Comments on EPA's Proposal to Retain the Secondary National Ambient Air Quality Standards for Oxides of Nitrogen and Sulfur 76 Fed. Reg. 46084 (August 1, 2011)

Prepared for the Alliance of Automobile Manufacturers

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Executive Summary

Air Improvement Resource, Inc. (AIR) reviewed the Administrator's August 1, 2011 proposal regarding secondary national ambient air quality standards for oxides of nitrogen (NO_x) and oxides of sulfur (SO_x) for the Alliance of Automobile Manufacturers (Alliance). AIR and the Alliance support the proposal to retain the current secondary standards. We agree with EPA's conclusion that the current secondary standards are adequate to protect against direct phytotoxic effects on vegetation. We do not support the proposal to add additional secondary standards identical to the new 1-hour primary standards. The proposed rule acknowledges that the form of the 1-hour primary standards is not ecologically relevant for a secondary standard. The adoption of inappropriate secondary standards is unnecessary to drive further emission reductions of SO_x and NO_x. Existing regulations are sufficient to insure continued reductions of emissions for the foreseeable future.

We agree with the Administrator that it is premature to adopt an Aquatic Acidification Index (AAI) standard. In addition to the many limitations and uncertainties noted in the proposed rule, we have serious concerns that the structure of an AAI-based standard is inherently flawed and an unsound basis for establishing a secondary NAAQS to protect against the effects of acidifying deposition. Both EPA and Congress have historically decided that secondary national air quality standards are <u>not</u> an appropriate approach to address regionally variable welfare effects. A further complication is that the welfare effects, to the extent they are due to nitrogen, are due to total nitrogen deposition, not just oxidized nitrogen. In particular, reduced N is important and, although included in the acidification index, it is not subject to regulation as a criteria pollutant.

The Administrator proposes to carry out a research field program over the next five years to further evaluate the AAI approach. EPA should not be fixated on seeing how an AAI standard can be used to provide appropriate protection from deposition effects. The research under the field program should be designed to evaluate both the AAI approach as well as other alternatives. Alternatives involving deposition standards under Title IV or a state or regional critical loads approach should be considered and evaluated. In this way, the pros and cons of several alternatives can be evaluated. The baseline for the effort should be a calculation of the impact of all current and planned regulations. These

additional tasks will address the threshold question in the next review of whether any additional deposition-specific regulations are needed.

The AIR/Alliance comments provide feedback on the proposed field program and on potential obstacles involved in implementing an AAI standard under the Clean Air Act. As currently delineated, it is not clear how the field program will be able to accomplish its stated goals, much less inform the wider question of alternatives to the AAI approach. There are also major issues involved in implementing an AAI standard under the Clean Air Act that EPA has not yet begun to address.

I. Introduction.

The U. S Environmental Protection Agency (EPA) is in the process of reviewing the secondary (or welfare-based) National Ambient Air Quality Standards (NAAQS) for Oxides of Nitrogen (NO_x) and Oxides of Sulfur (SO_x). The Integrated Science Assessment for Oxides of Nitrogen and Sulfur: Ecological Criteria[1] (ISA), which reviews the relevant science, was completed in December 2008. A Risk and Exposure Assessment (REA) was completed in December 2009.[2] The final Policy Assessment (PA)[3] that is intended to help "bridge the gap" between the relevant scientific information and the judgments required of the Administrator in determining whether, and if so, how, it is appropriate to revise the standards was issued in February 2011. Air Improvement Resource, Inc. (AIR) participated in public comments to EPA and the Clean Air Scientific Advisory Committee (CASAC) during the review.[4]

On August 1, 2011, EPA issued a proposed rule.[5] EPA is proposing to retain the current nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) secondary standards to provide protection for the direct effects on vegetation due to exposure to gaseous oxides of nitrogen and sulfur in the ambient air. Additionally, with regard to protection from the deposition of oxides of nitrogen and sulfur to sensitive aquatic and terrestrial ecosystems, including acidification and nutrient enrichment effects, EPA is proposing to add secondary standards identical to the NO_2 and SO_2 primary 1-hour standards and not set a new multi-pollutant secondary standard at this time. The proposed 1-hour secondary NO_2 standard would be set at a level of 100 ppb and the proposed 1-hour secondary SO_2 standard would be set at 75 ppb. Moreover, EPA has decided to undertake a field pilot program to gather and analyze additional relevant data to enhance the Agency's

[1] U. S. Environmental Protection Agency, Integrated Science Assessment for Oxides of Nitrogen and Sulfur: Ecological Criteria, EPA/600/R-08/082F, December 2008.
[2] U. S Environmental Protection Agency, Risk and Exposure Assessment for Review of the Secondary National Ambient Air Quality Standards for Oxides of Nitrogen and Oxides of Sulfur- Final Report. U.S. Environmental Protection Agency, Washington, D.C., EPA–452/R–09–008a, December 2009.
[3] U. S. Environmental Protection Agency, Policy Assessment for the Review of the Secondary National Ambient Air Quality Standards for NOx and SOx, EPA 452/R-11-005a, February 2011.
[4] J. M. Heuss, Comments on First External Review Draft of "Integrated Science Assessment for Oxides of Nitrogen and Sulfur: Ecological Criteria" Prepared for the Alliance of Automobile Manufacturers, March 17, 2008; Jon M. Heuss and George T. Wolff, Comments on EPA's Second External Review Draft "Policy Assessment for the Review of the Secondary National Ambient Air Quality Standards for NO_x and SO_x," Prepared for the Alliance of Automobile Manufacturers, November 5, 2010.
[5] 76 Federal Register 46084, August 1, 2011.

understanding of the degree of protectiveness that a new multi-pollutant approach would afford and to support development of an appropriate monitoring network for such a standard. The EPA solicits comment on the framework of such a standard and on the design of the field pilot program.

AIR reviewed the proposed rule. We support the proposal to retain the current secondary standards. We agree with EPA's conclusion[6] "that the current secondary standards are adequate to protect against direct phytotoxic effects on vegetation," and agree that they should be retained. We do not support the proposal to add additional secondary standards identical to the new 1-hour primary standards. EPA acknowledges that the form of the 1-hour primary standards is not ecologically relevant for a secondary standard. The adoption of inappropriate secondary standards is unnecessary to drive further emission reductions of SO_2 and NO_2.

We agree with the Administrator that it is premature to adopt a multi-pollutant Aquatic Acidification Index (AAI) standard. In addition to the many limitations and uncertainties noted in the proposed rule, we have serious concerns that the structure of an AAI-based standard is inherently flawed and an unsound basis for establishing a secondary NAAQS to protect against the effects of acidifying deposition. These concerns are detailed in the following discussion.

Even though the Administrator is not proposing to adopt the AAI formulation in this review, the proposed rule explains the AAI approach in detail and the Administrator asks for comments on the approach and on the field program the proposal outlines to gather information relevant to its adoption and implementation in the next review. Therefore, these comments include sections on the AAI structure and the proposed field program.

The proposed rule indicates that EPA has decided, in the context of evaluating the adequacy of the current secondary standards, to revisit the question of the appropriateness of setting secondary NAAQS to address remaining known or anticipated adverse public welfare effects resulting from the acidic and nutrient deposition of these criteria pollutants.

In addressing this question, it is important to make a distinction between direct effects and indirect effects. National air quality standards, either primary or secondary, are an appropriate approach for dealing with direct effects. National ambient air standards are not an effective or appropriate approach for dealing with indirect effects such as acid deposition. Both EPA and Congress have recognized this over the years. Congress addressed acid deposition through Title IV of the Clean Air Act (CAA). EPA has not used the national secondary standards to address deposition effects in any past reviews.

In contrast to the situation with human health effects where we are dealing with the direct effect of concentrations in the ambient air on human subjects, the effects on soils, forests, and aquatic ecosystems are of an indirect nature. They involve the deposition of SO_x and NO_x species followed by the interactions of those deposited species with the ecosystem in

[6] Ibid., at page 46110.

complex ways that result in effects that are removed in time and space from the ambient concentrations that led to the effects. As discussed in the ISA, the parameters that can be used to measure or assess such effects are not ambient concentrations, but rather biological, chemical, ecological, or biogeochemical indicators. In addition, the sensitivity of various ecosystems to such effects varies dramatically over the U. S., so the level of deposition that will potentially harm the most sensitive ecosystem will not affect the vast bulk of the country. Furthermore, there are substantial benefits from nitrogen deposition (and to a lesser degree sulfur deposition) in many ecosystems, so there must be a balancing of beneficial and adverse effects in the NAAQS review. A final complication is that both oxidized and reduced forms of nitrogen contribute to the effects discussed in the ISA, but reduced nitrogen (NH_x) is not a pollutant currently regulated under the Clean Air Act.

As a result of these complications, there is an important threshold question as to whether the secondary standard provisions of the Act are an appropriate mechanism for addressing the key welfare effects discussed in the ISA. For example, based on the Clean Air Act a strong case can be made that both primary and secondary NAAQS must be nationally uniform and that deposition effects should be addressed through Title IV of the Act or other regional efforts. Public comments during the review raised these issues in detail,[7] but the proposed rule does not address the arguments made in the public comments. The final rule must address this aspect of the threshold question.

Instead of a nationally uniform ambient standard, the proposed rule describes and considers a complex formulation called an atmospheric acidification index which includes considerations of the underlying ecosystem characteristics such as buffering capacity and nitrogen uptake, along with estimates of the annual cumulative deposition of oxidized forms of nitrogen and sulfur. The nationally-uniform aspect of such a standard would be the intent to provide protection against aquatic acidification as reflected in effects on an ecologic indicator, the chronic Acid Neutralizing Capacity (ANC)[8] of aquatic systems. ANC is not itself a causal agent for effects but it tends to correlate with pH and other indicators that do affect fish populations. Although the AAI would essentially be a deposition standard not an ambient standard, the EPA formulation would use an atmospheric model to develop factors to translate the ambient concentrations of NO_y (total oxidized nitrogen) and $SO_2 + SO_4^=$ (total oxidized sulfur) into deposition loads. Since the sensitivity of ecosystems to acidification varies widely, the AAI would be evaluated in a regional manner. A major complication in the development and implementation of such an approach is that deposition of reduced nitrogen (gaseous ammonia and particulate ammonium) is also acidifying. Reduced nitrogen is included in the AAI but it would not be subject to control in the current formulation of the AAI.

