MARYLAND DEPARTMENT OF THE ENVIRONMENT
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Proposed

Washington County 8- Hour Ozone Early Action Compact (EAC) State Implementation Plan (SIP)

SIP Revision 04-10

November 5, 2004

Submitted to:

U.S. Environmental Protection Agency
Region 3, Air Protection Division
1650 Arch Street
Philadelphia, Pennsylvania 17108-1086

Submitted by:

Maryland Department of the Environment
Air Quality Planning and Monitoring Program
Air and Radiation Management Administration

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APTF	- Attainment Plan Task Force
AQAD	- Air Quality Action Days
BMC	- Baltimore Metropolitan Council
CAP	- Clean Air Partners
CAMX	- Comprehensive Air Quality Model with Extensions
CARB	- California Air Resources Board
CMAQ	- Congestion Mitigation and Air Quality
CCTV	- Closed Circuit Television
CHART	- Coordinated Highways Action Response Team
DEQ	- Department of the Environmental Quality
DMS	- Dynamic Message Signs
EAC	- Early Action Compact
EAP	- Early Action Plan
EPA	- Environmental Protection Agency
FHWA	- Federal Highway Administration
HAR	- Highway Advisory Radio
HDE	- Heavy Duty Engines
ITS	- Intelligent Transportation Systems
IVR	- Interactive Voice Response
MDE	- Maryland Department of Environment
MDOT	- Maryland Department of Transportation
MM5	- Meteorology Model
MTA	- Maryland Transit Administration
MVA	- Motor Vehicle Administration (Maryland)
MWCOG	- Metropolitan Washington Council of Governments
NAAQS	- National Ambient Air Quality Standards
NEI	- National Emissions Inventory
NLEV	- National Low Emissions Vehicle
NOx	- Oxides of Nitrogen
OTR	- Ozone Transport Region
RACM	- Reasonably Available Control Measures
RACT	- Reasonably Available Control Technologies
SHA	- State Highway Administration (Maryland)
SIP	- State Implementation Plan
VDOT	- Virginia Department of Transportation
VEIP	- Vehicle Emissions Inspection Program
VMT	- Vehicle Miles Traveled
VOC	- Volatile Organic Compounds
WFC	- Winchester-Frederick County

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1.0 EXECUTIVE SUMMARY

This document, entitled *Washington County Early Action Compact, Ozone State Implementation Plan*, presents the Maryland Department of the Environment's (MDE's) and Washington County's progress in adopting and implementing air pollution control programs needed to reduce ground level ozone concentrations in Washington County.

Ground level ozone is a colorless odorless gas that is formed when emissions of volatile organic compounds (VOCs) and nitrogen oxides (NOx) undergo a chemical reaction under intense sunlight. Ground level ozone can cause serious health problems and is of particular concern to young children, the elderly and individuals with existing lung problems. Pollutants that cause ozone are also significant contributors to pollution of the Chesapeake Bay.

On December 31, 2002, Washington County and MDE submitted "The Early Action Compact for Washington County, Maryland", and the United State Environmental Protection Agency (U.S.EPA) approved it on the same day. The Early Action Compact (EAC) for Washington County is an air quality planning agreement developed to reduce ozone pollution, with the U.S. EPA, in partnership with the Maryland Department of the Environment and Washington County, Maryland (see Appendix A). As part of the agreement, Washington County is required to develop and implement through the State Implementation Plan (SIP) process a local air quality plan that shows how implemented pollution reduction measures will bring the area into attainment of the 8-hour ozone standard by December 31, 2007. The development and implementation of this plan must include specific steps and must meet certain target deadlines as set forth in the following list of milestones:

Table 1: List of Early Action Compact Milestones

DATE	ACTION
December 31, 2002	Compacts must be completed, signed by local, State (or Tribal) and EPA officials, and formally submitted
June 16, 2003	Compact areas identify/describe local control measures that are being considered during the planning process. Deadline for describing the control measures must be met to maintain program eligibility.
June 30, 2003	Submit semi-annual progress report to EPA.
December 31, 2003	Detailed discussion of local emission reductions strategies submitted.
March 31, 2004	The resulting local plan, including control measures, must be completed and submitted to the State by this date for inclusion in the SIP.
June 30, 2004	Submit semi-annual progress report to EPA.
December 31, 2004	States must submit a SIP consisting of the local plan, including all adopted control measures that demonstrate attainment of the 8-hour ozone NAAQS by December 31, 2007
June 30, 2005	Submit semi-annual progress report to EPA.
December 31, 2005	Compact areas must implement the local control measures that have been incorporated into the SIP.

June 30, 2006	Compact areas must certify progress toward attainment since previous milestone, e.g., continued implementation and progress toward improvement in air quality and emissions reductions.
December 31, 2007	Area must attain the 8-hour ozone NAAQS. Failure to attain by this date will result in the nonattainment designation becoming effective.

Washington County must submit an EAC State Implementation Plan (SIP) to the U.S. EPA by December 31, 2004. This plan must be prepared in accordance to U.S. EPA's EAC guidance and respective memorandums (these documents can be found in *Appendices B and C of this document)*. This SIP is Washington County's Air Quality Plan that outlines how the Washington County Early Action Compact area will achieve local reductions earlier than otherwise required to demonstrate attainment of the 8-hour ozone National Ambient Air Quality Standards (NAAQS) by December 31, 2007. Should Washington County fail to submit this SIP, meet future milestones, and/or fail to meet the 8-hour standard by December 31, 2007 then the County will get merged with the Washington D.C. Metropolitan 8-hour Ozone Nonattainment Area (NAA) at the "moderate" classification level and will share the Clean Air Act (CAA) requirements and 2010 attainment date with the entire NAA.

Table 2 provides a summary of the early action plan control measures. For potential control measures, the coverage area includes Washington County, but also upwind sources in adjacent EAP areas (Virginia and West Virginia). Detailed descriptions, emission benefits, and current status for the control measures by source category may be found in *Appendix D* of this document. *Appendix E* contains a comprehensive analysis of the transportation emissions reduction measures as well as references to the documentation used to support the analysis.

Available modeling and other technical analysis indicates that Washington County, with the planned control measures implemented, will be in attainment of the 8-hour ozone standard in December of 2007. The technical modeling was a joint effort between Maryland, Virginia, and West Virginia and modeled under one modeling domain. It includes a base case scenario using the 1999 National Emissions Inventory (NEI) and a future case that estimates the expected growth to 2007. The modeling exercise indicates that the desired result of reducing ozone concentrations to levels below the 8-hour ozone standard will be achieved by the implementation of the controls included in this EAP, and combined with the control strategies being implemented on the state and federal levels.

Table 2: List of Control Measures

STATE & LOCAL CONTROL MEASURES
Highway
VMT and Trip Reduction Measures
▪ Ride-Matching/Commuter Connections
▪ Transit Programs in Washington County
▪ Park & Ride Lots
▪ Telework Center/Telecommuting
▪ Air Quality Action Days
▪ Clean Air Partners/Public Education Outreach
▪ E-government/E-commerce Enhancements
▪ Enterprise Zone Jobs Tax Incentives
▪ Growth Management Program
Traffic Flow Improvements
▪ Signal System Enhancements
▪ Incident Management/Intelligent Transportation Systems (ITS)
On-Road Vehicle Acquisitions/Replacements
▪ On-Road Vehicle Acquisitions
State Control Measures
▪ Vehicle Emissions Inspection Program (VEIP)
Area Sources
▪ OTC Programs
▪ Low Emissions Paint
Off-Road Sources
▪ Off-Road Vehicle Replacement
Stationary Sources
▪ RACT Controls
FEDERAL CONTROL MEASURES
Highway
▪ NLEV
▪ TIER II
▪ HDE Standard
Off-Road Sources
▪ Phase I & II Engine Standards
▪ Engine Standards for Diesel Powered Engines
▪ Engine Standards for Gasoline Powered Marine Engines
▪ Engine Standards for Large Gasoline Powered Engines
▪ Engine Standards for Locomotive Engines
Stationary Sources
▪ NOx SIP Call

2.0 INTRODUCTION AND BACKGROUND

This document, entitled *Washington County Early Action Compact Ozone State Implementation Plan*, presents the Maryland Department of the Environment's (MDE's) progress in adopting and implementing air pollution control programs needed to reduce ground-level ozone concentrations in Washington County. Washington County is currently monitoring ozone values above the new 8-hour ozone standard and will need to comply with the 8-hour ozone standard by December 31, 2007 and maintain that standard until at least 2012. Failure to meet this obligation results in immediate reversion to the traditional nonattainment process.

