Key Takeaways from EPA's Latest Ozone and $PM_{2.5}$ Permit Modeling Guidance

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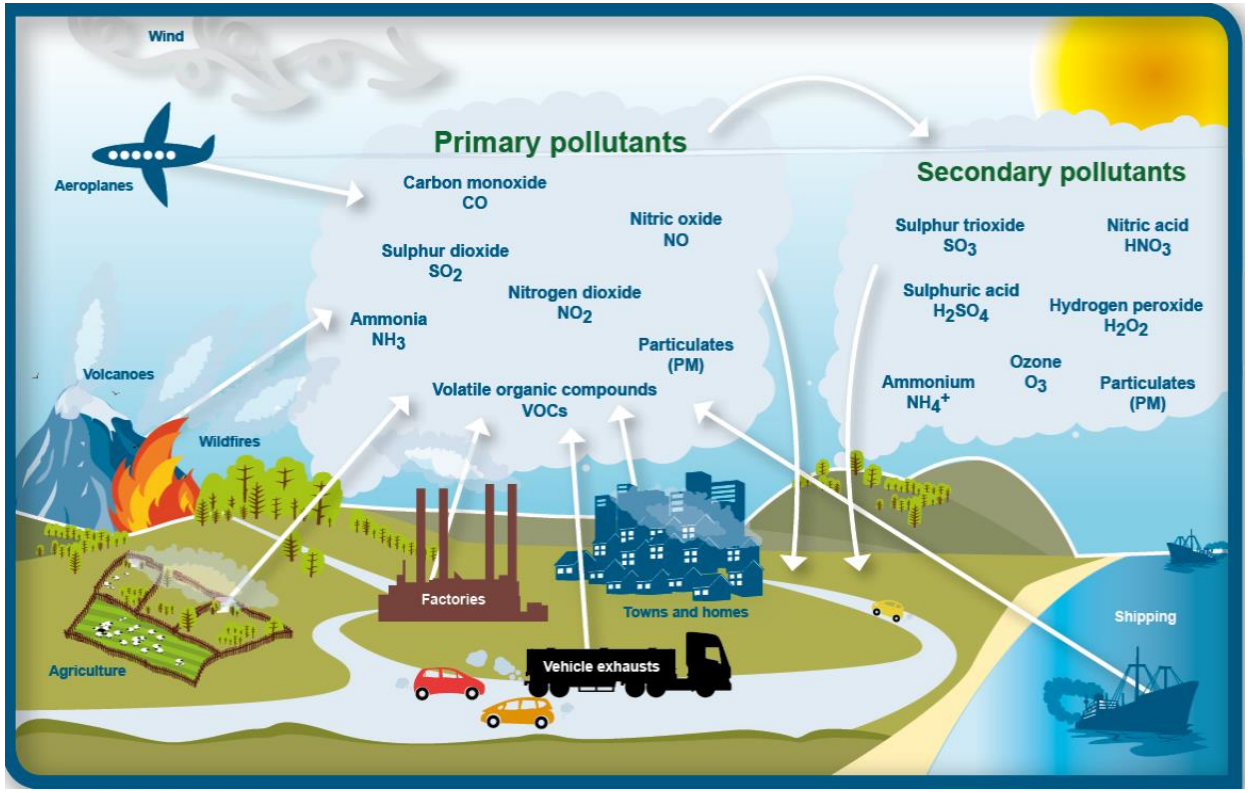
Introduction

- *"Guidance for Ozone and Fine Particulate Matter Permit Modeling"*
  - Released by U.S. EPA in final form on July 29, 2022
  - https://www.epa.gov/scram/guidance-ozone-and-fine-particulate-matter-permit-modeling
- Reflects U.S. EPA's recommendations for $PM_{2.5}$ and ozone modeling under the PSD program
  - Certain states also rely on this guidance for state-level permit modeling assessments
- Ozone and $PM_{2.5}$ are unique because they can form due to chemical reactions in atmosphere
  - Cannot be addressed using AERMOD or its predecessor, ISC