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[7]Comments by the Utility Air Regulatory Group on the First External Draft Policy Assessment, Docket No. EPA-HQ-OAR-2007-1145- 0070.1; Comments by the American Petroleum Institute on the First External Draft Policy Assessment, Docket No. EPA-HQ-OAR-2007-1145-0069.1, Comments by the Alliance of Automobile Manufacturers on the Second Draft Policy Assessment, supra note 4.

[8] ANC, defined as the total amount of strong base cations minus the total amount of strong acid anions, is an indicator of the ability of water to neutralize the acid or acidifying inputs it receives.

The way the standard would work is that measurements of ambient NO_y and $SO_2 + SO_4^=$ would be made in sensitive areas and used with the AAI equations to determine if the target ANC is achieved. If not, non-attainment would be triggered and a State Implementation Plan (SIP) would be required. The spatial extent of the region where additional controls would be required is not known or even considered in the proposed rule. The rule also discusses the probability that similar complex formulations could be used in subsequent reviews to establish secondary standards to protect against acidification in sensitive terrestrial ecosystems. AIR is concerned that promulgation of a secondary standard of the type discussed in the proposed rule would be a major expansion of EPA's regulatory authority.

There are many unanswered issues and questions concerning the regulatory authority for such a formulation as well as with the formulation itself, the extensive use of modeling in the determination of the relation between ambient concentrations and deposition, and how such a complicated scheme could be implemented. The issues and questions identified by AIR are discussed in greater detail in the following sections.

II. Both EPA and Congress have historically decided that secondary NAAQS are <u>not</u> an appropriate approach to address regionally variable welfare effects.

In previous reviews, EPA decided the secondary national air quality standards were not an appropriate approach to address deposition effects. Instead both EPA and Congress have regulated deposition through Title IV of the Clean Air Act. Nothing has changed to alter the fundamental limitations that led to those decisions. The proposed rule glosses over or omits the reasons given in past reviews as to why secondary NAAQS cannot adequately address deposition issues.

The basic understanding of the causes and effects of acidic deposition and eutrophication has been available to legislative and regulatory bodies for many years. Over those years, the appropriate mechanisms and approaches to address the concern that the proposed rule focuses on, the acidifying effects of NO_x and SO_x, have been debated and decided several times by EPA, Congress, and the States. The proposed rule summarizes some of this history but leaves out important relevant material. For example, the Utility Air Regulatory Group noted[9] that when EPA last decided the secondary SO_x standard, the Administrator indicated:

> The 1990 Amendments and the legislative history indicate, however, that Congress *reserved judgment* as to whether further action might be necessary or appropriate in the longer term and, if so, what form it should take. *Congress seems to have viewed these as questions it would itself address in the future*, based on further studies and research to be conducted by the EPA and other agencies. Consistent with the 1988 proposal notice, *Congress does not seem to have expected that the EPA would set a secondary standard for acidic deposition …. in the interim*. To the contrary, in section 404 of the 1990 Amendments, Congress specifically required the EPA to conduct a study of the feasibility and

[9] UARG comments on first draft PA, supra note 7.

> effectiveness of an acid deposition standard or standards, and to report to Congress by November 15, 1993 on the role that a deposition standard might play in supplementing the acidic deposition control program adopted in title IV, and what measures would be needed to integrate it with that program.[10]

The proposed rule also leaves out relevant material from the Clean Air Act charge to EPA to conduct the section 404 Study noted above and the results of the study that were transmitted to Congress in 1995.[11] The Section 404 Study was required to report on the feasibility and effectiveness of an acid deposition standard or standards to protect sensitive and critically sensitive aquatic and terrestrial resources. Protecting those resources is essentially what EPA is seeking to do through the secondary NAAQS process. The study was to 1) include the identification of the sensitive aquatic and terrestrial resources in the United States which may be affected by the deposition of acidic compounds, 2) describe the nature and numerical value of a deposition standard or standards that would be sufficient to protect such resources, 3) describe the measures that would need to be taken to integrate such standard or standards with the control program required by Title IV of the Clean Air Act, and 4) describe the cost-effectiveness of deposition standards compared to other control strategies including ambient air quality standards, new source performance standards and the requirements of Title IV of the Clean Air Act.

Both the way Congress set up the requirements of the section 404 study and the study report itself presume that deposition standards would be carried out under Title IV and that EPA's existing authority under Title I was not well-suited to the issue. The study evaluated a regional target approach and a national emission reduction approach for establishing deposition standards (in likely units of kg/hectare). In both cases, the report discusses the need for further legislative action by Congress. The report recommended against setting acid deposition standards at the time because of uncertainties, with the uncertainty in the rate of nitrogen effects on the watershed the most important impediment. The report also concluded that setting a uniform national deposition standard would not be appropriate. The final rule should draw on the section 404 report as it informs the decisions in the current review.

The previous review of the secondary NO_x standard[12] also provides an important perspective that must be included in the current review. In the 1996 final rule the Administrator acknowledged the concerns about acid deposition (particularly in the Adirondacks) and eutrophication (particularly in the Chesapeake Bay). With regard to acidification, the Administrator referred to one commenter who "recognized EPA's concern that revision of the secondary NAAQS may not be the best mechanism for addressing the effects of acid rain and supported regionally-targeted regulatory efforts." The final rule also refers to the section 404 report concerning deposition standards and

[10] 58 FR 21356; April, 21, 1993 (emphasis added) (citation omitted).
[11] U.S. EPA, Acid Deposition Standard Feasibility Study: Report to Congress, EPA 430-R-95-001a, October 1995.
[12] 61 FR 52852; October 8, 1996.

indicates that the Agency will continue, as appropriate, to assess the feasibility of developing regionally-targeted tools and policy initiatives.

With regard to eutrophication, the rule indicated:

> Given the complexities associated with estimating the contribution of nitrogen deposition to the eutrophication of estuarine and coastal waters and the limited data currently available, the Administrator again concludes that there is not sufficient quantitative information to establish a national secondary standard to protect sensitive ecosystems from the eutrophication effects caused by nitrogen deposition. The Administrator also concludes that regional control strategies which consider all of the factors contributing to eutrophication are more likely to be effective in mitigating this problem than a national standard which addresses only atmospheric deposition of nitrogen compounds.

The rule concludes:

> Given the multiple causes and regional character of these problems, the Administrator also concludes that adoption of a nationally-uniform secondary standard would not be an effective approach to addressing them. Therefore, the Administrator has determined, pursuant to section 109(d)(1) of the Act, as amended, that it is not appropriate to revise the current secondary standard for NOx to protect against welfare effects at this time.

The final rule went on to indicate that, in the interim, the EPA and the States are in the process of achieving significant reductions in NO_x emissions from both mobile and stationary sources in response to the Act's 1990 Amendments and local or regional initiatives. The Administrator pointed out that the NO_x emissions reductions achieved through these actions will provide additional protection against the environmental impacts associated with various pollution issues including eutrophication and acid deposition. Indeed, dramatic reductions in NO_x emissions have occurred since 1996 and, as documented below, will continue to occur due to regulations including but not limited to: 1) Tier 2 vehicle regulations which will continue to reduce NO_x emissions as new vehicles replace older ones, 2) the upcoming Tier 3 and California LEV III vehicle regulations which will reduce criteria emissions to near un-measurable levels, 3) the recent diesel tailpipe and fuel-sulfur regulations, 4) the recent off-road vehicle emissions rule, 5) the State Implementation Plans developed to meet the PM and ozone NAAQS, 6) the NO_x and SO_x reductions mandated by Cross-State Air Pollution Rule, 7) the Utility Mercury Standard, and 8) the Utility Air Toxics Standards.

A Panel of the National Research Council (NRC) has also addressed the issue of regionally different welfare standards. The proposed rule notes[13] that the NRC Panel recommended that EPA consider multiple pollutants, as appropriate, in forming the scientific basis for the NAAQS.[14] However, the Panel also acknowledged that

[13] Proposed Rule, supra note 5, at 46089.
[14] National Research Council. 2004. *Air Quality Management in the United States*. National Academies

concentration-based standards are inappropriate for some resources at risk, such as soils, groundwater, forests, surface water, and coastal eco-systems from air pollutants, such as sulfur and nitrogen.[15] For such resources, the Panel indicated that deposition-based standards would be more appropriate. The Panel also indicated that if acceptable exposure levels vary significantly from one region of the nation to another, consideration should be given to the promulgation of regionally distinct secondary standards. But the Panel noted that a move to regional secondary standards may require an amendment of the Clean Air Act.

The relevant history discussed above must be included and considered in the final rule and in the Administrator's decisions. Based on the various previous findings, any decision on regulatory action to address acid deposition is reserved to the Congress. Such a conclusion is based on Congress's prior actions, the legislative history of the relevant statutes, and EPA's own prior findings.

III. A secondary NAAQS, even a combined NO_x and SO_x secondary standard, is still not an appropriate approach to address regionally variable welfare effects, especially those that involve substances other than the criteria pollutants themselves.

The proposed rule indicates that a significant shift in understanding of the effects of oxides of nitrogen and sulfur has occurred since the last reviews, reflecting the large amount of research that has been conducted on the effects of deposition of nitrogen and sulfur to ecosystems.[16] In actuality, the knowledge of deposition effects has not undergone a major shift. What has changed is that EPA is now reluctant to consider asking Congress for authority for deposition standards and views the AAI formulation as a way to resolve the limitations that have led EPA, Congress, and the scientific community to conclude that secondary NAAQS are not an appropriate approach to controlling deposition-related effects. However, there are still fundamental obstacles to using secondary NAAQS to address deposition concerns.

First, acid deposition is a regional, not a national concern. Therefore, a uniform national ambient standard is not appropriate.

Second, the ecological indicator that the PA and the proposed rule recommends, ANC, is a measure of water quality, with units of μeq/L, and cannot substitute for a uniform national ambient standard. Promulgation of a secondary standard of the type discussed in the proposed rule would be a major expansion of EPA's regulatory authority. The PA also discusses the probability that similar complex formulations could be used in subsequent reviews to establish secondary standards to protect against acidification in sensitive terrestrial ecosystems. While the proposed rule recommends against using a similar approach to regulate eutrophication at this time, there is no reason why the

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Press, Washington, D.C.

