ROANOKE AREA CLEAN AIR PLAN

1st Semi-Annual Status Report

For

The Roanoke Ozone Early Action Compact Area

June 30, 2003

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Roanoke Ozone Early Action Compact Areas

Introduction & Project Background

In 1997 the United States Environmental Protection Agency (EPA) established a new 8-hour ozone National Ambient Air Quality Standard (NAAQS). This standard was the result of a review of ground level ozone and related health impacts, and was set to replace the older 1-hour standard. The purpose of this new standard was to address the longer-term impact of ozone exposure at lower levels. As such, the new standard is set at a lower level (0.08 parts per million) than the previous standard (0.120 parts per million) and is more protective of human health.

As part of the implementation of the new standard, states submitted area designation recommendations to the EPA in June of 2000 that identified potential ozone nonattainment areas based on air quality data from 1997 to 1999. The Roanoke Metropolitan Statistical Area (MSA) was identified at that time as one of the potential nonattainment areas in Virginia, mainly based on the fact that ozone concentrations exceeding the standard had been recorded at the monitor located in the Town of Vinton.

During the development of these state recommendations, as well as after this submission, a number of concerns were raised by the potential nonattainment areas about the adverse impacts of a possible nonattainment designation on these areas. In response, the Virginia Department of Environmental Quality (DEQ) began to investigate voluntary actions that could be implemented proactively to improve air quality and lessen the possible impact of a formal nonattainment designation in areas that marginally exceed the new standard.

The most promising of all the options explored is the EPA's ozone Early Action Compact (EAC) program. The EAC concept was originally developed by several areas in Texas in early 2002 and subsequently endorsed and expanded by the EPA as national voluntary program.

EACs are voluntary agreements by the localities, states, and the EPA to develop Early Action Plans (EAPs) to reduce ozone precursor pollutants and improve local air quality in a proactive manner, and in a shorter time than what would occur through the traditional nonattainment area designation and planning process. These plans must include the same components that make up

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Traditional State Implementation Plans (SIPs). This includes emissions inventories, control strategies, schedules and commitments, and a demonstration of attainment based on photochemical modeling.

The goal of an EAP is to develop a comprehensive strategy that will bring an area into attainment of the 8-hour ozone standard by 2007. This goal is will be achieved by selecting and implementing local ozone precursor pollutant control measures that when combined with other measures on the state and national level, are sufficient to bring the area into compliance with the standard. If the area is successful in developing a plan that demonstrates attainment of the 8-hour ozone standard by 2007, the EPA will defer the effective date of the nonattainment designation for the area. This deferral will remain in place as long as certain milestones are met, such as implementation of local controls by 2005. If all interim milestones are met and the area demonstrates attainment of the standard during the period from 2005 to 2007 through air quality data, then the nonattainment designations will be withdrawn by EPA, without further regulatory requirements. If an area fails at any point in the process, it will revert back to traditional nonattainment status, with all the associated requirements of such a designation.

The Roanoke MSA area has entered into an Early Action Compact with both the Commonwealth and EPA for the area including Botetourt and Roanoke Counties, the Cities of Roanoke and Salem, and the Town of Vinton. This Compact was signed by all the parties involved and then submitted to the EPA by the required date (December 31, 2002). The area has subsequently established and commissioned the Roanoke Early Action Plan Task Force to serve as the major stakeholder group to coordinate the development of an early action plan for the area. This Task Force has a diverse and knowledgeable membership, which will greatly aid in the development of a comprehensive plan.

Both this area, and the other Early Action Compact area in Virginia (Northern Shenandoah Valley), are well suited for this project due to their geographic location and extent, marginal nonattainment air quality levels, and common influences of ozone transport and other external factors. Both areas are located in the western part of Virginia and would be separate and relatively small nonattainment areas, if formally designated.

The remainder of this status report describes the project area, the significant events and progress made thus far, efforts to encourage public participation in the process, and the technical support activities underway to support the overall planning effort.

