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NATIONAL CENTER FOR ENVIRONMENTAL ASSESSMENT
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OFFICE OF
RESEARCH AND DEVELOPMENT

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MEMORANDUM

SUBJECT: CASAC Review of the First External Review Draft Integrated Science Assessment for Oxides of Nitrogen, Oxides of Sulfur, and Particulate Matter – Ecological Criteria

FROM: John Vandenberg, Ph.D.
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TO: Tom Armitage
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Clean Air Scientific Advisory Committee Secondary NAAQS Review Panel for Oxides of Nitrogen and Sulfur
EPA Science Advisory Board Staff Office (1400R)

The First External Review Draft *Integrated Science Assessment for Oxides of Nitrogen, Oxides of Sulfur, and Particulate Matter – Ecological Criteria* (hereafter referred to as this draft ISA) prepared by the U.S. Environmental Protection Agency's (U.S. EPA) National Center for Environmental Assessment – Research Triangle Park Division (NCEA-RTP) as part of EPA's ongoing review of the secondary (welfare-based) National Ambient Air Quality Standards for oxides of nitrogen, oxides of sulfur and particulate matter was released on February 23, 2017. Electronic copies are available for download at <http://www.epa.gov/isa>. This draft ISA will be reviewed by a panel of the Clean Air Scientific Advisory Committee (CASAC) at a public meeting scheduled for May 24-25, 2017. I am requesting that you forward this draft ISA and charge to the CASAC panel reviewing this document.

This ISA is intended to “accurately reflect the latest scientific knowledge useful in indicating the kind and extent of all identifiable effects on public health or welfare, which may be expected from the presence of [a] pollutant in the ambient air” [Clean Air Act, Section 108; 42 U.S.C. 7408(b)]. This draft ISA integrates the scientific evidence for review of the secondary (welfare-based) NAAQS for oxides of nitrogen, oxides of sulfur, and particulate matter, and provides draft findings, conclusions, and judgments on the strength, coherence, and plausibility of the evidence.

On August 21, 2013 (78 FR 53452), EPA formally initiated its current review of the air quality criteria for the ecological effects of oxides of nitrogen and oxides of sulfur and the associated secondary (welfare-based) NAAQS, requesting the submission of recent scientific information on specified topics. Similarly, on December 3, 2014 (79 FR 71764), EPA formally

initiated its current review of the air quality criteria for the particulate matter NAAQS. EPA conducted two workshops—the first on March 4 to 6, 2014 for oxides of nitrogen and oxides of sulfur (79 FR 8644, February 13, 2014) and the second on February 11, 2015 (79 FR 71764, December 3, 2014) for particulate matter—to gather input from invited scientific experts, internal and external to EPA, as well as from the public, regarding key science and policy issues relevant to the review of the secondary NAAQS for oxides of nitrogen, oxides of sulfur, and particulate matter. These science and policy issues were incorporated in EPA’s *Integrated Review Plan for the Secondary National Ambient Air Quality Standards for Ecological Effects of Oxides of Nitrogen, Oxides of Sulfur, and Particulate Matter* (January 18, 2017) as well as the *Integrated Review Plan for the Particulate Matter National Ambient Air Quality Standards* (81 FR 87933, December 6, 2016).

Following the review of this draft ISA, NCEA-RTP staff will produce a second external review draft addressing comments received from the CASAC panel and the public. The final ISA will provide the scientific basis for the U.S. EPA’s decision regarding the adequacy of the current secondary standards for ecological effects of oxides of nitrogen, oxides of sulfur, and particulate matter.

Charge to the CASAC Panel

The Charge for review of this ISA by the CASAC panel is provided below. The areas identified for CASAC comment are not intended to limit the scope of the panel’s review but rather are intended to assist the panel by highlighting specific areas where the Agency is seeking input.

1. Executive Summary and Chapter 1

The Executive Summary and Chapter 1 provide overviews of the ISA. The Executive Summary is intended to be a concise synopsis of key findings targeted to a broad audience, whereas Chapter 1 is a more detailed synthesis of the ISA’s most policy-relevant findings.

- a. Please comment on the extent to which the Executive Summary and Chapter 1 meet their objectives.
- b. The causality determinations are summarized in the Executive Summary and Chapter 1, please comment on the extent to which the causal framework is appropriately applied to evidence for each of the effect categories in chapters 3-12 to form causal determinations.

2. Atmospheric Chemistry

Chapter 2 describes scientific information on sources, atmospheric chemistry, measurement, modeling, ambient concentration trends, and atmospheric deposition of oxides of sulfur and nitrogen and suspended particulate matter.

- a. Please comment on the accuracy, clarity, level of detail, and relevance of the information presented regarding sources, chemistry, and measurement and modeling of ambient concentrations.

- b. Please comment on the accuracy, clarity, level of detail, and relevance of the information presented regarding measurement, modeling, prediction, and trends of atmospheric deposition of nitrogen and sulfur, including particulates, and related processes.