[15] Ibid. at page 312.

[16] Proposed Rule, supra note 5, at 46107.

justification for establishing a water quality standard and designating it as an air quality standard could not be stretched and used for any number of other welfare issues.

Third, the criteria pollutants NO_x and SO_x cover only a portion of the S and N compounds that are known to cause deposition-related effects. All the relevant conclusions concerning causality in the ISA refer to the evidence being sufficient to infer a causal relationship between acidifying deposition or N (or reactive N) deposition. In particular, reduced N is important and included in the acidification index but is not subject to regulation as a criteria pollutant. This omission can lead to the situation where sources of NO_x or SO_x emissions could be driven to zero while sources of reduced N would be totally uncontrolled and even allowed to increase.

Fourth, the air quality indicator discussed in the scheme described in the proposed rule, NO_y, while it includes both regulated and unregulated compounds, is an incomplete indicator. The PA indicates that the term "NO_y" refers to the complete set of oxidized nitrogen compounds, noting that NO_y includes all nitrogen oxides, including NO, NO_2, HNO_3, peroxyacetyl nitrate (PAN), N_2O_5, HONO, NO_3^- organic nitrates, and particulate NO_3. Thus, NO_y includes all oxidized forms of N that come from NO_x or for which the N in the compound comes from NO_x. However, it does not include the reduced N compounds that contribute to acidification. It also does not include all the organic N components that have been identified in total nitrogen deposition.[17] Therefore, it is an incomplete indicator.

Fifth, the beneficial effects of N deposition need to be weighed along with any adverse impacts in the Administrator's decision. The ISA, the PA and the proposed rule acknowledge that nitrogen is a fundamental nutrient for primary production in both managed and unmanaged ecosystems. The nutrients deposited from atmospheric sources on both managed and un-managed ecosystems are often referred to as passive fertilization. The proposed rule acknowledges that increases in the availability of nitrogen in N-limited forests via atmospheric deposition could increase forest production over large non-managed areas. However, it refers to the ISA noting that the evidence is mixed, with some studies showing increased production and others showing little effect on wood production.[18] To the extent there is increased production in all ecosystems (managed and un-managed) there will be increased carbon sequestration. This effect is a benefit that EPA must consider and weigh against potential adverse effects.[19] EPA acknowledges that it must assess the net impact on public health and/or welfare of a pollutant.[20] If a secondary NAAQS is ever proposed to address deposition effects, EPA

[17] S. E. Cornell, "Atmospheric nitrogen deposition: Revisiting the question of the importance of the organic component," Environmental Pollution, **159**, 2214-2222 (2011).
[18] ISA, supra note 1, at section 3.9.9
[19] See March 6, 2008 Office of Management and Budget memo from Susan Dudley to Administrator Johnson at footnote 1, quoting the Court's decision in American Trucking Association v. EPA that legally EPA must consider positive identifiable effects of a pollutants presence in ambient air in formulating air quality criteria under section 108 and NAAQS under section 109 of the Clean Air Act.
[20] See March 7, 2008 U. S EPA memo from Marcus Peacock to Susan Dudley of OMB at page 2, indicating that EPA agrees that it must consider the beneficial effects of an air pollutant as well as its adverse effects, and that it must assess the net impact of a pollutant.

must provide a framework within which the net impacts of N deposition can be evaluated.

The PA attempted to minimize the benefits with statements such as "In certain limited situations, additions of nitrogen can increase rates of growth, and these increases can have short term benefits in certain managed ecosystems."[21] However, the benefits of passive fertilization will occur in both managed and un-managed ecosystems and should be fully evaluated in the review. Because of EPA's interest in climate change, the extent of carbon sequestration due to atmospheric nutrient deposition should be of great interest to the Agency. In fact, other government agencies and national laboratories have major research programs evaluating possible ways to increase carbon sequestration. Determining the role of N and the optimal inputs of N in that effort is one of the major research strategies in that regard. In contrast to the Agency's downplaying of the impact of N deposition on forest growth and carbon sequestration, studies in Europe have evaluated the role of N deposition in detail and concluded that a decrease in nitrogen deposition causes a decrease of carbon accumulation all over Europe and for all modeled tree species.[22] The Agency should not ignore or downplay benefits from N deposition just because it gets in the way of EPA's favored approach.

Sixth, there is no unique link between ground-level NO_x and SO_x concentrations and the deposition that may lead to effects. This issue is discussed in greater detail below. The proposed rule indicates that the model is used to provide the link between atmospheric measurements and deposition because the current measurements of the important constituents in sensitive areas are limited or non-existent. For example, EPA states "we are unable to use current ambient monitoring data to adequately link measured current atmospheric concentrations to ecological effects transmitted through deposition."[23] However, there is no fundamental acidifying potential for the NO_y indicator the Agency favors. The ground-level atmospheric concentrations of the individual components of NO_y are the proximate cause of the dry deposition of those components, but ground-level concentrations of NO_y are not a satisfactory link to wet deposition. However, they are not a satisfactory link to dry deposition since a different mix of NO_y components will result in a different amount of N deposition since the deposition velocities for NO_y component species vary widely.

Seventh, as EPA sees a joint NO_x-SO_x standard being implemented, each of 80-some ecoregions would have a tradeoff curve of allowed ambient concentrations of NO_y plus SO_x. The tradeoff would provide multiple combinations of NO_y and SO_x to satisfy the AAI formulation and allows concentrations of one pollutant to increase in exchange for decreases in the other. This tradeoff situation raises issues of fairness in implementation and likely runs afoul of the Clean Air Act requirement that the secondary standards must specify a single air pollution concentration that applies to each individual criteria air

[21] PA, supra note 3, at page 4-45.
[22] G. Wamelink, et al., "Modelling impacts of changes in carbon dioxide concentration, climate and nitrogen deposition on carbon sequestration by European forests and forest soils," Forest Ecology and Management, **258**, 1794-1805 (2009).
[23] PA, supra note 3, at page 4-13.

pollutant.

In summary, there are still fundamental limitations and obstacles to using secondary NAAQS to address deposition effects. The final rule must acknowledge and address these issues.

IV. It is premature to adopt an Aquatic Acidification Index-based standard.

We agree with EPA that it is premature to adopt an Aquatic Acidification Index (AAI)-based standard. EPA defines the AAI in terms of a watershed's acid neutralizing capacity (ANC) according to the following equation:

$$AAI = F1 - F2 - F3[NO_y] - F4[SO_x].$$

F1 represents the pristine ANC of the watershed before an industrialized society existed. As stated in the NPRM[24], "A secondary standard, as defined in section 109(b)(2), must 'specify a level of air quality the attainment and maintenance of which, in the judgment of the Administrator, based on such criteria, is requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of [the] pollutant in the ambient air.'" It is unrealistic to assume that a such a pristine state is requisite to protect public welfare. Furthermore, we agree with EPA that[25] "relatively large uncertainties are introduced by a lack of data with regard to pre-industrial environmental conditions and other parameters that are necessary inputs to critical load models that are the basis for factor F1 in the AAI equation." Consequently, we do not think there is an adequate scientific basis for the establishment of realistic F1 values nor do we think that a pristine state is requisite to protect welfare.

F2 is the contribution of ammonia and ammonium compounds to the net acidification of the watershed. Since these substances are not routinely measured, EPA intends to rely on estimated concentrations using a complex atmospheric model that has had an inadequate performance evaluation. In the NPRM, EPA states[26] "observational data are not generally available to evaluate the modeled relationships between nitrogen and sulfur in the ambient air and associated deposition, which are the basis for the other factors (*i.e.*, F2, F3, and F4) in the AAI equation." We do not think it is appropriate to base a NAAQS on a calculation that cannot have a reality check.

F3 and F4 are the transference ratios that convert the measured ambient concentrations of NO_y and SO_x into annual deposition rates. As stated above, these too suffer from the fact that there are insufficient data to conduct an adequate model performance evaluation on the estimates of these important functions. In addition, as we have documented in our previous comments,[27] most of the deposition over most of the US occurs from wet deposition which is a function of the NO_y and SO_x concentrations at cloud level and not

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[24] Proposed Rule, supra note 5, at page 46086.
[25] Ibid,, at page 46134.
[26] Ibid.
[27] Heuss and Wolff, Comments on EPA's Second Draft PA, supra note 4.

at ground level where these species will be measured. Again, the absence of reality checks should preclude using this approach to determine attainment/nonattainment of a NAAQS.

In recognition of the many uncertainties and data gaps associated in the AAI-based standard, EPA has proposed not to adopt this standard now, but to conduct a pilot field program: "The data and analyses of this program will serve to inform the next review of the NAAQS for oxides of nitrogen and sulfur."[28] In section VII, we will evaluate the proposed pilot field program.

V. Adoption of 1-Hour NAAQS are inappropriate.

In the NPRM, EPA proposes to retain the existing secondary standards for NO_2 and SO_2, specifically, the current NO_2 standard of 0.053 parts per million averaged over a year and the SO_2 standard of 0.5 parts per million averaged over three hours, not to be exceeded more than once per year. We agree with EPA's conclusion[29] "that the current secondary standards are adequate to protect against direct phytotoxic effects on vegetation," and agree that they should be retained. However, the NPRM goes on to say:

> With regard to deposition-related effects, the Administrator has first to consider the appropriateness of the structure of the current standards to address ecological effects of concern. Based on the evidence as well as considering the advice given by CASAC on this matter, the Administrator concludes that the elements of the current standards are not ecologically relevant and thus are not appropriate to provide protection of ecosystems.[30]

To protect watershed ecosystems against adverse effects of acidic deposition, however, EPA feels that such a standard needs to employ:[31] "(1) total reactive oxidized nitrogen (NO_y) and SO_x as the atmospheric ambient air indicators; (2) a form that takes into account variable factors, such as atmospheric and ecosystem conditions that modify the amounts of deposited nitrogen and sulfur; the distinction between oxidized and reduced forms of nitrogen; effects of deposited nitrogen and sulfur on aquatic ecosystems in terms of the ecological indicator ANC." Despite concluding that concentration-based existing secondary standards are not an appropriate form for a deposition standard, EPA proposes to adopt the recently established, concentration-based 1-hour primary NO_2 and SO_2 standards as secondary standards as well. EPA acknowledges that the form is inappropriate but rationalizes[32] that "the Administrator recognizes that the new NO_2 and SO_2 primary 1-hour standards set in 2010, while not ecologically relevant for a secondary standard, will nonetheless result in reductions in oxides of nitrogen and sulfur that will directionally benefit the environment by reducing NO_y and SO_x deposition to sensitive ecosystems."

