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VIA FIRST CLASS MAIL AND EMAIL

Mr. John Bunyak
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Comments on the Draft FLAG Phase I Report-REVISED

Dear Mr. Bunyak:

These comments are submitted on behalf of the Utility Air Regulatory Group ("UARG")[1] in response to the July 8, 2008 *Federal Register* notice asking interested parties to comment on the Federal Land Managers' ("FLMs'") draft revisions to the FLM Air Quality Related Values Work Group ("FLAG") Phase I Report. The following sections of this letter provide an overview of UARG's comments on the draft FLAG Phase I Report (hereinafter the "FLAG 2008 Report")[2] and then offer more detailed comments on specific recommendations in the FLAG 2008 Report.

[1] UARG is an unincorporated association of individual electric utility companies and trade associations. UARG participates in federal and precedential state proceedings arising under the federal Clean Air Act and having an impact on UARG members. For example, for over thirty years, UARG has participated in proceedings to implement the Clean Air Act's programs for the prevention of significant deterioration of air quality ("PSD") and visibility protection.

[2] UARG filed legal and technical comments on the first FLAG report, which was published in 2000 and is hereinafter referred to as the "FLAG 2000 Report."

I. OVERVIEW OF UARG'S COMMENTS

The preface to the draft FLAG 2008 Report states that the purpose of the FLAG report is:

> (1) to develop a more consistent and objective approach for the FLMs to evaluate air pollution effects on public [air quality related values (AQRVs)] in Class I areas . . ., and (2) to provide State permitting authorities and potential permit applicants consistency on how to assess the impacts of new and existing sources on AQRVs in Class I areas, especially in the review of Prevention of Significant Deterioration (PSD) of air quality permit applications.[3]

UARG supports both objectives and supports many of the revisions that the FLMs have made to the FLAG Report in order to accomplish those objectives.

In particular, UARG supports the efforts of Report drafters to try to create consistency between the FLMs' and EPA's processes for evaluating visibility, ozone and deposition impacts. Examples of this include the FLMs' decision to use the "new EPA-approved visibility algorithm" (*i.e.*, the new IMPROVE algorithm)[4] and their decision to allow the use of other criteria derived from the 2005 BART guidelines. UARG also supports those Report provisions that explicitly allow permit applicants conducting impairment analyses to choose between alternative approaches, depending upon the circumstances of their individual permitting situations.

While UARG supports these aspects of the draft FLAG 2008 Report, UARG is concerned about -- and is (below) providing comments on -- other parts of the draft Report. In particular, Section II of UARG's comments focuses on a legal/policy issue: the need for clarity on the specific roles that the FLMs and State permitting authorities are to play in the PSD permitting process. Section III of these comments then addresses several technical concerns raised by portions of the draft FLAG 2008 Report, including (a) appropriate ways in which to consider weather-related visibility impairment in source impact assessments; (b) the need to define more

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[3] FLAG 2008 Report at i.

[4] *Id.* at iii.

precisely the "98th percentile visibility value" used in certain parts of the Report; (c) concerns with the use of Q/D as the initial screening criterion and possible alternative approaches; (d) the definition of certain model inputs, such as background ammonia concentrations and puff-splitting options; (e) the Report's apparent inflexibility concerning an applicant's making any deviations from certain procedures set out in the Report; and (f) the need for flexibility in finalizing modeling protocols.

II. Permitting Authorities Are the Final Decisionmakers in the PSD Permitting Process.

It is clear from the Clean Air Act that those States with authority to issue PSD permits are to have broad discretion in reviewing PSD permit applications and in deciding whether or not to issue PSD permits. Thus, when the FLM for a Class I area believes that a proposed facility will have an adverse impact on AQRVs in the Class I area, it is not enough for the FLM simply to state that conclusion. Rather the FLM must "demonstrate[] to the satisfaction of the State" that the source "will have" an adverse impact. *See* CAA § 165(d)(2)(C)(ii).

Similarly, the legislative history of the Clean Air Act demonstrates that Congress intended State permitting authorities to have primacy in many Clean Air Act processes, including deciding whether or not emissions from a proposed new source will have an adverse impact on AQRVs in a Class I area and deciding whether or not to issue a PSD permit to such a source. Congress initially took this position when it added the PSD program to the Clean Air Act in 1977. *See, e.g.,* S. Rep. No. 127, 95th Cong., 1st Sess. 29 (1977) (the PSD program "places primary responsibilities and authority with the States, backed by the Federal Government") ("1977 Senate Report").[5] Then in 1990, Congress re-affirmed its intention to give States primacy in evaluating PSD permit applications when it rejected a proposed PSD program amendment that would have given the FLMs the authority to "identify [AQRVs] and the potential adverse impacts of air pollution on such [AQRVs]."[6]

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[5] *See also* 1977 Senate Report at 36 (for the PSD program, "[t]he Federal Government's role . . . is far less extensive than under provisions required to achieve the primary and secondary [national ambient air quality] standards under the . . . Act").

[6] Specifically, the proposed amendment would have added to § 165(d)(2)(B) the following:

(continued...)

By rejecting that amendment, Congress confirmed that it did not intend to shift to the FLMs the authority to make binding adverse impact determinations. Rather, Congress chose (1) to continue to allow the FLMs to evaluate -- and provide State regulators with their views on -- how the experience of visitors to their Class I areas could be affected by the projected emissions of sources seeking PSD permits; and then (2) to continue to leave it to the State permitting authorities to review all the information provided by FLMs (and by PSD permit applicants and the public) and to make the final determinations whether or not to issue the PSD permits.

Many different portions of the draft FLAG 2008 Report address the role that the FLMs are to play -- and the role that States with PSD permit-issuing authority are to play -- in the PSD permitting process. In several places, the FLAG 2008 Report accurately describes the roles of each. For example, the revised Executive Summary of the FLAG 2008 Report (at p. vi) states:

> FLMs have no permitting authority under the Clean Air Act, and they have no authority under the Clean Air Act to establish air quality-related rules or standards. . . . [T]he FLAG report only explains factors and information the FLMs expect to use when carrying out their consultative role.

Thus, the FLM for a Class I area may evaluate the PSD permit application of a proposed new source, may conclude that the proposed new source could adversely impact visibility in the FLM's Class I area, and may convey its view on that issue "to the permitting authority -- usually a State agency -- for consideration in its determinations regarding the permit." *See* FLAG 2008 Report at i. But it is then the responsibility of the permitting authority to consider the "wide range of factors" relevant to evaluating a PSD permit application. *Id.* And following

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> In addition to the other authority provided by this section, the Federal land manager charged with the direct responsibility for management of such lands may, by rule, identify the air quality related values of such lands and the potential adverse impacts of air pollution on such values.

See 136 Cong. Rec. H2838 (May 23, 1990).

consideration of those factors, it is the permitting authority that has the authority to decide whether or not to issue a PSD permit and what, if any, additional AQRV-protective conditions must be included in that permit. The permitting authority can choose to disagree with the FLM's view and decide to issue the permit; it can agree with an FLM finding that visibility in a Class I area may be adversely affected and decide not to issue the permit; or it can "agree with the FLM's adverse impact finding" but then "still issue a permit if the emissions from the source are consistent with reasonable progress toward the national goal of preventing or remedying visibility impairment." *Id.* at 13.

Although the above-described portions of the FLAG 2008 Report accurately present information on the respective roles of the FLMs and State permitting authorities, other parts of the draft Report offer interpretations that are inconsistent with the Clean Air Act. For example, the draft Report (at p. vii) states that because there is no one formula that would "allow one to determine whether or not a source of air pollution causes or contributes to an adverse impact[, that] determination remains a project-specific management decision, the responsibility for which remains with the FLM, as delegated by Congress." And other passages in the draft report imply -- even if they do not state outright -- that it is the FLMs, rather than permitting authorities, that have the authority to make final adverse impact determinations.[7]

UARG requests that the final FLAG 2008 Report address these inconsistencies so that it is clear throughout the FLAG Report that it is the permitting authorities that have the responsibility for making final determinations of whether a proposed new source will have an adverse impact on AQRVs and for deciding whether or not to issue a PSD permit to a permit applicant.

