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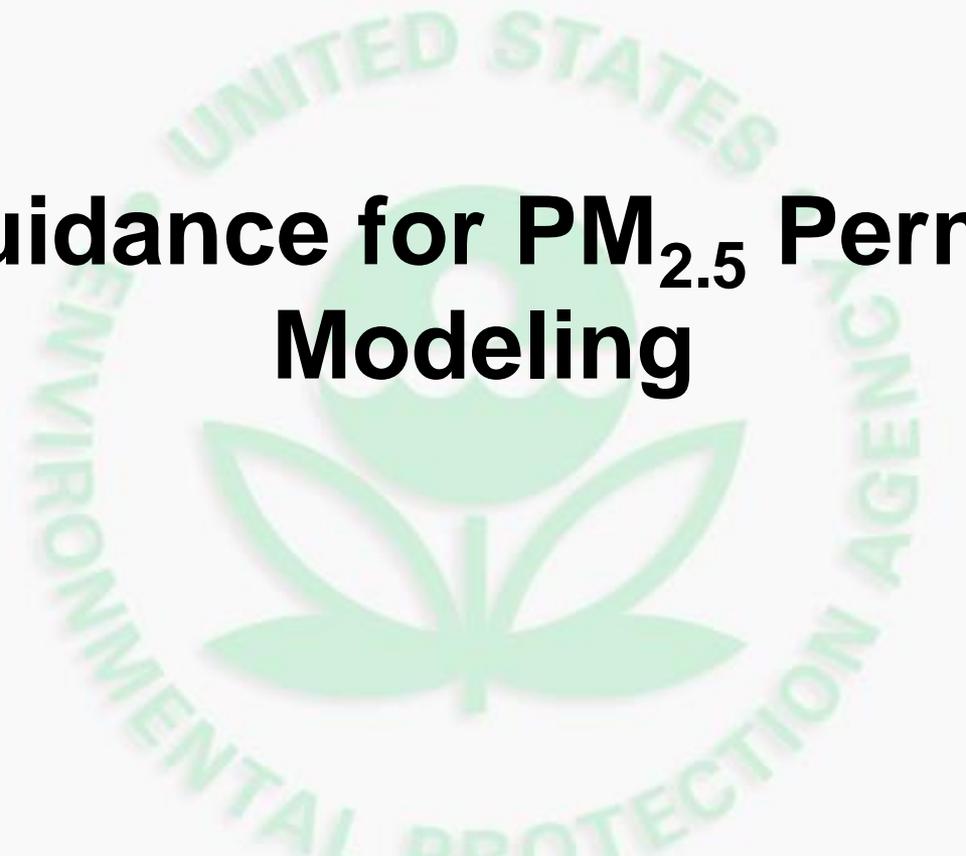
Modeling Guidance Updates

November 4, 2014

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2014 Region 4 Modelers' Workshop

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Guidance for PM_{2.5} Permit Modeling



Draft Guidance for PM_{2.5} Permit Modeling

- Publically released on Monday, March 4, 2013.
- Initial 45 day comment period through April 17, 2013 was extended by 45 days through May 31, 2013.
 - Numerous requests to extend the comment period by co-regulators, industry, and environmental groups.
 - The extension through May gave an opportunity for the entire dispersion modeling community to discuss the draft guidance document at the 2013 Regional, State, and Local Modelers' Workshop in Dallas, TX (April 22nd through 25th)
- At the end of the comment period, EPA had received 30 comprehensive comment packages.



Comments Received

- Most of the comments were supportive and positive.
- Earth Justice (Sierra Club) was very critical of our use of SILs throughout the draft guidance given the January 22, 2013 court decision.
- Industrial comments warned that the processes laid out in the draft guidance were complex and would be an additional burden on top of their issues with existing background levels of $PM_{2.5}$.
- Several industry related comments desired a more simplistic (surrogate) approach as was previously policy.



Comments Received

- A few of the industrial comments were emissions / stack testing related and have been shared with the appropriate groups within EPA.
 - Interim guidance for the treatment of condensable particulate matter test results in the PSD and NSR permitting programs
<http://www.epa.gov/ttn/emc/methods/psdnsrinterimcmpmemo4814.pdf>
- Most of the co-regulating agency comments provided specific feedback along the lines of the NACAA workgroup recommendations.
- Several of the co-regulating agencies desired more prescriptive approaches, especially in the assessment of secondarily formed $PM_{2.5}$.