2.1 The Problem: Ground-Level Ozone

All of the 134,246 residents of Washington County are likely to experience some of the adverse effects of air pollution at one time or another, either directly or indirectly, especially when they are working outdoors or exercising on a day when ground level ozone levels are high. Air pollution can affect human health, especially among children, the elderly and individuals with respiratory problems. The pollutants found in our air also have a measurable impact on Washington County's economy because of crop losses and increasing health care costs.

2.1.1 Source of Ozone Precursors

A number of diverse sources discharge volatile organic compounds (VOCs) and nitrogen oxides (NOx), the two primary pollutants responsible for ozone formation. Man-made (anthropogenic) sources are divided into four categories: point, area, on-road mobile, and off-road mobile sources.

Point sources are primarily manufacturing businesses that produce emissions equal to or greater than 10 tons per year (tpy) of VOCs or 25 tpy of NOx. Large industrial plants such as power plants and chemical manufacturers are examples of point sources.

Area sources are smaller sources of air pollution whose emissions are too small to be measured individually. Examples of area sources include commercial and consumer products (such as paints and hairspray), bakeries, gasoline refueling stations, printing facilities and autobody refinishing shops.

Mobile sources are broken down into two categories: on-road mobile sources and off-road mobile sources. The former include cars, vans, trucks, and buses (i.e. vehicles that operate on highways). Off-road mobile sources include boats, lawn and garden equipment, construction equipment, and locomotives.

2.1.2 Formation of Ozone Precursors

Ground-level ozone is formed when a mixture of common air pollutants react in heat and strong sunlight. The main ozone-causing pollutants are NOx (from fuel burning sources like utilities and automobiles) and VOCs (from sources such as gasoline, paints, inks and solvents). These two categories of pollutants are also referred to as ozone precursors. Motor vehicles account for about 30-40% of the ozone forming pollutants in the Washington and Baltimore areas. The formation of ozone is dependent on weather conditions such as temperature, the amount of sunlight, and wind direction and strength. Because sunlight and high temperatures function as catalysts to form ozone, the problem is seasonal, with the ozone season lasting from May through September in the Baltimore and Washington Region. Typically, ozone levels escalate rapidly around noontime, peak in the afternoon and taper off when the sun goes down.

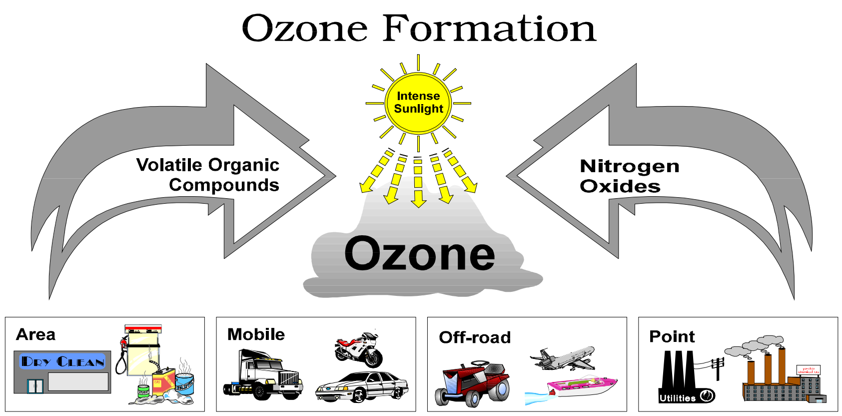

Figure 1: Ozone Formation

It is important to distinguish ozone in the upper atmosphere from ground-level ozone. The former, known as the ozone layer, acts as a shield in the sky to protect us from the sun's harmful ultra-violet rays. The latter, when in the air we breathe in high concentrations, poses a threat to human health and to the natural environment. Ground-level ozone (O_3) is not discharged directly but is formed through a complex series of chemical reactions when oxygen molecules and atoms (O_2 + O) are combined.

2.1.3 General Description of Health Effects of Ozone

Ozone is a highly reactive gas that reacts strongly with living tissues, as well as many man-made substances. Since 90% of the ozone breathed into the lungs is never exhaled, ozone molecules react with lung tissue to cause several health consequences.[1] Exposure to ozone can result in both acute and chronic effects in healthy individuals as well as those who are already sensitive to air pollution, such as children, asthmatics and the elderly (see Appendix F).

Acute effects among healthy populations include impaired lung function and reduced ability to perform physical exercise. For example, healthy young people developed significant lung function decrements, additional coughing and breathing pains, and enhanced airway reactivity to irritants when exposed to ozone at concentrations between 80-120 ppb for 6.6 to 7.0 hours while

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[1] *Sources and Health Effects of Ground-Level Ozone*, downloaded from http://www.dnr.state.wi.us/eq/air/ozone/b_effect.htm.

moderately exercising.[2] Among sensitive populations, acute effects include increased hospital admissions and emergency room visits for respiratory diseases.

Air pollution retards the development of children's lungs, making the victims weaker and more vulnerable to lung ailments, heart disease, and other health problems later in life[3]. High ozone levels may cause asthma, not just exacerbate it as previously thought, according to a study carried out by a team from Keck School of Medicine of the University of Southern California.

Chronic effects of ozone are more difficult to identify because individuals are exposed to a broad range of air pollutants and conditions over long periods of time. Epidemiological studies suggest lung function generally decreases in people living in areas with high ozone levels.

According to a recent study published in the Journal of the American Medical Association by Yale University, "children with asthma were particularly vulnerable to ozone even at levels below EPA's current 8-hour ozone standard". The editorial of the study warned, [that] " Air pollution is one of the most under-appreciated contributors to asthma". In addition, the Yale University scientists conducted a year-round community health study. The study focused on five hundred students that were monitored in a region with high levels of ozone for four years. Their findings showed that high levels of ozone and co-pollutants were associated with diminished lung function and frequent reports of respiratory problems among the students[4].

In Southern California's larger research studies, efforts were undertaken to ascertain whether exposure to high levels of ozone effect children. These studies showed that exposure to high levels of ozone increased absences for elementary schools; increased asthma attacks; and reduced lung function in children with asthma who spent more time outdoors playing[5.]

In sum, health effects from exposure to ozone can include any or all of the following:

- Increased susceptibility to respiratory infection.
- Impaired lung function and reduced ability to perform physical exercise.
- Severe lung swelling and death, due to short-term exposures greater than 300 ppb.
- Increased hospital admissions and emergency room visits from respiratory diseases.

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[2]Foinsbee et al., 1990; Horstman et al., 1990; McDonnell et al., 1991, *Out of Breath: A Report on the Health Consequences of Ozone and Acidic Air Pollution in Metropolitan Chicago*, American Lung Association of Metropolitan Chicago, October 19, 1994.

3 New England Journal of Medicine, Volume 351:1057-1067, September 9, 2004

4 America Lung Association **State of the Air**, May 2004, p.1-209.

5 Ibid.

2.1.4 Washington County Specific Health Effects

According to the American Lung Association, 2004[6] State of the Air report, populations at risk from increased ozone exposure in Washington County include:

- 25,492 children under the age of 14;
- 18,897 residents over the age of 65;
- 8,434 adult asthmatics and 2,573 child asthmatics;
- 4,598 residents with chronic bronchitis; and
- 1,662 residents with emphysema.

