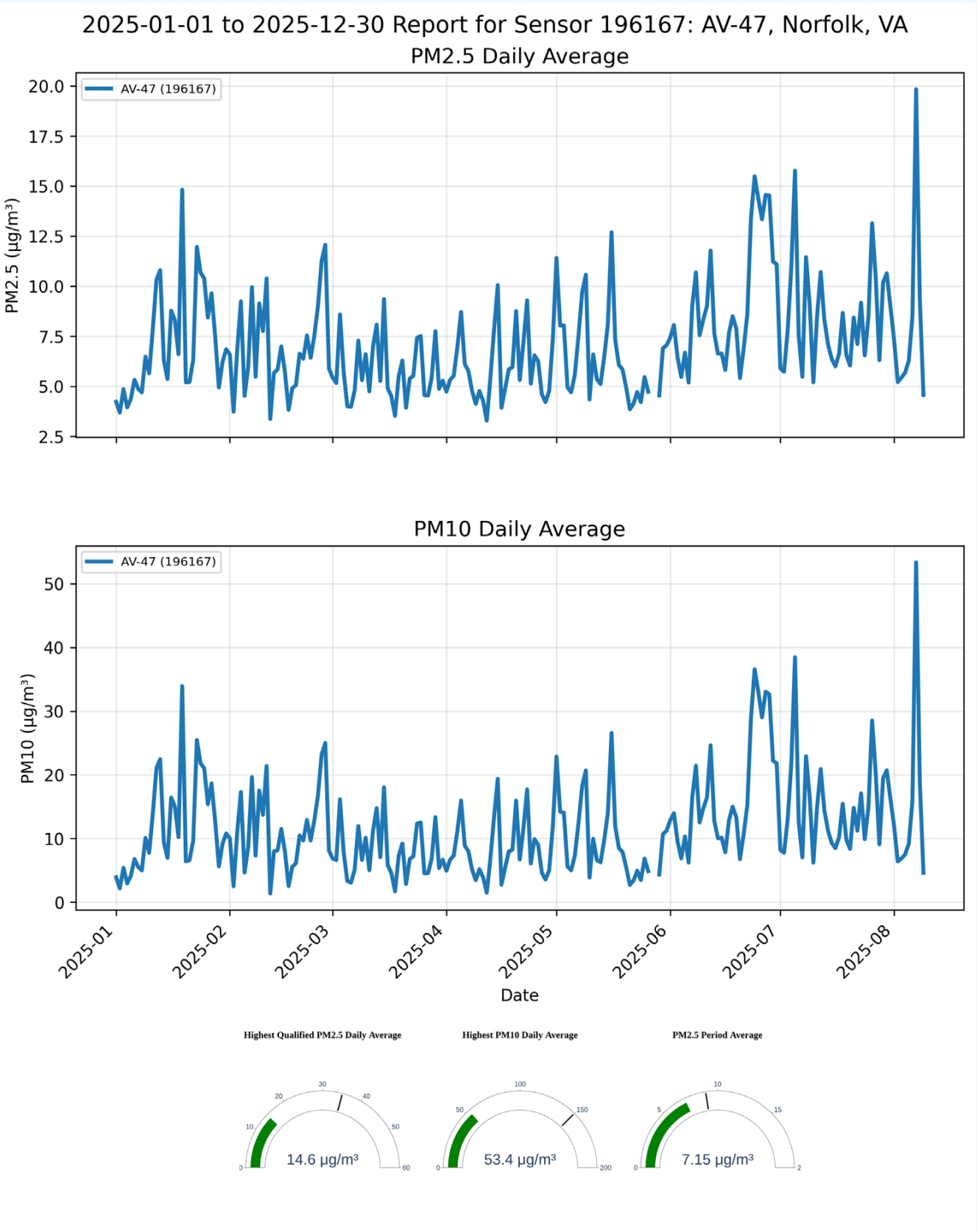
PM2.5 Daily Average



PM10 Daily Average

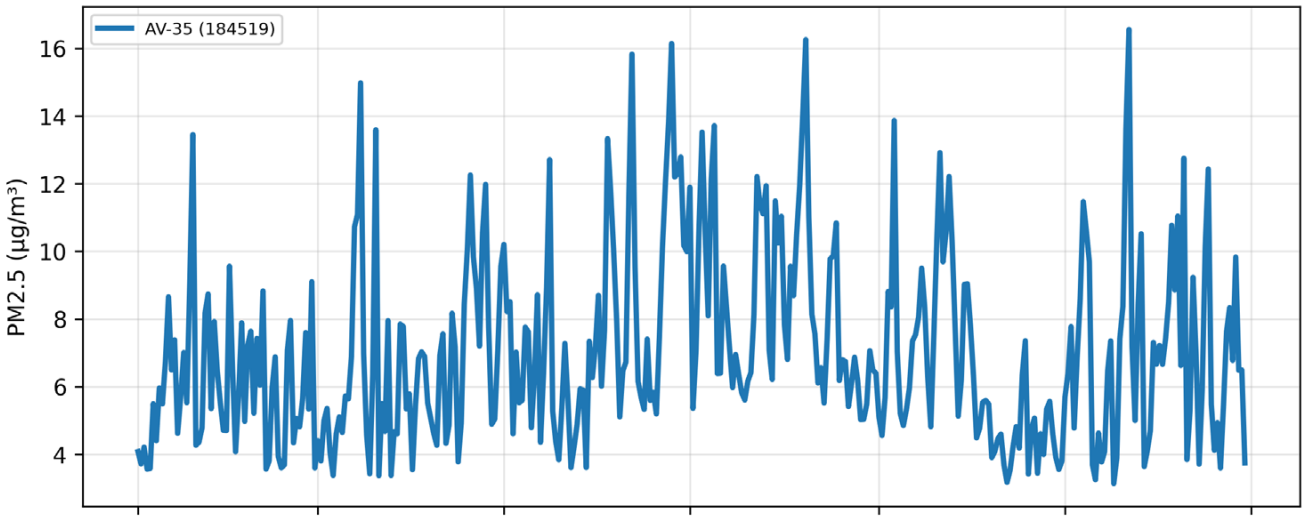




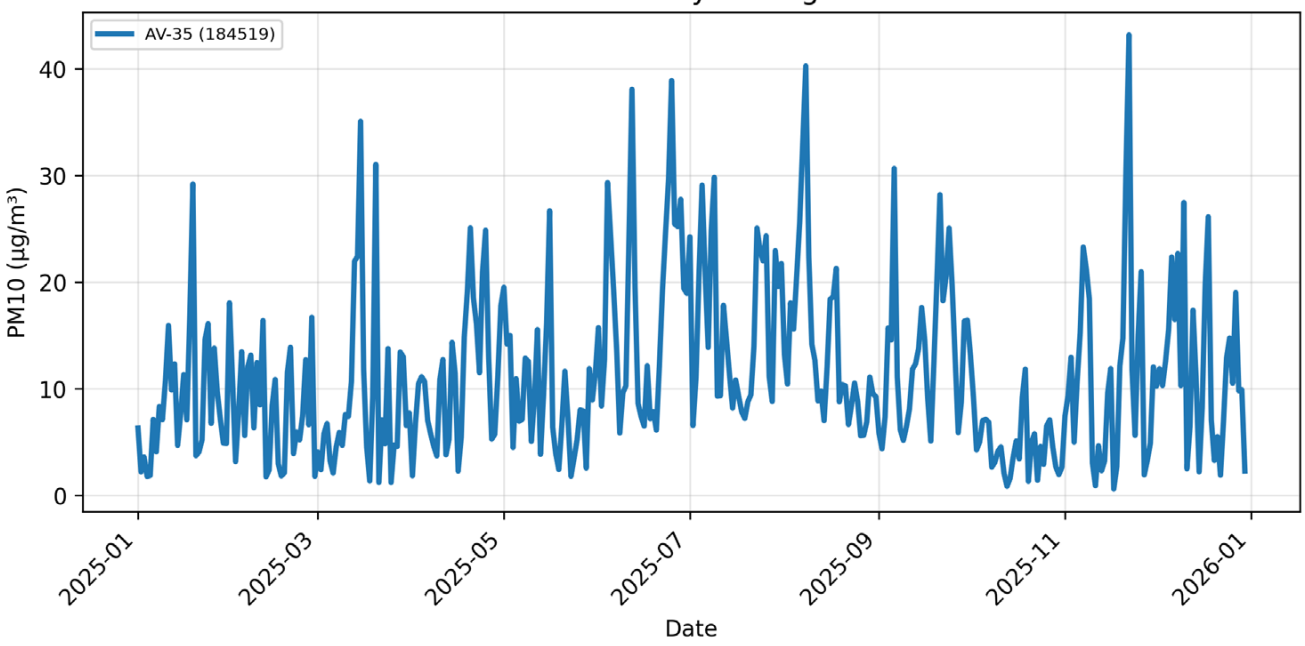

2025-01-01 to 2025-12-30 Report for Sensor 196167: AV-47, Norfolk, VA
PM2.5 Daily Average
AV-47 (196167)
PM2.5 (µg/m³)
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
PM10 Daily Average
AV-47 (196167)
PM10 (µg/m³)
50
40
30
20
10
0
2025-01
2025-02
2025-03
2025-04
2025-05
2025-06
2025-07
2025-08
Date
Highest Qualified PM2.5 Daily Average
14.6 µg/m³
Highest PM10 Daily Average
53.4 µg/m³
PM2.5 Period Average
7.15 µg/m³

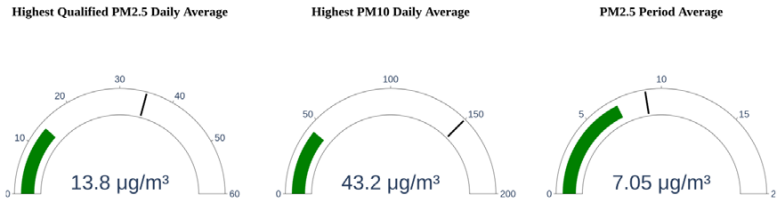
2025-01-01 to 2025-12-30 Report for Sensor 184519: AV-35, Pittsylvania_County, VA