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[7] *See, e.g.*, the FLAG 2008 Report at 17 ("If the FLM makes a final determination that a source will have an adverse impact, the FLM will oppose the permit. However, the permit applicant may propose to mitigate any adverse impacts . . . ."). The use of the term "final determination" and the suggestion that the FLMs will be establishing any basis for mitigation may mislead permit applicants as to the respective roles of the FLMs and State permitting authorities in the PSD permit-issuing process.

III. Technical Concerns Raised by the Draft FLAG 2008 Report

As noted above, many of the revisions made to the technical portions of the draft FLAG 2008 Report help to eliminate inconsistencies between the approaches in EPA's BART rule and guidance and the approaches in the FLAG 2000 Report. UARG believes these revisions improve the FLAG Report, and UARG supports them. The draft FLAG 2008 Report, however, raises some technical issues that are of concern to UARG. Several of these issues are addressed below.

A. Properly Accounting for Weather-Related Visibility Impairment

EPA's PSD rules -- which are to guide the permitting authority through its assessment of whether a proposed new source will have an adverse impact on visibility in Class I areas -- define the phrase "adverse impact" as follows:

> Adverse impact on visibility means . . . visibility impairment which interferes with the management, protection, preservation, or enjoyment of the visitor's visual experience of the Federal Class I area. This determination must be made on a case-by-case basis taking into account the geographic extent, intensity, duration, frequency and time of visibility impairments, and how these factors correlate with (1) times of visitor use of the Federal Class I area, and (2) the frequency and timing of natural conditions that reduce visibility.[8]

The draft FLAG 2008 Report specifies that an assessment of whether a proposed source is having an adverse impact on visibility is to be conducted by using atmospheric and optical models and compared against estimates of visibility under natural conditions in order to determine the color and contrast of a plume or the percentage change in ambient light extinction caused by a distant source. According to that Report, the natural conditions to be used in the analysis are annual average concentration values based on EPA's default natural conditions concentrations or average concentrations estimated for the clearest 20% of natural conditions days.

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[8] 40 C.F.R. § 51.301.

UARG is concerned that the natural conditions extinction or visibility values presented in the draft FLAG 2008 Report may represent an atmosphere that never encounters weather-related visibility impairment, such as fog, mist, clouds, rain, or snow. This concern is set out in more detail in the attached report from Dr. Ivar Tombach, "Weather-Related Visibility Impairment is an Important Factor in Source Impact Assessments." Dr. Tombach explains that in order to avoid running counter to EPA's visibility regulations,[9] the draft FLAG 2008 Report (at pp. 107 and 37, *e.g.*) sets out an alternative methodology for taking into account the impact of weather-related visibility impairment.

Specifically, the draft FLAG 2008 Report adopts "criteria derived from the 2005 BART guidelines that [set] a 98th percentile value to screen out roughly seven days of haze-type visibility impairment per year." FLAG 2008 Report at iii. This change from the FLAG 2000 Report makes the approach in the revised Report consistent with EPA's approach as set out in EPA's rules and guidance for implementing the Clean Air Act's regional haze provisions, including the establishment of BART limitations.[10]

UARG believes that the use of the 98th percentile approach is a significant improvement over previous approaches and strongly supports the inclusion of the 98th percentile approach into the FLAG Report. UARG is concerned, however, that in some instances, additional steps may

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[9] *See* page 18 of the draft FLAG 2008 FLAG Report, which explains that, as noted above, EPA's rules require adverse impacts on visibility to be determined, for PSD purposes, on a case-by-case basis taking into account, among other things, how the visibility impairment correlates with "the frequency and timing of natural conditions that reduce visibility" (quoting 40 C.F.R. § 51.301 (definition of "Adverse impact on visibility")).

[10] The draft FLAG 2008 Report (at p. 34) states that in its BART guidelines, "EPA indicated that for regional haze, a source whose 98th percentile value of the haze index is greater than 0.5 deciview (dv) (approximately a 5% change in light extinction) is considered to **contribute** to regional haze visibility impairment. Similarly, a source that exceeds 1.0 dv (approximately a 10% change in light extinction) **causes** visibility impairment." (Emphasis in original.) The draft Report notes that the 0.5 dv and 1.0 dv thresholds are similar to what were used in the FLAG 2000 Report. "Therefore, for consistency between visibility protection programs and to address similar concerns, the Agencies [drafting the FLAG Report] will also use the 98th percentile value as a threshold in the first-level visibility analyses for new source impacts." *Id.*

need to be taken (beyond just using the 98th percentile value) in order to take into account -- for both far field and near field analyses -- information demonstrating that visibility impairments due to the impact of weather-related conditions may occur on more than 7 days in any given year. Under such circumstances, using the 98th percentile approach does not adequately account for natural, weather-related visibility impairment.

In particular, although using the 98th percentile approach for any given year might partially compensate in certain cases for the most extreme weather-related visibility impairment, those responsible for evaluating the visibility impacts of proposed new or modified sources should not be evaluating the 8th haziest day of the year. Rather, they should be evaluating the day with the 8th highest relative impact on extinction. And the days with the highest impact relative to true natural conditions may not be the days with meteorological impairment. Dr. Tombach uses the following hypothetical example to illustrate this point:

> Assume that one year of impacts has been modeled for a source, the relative impacts are calculated using the protocols prescribed in the draft FLAG report, and the resulting calculated relative impacts are ranked in order from largest to smallest. Suppose that the 7 days with greatest calculated relative impact on extinction occur under a meteorological regime that is associated with clear skies. Suppose also that the 8th highest modeled relative impact occurs under a different meteorological regime that is, in reality, associated with fog and mist (although that fact is not taken into account in the prescribed analysis). Then, deleting the first 7 days from consideration and taking the 8th day as the one to be evaluated has not in any way compensated for not considering weather-related impairment. Rather, because the background extinction against which the modeling is compared fails to include the effect of weather-related impairment, the 8th day has become the improper one of concern, whereas in reality it should be much farther down the list because the true background extinction is greater than the value used for the calculation.

In short, taking the first seven days out of consideration and picking the impact on the 8th day for evaluation will not necessarily compensate adequately for the omission of weather-related impairment in the natural background conditions. Thus although UARG supports the draft Report's use of the 98th percentile approach, UARG encourages the Report drafters to recognize the limitations of that approach and to make it clear that, in individual cases,

permitting authorities may need to take additional steps to consider weather-related visibility impairment.

UARG is also concerned about the draft Report's use of the "climatologically representative" monthly averages of the factors, f(RH), that are to represent the increase in light extinction by hygroscopic particles as relative humidity increases. In many instances, the use of the monthly average f(RH) values in screening analyses (particularly in combination with the 98th percentile approach) is a meaningful improvement over the approach previously set out in the FLAG 2000 Report. In some instances, however -- as described in greater detail in the accompanying report by Dr. Tombach -- the monthly average f(RH) values provided in the draft FLAG 2008 Report and the 98th percentile approach will not adequately (or accurately) reflect the impact of weather-related conditions on visibility impairment at a specific Class I area. To allow permitting authorities to take into account weather-related conditions on visibility impairment in an appropriate way -- something they are required to do under the PSD rules -- permit applicants must be able to present their permitting authorities with better information on case-specific weather-related conditions, and permitting authorities must consider such information in making adverse impact determinations.

In addition, UARG is concerned that at times, weather-related visibility impairment will overwhelmingly dominate atmospheric extinction to the extent that any incremental increase in extinction due to pollutant emissions from a proposed new source will be negligible.[11] By not representing such situations properly, the 24-hour average impacts calculated by the FLAG procedure will overstate the relative impact of the proposed source. As spelled out in more detail in Dr. Tombach's report, weather events can be the most significant sources of visibility extinction on the days when greater than 5% extinction impact has been calculated for a source. Permitting authorities must be allowed to take this into account in evaluating whether a proposed new source will have an adverse impact on AQRVs.[12]

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[11] As noted in Dr. Tombach's report, this same issue is also relevant for near field "plume blight" modeling, where the background visual ranges used in VISCREEN and PLUVUE II analyses should reflect the true visual state of the atmosphere during each hour of analysis, including any weather-related visibility impairment, rather than the average values given in Table V.1-6 of the draft FLAG 2008 Report.