2.2 Clean Air Act Requirements

The original Air Pollution Control Act was passed in 1955 in response to public concerns raised over several air pollution episodes that resulted in many fatalities. The most famous episode was the four-day "killer fog" in London, England that claimed 4,000 lives. In 1948, a similar incident in Donora, Pennsylvania culminated in 20 fatalities and 7,000 illnesses. In response to public concerns, Congress adopted air pollution control laws.

With the passage of the original Air Pollution Control Act of 1955 and the Clean Air Act (the Act) of 1963 (amended in 1967, 1970, 1977, and 1990), Congress responded to the air pollution problem by offering technical and financial assistance to the states. The Act of 1963 and subsequent amendments are intended to protect public health and the environment from hazards associated with airborne pollutants. The 1970 Amendments to the Act sharply increased federal authority and responsibility for addressing the air pollution problem; however, Section 107(a) of the Act still provided that each state "shall have the primary responsibility for assuring air quality within the entire geographic area comprising the state". Despite the states' role in attaining and maintaining air quality standards within its borders, the challenges require an extensively cooperative state/federal partnership.

One of the most important components of the 1970 amendments to the Act was the creation of National Ambient Air Quality Standards (NAAQS) for air pollutants, which endanger public health and welfare. A system of primary NAAQS was established for the protection of human health and a set of secondary standards was established for the protection of public welfare, property, crops, animals and natural ecosystems. A geographic area that meets or does better than the primary standard is called an attainment area; areas that do not meet the primary standard are called nonattainment areas. The six criteria pollutants for which NAAQS have been established are: lead (Pb), carbon monoxide (CO), particulate matter (PM), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and ozone (O_3). The last four pollutants are serious respiratory irritants. They are highly reactive compounds that can oxidize or burn tissues of the mucous membranes and lungs. Prolonged exposure can cause permanent scarring of lung tissue and reduced lung capacity.

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6 Ibid.

Despite the 1970 legislation, air quality in many areas of the country still did not meet the NAAQS, especially for ozone. Congress amended the Act again in 1977, partly to address those areas that had not attained the NAAQS. SIP revisions submitted pursuant to the requirements of the 1977 amendments yielded progress in meeting the NAAQS. However, many areas remained nonattainment.

In 1990, Congress once again enacted comprehensive amendments to the Act to revise State Implementation Plan (SIP) requirements for nonattainment areas. The requirements of the 1990 Amendments to the Act represent an unprecedented commitment to protecting public health and the environment. Title I of the Act classifies areas that exceed national health-based air quality standards based upon the severity of their pollution problem. In accordance with these classifications, the Act sets new deadlines for achieving the standard, and requires a minimum set of basic measures for each classification to ensure early progress toward this goal. Areas with more severe classifications must implement increasingly stringent measures.

Table 3 shows the current designations for the State of Maryland. This document deals only with Washington County.

The ozone problem is regional in nature since ozone travels across county and state lines. The Act created regions such as the Ozone Transport Region (OTR) to facilitate coordination and consensus building between states in areas with pollution transport problems. The Northeast OTR comprises Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, Rhode Island, New Jersey, Delaware, Maryland, Pennsylvania, Washington, DC, and Northern Virginia. The coordinating body for the Northeast OTR is the Ozone Transport Commission (OTC). All Maryland counties are part of the Northeast OTR. The OTR is not a nonattainment classification, but does have certain requirements associated with it.

2.3 Background of 8-Hour Ozone Standard

The federal Clean Air Act (CAA) requires the EPA to set air quality standards for commonly occurring air pollutants that pose public health threats. As such, states rely on the EPA and other scientific bodies to set air quality standards. The standards are set to protect public health with an adequate margin of safety. The CAA does not require that issues such as the feasibility of meeting a standard, cost-effectiveness of controls, and economic factors be considered when setting these health-based standards.

The CAA also requires that established standards be reviewed every five years and, if necessary, revised to reflect the most recent health information available. To accomplish this, EPA reviews current scientific studies and determines whether the science supports revising the standards. In this task, EPA is assisted by a broad range of scientific experts, industry representatives, public interest groups, and other interested parties who provide input into the analysis and interpretation of the data and related recommendations. The Clean Air Scientific Advisory Committee (CASAC), a congressionally mandated group of independent scientific and technical experts, also provides recommendations to EPA on the adequacy of the agency's review.
Based on its review, EPA determined that changes were needed in the ozone and particulate matter standards. CASAC agreed that the ozone standard should be changed to address the health concerns about longer exposures to ozone at lower levels (e.g., permanent scarring of lung

tissue leading to decreased lung function), and that the standard should be changed from 1 hour to 8 hours.

On July 18, 1997, the Environmental Protection Agency (EPA) revised the air quality standards for ozone. The new standard has two parts. First, the level or concentration of the standard is set at the threshold of harmful health effects. Second, the form of the standard is set and becomes the test by which compliance with the standard is measured, e.g., the level of the standard may be exceeded once per year before a violation occurs. EPA revised both the level and form of the ozone standard. EPA's authority was challenged to set the standards as well as the levels at which they were set. In a February 2001 decision, the Supreme Court upheld EPA's authority to set national air quality standards and, in a March 2002 ruling, the D.C. Circuit Court rejected the claim that EPA acted arbitrarily in setting the new standards. These two rulings allow EPA to move forward in implementing the new standards.

On June 19, 2002, EPA endorsed a new and innovative protocol, known as the Early Action Compact, a signed innovative agreements between EPA and some areas of the country that do not meet the national 8-hour ozone air quality standard. The protocol defers the effective date of nonattainment designations and allows areas to reduce ground-level ozone pollution sooner than the Clean Air Act requires (a copy of the guidance can be found in Appendix G).

Table 3: Maryland 8-Hour Ozone Classifications

AREA	CLASSIFICATION	ATTAINMENT DATE (FROM JUNE 15, 2004)
BALTIMORE, MD Anne Arundel County, Baltimore City, Baltimore County, Carroll County, Harford County, Howard County	Moderate Nonattainment Part of the Ozone Transport Region	2010
WASHINGTON, D.C. Calvert County, Charles County, Frederick County, Montgomery County, Prince George's County	Moderate Nonattainment Part of the Ozone Transport Region	2010
PHILADELPHIA/WILMINGTON/TRENTON Cecil County	Moderate Nonattainment Part of the Ozone Transport Region	2010
KENT/QUEEN ANNE'S COUNTY Kent County, Queen Anne's County	Marginal Nonattainment Part of the Ozone Transport Region	June 2007
WASHINGTON COUNTY (HAGERSTOWN) MD EARLY ACTION COMPACT	BASIC (deferred) Part of the Ozone Transport Region	December 2007
OTHER MARYLAND COUNTIES Allegany, Caroline, Dorchester, Garrett, Somerset, St. Mary's, Talbot, Wicomico, Worcester	Attainment Part of the Ozone Transport Region	N/A

2.4 Background of Early Action Compact/Plan

The Early Action Compact (EAC) for Washington County is an agreement with U.S. Environmental Protection Agency (EPA), in partnership with Maryland Department of the Environment (MDE) and Washington County entering into a commitment to develop a State Implementation Plan (SIP) that will achieve local reductions earlier than otherwise required to demonstrate attainment under the 8-hour ozone standard. In order to take part in this new program states and counties had to sign an agreement by December 31, 2002, as stated in the November 14, 2002, EPA Holmstead Memorandum. The goal of the program is to meet attainment of the 8-hour ozone NAAQS by December 31, 2007, about three years earlier than otherwise required.

Washington County and MDE submitted "The Early Action Compact for Washington County, Maryland" on December 31, 2002, and EPA approved it on the same day. The first submittal requirement of the EAC process required the local area to identify and describe the local control measures that will be considered during the local planning process to remain eligible in the program. With cooperation of local stakeholders, Washington County has submitted all semiannual progress reports to EPA in accordance with their guidance memorandum dated April 4, 2003, to remain eligible in the program.

