



Guidance for Ozone and Fine Particulate Matter Permit Modeling

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Bottom Line Up Front (BLUF)

- EPA released the “Guidance for Ozone and Fine Particulate Matter Permit Modeling” in final form on July 29, 2022.
 - <https://www.epa.gov/scram/guidance-ozone-and-fine-particulate-matter-permit-modeling>
 - Will refer to it as the “Ozone and PM_{2.5} Permit Modeling Guidance” or “Final Guidance” throughout this webinar
- The final guidance reflects the EPA's recommendations for how a stationary source seeking a Prevention of Significant Deterioration (PSD) permit may demonstrate that it will not cause or contribute to a violation of the National Ambient Air Quality Standards (NAAQS) for ozone (O₃) and fine particulate matter (PM_{2.5}) and PSD increments for PM_{2.5}, as required under Section 165(a)(3) of the Clean Air Act and 40 CFR sections 51.166(k) and 52.21(k).
- Based on the feedback received to both the February 2020 draft and September 2021 revised draft guidance documents, we made a few clarifications and associated updates, but we are maintaining the “Holistic” compliance demonstration approach and all other recommendations from the revised draft guidance.



Review of How We Got Here...

- The EPA granted a petition by the Sierra Club in 2010 and committed to engage in rulemaking to evaluate updates to the *Guideline on Air Quality Models* as published as Appendix W to 40 CFR 51, and, as appropriate, incorporate new analytical techniques or models for O₃ and secondary PM_{2.5}.
- EPA's PM₁₀ Surrogate Policy officially ended in 2011.
- The PM_{2.5} NAAQS (annual and daily form) was revised in 2012.
- In 2013, the U.S. Court of Appeals for the District of Columbia Circuit vacated the Significant Monitoring Concentration (SMC) for PM_{2.5} and two provisions in EPA's PSD regulations containing Significant Impact Levels (SILs) for PM_{2.5}.
- During this while, the EPA embarked on a multi-year effort to develop guidance on assessing single-source PM_{2.5} impacts for the purposes of NSR-PSD permitting, which included co-regulator involvement and informal stakeholder comment/feedback.
- In 2014, the EPA finalized the ["Guidance on PM_{2.5} Permit Modeling."](#)



Guidance on PM_{2.5} Permit Modeling

- Released on May 20, 2014.
(https://www.epa.gov/sites/production/files/2020-09/documents/guidance_for_pm25_permit_modeling.pdf)
- Provided clarity and additional legal basis for the appropriate use of PM_{2.5} SILs in light of the January 22, 2013, Court of Appeals Decision.
- Established 4 recommended scenarios or assessment cases based on “Pollutant Applicability” that defined what air quality analysis, *if any*, that an applicant would follow for compliance demonstrations of the PM_{2.5} NAAQS or PSD Increments.
 - Only the individual components/precursors of PM_{2.5} (*i.e.*, NO_x, SO₂, and/or direct PM_{2.5}) that would by themselves be emitted by a new or modifying source in a significant amount would be included in the air quality analysis.
- The recommended scenarios included a combination of modeling with the Appendix W preferred or approved alternative dispersion model for Direct PM_{2.5} and qualitative/hybrid/quantitative approaches for adequately assessing secondarily formed PM_{2.5}.



Review of How We Got Here *(Cont)*...

- In 2017, the EPA revised the [Guideline on Air Quality Models](#) with specific recommendations for quantitatively assessing O₃ and secondarily formed PM_{2.5} using existing chemical transport modeling tools and techniques that had been previously used in the development of nonattainment State Implementation Plans (SIPs), NAAQS assessments, and various EPA rules.
- In association with the 2017 *Guideline* revisions, the EPA releases:
 - [Guidance on the Development of Modeled Emissions Rates for Precursors \(MERPs\) as a Tier 1 Demonstration Tool for Ozone and PM_{2.5} under the PSD Permitting Program](#) (MERPs Guidance),
 - [Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM_{2.5}](#) (Single-Source Chemical Transport Modeling Guidance),
 - [Use of Photochemical Grid Models for Single-Source Ozone and secondary PM_{2.5} impacts for Permit Program Related Assessments and for NAAQS Attainment Demonstrations for Ozone, PM_{2.5} and Regional Haze](#) (Single-Source Ozone and Secondary PM_{2.5} Modeling Memorandum),
 - [Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program](#) (SILs Guidance), and
 - **Committed to releasing a revision of the 2014 Guidance on PM_{2.5} Permit Modeling that included appropriate accounting for both ozone and fine particulate matter and their respective precursors.**



