



RE: Revision to the Wainwright QAPP

Damiana, Thomas to: Christopher Hall
Cc: Herman Wong, Nicole.StAmand, brad.c.thomas

11/25/2009 04:31 PM

History: This message has been forwarded.

Chris,

Please disregard the previous version of the revision I sent you. There was a slight oversight on the revised Table 7. I have corrected the revision and it is attached.

Please give me a shout if you have questions.

Tom

From: Damiana, Thomas
Sent: Wednesday, November 25, 2009 4:15 PM
To: 'Hall.Christopher@epamail.epa.gov'
Cc: 'Wong.Herman@epamail.epa.gov'; 'Nicole.StAmand@shell.com'; 'brad.c.thomas@conocophillips.com'
Subject: Revision to the Wainwright QAPP

Chris,

Attached is a letter and attachment describing a revision to the Wainwright Near-Term Monitoring Station QAPP. This revision is necessary to incorporate the quality assurance activities being conducted at the Deadhorse monitoring station. I have also attached a complete digital copy of the QAPP which has the revisions included in Appendix A.

Please let me know if you need hardcopies, and please give me a shout if you have questions about this revision or any other aspect of this monitoring project.

Have a Great Day!

Tom

Tom Damiana

Meteorologist/Engineer, Air Quality, Mountain/Southwest Region

Environment

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[attachment "Wainwright Near-Term Appendix A - Rev03.pdf" deleted by Christopher Hall/R10/USEPA/US] [attachment "FINALWainwright Near-Term Ambient Monitoring QAPP rev01.pdf" deleted by Christopher Hall/R10/USEPA/US]

Prepared for:
ConocoPhillips Alaska, Inc.
Wainwright, Alaska



Wainwright Near-Term Ambient Air Quality Monitoring Quality Assurance Project Plan

ENSR Corporation
November 2008
Document No.: 01865-100-2100

For record

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U.S. Environmental Protection Agency
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----- Forwarded by Julie Vergeront/R10/USEPA/US on 12/18/2009 10:11 AM -----



**Christopher
Hall/R10/USEPA/US**
12/18/2009 10:07 AM

To Thomas.Damiana@aecom.com
cc Herman Wong/R10/USEPA/US@EPA,
<Brad.C.Thomas@conocophillips.com>,
<Nicole.StAmand@shell.com>, "DeBell, Linsey"
<Linsey.DeBell@aecom.com>, Julie
Vergeront/R10/USEPA/US@EPA, Dave
Bray/R10/USEPA/US@EPA, Janis
Hastings/R10/USEPA/US@EPA, Suzanne
Skadowski/R10/USEPA/US@EPA
Subject EPA Approval for the Deadhorse QAPP

Tom,
We have approved the Deadhorse QAPP and I have attached the signature page below. Please provide to Herman or myself 3 hard copies each of both the Deadhorse and the 11/25/09 Wainwright QAPP by December 28, as these need to be part of the public record by the end of the month.

Thanks, Chris

Chris Hall
Air Data Analyst/Air QA Coordinator
US EPA, Region 10
1200 Sixth Avenue, Suite 900, OEA-095
Seattle, WA 98101-3140
(206) 553-0521 or 1-800-424-4372, ext 0521
hall.christopher@epa.gov



FIN&L_Deadhorse_QAPP approval page.pdf

A Project Management Elements

A.1 Approvals



December 16, 2009

Thomas Damiana
AECOM Corporation
Project Manager

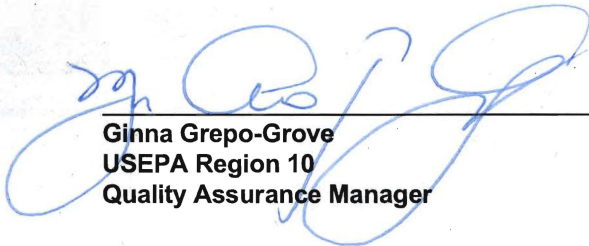
Date



December 16, 2009

Linsey DeBell
AECOM Corporation
Quality Assurance Manager

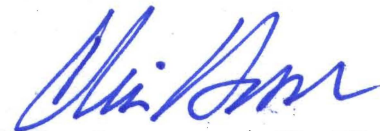
Date



12/18/09

Ginna Grepo-Grove
USEPA Region 10
Quality Assurance Manager

Date

for 

12/18/09

Herman Wong
USEPA Region 10
Project Coordinator

Date



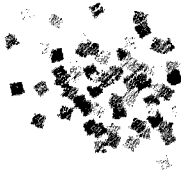
Fw: Precision and Bias measurements for PSD preconstruction monitoring at Prudhoe Bay Alaska.

Christopher Hall to: Damiana, Thomas
Cc: Herman Wong

08/18/2009 03:12 PM

2nd of 3 emails.

----- Forwarded by Christopher Hall/R10/USEPA/US on 08/18/2009 03:10 PM -----



Herman
Wong/R10/USEPA/US
08/18/2009 07:48 AM

To: Dennis Crumpler/RTP/USEPA/US@EPA
cc: Christopher Hall/R10/USEPA/US@EPA
Subject: Re: Precision and Bias measurements for PSD preconstruction monitoring at Prudhoe Bay Alaska

Morning Dennis:

Below are my thoughts on #2 and #3 in color.