AERMOD vs. Photochemical Grid Modeling

AERMOD

PGM



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$PM_{2.5}$ NAAQS and Surrogate Policy

- $PM_{2.5}$ NAAQS first promulgated in 1997
- Also in 1997, U.S. EPA released the PM_{10} surrogate policy
  - If PSD requirements (modeling, BACT) are met for PM_{10}, they are assumed to be met for $PM_{2.5}$
  - Originally enacted because of various technical issues associated with undertaking a $PM_{2.5}$ analysis
    - For example, issues with secondary formation, quantification of condensables, etc.
- Surrogate policy began to be phased out in late 2000s
  - Modeling and BACT required for project at LG&E Trimble County in Kentucky in 2009
  - Officially ended in 2011

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Initial Guidance on $PM_{2.5}$ Permit Modeling

- In 2010, U.S. EPA granted a petition from Sierra Club to develop new analytical techniques for secondary $PM_{2.5}$
- U.S. EPA released *Guidance on $PM_{2.5}$ Permit Modeling* in 2014
  - Recommended that an assessment be completed for direct $PM_{2.5}$ or precursors if exceeding PSD Significant Emission Rate (SER)
    - E.g., if direct $PM_{2.5}$ > 10 tpy, NO_X < 40 tpy, and SO_2 < 40 tpy, address impacts from direct $PM_{2.5}$ only
  - Also provided three options to address secondary formation:
    - Qualitative (narrative),
    - Hybrid qualitative/quantitative (calculations using existing photochemical model data), and
    - Quantitative (project-specific photochemical grid modeling)

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2014 Guidance on $PM_{2.5}$ Permit Modeling

Assessment Case	Description of Assessment Case	Primary Impacts Approach	Secondary Impacts Approach
Case 1: No Air Quality Analysis	Direct PM2.5 emissions < 10 tpy SER NOx and SO2 emissions < 40 tpy SER	N/A	N/A
Case 2: Primary Air Quality Impacts Only	Direct PM2.5 emissions ≥ 10 tpy SER NOx and SO2 emissions < 40 tpy SER	**Appendix W preferred or approved alternative dispersion model**	N/A
Case 3: Primary and Secondary Air Quality Impacts	Direct PM2.5 emissions ≥ 10 tpy SER NOx and/or SO2 emissions ≥ 40 tpy SER	**Appendix W preferred or approved alternative dispersion model**	• **Qualitative** • **Hybrid qualitative / quantitative** • **Full quantitative photochemical grid modeling**
Case 4: Secondary Air Quality Impacts Only	Direct PM2.5 emissions < 10 tpy SER NOx and/or SO2 emissions ≥ 40 tpy SER	N/A	• **Qualitative** • **Hybrid qualitative / quantitative** • **Full quantitative photochemical grid modeling**

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2017 *Guideline* Revision

- In 2017, U.S. EPA revised the *Guideline on Air Quality Models* and included new recommendations for secondary $PM_{2.5}$ and ozone permit modeling
  - Ozone added to guidance using techniques similar to secondary $PM_{2.5}$
- Recommended two-tiered methodology to address secondary formation
  - First tier: technically credible relationships between precursor emissions and impacts
  - Second tier: case-specific photochemical grid model
    - Expected to be rarely needed
    - Many, many inputs and complications

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The MERPs

- Tier 1 methodology: Modeled Emission Rates for Precursors (MERPs)
  - Initial guidance from U.S. EPA in 2016; revised in April 2019
- MERPs are emission rate that results in maximum ambient concentration that equals the Significant Impact Level (SIL)
- Project-specific concentrations can be calculated based on the ratio of the project emissions increase to the MERP
  - Project impact ($\mu g/m^3$) = SIL ($\mu g/m^3$) x Project Emissions Increase (tpy) / MERP (tpy)
- Developed based on PGM modeling completed for hypothetical sources of emissions