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[28] Proposed Rule, supra note 5, at page 46135.
[29] Ibid., at page 46110.
[30] Ibid., at page 46111.
[31] Ibid.
[32] Ibid., at page 46135.

Thus EPA believes that although 1-hour concentration-based standards are not ecologically relevant, they are needed to ensure further emission reductions of SO_2 and NO_2. This logic is flawed because there are many other regulations already in place that have been driving these emissions lower and lower for at least two decades. In addition, there are regulations that will continue to decrease NOx and SOx emissions for the foreseeable future. These regulations include but are not limited to: 1) Tier 2 vehicle regulations which will continue to reduce NOx emissions as new vehicles replace older ones, 2) the upcoming Tier 3 and California LEV III vehicle regulations which will reduce criteria emissions to near unmeasurable levels, 3) the recent diesel tailpipe and fuel-sulfur regulations, 4) the recent off-road vehicle emissions rule, 5) the State Implementation Plans developed to meet the PM and ozone NAAQS, 6) the NO_x and SO_x reductions mandated by Cross-State Air Pollution Rule, 7) the Utility Mercury Standard and, 8) the Utility Air Toxics Standards.

The progress is further illustrated by examining the actual data for air quality and deposition trends. In 1988, EPA initiated a nationwide network of rural air quality monitors known as the Clean Air Status and Trends Network (CASTNET).[33] A subset of these monitors operating continuously in the Eastern US since at least 1990 and in the Western US since at least 1996 have been designated as "reference" sites and have been used to determine nationwide trends in rural areas. The weekly CASTNET data were obtained from an EPA website.[34] Figures 1 - 4 illustrate the trends for SO_2, $SO_4^=$, total NO_3^- (particulate NO_3^- + HNO_3), and NH_4^+, respectively.

All species exhibit decreasing trends. In general, the concentrations of all species are significantly higher in the East than in the West reflecting the geographic distribution of sources. However, the declines in the East are significantly higher than in the West reflecting the fact that EPA regulations have targeted the Eastern power plants. In the East over the 21-year record, the declines in the means have been: SO_2 71%, $SO_4^=$ 54%, total NO_3^- 42% and NH_4^+ 39%. In the West the respective 15-year declines have been: 51%, 29%, 46% and 25%.

Similarly, the measured deposition of S and N species has declined; this is illustrated in Figures 5 and 6.[35] In the East, total S deposition declined 46% while in the West it declined 31%. For total N, the decline in the East was 26% and in the West 21%.

Any additional benefits from having the new 1-hour standards in place will accrue from them being primary standards. There are no additional control actions or benefits that will occur if they are also established as secondary standards. Consequently, it is not necessary that EPA adopt an "inappropriate" standard to ensure better air quality.

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[33] http://www.epa.gov/cludygxb/programs/castnet.html.
[34] http://java.epa.gov/castnet/.
[35] MACTEC Engineering and Consulting, Inc., "Clean Air Status and Trends Network (CASTNET) 2009 Annual Report," EPA Contract No. EP-W-09-028, February 2011.