Herman

Dennis Crumpler Hi Hermon, I guess we covered a lot more than I... 08/17/2009 12:42:06 PM

2. Network definition.

In the Region 10 Alaska case, we have a contractor, AECOM, installing, operating and maintaining ambient air monitoring stations for Conoco-Phillips and Shell. Currently, AECOM is operating and maintaining monitoring stations at Nuisquit for Conoco-Phillips, Badami for Shell, and Wainwright for Conoco-Phillips and Shell. AECOM will also be installing collocated PM2.5 samplers per PSD regulation and 40 CFR Part 58 at Prudhoe Bay for the benefit of Shell and Conoco-Phillips.

Under this AECOM network operation, I believe it is appropriate that the collocated PM2.5 sampling data at Prudhoe Bay can be used to comply with 40 CFR Part 58 for the Badami monitoring station. At Badami, Shell is installing a PM2.5 FEM sampler.

Do you have any thoughts on this point and the definition of "network"?
Network for PSD is an interesting concept, and I understand that it is even more interesting for outer continental shelf source permitting. I can speak authoritatively only on the QA aspects of design and I quote Section 3.2.5.5 of Appendix A.

3.2.5.5 For each PSD monitoring network, one site must be collocated. A site with the predicted highest 24-hour pollutant concentration must be selected.

Regarding bias I refer back to my response on Question 2, which in this case means that you probably need 5 independent FRM-based bias measurement events. However, since there is some question about the negative values, more events might not be a bad idea. It might give some hint as to the conditions that produce the negative values.

In reviewing language and how "network" is used in Appendix A, my interpretation is that AECOM is running a PSD network at the North Slope for Conoco-Phillips and Shell. Hence, the collocated sampler monitoring station at Prudhoe Bay can be used by AECOM clients to satisfy Appendix A of Part 58.

3. At Wainwright, valid PM2.5 data collection started on 06 March 2009. Assuming that the collocated sampling program at Prudhoe begins by 01 September 2009,

Is the PM2.5 data collected from 06 March 2009 to 30 August 2009 acceptable even though there was no concurrent collocated sampling during this period?

A strict interpretation would be that the data does not meet 40 CFR Part 51.21(m)(3) which links to Appendix A in 40 CFR Part 58.

A discretionary interpretation would be "yes" provided there are 25 valid sample pairs between 6 March 2009 and 5 March 2010 (assuming a one year data collection program).

I agree with the discretionary interpretation . Keep in mind that this is not a carte blanc acceptance of the data from Wainwright . A couple of the 5 subsequent bias measurements could be made at Wainwright . And, if there are other independent reasons to suspect the accuracy (bias) or precision of the data, those concerns would need to be resolved .

Shell is collecting the minimum four months of air quality data to meet 40 CFR Part 52.21(m)(1)(iv) and (m)(3). Paragraph (m)(3) refers to Appendix A in Part 58 and in there, I did not find any exemptions or discretionary words to the collocated monitoring. The language I read referred to scheduled samples and analysis on an annual or yearly basis. There was no indication of random samples, delayed samples or unscheduled samples. Hence, my interpretation of the regulations is that any valid and useable PM2.5 data in a PSD application ambient air quality analysis must be collected during the period in which there was concurrent and collocated sampling occurring at a monitoring station or network station. This is what I am willing to defend if challenged.



RE: Recently PM2.5 Wainwright Measurements

Damiana, Thomas to: Herman Wong

Cc: Christopher Hall, Pat Nair

08/26/2009 10:13 AM

History: This message has been replied to.

It was a more complex demonstration than that - it basically involved demonstrating that the high project impacts did not occur under the same conditions (season, wind speed, wind direction, etc.) as the high background impacts, and then demonstrating also that project impacts predicted under the same conditions that generated the high background value did not exceed the standards after adding in the high background value. It is a two part demonstration. Notice that according to this methodology, you never eliminate the high background value from consideration.

I think that Appendix W leaves the door open for dealing with this situation in a couple of ways though.

Tom

-----Original Message-----

From: Wong.Herman@epamail.epa.gov [mailto:Wong.Herman@epamail.epa.gov]

Sent: Wednesday, August 26, 2009 10:54 AM

To: Damiana, Thomas

Cc: Hall.Christopher@epamail.epa.gov; Nair.Pat@epamail.epa.gov

Subject: RE: Recently PM2.5 Wainwright Measurements

Are you thinking about eliminating measurements based on wind direction?

"Damiana,
Thomas"
<Thomas.Damiana@
aecom.com>

08/26/2009 09:50
AM

To
Herman Wong/R10/USEPA/US@EPA, Pat
Nair/R10/USEPA/US@EPA

cc
Christopher Hall/R10/USEPA/US@EPA

Subject
RE: Recently PM2.5 Wainwright
Measurements

Herman and Pat,

Just wanted to interject,

I do not feel like the high impact in Wainwright could be classified as

an Exceptional Event. In fact, I think it would be hard to classify it as an exceptional event.

What I do think is possible, and I would recommend to Shell, is to use approved Appendix W (Guideline on Air Quality Models) techniques to eliminate the high background from consideration. Rob Wilson turned us on to this methodology years ago when we had to deal with high particulate numbers at Nuiqsut. The Appendix W techniques would be approved for use by Herman, and you would not need to wait for an answer.