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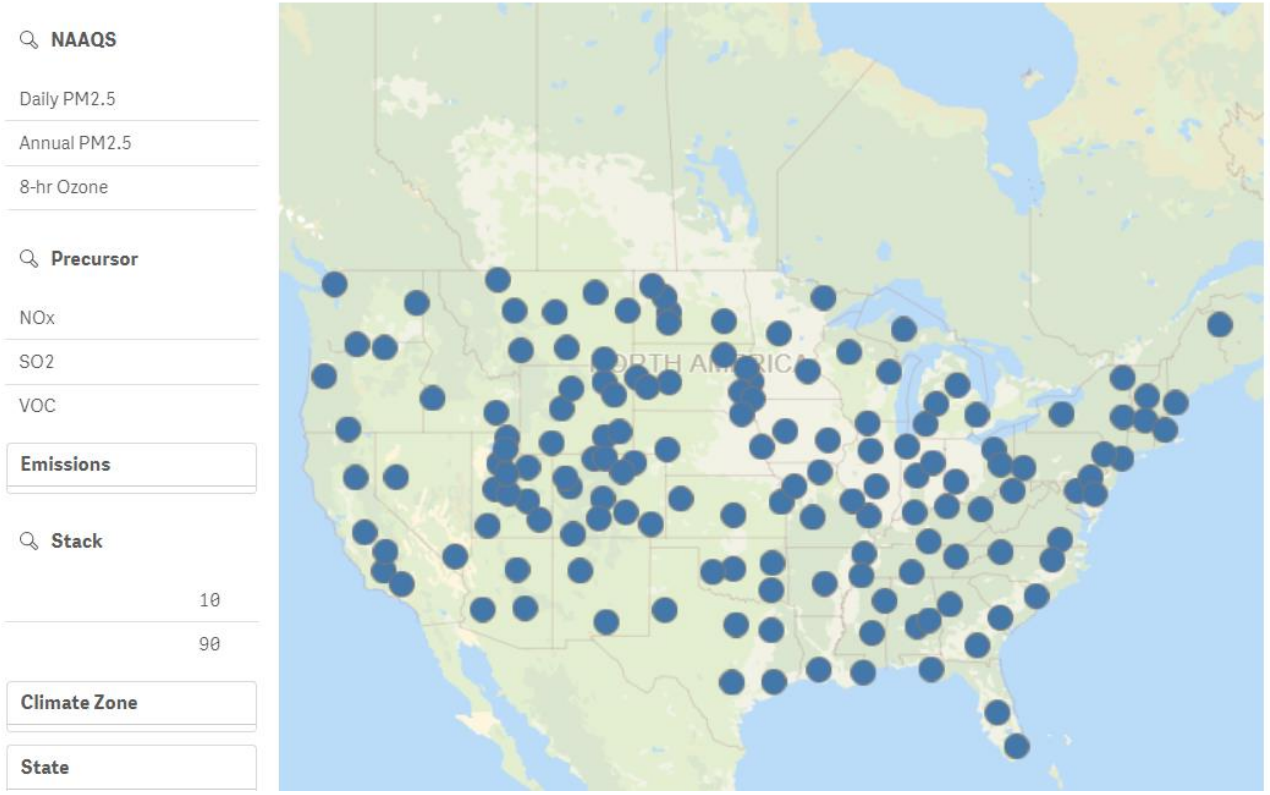
The MERPs

