

Single Source Secondary Impact Modeling for NSR/PSD Program

Kirk Baker
April 2014

NSR/PSD Secondary Impacts

- EPA granted **Sierra Club petition** (Jan 4, 2012) with commitment to update Appendix W (Guideline on Air Quality Models) to address O3 and secondary PM2.5 impacts
- Proposed updates to Appendix W and related guidance documents are due by the 11th Modeling Conference (March 2015) under Sierra Club petition agreement
- A need currently exists to fulfill EPA's commitment to update Appendix W to address chemically reactive pollutants in near field and long range transport applications
 - Separate work is ongoing to update Appendix W for primary pollutants; not the focus of this presentation

Interagency Workgroup on Air Quality Modeling (IWAQM) Phase I and II

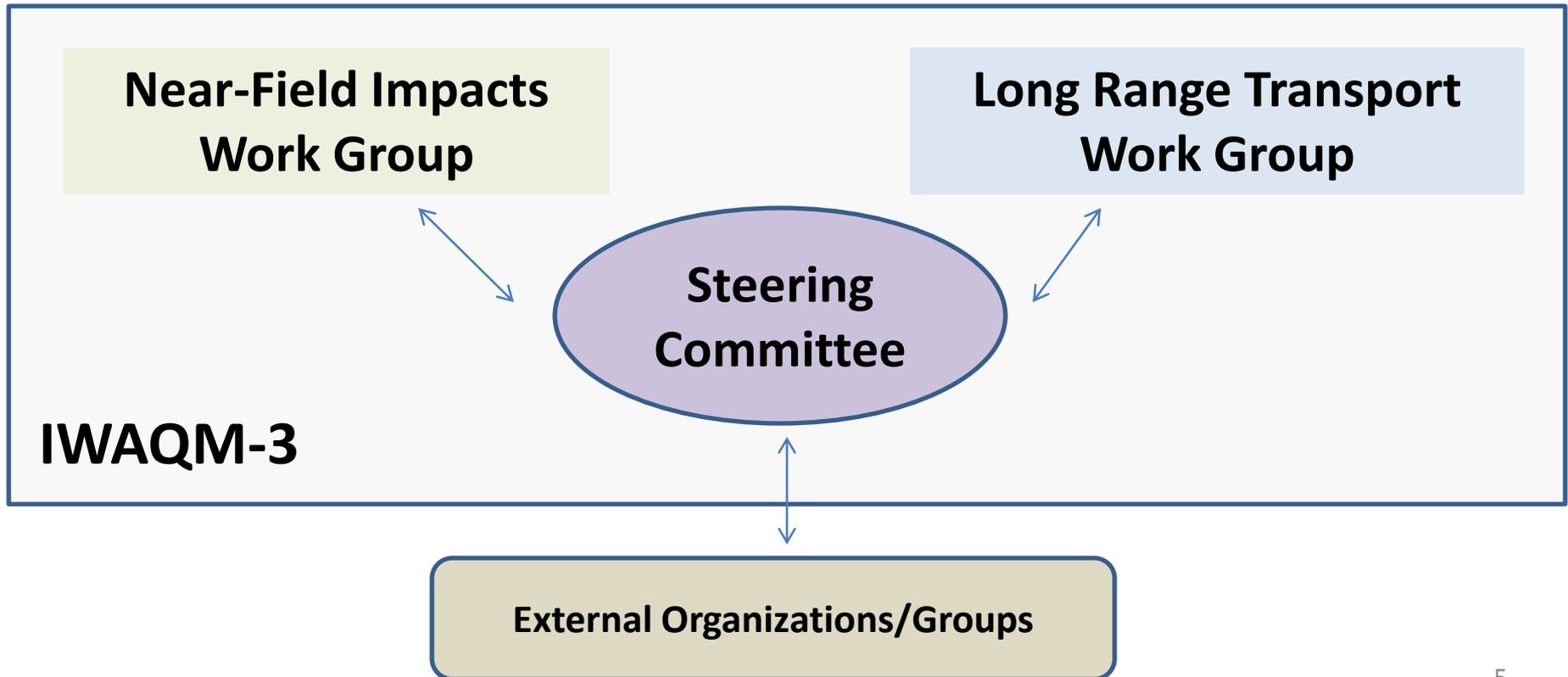
- Originally formed in 1991 to provide a focus for development of technically sound regional air quality models for regulatory assessments of single source impacts on Federal Class I areas
 - Participating Federal agencies: the Environmental Protection Agency (EPA), the U.S. Forest Service (USFS), the U.S. Fish and Wildlife Service (USFWS), and the National Park Service (NPS)
- The IWAQM process largely concluded in 1998 with the publication of the **Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts (EPA-454/R-98-019)**
 - The IWAQM Phase 2 report provided a series of recommendations for the application of the CALPUFF model for use in regulatory long range transport (LRT) modeling
 - Basis of subsequent Appendix W update designating CALPUFF as the preferred model for LRT
- Draft updates to the IWAQM Phase 2 report were released in 2009 to better reflect the state-of-the-practice of long range transport modeling techniques

