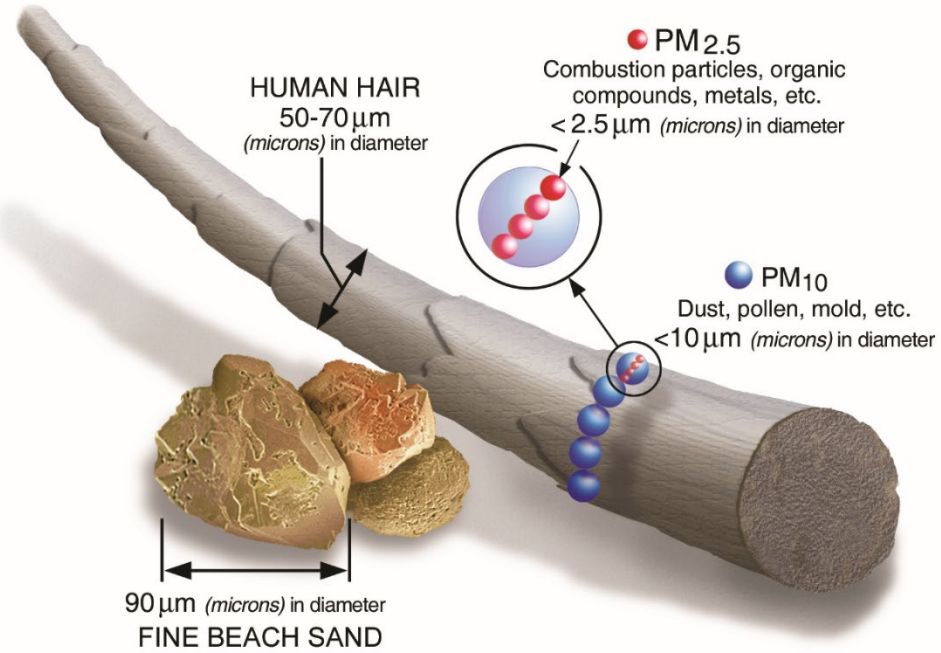


PM_{2.5}: New NAAQS Implementation Issues





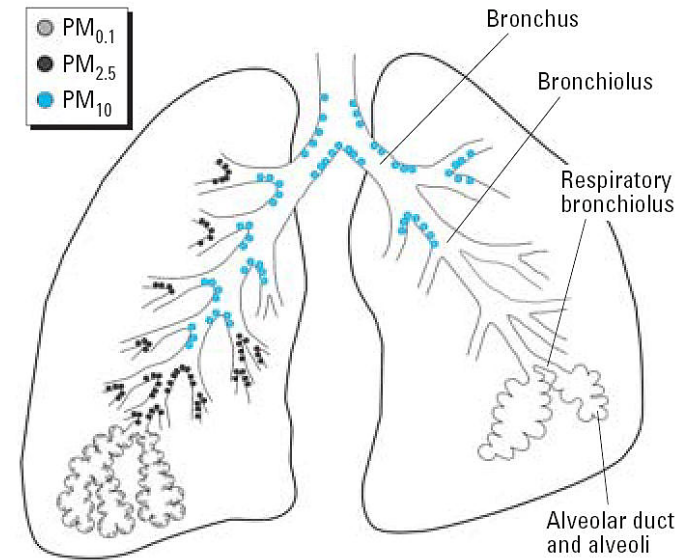
Agenda

1. Introduction to PM_{2.5}
2. NAAQS and Attainment
3. Emissions Reduction Strategies
4. Modeling
5. Monitoring



PM: A Public Health Consideration

- Primary NAAQS are a health-based standard
- PM can be deposited in the lungs
- Health effects include, but are not limited to:
 - respiratory symptoms (irritation of airways, coughing);
 - decreased lung function;
 - aggravated asthma;
 - irregular heartbeat;
 - increased risk of nonfatal heart attack;





NAAQS Changes

- PM_{2.5} regulated pollutant in 1997
- PM_{2.5} NAAQS strengthened in 2006, 2013
- Annual PM_{2.5} NAAQS reduced from 12 µg/m³ to 9 µg/m³ on February 7, 2024
- PM_{2.5}/PM₁₀ 24-hr NAAQS retained
- Published in Federal Register on March 6, 2024
- Implemented March 6, 2025

