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How Temporary Air Monitors Can Help Your Facility

Conference on the Environment

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Content

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Monitors in Minnesota

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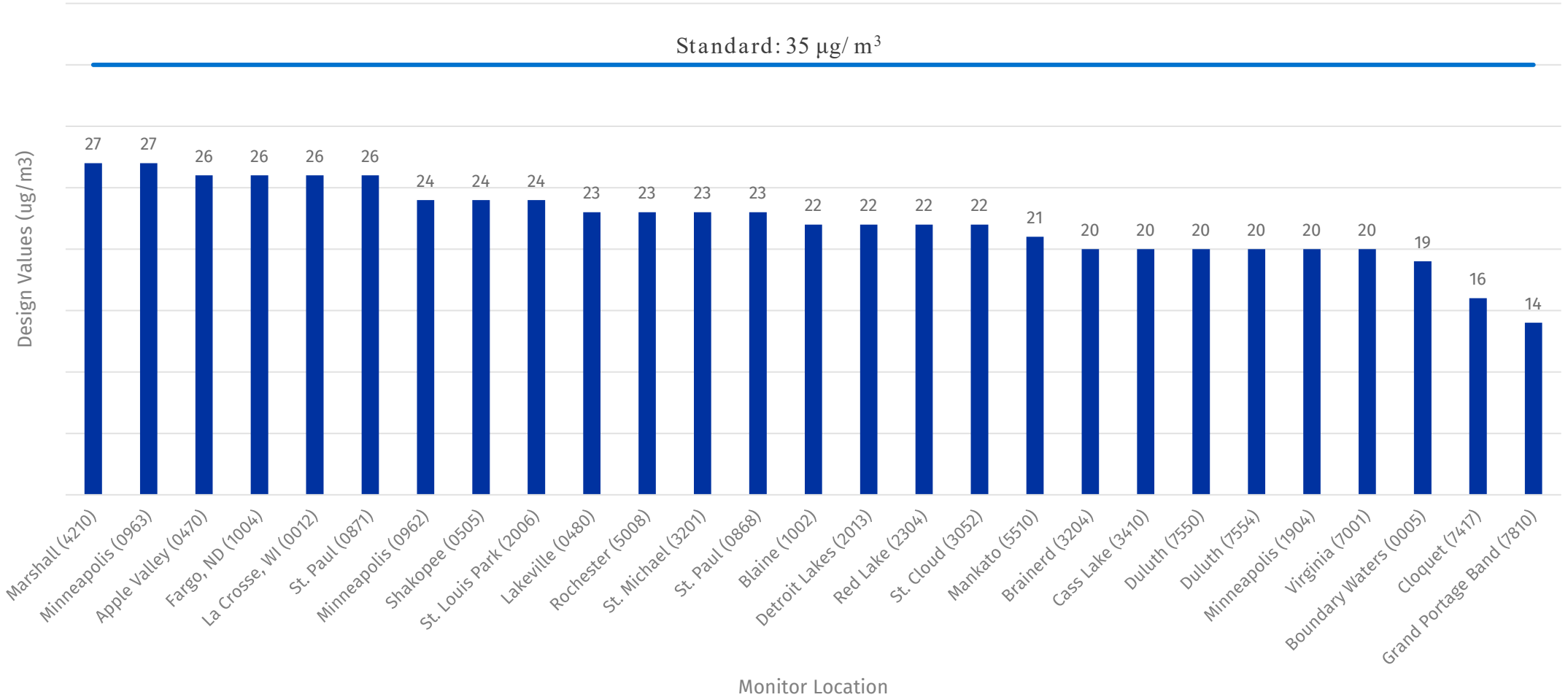
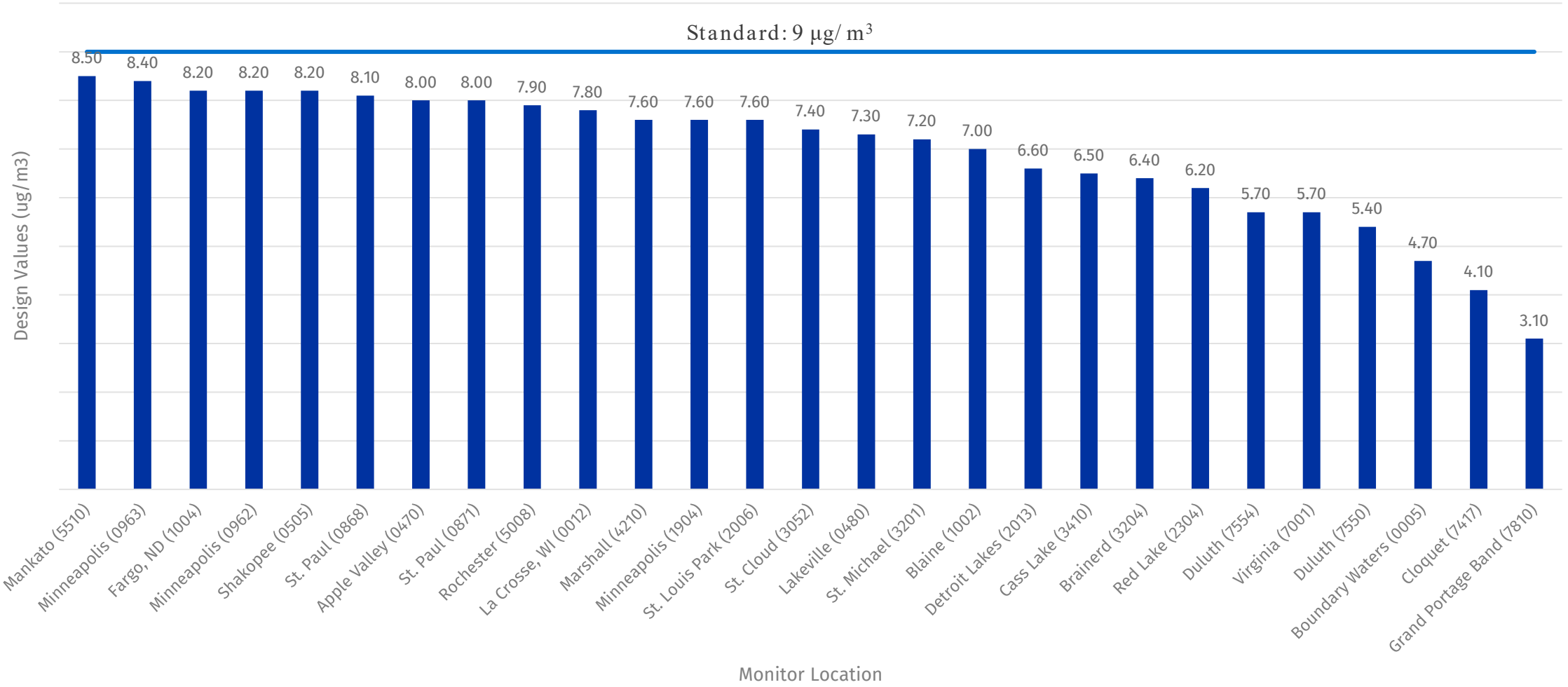
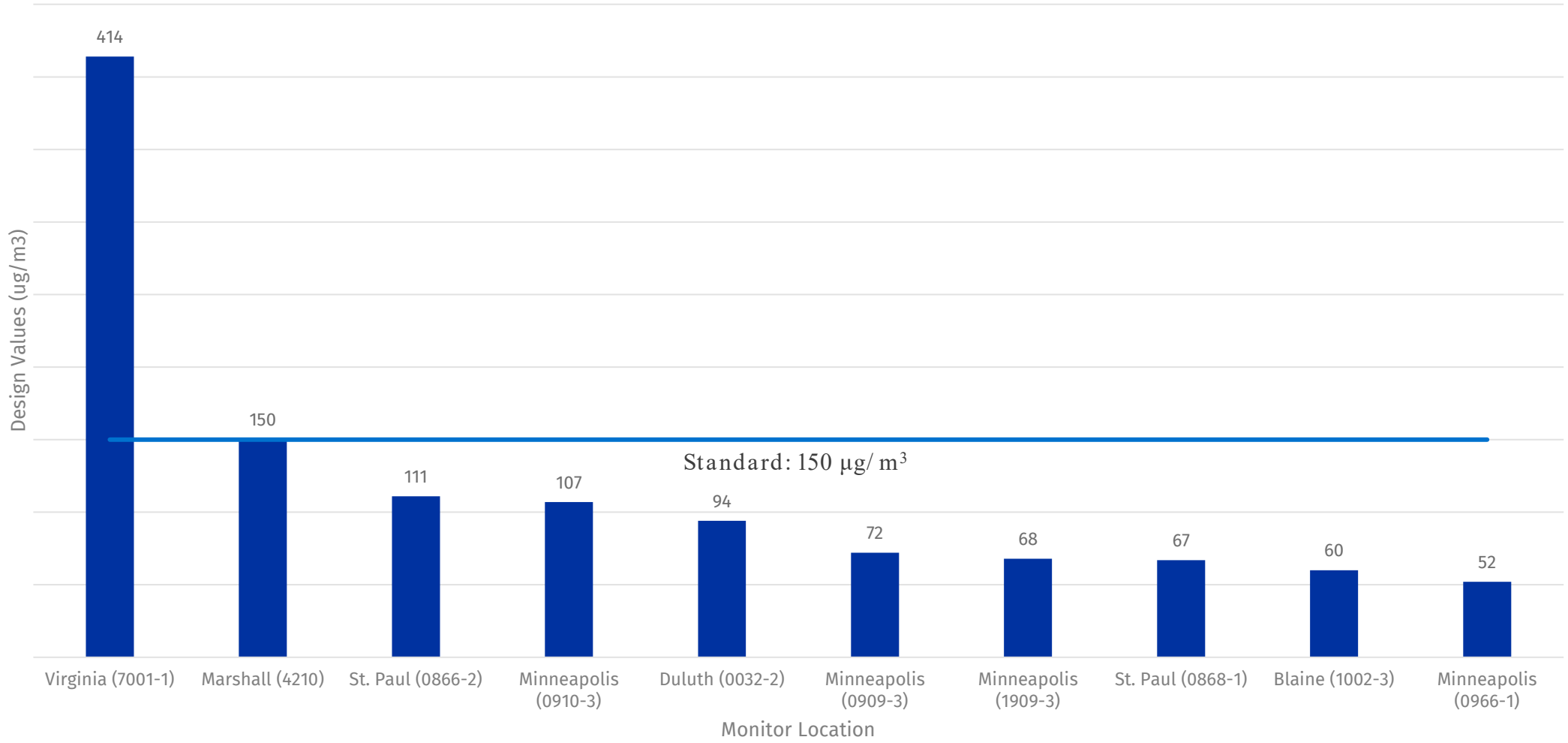
$PM_{2.5}$ 24-hr Design Values