The Attainment Demonstration included with this submittal shows that Washington County, with the planned control measures implemented, will be in attainment of the 8-hour ozone standard in 2007. The technical modeling was a joint effort between Maryland, Virginia, and West Virginia. The modeling includes a base case scenario using the 1999 National Emissions Inventory (NEI) and a future case scenario that estimates the expected growth to 2007. The modeling exercise indicates that the desired result of reducing ozone concentrations to levels below the 8-hour ozone standard will be achieved by the implementation of the controls included in this document in combination with the control strategies being implemented on the state and federal levels.

The EAC provides the opportunity to meet the 8-hour ozone standard expeditiously through local actions to reduce ozone precursor emissions. If successful, Washington County will avoid EPA designations as nonattainment and any requirements of the designation and classification.

2.5 Location and Description of EAC Area

Washington County is located in west-central Maryland, bounded by Pennsylvania, Virginia and West Virginia. The county extends east to South Mountain, south to the merging of the Shenandoah and Potomac Rivers, north to the Pennsylvania border and west to Sideling Hill Creek. It is bordered by the Appalachian Highlands, and situated at the center of the Cumberland Valley with low rolling hills, cultivated valleys, woodlands and moderate elevations of 500-800 feet above sea level. Hagerstown, the county seat, is located in the center of the county and approximately 75 miles west of Washington, DC, and Baltimore.

Washington County is part of the Washington DC – Baltimore Consolidated Metropolitan Statistical Area (CMSA), but is characteristically different from the core metropolitan areas of Baltimore and Washington DC with respect to the degree of urbanization, population density, growth, and commuting patterns. The CSMA boundaries are shown in Figure 2.

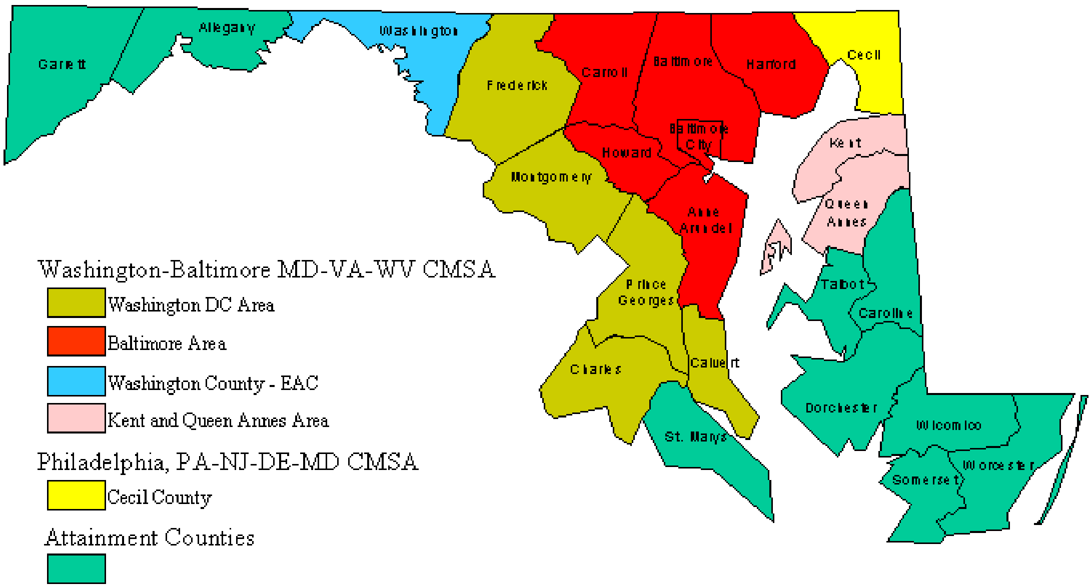


Figure 2: Maryland Consolidated Metropolitan Areas

The entire state of Maryland is part of the Northeast Ozone Transport Region (OTR). As part of the OTR, Washington County is already subject to many air control requirements such as New Source Review, Vehicle Emissions Inspection Program (VEIP), Reasonable Available Control Technology (RACT), and many other regional programs. Figure 3 below shows Maryland's current nonattainment designations for the 8-hour standard.

8-Hour Ozone Non-Attainment Areas in Maryland
State of Maryland

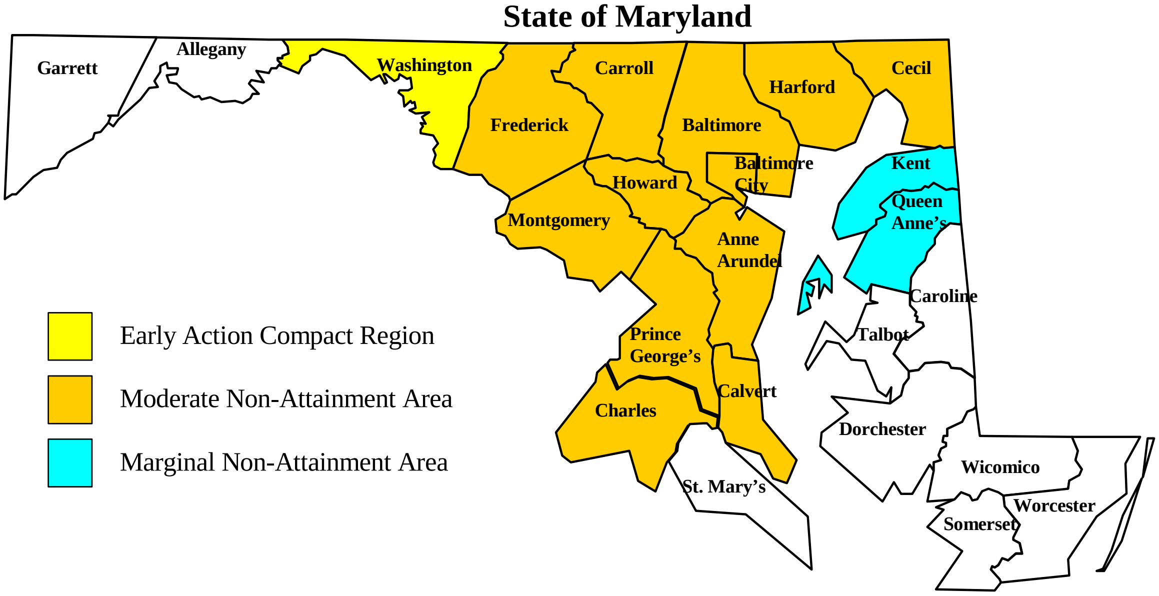


Figure 3: Map of 8-Hour Ozone Nonattainment Areas

2.6 Demographics

Washington County enjoys a high employment rate and moderate incomes, with a lower cost of living than nearby metropolitan areas. From the 2000 Census and Maryland Department of Labor, Washington County's basic demographics are provided in Table 4. The population is projected to grow to more than 145,000 by year 2020.

Table 4: Demographic Profile of Washington County for 2000

Population	Households	Employment Force
131,923	49,726	70,857

*SOURCE: Population & Households: U.S. Census Bureau (2000). Employment Force: MD Department of Labor, Licensing & Regulation, Office of Labor Market Analysis & Information (2003).

Washington County has extensive surface transportation grids relative to its population and economy. Interstate 81 bisects the County north/south, connecting New England to the southern states. U.S. Interstate 70 runs east/west, from Baltimore to California. U.S. Interstate 68 begins at the town of Hancock, taking commercial and public traffic to Morgantown, WV and other corridors west. Interstates 70 and 81 are major long distance routes for passengers and freight. U.S. Route 40 runs east/west through the City of Hagerstown, generally north of and parallel to 1-70. Other prominent federal highways include U.S. Routes 11, Alternate 40, and 522.
The location provides access to over 50% of the nation's population by overnight truck. Suppliers, customers and freight relay operations are plentiful in or near Washington County.

Development of new business and industry has been continuing with new investments created and an estimated million square feet under construction. Existing businesses have enjoyed growth, joining new companies in Washington County's commercial family. Both public and private sectors make up the top employers in the county. The top 10 employers in Washington County are provided in Table 5.