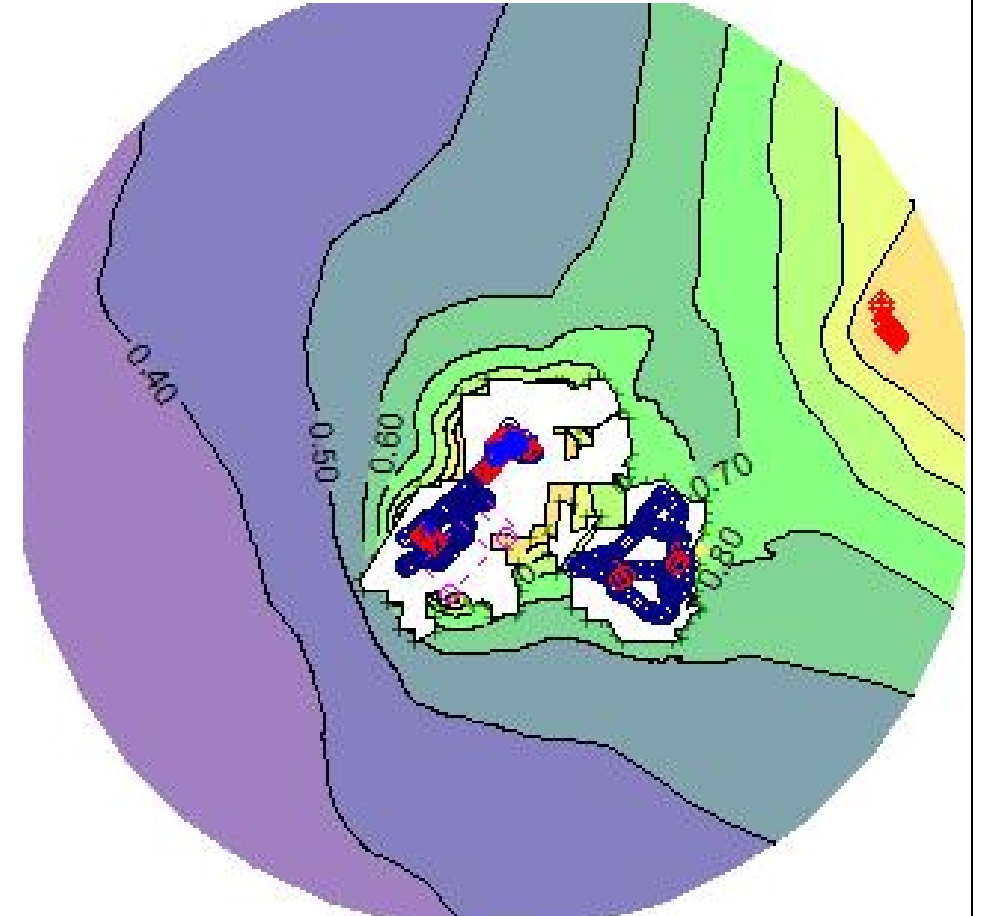
<https://www.epa.gov/pm-pollution/timeline-particulate-matter-pm-national-ambient-air-quality-standards-naqs>

	Primary (µg/m ³)	Secondary (µg/m ³)
Annual PM _{2.5}	9	15
24-hr PM _{2.5}	35	35
24-hr PM ₁₀	150	150



When to Evaluate PM_{2.5} NAAQS

- New or modified emission units triggering modeling
- Regulatory requirement
- Identified as a nearby source in a neighbor's analysis