- Ratios of NO_X, SO_2, and VOC emissions to secondary $PM_{2.5}$ and ozone available on U.S. EPA's MERPs Qlik website
  - Ratios vary by location, stack height, and emission rate
    - Chose most appropriate value to represent your project



https://www.epa.gov/scram/merps-view-qlik

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The MERPs

- Worst case MERPs
  - Emission rates resulting in concentration equal to SIL

Pollutant/ Averaging Period	Precursor	Worst Case MERP (tpy)
$PM_{2.5}$ – 24-hour	NO_X	1,073
$PM_{2.5}$ – 24-hour	SO_2	188
$PM_{2.5}$ – Annual	NO_X	3,182
$PM_{2.5}$ – Annual	SO_2	859
Ozone – 8-hour	NO_X	125
Ozone – 8-hour	VOC	1,049

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Ozone and $PM_{2.5}$ SILs

- U.S. EPA released guidance on SILs in April 2018
  - Provided separate legal basis memorandum
  - Provided separate technical basis for SILs
    - Statistical analysis of air quality to justify insignificant concentration levels
- Recommended SILs (NAAQS and Class II Increment)
  - Ozone 8-hour: 1.0 ppb
  - $PM_{2.5}$ 24-hour: 1.2 $\mu g/m^3$
  - $PM_{2.5}$ Annual: 0.2 $\mu g/m^3$
    - Note that some locations continue to use 0.3 $\mu g/m^3$
- Recommended SILs (Class I Increment)
  - $PM_{2.5}$ 24-hour: 0.27 $\mu g/m^3$
  - $PM_{2.5}$ Annual: 0.05 $\mu g/m^3$

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2022 Guidance on Ozone and $PM_{2.5}$ Permit Modeling

- Intended to replace 2014 $PM_{2.5}$ Permit Modeling Guidance
  - Issued as draft in February 2020
  - Issued as revised draft in September 2021
    - 2020 draft guidance was reconsidered in light of early 2021 Executive Order to review certain rulemaking and guidance
  - Finalized in July 2022
- Incorporates concepts of SIL and MERPs
- Major change between 2020 and 2021 drafts
  - Recommendation for “holistic” approach to applicability for secondary formation
  - Address all components of $PM_{2.5}$ or ozone if triggering for any

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2022 Guidance on Ozone and $PM_{2.5}$ Permit Modeling

Table III-1. EPA Recommended Approaches for Assessing O_3 Impacts by Assessment Case

Assessment Case	Description of Assessment Case		Secondary Impacts Approach*
Case 1: No Air Quality Analysis	NO_X emissions and VOC emissions < 40 tpy SER		N/A
Case 2*: Secondary Air Quality Impacts	NO_X emissions or VOC emissions ≥ 40 tpy SER		Include both precursors of O_3, see Section II.2. • **Tier 1 Approach** (*e.g.*, MERPs) • **Tier 2 Approach** (*e.g.*, Chemical Transport Modeling)

* In unique situations (*e.g.*, in parts of Alaska where photochemistry is not possible for portions of the year), it may be acceptable for the applicant to rely upon a qualitative approach to assess the secondary impacts. Any qualitative assessments should be justified on a case-by-case basis in consultation with the appropriate permitting authority and the appropriate EPA Regional Office.

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2022 Guidance on Ozone and $PM_{2.5}$ Permit Modeling

Table III-2. EPA Recommended Approaches for Assessing Primary and Secondary $PM_{2.5}$ Impacts by Assessment Case

Assessment Case	Description of Assessment Case	Primary Impacts Approach	Secondary Impacts Approach*
Case 1: No Air Quality Analysis	Direct $PM_{2.5}$ emissions < 10 tpy SER and NO_X emissions and SO_2 emissions < 40 tpy SER	N/A	N/A
Case 2*: Primary and Secondary Air Quality Impacts	Direct $PM_{2.5}$ emissions ≥ 10 tpy SER or NO_X emissions or SO_2 emissions ≥ 40 tpy SER	**Appendix W preferred or approved alternative dispersion model**	Include both precursors of $PM_{2.5}$, see Section II.2. • **Tier 1 Approach** (*e.g.*, MERPs) • **Tier 2 Approach** (*e.g.*, Chemical Transport Modeling)

* In unique situations (*e.g.*, in parts of Alaska where photochemistry is not possible for portions of the year), it may be acceptable for the applicant to rely upon a qualitative approach to assess the secondary impacts. Any qualitative assessments should be justified on a case-by-case basis in consultation with the appropriate EPA Regional Office or other applicable permitting authority.