[12] The Assistant Secretary of the Interior for Fish and Wildlife and Parks has endorsed consideration of weather-related visibility impairment. When he concluded that weather events

(continued...)

In summary, UARG supports the FLAG 2008 Report's inclusion of the 98th percentile approach for identifying sources that have the potential to have an adverse impact on visibility. In some instances, though, the use of that approach must be supplemented by additional or alternative approaches to take into account more fully the contributions of natural, weather-related visibility impairment. As set out in Dr. Tombach's accompanying technical report, those additional or alternative approaches exist and should be used for making more realistic assessments of source impacts on visibility impairment.

B. Defining the 98th Percentile Value

As noted above, UARG supports efforts to make the FLAG report consistent with EPA rules and guidance, and UARG believes that the use of the 98th percentile approach is a better indicator of impact than the previous approach in the FLAG guidance. However, as described in more detail in the accompanying report from TRC,[13] the exact definition of the 98th percentile approach should be more fully spelled out in the draft FLAG 2008 Report.

Specifically, where the recommended modeling period must be 3 to 5 years (as is suggested by the draft Report), should the permit applicant calculate -- and should permit reviewers evaluate -- the 98th percentile value in each year or, alternatively, should they assess the 98th percentile value over the full three to five years being evaluated? The draft Report suggests that the former approach should be used (evaluating the 98th percentile value in each separate year), *see, e.g.*, FLAG 2008 Report at 34, but UARG believes -- for the reasons set out in the accompanying TRC report -- that the 98th percentile value should be defined as extending over the entire three- to five-year simulation period, rather than covering only one year. Evaluating

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were the most significant sources of visibility extinction on the days when greater than 5% extinction impact had been calculated for a proposed source being evaluated, he withdrew his prior finding of an adverse air quality impact on AQRVs. *See* Letter from Craig Manson, Assistant Secretary for Fish and Wildlife and Parks, U.S. Department of the Interior, to Ms. Jan Sensibaugh, Director, Montana Department of Environmental Quality (Jan. 10, 2003).

[13] *See* J. Scire, J. Popovic, and C. Escoffier-Czaja, "Review of Draft 2008 Phase I Report of FLAG," (September 8, 2008).

air quality over a multi-year period -- as has been done in other Clean Air Act programs[14] -- would make the resulting assessment less sensitive to unrepresentative conditions that might occur in a single year. That, UARG believes, would be an improvement over making an evaluation based on data from just one, possibly unrepresentative, year of data.

In summary, the Draft FLAG 2008 Report should define the 98th percentile values as extending over an entire 3- or 5-year simulation period. Although doing this would not eliminate all the above-mentioned concerns that UARG has with the 98th percentile approach, it would mitigate some of those concerns.

C. Concerns Over the Proposed Use of Q/D ≤ 10 as the First-Level Screening Criterion

In developing its BART regulations and guidelines, EPA reasonably concluded that it would be appropriate to eliminate from the BART review process sources whose likely impacts on Class I area visibility would be below certain threshold levels. In setting those threshold levels, EPA explained:

> Based on our analyses, we believe that a State that has established 0.5 deciviews as a contribution threshold could reasonably exempt from the BART review process sources that emit less than 500 tons per year of NOx or SO_2 (or combined NOx and SO_2), as long as these sources are located more than 50 kilometers from any Class I area; and sources that emit less than 1000 tons per year of NOx or SO_2 (or combined NOx and SO_2) that are located more than 100 kilometers from any Class I area. You [*i.e.,* the State] do, however, have the option of showing other thresholds might also be appropriate given your specific circumstances.

70 *Fed. Reg.* 39104, 39163, col. 1 (2005). In other words, EPA believed it was reasonable to exclude certain sources from the BART review process, it gave a couple of examples of exemption thresholds that could reasonably be used as a screening criterion, and it made it clear that those example thresholds were not intended to be the only thresholds that could be used.

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[14] For example, EPA uses a multi-year period for evaluating compliance with the 24-hour $PM_{2.5}$ ambient air quality standard. *See* 40 C.F.R. Part 50, App. N.

UARG agrees with EPA that it is reasonable to set screening criteria in order not to subject to BART review all proposed new and modified sources. And UARG agrees with EPA that the two examples it provided in its BART rules and guidance are, as a general matter, reasonable ones. UARG is concerned, however, with how the draft FLAG 2008 Report takes those two examples and purports to use them to establish a single initial screening criterion: Q/D, where Q is the size of a source (expressed as the sum, in tons per year, of the maximum allowable emissions of SO_2, NO_x, PM_{10} and H_2SO_4),[15] and D is the distance of the source from a Class I area (expressed in kilometers). The draft Report states that if Q/D for a proposed source is less than 10, then no further Class I area AQRV impact analyses would be required; however, if Q/D is greater than or equal to 10, then substantial additional analyses could be required.

UARG is concerned about the use of this single screening criterion. The FLAG 2008 Report provides no technical basis for using a Q/D value of 10 as a screening threshold. The Report refers to the BART guidelines, but as noted above, the BART guidelines provide no technical basis for the use of 10 as the absolute threshold value. And an examination of the available data suggests that a doubling or even a tripling of the proposed threshold (*i.e.*, changing the screening threshold from 10 to 30) is justified. *See* the attached TRC report at 1-3.

In addition to being concerned with the report's proposal to set Q/D equal to 10, UARG is concerned more broadly with the use of any Q/D value as the sole basis for screening sources from having to undertake more extensive modeling analyses. Q/D does not account for meteorological factors, *e.g.*, prevailing winds. Nor does it account for the relative spatial location of the facility relative to the Class I areas. Also, the FLAG 2008 Report's definition of Q does not account for the significant variation in extinction efficiency among the various species of pollutants. For example, the particulate matter ("PM") extinction efficiencies range from 0.6 for coarse $PM_{2.5}/PM_{10}$ to 4.0 for organic (condensable) PM and to 10 for elemental carbon. For hygroscopic pollutants such as sulfates and nitrates, the humidity term is used to multiply the extinction efficiency and pollutant concentrations. As described in the TRC Report accompanying these comments, combining various non-hygroscopic species into the definition of Q with hygroscopic emissions may be overly conservative as a predictive tool.

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[15] See section III. G. 2. of these comments for additional comments concerning the Report's proposal to define Q as the sum of emissions of SO_2, NO_x, PM_{10}, and H_2SO_4.

Moreover, there is no limit on how far away a Class I area could be in the application of the Q/D rule. This could lead to very large modeling domains -- and perhaps inappropriately eliminate the possibility for high resolution simulations due to the large number of cells required to cover the large modeling domain area -- if the Q/D criterion is used to determine which Class I areas are to be included in a modeling analysis. For example, applying that criterion could theoretically result in a BART analysis having to be done for a 25,000-ton-per-year source located 2500 km from a Class I area (*i.e.*, the distance from Cheyenne to Washington, D.C.).

A better-justified screening criterion than Q/D $\leq$ 10 is presented in the TRC Report accompanying these comments. Specifically, that TRC Report provides information on the analysis -- done by the VISTAS States -- which compares Q/D values to the results of screening CALPUFF simulations and refined simulations, using a simple screening simulation in No-Observations (No-Obs) mode (*i.e.*, using only MM5 or other prognostic gridded meteorological data). As described in more detail in the TRC Report, in VISTAS, this proved to be a very useful screening procedure for reducing the number of Class I areas subject to more refined simulations and/or eliminating sources from further analysis. Use of the No-Obs screening approach required far less effort than full-blown modeling analyses,[16] and it was a much more accurate predictor of the results of a refined CALPUFF simulation than was the Q/D $\leq$ 10 criterion.