Figure 1A
Trend in Annual SO_2 Concentrations
Eastern Reference Sites

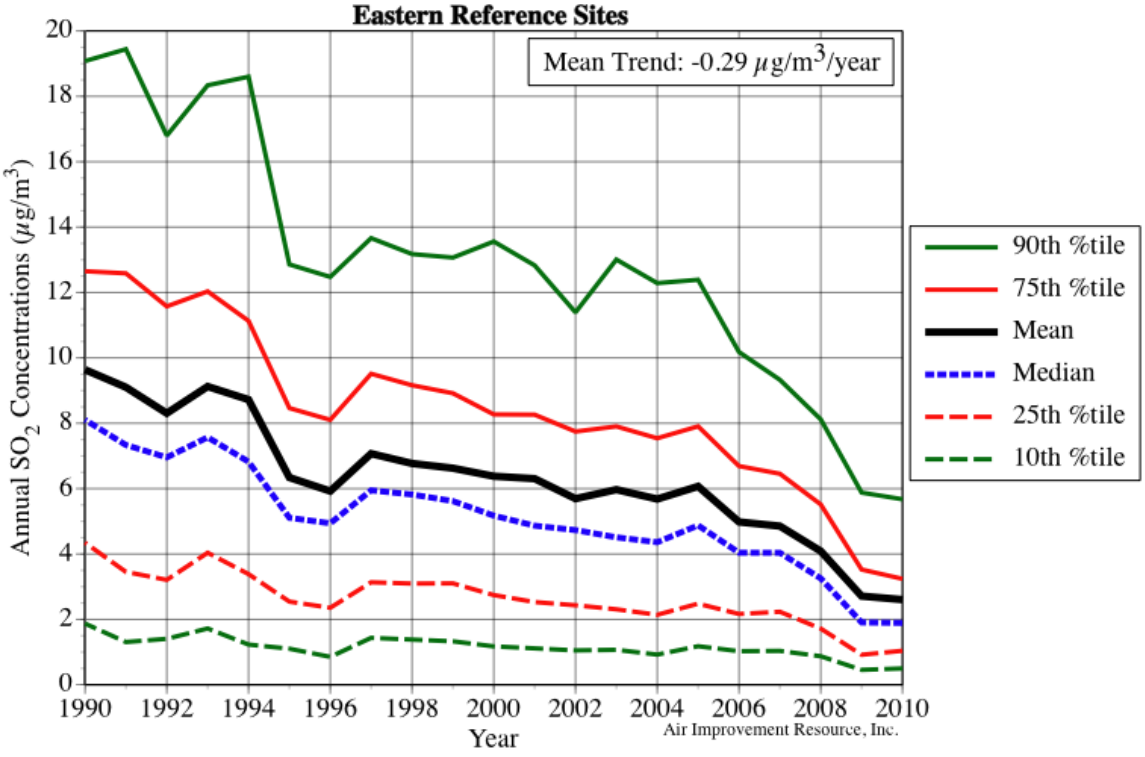


Figure 1B
Trend in Annual SO_2 Concentrations
Western Reference Sites

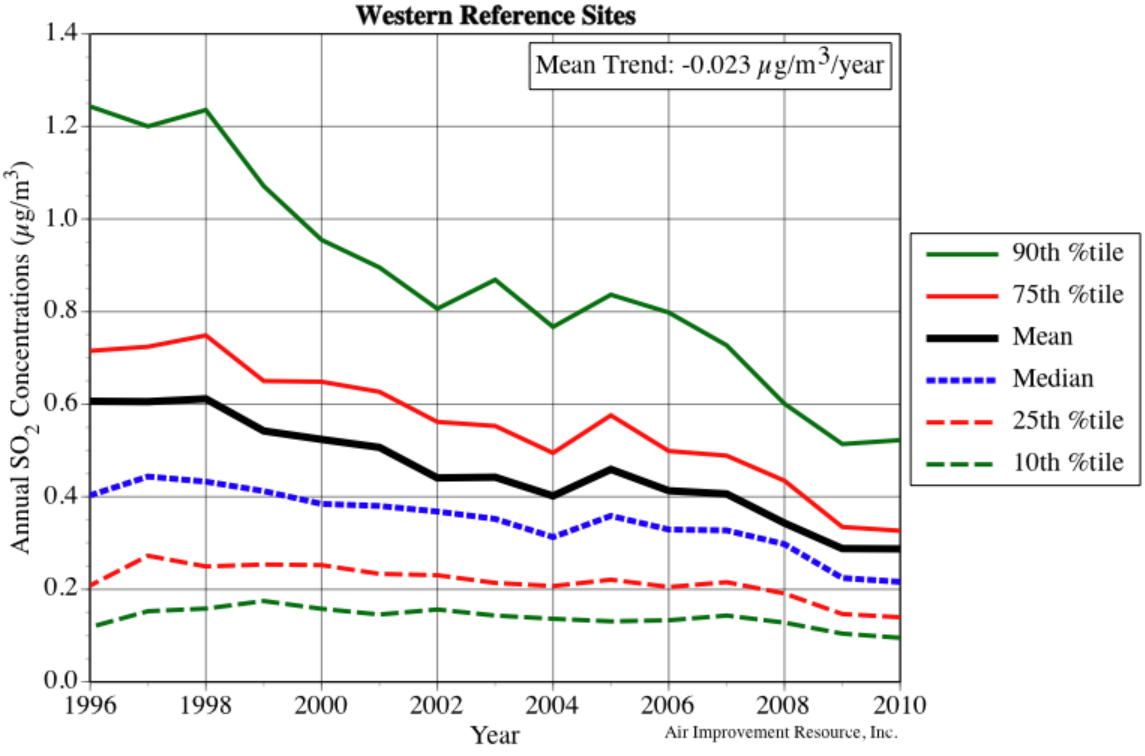


Table 2A
Trend in Annual SO_4^{2-} Concentrations
Eastern Reference Sites

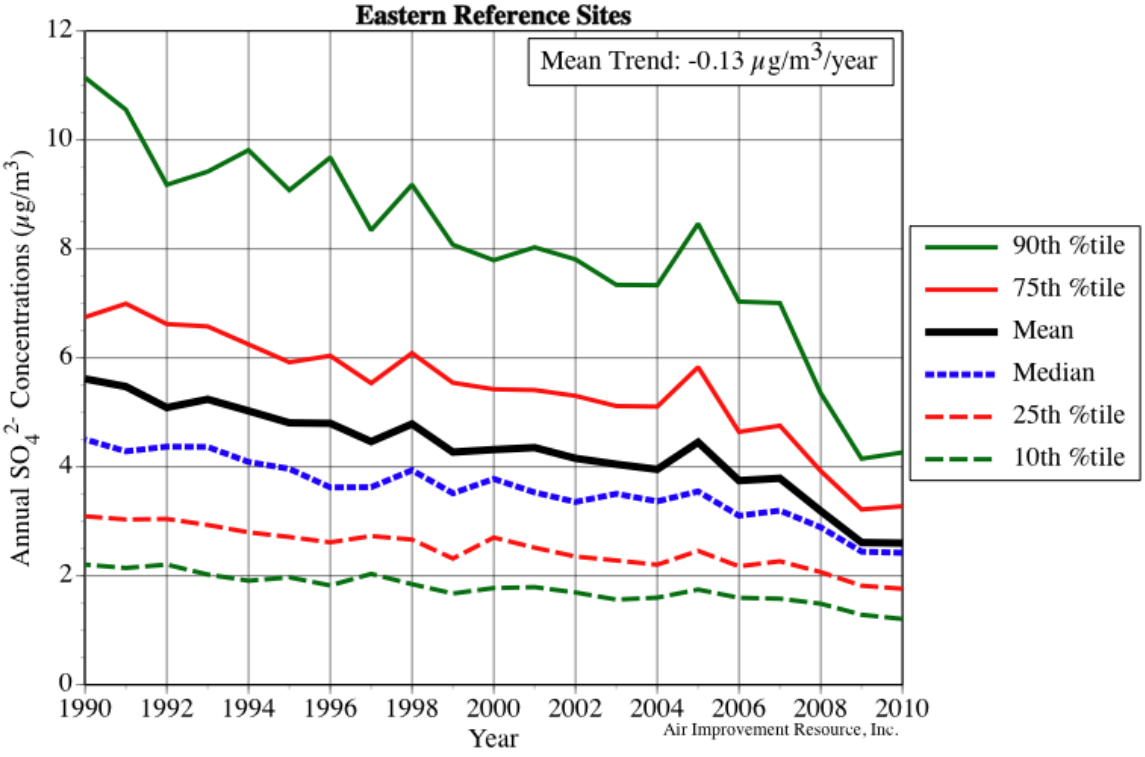


Table 2B
Trend in Annual SO_4^{2-} Concentrations
Western Reference Sites

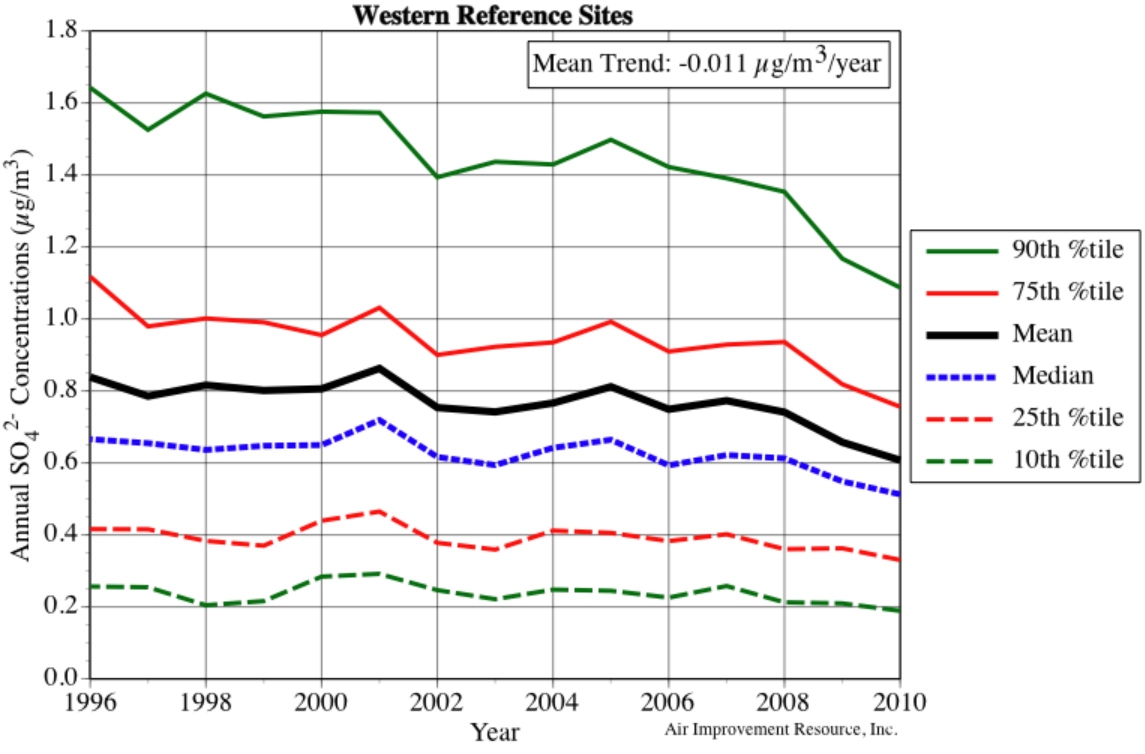


Figure 3A
Trend in Annual Total NO_3^- Concentrations
Eastern Reference Sites

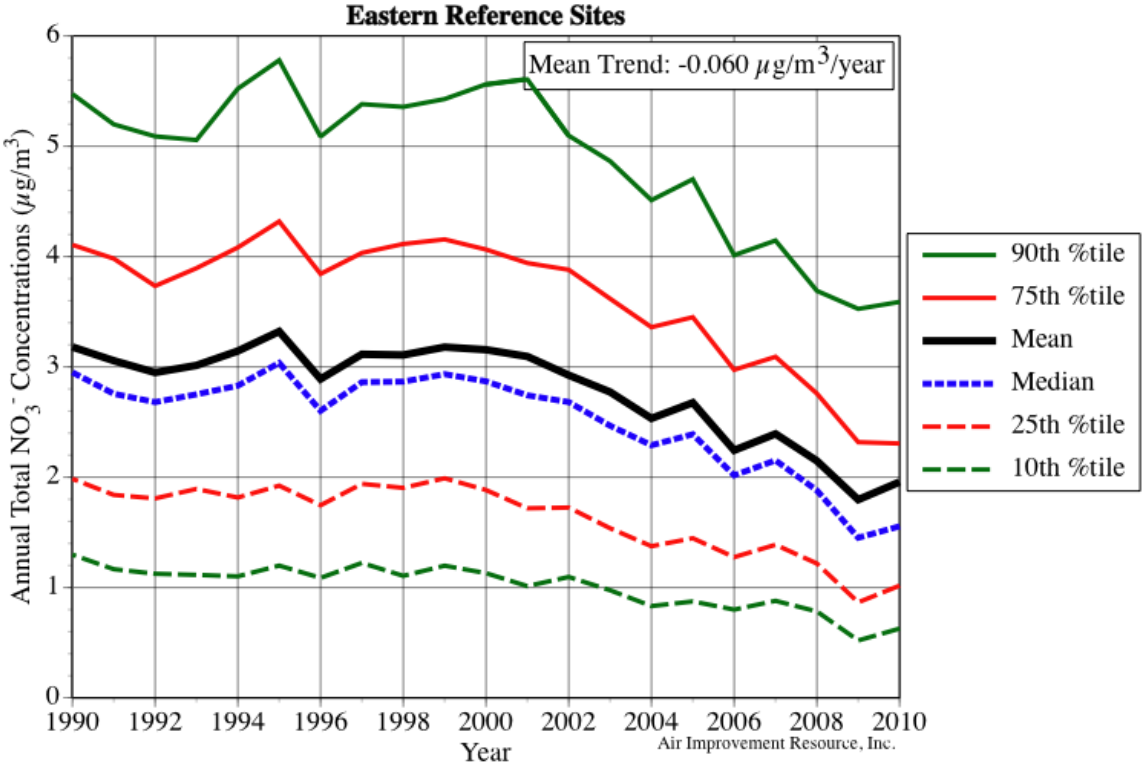


Figure 3B
Trend in Annual Total NO_3^- Concentrations
Western Reference Sites

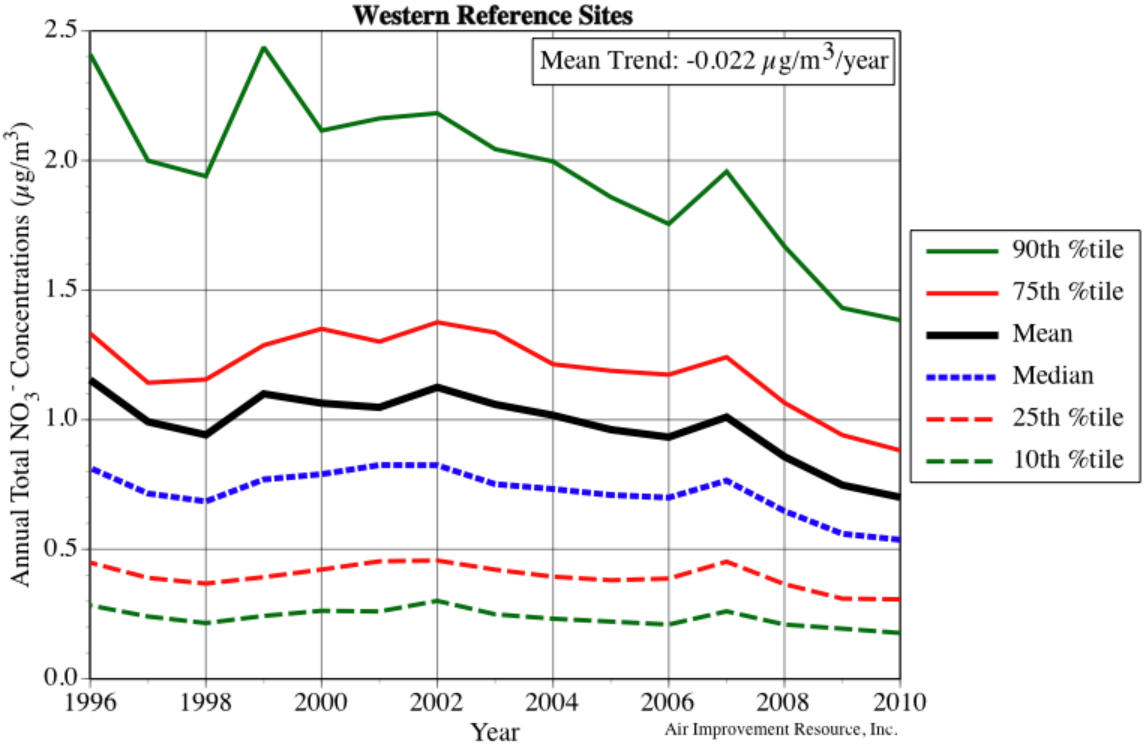


Figure 4A
Trend in Annual NH_4^+ Concentrations
Eastern Reference Sites

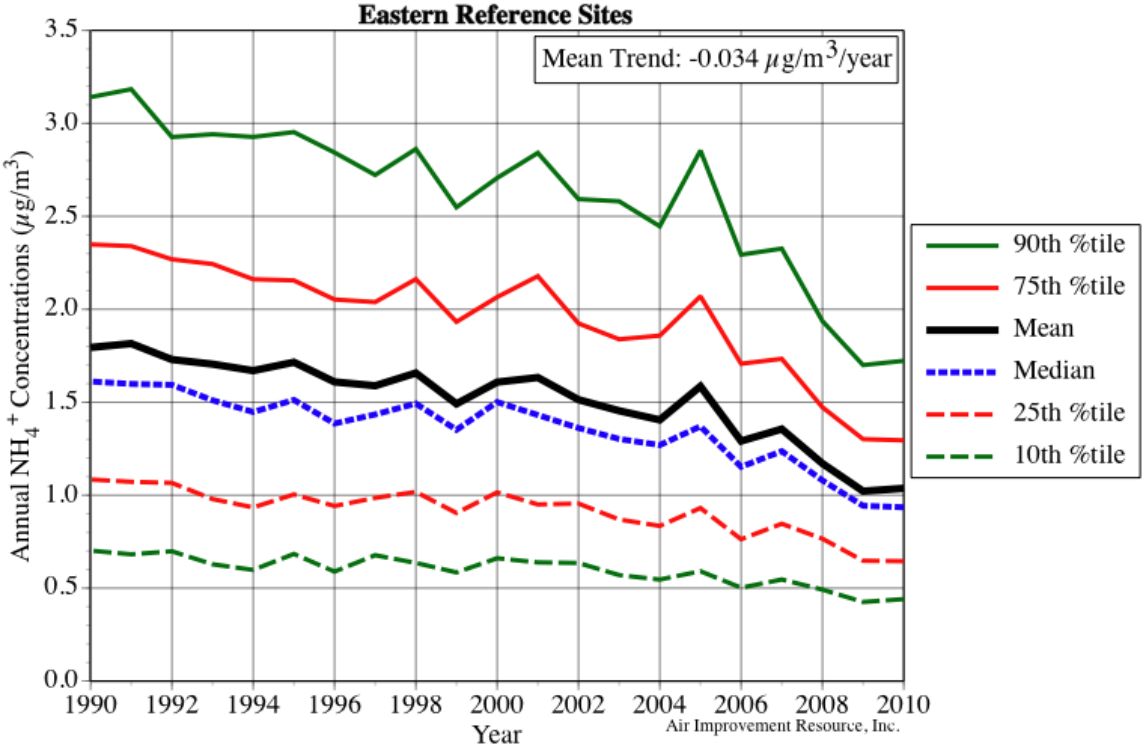
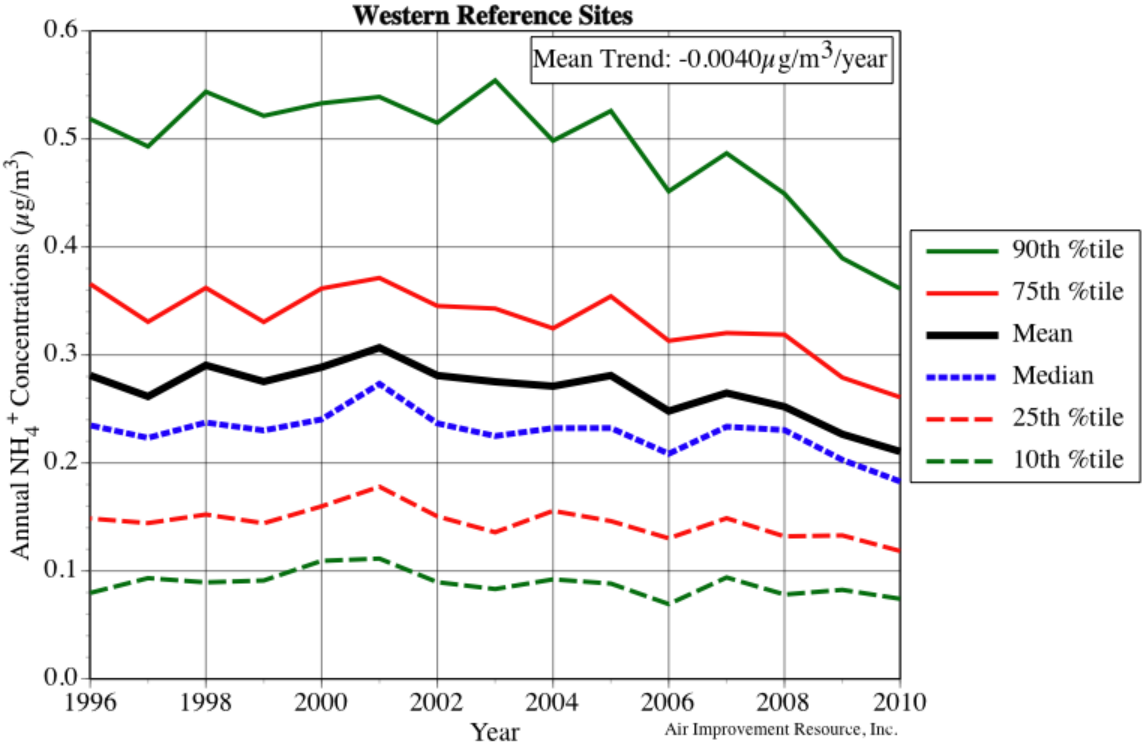


Figure 4B