Tom

-----Original Message-----

From: Wong.Herman@epamail.epa.gov [mailto:Wong.Herman@epamail.epa.gov]
Sent: Wednesday, August 26, 2009 8:40 AM
To: Nair.Pat@epamail.epa.gov
Cc: Hall.Christopher@epamail.epa.gov; Damiana, Thomas
Subject: Recently PM2.5 Wainwright Measurements

Pat:

Yesterday, Tom Damiana and I spoke about the PM2.5 measurements from Wainwright. Tom conveyed that there is another quarter worth of measurements that will be available to EPA soon and one of the measured 24-hour PM2.5 concentrations was 14 micrograms per cubic meter.

In Table 11 of my AQIA TSD, a background of 8 micrograms per cubic was added to the predicted impact which resulted in a total impact of 96 percent of the NAAQS. If 14 is added to the predicted impact, the total impact would be 113 percent of the NAAQS. We can't issue a permit with a predicted violation! This is in addition to the collocated sampler issue.

Tom expressed to me that Shell may make the case that this is an exceptional event. Should this happen, I assume that OEA would make the determination which could be a long process.

Another option would be for Shell to remodel the PM2.5 emissions without condensables. Dave mentioned this option to me because of what may happen for the other Shell application. He will verify with OAQPS that EPA will not be issuing a reconsideration decision regarding condensables within the next 3-4 months.

I need to be reasonably certain that a model violation of the PM2.5 NAAQS would not occur based on the modeling results. Currently, we are assuming that a minimum four months of collected data is adequate. Based on the Wainwright measurements, I now believe that it would be prudent to change the data collection period to include the Shell drilling season in the Chukchi Sea, i.e., data collection from July to December which I assume is a permit condition.

Herman



North Slope Particulate Summary
 Damiana, Thomas to: Herman Wong
 Cc: "Thomas, Brad C"

08/26/2009 08:53 AM

History: This message has been replied to and forwarded.

Herman,

Here is the summary of particulate concentrations measured by the ConocoPhillips particulate monitoring network so far this year:

North Slope Particulate Data Summary

- Wainwright March 6 through August 23, 2009
- Nuiqsut, Alaska July 21 through August 23, 2009

	Wainwright		Nuiqsut	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)
Number of Valid Values	149	158	34	32
Average of all Valid Values	17	3	17	10
Maximum	114	14	96	89
Minimum	-2	-3	-1	3
Number of Values > 3 µg/m ³	NA	80	NA	31
Average of Values > 3 µg/m ³	NA	5.2	NA	10
No. of Values > 3 µg/m ³ (1 in 3 day)	NA	26	NA	11
Avg. of Values > 3 µg/m ³ (1 in 3 day)	NA	5.3	NA	9.1

The spreadsheet of raw values is attached to this email incase there are some numbers that you would like to see that I have not calculated.

As we discussed on the phone, there has been an increase in particulate concentrations measured during July and August as the temperatures have increased, and the disturbed areas have dried out. I have not done a thorough analysis yet, but I am sure that all of the elevated concentrations that we have measured at both Nuiqsut and Wainwright are the result of windblown fugitive dust. For me, at Nuiqsut it was odd to see PM2.5 concentrations nearly equal to the PM10 concentrations during the strongest of these events (see the maximum concentration shown above for Nuiqsut) – it suggests that the fugitive dust is concentrated in the smaller size fractions, which is entirely anticipated. However, we know that the dust in Nuiqsut, unlike the dust in Wainwright, is from silt deposits along the river banks adjacent to the station, so maybe the small size fractions make sense. These fugitive dust impacts are going to present a problem for us when modeling just as the PM10 impacts do since we are seeing maximum 24-hr PM2.5 impacts over the NAAQS. I think the Wainwright concentrations show a much more typical relationship between PM2.5 and PM10, and that is likely because the source is nearby roadways.

I also wanted to reiterate my experience with collocated PM10 monitoring in the early days of the Nuiqsut project. In about 2000, we conducted 2-years of collocated FEM/FRM particulate monitoring in Nuiqsut on a 1 in 3 day sampling schedule. During that entire time, I only recall two sample pairs that were above 20 micrograms per cubic meter, which at the time was the threshold for making valid precision comparisons. In the end, the collocated sampling was not successful in establishing precision; however, the data did convince the State of Alaska that the FEM was overestimating concentrations and decided that the collocated program was no longer necessary.

Hope this analysis helps you understand the concentrations we are measuring, and please give me a shout if you would like to discuss the analysis.

Tom

Tom Damiana

Meteorologist/Engineer, Air Quality, Mountain/Southwest Region

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Please note: My e-mail has changed to [thomas.damiana@aecom.com]. Please update your address books accordingly. ENSR's parent company, AECOM Technology Corporation, is evolving to better serve its global clients. AECOM is forming a global business line – AECOM Environment – by utilizing the skills and capabilities from across its global environmental operations, including resources from ENSR, Earth Tech, STS and Metcalf & Eddy. AECOM Environment is devoted to providing quality environmental services to its global clients. With access to approximately 4,200 staff in 20 countries, AECOM Environment will be one of five new AECOM business lines, which also include AECOM Water, AECOM Transportation, AECOM Design, and AECOM Energy.