In short, there is no technical justification for the use of the Q/D $\leq$ 10 criterion. Thus, it should not be included in the draft FLAG 2008 Report or, at the very least, it should not be the sole screening threshold included in the FLAG Report. An alternative screening threshold or second-level screen that should be included in the FLAG 2008 Report is the No-Obs approach used by VISTAS and described in greater detail in the TRC Report that accompanies these comments.

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[16] As described in the TRC Report, the 12-km screening simulations were based on standard CALMET meteorological datasets that were pre-approved by the States and EPA for use in BART analyses. The elimination of the need to do any upfront meteorological modeling substantially reduced the level of effort required to conduct the initial screening. Indeed, simulation times were on the order of a few hours on personal computers.

D. Definition of Model Inputs

The draft FLAG 2008 Report does not provide adequate guidance on certain key model inputs, including background ammonia concentrations. This particular input is critical to determining levels of ammonium nitrate, which can be limited by the availability of ambient ammonia.

In the past, FLMs have recommended holding ammonia values constant, both spatially and temporally. However, as discussed in more detail in the TRC Report accompanying these comments, data from many sources -- including CMAQ modeling simulations -- demonstrate that there is substantial seasonal and spatial variability in ammonia concentrations.

In an effort to evaluate an alternative to the use of a constant ammonia value, a separate model study was conducted in Wyoming. That study compared observed and predicted nitrate concentrations, using constant background ammonia and an alternative approach: the Ammonia Limiting Method ("ALM"), which involves the varying of ammonia in both time and space. The use of constant background ammonia at the 0.5 ppb and 1.0 ppb levels resulted in over-predictions of ammonium nitrate concentrations by factors of 2-3 and 3-4, respectively. The use of ALM resulted in much closer agreement with the observations.

As noted in the accompanying TRC Report, there have been substantial developments in the ability to use CMAQ model output as input into CALPUFF. This will allow the use of varying ammonia in ALM easily, using predefined files for each Class I area. In addition, this method allows for better background data to be included, reflecting, for example, future emission reduction scenarios as defined in the CMAQ simulations.

UARG is also concerned that the draft FLAG 2008 Report may not provide adequate guidance on the use of CALPUFF's puff-splitting approach. When running CALPUFF in far field analyses, it is essential that CALPUFF's puff-splitting algorithm be used; otherwise, the model will substantially over-predict far field pollutant concentrations.

UARG recommends that the FLAG 2008 Report be revised to make it clear that ALM can be used to predict ammonium nitrate concentrations and that CALPUFF's puff-splitting algorithm can and should be used in far field analyses.

E. Inappropriate Restrictions on Technical Enhancements in the Standard First-Level Modeling Approach

In several places, the draft FLAG 2008 Report indicates that if a permit applicant (or anyone else doing a first-level modeling analysis) makes any deviations from the procedures set out in the Report, that could compromise the integrity of the analysis and could trigger the need to do a full-blown, much more complex and costly refined hourly modeling analysis.[17] UARG is concerned that this policy -- particularly if applied inflexibly -- could prevent improvements from being made to the overall source impact assessment process. In particular, UARG is concerned that such a policy could preclude those undertaking and reviewing such assessments from using in future analyses the modeling improvements and enhancements that they develop or derive in the course of the analyses they are doing now.

This is not a theoretical concern. In the past, regulators have recognized the value of innovative approaches developed in one set of permitting cases and have chosen to use those model/process "refinements" in subsequent cases. Indeed, the draft FLAG 2008 Report includes several "refinements" or "enhancements" introduced into CALPOST over the years as more and more experience has been gained in the application of the FLAG 2000 Report procedures. These past enhancements include the introduction of the new IMPROVE methodology (Method 8 in CALPOST), the use of elevation-dependent Rayleigh scattering, the use of monthly average relative humidity, and the use of 98th percentile values as a factor that mitigates the effects of a failure to consider individual weather events. Going forward, UARG expects strides to be made in the use of time-varying background for ammonia and the use of the above-described Ammonia Limiting Method.

UARG believes enhancements in first-level modeling approaches should be encouraged, not discouraged. This can be done by making it clear in the FLAG 2008 Report that permitting authorities have the discretion to allow the development and use of well-considered improvements to first-level modeling approaches.

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[17] For example, at page 33, the FLAG 2008 Report states:

> We wish to emphasize that the first-level procedures defined herein are to be taken as a whole; any deviations from these procedures or ostensible refinements compromise the integrity of the analysis, and may warrant an hourly analysis for all hours in the analysis.

F. The Need for Flexibility in Finalizing Modeling Protocols

Anyone who has undertaken the types of modeling analyses covered by the FLAG Report knows it is essential for the parties to reach agreement on all key parameters of the modeling that is to be done in each case. What is not so clear is whether there is a "best" time for reaching such agreements in all cases.

The draft FLAG 2008 Report states that the selection of "model parameters and input data should be documented in a written protocol and agreed upon by the affected Agencies in advance of any modeling being conducted." FLAG 2008 Report at 33-34. As set out in more detail in the TRC Report that accompanies these comments, the finalization of model parameters ***in advance of any modeling being conducted*** is not good practice. An essential part of meteorological modeling is the development and testing of the model parameters to ensure that the simulation will accurately represent relevant processes.[18] Making these decisions before conducting any modeling is not standard practice and, in any event, is not good scientific practice.

For these reasons, the final FLAG 2008 Report should make it clear that the finalization of model parameters is important but that it need not -- and generally should not -- be done in advance of any modeling being conducted.

G. Other Issues

UARG also has concerns with the following statements and proposals in the draft FLAG 2008 Report.

1. Avoiding Multiple Rulemakings/Comment Periods

The draft FLAG 2008 Report, at several points, suggests that the FLM evaluating a PSD permit application might initiate a notice-and-comment rulemaking on that application that is separate and apart from the rulemaking being conducted by the permitting authority. Specifically, the draft Report states (at pages 16 and 17) that if the FLM makes a preliminary determination that

[18] For example, the definition of grid spacing and some CALMET parameters are application-specific that require model testing.

a proposed project will cause, or contribute to, an adverse impact on AQRVs -- or if no adverse impact is found but a permit applicant asks the FLM to "certify" that there is no adverse impact -- then the FLM will follow a number of procedural steps, including:

> notify[ing] the public of [its] determination either through the permitting authority's notice procedures, or through separate notice in the *Federal Register.* Such notice should include . . . an announcement of at least a 30-day public comment period on issues directly relevant to the determination in question.

UARG believes that it would be confusing and disruptive to have multiple entities (*i.e.,* the permitting authorities *and* FLMs) conducting separate -- but related -- rulemakings on adverse impact issues arising out of one PSD permit application. There should be only one notice-and-comment rulemaking on a PSD permit application, that rulemaking should be conducted by the permitting authority, and all issues of concern to the FLMs should be incorporated into that one rulemaking. If the FLMs have previously encountered difficulties in getting issues addressed in the rulemakings being conducted by the permitting authorities, then they should seek changes in the way that such rulemakings are conducted. The appropriate solution, however, is not to have "dueling rulemakings" on related issues arising out of one PSD permit application.

2. Using Annual Average Natural Conditions or 20% Best Natural Background Values

To calculate the reference natural conditions used in the comparisons for thresholds of concern, the draft FLAG 2008 Report indicates that applicants are to use the

> estimates of annual average natural visibility conditions for each Class I area as presented in Table V.1-2, unless otherwise recommended by the FLM or permitting authority. Alternative estimates of visibility conditions are provided in Table V.1-1 for consistency with State agencies that elected to use 20% best visibility for regional haze or BART implementations.[19]

The second sentence in the quoted passage is consistent with EPA guidance for implementing BART, making it clear that State permitting authorities may determine if annual average

[19] FLAG 2008 Report at ix. *See also id.* at 34.

conditions or 20% best visibility values are to be used. The first sentence, however, suggests that the FLM may have the authority to make that choice.[20]

The FLAG Report should clarify that the permitting authority is responsible for making this determination. This is not a decision to be made by the FLM.