Nonattainment Areas for 2012 NAAQS

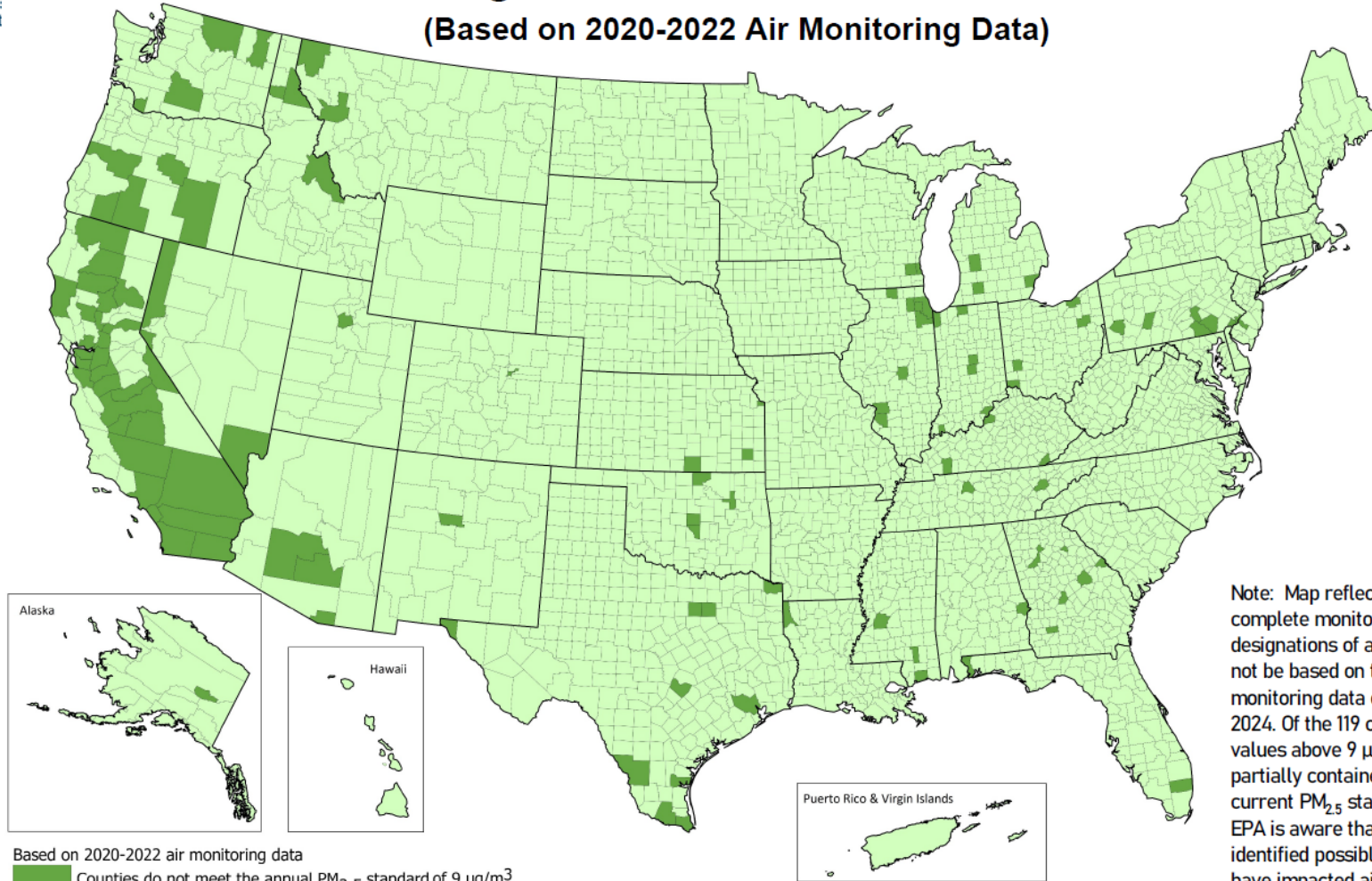
PM-2.5 Nonattainment Areas (2012 Standard)



Nonattainment areas are indicated by color. When only a portion of a county is shown in color, it indicates that only that part of the county is within a nonattainment area boundary.



Most Counties with Monitors Already Meet the Strengthened Particle Pollution Standard (Based on 2020-2022 Air Monitoring Data)



Based on 2020-2022 air monitoring data

Counties do not meet the annual PM_{2.5} standard of 9 ug/m³

This information is provided for illustrative purposes only and is not intended to predict the outcome of any forthcoming designations process.