$PM_{2.5}$ Annual Design Values

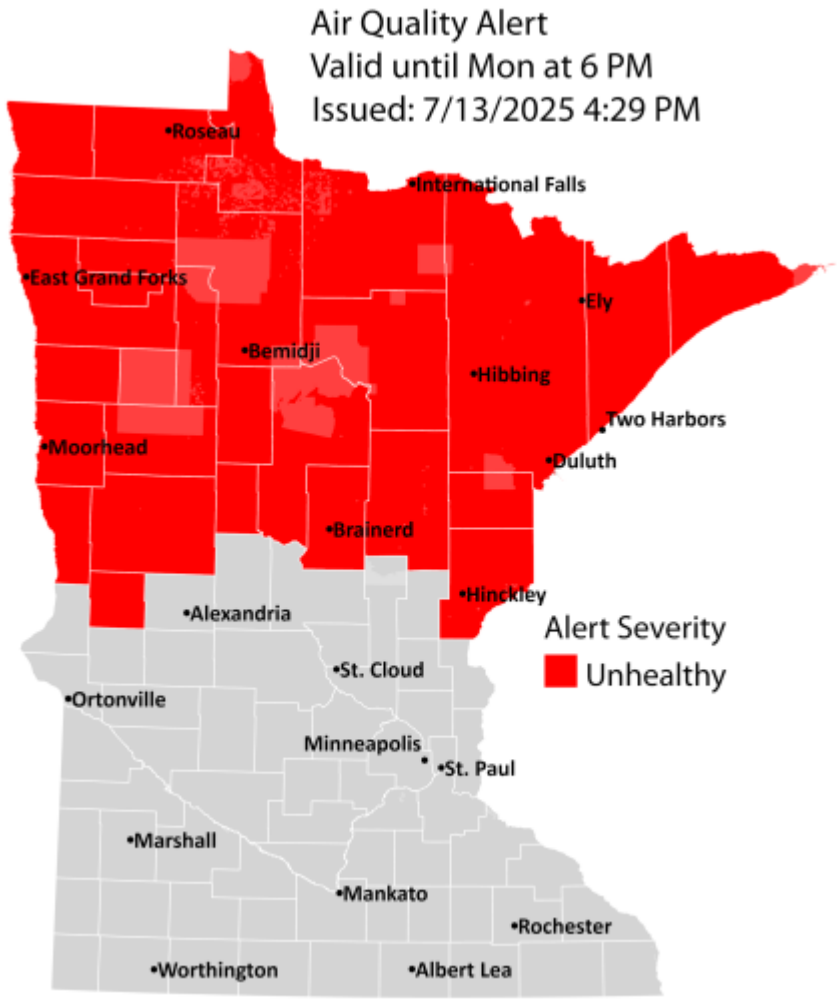


PM_{10} 24-hr Design Values

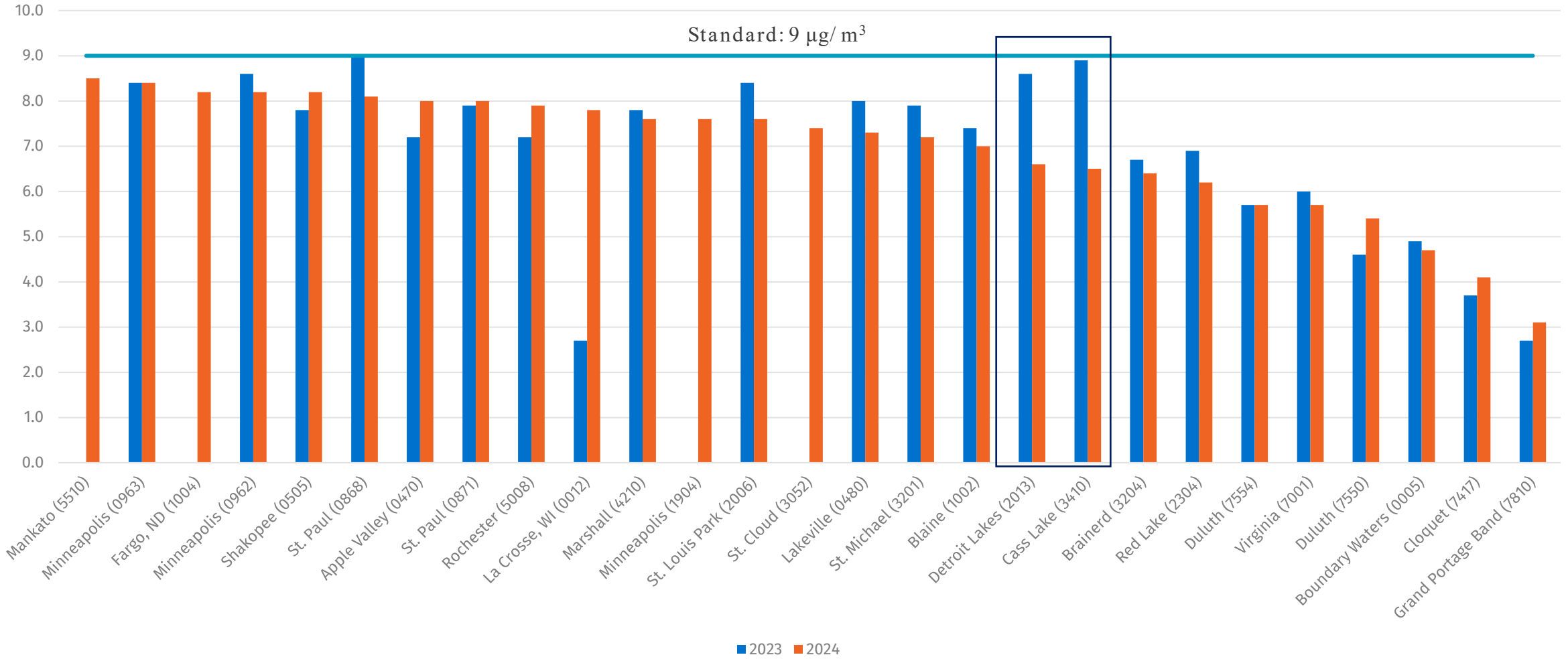


AQI Alerts in 2024

- 40+ days with AQI alerts in Minnesota
  - There were 31 days with AQI alerts in 2023
- AQI alert from July 11th to July 14th was a purple alert, indicating potential concentrations up to 225 µg/ m^3



2024 vs 2023 $PM_{2.5}$ Annual Design Value



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Why does this matter?

- Modeling
- Higher background concentrations result in less headroom for facilities when conducting air dispersion modeling.