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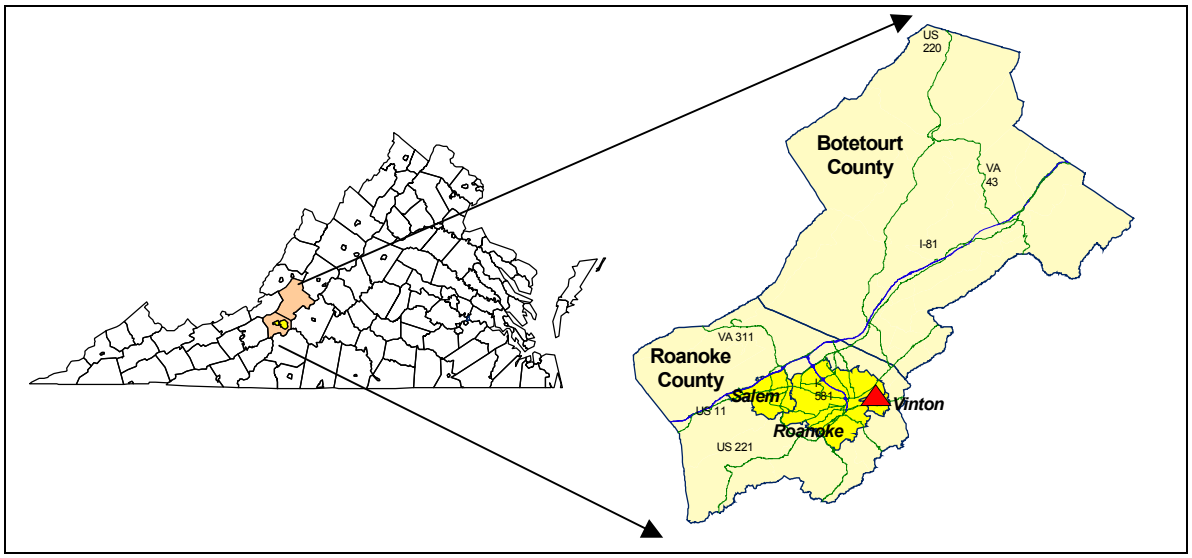
Description of Early Action Area

The Roanoke Metropolitan Statistical Area (MSA) is located within the Blue Ridge Mountains area of Virginia, and has typical topographic characteristics of such an mountain & valley area. The major urbanized center area is located in a valley and made up of the Cities of Roanoke and Salem, along with the Town of Vinton where the ozone monitor for the area is located. This core urban area is surrounded by the more suburban and rural Roanoke County with Botetourt to the North. The major commercial transportation corridor of Interstate 81 runs through the entire MSA from north to south, which is just to the west of the urban core. A significant portion of Northwestern Botetourt County is rural and part of the Jefferson National Forest.

Figure 1 – Roanoke MSA Early Action Area



The vital statistics of the area in terms of ozone related criteria are as follows:

- Land Area – 851 square miles
- Population (2000) – 235,932
- Population density (2000) – 277 per square mile
- Projected Population (2010) – 244,499
- Volatile Organic Compound Emissions (1999) – 42 tons per summer day
- Oxides of Nitrogen Emissions (1999) – 52 tons per ozone season day
- Prevailing Ozone Season Wind Direction – From the Southwest
- 8-hour Ozone Design Value (2000 – 2002) – 0.087 parts per million

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PROJECT ORGANIZATION & PROGRESS SUMMARY

The Ozone Early Action Plan development process is a joint effort of the Roanoke Valley Area Metropolitan Planning Organization and the Virginia Department of Environmental Quality. The Roanoke Valley-Alleghany Regional Commission (RVARC) is the administrative agency for the Roanoke Valley Area Metropolitan Planning Organization. Staff with the Commission have been detailed to work on the Ozone Early Action Plan and to manage the involvement of a consultant, E.H. Pechan & Associates, which is assisting with development of the plan.

Project Organization

The Ozone Early Action Plan Task Force was established to guide the consultant and Roanoke Valley-Alleghany Regional Commission staff in the development of the Ozone Early Action Plan when it is not practical to engage the public at large on every minor detail. The Task Force is staffed by the RVARC, making Wayne Strickland the Task Force's ex-officio director.

Stakeholder Involvement and Meetings

The membership of the Task Force is not static; however, at a minimum, its current members include representatives from the organizations listed in the following table.