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2022 Guidance on Ozone and $PM_{2.5}$ Permit Modeling

- Other topics covered
  - SIL modeling approaches
    - Need to combine impacts of direct $PM_{2.5}$ and secondary before comparing with SIL
  - Cumulative impact analyses
    - NAAQS
      - Combine project, nearby sources, background, and secondary impacts to compare with NAAQS
      - If exceed SIL for ozone, add impact to representative background and compare with NAAQS

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2022 Guidance on Ozone and $PM_{2.5}$ Permit Modeling

- Other topics covered
  - Cumulative impact analyses
    - PSD increment
      - Combine increment affecting direct and secondary impacts
    - Guidance discusses “cause or contribute” analysis showing project is less than SIL at time/location of NAAQS/increment exceedances
      - Uses MAXDCONT output option in AERMOD
      - Note that some states are receiving pressure to not issue permits with exceedances
- Guidance is specifically for PSD permit modeling, but many states consider this guidance for state-required permit modeling
  - E.g., some do not require secondary analysis for $PM_{2.5}$ for state modeling
  - States may use concepts for EJ modeling where required

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U.S. EPA Says: It's Only Guidance

"This guidance does not create any rights or obligations enforceable by any party or impose binding, enforceable requirements on any PSD permit applicant, PSD permitting authority, the EPA, or any other person. Since each permitting action will be considered on a case-by-case basis, this document does not limit or restrict any particular justifiable approach that permit applicants and permitting authorities may take to conduct the required compliance demonstrations. Each individual decision to issue a PSD permit must be supported by a record sufficient to demonstrate that the proposed construction and operation of a stationary source will not cause or contribute to a violation of the applicable NAAQS and PSD increments."

- In practice…
  - Many permitting authorities are reluctant to diverge from approaches in U.S. EPA guidance
- If novel approach is desired, communicate early with permitting authority, EPA Region, and EPA OAQPS to avoid later delays
  - Submit and get approval for a modeling protocol

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Happy New Year – EPA Announced Proposal for Revised National Ambient Air Quality Standards (NAAQS) – January 2023

- EPA Press Release Announcement – January 6, 2023
  - https://www.epa.gov/newsreleases/epa-proposes-strengthen-air-quality-standards-protect-public-harmful-effects-soot
- Details available online
  - Background Info on Proposed Decision
    - https://www.epa.gov/pm-pollution/proposed-decision-reconsideration-national-ambient-air-quality-standards-particulate
  - Proposal published in the Federal Register January 27, 2023
    - https://www.federalregister.gov/documents/2023/01/27/2023-00269/reconsideration-of-the-national-ambient-air-quality-standards-for-particulate-matter
    - Comment period ended March 28, 2023 (over 750,000 comments received)

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Current PM NAAQS Review – Tabular Summary

Proposed PM NAAQS

PM Standard	Current NAAQS	Recommended NAAQS	Final NAAQS
PM_{10} – 24-hr	150 µg/m^3	Retain	TBD
$PM_{2.5}$ – Annual	12 µg/m^3	9-10 ug/m^3 and soliciting comment- 8 ug/m^3 or 11 ug/m^3	TBD
$PM_{2.5}$ – 24-hr	35 µg/m^3	Retain, and soliciting comment- 25 ug/m^3	TBD
$PM_{2.5}$ – Secondary Annual	15 µg/m^3	Retain	TBD

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So, We've Got a Proposal.....

- When will any final revised $PM_{2.5}$ NAAQS become effective?
  - Could be late 2023 or early 2024
  - NAAQS issued as "final" in Federal Register, and typically "effective" 60 days after publication
  - The effective date of any revised $PM_{2.5}$ NAAQS, will become a critical date for any ongoing/planned facility permitting efforts, so keep close tabs on this!