- Regulatory Uncertainty
- The $PM_{2.5}$ NAAQS is currently being revisited by the EPA, but that doesn't preclude MN from having a separate MAAQS standard.
- Currently expecting the EPA to announce updates to the $PM_{2.5}$ NAAQS soon, targeting a final rule signature in spring 2026.

- Environmental Concerns
- Wildfires are going to continue to happen.
- If background concentrations continue to increase, knowing a facility's individual impact will help.

Monitoring vs. Modeling

- “Ground Truth Air Quality” – when properly operated, the actual measurements of air quality are difficult to challenge and provide the actual air quality in an area
- Real time data on actual emissions – background concentration, your facility’s impacts, impacts of neighbors
- Can lead to better understanding of where your facility’s emissions are coming from and improve future model performance

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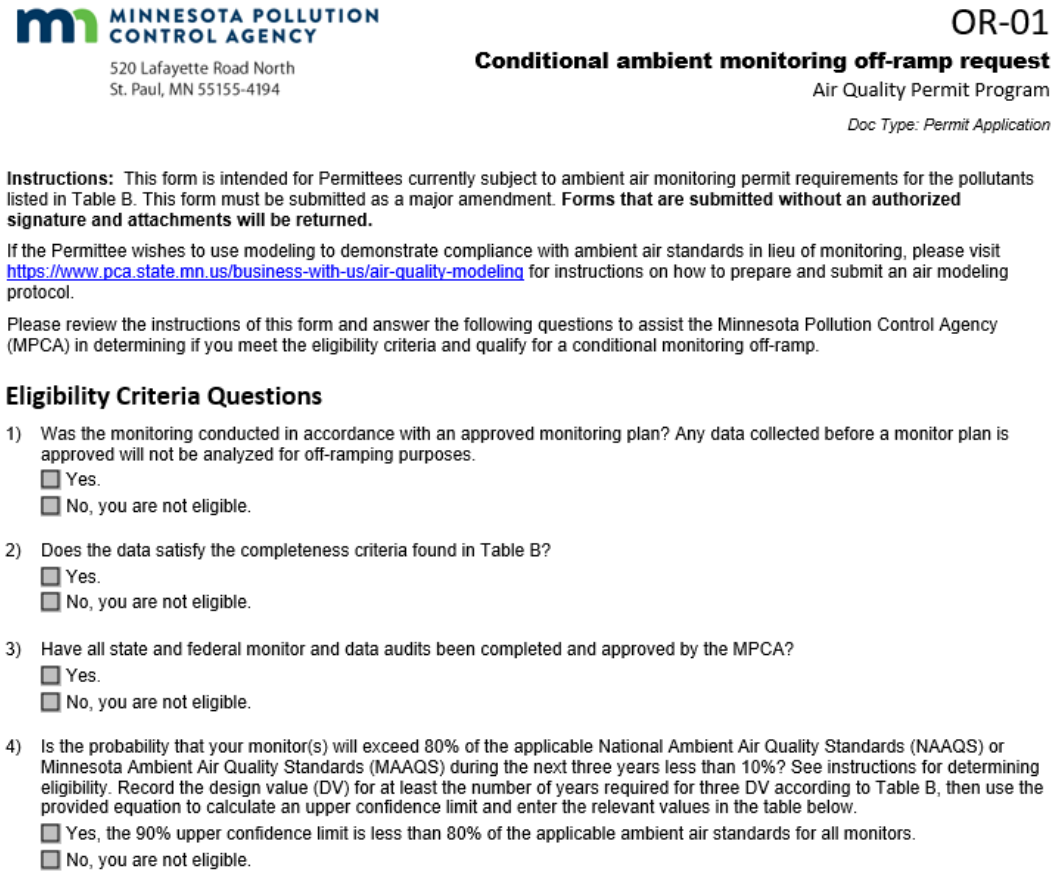
Challenges with Monitoring

- Expensive
- Large initial capital cost to install monitors (~$100k - $200k depending on the number of monitors)
- Annual costs for maintenance and data validation

- "Permanent"
- While the MPCA does have an off-ramp procedure, the conditions may be challenging to meet for a facility.

- Risks
- In the event of a monitored exceedance, a facility must show that it is not culpable.