Prerequisite Pieces All Fit Together

- The SILs Guidance provides a policy, legal, and technical basis for recommended 8-hour O₃ and daily/annual PM_{2.5} SILs... an essential aspect of the NSR-PSD NAAQS and PSD Increments compliance program.
- The MERPs Guidance provides a framework that permit applicants may choose to use, in conjunction with the appropriate reviewing authority, to estimate single-source impacts on secondary pollutants using a “Tier 1” approach based on existing empirical relationships between precursors and secondary impacts established using state-of-the-science chemical transport models.
 - [MERPs VIEW Qlik Application](#) – Online application to access EPA’s updated hypothetical single source inventory of modeled O₃ and PM_{2.5} impacts to support appropriate PSD applications
- The Single-Source Chemical Transport Modeling Guidance and the Single-Source Ozone and Secondary PM_{2.5} Modeling Memorandum provide the necessary basis and ability to use photochemical models to estimate the single-source impacts on chemically reactive pollutants for permit related program demonstrations and NAAQS attainment demonstrations, whether for a “Tier 2” approach or establishing Tier 1 empirical relationships.



Draft Guidance for Ozone and Fine Particulate Matter Permit Modeling

- The draft “Guidance for Ozone and Fine Particulate Matter Permit Modeling” was released on February 10, 2020, for review and informal comment.
 - Lengthy and robust internal coordination (OAR, OAQPS-AQPD, OAQPS-AQAD, OGC, & Regional Offices)
 - It was a replacement for the 2014 Guidance for PM_{2.5} Permit Modeling and included appropriate compliance demonstration assessment recommendations for direct and secondarily formed components of O₃ and PM_{2.5} for the NAAQS and of PM_{2.5} for PSD increments.
 - Included an expanded PSD Increments for PM_{2.5} discussion (Section V) that provided a more complete explanation of the PSD Increments terminology / system and of both the Source and Cumulative Impact Assessments (SIA/CIA) for PSD Increments.
 - <https://www.epa.gov/scram/draft-guidance-ozone-and-fine-particulate-matter-permit-modeling>
- The draft guidance continued to rely upon a “Pollutant Applicability” approach that was outlined in the 2014 “Guidance on PM_{2.5} Permit Modeling,” except being expanded to both O₃ and PM_{2.5}.
 - Only the individual components/precursors of O₃ or PM_{2.5} (*i.e.*, NO_x, VOC, SO₂, and/or direct PM_{2.5}) that would by themselves be emitted by a new or modifying source in a significant amount would be included in the air quality analysis.
- 14 informal comment packages received from the co-regulatory (Regional Office, State, & Local) and external stakeholder communities.



Revised Draft Guidance for Ozone and Fine Particulate Matter Permit Modeling

- Upon reconsideration by the new administration and consistent with Executive Order 13990, EPA altered an important aspect of the draft guidance and then sought additional public review and comment via a revised draft guidance document released on September 20, 2021.
 - <https://www.epa.gov/scram/revised-draft-guidance-ozone-and-fine-particulate-matter-permit-modeling>
- In the revised draft guidance, the “Pollutant Applicability” approach was replaced with a “Holistic” approach.
 - In order to make the required demonstration that the allowable emissions increases from a source or modification would not cause or contribute to any NAAQS or PSD increment violation, sources should provide a **full accounting** of the combined impacts of their allowable precursor (and direct component, in the case of PM_{2.5}) emissions on ambient concentrations of the relevant NAAQS (*i.e.*, O₃ or PM_{2.5}) if any precursor(s) (or the direct component, in the case of PM_{2.5}) would be emitted in a significant amount.
- This “Holistic” approach was and continues to be supported both scientifically and legally:
 - Scientifically – ensures that the source provides a full accounting of its projected air quality impacts for the relevant NAAQS, including all precursor (and direct component, in the case of PM_{2.5}) emissions
 - Legally – needed to meet the requirements in the PSD regulations that the owner or operator of a proposed new major stationary source or major modification demonstrate that it will not cause or contribute to a NAAQS or PSD increment violation
- 13 informal comment packages received from the co-regulatory (State, Local, & Tribal) and external stakeholder communities