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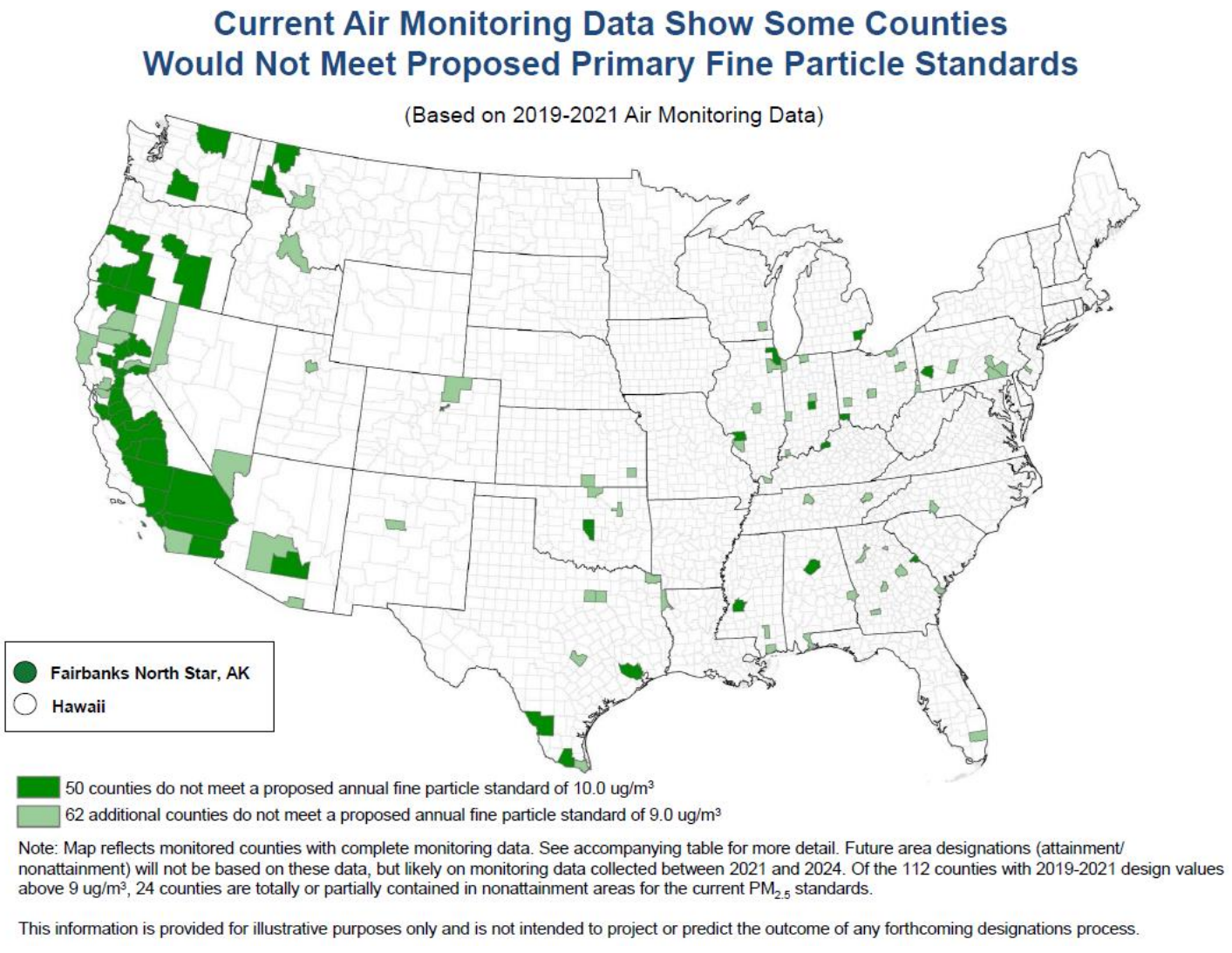
Current Monitoring Data, 2019-2021 Design Data



https://www.epa.gov/system/files/documents/2023-01/PM%20Maps%20-%202022%20proposal%20%282%29.pdf