AECOM Environment provides a blend of global reach, local knowledge, innovation, and technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments. Though our appearance is changing, our commitment to the success of your projects and your organization remains strong. We will keep you apprised of future details.

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North Slope Particulate Summary.xls



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

MAR 23 2010

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Modeling Procedures for Demonstrating Compliance with PM_{2.5} NAAQS

FROM: Stephen D. Page, Director
Office of Air Quality Planning and Standards

TO: See Addressees

This memorandum addresses the need for recommendations regarding appropriate dispersion modeling procedures which can be used to demonstrate compliance with PM_{2.5} National Ambient Air Quality Standards (NAAQS). The need for these recommendations arises from several recent regulatory actions and proposals which increase the likelihood that applicants for permits under the new source review (NSR) and prevention of significant deterioration (PSD) programs may be required to demonstrate compliance with PM_{2.5} NAAQS rather than relying upon the PM₁₀ surrogate policy established in 1997. These recommendations are intended to facilitate appropriate and consistent implementation of current guidance regarding PM_{2.5} dispersion modeling contained in the *Guideline on Air Quality Models*, Appendix W to 50 CFR Part 51, while acknowledging that such guidance is somewhat limited in detail due to technical issues associated with PM_{2.5} modeling.

This memorandum provides recommendations on two aspects of the modeling procedures for demonstrating compliance with the PM_{2.5} NAAQS. First, this memorandum discusses some of the technical issues that must be addressed by any applicant or permitting authority that is seeking to rely on the PM₁₀ surrogate policy. Second, this memorandum provides additional information on modeling procedures to demonstrate compliance with PM_{2.5} NAAQS without relying upon the PM₁₀ surrogate policy.

BACKGROUND

On July 18, 1997, EPA revised the NAAQS for particulate matter to add new annual and 24-hour standards for fine particles using PM_{2.5} as the indicator. EPA revised the 24-hour NAAQS for PM_{2.5} on September 21, 2006, reducing the standard from 65 µg/m³ to 35 µg/m³. EPA also retained the previous 1997 annual standard for PM_{2.5} and the 24-hour standard for PM₁₀, while revoking the previous annual standard for PM₁₀. For attainment of the new 24-hour PM_{2.5} NAAQS based on ambient monitoring, the average of the 98th percentile 24-hour values

over three years of monitoring must not exceed 35 $\mu\text{g}/\text{m}^3$. The annual $\text{PM}_{2.5}$ NAAQS is set at 15 $\mu\text{g}/\text{m}^3$ based on the average of the annual mean $\text{PM}_{2.5}$ concentrations over three years.

Citing significant technical difficulties with respect to $\text{PM}_{2.5}$ monitoring, emissions estimation, and modeling, EPA established a policy, known as the PM_{10} surrogate policy, on October 23, 1997. This policy allowed permit applicants to use compliance with the applicable PM_{10} requirements as a surrogate approach for meeting $\text{PM}_{2.5}$ NSR requirements until the technical difficulties were resolved. On May 16, 2008, EPA promulgated final rules governing the implementation of the NSR program for $\text{PM}_{2.5}$, which included a “grandfathering provision” allowing applicants for federal PSD permits covered by 40 CFR § 52.21, with complete permit applications submitted as of July 15, 2008, to continue relying on the PM_{10} surrogate policy. In response to a petition challenging the continued use of the PM_{10} surrogate policy for issuing PSD permits, on June 1, 2009, EPA issued a 3-month administrative stay of the grandfathering provision for $\text{PM}_{2.5}$ affecting federal PSD permits to give EPA time to propose repealing the challenged grandfathering provision. On September 16, 2009, the original 3-month stay was extended to June 22, 2010, to allow additional time for EPA to formally propose repeal of the grandfathering provision from the $\text{PM}_{2.5}$ NSR implementation rule for federal PSD permits issues under 40 CFR § 52.21. On February 11, 2010, EPA published its proposal to repeal the grandfathering provision in the *Federal Register* at 75 FR 6827. These actions cite the fact that the technical difficulties which necessitated the PM_{10} surrogate policy have been largely, although not entirely, resolved.

As part of the proposed rulemaking to repeal the grandfathering provision contained in the federal PSD program, EPA has also proposed to end the use of the PM_{10} surrogate policy for state PSD programs that EPA has approved as part of the state implementation plan (SIP) under 40 CFR § 51.166. Under the PSD programs for $\text{PM}_{2.5}$ currently in effect for SIP-approved states, states would be allowed to continue using the PM_{10} surrogate policy until May 2011, or until EPA approves the revised SIP for $\text{PM}_{2.5}$, whichever occurs first. While we continue to allow states to use the PM_{10} surrogate policy during their transition to the new $\text{PM}_{2.5}$ requirements, we have also made it clear that the policy needs to be implemented by taking into account court decisions that address the surrogacy concept. Accordingly, an applicant seeking a PSD permit under a SIP-approved PSD program may still rely upon the PM_{10} surrogate policy as long as (1) the appropriateness of the PM_{10} -based assessment for determining $\text{PM}_{2.5}$ compliance has been adequately demonstrated based on the specifics of the project; and (2) the applicant can show that a $\text{PM}_{2.5}$ analysis is not technically feasible. Absent such demonstrations, applicants would be required to submit a $\text{PM}_{2.5}$ -based assessment to demonstrate compliance with the $\text{PM}_{2.5}$ standards, in addition to meeting the other requirements under the NSR/PSD programs.