Final Guidance for Ozone and Fine Particulate Matter Permit Modeling

- The final “Guidance for Ozone and Fine Particulate Matter Permit Modeling” was released on July 29, 2022.
 - Based on the feedback received to both the February 2020 *draft* and September 2021 *revised draft* guidance documents
 - There were a few clarifications and associated updates, but the final guidance maintains the “Holistic” compliance demonstration approach and all other recommendations from the *revised draft* guidance.
 - <https://www.epa.gov/scram/guidance-ozone-and-fine-particulate-matter-permit-modeling>
- To clearly address several of the comments received... “*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 the final guidance, EPA is basing our recommended compliance demonstration approaches on our legal and policy definition of the NAAQS pollutants, O₃ and PM_{2.5}.



Final Guidance – O₃ Assessments

- Table III-1. EPA Recommended Approaches for Assessing O₃ Impacts by Assessment Case

- There is not a primary impacts approach for O₃. Only the secondary formation from NO_x and VOC is considered.
- Given the reasonable particularity for which quantitative assessments of secondarily formed O₃ can be made (e.g., MERPs), qualitative assessments are no longer recommended in most situations.

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. <ul style="list-style-type: none"> 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.		

- Note: Do not sum precursor emissions levels to compare to the SER.*



Final Guidance – PM_{2.5} Assessments

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

- Essentially identical to Table III-1 for O₃ with the exception of the assessment of Direct PM_{2.5}.
- Given the reasonable particularity for which quantitative assessments of secondarily formed PM_{2.5} can be made (*e.g.*, MERPs), qualitative assessments are no longer recommended in most situations.

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. <ul style="list-style-type: none"> Tier 1 Approach (<i>e.g.</i>, MERPs) Tier 2 Approach (<i>e.g.</i>, Chemical Transport Modeling)
* In unique situations (<i>e.g.</i> , 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.			

- Note: Do not sum direct component and precursor emissions levels to compare to the SER.*



Don't Stress Precursor Assessment...

- Take advantage of the [MERPs Guidance](#) and related hypothetical source modeling readily available from EPA via the [MERPs VIEW Qlik Application](#)
- The empirical relationship that is established in the development of a MERP for a particular precursor in a region/area can be used to reasonably estimate the impact of that precursor from other sources in that region/area when the equation is rewritten to solve for the “modeled air quality impact.”

- Original MERPs equation as presented in the MERPs Guidance

$$\text{MERP} = \text{Critical Air Quality Threshold} * \left(\frac{\text{Modeled emission rate from hypothetical source}}{\text{Modeled air quality impact from hypothetical source}} \right)$$

- Modified MERPs equation to solve for modeled air quality impact

$$\text{Modeled air quality Impact from hypothetical source} = \text{Critical Air Quality Threshold} * \left(\frac{\text{Modeled emission rate from hypothetical source}}{\text{MERP}} \right)$$

- *Note: Permit authorities are free to develop other Tier 1 approaches, but MERPs are our current recommendation.*



Single Impact Assessment (SIA)

- For an O₃ SIA, one would add the MERP calculated modeled impact for each precursor (NO_x and VOC).
 - If the combined O₃ impact for both precursors is less than the O₃ SIL, then you have an adequate O₃ compliance demonstration... otherwise an O₃ CIA is required.
- For a PM_{2.5} SIA, one would run AERMOD (or approved alternative) for the direct PM_{2.5} sources at the new or modifying facility. Add the high-first-high (H1H) value from AERMOD to the MERP calculated modeled impact for each precursor (NO_x and SO₂).
 - If the combined PM_{2.5} impact for the direct and both precursors is less than the appropriate PM_{2.5} SIL, then you have an adequate PM_{2.5} compliance demonstration... otherwise a PM_{2.5} CIA is required.
- *Note: It is strongly encouraged that the most representative MERP relationship for the region/area is used and not the most conservative relationships for the entire country.*