MINNESOTA POLLUTION CONTROL AGENCY
520 Lafayette Road North
St. Paul, MN 55155-4194

OR-01
Conditional ambient monitoring off-ramp request
Air Quality Permit Program
Doc Type: Permit Application

Instructions: This form is intended for Permittees currently subject to ambient air monitoring permit requirements for the pollutants listed in Table B. This form must be submitted as a major amendment. **Forms that are submitted without an authorized signature and attachments will be returned.**

If the Permittee wishes to use modeling to demonstrate compliance with ambient air standards in lieu of monitoring, please visit https://www.pca.state.mn.us/business-with-us/air-quality-modeling for instructions on how to prepare and submit an air modeling protocol.

Please review the instructions of this form and answer the following questions to assist the Minnesota Pollution Control Agency (MPCA) in determining if you meet the eligibility criteria and qualify for a conditional monitoring off-ramp.

Eligibility Criteria Questions

1) Was the monitoring conducted in accordance with an approved monitoring plan? Any data collected before a monitor plan is approved will not be analyzed for off-ramping purposes.
   ☐ Yes.
   ☐ No, you are not eligible.

2) Does the data satisfy the completeness criteria found in Table B?
   ☐ Yes.
   ☐ No, you are not eligible.

3) Have all state and federal monitor and data audits been completed and approved by the MPCA?
   ☐ Yes.
   ☐ No, you are not eligible.

4) Is the probability that your monitor(s) will exceed 80% of the applicable National Ambient Air Quality Standards (NAAQS) or Minnesota Ambient Air Quality Standards (MAAQS) during the next three years less than 10%? See instructions for determining eligibility. Record the design value (DV) for at least the number of years required for three DV according to Table B, then use the provided equation to calculate an upper confidence limit and enter the relevant values in the table below.
   ☐ Yes, the 90% upper confidence limit is less than 80% of the applicable ambient air standards for all monitors.
   ☐ No, you are not eligible.

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Temporary Monitors

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What are temporary monitors?

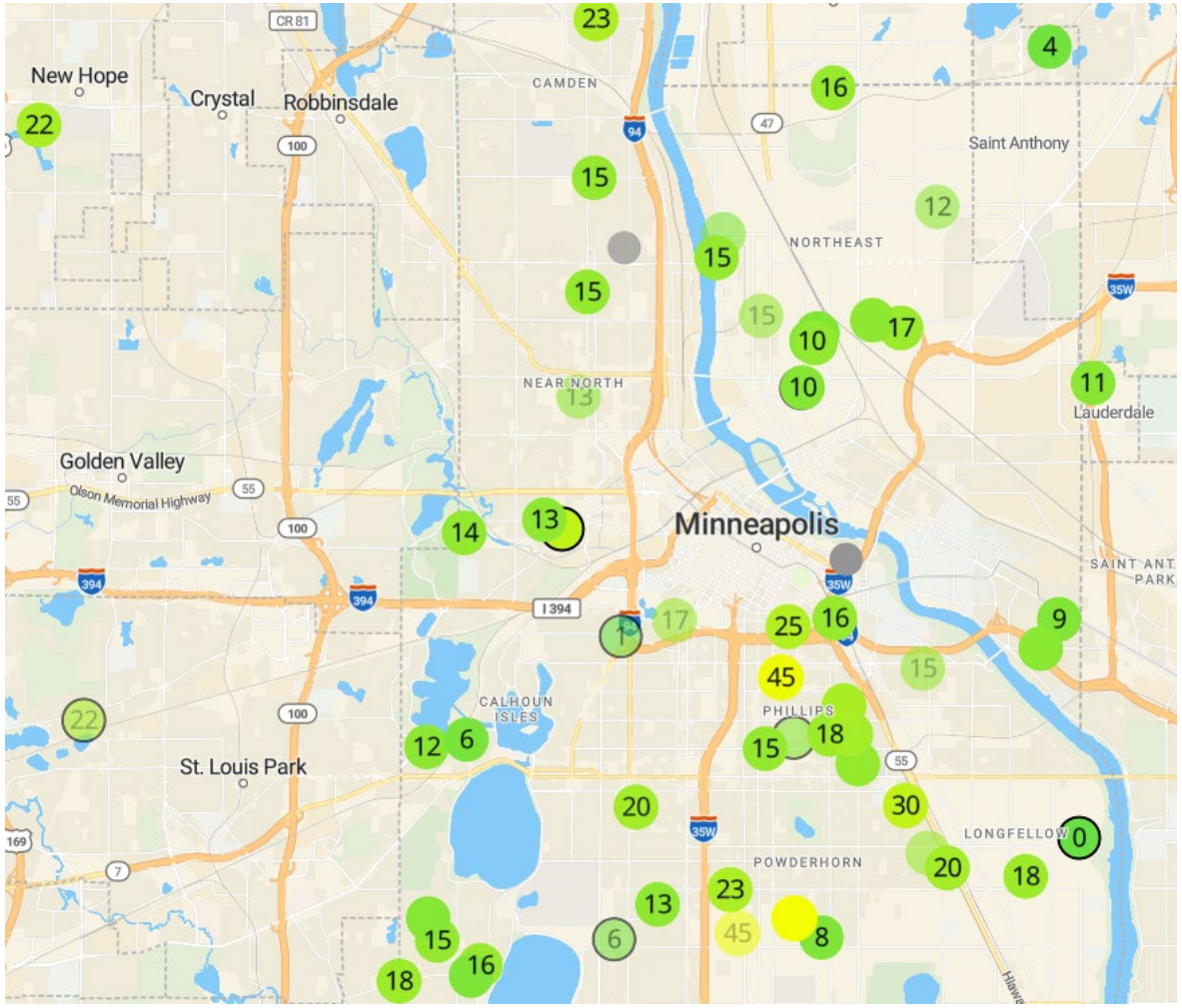
- Non-regulatory air quality monitors
- Community Air Monitors
- Portable monitors that provide regulatory-quality data
- Home application