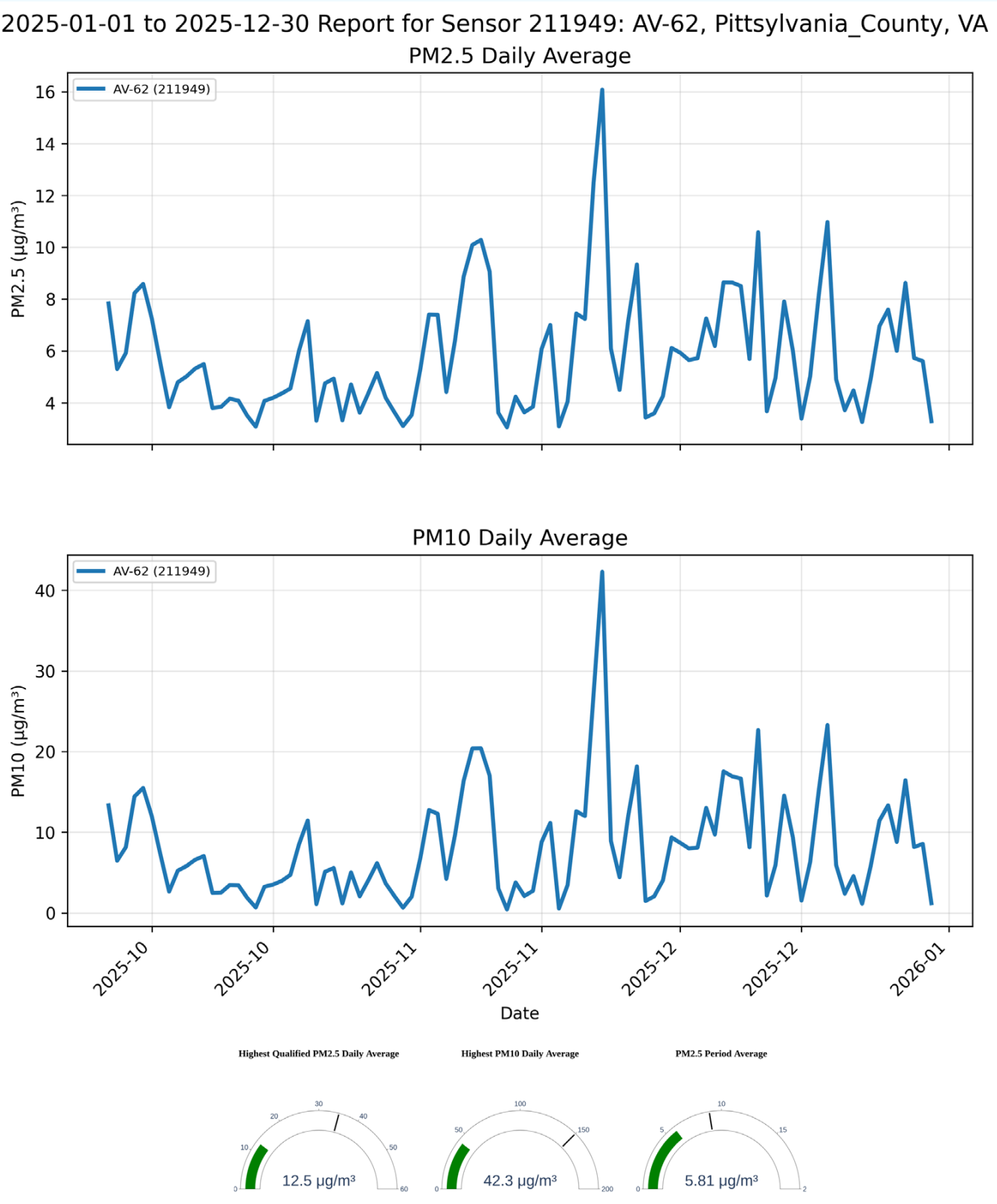
PM2.5 Daily Average

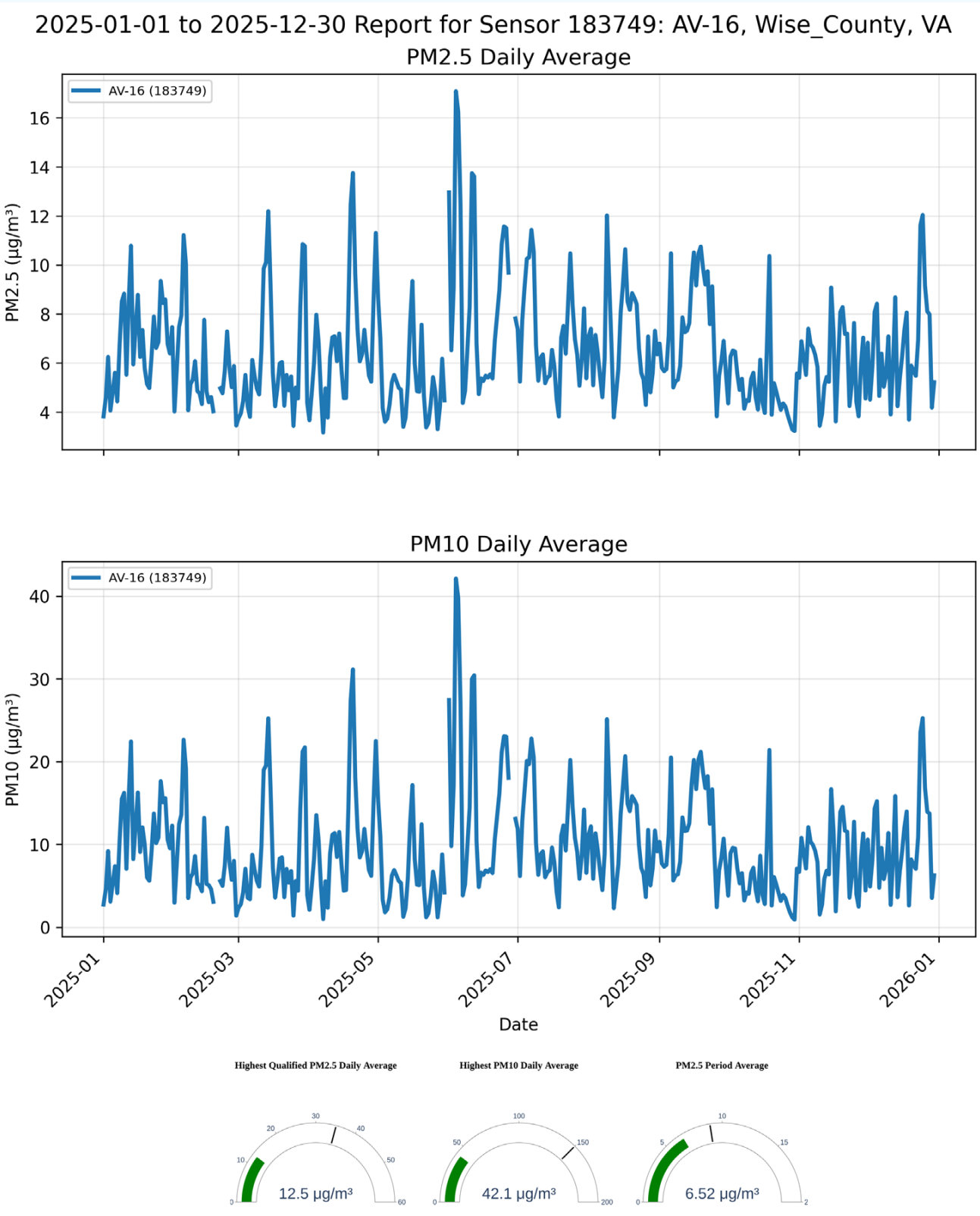


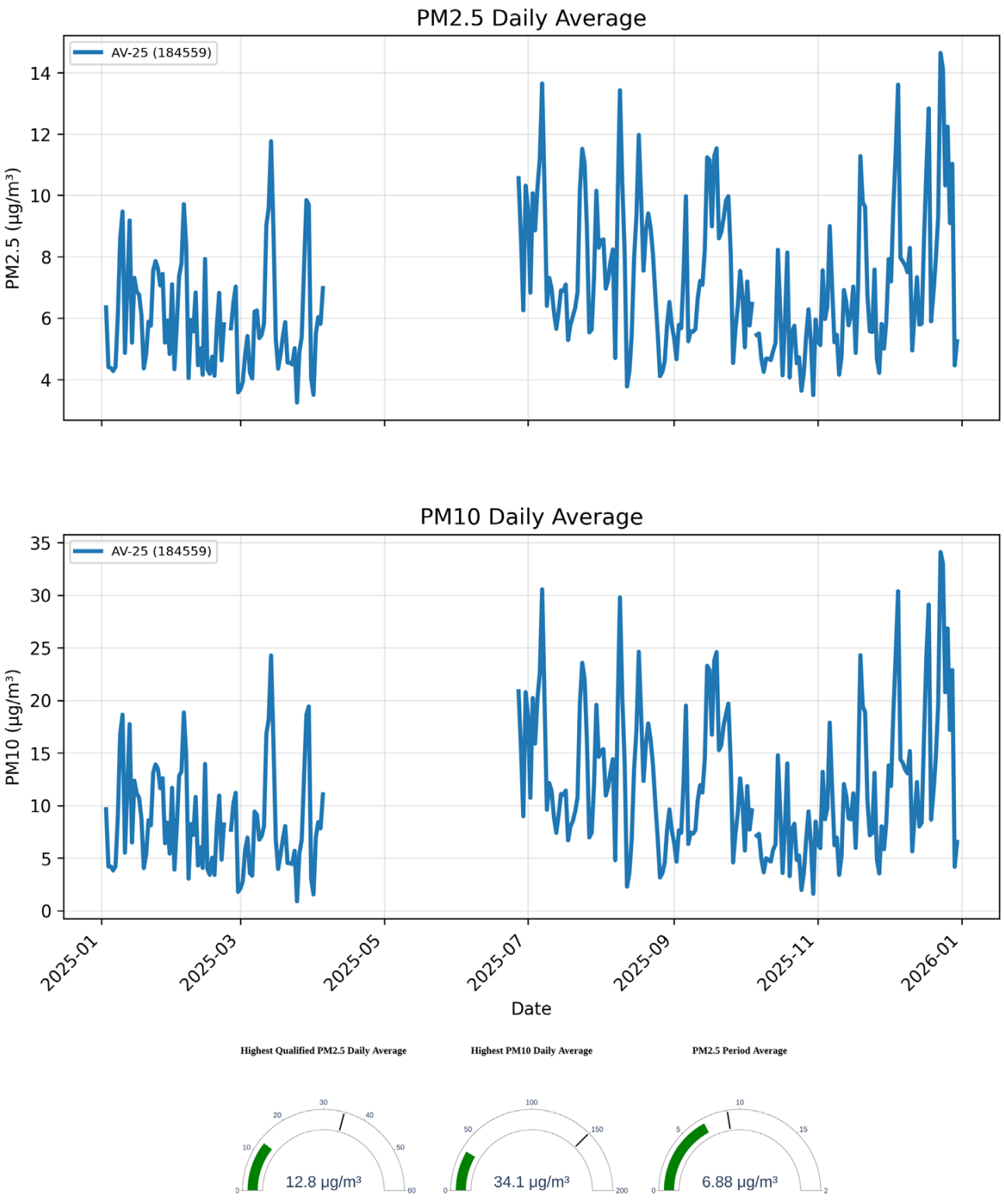
PM10 Daily Average





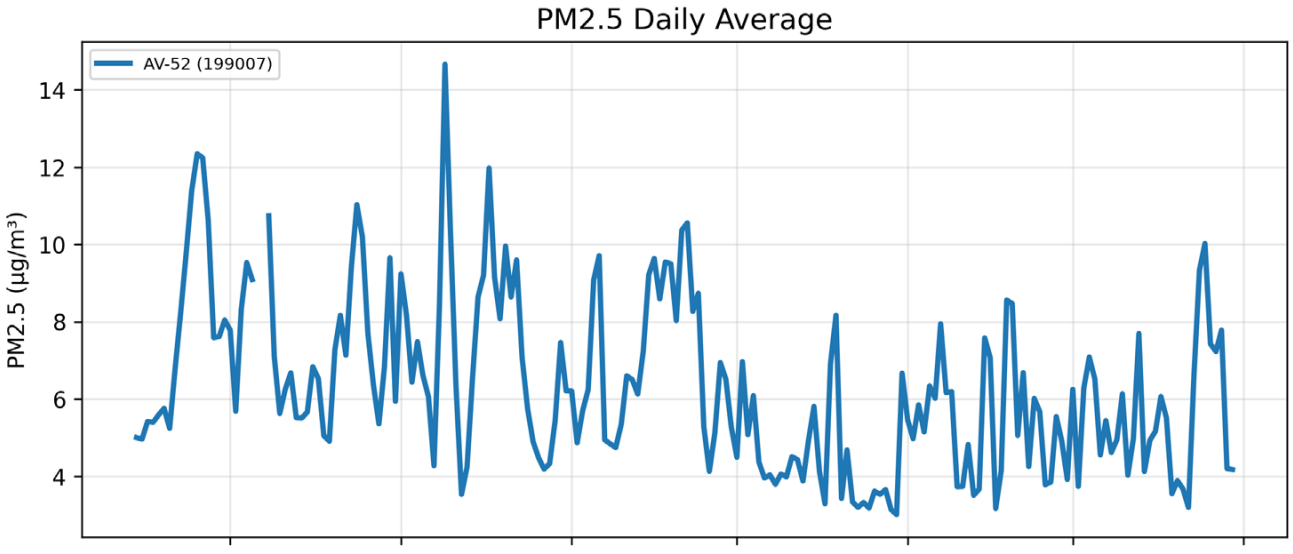

2025-01-01 to 2025-12-30 Report for Sensor 211949: AV-62, Pittsylvania_County, VA
PM2.5 Daily Average
AV-62 (211949)
PM2.5 (µg/m³)
PM10 Daily Average
AV-62 (211949)
PM10 (µg/m³)
2025-10
2025-10
2025-11
2025-11
2025-12
2025-12
2026-01
Date
Highest Qualified PM2.5 Daily Average
12.5 µg/m³
Highest PM10 Daily Average
42.3 µg/m³
PM2.5 Period Average
5.81 µg/m³

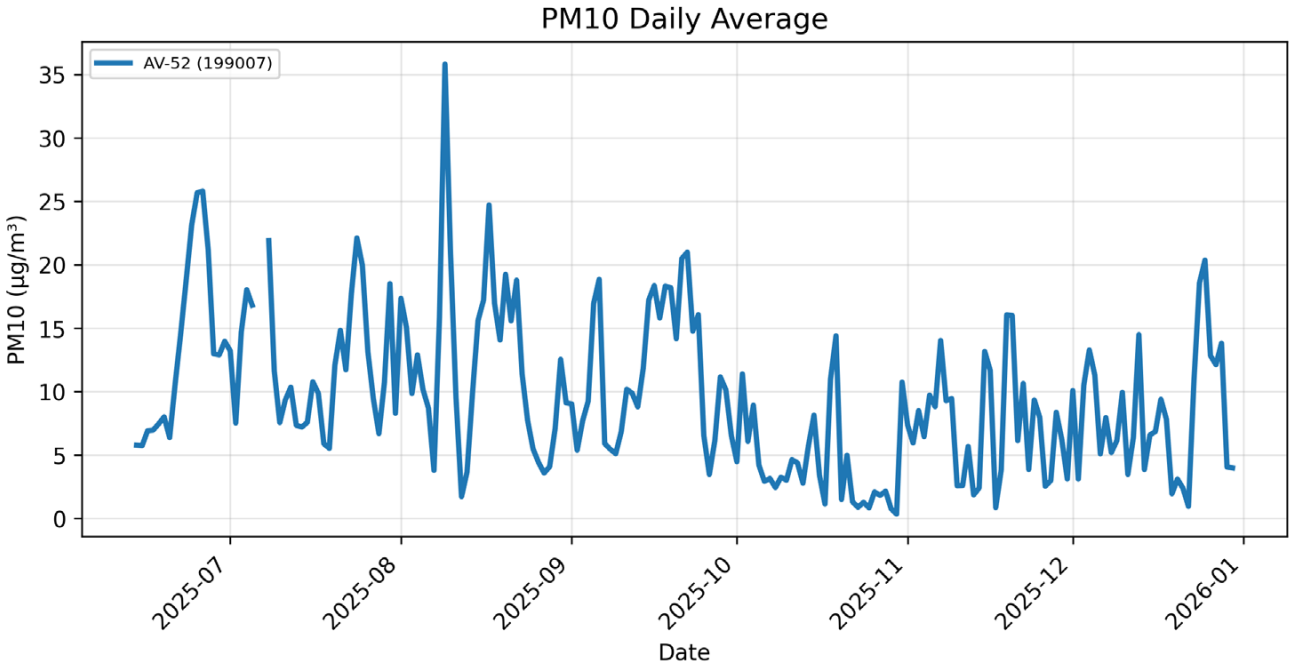

2025-01-01 to 2025-12-30 Report for Sensor 183749: AV-16, Wise_County, VA
PM2.5 Daily Average
AV-16 (183749)
PM2.5 (µg/m³)
PM10 Daily Average
AV-16 (183749)
PM10 (µg/m³)
2025-01
2025-03
2025-05
2025-07
2025-09
2025-11
2026-01
Date
Highest Qualified PM2.5 Daily Average
12.5 µg/m³
Highest PM10 Daily Average
42.1 µg/m³
PM2.5 Period Average
6.52 µg/m³

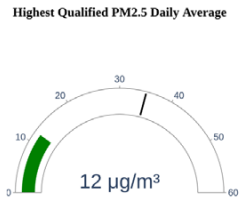

2025-01-01 to 2025-12-30 Report for Sensor 184559: AV-25, Wise_County, VA
PM2.5 Daily Average
AV-25 (184559)
PM2.5 (µg/m³)
PM10 Daily Average
AV-25 (184559)
PM10 (µg/m³)
2025-01
2025-03
2025-05
2025-07
2025-09
2025-11
2026-01
Date
Highest Qualified PM2.5 Daily Average
12.8 µg/m³
Highest PM10 Daily Average
34.1 µg/m³
PM2.5 Period Average
6.88 µg/m³

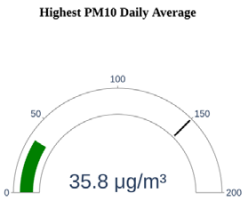
WEST VIRGINIA

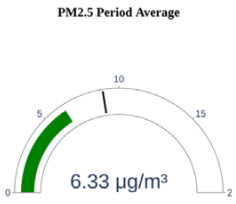
2025-01-01 to 2025-12-30 Report for Sensor 199007: AV-52, Boone_County, WV