4. Summing Pollutants in Q/D Calculations

As noted above, in doing Q/D calculations, the draft Report proposes to define Q as the sum of emissions of SO_2, NO_x, PM_{10} and H_2SO_4. UARG urges that distinctions be made as to the pollutants to be included within "Q," depending upon whether one is evaluating the impact of a proposed new source on ozone, on visibility, or on deposition.[21]

Specifically, for an analysis of the impact of a proposed source on ozone levels, it would be appropriate to include in Q, of these four pollutants, only NOx.[22] Similarly, for doing an analysis of the impact of a proposed source on deposition, it would make sense not to include PM_{10}. And for an evaluation of a source's impact on visibility, the pollutants to be included within Q might vary depending upon where the proposed source is to be located. For example, if one is evaluating the impact of a source that is being proposed in the Southeast and if the source would be located more than 50 km from a Class I area, then Q would logically include SO_2 and H_2SO_4, but not NOx (because NOx is not a visibility-impairing pollutant of concern in the Southeast) and not direct PM (because direct PM emissions are not relevant at distances greater than 50 km).

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[20] *See* the attached Memorandum from Joseph W. Paisie, EPA Group Leader to Kay Prince, Branch Chief, EPA Region 4, "Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations" (July 19, 2006).

[21] For the reasons set out previously in our comments, UARG requests that Q/D $\leq$ 10 *not* be used as the sole screening criterion. If that criterion is used, however, then UARG requests that appropriate distinctions be made as to the pollutants to be included within the value of Q.

[22] This assumes (as the draft Report appears to do) that the area being evaluated is NOx limited for ozone and thus that VOC emissions need not be considered.

5. Analyses of Impacts on Class II Areas

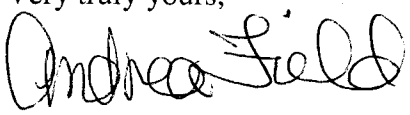
The draft Report several times refers to the right of FLMs to evaluate the impacts of proposed new sources on Class II parks and wilderness areas. UARG urges that the need, if any, for such analyses be evaluated on a case-by-case basis and that there be substantial flexibility (*e.g.*, the use of alternative significance/non-significance thresholds) in conducting any such analyses.

6. "Revised" Sections in the Draft Report that Have Not Been Revised

Some portions of the draft Report have been changed from the FLAG 2000 Report but are not labeled as having been "Revised." To ensure that commenters know about -- and have a chance to comment on -- all major changes to the FLAG 2000 Report, UARG requests that the report drafters make clear exactly which portions of the Report have been changed. If there have been significant changes to sections of the draft Report which were not marked as having been revised, then UARG requests an opportunity to comment on those sections once they have been properly labeled.

UARG appreciates this opportunity to comment on the draft FLAG 2008 Report and looks forward to participating in other proceedings to address implementation of the Clean Air Act's visibility improvement provisions.

Very truly yours,



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Weather-Related Visibility Impairment is an Important Factor in Source Impact Assessments

Ivar Tombach
5 September 2008

The draft revised FLAG Report[1] prescribes visibility analysis approaches for identifying proposed sources that may adversely impact visibility in Class I areas. Approaches are presented for analysis of near field visual impacts of coherent plumes and for haze impacts by emissions from distant or multiple sources. Such impacts are to be calculated by atmospheric and optical models and compared against estimates of visibility under natural conditions in order to determine the color and contrast of a plume or the percentage change in ambient light extinction caused by a distant source.

The natural conditions to be used in this analysis are annual average concentration values based on the Environmental Protection Agency's default natural conditions concentrations or average concentrations estimated for the clearest 20% of natural conditions days, values for which are presented in Tables V.1-1 and V.1-2 in the draft FLAG report. Background light extinction and visual range are to be calculated using the new IMPROVE algorithm and "climatologically representative" monthly averages of the factors, f(RH), that represent the increase in light extinction by hygroscopic particles as the relative humidity increases. These monthly f(RH) are presented in tables V.1-3 through V.1-5 in the draft FLAG report.

Since they were derived via the IMPROVE algorithm from speciated particulate matter concentrations and monthly average f(RH) values, the natural conditions extinction or visibility values presented in the draft FLAG report represent an atmosphere that never encounters weather-related visibility impairment, such as fog, mist, clouds, rain, or snow. The f(RH) factors allow for increasing uptake of water by particles as the RH increases, but the model that represents the growth in particle size and resultant light scattering becomes unreliable as RH approaches 100% (and it is increasingly difficult to measure RH as it approaches 100%) and therefore the f(RH) values in the FLAG tables are capped

[1] Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report – Revised. 06/27/08 Draft.

at what their values would be at RH = 95%. The extinction in an actual atmosphere that is at RH = 100+% (meaning it is supersaturated with water), which is the condition that produces the droplets in fog, is not reflected in the IMPROVE algorithm, and so the natural conditions visibilities that result from using the IMPROVE algorithm never show any effect of fog or other weather-related visibility impairment.

This approach to considering weather-related visibility impairment is explained at several places in the draft FLAG report. On page 107, the draft FLAG report states: "Regarding correlation with the frequency and timing of natural conditions that reduce visibility, the first-level modeling analysis will not provide this information directly, but, by using the percentile approach and monthly relative humidity values, the Agencies have attempted to provide a reasonable approach to addressing weather impacts." There is further elaboration on page 37 of the draft FLAG report with the statement that "The Agencies believe that by paralleling the BART guideline procedures they have adequately taken into account the effects of meteorological extremes ...." This is followed by an admonition that a permit applicant is not to "attempt to disregard specific impact days due to weather."

This approach seems to run counter to the Environmental Protection Agency's visibility regulations, which -- as quoted on page 18 of the draft FLAG report -- provide that an adverse impact on visibility is to be determined on a case-by-case basis taking into account, among other things, how the visibility impairment correlates with "the frequency and timing of natural conditions that reduce visibility."[2] The discussion that follows below points out that, contrary to the applicable regulations, the FLAG approach does *not* adequately take into account natural, weather-related visibility impairment. By not treating this issue properly, FLAG's neglect of natural weather-related light extinction has several important implications for the credibility of a visibility impact assessment, as will be discussed below.

The FLAG Approach Does Not Fully Compensate for the Effects of Weather-Related Visibility Impairment. Using the 98th percentile value of daily impact in lieu of the day of peak impact does not compensate fully for the influence of weather-related visibility impairment on the natural conditions background. If the days in a year were ranked according to natural conditions visual range or extinction (which is not the ranking required by FLAG) with the effects of weather-related visibility impairment taken into account, then picking the 98th percentile day would eliminate the seven days with the poorest visibility, which might compensate to some degree for the most extreme weather-related visibility impairment. But the 98th percentile that FLAG addresses is not the 8th haziest day of the year, but rather the day with the 8th highest relative impact on extinction. The days with the highest impact relative to true natural conditions are unlikely to be the days with meteorological impairment, as we discuss further later in this memo. Consequently, taking the first seven days out of consideration and picking the impact on the 8th day for evaluation will not necessarily mitigate adequately the omission of weather-related impairment in the natural background conditions.

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[2] 40 CFR 51.301(a)

A simple hypothetical example may be useful to illustrate the point. Assume that one year of impacts has been modeled for a source, the relative impacts are calculated using the protocols prescribed in the draft FLAG report, and the resulting calculated relative impacts are ranked in order from largest to smallest. Suppose that the 7 days with greatest calculated relative impact on extinction occur under a meteorological regime that is associated with clear skies. Suppose also that the 8th highest modeled relative impact occurs under a different meteorological regime that is, in reality, associated with fog and mist, (although that fact is not taken into account in the prescribed analysis). Then, deleting the first 7 days from consideration and taking the 8th day as the one to be evaluated has not fully compensated for not considering weather-related impairment. Rather, because the background extinction against which the modeling is compared fails to include the effect of weather-related impairment, the 8th day has become the improper one of concern, whereas in reality it should be much farther down the list because the true background extinction is greater than the value used for the calculation.