◗Blue Ridge Bicycle Club	◗Roanoke Regional Chamber of Commerce
◗Blue Ridge Environmental Network	◗US Forest Service
◗Piedmont Environmental Council	◗RIDE Solutions
◗Salem – Roanoke County Chamber of Commerce	◗Virginia Tech.
◗Norfolk Southern Corp.	◗Southern Environmental Law Center
◗Clean Valley Council	◗Roanoke Valley Greenways Commission
◗Roanoke Valley Asthma and Air Quality Coalition	◗Sierra Club – Virginia Chapter
◗Roanoke Valley Economic Development Partnership	◗Roanoke Valley Resource Authority
◗Virginia Health Department	◗City of Roanoke
◗City of Salem	◗County of Roanoke
◗County of Botetourt	◗Town of Vinton
◗Virginia DEQ	◗Virginia DOT
◗Federal Highway Administration	

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The Task Force represents the public throughout the process. Many other organizations have participated on an ad hoc basis. Thus far, we have not turned away any stakeholder interested in serving on the Task Force. There is room for new organizations to participate as the planning process continues.

The public at large is engaged and will continue to be engaged in a manner similar to the May 29, 2003 public input meeting (see below). The following list describes the meetings, media coverage, and public participation related to the Ozone Early Action Plan, beginning with the signing of the Early Action Compact.

- ***Monday December 16, 2002*** Early Action Compact (EAC) Signing Ceremony, Public and Press Invited, Press Releases preceded the event, a media pack was developed in conjunction with RVARC's on call PR Consultant.
- ***January 14, 2003*** Ozone EAP Task Force Kickoff meeting.
- ***Wednesday February 19, 2003*** – EAP was featured in Leadership Roanoke Valley Air Quality Program at Roanoke County Fire and Rescue Training Center (LRV Quality of Life Program – All Day).
- ***February 28, 2003*** – **EAP Task Force Meeting** – Consultant Presentations and Selection of finalist for contract.
- ***March 10, 2003*** – Oral Presentation to Cosmopolitan Club (Mark McCaskill, Lunch Meeting, Q&A included).
- ***March 28,2003*** – **EAP Task Force Meeting** – Air Quality Modeling Presentation and Discussion – Virginia DEQ.
- ***April 10, 2003*** – Oral Presentation to Roanoke Regional Chamber of Commerce Transportation Committee concerning the EAP. (Mark McCaskill, 12:00 pm, Q&A included).
- ***April 23, 2003*** – Oral Presentation to Roanoke Valley Greenways Commission concerning the EAP. (Mark McCaskill, 5:00 pm, Q&A included).
- ***May 1, 2003*** – Media Interview Channel 10 6:00 O'clock News.
- ***May 2, 2003*** – **EAP Task Force Meeting** – E.H. Pechan Associates – Draft Strategies Menu Discussion

May 2, 2003 Ozone EAP Task Force Meeting

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- **May 15, 2003** Advertisement sent to Roanoke *Times* and Roanoke *Tribune* for May 29, 2003 public input meeting. Advertisement ran in the Sunday May 18, 2003 Edition (Roanoke *Times*) and Thursday May 22, 2003 edition (Roanoke *Tribune*).
- ***May 16, 2003*** – Distribution of Draft Strategies List to "Regional Mayor's and Chairs" meeting (Local Elected and Chief Administrative Officers for the Region).
- ***May 16, 2003*** – Notice of May 29th public meeting in Roanoke Regional Chamber's Monthly Electronic Newsletter "Member Connections."
- ***May 19, 2003*** – **EAP Task Force** teleconference with E.H. Pechan and Associates concerning draft strategies.
- ***May 19, 2003*** – May 29th meeting press release to following recipients (Joe McKean, WDBJ-TV; Melissa Preas, WSLS-TV; Ray Reed, The Roanoke *Times*; Chris Kahn, Associated Press; William Little, Fincastle Herald; Claudia Whitworth, The Roanoke *Tribune*; Jeff Walker, The Vinton Messenger; Meg Hibbert, Salem *Times Register*; Rick Mattioni, WVTF-FM (Public Radio); Kevin LaRue, WFIR-FM (Roanoke's News Radio).
- ***May 27, 2003*** – Retransmission of above press release.
- ***May 29, 2003*** – Interview with Dan Heyman WVTF News concerning public meeting.
- ***May 29, 2003*** – Article published in Roanoke *Times* concerning public meeting.
- ***May 29, 2003*** – Public Meeting Roanoke County Headquarters Library (28 Attendees) – Public comments cataloged and transmitted to E.H. Pechan and Associates for revision of draft strategies list.