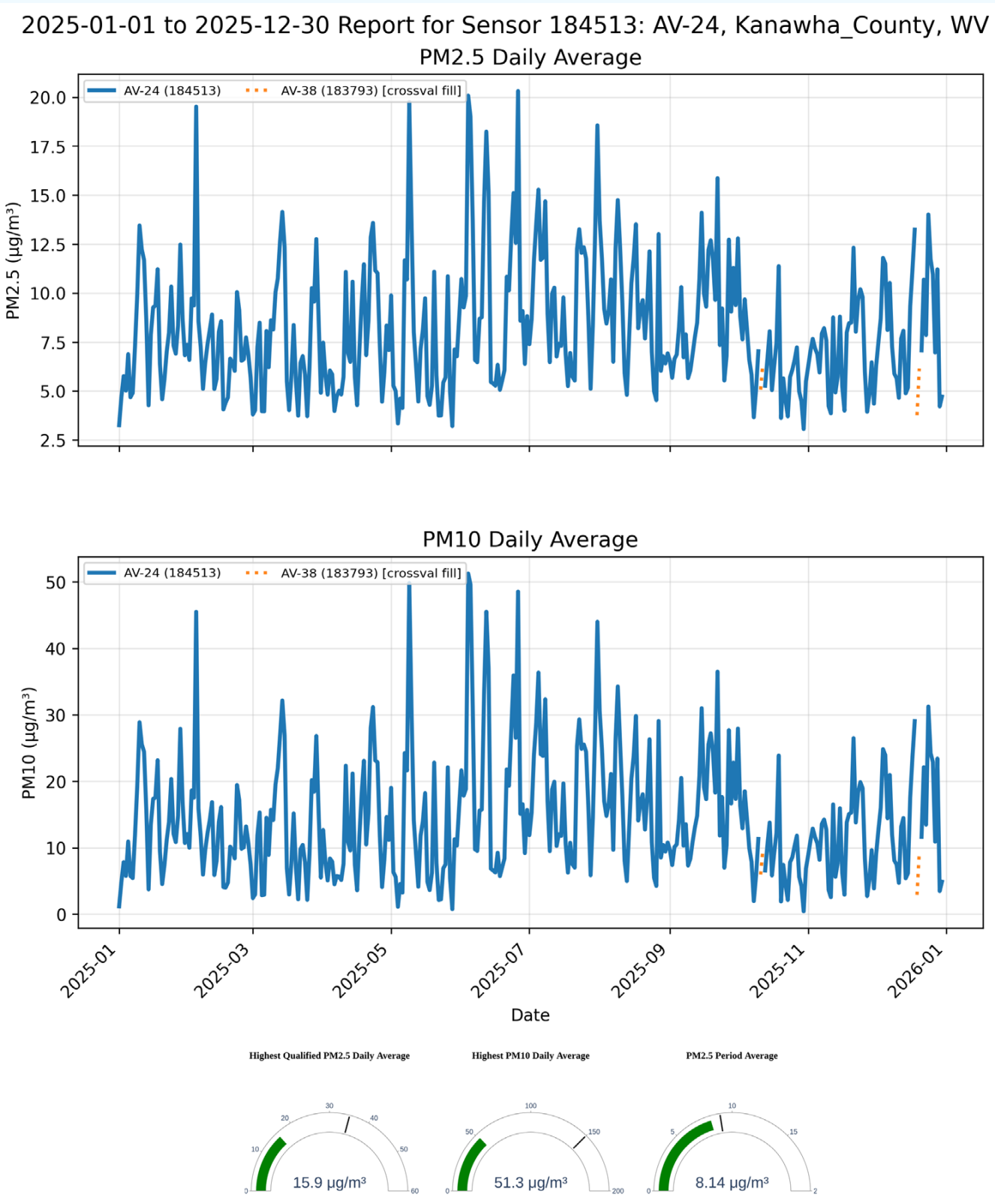




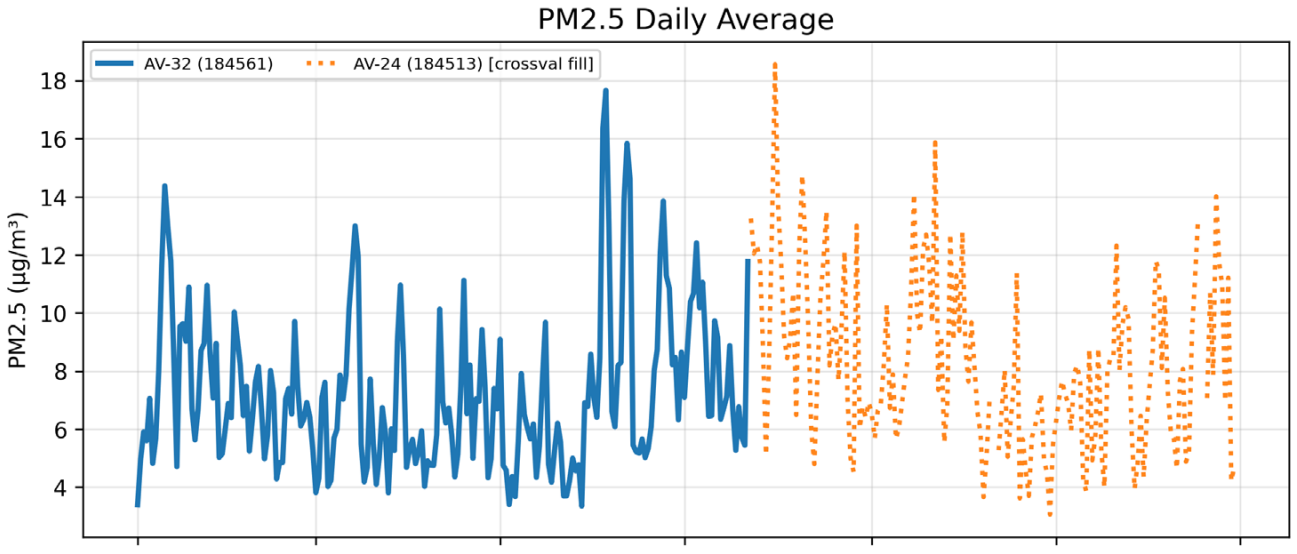


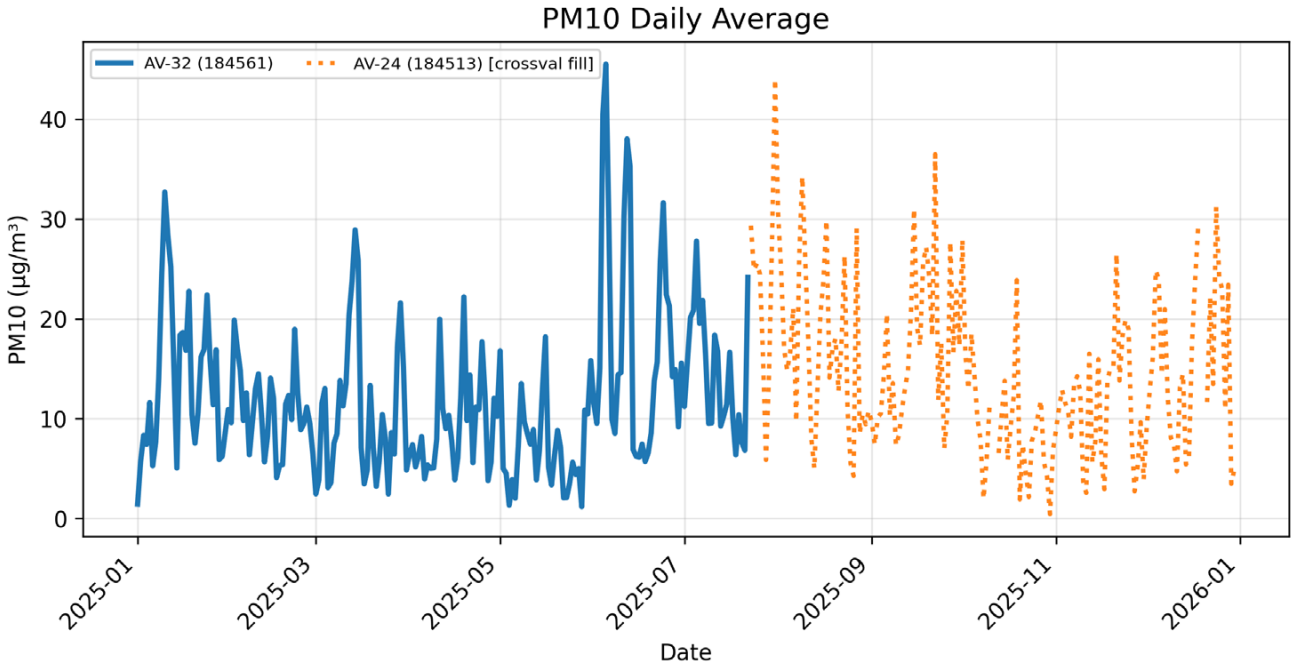


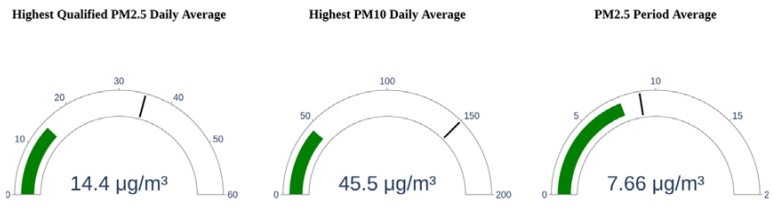



2025-01-01 to 2025-12-30 Report for Sensor 184513: AV-24, Kanawha_County, WV
PM2.5 Daily Average
AV-24 (184513)
AV-38 (183793) [crossval fill]
PM2.5 (µg/m³)
PM10 Daily Average
PM10 (µg/m³)
Date
Highest Qualified PM2.5 Daily Average
15.9 µg/m³
Highest PM10 Daily Average
51.3 µg/m³
PM2.5 Period Average
8.14 µg/m³

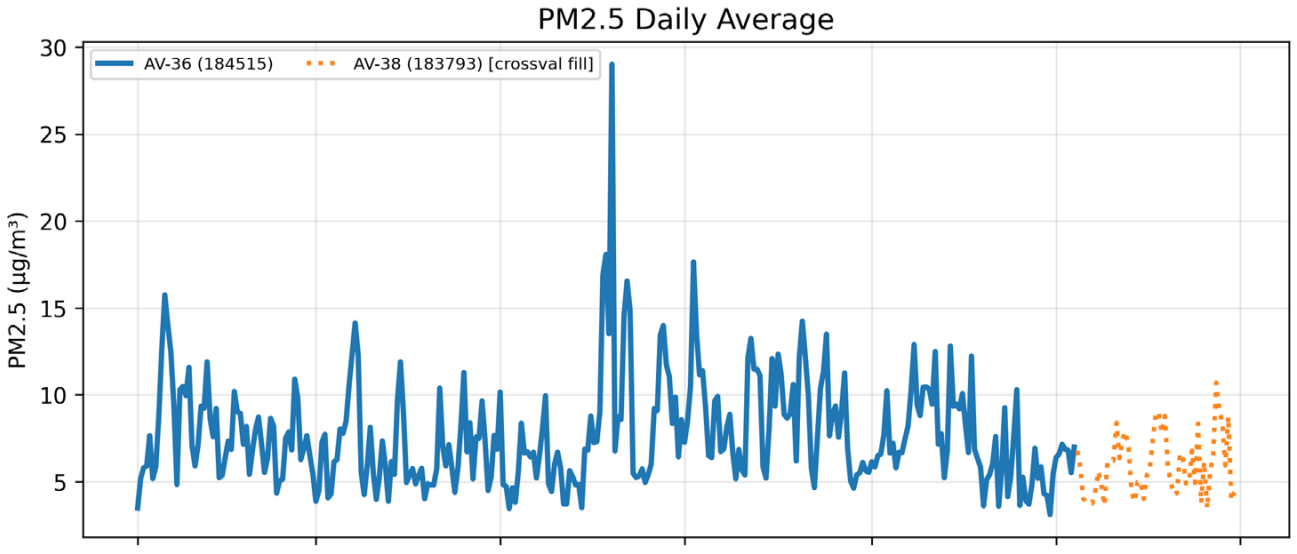
2025-01-01 to 2025-12-30 Report for Sensor 184561: AV-32, Kanawha_County, WV

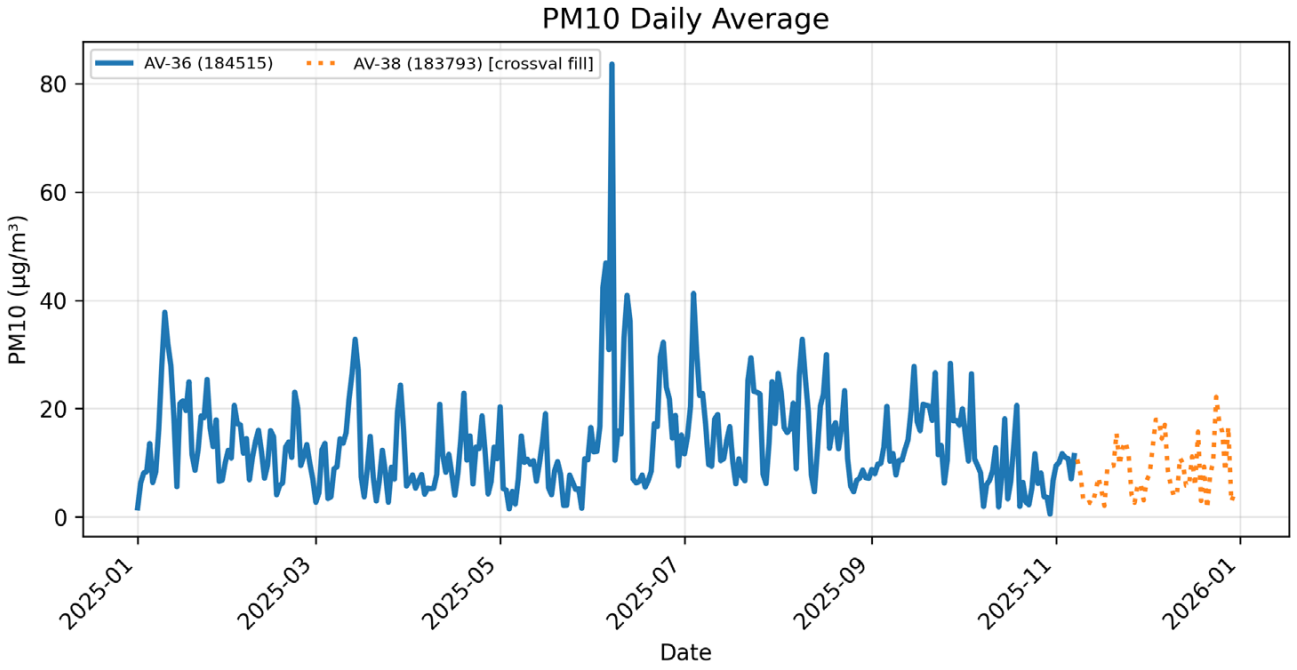


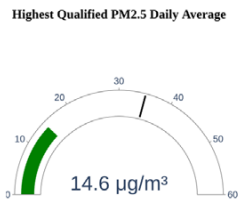


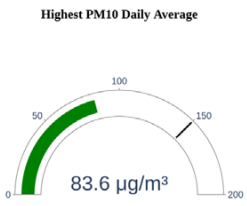


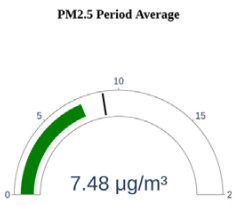
2025-01-01 to 2025-12-30 Report for Sensor 184515: AV-36, Kanawha_County, WV