Addressing Single Source Secondary Impacts

- IWAQM (phase 3) initiated in July 2013 to provide a mechanism for updating Appendix W and related guidance documents in partnership other Federal Agencies
 - Increase knowledge regarding NSR/PSD program and single source secondary impacts
 - Understand and evaluate modeling techniques for single source secondary impacts
 - March 2015 anticipated end date of IWAQM3 process

IWAQM3 Organizational Framework

- IWAQM3 consists of 2 working groups and a steering committee



Appendix W

PM Modeling Guidance

O3 Modeling Guidance

FLAG

Single Source Modeling Guidance for Ozone & PM2.5

Secondary Impacts & Screening
Approaches Topic Report

Increasingly dynamic

Long Range
Transport Models,
Approaches, and
Evaluation Report

EPA Fine Scale Team technical work/projects (outside IWAQM3 process)

- New work related to single source secondary impact evaluation and approaches
 - EPA/ENVIRON plume measurement and inert tracer reports
- Critical elements and approaches being prepared for peer review

Appendix W

- Intent is to develop appropriate detail that will be relevant over the long term to minimize the need for future updates
- Increasing technical detail and reflections of the current practice of model application in guidance documents which are more dynamic

Appendix W

PM Modeling Guidance

O3 Modeling Guidance

FLAG

Single Source Modeling Guidance for Ozone & PM2.5

Secondary Impacts & Screening
Approaches Topic Report

Increasingly dynamic

Long Range
Transport Models,
Approaches, and
Evaluation Report

Technical Work/Projects

- AWMA extended abstract on photochemical model approaches
- EPA/ENVIRON plume measurement and inert tracer reports
- Critical elements and approaches being prepared for peer review

PM Modeling Guidance (draft)

- Draft guidance released in March 2013
 - http://www.epa.gov/scram001/guidance/guide/Draft_Guidance_for_PM25_Permit_Modeling.pdf
- More technical and programmatic detail than Appendix W
 - Regulatory background
 - Key emissions thresholds
 - Detail where screening and refined analysis are appropriate for NSR/PSD programs
- References the single source modeling guidance for O3 and PM2.5 document, which contains the most dynamic technical details
- IWAQM3 NFI workgroup will review PM Modeling Guidance document for consistency with single source modeling guidance