Table 5: Top 10 Employers in Washington County

Number	Employer	Employees
1	Washington County Health System	3,000
2	State of Maryland	2,591
3	Washington County Public Schools	2,563
4	Citicorp Credit Services, Inc.	2,500
5	First Data Merchants Services	2,081

6	Garden State Tanning	1,140
7	Mack Trucks, Inc.	1,133
8	Washington County Government	830
9	Phoenix Color Corporation	725
10	Federal Government	655

*Source: Economic Development Commission 2002 Annual Report, Hagerstown-Washington County.

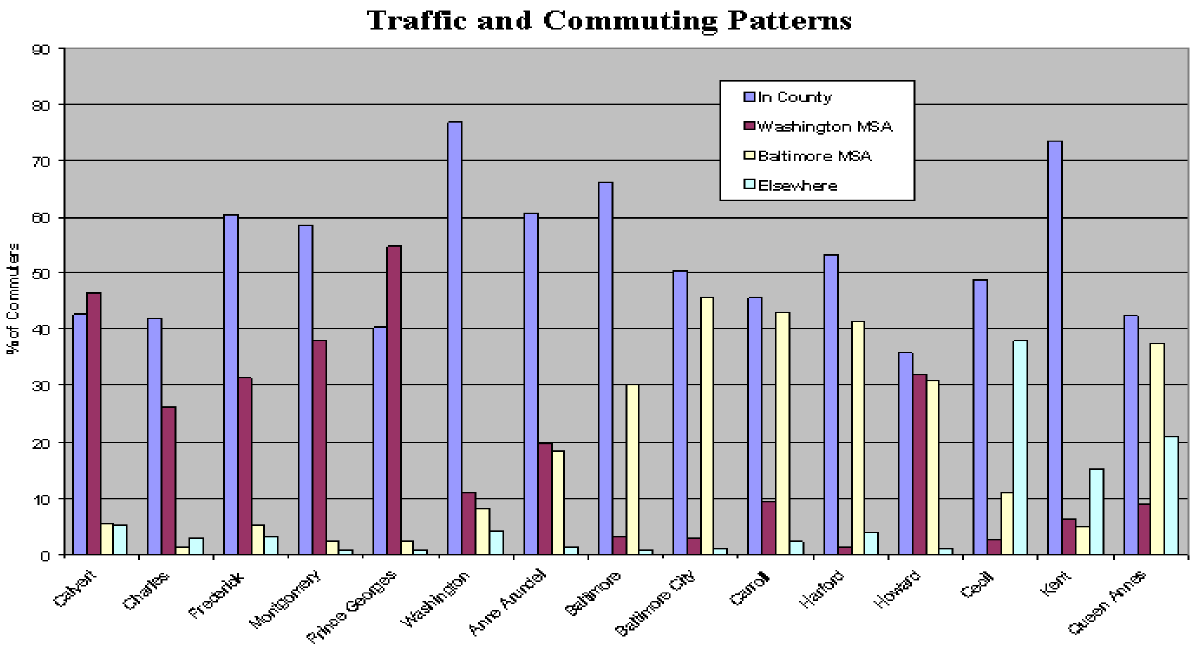
Projected population growth in Washington County is expected to increase from the current 2000 levels, but not at the same rate from 1990 to 2000. The total land area in the county is 485 square miles. The population density is relatively small compared to the counties in the Baltimore and Washington DC areas, which have a population density over 1000 persons per square mile. The projected growth and population densities for Washington County are shown in Table 6.

Table 6: Washington County Population Growth and Density

Year	Population	Population Density	Percent Change (10 Year)
1990	121,393	265	
2000	131,923	288	+8.7%
2010	139,000	303	+5.4%

*Source: U.S Census Bureau.

The traffic and commuting patterns in Washington County show a high percentage (~76%) of the trips are performed within the county. Despite the high percentage of through traffic on Interstates I-81 and I-70, the majority of the work trips are local. As compared to the other counties in the state, the primary work trips are to the central business districts in Baltimore and Washington DC, which is expected. Figure 4 shows the county percentages of commuting patterns in county, to Washington, DC Metropolitan Statistical Areas (MSA), Baltimore MSA or elsewhere.



Source: US Census 2000 Transportation Planning Package (CTPP), County-to-County Work Flow

Figure 4: Traffic and Commuting Patterns for Maryland

2.7 Washington County Monitoring Data

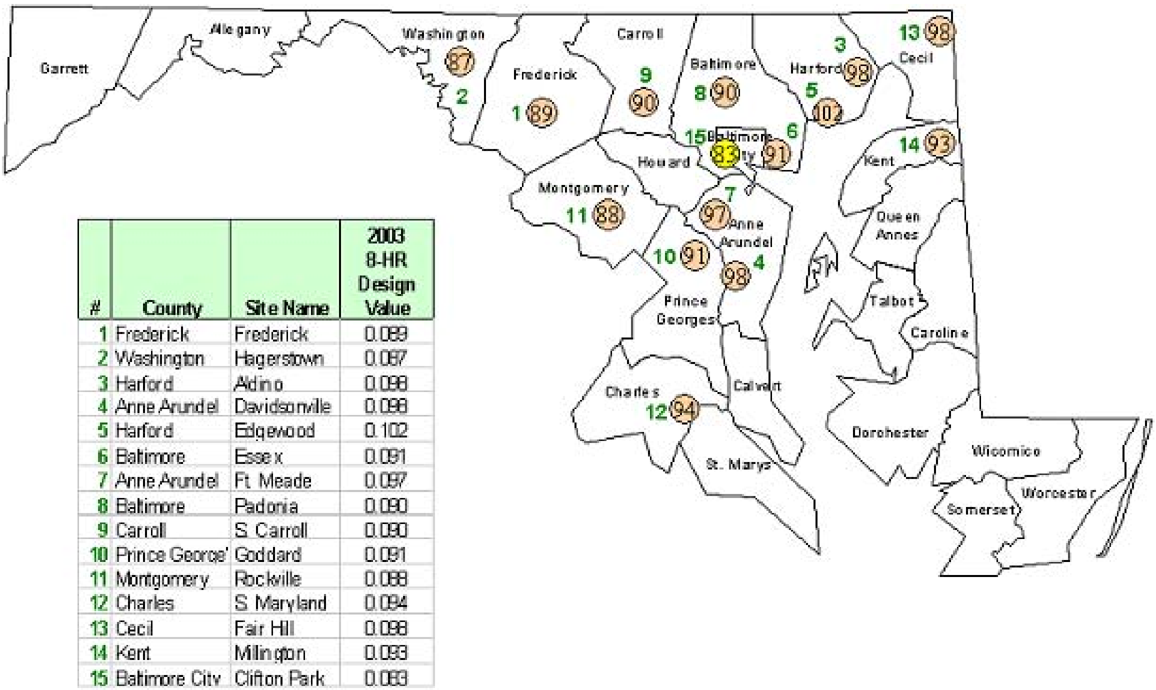
The Washington County ozone monitor is located on Roxbury Road in Hagerstown at the Maryland Correctional Institute. The design value for the 8-hour ozone standard is based on the fourth highest ozone reading for each year and averaged over three years. Table 7 shows the monitor data between 2001 and 2003. The 8-hour ozone standard is 0.085 ppm.

Table 7: Washington County 8-Hour Ozone Monitor Data (2001-2003)

	2001	2002	2003	Design Value
4^{th} MAX Ozone (ppm)	0.086	0.096	0.078	0.087
Days > Std	5	17	3	

*Source: U.S. Environmental Protection Agency: Air Data, Monitor Values Report. http://aospub.epa.gov/airsdata/adaqs

A total of fifteen monitors are located throughout the state of Maryland. All of the monitors except the Washington County monitor are located in either the Washington DC or Baltimore Area. The design value for each monitor is provided in Figure 5. The values represent the fourth highest average over the last three years (2001-2003).