May 29, 2003 Public Meeting

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Products

Thus far, the Ozone Early Action Plan Task Force has prepared two major documents. The first is the list of local control measures that are under consideration ("Ozone Early Action Plan: Potential Emission Reduction Control Measures for Roanoke," Virginia, June 16, 2003). The second is this progress report.

AIR QUALITY TECHNICAL SUPPORT ACTIVITIES

The air quality planning process is very complex and resource intensive. The DEQ has committed substantial financial and staff resources to complete this technical analysis for the early action project. This process typically involves a number of steps to evaluate air quality problems, and then to develop and test control strategies to solve the problem. In general, the major steps of this process are as follows.

- An air quality problem is observed through monitoring or some other mechanism.
- The current air quality conditions are evaluated by estimating baseline emission of the air pollutants contributing to the problem, the simulation of one or more observed events, or "episodes" of high pollution concentrations using a photochemical model. This is done to determine what conditions and factors contribute to these poor air quality events.
- Future air quality is then predicted using the same model by estimating future emissions, selecting emission control measures, and testing these measures to determine whether they will lessen or eliminate the air quality problem.

Two of the major analytical tools used to evaluate air quality as part of this process are the estimation of air pollutants in a given area, commonly referred to as emissions inventories, and regional or urban scale air quality models. Both of these activities are currently underway in order to support the development of a technically sound air quality plan.

Emissions Inventories

Emissions inventories are comprehensive estimates of all air pollutants emitted from all sources in a given geographic area during a given time period. These inventories represent numerous estimates on an individual source basis that are then summarized by major source categories. The inventory development process represents an extensive effort to collect emissions and/or related data

combined with complex methods and models to produce the emissions estimates. The major source categories used in the inventory process are.

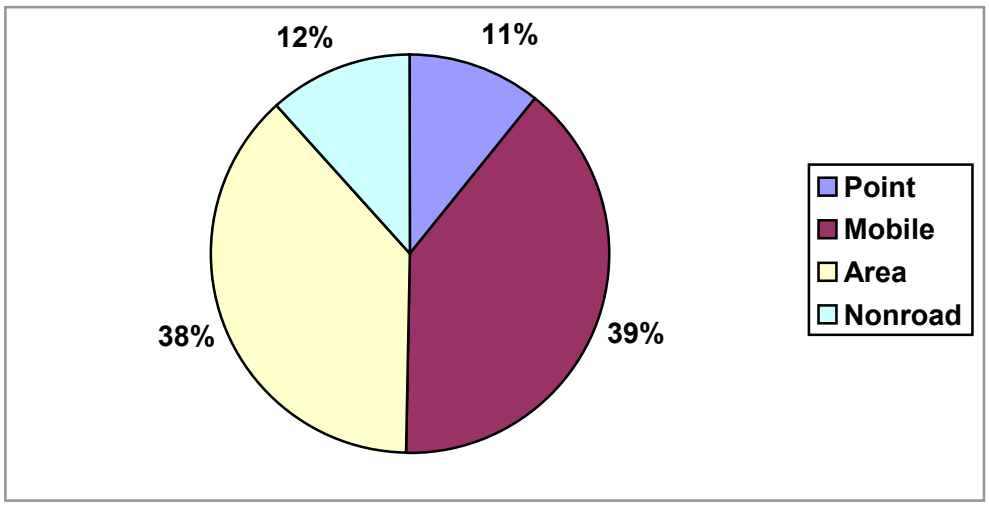
- **Stationary Point Sources:** Large utility and industrial facilities with significant individual emissions.
- **Mobile Sources:** Motor vehicles operated on public roads such as interstates, freeways, and local roads.
- **Area Sources:** Small individual sources of emissions such as gasoline distribution and marketing, solvent usage, and others.
- **Nonroad Mobile Sources:** Motor vehicles and equipment such as lawn & garden tools, construction equipment, locomotives, and aircraft.

The EPA currently requires states to develop periodic emissions inventories (PEI) of ozone precursor pollutants every three years for ozone areas to support planning and progress tracking. Many states including Virginia, have expanded the coverage of this inventory to the entire state and have included additional pollutants. The EPA has also established as central repository, the National Emissions Inventory (NEI), to store and maintain all state developed periodic inventories on a national basis.