Appendix W

PM Modeling Guidance

O3 Modeling Guidance

FLAG

Single Source Modeling Guidance for Ozone & PM2.5

Secondary Impacts & Screening
Approaches Topic Report

Increasingly dynamic

Long Range
Transport Models,
Approaches, and
Evaluation Report

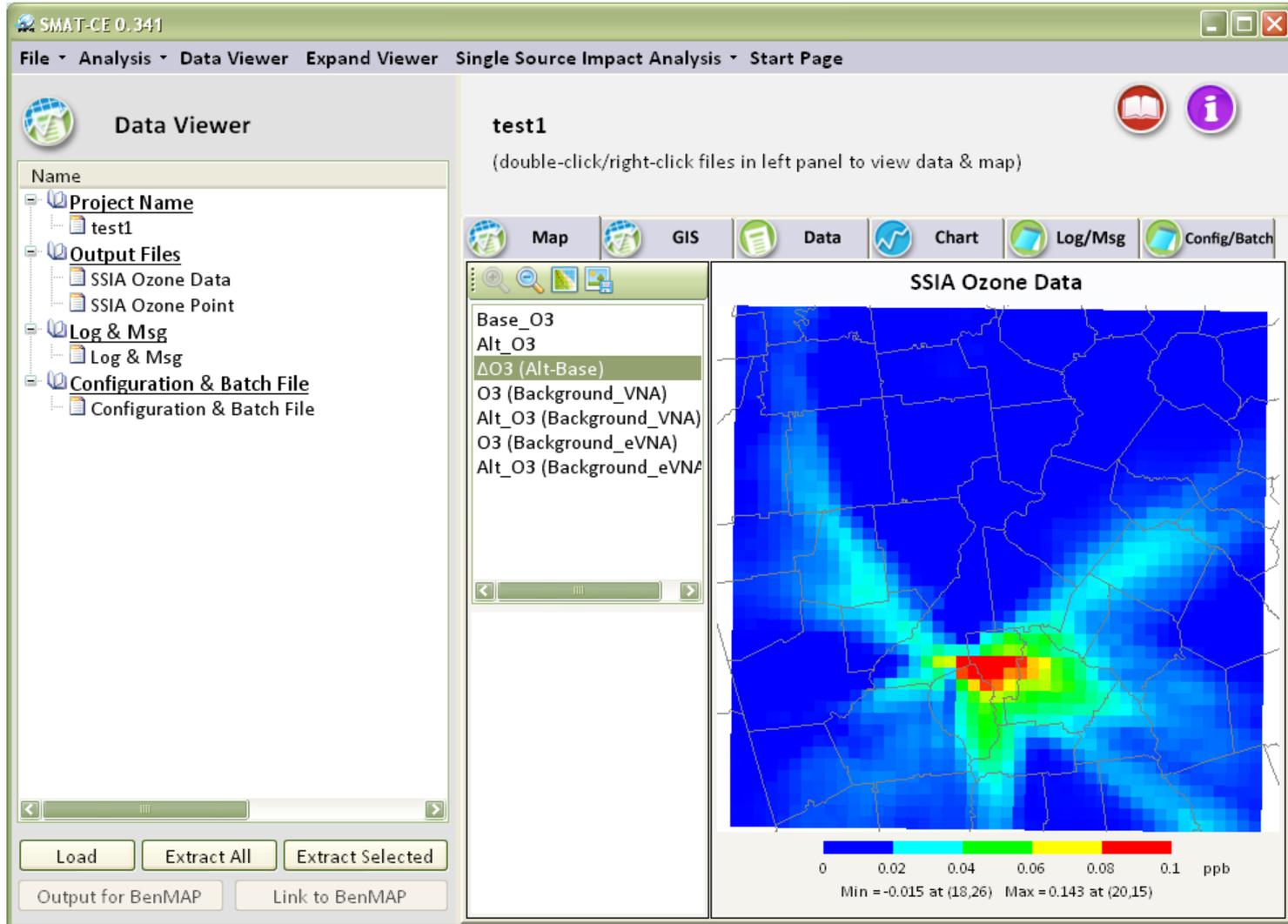
Technical Work/Projects

- AWMA extended abstract on photochemical model approaches
- EPA/ENVIRON plume measurement and inert tracer reports
- Critical elements and approaches being prepared for peer review

Single Source Modeling Guidance for O3 & PM2.5

- Broad overview of potential tools to estimate near-field secondary impacts from single sources
 - Criteria for tools to be suitable for this purpose & how to use those tools
- How to apply a suitable model for PSD/NSR impact analysis
 - Appropriate episode selection, inputs, domain, receptor locations, simulation length, etc.
- How to post process model results for PSD/NSR assessment test
 - Approach coded into single source assessment tool (Windows program SMAT-CE)
- Modeling guidance in this document should be consistent with FLAG, PM Modeling guidance, and Appendix W

Windows based single source assessment tool (alpha)



Appendix W

PM Modeling Guidance

O3 Modeling Guidance

FLAG

Single Source Modeling Guidance for Ozone & PM2.5

**Secondary Impacts & Screening
Approaches Topic Report**

Increasingly dynamic

Long Range
Transport Models,
Approaches, and
Evaluation Report

Technical Work/Projects

- AWMA extended abstract on photochemical model approaches
- EPA/ENVIRON plume measurement and inert tracer reports
- Critical elements and approaches being prepared for peer review

IWAQM NFI Topic Report

Secondary Impacts Review & Screening Approaches Report

- What do we know about the relationships between single source precursors and secondary impacts?
- Overview of published emissions and secondary impacts from single sources to provide context for expected impacts
 - How variable by area, season, by distance from the source, etc.
- Identify credible screening approaches for estimating secondary pollutant impacts from single sources
 - How to use these tools for a near field impact assessment
 - How broadly applicable are these tools?
 - How to evaluate screening approaches
 - What gaps in science/research exist related to screening tools for secondary pollutants?