PM_{10} SURROGACY DEMONSTRATIONS

Given the need for applicants that continue to rely on the PM_{10} surrogate policy to demonstrate the appropriateness of the policy based on the specifics of the project, we feel that it is appropriate and timely to address some of the technical issues associated with a surrogacy demonstration. EPA’s August 12, 2009, Administrative Order in response to petitions regarding the Title V permit for Louisville Gas and Electric Company (LG&E), Trimble Generating Station, provides a brief summary of the case law history that bears on the PM_{10} surrogacy issue

which suggests that an appropriateness demonstration “would need to address the differences between PM₁₀ and PM_{2.5}.”¹ The LG&E order cites two examples in this regard: 1) “emission controls used to capture coarse particles may be less effective in controlling PM_{2.5}”; and 2) “particles that make up PM_{2.5} may be transported over long distances while coarse particles normally only travel short distances.” These examples serve to highlight the two main aspects of PSD permitting for which the appropriateness of the surrogate policy should be demonstrated: 1) the Best Available Control Technology (BACT) emission control technology assessment; and 2) the ambient air quality impact assessment to demonstrate compliance with the applicable NAAQS.

While acknowledging “an evolving understanding of the technical and legal issues associated with the use of the PM₁₀ Surrogate Policy,” the LG&E order offers two steps as possible approaches for making an appropriateness demonstration, without suggesting that the “two steps are necessary or sufficient to demonstrate that PM₁₀ is a reasonable surrogate for PM_{2.5}” and clearly stating that “these two steps are not intended to be the exclusive list of possible demonstrations” regarding surrogacy. The two steps offered in the LG&E order are primarily relevant to the appropriateness demonstration regarding emission controls under BACT, while the discussion here will be focused on the appropriateness demonstration in relation to ambient air impacts.

Given the range of application-specific factors that may need to be addressed for an appropriateness demonstration in relation to ambient air impacts, it is not practical to provide detailed guidance regarding how to conduct such demonstrations. However, the following list identifies some of the “differences between PM₁₀ and PM_{2.5}” in relation to ambient air impacts that should be addressed in the development of a surrogacy demonstration:

1. While EPA revoked in 2006 the annual PM₁₀ standard that was in effect when the surrogate policy, the surrogacy demonstration would still need to address the appropriateness of the PM₁₀ surrogate policy in relation to the annual PM_{2.5} standard, and would likely require a modeling analysis of annual PM₁₀ impacts.
2. The current 24-hour NAAQS of 35 µg/m³ is well below the previous level of 65 µg/m³ that was in effect when the PM₁₀ surrogate policy was established. The background monitored levels of PM_{2.5} are, therefore, likely to account for a more significant fraction of the cumulative impacts from a modeling analysis relative to the current 24-hour PM_{2.5} NAAQS than for PM₁₀.
3. Secondary formation of PM_{2.5} from emissions of NO_x, SO_x and other compounds from sources across a large domain will often contribute significantly to the total ambient levels of PM_{2.5}, and may be the dominant source of ambient PM_{2.5} in some cases. In contrast, secondarily formed particles are less likely to be significant portion of PM₁₀, which may result in significant differences in the spatial and temporal patterns of ambient impacts between PM_{2.5} and PM₁₀.

¹ A discussion of the case law that bears on the PM₁₀ surrogacy issue also appears in the February 11, 2010, proposed rule at 75 FR 6831-6832.

4. The probabilistic form of the PM_{2.5} NAAQS, based on the multiyear average of the 98th percentile for the daily standard, differs from the expected exceedance form of the PM₁₀ NAAQS, which allows the standard to be exceeded once per year on average using the high-sixth-high (H6H) value over 5 years. These differences affect the temporal and spatial characteristics of the ambient air impacts of PM₁₀ and PM_{2.5}. Differences in the form of the NAAQS also complicate the process of combining modeled impacts with monitored background levels to estimate cumulative impacts under the NSR/PSD permitting programs, as well as the determination of whether modeled impacts from the facility will cause a significant contribution to any modeled violations of the NAAQS that may occur.

These factors complicate the viability of demonstrating the appropriateness of the PM₁₀ surrogate policy to comply with the requirement for a PM_{2.5} ambient air quality impact assessment. In light of these complications, applicants may elect to use PM_{2.5} dispersion modeling to explicitly meet the requirement of an ambient air quality impact assessment under the PSD permitting program, provided that the technical difficulties with respect to PM_{2.5} monitoring, emissions estimation, and modeling have been sufficiently resolved in relation to the specific application.