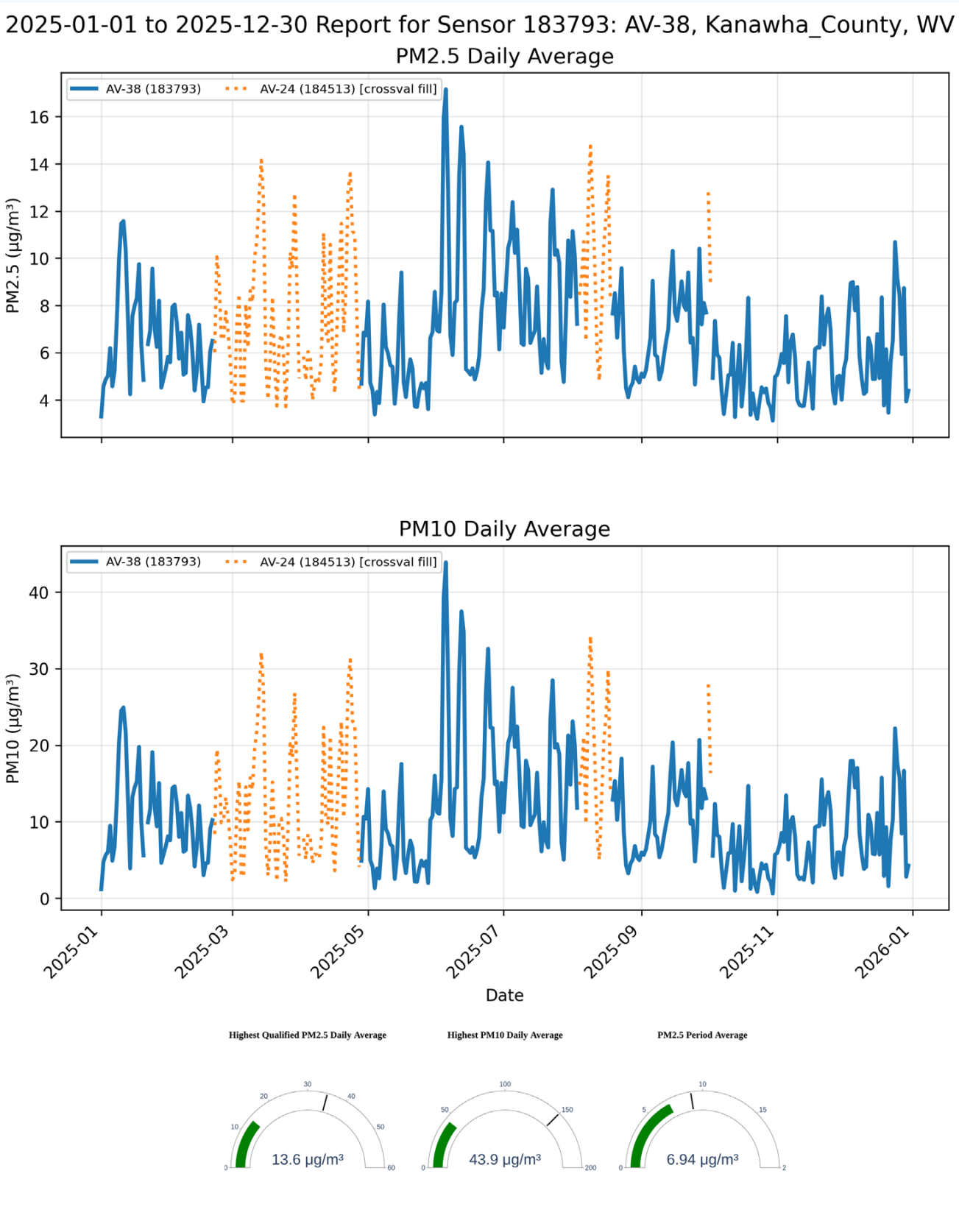




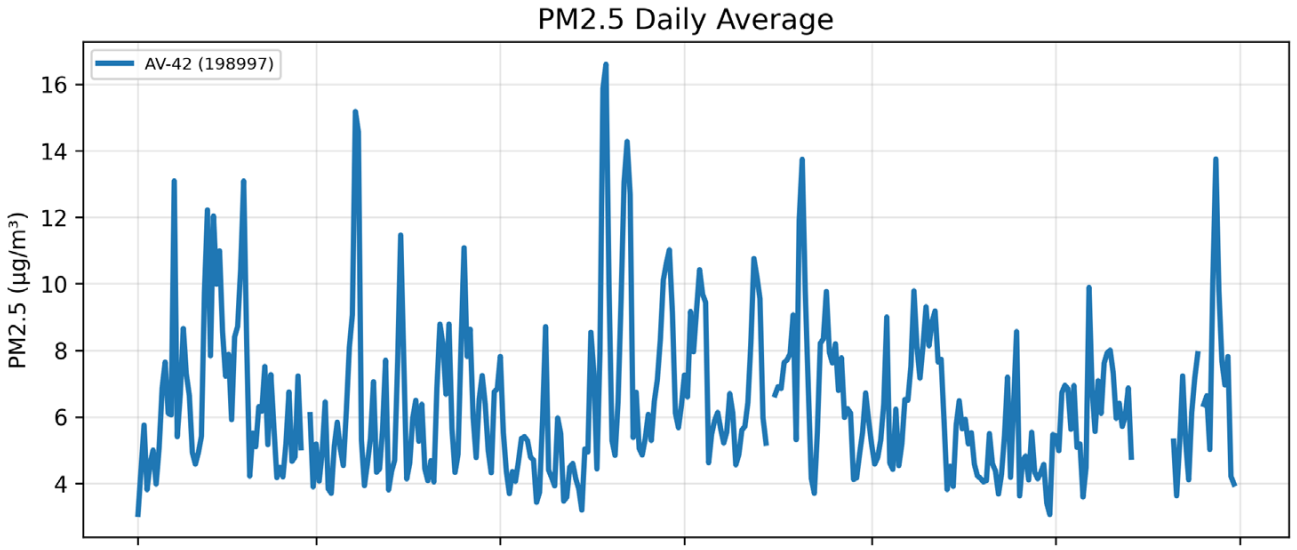


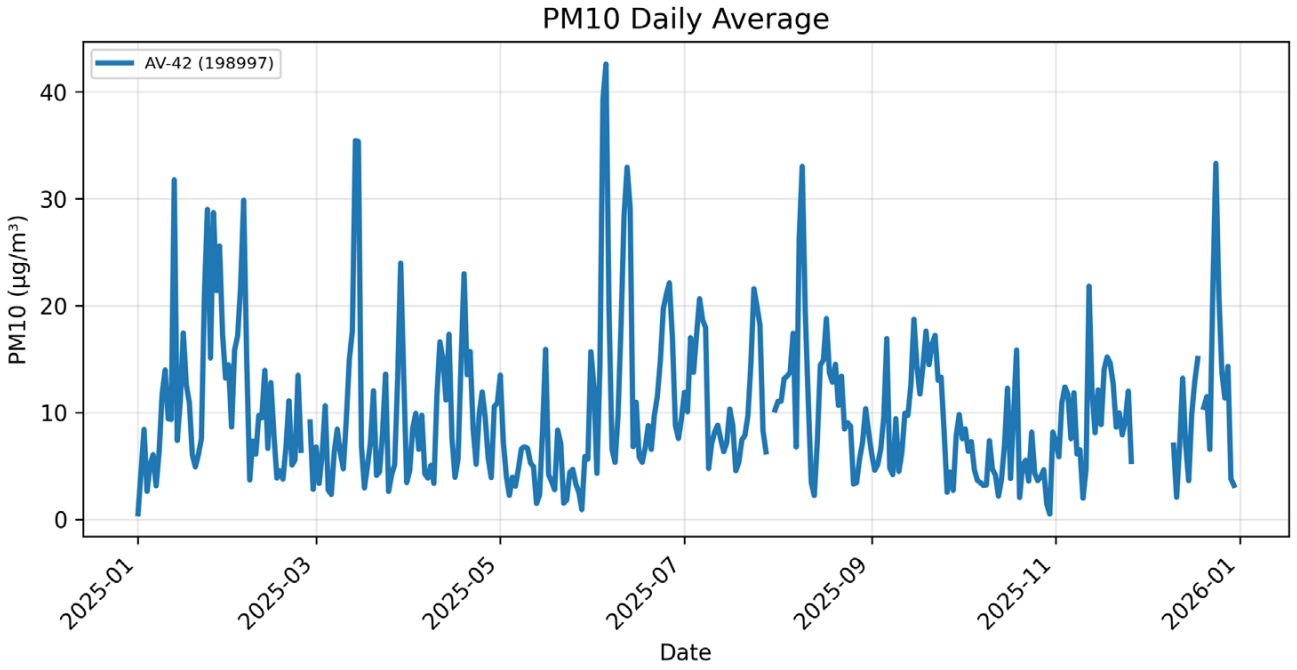


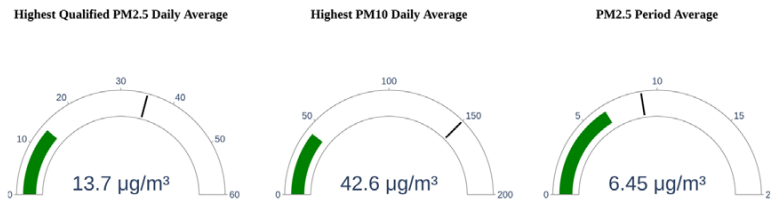



2025-01-01 to 2025-12-30 Report for Sensor 183793: AV-38, Kanawha_County, WV
PM2.5 Daily Average
AV-38 (183793)
AV-24 (184513) [crossval fill]
PM2.5 (µg/m³)
PM10 Daily Average
PM10 (µg/m³)
Date
2025-01
2025-03
2025-05
2025-07
2025-09
2025-11
2026-01
Highest Qualified PM2.5 Daily Average
13.6 µg/m³
Highest PM10 Daily Average
43.9 µg/m³
PM2.5 Period Average
6.94 µg/m³

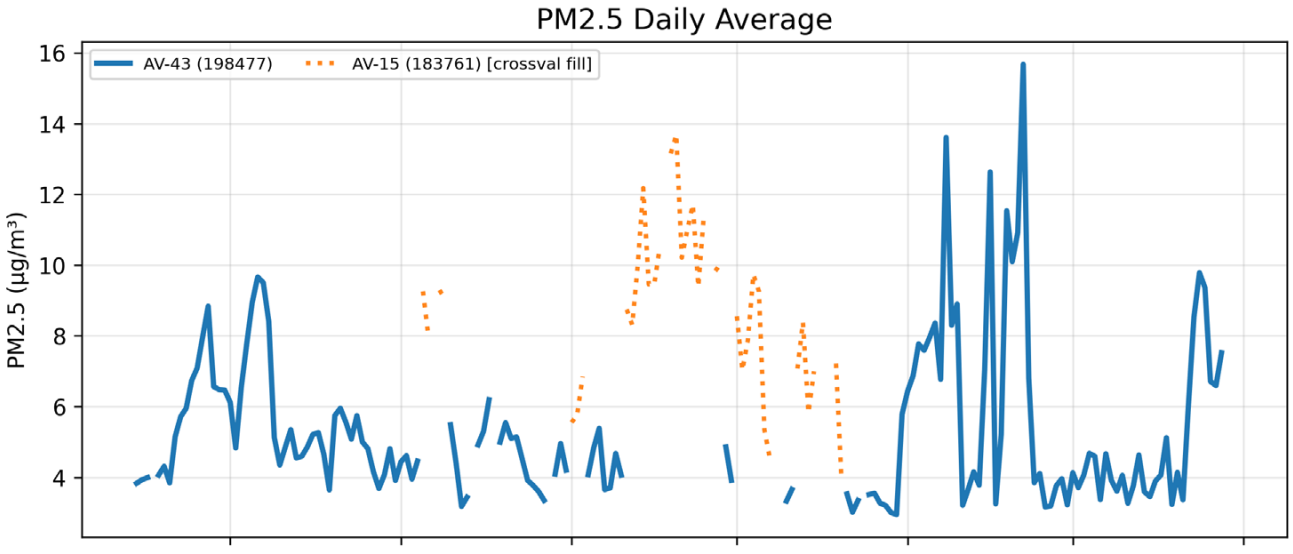
2025-01-01 to 2025-12-30 Report for Sensor 198997: AV-42, McDowell_County, WV

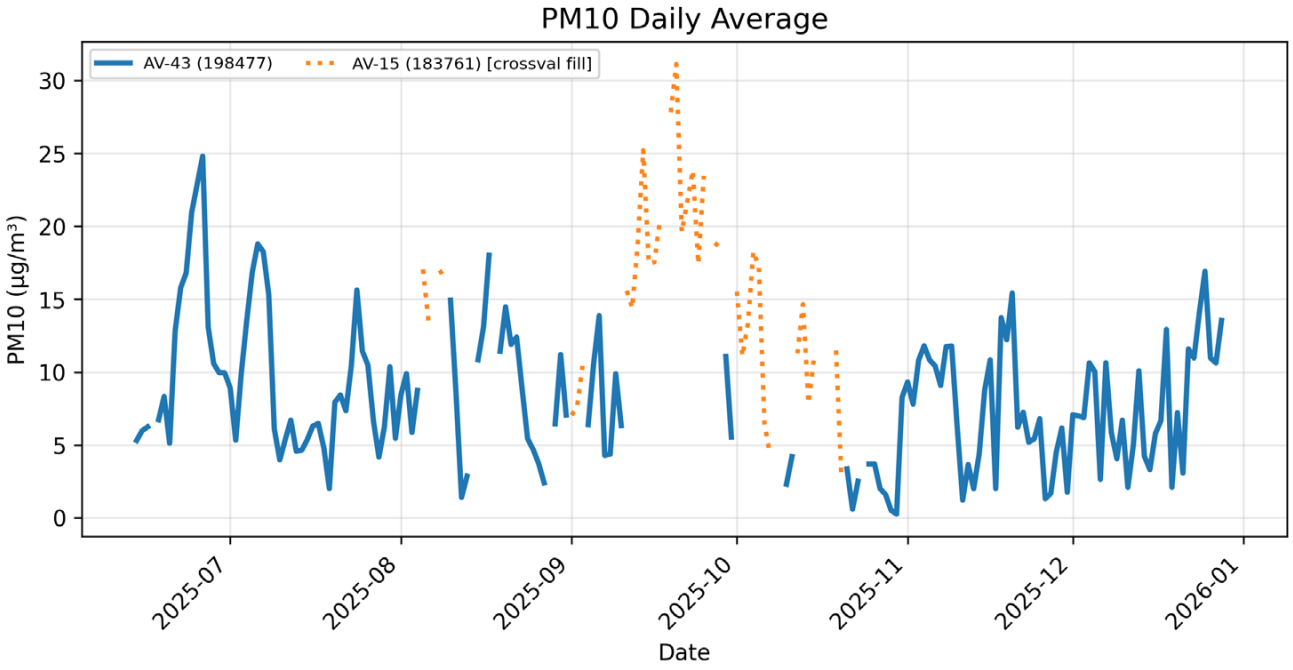


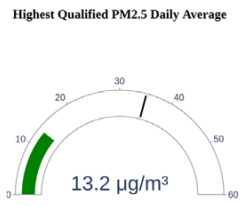


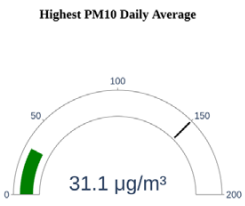


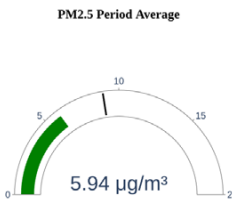
2025-01-01 to 2025-12-30 Report for Sensor 198477: AV-43, Raleigh County, WV



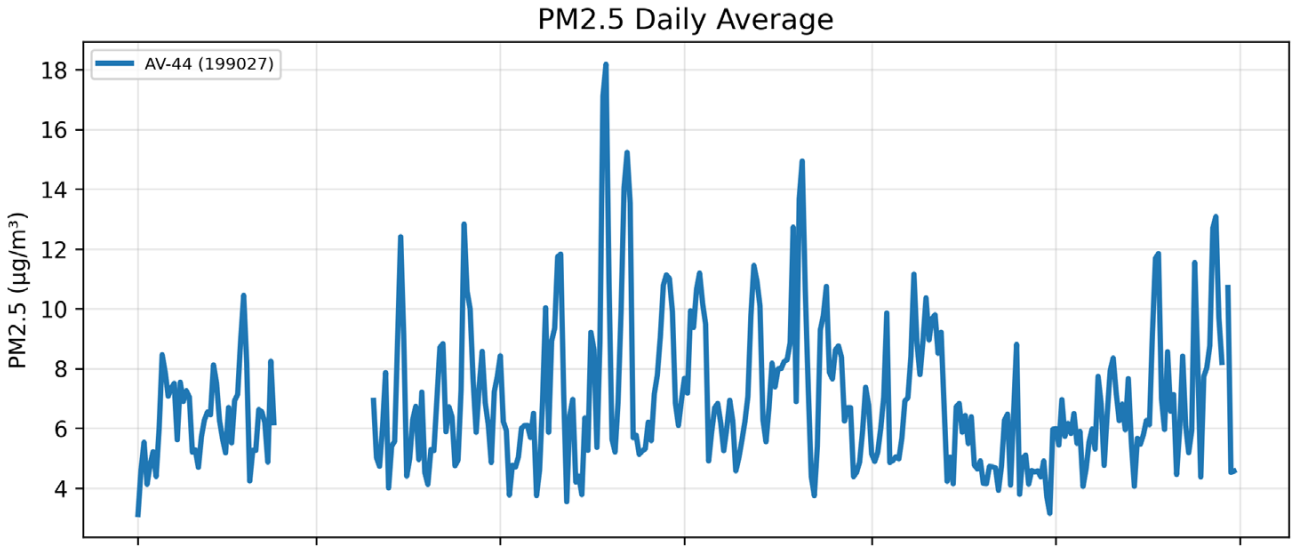


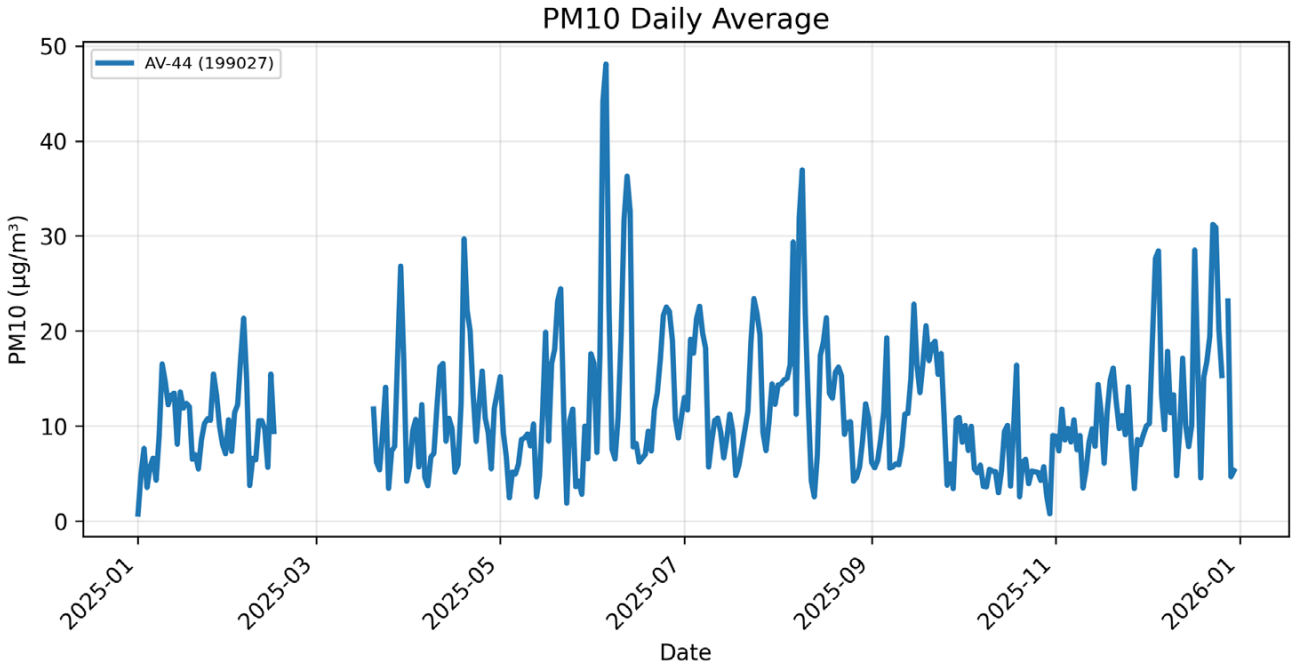


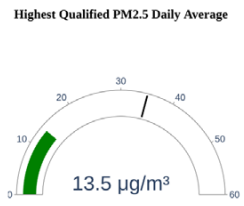


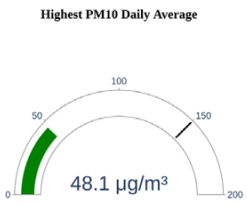


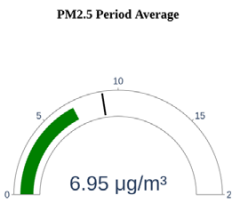
2025-01-01 to 2025-12-30 Report for Sensor 199027: AV-44, McDowell_County, WV