Trend in Annual NH_4^+ Concentrations
Western Reference Sites



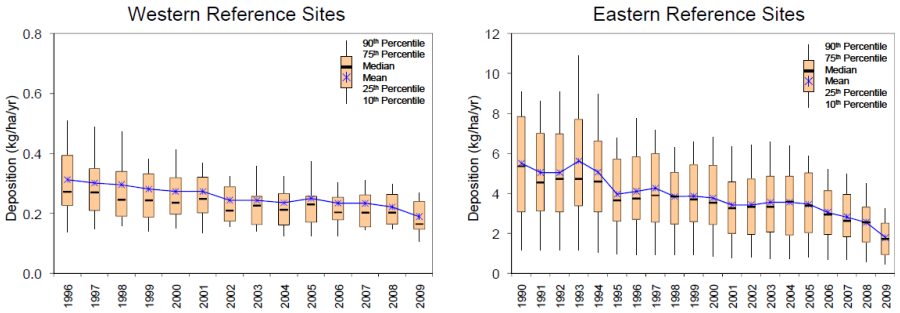


Figure 5a: Trends in dry sulfur deposition.[33]

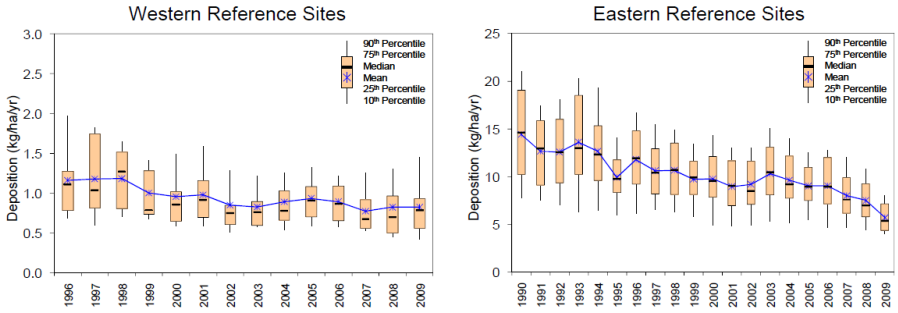


Figure 5b: Trends in total sulfur deposition.[33]

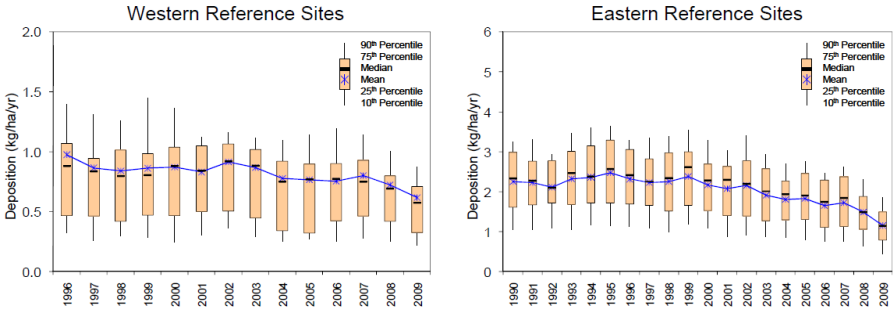


Figure 6a: Trends in dry nitrogen deposition.[33]

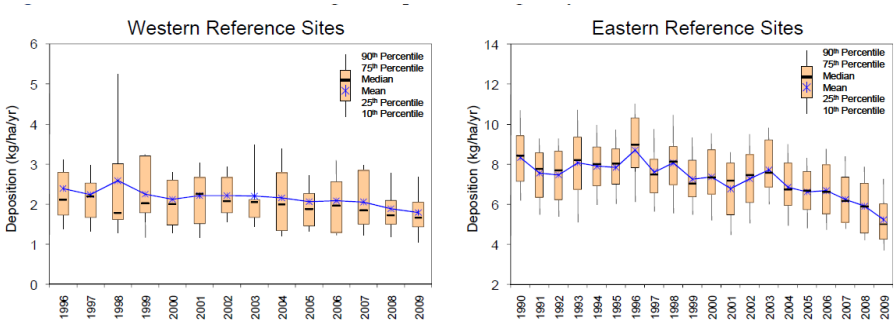


Figure 6b: Trends in total nitrogen deposition.[33]

Moreover, it sets a bad precedent to establish a secondary standard that EPA recognizes is not ecologically relevant. If the states are required to do additional monitoring for compliance with the 1-hour standards in rural and remote locations it will be a waste of resources.

VI. EPA should use the next five years to evaluate not only the AAI approach but also other alternatives to protect aquatic and terrestrial resources from deposition effects.