Furthermore, in near-field "plume blight" analyses, the maximum hourly impacts on plume color and contrast are to be selected as indications of the impact of the source on visibility. There is no consideration of a 98th percentile. So for the near field analyses, the statements on pages 37 and 107 of the draft FLAG report that assert that the prescribed analysis procedure accounts for meteorological extremes ring hollow.

The Monthly Average f(RH) Values in the FLAG Report Result in Underestimates of the True Visibility Impairment under Natural Conditions. The monthly average f(RH) values provided in Tables V.1-3 through V.1-5 in the draft FLAG report cause one to underestimate the actual impact of moisture in the air on visibility impairment by particles in fog and clouds. Those values of f(RH) do not reflect the huge increase in size of fog and cloud droplets that have grown from air pollution particles serving as cloud condensation nuclei in an atmosphere that is supersaturated in moisture. For example, according to Mie theory,[3] a representative continental fog droplet of 10 μm diameter will scatter about 400 times as much light, and hence cause 400 times as much light extinction, as the 0.5 μm diameter particle from which it originated. (Fog droplets can range in size from about 5 μm to about 50 μm, depending on the type of fog.) In effect, we could say the growth in light scattering corresponds effectively to an f(RH) = 400 for this example, although RH has no meaning in supersaturated conditions. If the same 10 μm fog droplet originated from a 0.2 μm diameter particle, which is quite feasible, then the effective f(RH) would be over 5000. If those hours of the month when there is weather-related visibility impairment in the form of fog or clouds are not included in the monthly averages of the various forms of f(RH), then the baseline natural light extinction calculated using the IMPROVE formula (Figure V.1-1) will be too small and the background visual ranges in Table V.1-6 will be too large.

Typical situations where this is important, even under natural conditions, include the fog or mist that forms around dawn at times at some locations (sometimes almost every day), coastal areas subject regularly to marine fog, and locations on mountainsides that become

[3] See, for example, Figure 22.3 in the textbook, *Atmospheric Chemistry and Physics* by John H. Seinfeld and Spyros N. Pandis; John Wiley & Sons, 1998.

immersed regularly in stratus clouds. Although the hygroscopic sulfate, nitrate and sea salt considered by the IMPROVE formula will not necessarily be the only sources of the condensation nuclei around which the fog droplets form, we could say that such a fog condition is analogous to there being an "effective f(RH)". As the example above shows, such an "effective f(RH)" in supersaturated conditions can be much greater, often by an order of magnitude or more, than hourly f(RH) values that have been capped at RH = 95%. In those hours the background light extinction will consequently be much greater than that calculated for days without weather-related visibility impairment, and the actual visual range will be much smaller.

Weather-Related Visibility Impairment Can Neutralize Visibility Impacts of Source Emissions. At times, the weather-related visibility impairment will overwhelmingly dominate atmospheric extinction to the extent that the incremental increase in extinction due to pollutant emissions will be negligible. By not representing such situations properly, the 24-hr average impacts calculated by the FLAG procedure will overstate the relative impact of the source.

As a hypothetical example, assume that the natural conditions estimate of light extinction, as calculated using the IMPROVE algorithm and the data in the tables in the draft FLAG report, is 40 Mm^{-1} (which corresponds to a visual range of roughly 100 km). Then an extinction impact of, say, 4 Mm^{-1} by a source will be about a 10% impact, which would be considered adverse by a FLM. If, however, there is actually fog at the time and the visual range is really 1 km (corresponding to an extinction of about 4000 Mm^{-1}), the actual relative impact of the same 4 Mm^{-1} will be 0.1%, which is well below the 5% level and would not be of concern to a FLM. Although such a situation may not take place for a full 24 hours, the correct 24-hr average of hourly percentage impacts will be reduced from the value that is calculated when the effect of the weather-related extinction is ignored.

The Assistant Secretary of the Interior for Fish and Wildlife and Parks has given high-level endorsement to considering weather-related visibility impairment, by stating, "It is our interpretation that 'natural conditions' include significant meteorological events such as fog, precipitation, or naturally occurring haze."[4] Consequently, he concluded that weather events were the most significant sources of visibility extinction on the days when greater than 5% extinction impact had been calculated for a source, and therefore he withdrew his prior determination of an adverse air quality impact on AQRVs.

Note that the same issue is also relevant for near field "plume blight" modeling, where the background visual ranges used in VISCREEN and PLUVUE II analyses should reflect the true visual state of the atmosphere during each hour of analysis, including any weather-related visibility impairment, rather than the average values given in Table V.1-6 of the draft FLAG report.

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[4] Letter of January 10, 2003, from Craig Manson, Assistant Secretary for Fish and Wildlife and Parks, U.S. Department of the Interior, to Ms. Jan Sensibaugh, Director, Montana Department of Environmental Quality.

Conclusion

This discussion has demonstrated that the approach prescribed by the draft FLAG report for identifying potential sources that would have an adverse impact on visibility does not fully take into account the contributions of natural, weather-related visibility impairment, such as dense fog, which can be sufficient to neutralize the relative visibility impacts of any source. Use of the 98^{th} percentile value of relative impact on visibility is helpful but may not be an adequate substitute for a more complete evaluation of weather-related visibility impairment.

Methods exist for making more realistic estimates of the relative visibility impact of a source. For analyses of distant source impacts with CALPUFF, the Method 7' calculation in CALPOST (but not the Method 6 prescribed by the draft FLAG report) addresses this issue. For near field plume analyses, each hour of analysis should use a realistic representation of the visual range at that time.

REVIEW OF DRAFT 2008 PHASE I REPORT OF FLAG

J. Scire, J. Popovic and C. Escoffier-Czaja
TRC
Lowell, MA

September 8, 2008

TRC has conducted a review of the draft 2008 Phase I Report of the Federal Land Managers Air Quality Related Values Workgroup (FLAG 2008). This memo outlines the results of that review, highlighting areas that are likely to be most important in the definition of impacts on Air Quality Related Values (AQRVs), such as visibility and deposition over long range transport distances (50 km or greater).

Issue 1. Initial Screening Criterion. The FLAG (2008) report proposes screening criteria based on an evaluation of the ratio of emissions (Q) from a facility (in tons per year), divided by the distance (D, in km) to a Class I area. If the ratio of Q/D is 10 or less, no further Class I AQRV impact analyses would be required. Q is defined as the sum of SO_2, NO_x, PM_{10} and H_2SO_4 emissions in tons per year based on 24-hour maximum allowable emissions, with provisions for seasonally or intermittently operating sources.

Comments: Although the introduction of a simple initial screening criterion is useful, there are several issues with the Q/D $\leq$ 10 proposal that could be improved.

- Q/D $\leq$ 10 can be a simple and inexpensive first-level screen for excluding from further review some of the smallest impacts, but the FLAG (2008) report provides no technical basis for the threshold value of 10. Although the FLAG report references the BART guidelines, those guidelines provide no data supporting the use of 10 as the threshold.
- Table 1 -- based on data from the VISTAS area -- shows how Q/D values compared to the results of screening CALPUFF simulations and refined simulations. These data suggest a Q/D value greater than 10 may be justifiable. Indeed, 100% of the cases with Q/D < 20 and 99.3% of the cases with Q/D < 30 passed the BART 0.5 dv threshold in refined simulations. In some instances, sources with Q/D values greater than 40 pass the 0.5 deciview threshold test for 98th percentile visibility impacts.

Table 1. Analysis of Q/D Values Compared to the Results of Screening and Refined CALPUFF BART Analyses using Visibility Method 6.