In the specific case of the ozone early action plan for the Roanoke area, a baseline, projection, and controlled projection inventory must be developed to support the planning and modeling process. Due to the fact that a 1999 high ozone episode has be selected as the initial modeling exercise to support this project (see **Air Quality Modeling**), a baseline emissions inventory year of 1999 has also been selected which corresponds to the latest PEI inventory. Therefore, the NEI data will be used as a source of emissions data for this effort.

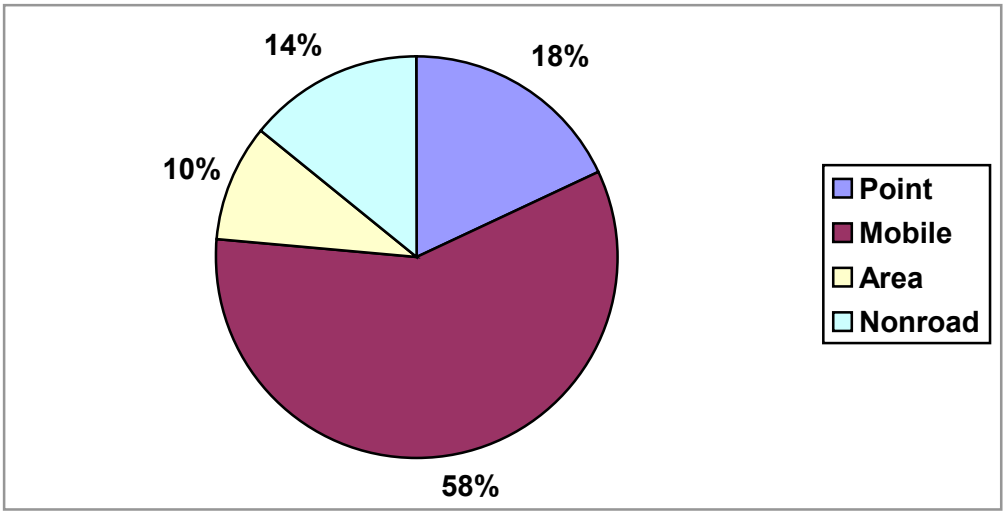
Summaries of the local baseline (1999) inventories for the two major ozone precursors, volatile organic compounds (VOC) and oxides of nitrogen (NO_X) are presented below. The emissions from the entire Roanoke EAP area are combined to produce a single summary of area emissions. Figure 2 and the associated data table presents the VOC emissions summary and Figure3 (and table) presents the NO_X emissions summary. These inventories are expressed in terms of tons per ozone season day.

Figure 2: Roanoke Area Emissions Inventory – 1999 Baseline Ozone Season Daily Emission of Volatile Organic Compounds (VOC)



Summary of the Roanoke Baseline VOC Emissions Inventory for Calendar Year 1999	
Major Source Categories	Emissions (tons/day)
Major Stationary Point Sources	
28 individual facilities (Botetourt : 7, Roanoke Co.: 12, Roanoke City: 5, Salem City: 4)) - Description: Includes cement production, metal works, minerals production, gas terminals, & others.	4.55 tpd
On-Road Mobile Sources	
Motor Vehicles on Interstates – **Description**: local and through traffic on the I-81 corridor. Large percentage of heavy-duty diesel trucks.	4.05 tpd
Motor Vehicles on all other Roads – Description: Vehicle traffic on all other public roads from major arterials to local roads.	12.72 tpd
Area Sources	
Use of solvent-based products – Description: paints, cleaners, consumer products, & others.	11.23 tpd
Gasoline distribution & Marketing – Description: Gasoline storage & transfer operation at terminals and service stations	3.74 tpd
All Others – description: Open burning, landfills, & others	1.20 tpd
Non-Road Mobile Sources	
Non-road equipment – Description: lawn & garden, construction, recreational vehicles and boats.	4.61 tpd
All others – Description: Locomotives & aircraft	0.36 tpd
Total	**42.46 tpd**

Figure 2: Roanoke Area Emissions Inventory – 1999 Baseline Ozone Season Daily Emission of Oxides of Nitrogen (NO_X)