Guidance for PM_{2.5} Permit Modeling

- Signed by Steve Page and released on May 20, 2014 during the middle of the 2014 RSL Modelers' Workshop in Salt Lake City, UT.
- Available for download from the EPA's SCRAM website:
http://www.epa.gov/ttn/scram/guidance/guide/Guidance_for_PM25_Permit_Modeling.pdf



Guidance for PM_{2.5} Permit Modeling

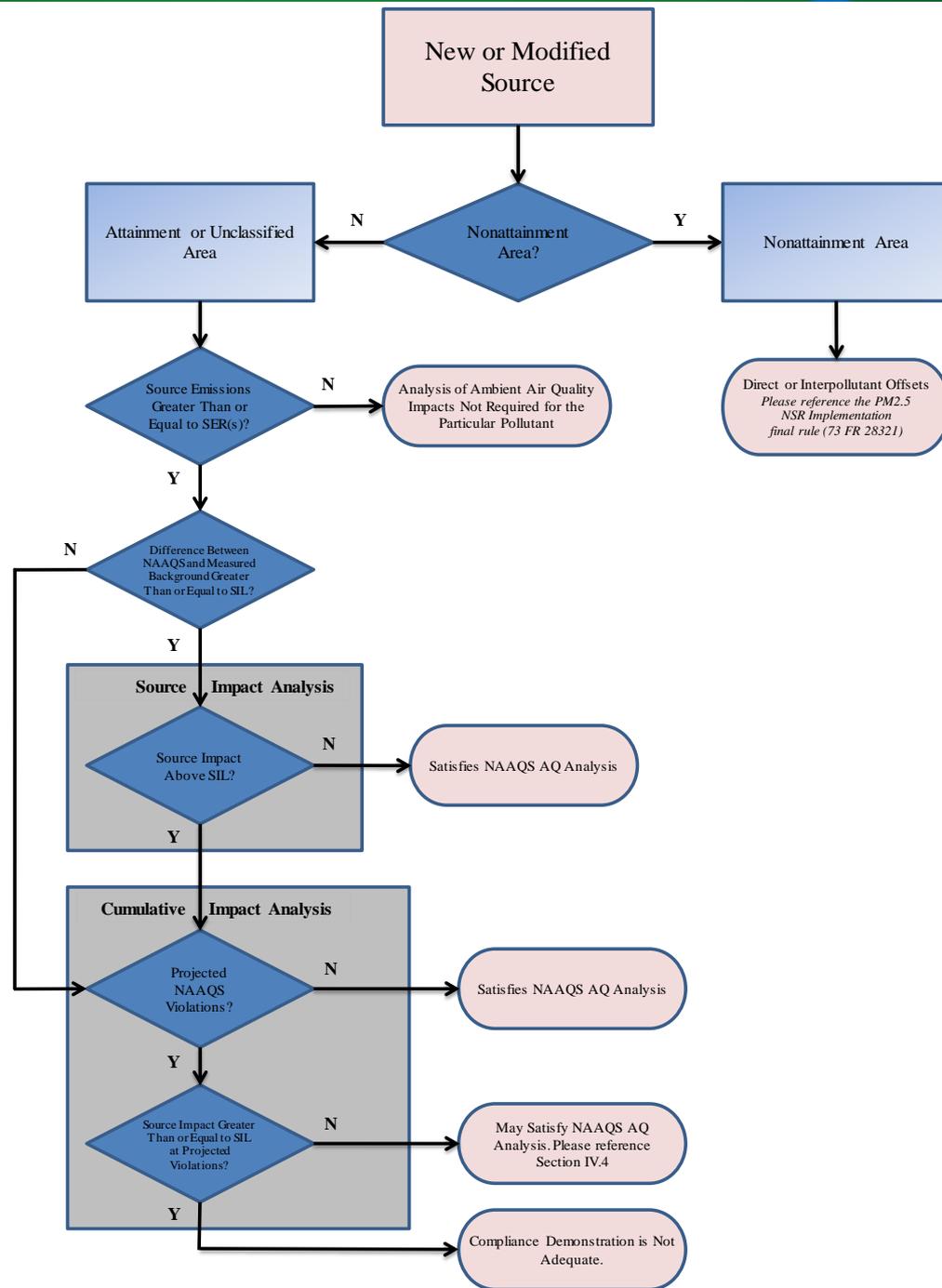
- Noteworthy changes made to the draft version include:
 - Clarifications throughout with respect to procedures for adequately addressing primary and secondarily formed PM_{2.5}.
 - Inclusion of an example hybrid (qualitative/quantitate) secondary PM_{2.5} impact assessment based on a location representative of more typical background PM_{2.5} concentrations. (*Reference Appendix D*)
 - Revision of a second tier cumulative PM_{2.5} NAAQS compliance approach. (*Reference Section IV.3 and Appendix E*)
 - Revision of Section V and other sections relative to PSD Increment for PM_{2.5}.