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Primary PSD Permitting Based Implications

- How will this rulemaking impact current/near term PSD permitting actions?
  - No grandfathering provisions (pg. 455 of pre-publication version)
  - This means any PSD permit not **final** on the effective date of the NAAQS, is required to evaluate compliance with the NAAQS
    - No draft permit, no submitted application by date, no grandfathering of any kind – permit must be "final" before the effective date of the revised NAAQS
  - So, if you submit a PSD application showing $PM_{2.5}$ impacts of 10.4 µg/m^3, and the NAAQS becomes final/effective at 10 µg/m^3 prior to final permit issuance, the permitting authority cannot issue the permit until a complaint modeling demonstration at a level of 10 µg/m^3 is provided
    - A significant risk factor for PSD applications/review in progress

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Primary PSD Permitting Based Implications

- So, you've got a PSD permit, but you need to extend the permit….
  - Not uncommon to request at least a first-time extension of the 18-month PSD permit construction window – but now the NAAQS are proposed to be updated…
    - Addressed in PSD 2014 permit extension guidance
    - https://www.epa.gov/nsr/guidance-extension-prevention-significant-deterioration-psd-permits
    - EPA addresses on page 6 of the referenced guidance
    - Indicated as a case-by-case evaluation – no definitive statements one way or the other
    - Magnitude of emissions, prior modeling results, influence of precursor pollutants, etc. could all play a part in any case-by-case determination
    - Definitive risk factor to outline/discuss with clients that may be seeking an extension of the PSD permit, which triggered PSD for $PM_{2.5}$ (or its precursors)

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States with Minor Source Permit Modeling Requirements

- Case-by-Case Situation (depending on the agency, how State NAAQS were established, etc.)
  - With a revised NAAQS, agency may not be comfortable issuing even a minor source permit for a project that exceeds Federal NAAQS (before State NAAQS/regulatory updates)
  - Incorporation by reference – do State NAAQS become effective at same time?
  - As with PSD, confer with the local permitting authority for any modeling evaluations for ongoing/planned permit applications
  - Some States have no permit modeling requirements for minor sources, whereas others do
    - Recent requests for $PM_{2.5}$ modeling for minor projects in some States (e.g., Virginia) – part of the cited reason, upcoming revised NAAQS
    - Be sure to confer with the local agency!

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Implications of Nonattainment

- States must submit initial recommendations for designations within one year after promulgation of a new NAAQS
- EPA will review these recommendations and can then take up to two years from promulgation of a new NAAQS to issue designations
- If an area is designated nonattainment:
  - State must develop a SIP
    - Could mean new controls or lower limits for sources
  - Major sources will trigger nonattainment NSR instead of PSD
- What if area has monitored data exceeding NAAQS prior to designation?
  - Could be required to model, but background may be greater than NAAQS

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Summary

- July 2022 guidance is latest from U.S. EPA on Ozone and $PM_{2.5}$ Permit Modeling
- Previous $PM_{2.5}$ and ozone guidance is replaced
  - E.g., 2014 $PM_{2.5}$ and 2020/2021 draft $PM_{2.5}$/ozone
- Biggest change from prior guidance is “holistic” approach
  - Trigger AERMOD modeling for direct $PM_{2.5}$ even if project only triggers PSD for NO_X or SO_2 emissions
- Possible reduction to $PM_{2.5}$ NAAQS may result in need for further refinements to modeling guidance
  - Modeling guidance tends to lag NAAQS revisions
    - E.g., 1-hour NO_2/SO_2 and $PM_{2.5}$ guidance in 2010s

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Questions?

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