Summary of the Roanoke Baseline NO_X Emissions Inventory for Calendar Year 1999	
Major Source Categories	Emissions (tons/day)
Major Stationary Point Sources	
28 individual facilities (Botetourt : 7, Roanoke Co.: 12, Roanoke City: 5, Salem City: 4)) - Description: Includes cement production, metal works, minerals production, gas terminals, & others.	9.31 tpd
On-Road Mobile Sources	
Motor Vehicles on Interstates - **Description**: local and through traffic on the I-81 corridor. Large percentage of heavy-duty diesel trucks.	18.03 tpd
Motor Vehicles on all other Roads - Description: Vehicle traffic on all other public roads from major arterials to local roads.	12.33 tpd
Area Sources	
Fuel Consumption – Description: Fuel consumption for heating, cooling, and other purposes in all sectors.	4.75 tpd
All Others – description: Open burning, landfills, & others	0.20 tpd
Non-Road Mobile Sources	
Non-road equipment – Description: lawn & garden, construction, recreational vehicles and boats.	5.50 tpd
All others – Description: Locomotives & aircraft	1.83 tpd
Total	**51.95 tpd**

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Air Quality Modeling

Air Quality analyses are used to simulate the combination of meteorology, emissions, and atmospheric chemistry that promote ozone formation and higher ambient concentrations in a given area. Once a representative scenario, or episode conducive to ozone formation, based on an actual observed ozone event is selected and validated, various emission reduction strategies can be tested to predict whether they would succeed in reducing ozone and attaining the ozone standard. The major steps involved in photochemical modeling is as follows:

- Selection of type and geographic scale of photochemical model
- Selection of representative ozone episode(s)
- Base case episode modeling and validation
- Future year projection and attainment demonstration modeling

The specific Virginia early action modeling plan is discussed below:

Model and Domain Selection

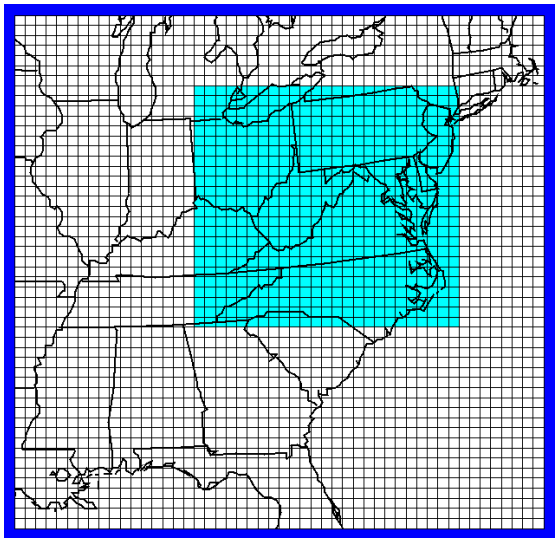
Due to the regional nature of ground level formation and transport that is prevalent in the Eastern United States, combined with the reasonable assumption the early action area is impacted by ozone transport, a regional photochemical modeling exercise has been selected for this project. This selection will allow for the evaluation of the impact of transport on the study area, as well as the impact of regional and national control strategies in reducing ozone transport into these areas.

The model selected for this purpose in EPA's MODELS3/CMAQ model which is EPA latest modeling platform for such analyses. The meteorological inputs required to run the model will be developed using the MM5 meteorology model, and the emissions inputs will be developed using the SMOKE emissions preprocessor model. The purpose of these model data input preprocessors is to temporally and spatially allocate these inputs to a grid system used by the photochemical model to recreate the atmospheric interaction of all these factors in promoting ozone formation.

Due the need to model a larger region for ozone transport assessment, a regional domain that covers a large portion of the Mid-Atlantic States has been chosen to support the early action modeling. This domain has been used in previous analyses by the State to assess transport and the regional effect of emission reductions. The domain will consist of a series of descending grid cells from 36 kilometers (km) at the edges of the domain, to 12 km in the Mid-Atlantic area. A local 4 km exercise for the project area may be added later to provide

further resolution. In this way the resolution of the model and modeling results will be the highest in and around the early action planning areas. This modeling domain is shown in Figure 4.