For surrogacy demonstrations, it is assumed that as an initial step the applicant will have conducted an appropriate dispersion modeling analysis which demonstrates compliance with the PM₁₀ NAAQS, including an analysis of annual PM₁₀ impacts to address item 1. A simple example illustrating when a PM₁₀ modeling analysis might serve as a surrogate for PM_{2.5} modeling would be if a clearly conservative assumption is made that all PM₁₀ emissions are PM_{2.5}, and the modeled PM₁₀ impacts are taken as a direct surrogate for PM_{2.5} impacts and compared to the PM_{2.5} NAAQS. If an adequate accounting for contributions from background PM_{2.5} concentrations to the cumulative impact assessment can be made, and a reasonable demonstration that the modeled PM₁₀ emission inventory adequately accounted for potential nearby sources of PM_{2.5}, then the appropriateness of surrogacy could be reasonably found in this example. An analysis of source-specific PM_{2.5}/PM₁₀ emission factor ratios may also support the assumption of a more realistic, yet still conservative approach for taking a ratio of modeled PM₁₀ ambient impacts to provide conservative estimates of PM_{2.5} impacts.

While additional modeling analyses, short of explicit PM_{2.5} modeling, may also be used to support the surrogacy demonstration in some cases, it is important to make a clear distinction between modeling analyses for purposes of surrogacy demonstrations and modeling analyses that are intended to explicitly demonstrate compliance with the PM_{2.5} standards. The distinction between these two types of modeling analyses may not always be clear, but one important distinction is whether or not a PM_{2.5} emission inventory has been developed as the basis for the modeling. The distinction between these types of modeling is important because modeling procedures that may be considered appropriate for one type of analysis may not be appropriate for the other. The following section elaborates further on this point.

PM_{2.5} MODELING ANALYSES

The differences between PM₁₀ and PM_{2.5} described above in relation to surrogacy demonstrations, especially items 2 through 4, also have implications on how best to conduct an explicit PM_{2.5} NAAQS compliance demonstration through dispersion modeling. Due to the potentially significant contribution from secondary formation of PM_{2.5}, and the more prominent role of monitored background concentrations of PM_{2.5} in the cumulative analysis, certain aspects of standard modeling practices used for PM₁₀ and other criteria pollutants may not be appropriate for PM_{2.5}. Our recommendations for addressing these issues in terms of explicit PM_{2.5} modeling analyses are described in more detail below.

Given the issues listed above, and especially the important contribution from secondary formation of PM_{2.5}, which is not explicitly accounted for by the dispersion model, PSD modeling of PM_{2.5} should currently be viewed as screening-level analyses, analogous to the screening nature of the guidance in Section 5.2.4 of Appendix W regarding dispersion modeling for NO₂ impacts given the importance of chemistry in the conversion of NO emissions to ambient NO₂. The screening recommendations presented below for demonstrating compliance with the PM_{2.5} NAAQS through dispersion modeling have been developed with the factors listed above in mind. As with any modeling analysis conducted under Appendix W, alternative models and methods may be considered on a case-by-case basis, subject to approval by the Regional Office in accordance with the recommendations in Section 3.2 on “Use of Alternative Models.”

The following sections describe the recommended modeling methods for the two main stages in a typical PSD ambient air quality analysis: 1) preliminary significant impact analysis; and 2) cumulative impact assessment. The rationale for the recommendations is also provided.

Preliminary Significant Impact Analysis

The initial step in air quality impact assessments under NSR/PSD is typically a significant impact level analysis to determine whether the proposed emissions increase from the proposed new or modified source (i.e., project emissions) would have a “significant” ambient impact. Thus, the first step of the ambient impact analysis is to determine whether those emissions would result in ambient air concentrations that exceed a de minimis level, referred to as the Significant Impact Level (SIL). If modeled impacts from the facility do not exceed the SIL, then the permitting authority may be able to conclude, based on this preliminary analysis, that the project would not cause or contribute to a violation of the NAAQS. Under these circumstances, EPA would not consider it necessary for the facility to conduct a more comprehensive cumulative impact assessment that would involve modeling the facility’s total emissions along with emissions from other nearby background sources, and combining impacts from the modeled emission inventory with representative ambient monitored background concentrations to estimate the cumulative impact levels for comparison to the NAAQS. The SIL is also used to establish the significant impact area of the facility for purposes of determining the geographic range of the background source emission inventory that would be appropriate should a cumulative impact assessment be necessary.

EPA's 2007 proposed rule to establish PSD increments, SILs, and a Significant Monitoring Concentration (SMC) for PM_{2.5} included three options for the PM_{2.5} SILs for both the 24-hour and annual NAAQS. Until the PM_{2.5} SILs are finalized, the proposed SILs may not be presumed to be appropriate de minimis impact levels. However, EPA does not preclude states from adopting interim de minimis impact levels for PM_{2.5} to determine whether a cumulative impact analysis will be necessary, provided that states prepare an appropriate record to support the value used. Such de minimis levels do not necessarily have to match any of the SILs that have been proposed for PM_{2.5}, but the levels proposed by EPA and the record supporting EPA's proposed rule could be considered in the state's determination.

The modeling methods used in this initial significant impact assessment phase of the PM_{2.5} analysis, based on either a state's interim de minimis levels or EPA-finalized SILs, are similar to the methods used for other pollutants, including the use of maximum allowable emissions. However, due to the probabilistic form of the NAAQS, we recommend that the highest average of the modeled annual averages across 5 years for National Weather Service (NWS) meteorological data or the highest modeled annual average for one year of site-specific meteorological data be compared to the annual screening level (SIL). Similarly, the highest average of the maximum 24-hour averages across 5 years for NWS meteorological data or the highest modeled 24-hour average for one year of site-specific meteorological data should be compared to the 24-hour screening level (SIL).