Appendix W

PM Modeling Guidance

O3 Modeling Guidance

FLAG

Single Source Modeling Guidance for Ozone & PM2.5

Secondary Impacts & Screening
Approaches Topic Report

Increasingly dynamic

Long Range
Transport Models,
Approaches, and
Evaluation Report

EPA Fine Scale Team technical work/projects (outside IWAQM3 process)

- New work related to single source secondary impact evaluation and approaches
 - EPA/ENVIRON plume measurement and inert tracer reports
- Critical elements and approaches being prepared for peer review

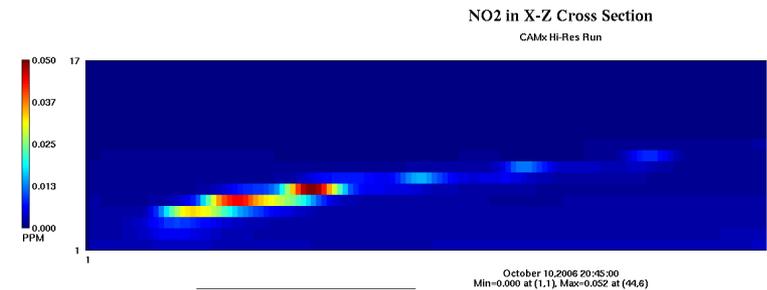
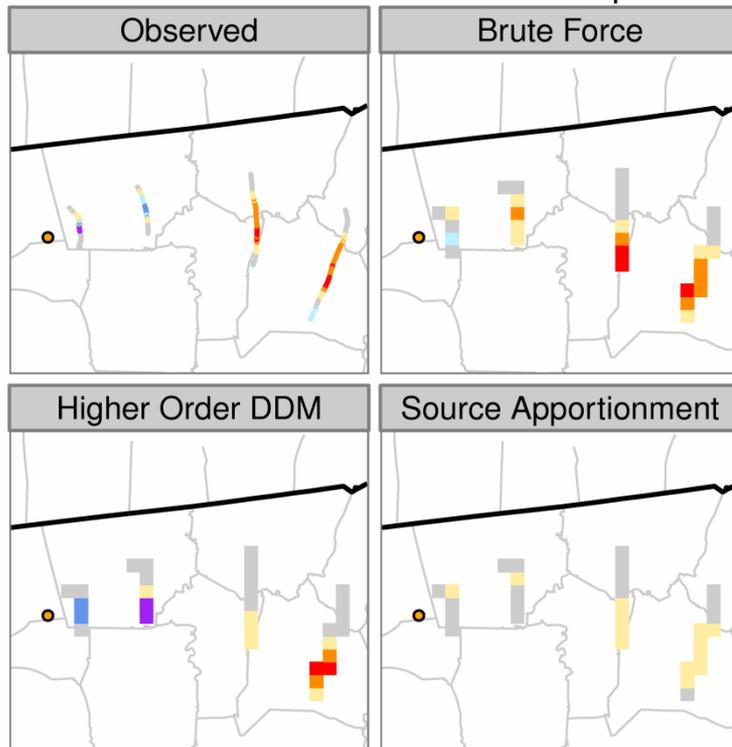
Single Source Secondary Impacts

- No existing approaches or tools (just Scheffe tables)
 - Disadvantage is more time and resources are needed to build confidence in tools and approaches for permit modeling
 - Advantage is that energy does not need to be used to change precedent
- Answer fundamental questions:
 - What are typical secondary impacts? How variable are these impacts? What tools are most appropriate?
 - Little research and peer reviewed data exists
- Explore modeling approaches for single source secondary impacts (ozone and PM2.5)
 - Understand stack parameter and location impacts on secondary pollutant impacts
- Explore approaches for single source secondary impact screening tool; develop a proof of concept approach
- Relate emissions to downwind O3 and PM impacts
 - Provide information to inform SER and SIL for O3 and PM
- Update single source secondary impact modeling guidance