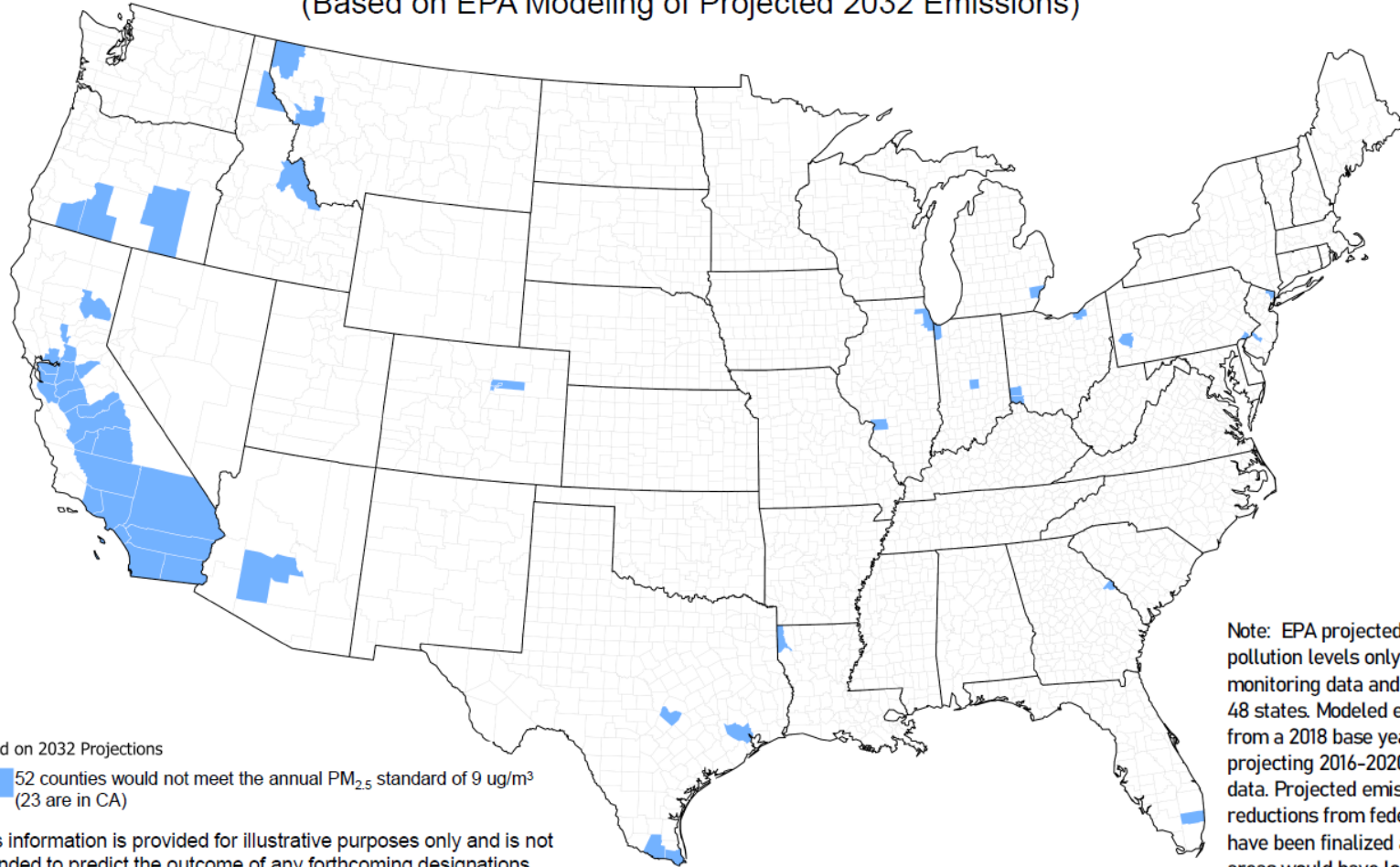
Note: Map reflects monitored counties with complete monitoring data. Future final designations of attainment/nonattainment will not be based on these data, but likely on monitoring data collected between 2022 and 2024. Of the 119 counties with 2020-2022 design values above 9 $\mu\text{g}/\text{m}^3$, 59 counties are totally or partially contained in nonattainment areas for current PM_{2.5} standards. In years 2021 and 2022, EPA is aware that some states have already identified possible exceptional events that may have impacted air quality in the US and may be relevant to designations decisions.



EPA Projects More than 99% of Counties would Meet the Revised Fine Particle Pollution Standard

Projection of Counties with Monitors that would not Meet in 2032

(Based on EPA Modeling of Projected 2032 Emissions)



Based on 2032 Projections

52 counties would not meet the annual $PM_{2.5}$ standard of $9 \mu g/m^3$ (23 are in CA)

This information is provided for illustrative purposes only and is not intended to predict the outcome of any forthcoming designations process.

Note: EPA projected future fine particle pollution levels only for counties with monitoring data and within the contiguous 48 states. Modeled emissions are developed from a 2018 base year and used in projecting 2016-2020 monitoring data. Projected emissions reflect expected reductions from federal regulations that have been finalized as of March 2023. Some areas would have longer than 2032 to attain the revised $PM_{2.5}$ standard.