- Can provide representative monitoring data for a specific area
- Portable (easy to test multiple locations)
- Cost effective
- Different technologies can result in much different data

Types of Monitors

- Particle Sensors
- Low-cost monitors
- Utilize laser particle counters
- Can tend to “read high”

- Nephelometer-Based Sensors
- Uses light to calculate density of particles
- Expensive
- Regulatory-quality data



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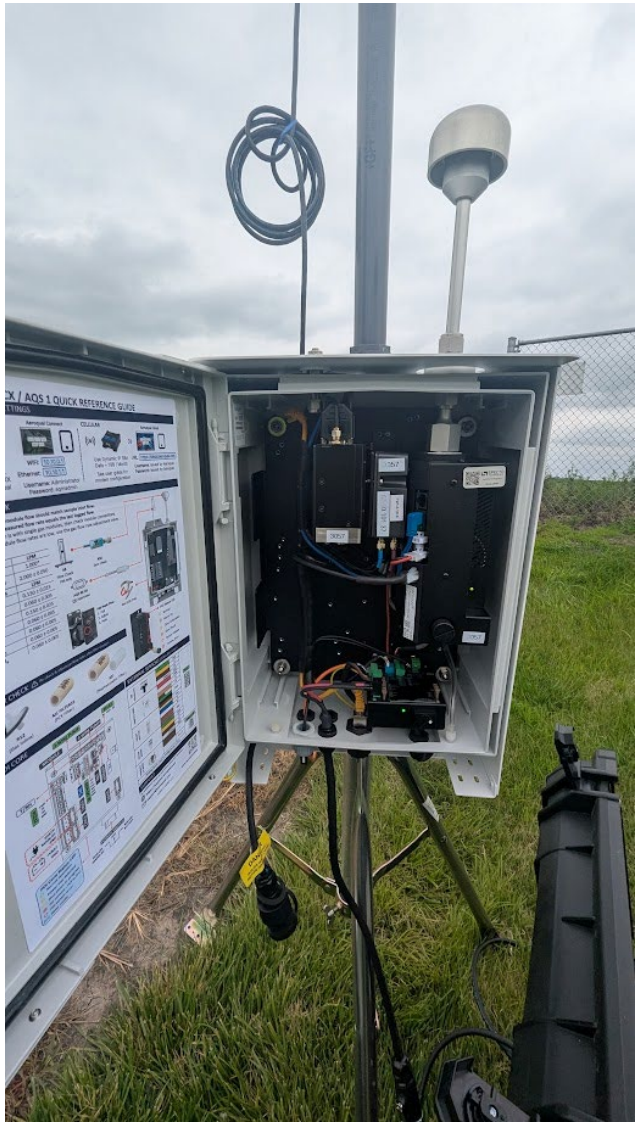
Regulatory-Quality Temporary Monitors

- Calibrated to NIST standards
- Can monitor for both PM and gaseous pollutants
- Extremely portable – runs off a battery or solar panels
- Remote connection
- Expensive