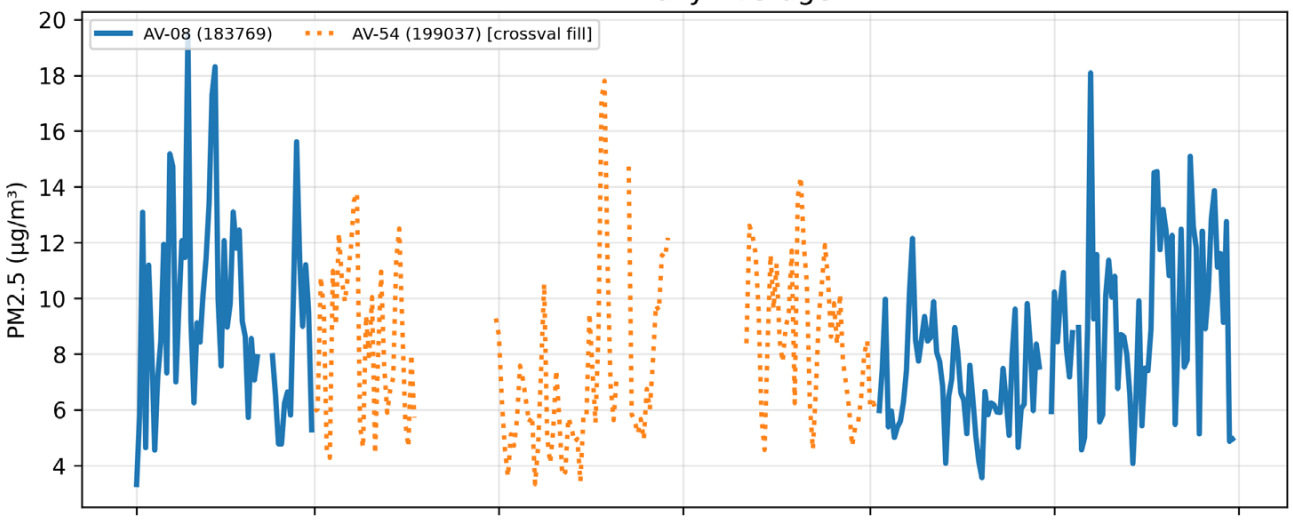




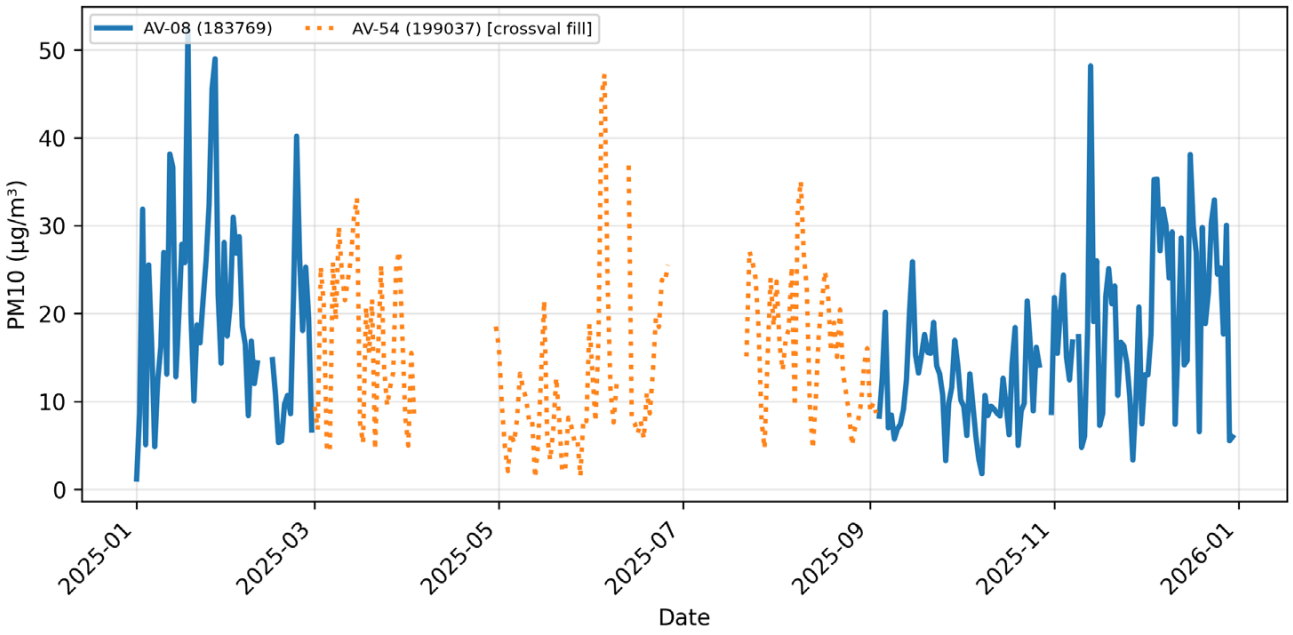


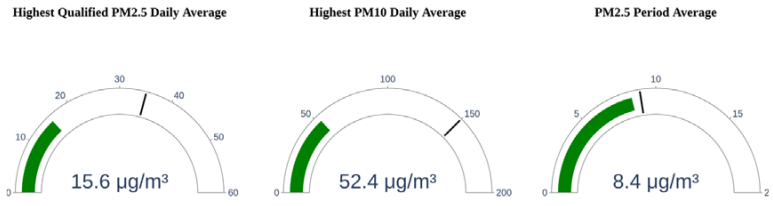
2025-01-01 to 2025-12-30 Report for Sensor 183769: AV-08, Raleigh_County, WV

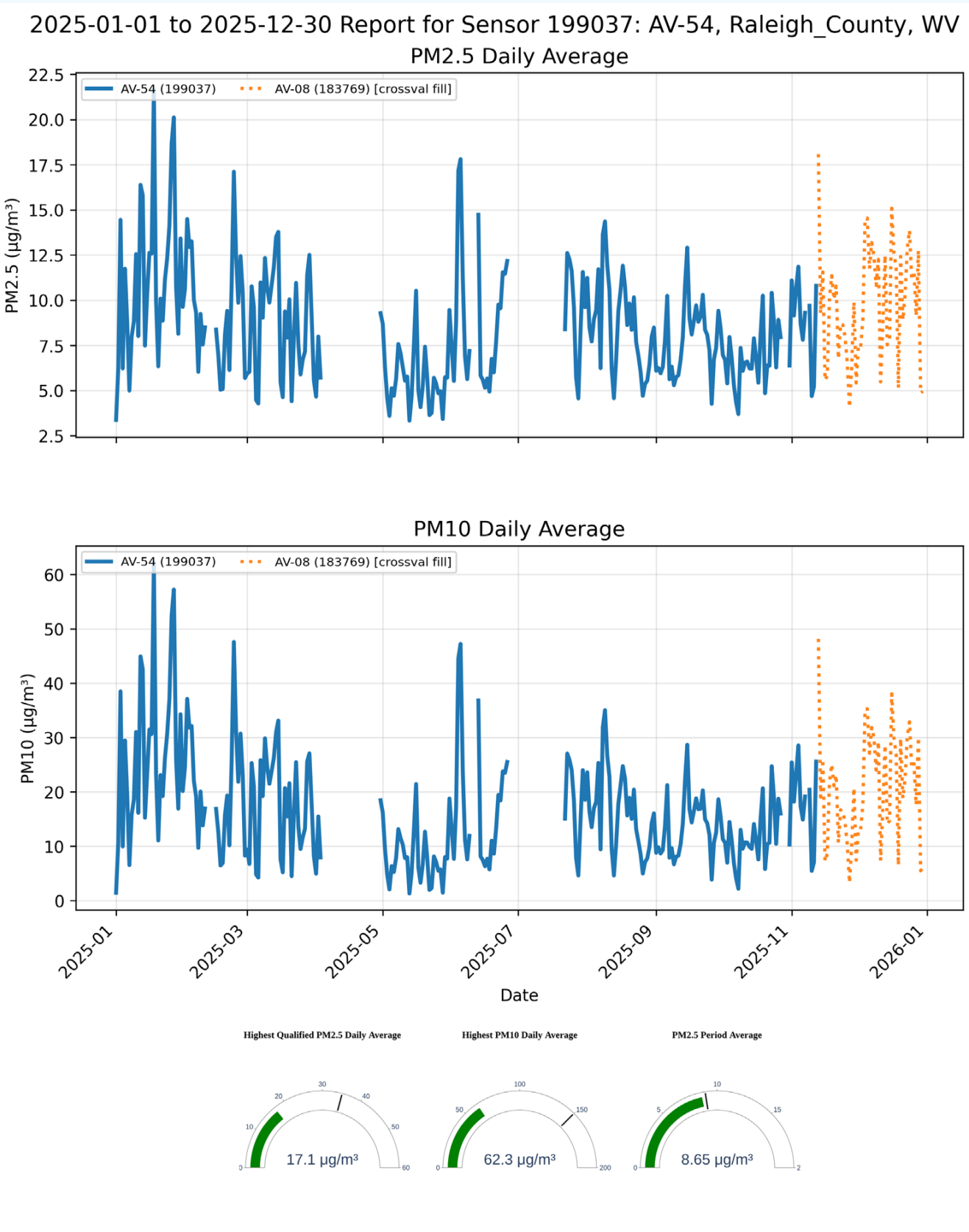
PM2.5 Daily Average

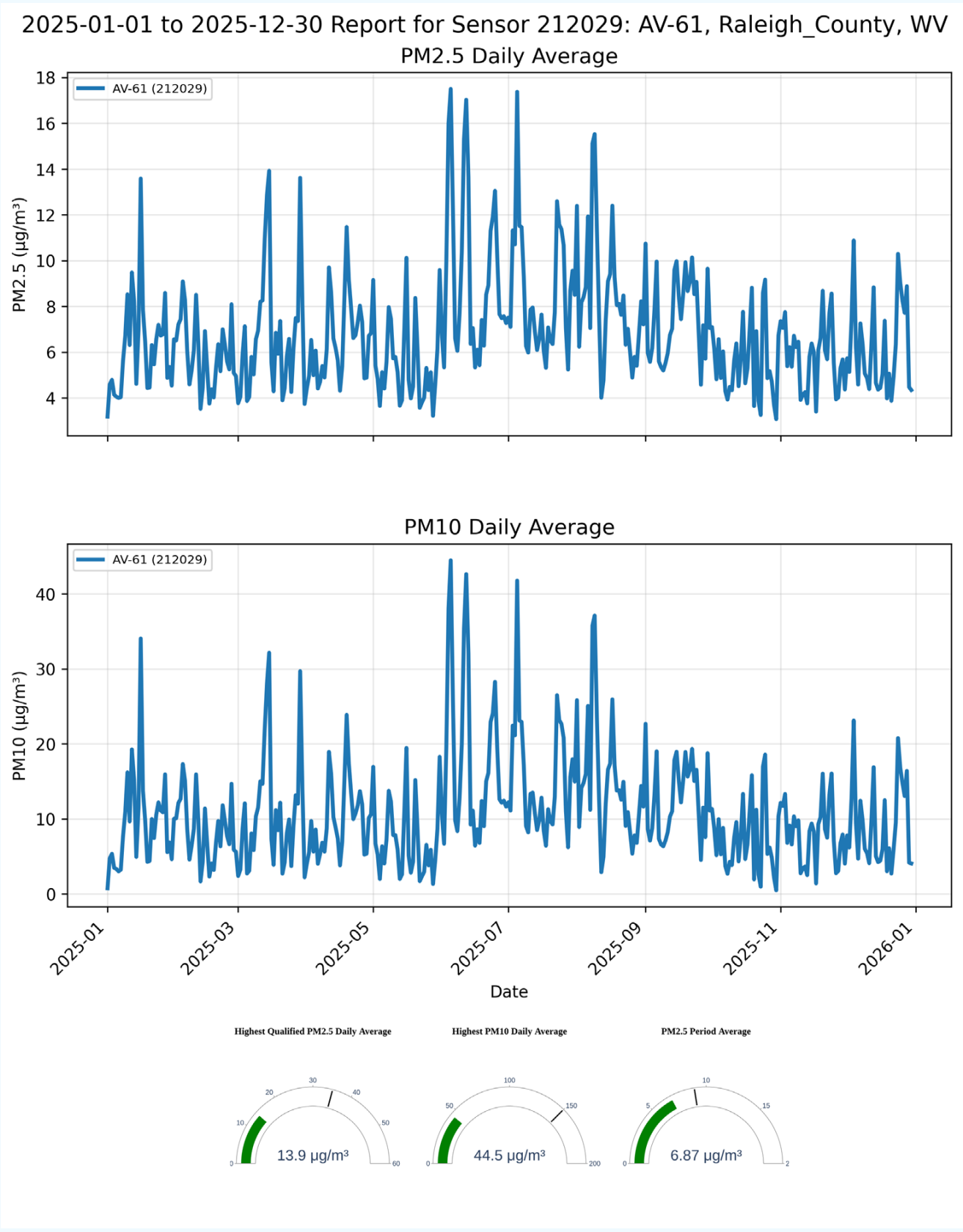


PM10 Daily Average



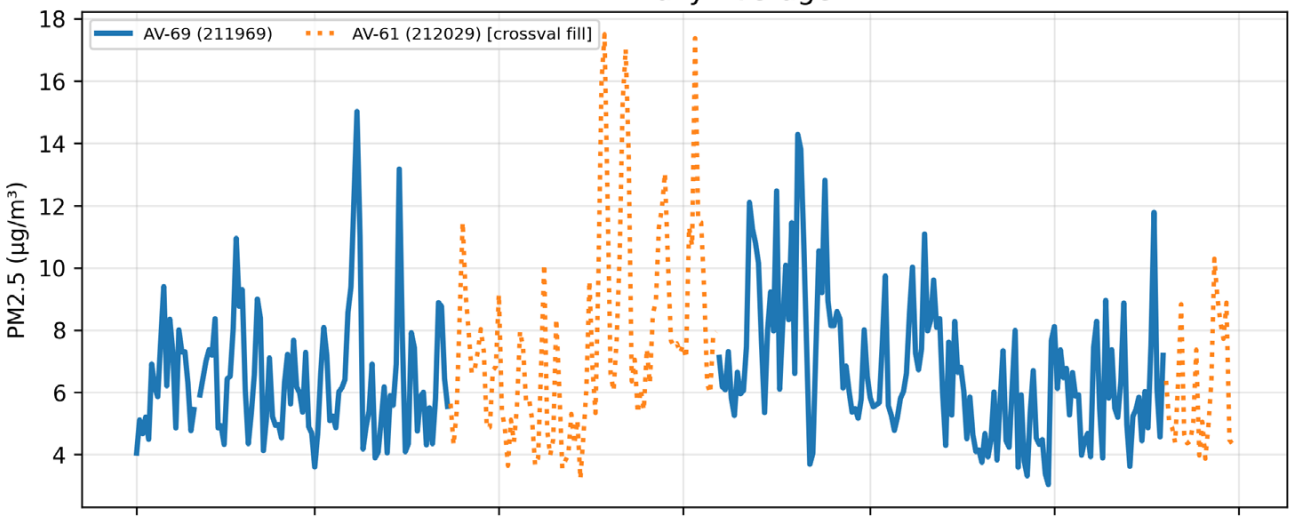



2025-01-01 to 2025-12-30 Report for Sensor 199037: AV-54, Raleigh_County, WV
PM2.5 Daily Average
AV-54 (199037)
AV-08 (183769) [crossval fill]
PM2.5 (µg/m³)
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
PM10 Daily Average
AV-54 (199037)
AV-08 (183769) [crossval fill]
PM10 (µg/m³)
60
50
40
30
20
10
0
2025-01
2025-03
2025-05
2025-07
2025-09
2025-11
2026-01
Date
Highest Qualified PM2.5 Daily Average
17.1 µg/m³
Highest PM10 Daily Average
62.3 µg/m³
PM2.5 Period Average
8.65 µg/m³