#	County	Site Name	2003 8-HR Design Value
1	Frederick	Frederick	0.089
2	Washington	Hagerstown	0.087
3	Harford	Aldino	0.098
4	Anne Arundel	Davidsonville	0.098
5	Harford	Edgewood	0.102
6	Baltimore	Essex	0.091
7	Anne Arundel	Ft. Meade	0.097
8	Baltimore	Padonia	0.090
9	Carroll	S. Carroll	0.090
10	Prince George'	Goddard	0.091
11	Montgomery	Rockville	0.088
12	Charles	S. Maryland	0.094
13	Cecil	Fair Hill	0.098
14	Kent	Millington	0.093
15	Baltimore City	Clifton Park	0.083

Figure 5: Maryland 8-Hour Ozone Monitor Design Values (2001-2003 Data)

2.8 Washington County 1999 Emissions Inventory

On December 3, 2003 the EPA identified the proposed 8-hour ozone nonattainment areas for the state of Maryland. The letter to Maryland identifies Washington County as an EAC area and notes that EPA will defer its nonattainment designation. However, the letter also explains that if the EAC milestones are not met by December 31, 2007, Washington County would be classified the same as the Washington DC area and would become part of the Washington D.C. Nonattainment Area.

Figure 6 shows the emission levels for Washington County and adjacent counties in the Baltimore/Washington nonattainment areas based on the 1999 National Emission inventory (NEI) maintained by EPA. This inventory is used for the base scenario for the technical modeling.

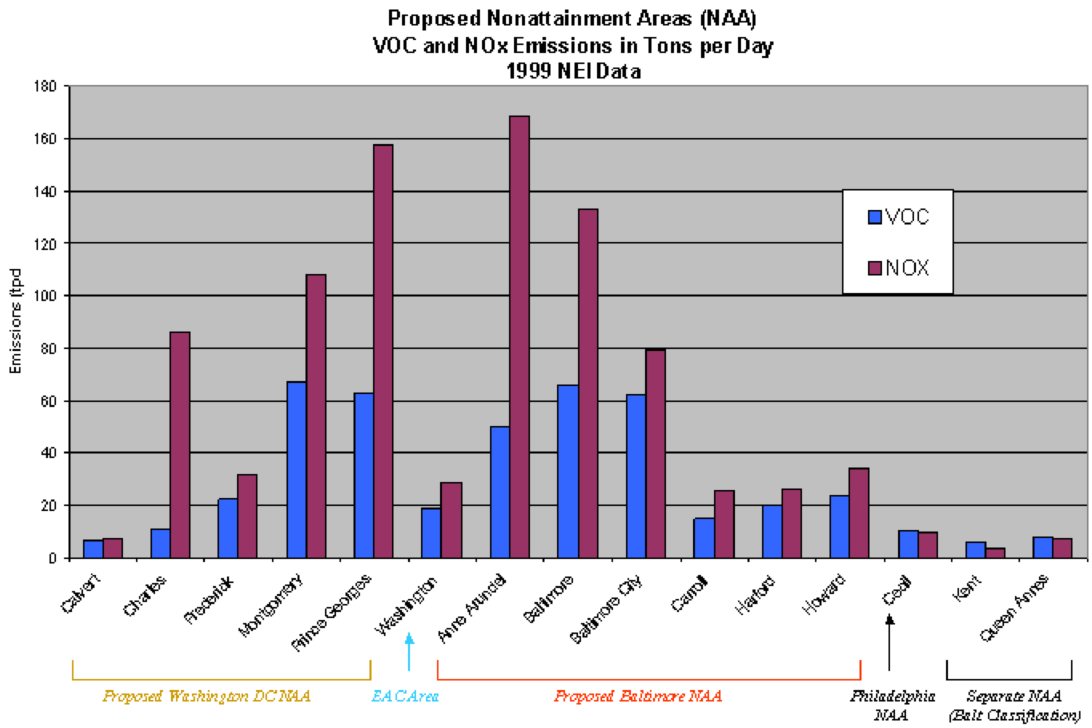


Figure 6: 1999 NEI for VOC and NOx by Proposed Nonattainment Areas

The NEI is submitted on a triennial basis and maintained by EPA. It includes a number of sources, but is grouped into four major source categories. The four major sources and their descriptions include:

Point Sources – Large stationary sources like utility and industrial facilities

Area Sources – Small individual sources like dry cleaners, solvents, and gasoline distribution

Non-road – Construction vehicles, marine vessels, lawn and garden vehicles, locomotives and aircraft that primarily operate off public roads.

Highway – 28 motor vehicle classes that operate on interstates, arterials and collectors within the public road network.

For Washington County, the emissions from highway (on-road) sources make up 48% of the VOC and 44% of the NOx as reported in the 1999 NEI. Figure 7 shows the emission distribution between the major sources.

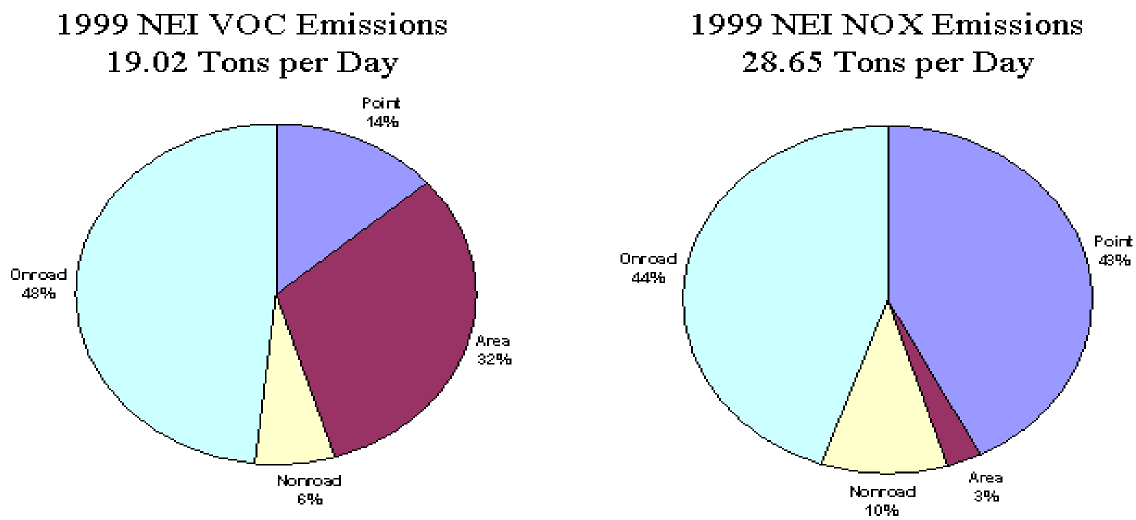


Figure 7: Washington County VOC and NOx Emissions by Major Source

The 1999 NEI served as the starting point to the control measure selection process for the Washington County Early Action Compact Plan (EAP). The EAP control measures upon implementation will total an emissions reduction of 1.58 tons/day of VOC emissions and 5.54 tons/day of NOx emissions from the baseline. These reductions correspond with a 15% VOC and a 28% NOx emissions reduction from the 1999 levels. A summary by major sources is provided in Table 8.

Table 8: Washington County Control Measures Emissions Reductions

Source	1999 Emissions Inventory		2007 Emissions Reductions (tons per day)	
	VOC	NOx	VOC	NOx
State and Local Control Measures				
Point	**2.61**	**12.2**	**0.00**	**-1.45**
Area	**6.01**	**0.74**	**-0.03**	**0.00**
Non-Road	**1.2**	**2.91**	**0.00**	**0.00**
On-Road	**9.2**	**12.8**	**-0.56**	**-0.65**
Federal Control Measures			**-0.95**	**-3.41**
TOTALS	**19.02**	**28.65**	**-1.85**	**-5.54**

2.9 National Ozone Standard

The Federal Clean Air Act is the comprehensive law that regulates airborne emissions from area, mobile, and stationary sources nationwide. This law authorizes the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment. The EPA currently has two NAAQS for ozone, the 1-hour peak standard and the 8-hour standard.