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Use Cases

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Facility Monitoring

- Install an upwind and downwind monitor at the facility
- Identify external impacts affecting pollutant concentrations
- “Test Drive”

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Refine Emission Rates

- Motivations for monitoring in lieu of modeling are usually due to conservative emission factors
- Using temporary monitors as a pseudo stack test
- Results in more accurate emission calculations and air quality modeling demonstrations

Equation 1. Gaussian Equation

$$C = \frac{FK}{2\pi U_s} \int_x \frac{VD}{\sigma_y \sigma_z} \left(\int_y e^{-0.5\left(\frac{y}{\sigma_y}\right)^2} dy \right) dx$$

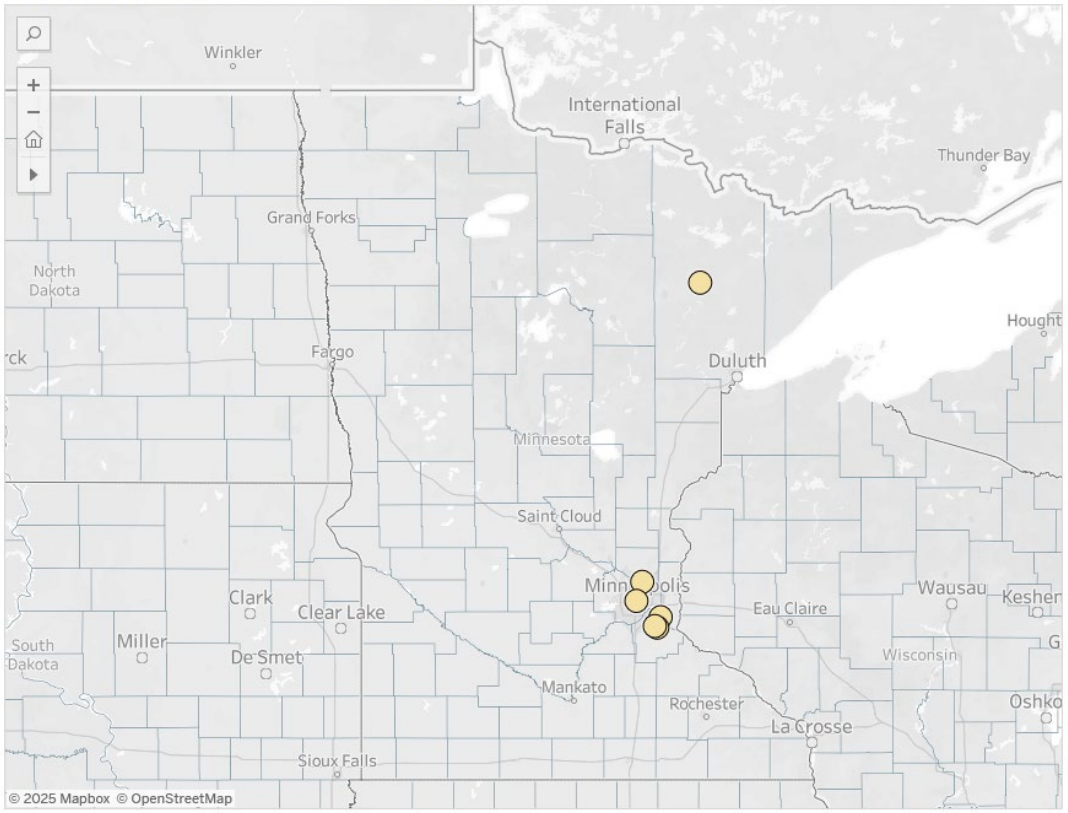
Equation 2. Simplified Gaussian Equation

$$C = FP$$

Representative Background Concentration

- Useful if a facility is in an area with no representative monitors
- If intending to use for a regulatory exercise, a facility may need to install a permanent monitor
- However, a facility is not tied to keep the monitor running if compliance can be determined via modeling.

Sulfur dioxide compared to the 1-hour standard, 2024



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Summary

- 2024 Design Values for Minnesota
- PM Concentrations in the are in line with recent history
- 2025 has not been a good year for wildfires
- Expect PM_{10} and $PM_{2.5}$ design values to increase

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- Before Installing Permanent Monitors:
- Use temporary monitors as a tool in the decision-making process
- There are different types of monitors for different applications

02

- Potential Uses for Temporary Monitors:
- Facility monitoring
- Refining emission calculations
- Determining a representative background concentration

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Thank you

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