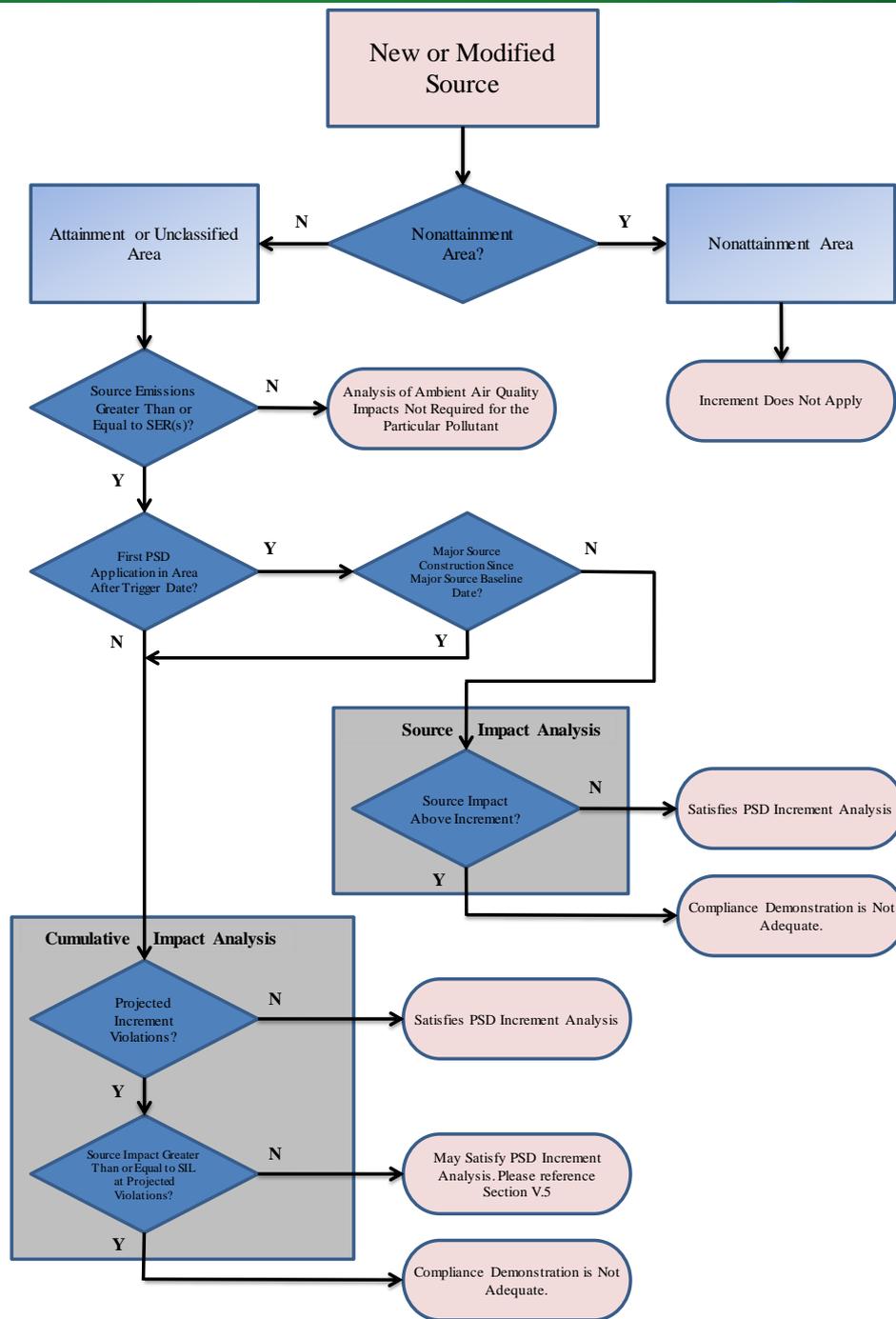
Appropriate Use of SILs

- Per a January 22, 2013 U.S. Court of Appeals decision, any permitting authority wishing to use a particular SIL value as a screening tool in a significant impact analysis should determine whether a substantial portion of the NAAQS has already been consumed.
 - Preconstruction monitoring data (or adequately representative monitoring data from an existing monitoring network) should be evaluated against the respective $PM_{2.5}$ NAAQS.
 - If the difference (headroom) between the NAAQS and the measured $PM_{2.5}$ background in the area is greater than the applicable SIL value, then the EPA believes it would be sufficient in most cases for permitting authorities to conclude that a source with an impact below that SIL value will not cause a new NAAQS violation.