Q/D	Total cases	**No. Passing 12-km screen using max deciview**	No. Passing 12-km screen using 98th percentile value deciview	No. Passing 4-km refined run using max deciview	**No. Passing 4-km refined run using 98th percentile value deciview**
< 10	27	**27**	27	27	**27**
≥ 10	165	**115**	146	122	**144**
Breakdown					
10-20	73	**72**	73	72	**73**
20-30	43	**34**	43	37	**42**
30-40	17	**4**	13	10	**13**
>40	32	**5**	17	3	**16**

- There is technical support for alternative thresholds. For example, the preliminary analysis presented in Table 1 suggests that there is technical support for the use of an alternative screen that is much more accurate than Q/D in predicting the results of a refined higher resolution run of a CALPUFF simulation. The alternative screen would use a simple coarse scale CALPUFF screening simulation based on the maximum visibility impact using No-Observations (No-Obs) mode meteorological data (i.e., using only MM5 or other prognostic gridded meteorological data).
- This alternative screening approach, based on the maximum impact using No-Obs mode meteorological data, accurately predicted 100% of the 98th percentile refined modeling outcomes for Q/D < 10. See the columns highlighted in bold in Table 1. The No-Obs screen accurately screened out 115 cases with Q/D ≥ 10 that were confirmed as below the 0.5 dv impact threshold with the refined higher resolution 98th percentile simulations. There were no cases that passed the No-Obs screen based on the maximum impact that did not also pass with the refined modeling simulations. In 29 cases, the screening approach conservatively identified impacts above 0.5 dv that the refined modeling showed were below the 0.5 dv threshold. Of 165 cases with Q/D ≥ 10, refined modeling predicted 144 cases with 98th percentile impacts that passed the 0.5 dv threshold. The

Q/D < 10 test failed to identify any of these 144 cases as passing, while the No-Obs screen identified 115 of the 144 cases.

- The just-described 12-km screening simulations were based on standard CALMET meteorological datasets that were pre-approved by the states and EPA for use in BART analyses. This reduced the level of effort in conducting the screening substantially because no meteorological modeling was required. In VISTAS, this proved to be a very useful screening procedure in reducing the number of Class I areas subject to more refined simulations and/or eliminating sources from further analysis. Using the screening meteorological dataset, simulation times were on the order of just a few hours on personal computers.
- The advantages of using a screening simulation other than (or in addition to) Q/D include the following:
    - As Q is now defined in the FLAG (2008) report, it does not account for the significant variation in extinction efficiency among the various species of pollutants. For example, the extinction efficiency ranges from 0.6 for coarse PM in the 2.5-10 μm diameter size range, to 4.0 for organic (condensable) PM, to 10 for elemental carbon. For hygroscopic pollutants such as sulfate and nitrate, the humidity term is used to multiply the extinction efficiency and pollutant concentrations. Lumping various non-hygroscopic species into the definition of Q with hygroscopic emissions and applying that same humidity term to those non-hygroscopic species may therefore be overly conservative as a predictive tool.
    - Q/D does not account for meteorological factors such as the prevailing winds and the relative spatial location of the facility relative to the Class I areas.
    - There is no limit on how far away a Class I area could be in the application of the Q/D rule. This could lead to very large modeling domains if the Q/D criterion is used to determine which Class I areas are to be included in a modeling analysis.
- For all these reasons, it is recommended that more detailed technical analyses be conducted on whether a higher Q/D value should be used as a first-level screen and whether a simple No-Obs coarse-scale CALPUFF screening simulation should be used as a second-level screen before proceeding to more refined CALPUFF modeling.

Issue 2. Limitations in FLAG (2008) on Technical Enhancements in the Standard First Level Modeling Approach.. The FLAG (2008) report contains the following language (p. 33):

We wish to emphasize that the first-level procedures defined herein are to be taken as a whole; any deviations from these procedures or ostensible refinements compromise the integrity of the analysis, and may warrant an hourly analysis for all hours in the analysis.

Adherence to this restriction would preclude any technical enhancements not part of the definition of the first-level procedures, short of the much more complex refined hourly analysis. This restriction on technical improvements is not wise policy because it prevents the use of knowledge gained during the process from feeding back into the methods used. It is worth noting that the FLAG (2008) recommendations themselves reflect very closely a series of enhancements introduced into CALPOST over the years, as more and more experience was gained in the application of the FLAG (2000) procedures. These enhancements include the introduction of the new IMPROVE methodology (Method 8 in CALPOST), the use of elevation-dependent Rayleigh scattering, the use of monthly average relative humidity and the 98th percentile value as a factor that mitigates the effects of a failure to consider individual weather events. Going forward, particular enhancements that should be considered include the ability to use time-varying background ammonia and the use of the Ammonia Limiting Method (ALM). ALM is discussed more below.

Issue 3. Modeling Protocol. The FLAG (2008) report indicates "*Selection of model parameters and input data should be documented in a written protocol and agreed upon by the affected Agencies in advance of any modeling being conducted*" (pp. 33-34). Although the development of a protocol is certainly worthwhile to facilitate agreement on the modeling approach, the finalization of model parameters ***in advance of any modeling being conducted*** is not good practice. An essential part of meteorological modeling is the development and testing of the model parameters to ensure the simulation accurately represents relevant processes. Several CALMET input parameters have no default values, but rather are to be defined based on site-specific model testing. For example, the definition of CALMET grid spacing, the CALMET radius of influence parameters and several other CALMET inputs are in this category of application-specific parameters requiring model testing. Making these decisions prior to any modeling being conducted is not standard practice, nor is it good scientific practice.

Issue 4. Definition of 98th Percentile Value. The exact definition of the 98th percentile visibility value is left undefined in FLAG (2008). In BART analyses, the 98th percentile value over each

year has been used. Under this "highest year" approach, the 98th percentile value would be the highest of the 8th highest value recorded in any year during the period modeled (usually at least 3 years). The recommended modeling period is described in the FLAG (2008) document as 3-5 years.

An alternative approach -- recommended here -- is that the 98th percentile value be defined over the entire simulation period (i.e., over 3-5 years, not on an annual basis). So for a three year period, this would be the 22nd highest 24-hour average value. For a 5-year period, the 98th percentile value would be the 37th highest value. Defining the 98th percentile over the entire simulation period is preferable because it makes the analysis less sensitive to a year of unrepresentative conditions. For example, consider a simulation period of five years, where the number of days where the change in light extinction is $\geq$ 5% is 3, 8, 4, 2, 3 days for years 1-5, respectively. Under a "highest year" approach, Year 2 would produce an adverse determination, since the 98th percentile value in that year would exceed a 5% change in light extinction. However, the overall sum of 20 exceedances over the five year period is well below the 98th percentile value for that entire period (which would allow 36 exceedances). The proposed definition is a more robust indicator of impact because it makes the analysis less sensitive to unrepresentative conditions.

Issue 5. Definition of Model Inputs. The FLAG (2008) report does not define certain model inputs, such as the background ammonia concentration, puff splitting options, etc. The background ammonia concentrations are especially critical because the formation of ammonium nitrate can be limited by the availability of ambient ammonia. Past FLM recommendations involved the use of constant ammonia spatially and temporally. However, data from many sources, including CMAQ modeling simulations, demonstrate the substantial seasonal and spatial variability in ammonia concentrations. See Figure 1 for the monthly average ammonia concentrations over the United States for two months. The variability in time and space is substantial, and this is a significant factor in the proper prediction of concentrations of ammonium nitrate, one of the two most critical species for most visibility applications. Also, Figure 2 shows findings of a model evaluation study conducted in Wyoming, comparing observed nitrate concentrations with predicted nitrate concentrations using both constant background ammonia and application of the Ammonia Limiting Method (ALM), which involves time- and space-varying ammonia. The use of constant background ammonia at the 0.5 ppb and 1.0 ppb levels resulted in overprediction of ammonium nitrate concentrations in the range of factors of 2-

3 and 3-4, respectively. The use of ALM resulted in much closer agreement with the observations.

Note that there have been substantial developments in the ability to use CMAQ model output as input into CALPUFF, which will allow the use of varying ammonia in ALM easily, using predefined files for each Class I area. In addition, this method allows for better background data to be included, reflecting for example future emission reduction scenarios as defined in the CMAQ simulations.