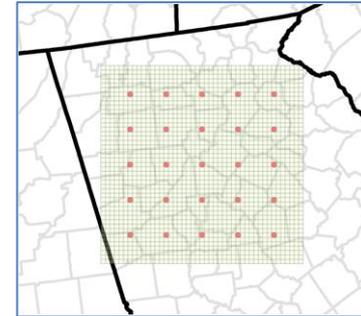
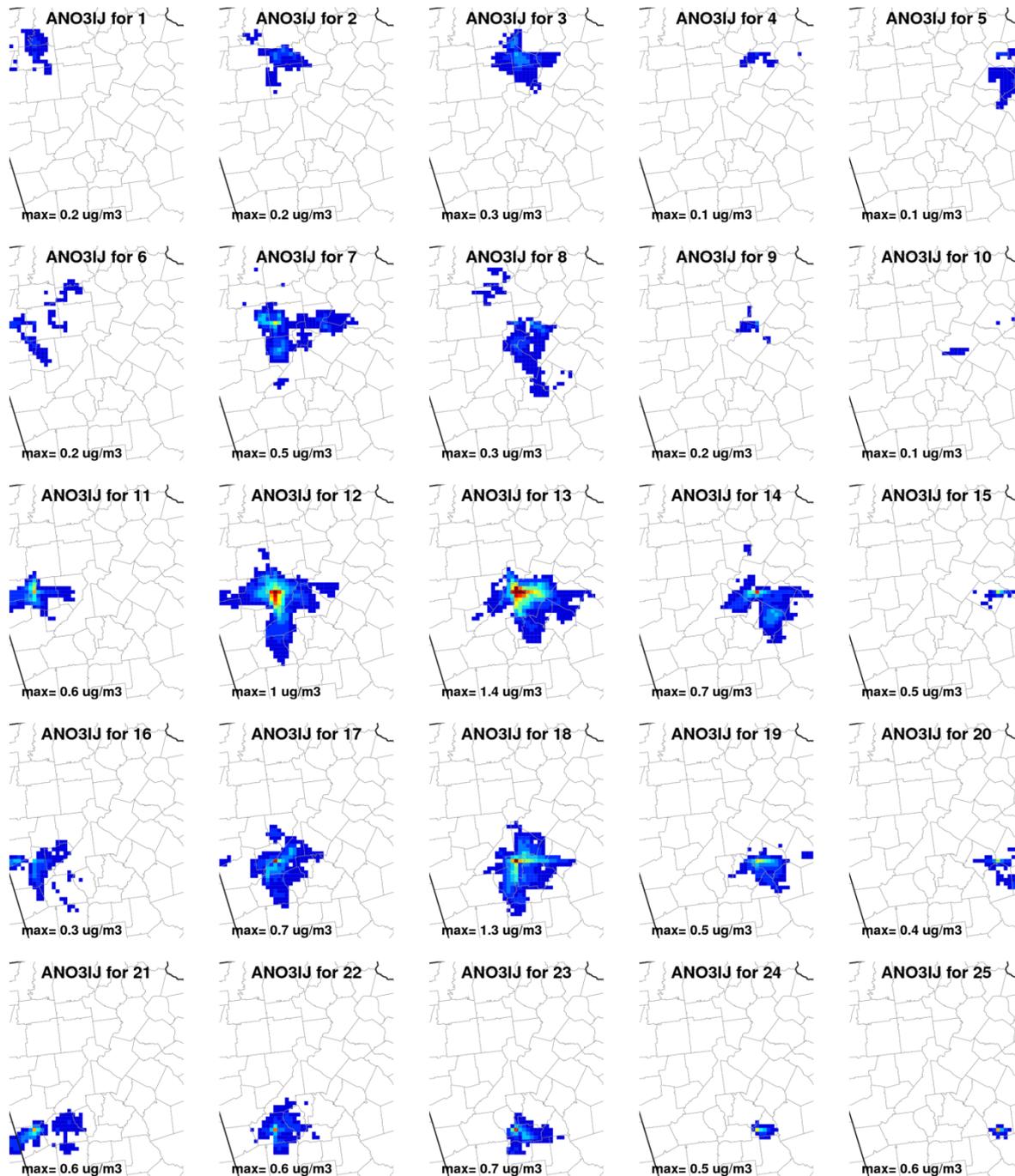
Can a single source impact be realistically estimated with a grid model?

- **Current/ongoing work**
- 1999 TVA plume measurement study is initial evaluation platform
- **Existing preliminary work**
- Evaluation of Chemical Dispersion Models using Atmospheric Plume Measurements from Field Experiments (UNC/ENVIRON report on SCRAM)

Cumberland Power Plant: Ozone Impacts



PM2.5 Nitrate Ion



Appendix W

PM Modeling Guidance

O3 Modeling Guidance

Single Source Modeling Guidance for Ozone & PM2.5

Secondary Impacts & Screening
Approaches Topic Report

Increasingly dynamic

FLAG

**Long Range
Transport Models,
Approaches, and
Evaluation Report**

Technical Work/Projects

- AWMA extended abstract on photochemical model approaches
 - EPA/ENVIRON plume measurement and inert tracer reports
- Critical elements and approaches being prepared for peer review

Long Range Transport Workgroup

- Kick-off conference call in Fall 2013
- Need to update appropriate sections of Appendix W and FLAG
- Ensure Federal Lang Managers' Air Quality Related Values Work Group Report (FLAG) guidance is consistent with Single Source Modeling for O₃ and PM_{2.5} guidance and Appendix W