Options for reducing PM emissions

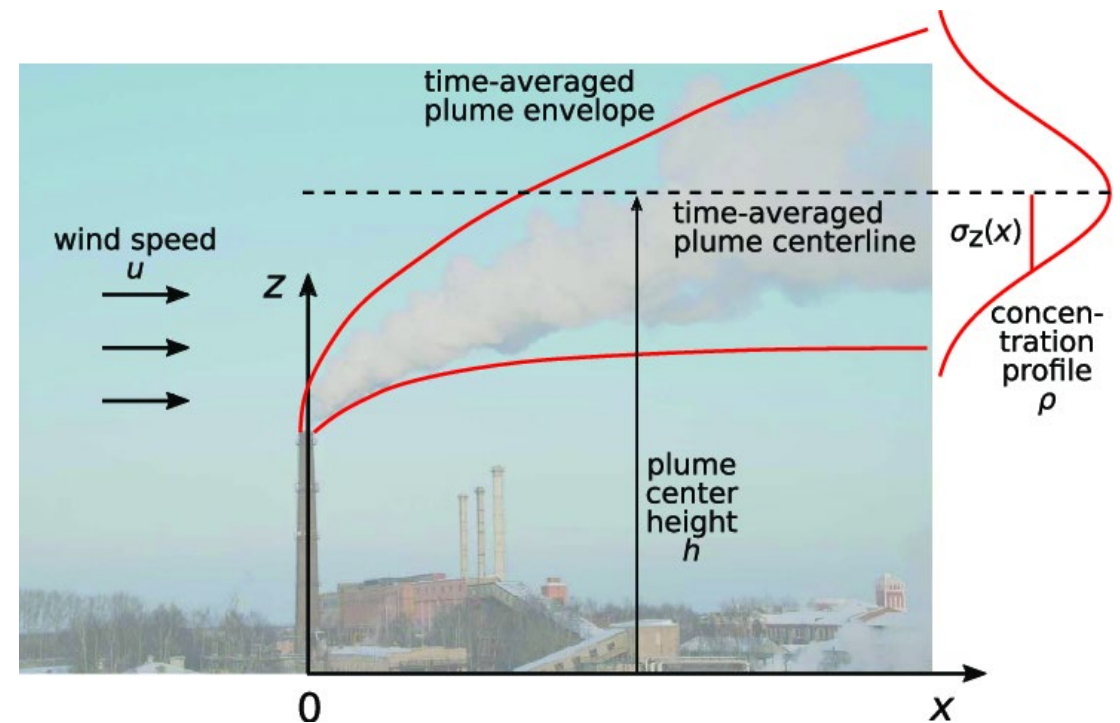
- Baghouses
- HEPA Filters
- Electrostatic precipitators
- Regular Maintenance
- Optimize combustion





Using Modeling for Compliance

- Modeled results can demonstrate compliance with NAAQS
- AERMOD is a dispersion model developed and maintained by the EPA that uses principles of boundary layer turbulence to estimate pollutant concentrations.
- AERMOD is the preferred model for federal NSR and PSD programs
- Inputs include local meteorological data, topographical data, emission parameters such as stack height and exit flow rate, and receptor locations and heights.



Project Risks

- What to do when modeling is challenging?
- Can project meet NAAQS?
- High background, model Significant Impact Levels (SILs)
- Too many nearby sources, model SILs
- Annual $PM_{2.5}$ SIL is $0.13 \mu\text{g}/\text{m}^3$
- Monitoring?





Using Monitoring for Compliance

- Permittees moving toward monitoring instead of modeling
- Modeling too challenging and time consuming
- Monitoring is real-time and based on actual emissions, not potential
- Monitoring burden of proof in nonattainment area



Reviewing Authority Requirements

- Use modeling to site monitor(s)
- Ambient monitoring plan
- Terrain characteristics
- Preclude public access
- Power needs
- Meteorology considerations
- Data collection



Manufacturing Facility

- Long history of modeling at site
- PM₁₀/PM_{2.5} Monitoring
- Two monitors, upwind/downwind



Manufacturing Facility Results

- Ambient monitors a fraction of NAAQS
- Client keeps list of exceptional events – wildfire smoke
- 75% completeness plus spend time reviewing data to ensure representativeness
- Can make changes within the facility without doing modeling
- Have high certainty that reviewing authority will issue permit change
- No concern with model or meteorological data changes and then not passing
- Heating and cooling of monitors need to be maintained otherwise monitors get shutdown
- Ambient monitoring is written into the permit, will need to do root cause analysis for any exceedance if identified, will be time consuming
- If third party is involved to review and analyze data, need clear communication who has the responsibility for each task associated with the monitor.