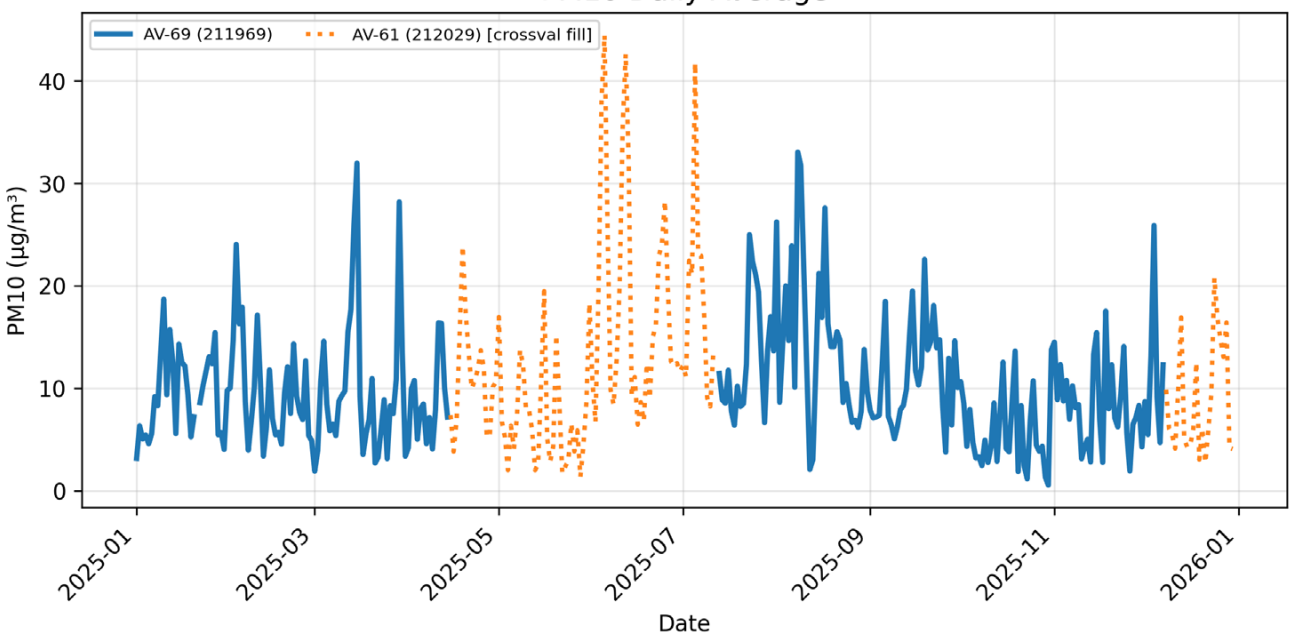

2025-01-01 to 2025-12-30 Report for Sensor 212029: AV-61, Raleigh_County, WV
PM2.5 Daily Average
AV-61 (212029)
PM2.5 (µg/m³)
PM10 Daily Average
AV-61 (212029)
PM10 (µg/m³)
2025-01
2025-03
2025-05
2025-07
2025-09
2025-11
2026-01
Date
Highest Qualified PM2.5 Daily Average
13.9 µg/m³
Highest PM10 Daily Average
44.5 µg/m³
PM2.5 Period Average
6.87 µg/m³

2025-01-01 to 2025-12-30 Report for Sensor 211969: AV-69, Raleigh County, WV

PM2.5 Daily Average

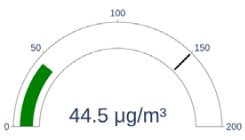


PM10 Daily Average



Highest Qualified PM2.5 Daily Average

Highest PM10 Daily Average



PM2.5 Period Average

The following monitors are either offline or received insufficient data to include in the annual report:

AV-01, sensor 183803 — Test monitor. No longer receiving data.

AV-02, sensor 183791 — Lee County, VA. Replaced.

AV-03, sensor 183807 — McDowell County, WV.

AV-06, sensor 183739 — Raleigh County, WV.

AV-07, sensor 183755 — Naoma, Raleigh County, WV — No data. Removed.

AV-11, sensor 183781 — Lackawanna County, PA.

AV-13, sensor 183777 — Kenton County, KY.

AV-17, sensor 183799 — Wise County, VA — Insufficient data.

AV-18, sensor 183753 — UVA Wise, Wise County VA — Removed. Replaced by AV-25.

AV-19, sensor 184351 — Wise County, VA.

AV-20, sensor 183741 — McDowell County, WV.

AV-21, sensor 183779 — McDowell County, WV.

AV-22, sensor 184511 — Clark County, KY.

AV-23, sensor 184345 — Campbell County, TN.

AV-28

AV-31, sensor 184567 — Pittsylvania County, VA.

AV-33, sensor 184553

AV-37, sensor 183783

AV-41, sensor 198821 — McDowell County, WV.

AV-43, sensor 198477

AV-46, sensor 198999 — Norfolk, VA.

AV-48 — Permanently removed.

AV-50, sensor 196153 — Grundy County, TN.

AV-56, sensor 199033 — Buchanan County, VA.

AV-58

AV-66, sensor 211961 — Buchanan County, VA.

AV-67, sensor 301657 — VA

AV-68, sensor 211957 — Shelby_County, TN.

Appendix C

Wind Direction and Speed
vs
NOAA stationary source

WIND SPEED AND DIRECTION COMPARISON: NOAA VS. RAMP MONITORS

TThis table summarizes the comparison between hourly wind speed and direction measurements from the NOAA weather station at Tri-Cities Airport in Blountville, Tennessee, and two RAMP monitors located in Bristol, Virginia, (1145) and Bristol, Tennessee (1144). Negative wind speed differences indicate that the RAMP monitors typically recorded lower wind speeds than the NOAA station, probably due to being on the ground versus at a tower. Both units showed a deviation in wind direction due to NOAA. This comparison is a part of our Quality Assurance protocol.

PMetric	NOAA/METAR	RAMP 1144	RAMP 1145
Mean WS (m/s)	2.08	0.33	0.43
Mean WS Diff (m/s)		-1.44	-1.76
Max WS Diff (m/s)		1.04	1.79
Min WS Diff (m/s)		-7.85	-9.19
Mean WD (°)	307.2	14.4	44.02
Mean WD Diff (°)		66.38	77.2
Max WD Diff (°)		179.63	179.78
Median WD Diff (°)		54.34	72.37

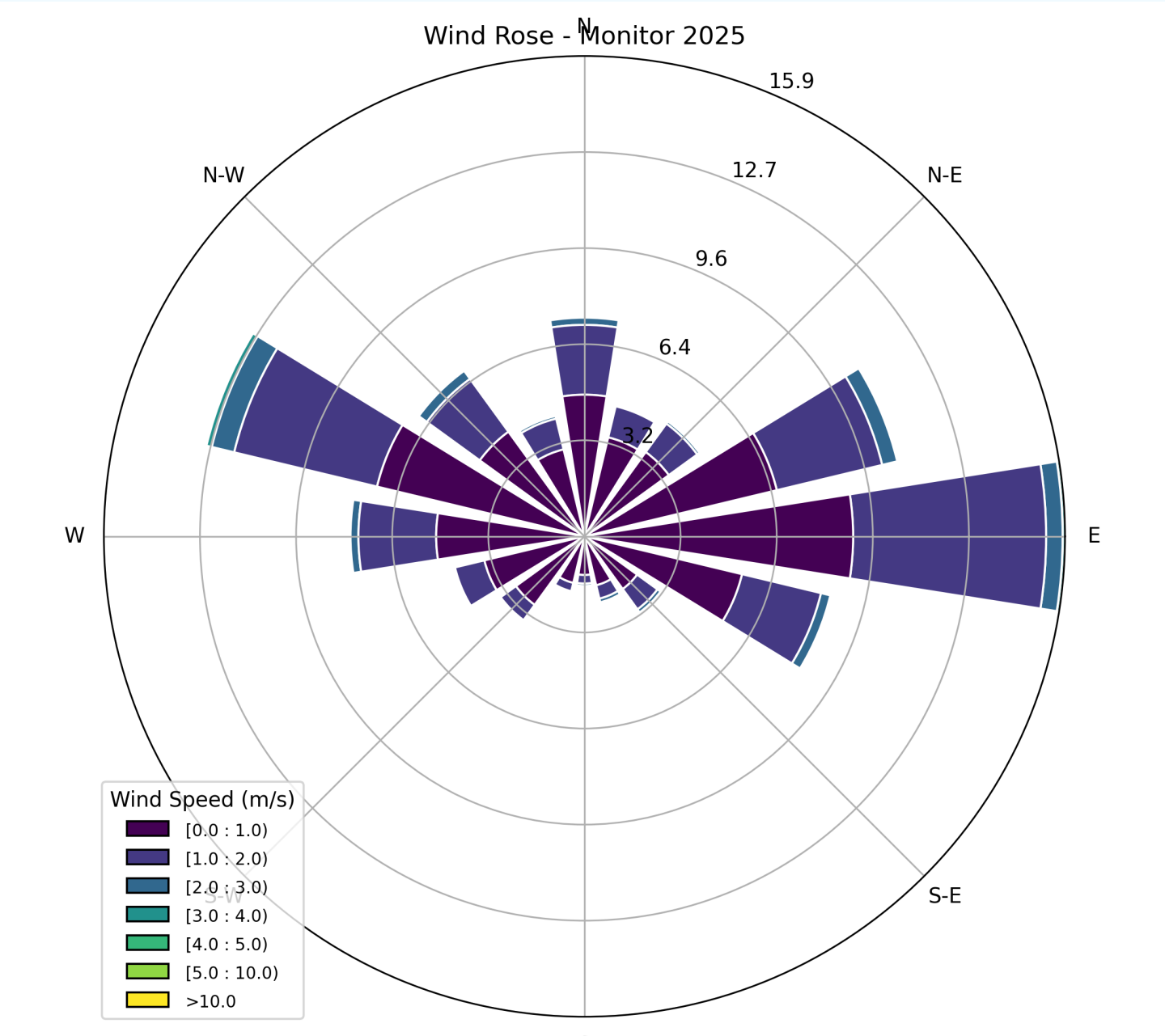
Appendix D

Wind Roses

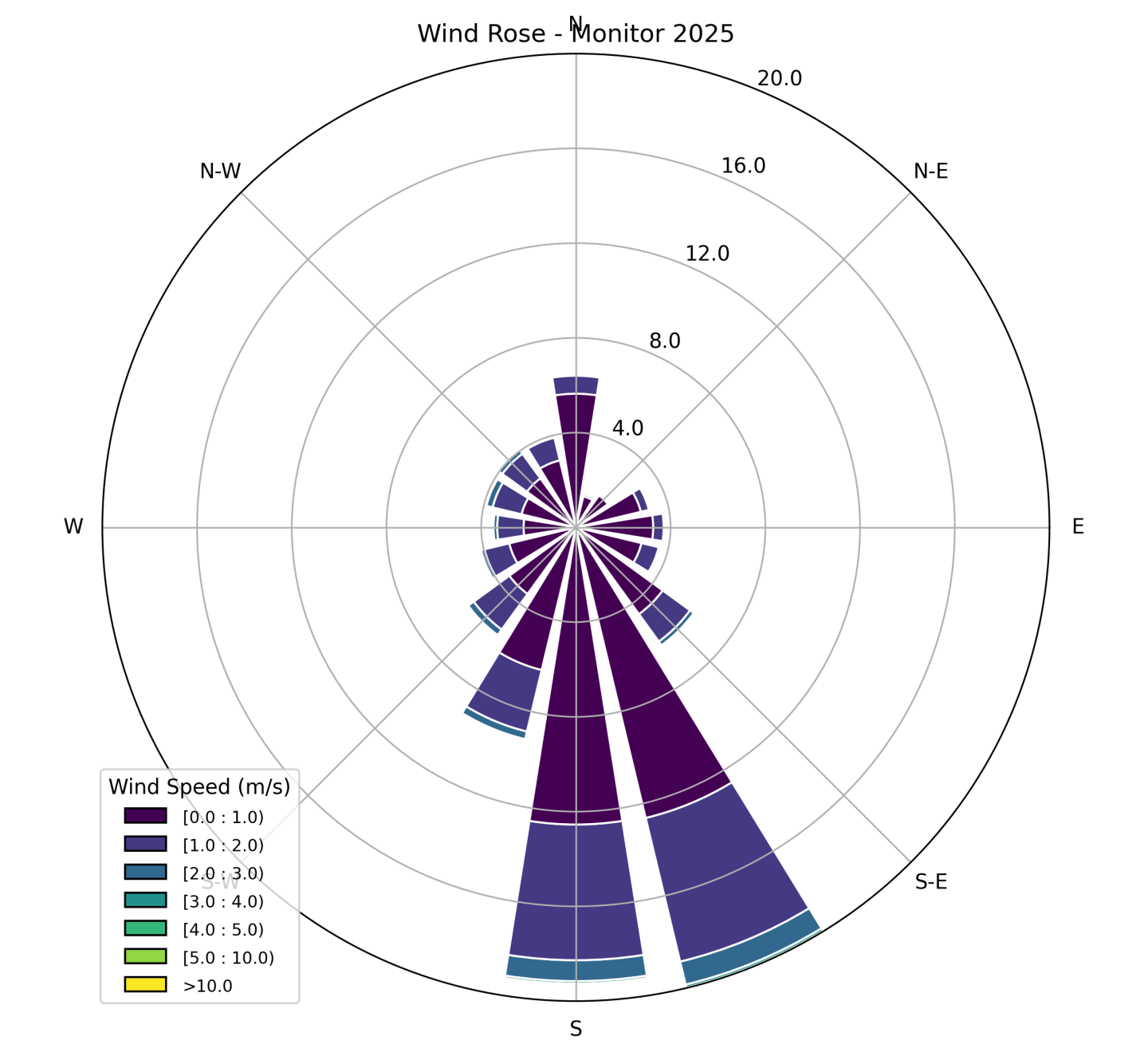
WIND ROSES

Wind roses visualize both direction and frequency of wind events, overlaid with pollutant concentrations. They help assess whether specific wind patterns coincide with higher exposures.

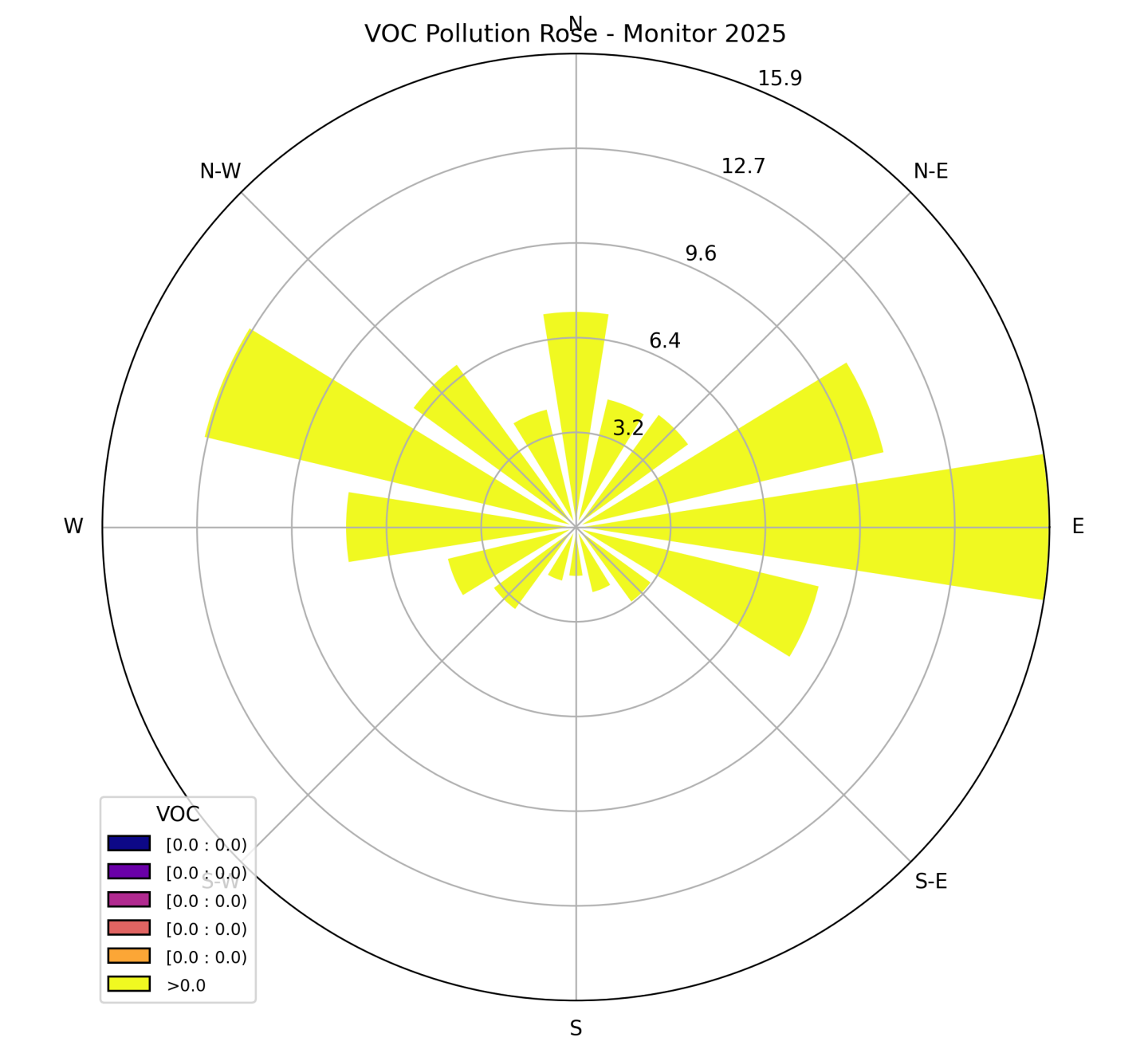
Wind Speed — Monitor 1144, 4Q 2025 (Units: mph)