CMAQ NH3(gas) MONTHLY AVERAGE

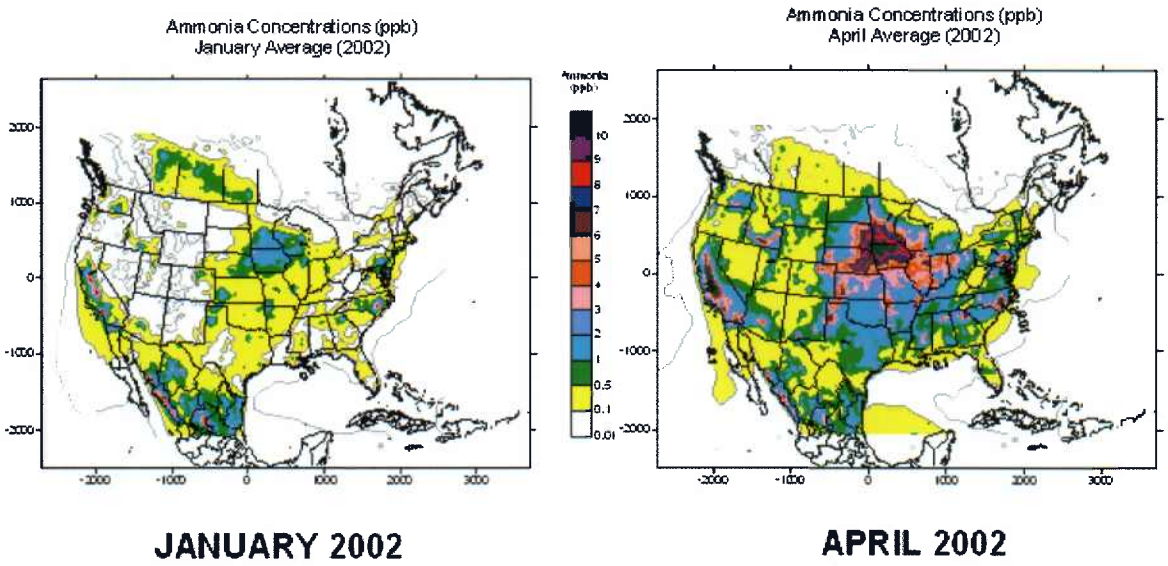

Figure 1. Monthly average ammonia concentrations as predicted by CMAQ model simulations.

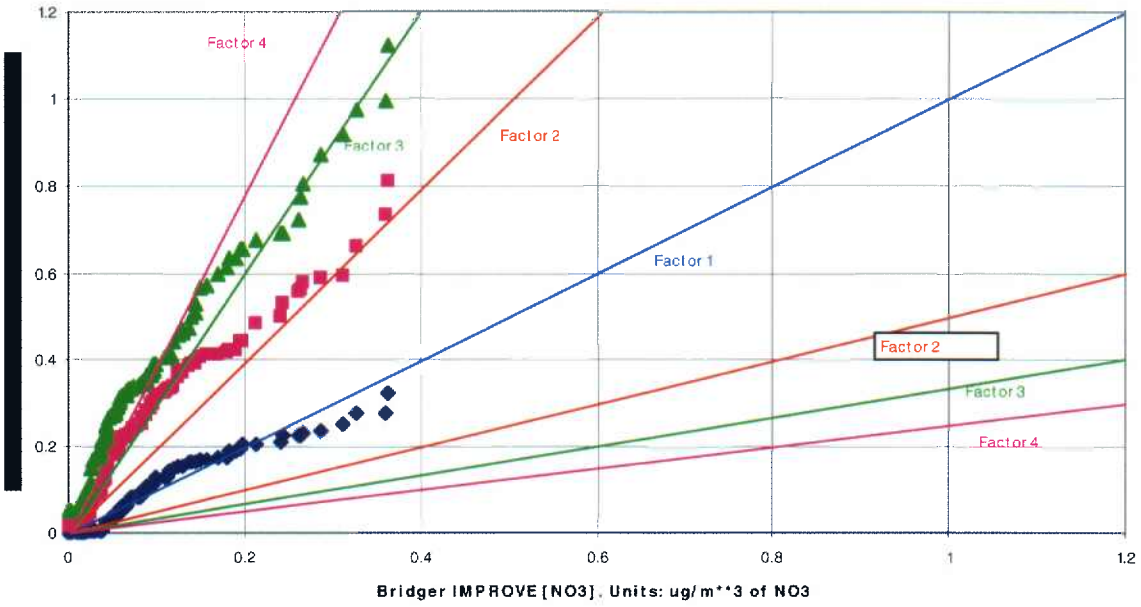

Figure 2. Comparison of observed and predicted NO_3 concentrations at the Bridger IMPROVE monitoring site using ALM (blue) vs constant ammonia of 0.5 ppb (pink) and 1.0 ppb (green).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

JUL 19 2006

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations

FROM: Joseph W. Paisie, Group Leader
Geographic Strategies Group (MC 504-2)

TO: Kay Prince, Branch Chief
EPA, Region 4

In July 2005, EPA issued BART Guidelines that provide guidance to the States in making BART determinations for large power plants and other BART sources. In the BART Guidelines, we described several approaches that States could use to determine whether a source should be subject to review for BART, or whether it should be exempt from the BART requirements. As you know, BART applies to existing sources of a certain type, age, and size that "emit any air pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility in any [Class I] area." CAA §169A(b)(2)(A). One approach discussed in the Guidelines for determining that a source does not meet the threshold test for BART is to use the air quality model CALPUFF.

We understand that many States and Regional Planning Organizations (RPOs) are currently considering the use of CALPUFF for making BART determinations. We have received a question asking whether States can, or should, allow sources to use CALPUFF to estimate visibility impacts on a pollutant specific basis, or whether EPA intended CALPUFF to be used to model a source's visibility impacts based on its total emissions of visibility-impairing pollutants. We have also received a question regarding the process for estimating natural background conditions, one of the factors used to estimate a source's impact on visibility. This memo addresses these two questions.

Pollutant-Specific CALPUFF Analyses

Because of the complexity and nonlinear nature of atmospheric chemistry and chemical transformation among pollutants, EPA does not generally recommend that CALPUFF be used on a pollutant specific basis to determine whether a source meets the threshold test for BART. In

certain situations, however, it may be appropriate to do just that. For example, if a State chooses to adopt the Clean Air Interstate Rule (CAIR) program to address emissions of SO_2 and NO_x from electric generating units (EGUs), the CAIR may satisfy the requirements for BART for these pollutants from these sources. However, the State must determine whether its BART-eligible EGUs are subject to review under BART for direct emissions of particulate matter (PM). Because the task of predicting the impacts of PM on visibility is a relatively straight-forward exercise, unlike predicting the impacts of SO_2 and NO_x, we would recommend the use of CALPUFF on a pollutant specific basis to model only the impact of PM emissions on visibility. Using the results of such an analysis, States may then determine whether a source should be subject to review for PM controls, or alternatively, that the source is not subject to BART for PM.

Estimating Natural Visibility Conditions

The BART Guidelines explain that States should estimate a source's impact on visibility by "calculat[ing] daily visibility values for each receptor as the change in deciviews compared against natural visibility conditions." 70 Fed. Reg. 39104, 39162 (July 6, 2005). EPA has provided guidance to the States specifically for the complex task of estimating natural visibility conditions, *see* "Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule," EPA-454/B-3-005 (September 2003), but neither the BART Guidelines nor the guidance described above specify whether for purposes of determining whether a source is subject to BART, States should use annual values in calculating natural background visibility estimates or some other averaging period. The preamble to the BART Guidelines, however, states that the BART Guidelines suggest that States use a natural visibility baseline for the 20% best days for determining a source's impact on visibility.

We are clarifying here that the EPA did not intend to limit States to the use of the 20% best visibility days for this comparison through the statement in the preamble describing the BART Guidelines. States may use the 20% best visibility days or an annual average. The BART Guidelines allow for this flexibility, and we believe that either value would allow for States to determine appropriately whether a source is reasonably anticipated to cause or contribute to any impairment in visibility.

I am requesting that in your role as sublead Region for PM and Regional Haze, you transmit this memo to the other Regions. I would like to thank you in advance for your assistance.

If you have any questions about either of these issues, please contact either Kathy Kaufman or Todd Hawes in my office.