Using the average of the highest values across the years modeled preserves one aspect of the form of the NAAQS, while using the average of the first highest 24-hour averages rather than the 98th percentile (8th highest) values from the distribution is consistent with the screening-level nature of the analysis. In addition, since the PM_{2.5} NAAQS is based on air quality levels averaged over time, it is appropriate to use an average modeled impact for comparison to the SIL since that will more accurately characterize the modeled contribution from the facility in relation to the NAAQS than use of the highest modeled impacts from individual years. At the present time, the dispersion modeling recommendations presented here are based on modeling only the primary or direct PM_{2.5} emissions from the facility.

Cumulative Impact Assessment

Unless modeled ambient air concentrations of PM_{2.5} from the project emissions are shown to fall below the state's de minimis level or EPA's promulgated SIL (when finalized), then a cumulative impact assessment would be necessary to account for the combined impact of facility emissions, emissions from other nearby sources, and representative background levels of PM_{2.5} within the modeling domain. The cumulative impacts are then compared to the NAAQS to determine whether the facility emissions will cause or contribute to a violation of the NAAQS. Several aspects of the cumulative impact assessment for PM_{2.5} will be comparable to assessments conducted for other criteria pollutants, while other aspects will differ due to the issues identified above.

Modeling Inventory

The current guidance on modeling emission inventories contained in Section 8.1 of Appendix W will generally be applicable for the PM_{2.5} modeling inventory, recognizing that these recommendations only address modeling of primary PM_{2.5} emissions. The guidance in Appendix W addresses the appropriate emission level to be modeled, which in most cases is the maximum allowable emission rate under the proposed permit. Nearby sources that are expected to cause a significant concentration gradient in the vicinity of the facility should generally be included in the modeled inventory. Since modeling of PM_{2.5} emissions has not been a routine requirement to date, the availability of an adequate PM_{2.5} emission inventory for background sources may not exist in all cases. Recommendations for developing PM_{2.5} emission inventories for use in PSD applications will be addressed separately, but existing PM₁₀ inventories may provide a useful starting point for this effort.

Monitored Background

The determination of representative background monitored concentrations of PM_{2.5} to include in the PM_{2.5} cumulative impact assessment will entail different considerations from those for other criteria pollutants. An important aspect of the monitored background concentration for PM_{2.5} is that the monitored data should account for the contribution of secondary PM_{2.5} formation representative of the modeling domain. As with other criteria pollutants, consideration should also be given to the potential for some double-counting of the impacts from modeled emissions that may be reflected in the background monitoring, but this should generally be of less importance for PM_{2.5} than the representativeness of the monitor for secondary contributions. Also, due to the important role of secondary PM_{2.5}, background monitored concentrations of PM_{2.5} are likely to be more homogeneous across the modeling domain in most cases, compared to other pollutants. We plan to address separately more detailed guidance on the determination of representative background concentrations for PM_{2.5}.

Comparison to NAAQS

Combining the modeled and monitored concentrations of PM_{2.5} for comparison to the PM_{2.5} NAAQS also entails considerations that differ from those for other criteria pollutants, due to the issues identified above. Given the importance of secondary contributions for PM_{2.5} and the typically high background levels relative to the NAAQS for PM_{2.5}, greater emphasis is placed on the monitored background contribution relative to the modeled inventory. Also, given the probabilistic form of the PM_{2.5} NAAQS, careful consideration must be given to how the monitored and modeled concentrations are combined to estimate the cumulative impact levels.

The representative monitored PM_{2.5} design value, rather than the overall maximum monitored background concentration, should be used as a component of the cumulative analysis. The PM_{2.5} design value for the annual averaging period is based on the 3-year average of the annual average PM_{2.5} concentrations; for the 24-hour averaging period, the design value is based on the 3-year average of the 98th percentile 24-hour average PM_{2.5} concentrations for the daily standard. Details regarding the determination of the 98th percentile monitored 24-hour value

based on the number of days sampled during the year are provided in the ambient monitoring regulations, Appendix N to 40 CFR Part 50.

The modeled annual concentrations of (primary) PM_{2.5} to be added to the monitored annual design value should be computed using the same procedure used for the initial significant impact analysis based on the highest average of the modeled annual averages across 5 years for NWS meteorological data or the highest modeled annual average for one year of site-specific meteorological data. The resulting cumulative annual concentration would then be compared to the annual PM_{2.5} NAAQS of 15 µg/m³.

For the 24-hour NAAQS analysis, the modeled concentrations to be added to the monitored 24-hour design value should be computed using the same procedure used for the preliminary analysis based on the highest average of the maximum modeled 24-hour averages across 5 years for NWS meteorological data or the maximum modeled 24-hour average for one year of site-specific meteorological data. As noted above, use of the average modeled concentration across the appropriate time period more accurately characterizes the modeled contribution from the facility in relation to the NAAQS than use of the highest modeled impact from individual years, while using the average of the first highest 24-hour averages rather than the 98th percentile (8th highest) values is consistent with the screening nature of PM_{2.5} dispersion modeling. Furthermore, combining the 98th percentile monitored with the 98th percentile modeled concentrations for a cumulative impact assessment could result in a value that is below the 98th percentile of the combined cumulative distribution and would, therefore, not be protective of the NAAQS.