- Reference: Figure II-1. (NAAQS)



- Reference: Figure II-2. (Increment)





PSD Modeling of PM_{2.5}: Screening Nature, Consultation, & Protocol

- Given that the contributions of precursor pollutant emissions to the secondary formation of PM_{2.5} are not explicitly accounted for by the currently preferred dispersion models and/or techniques and the prominent role of background concentrations in cumulative impact analyses, certain aspects of standard modeling practices used for other criteria pollutants may not be appropriate.
- As such, PSD compliance demonstrations that assess secondary PM_{2.5} should be viewed as screening-level analyses analogous to the screening nature of Section 5.2.4 of Appendix W for NO₂ impacts.



PM_{2.5} Compliance Demonstration: Assessment Cases

- We have established 4 different scenarios or assessment cases that further define what air quality analyses, *if any*, that an applicant would follow for compliance demonstrations of the PM_{2.5} NAAQS or PSD Increments.
- Each of these 4 scenarios are outlined in the table on the following slide.



PM_{2.5} Compliance Demonstration: Assessment Cases (Continued)

- Reference: Table III-1. (NAAQS) and V-2. (Increment)

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 Both NO _x and SO ₂ emissions < 40 tpy SER	N/A	N/A
Case 2: Primary Air Quality Impacts Only	Direct PM _{2.5} emissions ≥ 10 tpy SER Both NO _x and SO ₂ emissions < 40 tpy SER	Appendix W preferred or approved alternative dispersion model	N/A
Case 3: Primary and Secondary Air Quality Impacts	Direct PM _{2.5} emissions ≥ 10 tpy SER Both NO _x and/or SO ₂ emissions ≥ 40 tpy SER	Appendix W preferred or approved alternative dispersion model	<ul style="list-style-type: none"> • Qualitative • Hybrid qualitative / quantitative • Full quantitative photochemical grid modeling
Case 4: Secondary Air Quality Impacts Only	Direct PM _{2.5} emissions < 10 tpy SER Both NO _x and/or SO ₂ emissions ≥ 40 tpy SER	N/A	<ul style="list-style-type: none"> • Qualitative • Hybrid qualitative / quantitative • Full quantitative photochemical grid modeling



Modeling of Directly Emitted PM_{2.5}

- Cases 2 & 3 both require compliance demonstration for the direct PM_{2.5} through dispersion modeling.
- Typical significant impact and cumulative impact analysis approach.
- Model Selection:
 - AERMOD, *EPA's preferred near-field dispersion model.*
- Model Considerations:
 - Modeling domain.
 - Source inputs.
 - Meteorological inputs.
- Cumulative impact analyses would necessitate the inclusion of background (monitored and/or other sources explicitly modeled)



Assessment of Secondarily Formed PM_{2.5}

- Case 3 and 4 requires some level of assessment of precursor pollutant emissions to the secondary formation of PM_{2.5}.
- The assessment of the precursor pollutant emissions to the secondary formation of PM_{2.5} could be completely qualitative in nature, could be a hybrid qualitative / quantitative approach, or may be a full photochemical grid modeling exercise.
- The combination of the modeled direct impacts of PM_{2.5} with that of secondarily formed PM_{2.5} will require additional thought and justification depending on assessment approach.
- Consultation with the appropriate permit reviewing authority is paramount, including the approval of a modeling protocol that includes a well constructed conceptual description of the PM_{2.5} for the region surrounding the project source.



Revised Second Tier for 24-hour PM_{2.5} NAAQS Compliance Demonstration

- The second tier method for 24-hour PM_{2.5} NAAQS compliance demonstrations was proposed to provide flexibility and relieve a degree of conservativeness in the modeling that resulted from situations where background PM_{2.5} concentrations peaked in seasons that were offset from the seasons to which the source PM_{2.5} impacts peaked.
- The second tier methodology proposed in the draft guidance could have unintended consequences of being higher or more conservative than the first tier.



Revised Second Tier for 24-hour PM_{2.5} NAAQS Compliance Demonstration *(Cont.)*

- In the final guidance, the second tier methodology was been appropriately updates to avoid unintended consequences.
 - Coordination with EPA's Office of Transportation and Air Quality (OTAQ), experience gained from interactions with industrial stakeholders, and internal testing of real-world examples of facilities in a variety of PM_{2.5} environments.
- Revised second tier methodology is consistent with EPA's original SIP modeling guidance



Revised Second Tier for 24-hour PM_{2.5} NAAQS Compliance Demonstration *(Cont.)*

- Recommend that the distribution of monitored data equal to and less than the annual 98th percentile be appropriately divided into seasons (or quarters) for each of the three years that are used to develop the monitored design value.
 - This results in data for each year (for three years) which contains one season (quarter) with the 98th percentile value and three seasons (quarters) with the maximum values which are less than or equal to the 98th percentile value.
 - The monitored concentrations greater than the 98th percentile in each of the three years would not be included in the seasonal (or quarterly) subsets.