EPA should not fixate on seeing how an AAI standard can be used to provide appropriate protection from deposition effects. The research under the field program should be designed to evaluate both the AAI approach as well as other alternative approaches. Alternatives involving deposition standards under Title IV or a state or regional critical loads approach should be considered and evaluated. In this way, the pros and cons of several alternatives can be evaluated. The baseline for the effort should be a calculation of the impact of all current and planned regulations. This approach will address the threshold question of whether any additional deposition-specific regulations are needed.

VII. It is not clear how the pilot field program will accomplish its goals.

Because of the many uncertainties associated with the AAI-based NAAQS, the Administrator has proposed a 5-year pilot field study to obtain the data necessary to reduce these uncertainties and is soliciting comments on this field program. The stated purposes of this program are:[36] "to collect and analyze data so as to enhance our understanding of the degree of protectiveness that would likely be afforded by a standard based on the AAI as developed in the PA," and to "support development of an appropriate monitoring network that would work in concert with such a standard to result in the intended degree of protection." The pilot program would be conducted in 3 to 5 ecoregions (out of 84 shown in Figure 7[37]) with at least one ecoregion in the East, the Upper Midwest and the West. The selected ecoregions would have a minimum of two existing CASTNET (Clean Air Status and Trends Network) monitoring sites and co-located National Atmospheric Deposition Program (NADP) National Trends Network (NTN) collection sites. The CASTNET sites currently measure SO_2 and HNO_3 and particulate $SO_4^{=}$, NO_3^{-} and NH_4^{+} on a weekly basis using a CASTNET filter pack (CFP). Hourly meteorological data are also collected which serve as input to a model that estimates the dry deposition of these species. At the co-located NTN sites, precipitation samples are collected for the determination of the wet deposition of $SO_4^{=}$, NO_3^{-} and NH_4^{+}.

The NPRM lists seven scientific objectives of the pilot program:

> (1) Evaluate measurement methods for the ambient air indicators of NO_y and SO_x and consider designation of such methods as Federal Reference Methods (FRMs);

[36] Proposed Rule, supra note 5, at page 46135.
[37] PA, supra note 3.

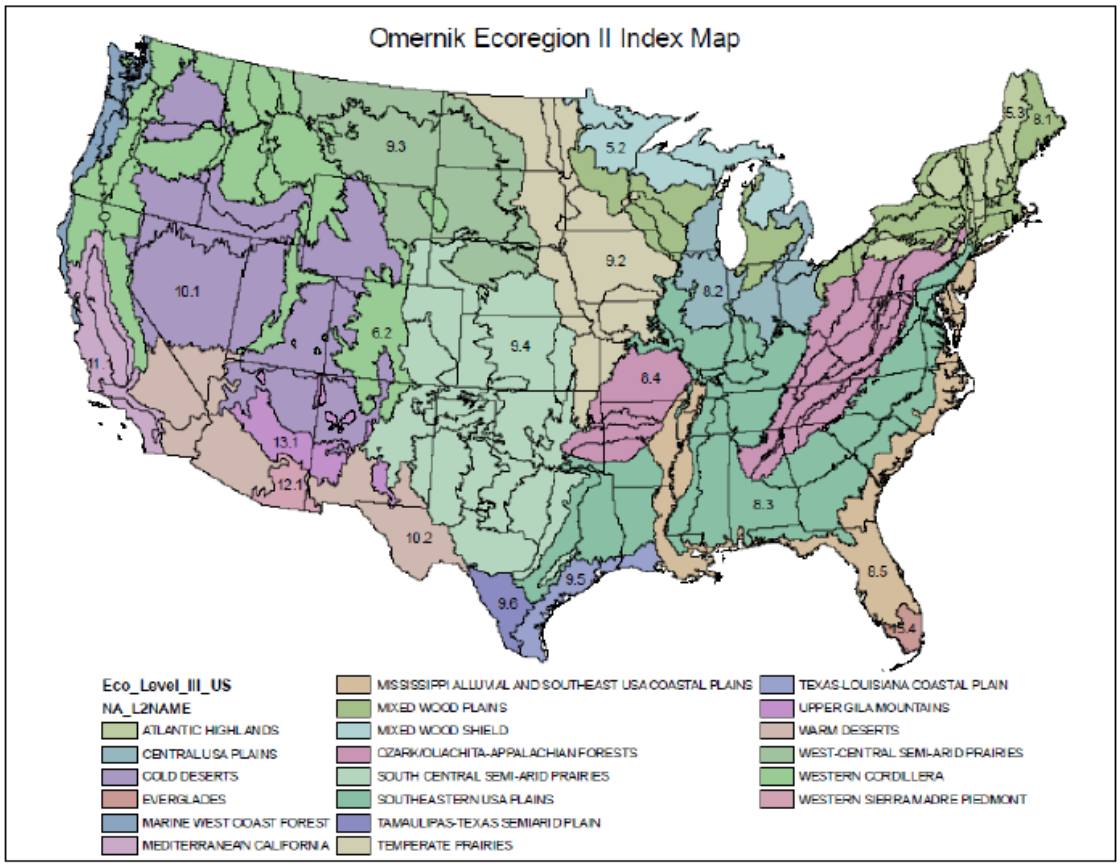


Figure 7: The Omernik ecoregions with the 84 level III delineations defined as the regions outlined within each level II group.[37]

(2) Examine the variability and improve characterization of concentration and deposition patterns of NO_y and SO_x, as well as reduced forms of nitrogen, within and across a number of sensitive ecoregions across the country;
(3) Develop updated ecoregion-specific factors (*i.e.*, F1 through F4) for the AAI equation based in part on new observed air quality data within the sample ecoregions as well as on updated nationwide air quality model results and expanded critical load data bases, and explore alternative approaches for developing such representative factors;
(4) Calculate ecoregion-specific AAI values using observed NO_y and SO_x data and updated ecoregion-specific factors to examine the extent to which the sample ecoregions would meet a set of alternative AAI-based standards;
(5) Develop air monitoring network design criteria for an AAI-based standard;
(6) assess the use of total nitrate measurements as a potential alternative indicator for NO_y;
(7) Support related longer-term research efforts, including enhancements to and evaluation of modeled dry deposition algorithms.[38]

[38] Proposed Rule, supra note 5, at page 46136.

Each one of these objectives will be discussed separately.

1. Development of FRMs

This objective appears to be the most straightforward one of the program. For each NAAQS constituent an FRM must be developed. Since the multi-pollutant based AAI standard specifies SO_x and NO_y as the pollutant indicators of interest, FRMs must be developed for each of the SO_x and NO_y species. At present FRMs exist only for continuous measurements of NO_2 and SO_2. Since the multi-pollutant standard is expected to be a yearly or multi-year average, the Agency will examine non-continuous filter pack based methods like the CFP which has been providing data for SO_2 and HNO_3 and particulate $SO_4^{=}$, NO_3^{-} and NH_4^{+} on a weekly basis at the CASTNET sites. The measurement of the remaining NO_y constituents will likely be accomplished using a modified continuous chemiluminescence method. While there is considerable development and testing work to be performed to develop these FRMs, it appears to be an achievable task in the next 5 years. However, if the overall scope of the research effort is broadened to evaluate other approaches such as deposition standards, appropriate measurement methods for a wider range of constituents and media will be needed.

2. Examine and Characterize Concentrations and Deposition Patterns of NO_y, SO_x and NH_x Species

The 84 ecoregions EPA is considering using are shown in Figure 7. It is not clear from the information provided in the NPRM how collecting these data at 2 sites in 3 to 5 ecosystems is going to provide useful information on spatial variations in concentration and deposition patterns in the pilot regions much less that would be applicable to the other 79 to 81 ecoregions not represented in the pilot study. EPA must elaborate on this objective further to explain how this information will be useful.

3. Develop Ecoregion-Specific Factors (i.e. F1 through F4)

There are several sub-parts to this objective. First is to develop ecosystem-specific factors based on collected data. Second is to update nationwide air quality model results. Third is to expand critical load data bases and finally, to explore alternative approaches for developing such representative factors.

These are very ambitious objectives, but EPA provides insufficient details to evaluate whether they are achievable. For example EPA states:[39] "A parallel multiagency national critical load data base development effort would be used as the basis for calculating updated F1 factors." They further state:[40] "An extended water quality sampling effort should parallel the air quality measurement program to address some of the uncertainties related to factor F1 and the representativeness of the nth percentile critical load as discussed in section III.B.5.b.i." These statements are so vague they provide insufficient

[39] Proposed Rule, supra note 5, at page 46137.
[40] Proposed Rule, supra note 5, at page 46138.

details to determine exactly what EPA is going to do or how they intend to reach this objective.

There are even more uncertainties in developing ecoregion-specific values of F2, F3 and F4, which are the factors that transform the ambient measurements to deposition values. First of all they state:[41] "Using this new set of F factors, observations of NO_y and SO_x derived from the pilot program, averaged across each ecoregion, would be used to calculate AAI values in the sample ecoregions." For this to be a valid procedure, the differences between the values obtained at the 2 sites within an ecoregion would have to be small. What if the differences are large? Further, the dry deposition components are not routinely measured; they are estimated from a model. Consequently, a reality check of a model performance evaluation cannot be conducted. EPA acknowledges this when they state:

> The EPA recognizes that a source of uncertainty in an AAI-based secondary standard that would not be directly addressed in the pilot program stems from the uncertainty in the model used to link atmospheric concentrations to dry deposition fluxes. Currently, there are no ongoing direct dry deposition measurement studies at CASTNET sites that can be used to evaluate modeled results. It was strongly recommended by CASAC AMMS (Air Monitoring and Methods Subcommittee) that a comprehensive sampling-intensive study be conducted in at least one, preferably two sites in different ecoregions to assess characterization of dry deposition of sulfur and nitrogen.[42]

While this is a step in the right direction, it is insufficient to provide confidence that the relationships found at one or two sites will be applicable nationwide. Dry deposition rates are a function of not only the species ambient concentrations but also of the surface roughness and the vegetation leaf-out and leaf area index which are site specific.[43]

As we pointed out in earlier comments,[44] there are also issues with the transformation factors for wet deposition. EPA assumes that there is a relationship between the species measured concentration near the surface and the wet deposition of that species. There is no theoretical basis for this assumption. The wet deposition is a function of the concentrations of the species and precursors of the species at cloud level, which could be a different air mass than at the surface, and to a much lesser degree of the concentrations in the air column below the cloud. Consequently, one would expect any empirical statistical relationship between a species surface concentration and wet deposition to vary widely over time and geographic region.