The recommendations provided above constitute a First Tier modeling analysis for PM_{2.5} compliance demonstrations. For applications where impacts from primary PM_{2.5} emissions are not temporally correlated with background PM_{2.5} levels, combining the modeled and monitored contributions as described above may be overly conservative. In these cases, a Second Tier modeling analysis may be considered that would involve combining the monitored and modeled PM_{2.5} concentrations on a seasonal or quarterly basis, and re-sorting the total impacts across the year to determine the cumulative design value. We plan to provide separately additional details regarding this Second Tier, including a discussion of circumstances where this approach may be appropriate.

Determining Significant Contributions to Modeled Violations

If the cumulative impact assessment following these screening recommendations results in modeled violations of the PM_{2.5} NAAQS, then the applicant will need to determine whether the facility emissions are causing a significant contribution to those modeled violations. A “significant contribution” determination is based on a comparison of the modeled impacts from the project emissions associated with the modeled violation to the appropriate SIL. The significant contribution determination should be made following the same procedures used during the initial significant impact analysis, based on a comparison of the average of the modeled concentrations at the receptor location showing the violation, across 5 years for NWS meteorological data and the highest modeled concentration for one year of site-specific meteorological data. For a violation of the annual NAAQS, the average of the annual values at

the affected receptor(s) is compared to the SIL, while the average of the highest 24-hour average concentrations at the affected receptor(s) should be used for the 24-hour NAAQS. Use of the average modeled concentration is appropriate in this context since it is consistent with the actual contribution of the facility to the cumulative impacts at the receptor(s) showing violations and accounts for the fact that modeled violations of the 24-hour NAAQS represent average impacts across the modeling period.

Synopsis

Significant Impact Analysis: Compare the average of the highest modeled individual year's annual averages and the average of the first highest individual year's 24-hour average concentrations from project emissions to their respective screening levels, which may be based on the state's de minimis levels or EPA-finalized SILs. If modeled impacts exceed the screening levels, a cumulative impact assessment would need to be performed.

Cumulative Impact Assessment: Develop an emission inventory of background sources to be included in the modeling analysis using traditional guidance. That would include using the significant impact area established in the initial significant impact analysis, plus a 50-km annular ring to determine the geographic extent of the background emission inventory. From data obtained within this combined area, compare the average of the highest modeled individual year's annual averages and the average of the first highest individual year's 24-hour averages, plus representative background monitored concentrations, to their respective NAAQS. Monitored background concentrations are based on the 3-year average of the annual PM_{2.5} concentrations, and the 3-year average of the 98th percentile 24-hour averages. To determine whether the proposed project's emissions cause a significant contribution to any modeled violations of the NAAQS, the proposed project's impacts at the affected receptor(s) are determined based on the average of the highest modeled individual years' annual averages and average of the first highest individual years' 24-hour averages from the proposed project's emissions, and are compared to the state's de minimis levels or EPA-finalized SILs.

Additional Caveats

A few additional caveats should be considered while implementing these recommendations:

1. The current preferred dispersion model for near-field PM_{2.5} modeling, AERMOD, does not account for secondary formation of PM_{2.5}. Therefore, any secondary contribution of the facility's or other modeled source's emissions is not explicitly accounted for. While representative background monitoring data for PM_{2.5} should adequately account for secondary contribution from background sources in most cases, if the facility emits significant quantities of PM_{2.5} precursors, some assessment of their potential contribution to cumulative impacts as secondary PM_{2.5} may be necessary. In determining whether such contributions may be important, keep in mind that peak impacts due to facility primary and secondary PM_{2.5} are not likely to be well-correlated in space or time, and these relationships may vary for different precursors. We plan to issue separately additional guidance regarding this issue.

2. While dry and/or wet deposition may be important processes when estimating ambient concentrations of particulate matter (PM) in general, these factors are expected to be minor for PM_{2.5} due to the small particle size. In addition, there may be additional uncertainty associated with deposition modeling for PM_{2.5} due to the variable makeup of the constituent elements for PM_{2.5} and the fact that deposition properties may vary depending on the constituent elements of PM_{2.5}. Therefore, use of deposition algorithms to account for depletion in estimating ambient PM_{2.5} concentrations should be done with caution and only when clear documentation and justification of the deposition parameters is provided.
3. While EPA has proposed PSD increments for PM_{2.5}, the increments have not been finalized yet. Until the increments are finalized, no increment analysis is required for PM_{2.5}. However, it should be noted that some of the recommendations presented here in relation to NAAQS modeling analyses may need to be modified for PM_{2.5} increment analyses due to the differences between the forms of the NAAQS and increments. We plan to provide further clarification of these differences separately, once the increments are finalized.

This memorandum presents EPA's views on these issues concerning modeling procedures for demonstrating compliance with the PM_{2.5} NAAQS. The statements in this memorandum do not bind State and local governments and the public as a matter of law. If you have any questions concerning this memorandum, please contact Tyler Fox, Leader, Air Quality Modeling Group at (919) 541-5562.

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