3. Gas phase effects

Chapter 3 characterizes scientific evidence on the effects of gas-phase SO₂, NO₂, NO, peroxyacetyl nitrate (PAN), and HNO₃ on vegetation. Please comment on the characterization of these effects and the integration of new information into the long history of evidence on this topic.

4. Soil Biogeochemistry

Chapter 4 characterizes scientific evidence on the biogeochemical response of soils to nitrogen and sulfur deposition. Please comment on the accuracy, clarity, level of detail, and relevance of the discussion regarding indicators, processes, models, monitoring and characterization of national-scale sensitivity.

5. Terrestrial Acidification

Chapter 5 characterizes the scientific evidence on the terrestrial biological responses to acidifying deposition, including effects on physiology, productivity, and community composition, as well as a discussion of critical loads for these effects. Please comment on the accuracy, clarity, level of detail, and relevance of the discussion regarding terrestrial biological responses to acidifying deposition and the critical loads for these effects.

6. Terrestrial Nitrogen Enrichment

Chapter 6 characterizes the scientific evidence on the terrestrial biological responses to nitrogen enrichment, including effects on physiology, productivity, and community composition, as well as a discussion of critical loads for these effects. Please comment on the accuracy, clarity, level of detail, and relevance of the discussion regarding physiological mechanisms, ecological processes, and the characterization of sensitivity among biomes, among ecoregions, and nationally.

7. Aquatic Biogeochemistry

Chapter 7 characterizes scientific evidence on aquatic biogeochemical response in freshwater and estuarine systems to nitrogen and sulfur deposition.

- a. Please comment on the accuracy, clarity, level of detail, and relevance of information on biogeochemical processes and chemical indicators presented in the chapter as well as the adequacy of the discussion of monitoring, models, and national-scale sensitivity.

- b. Please provide suggestions that may further improve the utility of this chapter as the foundation for linking biogeochemical alterations associated with nitrogen and sulfur deposition to biological effects in aquatic systems.

8. Freshwater Acidification

Chapter 8 summarizes biological indicators of acidifying deposition and effects on biodiversity of freshwater biota. These effects have been well established for several decades. Please comment on the accuracy, clarity, level of detail, and relevance of information presented on the biological indicators of acidifying deposition and the effects of deposition on biodiversity in freshwater biota.

9. Freshwater Nitrogen Enrichment

Chapter 9 summarizes the biological effects associated with N deposition to freshwater systems. Please comment on the accuracy, clarity, level of detail, and relevance of the discussion of biological change associated with atmospheric deposition to lakes and streams.

10. Estuarine and Near Coastal Nitrogen Enrichment

Chapter 10 describes biological indicators and effects of nitrogen enrichment in coastal areas. Please comment on the accuracy, clarity, level of detail, and relevance of information presented on the biological indicators and effects of nitrogen enrichment in coastal waters and on nutrient-enhanced coastal acidification.

11. Wetland Nitrogen Enrichment

Chapter 11 describes biological indicators and effects of nitrogen enrichment in freshwater wetlands and coastal wetlands. Please comment on the accuracy, clarity, level of detail, and relevance of information presented on the biological indicators and effects of nitrogen enrichment in freshwater and coastal wetlands.

12. Sulfur Enrichment

Chapter 12 describes biological effects and indicators of S enrichment in freshwater aquatic and wetland ecosystems. Please comment on the accuracy, clarity, level of detail, and relevance of information presented on the biological effects of nutrient-enhanced sulfide phytotoxicity and nutrient-enhanced mercury methylation.

13. Climate Modification of Ecosystem Response

Chapter 13 describes how climate, specifically temperature and precipitation, modify ecosystem response to nitrogen and sulfur deposition. CASAC made the suggestion to include this topic in their comments on the draft Integrated Review Plan in April 2016. Please comment on the accuracy, clarity, level of detail, and relevance of information presented on modification of ecosystem response due to changes in temperature and precipitation.

14. Ecosystem Services

Chapter 14 is a summary of recent advances in ecosystem services frameworks, studies that evaluate the effects of anthropogenic nitrogen on ecosystem services and several “profiles” of threatened and endangered species for which nitrogen is listed as a stressor. Please comment on the accuracy, clarity, level of detail, and relevance of this summary of ecosystem services frameworks and the effects of nitrogen inputs on ecosystem services.

15. Appendices

Case studies at five locations in the U.S. (Southern California, Northeastern U.S., Rocky Mountain National Park, Southeastern Appalachia, Tampa Bay) are included in Appendix C to support potential place-based risk and exposure assessment options to be conducted by the Office of Air Quality Planning and Standards.

- a. Please comment on the adequacy of the information for the case studies and identify additional considerations, if any, relevant to evaluation of effects in these locations.

Particulate matter components other than nitrogen and sulfur and their transformation products have ecological effects.

- b. Please comment on the adequacy of the characterization of non-nitrogen and non-sulfur particle associated components and their ecological effects.

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