Wind Speed — Monitor 1145, 4Q 2025 (Units: mph)

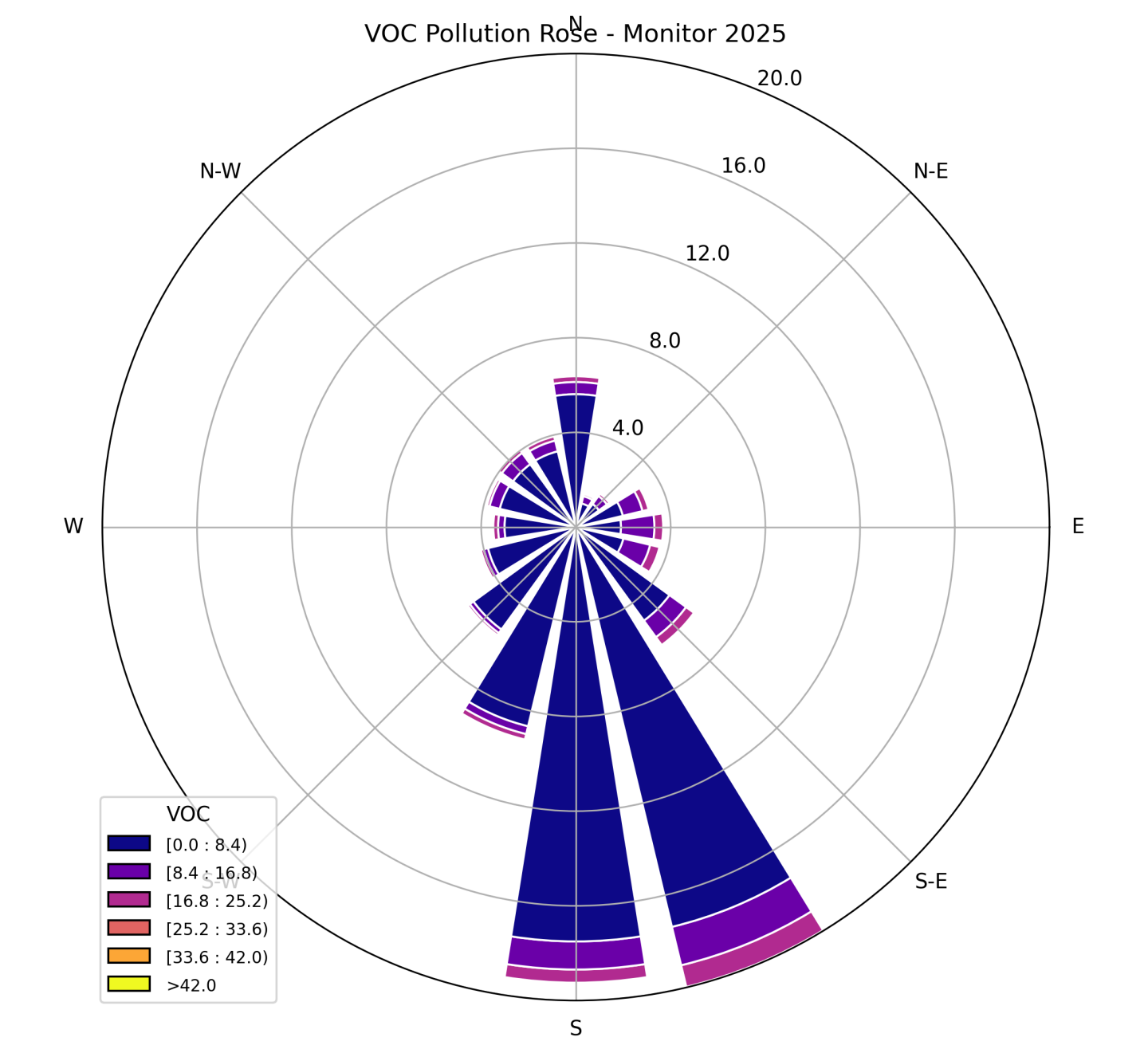


Volatile Organic Compounds — Monitor 1144, 4Q 2025 (Units: ppb)



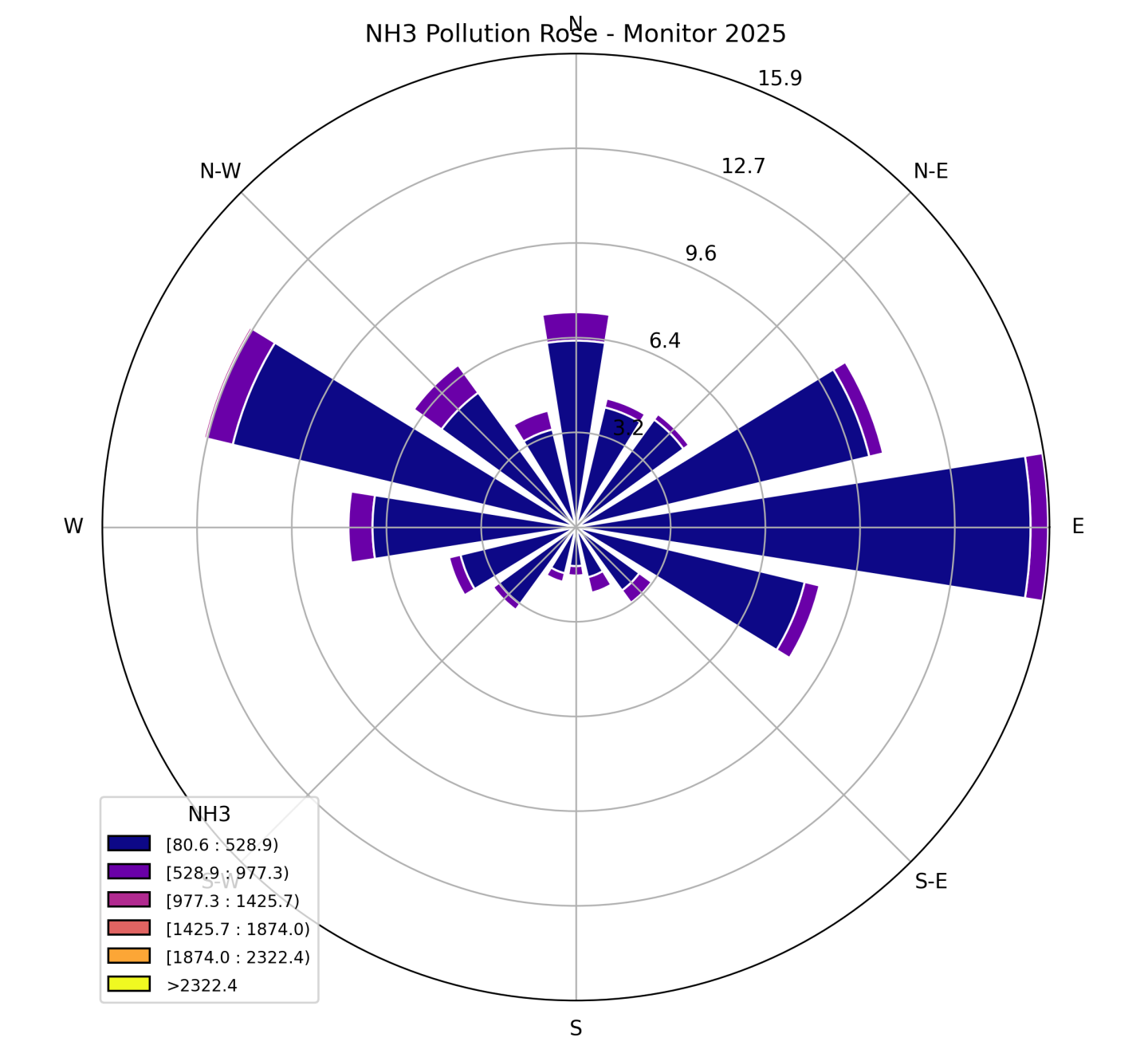
Note: Monitor 1144 sensor is failing to report VOC data. The sensor is being replaced

Volatile Organic Compounds — Monitor 1145, 4Q 2025 (Units: ppb)

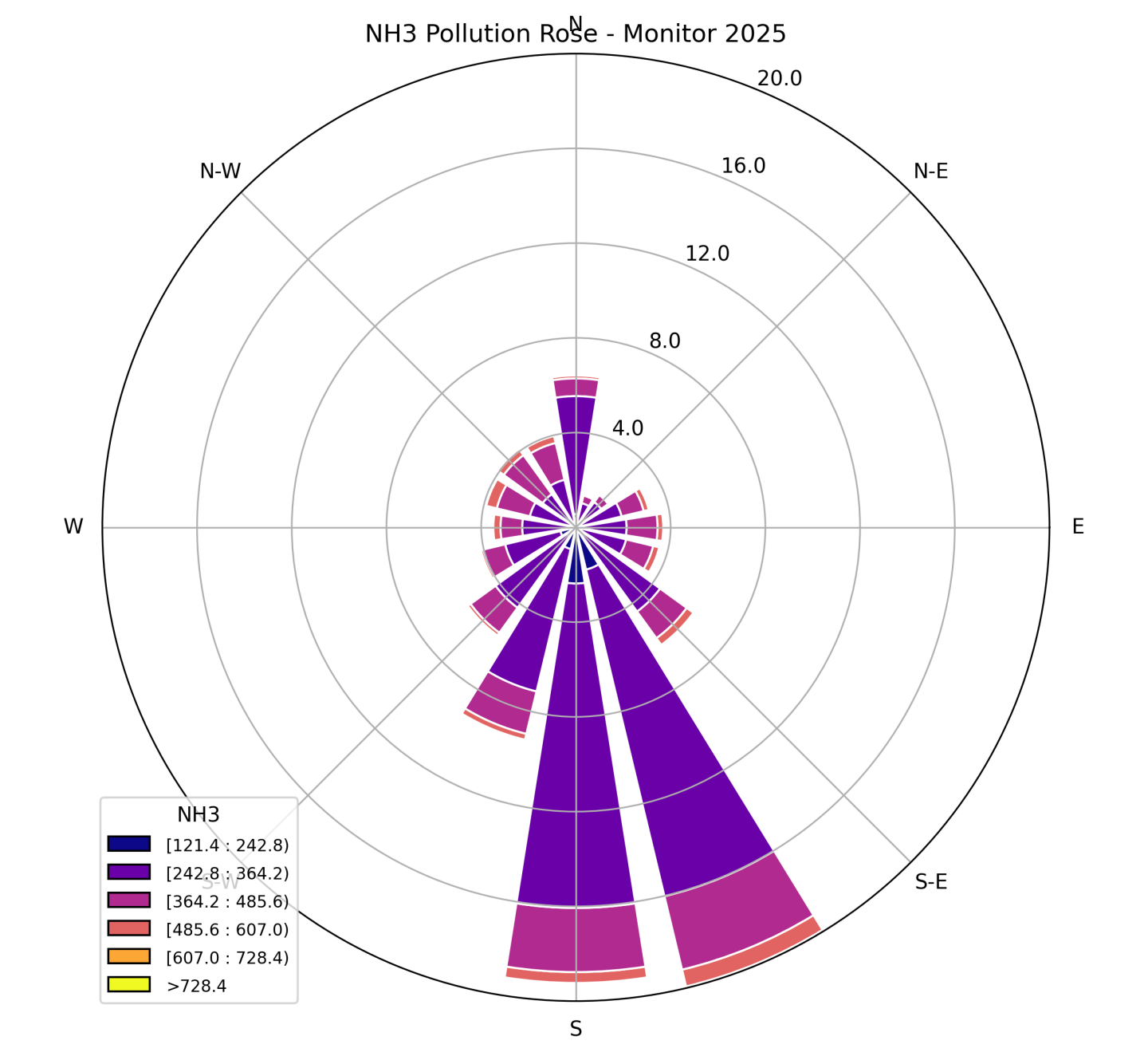


Note: Monitor 1145 sensor is failing to report VOC data. The sensor is being replaced

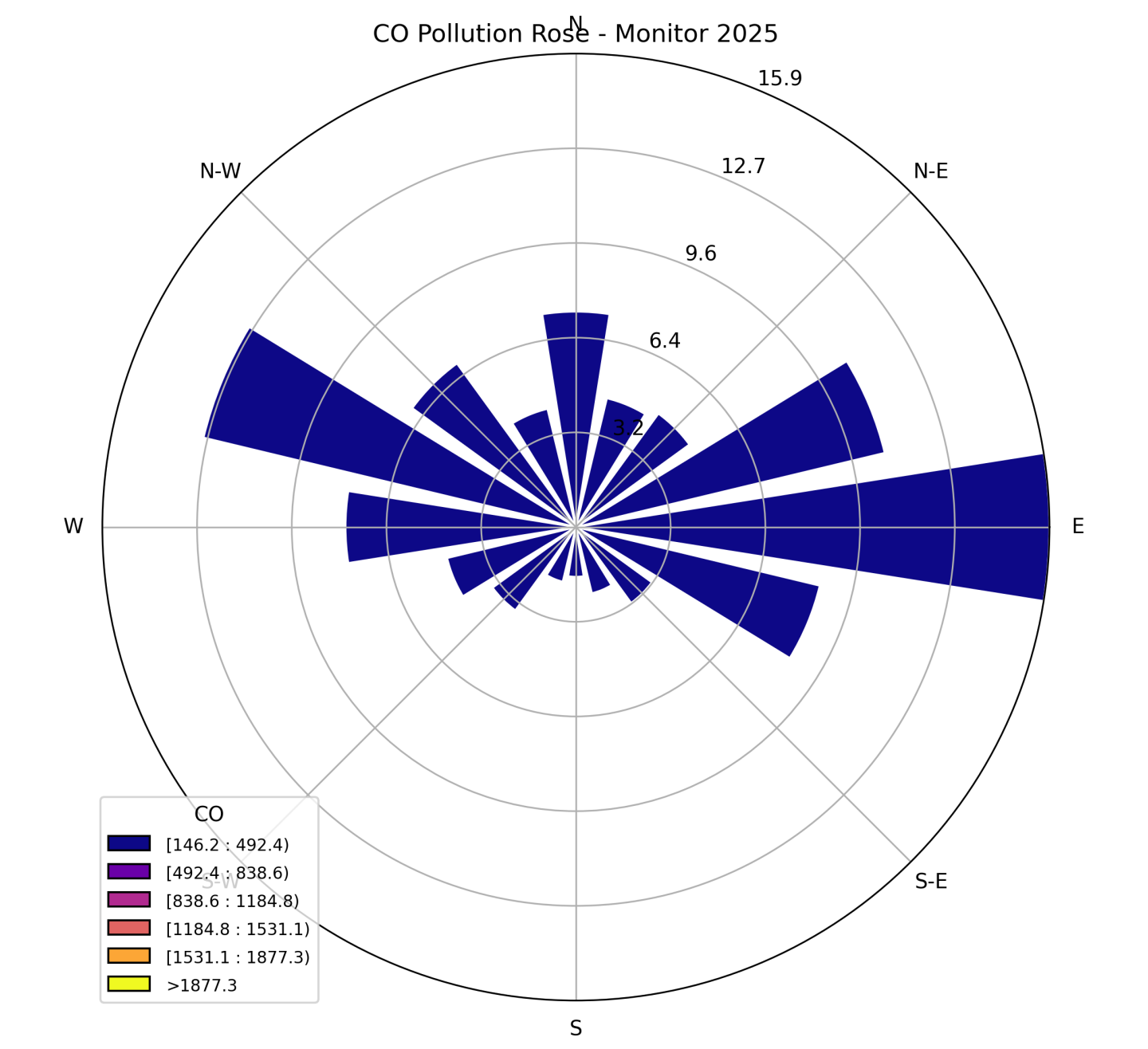
Ammonia — Monitor 1144, 4Q 2025 (Units: ppb)