Cumulative Impact Assessment (CIA)

- For an O₃ CIA, the secondary impacts from the modified MERP equation for each precursor (NO_x and VOC) would be combined with background.
 - If the combined value is less than the NAAQS or PSD Increment, then an adequate O₃ compliance demonstration has been made.
 - If violations are found, then a Tier 2 analysis would be required. Please contact the EPA Regional Office and OAQPS through the appropriate permit review authority.
- In a PM_{2.5} CIA, the secondary impacts from the modified MERP equation for each precursor (NO_x and SO₂) would be added to the background that is included with the traditional AERMOD modeling of the direct PM_{2.5} from the new or modifying source and any nearby sources.
 - If no violations of the NAAQS or PSD Increment are found in the domain, then an adequate PM_{2.5} compliance demonstration has been made.
 - If violations are found, then the traditional culpability analysis would ensue.
- *Note: A misconception has been that cumulative modeling meant that a Tier 2 assessment and the need for chemical transport modeling (e.g., CMAQ or CAMx). This is not the case... one can continue using a Tier 1 approach with the modified MERP equation, even in situation when the SIL is exceeded and/or the precursor pollutant emissions rate is above the MERP threshold for that region/area.*



Continued Cautionary Statements

- Hourly Pairing of Background is Still Out
 - Considering the spatial and temporal variability throughout a typical modeling domain on an hourly basis and the complexities and limitations of hourly observations from the current PM_{2.5} ambient monitoring network, we do not recommend a "paired sums" approach on an hour-by-hour basis.
 - The pairing of daily monitored background and 24-hour average modeled concentrations is not recommended except in rare cases of relatively isolated sources where the available 1-in-1 day FRM/FEM monitor can be shown to be representative of the ambient concentration levels in the areas of maximum impact from the proposed new source.
- The EPA also does not endorse or recommend any 'scaling' techniques for the assessment of primary PM_{2.5} when less than 10 tpy and an air quality assessment is necessary.
 - If one needs to or is required to assess primary PM_{2.5}, then it should be done with the EPA recommended screening model, AERSCREEN, or the EPA preferred model, AERMOD, as described in Section 4.2.3.5 of Appendix W.
 - AERSCREEN/AERMOD modeling will already be necessary for the 1-hour NO_x or SO₂ sources that are above the respective SERs, so only marginal increase in computational and operational costs.
 - Accurate/appropriate source and emissions characterizations will become increasingly important!
 - Reliance upon old or overly conservative emissions factors could easily cause compliance demonstration issues.



Final Thoughts on the Final Guidance

- The July 29, 2022, “Guidance for Ozone and Fine Particulate Matter Permit Modeling” fully replaces the previous September 20, 2021, revised draft and February 10, 2020, draft guidance documents and the recommendations contained within them.
- The 2014 “Guidance on PM_{2.5} Permit Modeling” is completely retired at this point and has been replaced with new guidance and clarifications presented throughout this webinar.
- As additional experience is gained with O₃ and PM_{2.5} PSD compliance demonstrations, the EPA *may* update this and related guidance and provide further specificity on procedures for assessing the impacts of a single source on O₃ and secondary PM_{2.5} concentrations.
- The EPA continues to recommend that permit applicants engage early with the appropriate reviewing authority and that the co-regulatory agencies consult with the appropriate EPA Regional Office regarding all O₃ and PM_{2.5} compliance demonstrations, *especially if a permit applicant feels compelled to perform any chemical transport modeling.*



Questions?

- I'll circumvent the first question(s):
 - Yes, this release webinar presentation will be posted on SCRAM within the next 24-hours... same web page as the final guidance posting.
 - No, we do not have / are not going to post a recording of today's webinar.
- We have time for a few additional questions during this webinar.
 - Please unmute your microphone to ask your question or use the chat box.
 - We will make every attempt to answer your question today or will follow-up after this engagement.
- Further questions or needed clarifications in the future can be directed to George Bridgers, Bridgers.George@epa.gov.