Areas formally declared in violation of the NAAQS and adjacent contributing areas are designated “nonattainment areas.” Nonattainment areas must meet certain Clean Air Act requirements, such as:

Transportation Conformity - Requires a demonstration that regional long-range transportation plans will not negatively impact air quality, or federal transportation funds can be withheld.

New Source Review - Requires a review of new or expanded industrial operations to minimize air pollution.

Rate of Progress Requirements - A certain percentage of pollutants must be reduced each year.

Specific attainment date - Consequences of failure to reach attainment by the specified date include more stringent control measures and the potential for stiff penalties.

10-year maintenance plan - Includes additional or continuing mandatory programs for 10 years following attainment.

Another requirement obligates the state to develop and implement a prescriptive comprehensive clean air plan that mandates how the area will come into compliance with the standard. This plan and any revisions to it are known as the State Implementation Plan (SIP).

2.9.1 1-Hour Standard in Washington County

An area must have a monitored hourly peak ozone concentration below 125 parts per billion (ppb) to meet the 1-hour ozone standard. If an area exceeds the standard more than three times in three years, it is subject to a nonattainment designation. The Hagerstown monitor located in Washington County has not exceeded the 1-hour standard since 1999. Washington County remains in compliance for the 1-Hour ozone standard. Washington County has one ozone monitor located in the city of Hagerstown.

2.9.2 8-Hour Standard in Washington County

The Washington County area has exceeded the federal health standard for ground level ozone during the past several years. The number of ozone exceedance days ranged from a low of 2 in 2000 to a high of 17 in 2002. Federal law allows one violation of the standard a year (averaged over 3 years) in any one location. Figure 8 shows the number of days that Washington County has violated the 8-hour ozone standard. Between 2000-2003, there were a total of 27 days when Washington County’s ozone monitor measured exceedances of the 8-hour ozone standard.

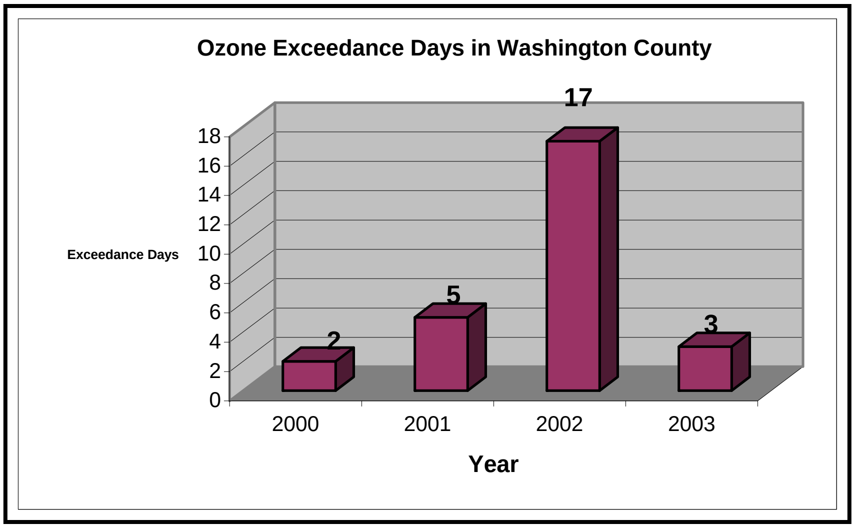


Figure 8: 8- Hour Ozone Exceedance Days in Washington County

2.10 Ozone Early Action Program (OEAP)

The region is volunteering to put itself into the OEAP process to expedite air cleanup for future public health and welfare.

2.10.1 Protocol for OEAP

The OEAP was developed according to protocol endorsed by EPA Region 6 on June 19, 2002 (as supplemented in a letter dated October 18, 2002, from Gregg Cooke, EPA, to Robert Huston, Texas Commission on Environmental Quality). The Protocol offers a more expeditious time line for achieving clean air than expected under EPA's 8-hour implementation rulemaking.

The principles of the OEAP to be executed by Local, State and EPA officials are:

- Early planning, implementation, and emission reductions leading to expeditious attainment and maintenance of the 8-hour ozone standard;
- Local control of the measures to be employed, with broad-based public input;
- State support to ensure technical integrity of the OEAP;
- Formal incorporation of the OEAP into the SIP;
- Deferral of the effective date of nonattainment designation and related requirements so long as all OEAP terms and milestones are met; and
- Safeguards to return areas to traditional SIP requirements should OEAP terms and/or milestones be unfulfilled, with appropriate credit given for emission reduction measures implemented.

2.10.2 The Washington County OEAP Components:

1. The Early Action Compact (EAC) — EAC is a Memorandum of Agreement to prepare and implement an Early Action Plan (EAP). More specifically, the EAC sets measurable milestones for developing and implementing the EAP.

2. The Early Action Plan (EAP) — EAP serves as Washington County's official air quality improvement plan, with quantified emission-reduction measures. The EAP will include all necessary elements of a comprehensive air quality plan, but will be tailored to local needs and driven by local decisions. Moreover, the EAP will be incorporated into the formal SIP and the region will be legally required to carry out this plan just as in nonattainment areas. For example, development of EAP will require the same scientific diligence and undergo the same scrutiny as the nonattainment areas' SIPs, so that the emission reduction strategies selected will be adequate to ensure the region stays in attainment of the 8-hour standard.

2.10.3 OEAP Versus Traditional Nonattainment

A major advantage of the region's participation in an OEAP is the flexibility afforded to the signatories in selecting emission reduction measures and programs that are best suited to local needs and circumstances. Recognizing the varied social and economic characteristics of the region, not all measures can or should be implemented by every entity.

The primary differences between OEAP and the traditional nonattainment area process are:

- The OEAP allows for more local control in selecting emission-reduction measures.
- The OEAP provides deferral of nonattainment designation and related requirements, as long as Plan requirements and milestones are met. This would prevent any related stigma associated with a nonattainment designation.
- The OEAP is designed to achieve clean air faster than under the traditional SIP process.
- Should any milestones be missed in designing or implementing the Plan, the area would automatically revert to the traditional SIP requirements, with appropriate credit given for emission reduction measures already implemented.

2.10.4 OEAP Timeline

The Washington County OEAP is designed to enable a local, proactive approach to ensuring attainment of the 8-hour ozone NAAQS, and so protect human health. Using the OEAP approach, the region could begin implementing by 2005 emission-reduction measures directed at attaining the 8-hour standard. This allows for a significantly earlier start than waiting for formal EPA nonattainment designation and it gives more flexibility in choosing which emission reduction strategies to implement.

2.10.5 Early Action Compact Milestone Requirements

For an area to participate in the Early Action Compact program, the local community must develop and implement through the State SIP a local air quality plan that will bring the area into attainment of the 8-hour NAAQS by December 31, 2007. The development and implementation of this plan must include specific steps and must meet certain target deadlines as set forth in the following list of milestones.

Table 9: Early Action Compact Milestones

DATE	ACTION
December 31, 2002	Compacts must be completed, signed by local, State (or Tribal) and EPA officials, and formally submitted
June 16, 2003	Compact areas identify/describe local control measures that are being considered during the planning process. Deadline for describing the control measures must be met to maintain program eligibility.
June 30, 2003	Submit semi-annual progress report to EPA.
December 31, 2003	Detailed discussion of local emission reductions strategies submitted.
March 31, 2004	The resulting local plan, including control measures, must be completed and submitted to the State by this date for inclusion in the SIP.
June 30, 2004	Submit semi-annual progress report to EPA.
December 31, 2004	States must submit a SIP consisting of the local plan, including all adopted control measures that demonstrate attainment of the 8-hour ozone NAAQS by December 31, 2007
June 30, 2005	Submit semi-annual progress report to EPA.
December 31, 2005	Compact areas must implement the local control measures that have been incorporated into the SIP.
June 30, 2006	Compact areas must certify progress toward attainment since previous milestone, e.g., continued implementation and progress toward improvement in air quality and emissions reductions.
December 31, 2007	Area must attain the 8-hour ozone NAAQS. Failure to attain by this date will result in the nonattainment designation becoming effective.