Revised Second Tier for 24-hour PM_{2.5} NAAQS Compliance Demonstration *(Cont.)*

- The maximum concentration from each of the seasonal (or quarterly) subsets should then be averaged across these three years of monitoring data.
- The resulting average of seasonal (or quarterly) maximums should then be included as the four seasonal background values within the AERMOD model.
- The excluded monitored concentrations are the same values that are excluded when determining the monitored design value.



PM_{2.5} Increments

- The recommendations for assessing secondary PM_{2.5} impacts associated with precursor emissions on NAAQS analyses, based on the four assessment cases, are also applicable for increment analyses.
- First source into an increment impact area should be able to exercise a typical Source Impact Analysis with a minimal “headroom” checks.
 - Reference Figure II-2.



PM_{2.5} Increments

- Expanded conversation on the use of monitoring to track increment (consumption and expansion) in the baseline area based on regional considerations.
 - Additional clarification will be necessary as more real-world application of using monitoring in a cumulative increment compliance demonstration is gained.
- **Early coordination** with the reviewing authority is encouraged to identify the appropriate baseline concentration and baseline area for the proposed new/modified source, and the inventory of increment-affecting sources.



SILs & Modeling Domain

- Since the release of the Guidance in May, there have been several inquiries concerning the determination of the modeling domain based on a variation of the “significant impact area.”
- Applicants are seeking to use the H8H metric instead of the H1H from the source’s impact analysis (screening) to determine the domain for cumulative modeling.
- This is inappropriate since the H8H metric is only relevant to a potential cumulative violations.
- It is possible that a source could have a significant impact to a cumulative violation below the source’s 8th high individual impact.
- All cumulative violations from the H8H and below should be assessed.
- **Appendix W does not recommend modeling the entire SIA.**

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New / Future Clarification Memorandums



Supplemental NO₂ Clarification Memo

- “Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO₂ National Ambient Air Quality Standard“
- Status of the Ambient Ratio Method (ARM) and Ambient Ratio Method 2 (ARM2) Tier 2 modeling approaches for demonstrating NAAQS compliance under the PSD program.
- ARM2 was developed by API with close coordination with EPA-OAQPS and included in the AERMOD version 14134 release as a beta option.



Supplemental NO₂ Clarification Memo

- Selection and application of the NO₂/NO_x In-Stack Ratio (ISR) for use in Tier 3 NO₂ modeling application
- The appropriate applications for the Ozone Limiting Method (OLM) and Plume Volume Molar Ratio Method (PVMRM) Tier 3 NO₂ modeling schemes.
- The treatment of background sources and monitoring data in compliance demonstrations.
- Available for download from the EPA's SCRAM website:

http://www.epa.gov/ttn/scram/guidance/clarification/NO2_Clarification_Memo-20140930.pdf



Significant Concentration Gradient Clarification Memo

- The practice of modeling the entire Significant Impact Area (SIA) and all sources within is not recommended in Appendix W.
- With previous standards, it has not been an issue and was standard practice; however, that practice is causing significant problems with the more stringent 1-hour NO₂ and SO₂ and revised PM_{2.5} standards.
- Understanding what the background monitor truly represents and which nearby sources then need to be explicitly modeled is paramount.



Significant Concentration Gradient Clarification Memo

- Appendix W discusses the concept of significant concentration gradients but is vague on the definition.
 - *“All sources expected to cause a significant concentration gradient in the vicinity of the source or sources under consideration for annual emission limit(s) should be explicitly modeled. The number of such sources is expected to be small except in unusual situations.”*
 - These locations can include the area of maximum impact of the source, the area of maximum impact of nearby sources, and the area where all sources combine to cause maximum impact.



Significant Concentration Gradient Clarification Memo

- The clarification memo will go into more detail of how to calculate concentration gradients and provide some examples of where sources should and should not be included in a cumulative modeling demonstration.
- Emphasis that the applicants and reviewing authority should still exercise best professional judgment in the selection of nearby sources to explicitly model.
- Hopefully released by late 2014 and portions of the memo will be incorporated into the Appendix W revisions.

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Discussion & Questions?