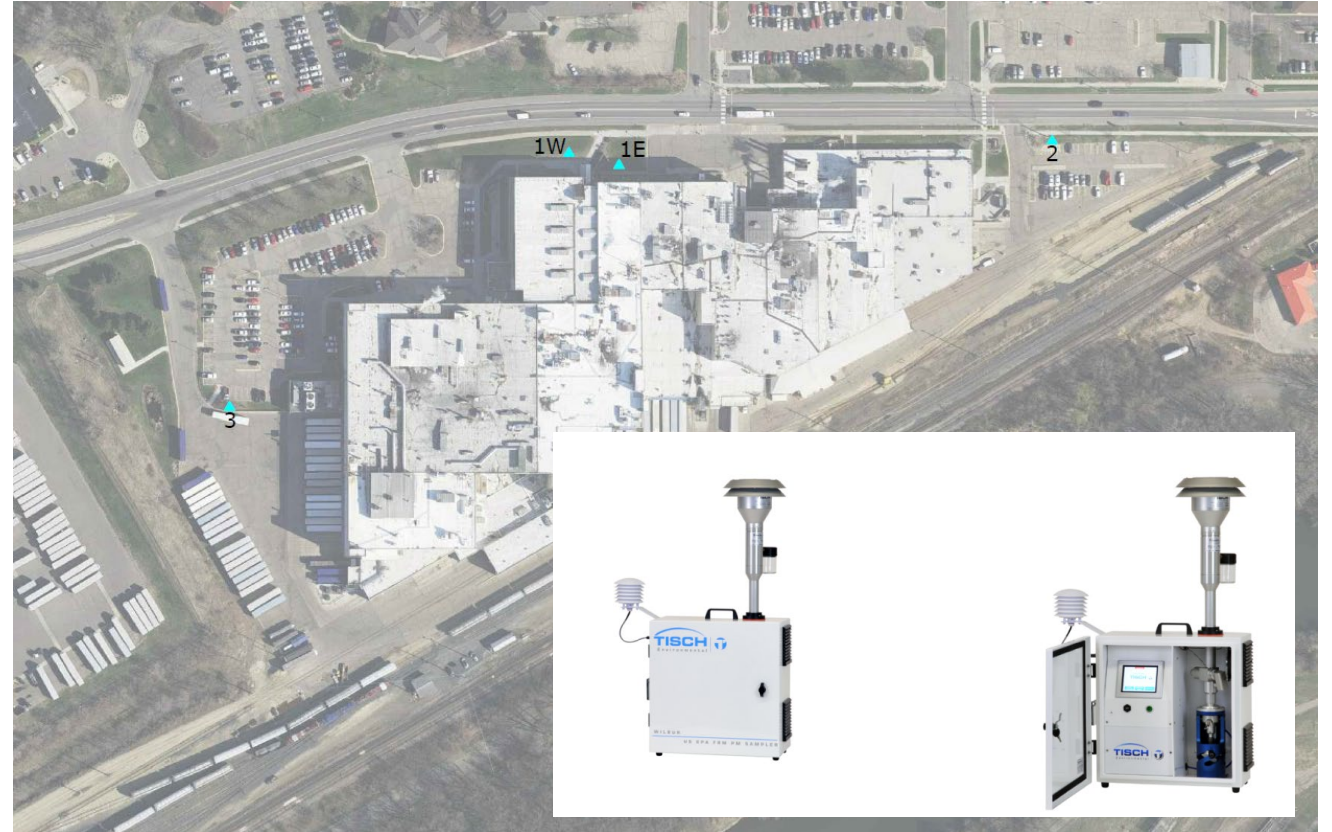
Food Production Facility

- PM_{2.5} Modeling Required for Title V permit reissuance
- Would need many stack changes, operational restrictions, stack testing
- Large economic investment



Non-regulatory PM_{2.5} Monitoring

- Multiple rounds of portable PM_{2.5} sampling
- Used Tisch Wilbur PM_{2.5} samplers
- Results well below the 24-hour PM_{2.5} NAAQS
- Elected to pursue permanent PM_{2.5} ambient monitoring



Food Production Facility Lessons Learned

- Initially lost power for two weeks without knowing
- Installed a light system to make it obvious power is lost
- Rail line close to facility. Idling locomotives can cause monitor spikes. Need to document for quarterly reports.
- Only monitoring PM_{2.5}. Adding PM₁₀ would have been beneficial
- Overall, a positive program
 - Less than 1% missing data
 - Minimal equipment issues
 - Relatively low ambient concentrations



Costs

- \$50k+ for equipment, install, siting analysis
- \$100k-\$250k annual for ongoing data review and collection





Conclusions

- The revised PM_{2.5} annual NAAQS is challenging
- Modeling is first step to address high concentrations
- Monitoring may be required for challenging sites

Thank you

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