Finally, there is also an issue with the data collected in the pilot program being used in a timely fashion to provide updated modeling results. This issue too, is acknowledged by EPA:

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[41] Proposed Rule, supra note 5, at page 46137.
[42] Proposed Rule, supra note 5, at page 46138.
[43] MACTEC, CASTNET 2009 Annual Report, supra note 35.
[44] Heuss and Wolff, Comments on EPA's Second Draft PA, supra note 4.

> Because there often is significant lag in the availability of contemporary emissions data to drive air quality modeling, the complete use of these data sets will extend beyond the 5-year collection period of the pilot program. Consequently, the immediate application of those data will address instrument performance comparisons that explore the feasibility of using continuous SO_2 instruments in rural environments, and using the speciated NO_y data to assess NO_y instrument performance. Although contemporary air quality modeling will lag behind measurement data availability, the observations can be used in deposition models to compare observed transference ratios with the previously calculated transference ratios to test temporal stability of the ratios.[45]

In other words, in five years when EPA intends to propose a new multi-pollutant AAI-based standard based on this pilot program, the new and improved modeling results will not be available to inform the Administrator. In addition to this miss-match, there is a problem related to using a model that is continually undergoing improvements and updates for regulatory purposes.

4. Calculate Ecoregion-Specific AAI Values and Updated Ecoregion-Specific Factors to Examine the Extent to Which the Sample Ecoregions Would Meet a Set of Alternative AAI-Based Standards

This objective is predicated upon the successful completion of objectives 2 and 3. Consequently, all of the issues that we raised in 2 and 3 apply here as well. There is another major issue with developing and applying ecoregion-specific factors. The ANC of specific water bodies is highly variable. This variation arises because the geology, topography, and land use in the immediate vicinity of a specific water body determines the path of deposited material, runoff rate, and extent of acidification. In addition, even in acid-sensitive ecoregions, only a small portion of the water bodies are acidified or at risk. For example, an ecoregion is considered acid sensitive in the AAI formulation if greater than one percent of water bodies have ANC less than 100 μeq/L and greater than five percent of water bodies have ANC less than 200 μeq/L. Because of the very high spatial variability, determining all the factors that enter into the AAI formulation involves either choosing a "representative" value or spatially aggregating the data. It is not clear how to choose the representative values used in the formulation and how the simplified, representative formulation then compares to the distribution of real-world situations in the given ecoregion. These issues add substantial uncertainty to the AAI approach.

5. Develop Air Monitoring Network Design Criteria for an AAI-Based Standard

There are numerous issues that need to be considered in the development of these criteria. First it must be demonstrated that the spatial variability within ecoregions is such that the data collected at one or two sampling sites are indeed representative of the air quality, deposition patterns and critical loadings of the ecoregion as a whole.

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[45] Proposed Rule, supra note 5, at page 46138.

Second it must be demonstrated that there exists relationships between measured air quality and deposition rates that have been adequately tested though model performance evaluations. Given the concerns raised in 3, we are not convinced this pilot study will demonstrate a robust relationship between surface concentrations and deposition.

Third, it must be demonstrated that the atmospheric modeling system has the skill to predict concentrations of NH_x that are representative of specific ecoregions for all ecoregions based on a model performance evaluation. We are not convinced that the pilot will accomplish this objective either.

6. Assess the Use of Total Nitrate Measurements as a Potential Alternative Indicator for NO_y

This objective is included because CASAC[46] suggested that the total nitrate (HNO_3+ particulate NO_3^-) as collected by the CFP may be a good surrogate for deposited NO_y species because most of the deposition is due to the two nitrate species. Whether or not this is true, it would need to be determined by examining a data base containing concurrent total nitrate and NO_y measurements as well as NO_y wet and dry deposition measurements. As we pointed out in our earlier comments,[47] typically two-thirds of the deposition of NO_y species is due to wet deposition and part of this is due to in-cloud oxidation of NO_2 which is not collected by the CFP. Consequently, this objective must be carefully evaluated.

7. Support Related Longer-Term Research Efforts, Including Enhancements to and Evaluation of Modeled Dry Deposition Algorithms

This is a laudable objective but as we pointed out in 3, we believe that dry deposition measurements at one or two sites will not provide sufficient evidence that the algorithm applies to the entire US. It would need to be tested at a wide variety of sites with different surface characteristics under a variety of meteorological conditions.

In summary, the proposed pilot field program is an extremely complex undertaking. Unfortunately, a number of the program elements have not been adequately articulated by EPA so it is not clear how they will be accomplished. In addition we have serious misgivings that adequate model performance will be conducted and demonstrated in the 5-year time frame to be ready to inform the next NAAQS review. We recommend that EPA focus on a successful completion of the program objectives and not be constrained by the 5-year timetable. This will not result in any delays in air quality improvements because many other programs are in place that will continually drive emissions of NO_y and SO_x species lower and lower for the foreseeable future.

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[46] Russell and Samet, " Review of EPA Draft Documents on Monitoring and Methods for Oxides of Nitrogen (NO_x) and Sulfur (SO_x)," EPA-CASAC-11-006, May 25, 2011.
[47] Heuss and Wolff, Comments on EPA's Second Draft PA, supra note 4

VIII. There are major issues involved in implementing an AAI standard under the Clean Air Act that EPA has not yet begun to address.

The proposed rule acknowledges that

> "… the Administrator also recognizes that a new, innovative AAI-based standard would raise significant implementation issues that would need to be addressed consistent with the CAA requirements for implementation-related actions following the setting of a new NAAQS."[48]

The proposed rule lists some of these issues and indicates that while the field study collects data, "the implementing agencies and other stakeholders have an opportunity to discuss and thoroughly understand how such a standard would work." It is amazing that the AAI approach would have been developed without careful consideration of the issues EPA lists, since any one of the issues could provide an insurmountable obstacle to its implementation. In the following, each of the implementation issues noted by EPA is discussed.

1. What are the appropriate monitoring network density and siting requirements to support a compliance system based on ecoregions?

This is an important question that EPA to date has failed to address. Is compliance to be measured at a single site or at a suite of sites? The PA indicates that:

> "… an aquatic acidification standard would be interpreted as follows: the standard would be met at a monitoring site when the measured annual-average concentrations of NO_y and SO_2 are such that the value of the annual AAI, averaged over 3 to 5 years, is equal to or greater than the level of the standard, when using the region-specific values of factors F1 through F4 for the ecoregion in which the monitor is located."[49]

The above statement implies that compliance would be required for each monitoring site. However, the pollution of interest that is the proximate cause of any effects is the deposition of N and S spatially averaged over some as yet undefined sensitive area that influences the aquatic resource of concern. The question of spatial averaging is left unanswered in the proposed rule. Since the ecoregions discussed in the PA and the proposed rule contain urban and rural areas, road networks, and both managed and unmanaged ecosystems, choosing one or more appropriate sites will be difficult. It is also not clear what measurements should be made at a site since ground-level NO_y is an inappropriate measure for either wet or dry deposition. Given these concerns, the development and application of actual measurements of dry and wet deposition would be a far preferable approach compared to the AAI approach to deal with acid deposition.

2. Given the unique spatial nature of the secondary standard (e.g., ecoregions),

[48] Proposed Rule, supra note 5, at page 46135.
[49] PA, supra note 3, at page ES-9.

what are the appropriate parameters for establishing nonattainment areas?

This is also an important question that EPA has yet to address, given that states are required to recommend designations of nonattainment areas within a year after a new NAAQS is promulgated under section 107 of the Clean Air Act. Given the irregular shapes of the ecoregions, their lack of correspondence with state and county boundaries, the variable locations of the small portion of sensitive resources within those ecoregions, and the lack of information on the area of deposition influence of various ground-level and elevated sources, establishing relevant nonattainment areas will require extensive study.

3. How can new or modified major sources of oxides of nitrogen and oxides of sulfur emissions assess their ambient impacts on the standard and demonstrate that they are not causing or contributing to a violation of the NAAQS for preconstruction permitting? To what extent does the fact that a single source may be impacting multiple areas, with different acid sensitivities and variable levels of NO_y and SO_x concentrations that would be necessary to achieve a national ANC target, complicate this assessment and how can these additional complexities best be addressed?

This attribution issue may be an intractable problem. The prevention of significant deterioration requirements for major new or modified sources under section 165 of the Clean Air Act were not established with consideration of as complex an issue as the AAI methodology in mind. How would the owner of such a source demonstrate it would not cause or contribute to a violation of the new NAAQS given the spatial issues noted in the question and given that there may be a significant lag between reduction in deposition and improvement in water quality? The unintended consequences of establishing an AAI standard could be the shutting down of new or modified sources and loss of jobs therefore due to prolonged legal battles over section 165 requirements.

4. What additional tools, information, and planning structures are needed to assist states with SIP development, including the assessment of interstate pollutant transport and deposition?

A threshold question that EPA has not addressed is whether the expected emission reductions over the next several decades will make adoption of any deposition-specific regulations superfluous. The REA evaluated the continuation of current emissions out to the year 2050 as one of the scenarios. This is clearly not relevant. Appendix D of the PA evaluated further reductions of 42 and 48% for SO_x and NO_y and showed major improvements (increase) in ANC. The PA and the proposed rule indicate that "expected emission changes over the next two decades should be far greater than the 42 and 48% SO_x and NO_y reductions used in this analysis, with a consequent further reduction in ecoregions that would likely not meet alternative standards."[50] EPA should not consider expanding its bureaucracy and adding unfunded mandates for the states until the full impact of current regulations is evaluated.

[50] PA, supra note 3, at page 7-61 and Proposed Rule, supra note 5, at page 46129.

5. Would transportation conformity apply in nonattainment and maintenance areas for this secondary standard, and, if it does, would satisfying requirements that apply for related primary standards (e.g., ozone, $PM_{2.5}$, and NO_2) be demonstrated to satisfy requirements for this secondary standard?

This is another CAA requirement that EPA has not thought through.

In summary, EPA has not thought through all the ramifications of the AAI approach. This is unfortunate since the section 404 study requested by Congress in 1990 specifically asked EPA to consider and evaluate the impediments to implementation of various possible approaches for dealing with acid deposition.