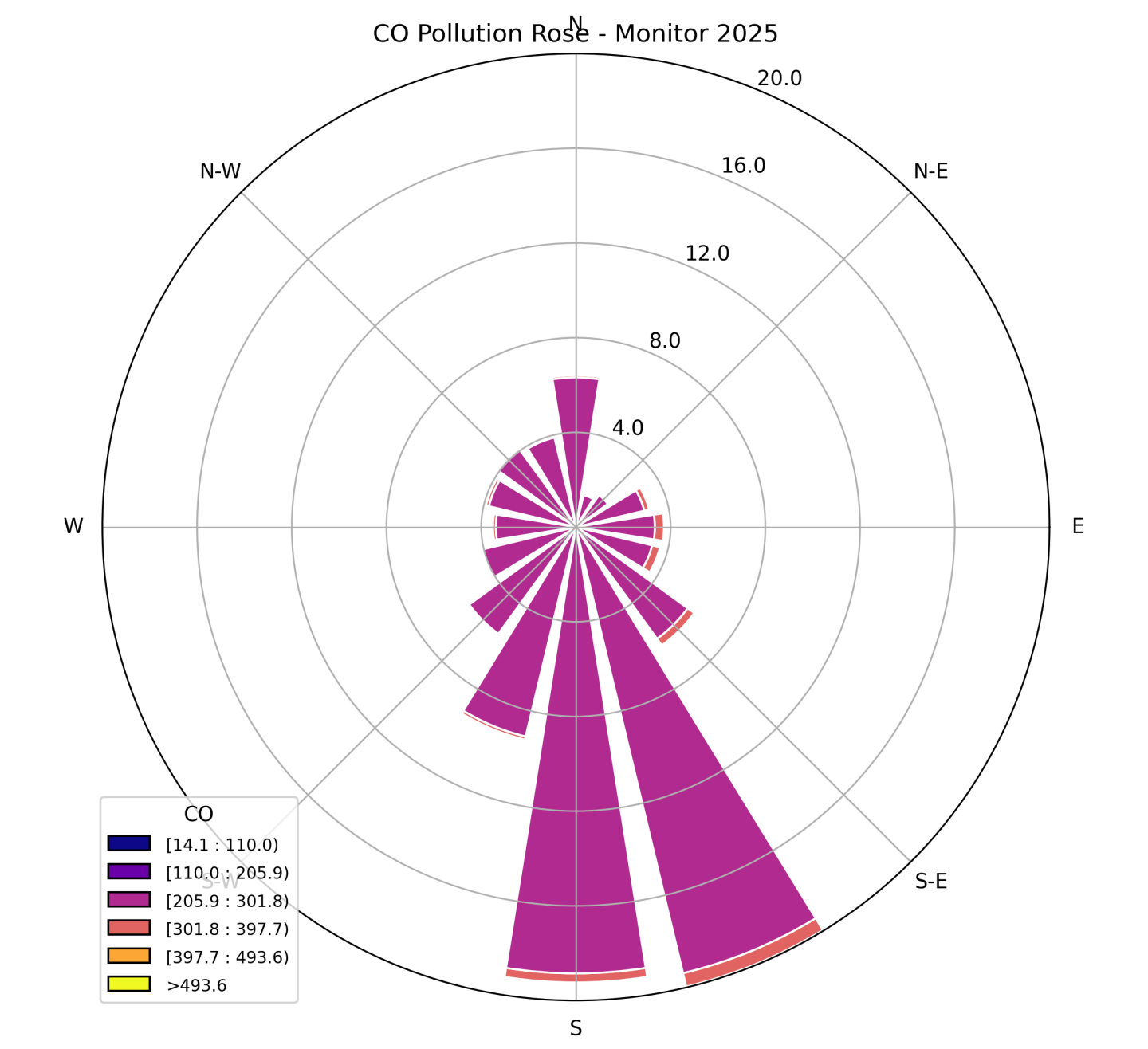
Ammonia — Monitor 1145, 4Q 2025 (Units: ppb)



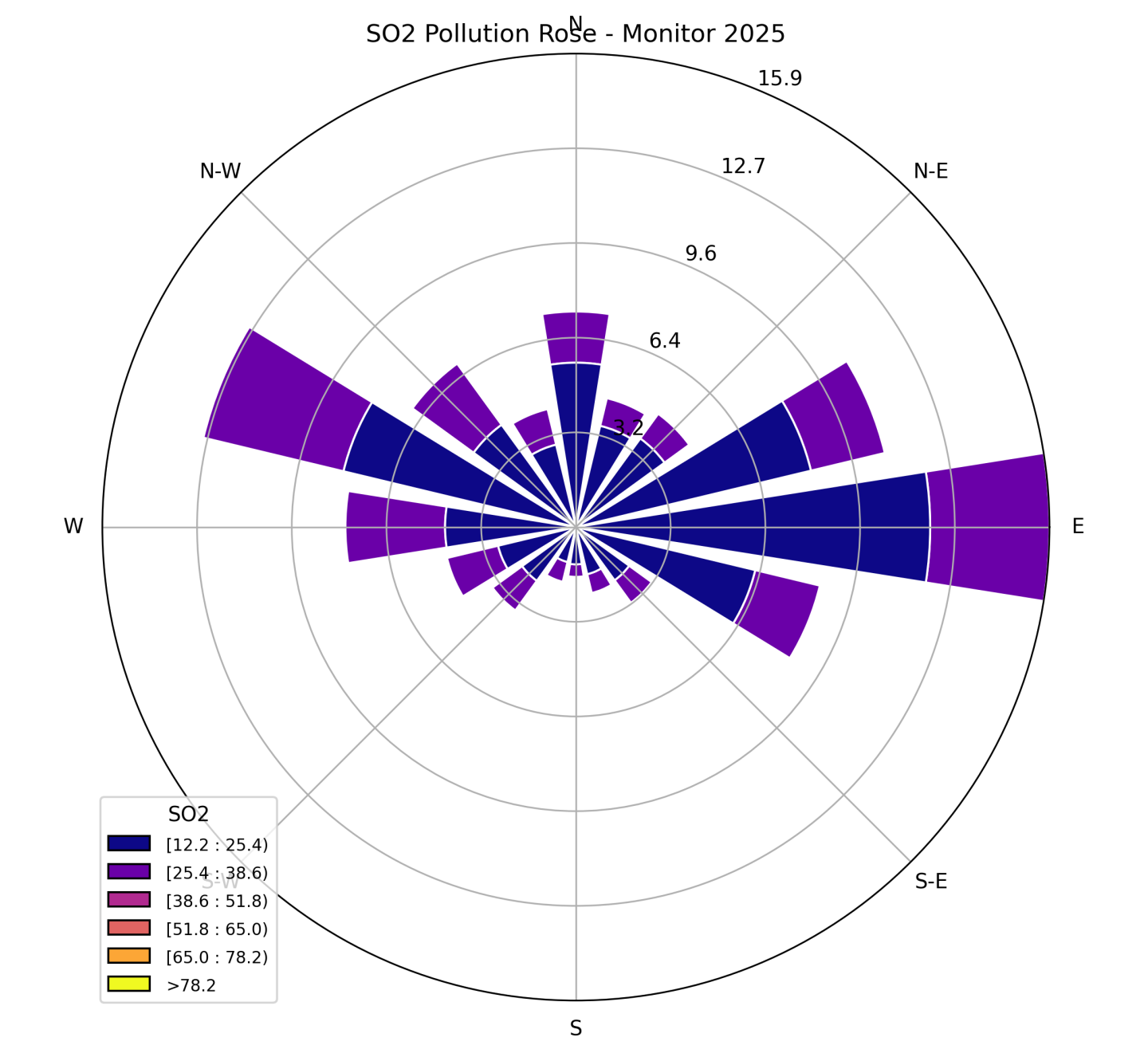
Carbon Monoxide — Monitor 1144, 4Q 2025 (Units: ppb)



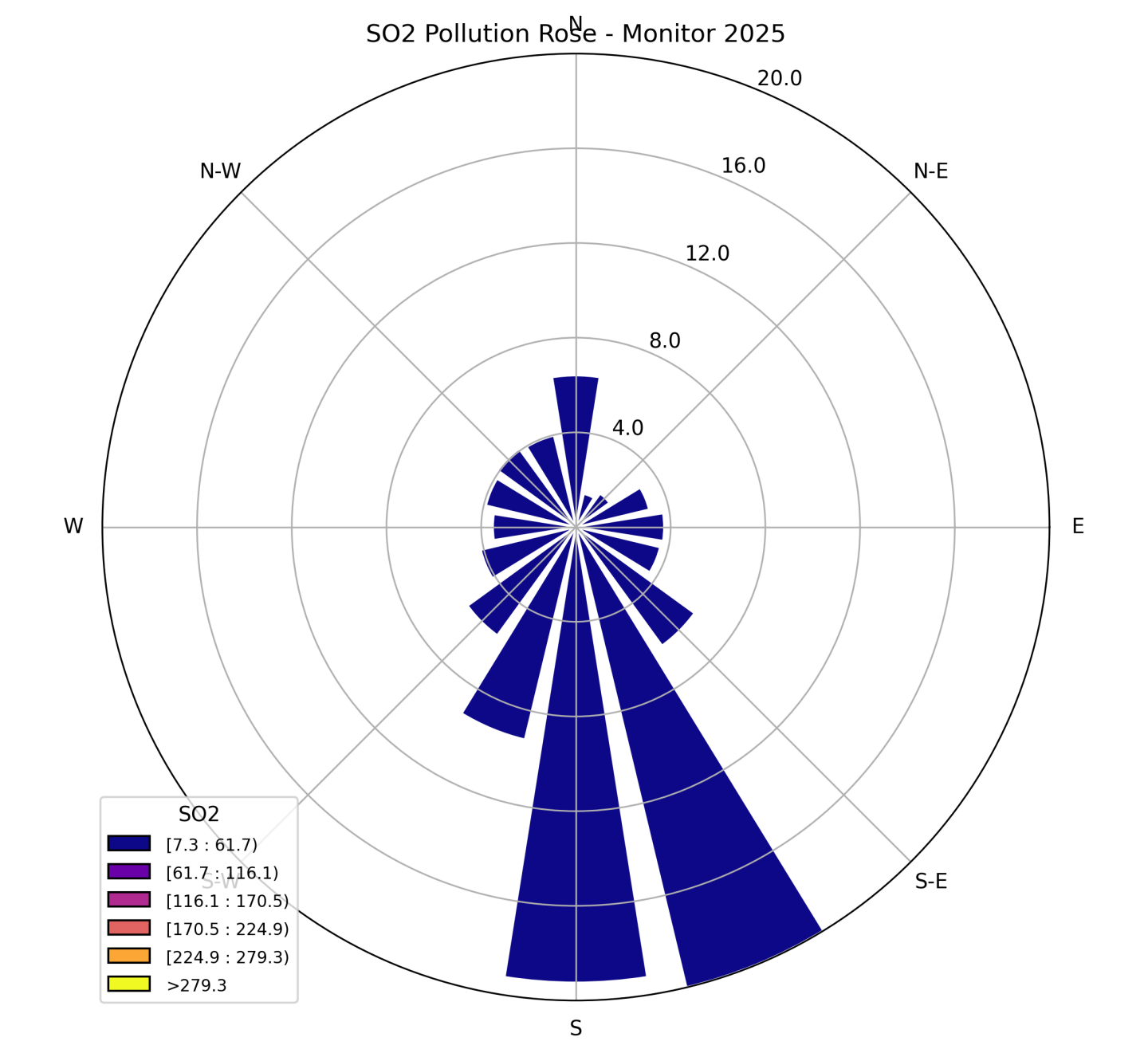
Carbon Monoxide — Monitor 1145, 4Q 2025 (Units: ppb)



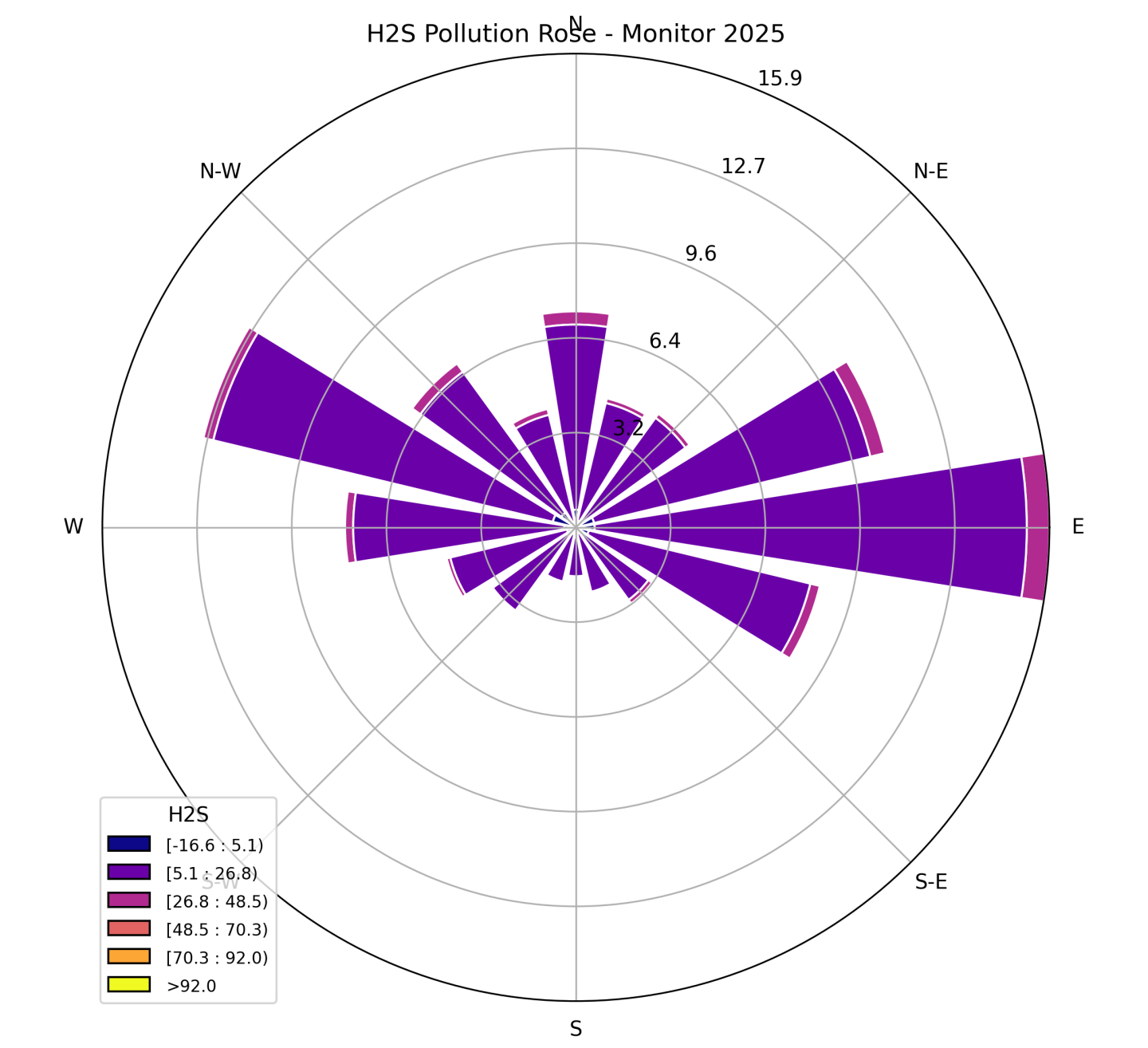
Sulfur Dioxide — Monitor 1144, 4Q 2025 (Units: ppb)



Sulfur Dioxide — Monitor 1145, 4Q 2025 (Units: ppb)



Hydrogen Sulfide — Monitor 1144, 4Q 2025 (Units: ppb)



Hydrogen Sulfide — Monitor 1145, 4Q 2025 (Units: ppb)