Figure 4: Early Action Modeling Domain of 36 km & 12 km Resolution

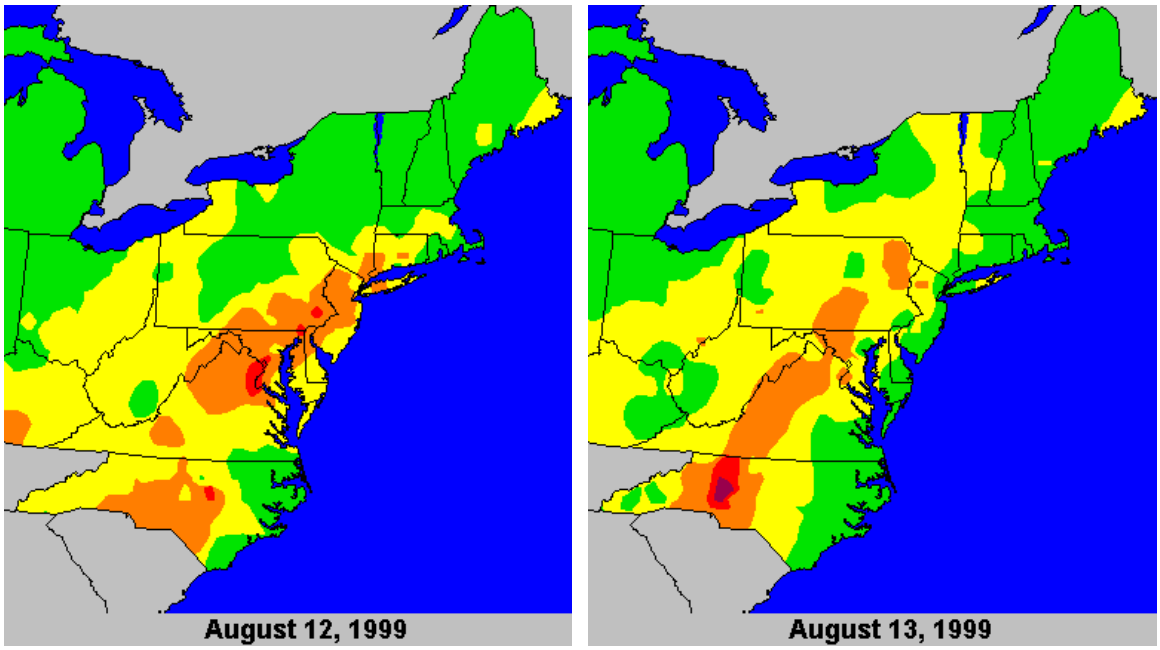


Episode Selection

One of the key aspects of a modeling analysis of a particular area and air pollution problem is to select one or more representative episodes to model. The selection process should reflect one or more of the prevailing meteorological and emissions conditions that produce higher levels of ozone in the subject area. An additional consideration for this project is that EPA guidance requires that the baseline emission inventory and subsequent episode(s) selected for an early action plan are no older than 1999. Finally, since three states are developing plans in the same general area, an episode common to all three was selected.

The result of this process produced an ozone episode that occurred on August 12th and 13th in 1999. This episode was selected mainly because exceedences of the ozone standard were observed at all the area monitors involved in this effort (including Roanoke), during this period. To adequately simulate the events leading up and following this episode, a 10 day period from August 8th to the 18th will be modeled. After the completion of this modeling exercise, an additional episode, probably in 2002, will be selected and modeled to retest and confirm the results of the initial modeling and to begin the analysis of other nonattainment areas in Virginia. The EPA ozone maps of the August 12th & 13th, 1999 episode are shown in Figure 5.

Figure 5: The Ozone Episode of August 12th & 13th, 1999



Modeling Progress to Date

A 1997 episode was originally selected to support the development of the early action plan since emissions and meteorological data were readily available and quality assured. However, subsequent to this decision, EPA early action plan guidance required that inventories and episodes no older than 1999 be used in this effort. As a result, the episode described above as been selected to support the air quality planning effort. However, this change in the modeling plan and episode has resulted in a change to the modeling project schedule.

As of the date of this document, the DEQ has obtained the necessary meteorological data for the 1999 episode and is working to preprocess this data through the MM5 model. Emissions data for 1999 from all state in the modeling domain has also been obtained from the NEI. This emissions data has been supplemented with state specific data from Virginia and West Virginia. The conversion of this data to SMOKE input files and the preprocessing of this data through the SMOKE emission model will soon be completed. After the conclusion of these data processing tasks, the modeling of the 1999 base case episode will begin. The base case modeling exercise is scheduled to be completed by the end of August.