2.11 State Implementation Plan (SIP) Process

The CAAA requires states to develop and implement ozone reduction strategies in the form of a State Implementation Plan (SIP). The SIP is the state's "master plan" for attaining and maintaining the NAAQS. The SIP is basically a "work in progress" in need of periodic revisions. *The Early Action Plan State Implementation Plan for Washington* has been written for this purpose according to a timeline and requirements established by the November 14, 2002, memorandum from Jeffrey Holmstead.

EPA has identified four fundamental principles that SIP control strategies must adhere to in order to achieve the desired emissions reductions.[7] The four fundamental principles are:

- that emissions reductions ascribed to control measures must be quantifiable and measurable (*quantifiable*);
- that the control measures must be enforceable, in that the state must show that they have adopted legal means for ensuring that sources are in compliance with the control measure (*enforceable*);
- that measures are replicable (*real*); and
- that the control strategies be permanent in that the SIP must contain provisions to track emissions changes at sources and to provide for corrective actions if the emissions reductions are not achieved according to the Plan (*permanent*).

Once a SIP is approved by the Administrator of the EPA, it is enforceable as a state law and as federal law under Section 113 of the CAAA. If the SIP is found to be inadequate in the EPA's judgement, and if the state fails to make amendments to rectify the problem, under §110(c)(1), the EPA Administrator issues binding amendments to the SIP. These amendments are referred to as the federal implementation plan (FIP). Should Washington County fail to submit their SIP, and meet the standards, and then they get merged with the Washington Metropolitan Nonattainment Area (NAA) at moderate classification and requirements with 2010 attainment date for the entire NAA.

[7] These four fundamental principles are outlined in the General Preamble to Title I of the Clean Air Act Amendments of 1990 at *Federal Register* 13567 (EPA, 1992).

3.0 OZONE TRANSPORT PROBLEM

High ozone levels in Washington County are significantly affected by ozone pollution floating in from distant upwind areas, like the Ohio River Valley, and closer neighboring areas like the Baltimore and Washington, DC metropolitan areas. MDE has conducted significant research to estimate the role of ozone transport into Maryland. More information can be found in Appendix H. On most high ozone days in Washington County, the MDE research indicates that over 90% of the problem originates from sources outside of the county. Despite the overwhelming role of ozone transport, the early reductions to be achieved under this EAC will help bring cleaner air to the area more quickly.

Because Maryland's high ozone levels are so significantly affected by ozone transport, Maryland was the first state in EPA Region III to submit its transport regulations (called the NOx SIP Call) and has filed a petition under Section 126 of the Clean Air Act to compel ozone precursor emissions reductions in upwind states. Efforts included in the Washington County EAP are under way to update regional transport modeling efforts as described in the Technical Efforts Section.

Maryland has developed air quality plans that incorporate a vast number of controls and programs aimed at reducing harmful emissions that cause air quality problems in our state. Maryland has implemented federal control programs, especially those that affect sources that can only be controlled through federal regulation. The Maryland Department of the Environment has gone further to develop State initiatives that have been used as model rules in other states to achieve additional reductions. The State has also utilized new opportunities, such as EPA's Voluntary Measures Policy, to encourage innovative reduction programs at the local government level. The Maryland Department of the Environment has supported the development of a number of regional controls and subsequently implemented these regulations aimed at reducing the precursors of ground level ozone.

3.1 Existing Control Measures in Washington County

The existing air pollution controls being implemented in Washington County are already much more stringent than the existing pollution controls in neighboring states. As such, Washington County commences work on its Early Action Plan (EAP) from a much higher rate of controls, and therefore has fewer and possibly less efficient control measures to choose from. Because Maryland is part of the Ozone Transport Region, Washington County is already subject to New Source Review, Enhanced Vehicle Emissions Inspection Program, VOC and NOx RACT and many other control programs. Below is a detailed list of control measures in Washington County.

3.2 Source Sectors

3.2.1 Area Sources

1. Automotive and light-duty truck coating
2. Can coating
3. Coil coating
4. Large appliance coating

5. Paper, fabric, vinyl and other plastic parts coating
6. Control of VOC emissions from solid resin decorative surface manufacturing
7. Metal furniture coating
8. Flexographic and rotogravure printing
9. Lithographic printing
10. Dry cleaning installations
11. Miscellaneous metal coating
12. Aerospace coating operations
13. Brake shoe coating operations
14. Control of VOC from structural steel coating operations
15. Manufacture of synthesized pharmaceutical products
16. Paint, resin and adhesive manufacturing and adhesive application
17. Control of VOC equipment leaks
18. Control of VOC emissions from yeast manufacturing
19. Control of VOC emissions from screen printing and digital imaging
20. Control of VOC emissions from expandable polystyrene operations
21. Control of landfill gas emissions from municipal solid waste landfills
22. Control of VOC emissions from commercial bakery ovens
23. Control of VOC from vinegar generators
24. Control of VOC emissions from leather coating
25. Control of VOC from explosives and propellant manufacturing
26. Control of VOC emissions from reinforced plastic manufacturing
27. Control of VOC from marine vessel coating operations
28. Control of VOC from bread and snack food drying operations
29. Control of VOC from distilled spirits facilities
30. Control of VOC from organic chemical production
31. Control of VOC from asphalt paving
32. Control of gasoline and VOC storage and handling (Stage I)

3.2.2 Mobile Sources

1. Motor vehicle emission control devices (federal mandates, Tier I & II, etc.)
2. Maryland Enhanced Vehicle Emissions Inspection Program (high enhanced I/M)
3. Diesel vehicle emissions control program
4. National Low Emissions Vehicle (NLEV)

3.2.3 Stationary Point Sources

1. Lower major source cutoff of 50 tons per year
2. Reasonably Available Control Technology (RACT) regulations
3. New Source Review (NSR)
4. NOx SIP Call
5. NOx Reduction and Trading Program

3.2.4 Stationary Area Sources

1. Automobile refinish coatings
2. Consumer Products Regulation
3. Degreasing Regulations
4. Architectural and industrial maintenance coatings (AIM)

5. Stage I Vapor Recovery

3.2.5 Nonroad Sources

1. EPA rules for large and small compression-ignition engines
2. EPA rules for smaller spark-ignition engines
3. EPA rules for recreational spark-ignition marine engines

In addition, many federal controls are scheduled for implementation by 2007, providing substantial VOC and NOx reductions. They include Tier 2 vehicles and low sulfur gasoline starting in 2004, the heavy-duty engine rule, and low sulfur diesel scheduled for 2007.

Maryland believes many of the control programs adopted in Washington County would provide local air quality benefits in other states and provide air quality benefits to states being impacted by transported pollution at the same time. The more widespread these measures are, the more benefit they provide. Since much of the groundwork, such as rule development and negotiations with the sources, has been done, broader implementation of these rules is cost effective and efficient. Measures that might be implemented include our most recent OTC rules for cleaner paints, consumer products, and gas cans. These programs are being implemented by the OTC member states and we believe regional control programs like these can provide significant air pollution benefits that improve the air quality for the entire eastern United States.

3.3 No Significant Contribution Demonstration

MDE believes that all State Implementation Plans (SIPs) for Early Action Compacts should include a "No Significant Contribution" Demonstration. The Department believes this is inferred under Section 110 (a) (2) (D) of the Clean Air Act (CAA) that states that each SIP must:

"D) contain adequate provisions -
(i) prohibiting, consistent with the provisions of this title, any source or other type of emissions activity within the State from emitting any air pollutant in amounts which will -
(I) contribute significantly to nonattainment in, or interfere with maintenance by, any other State with respect to any such national primary or secondary ambient air quality standard, or
(II) interfere with measures required to be included in the applicable implementation plan for any other State under part C to prevent significant deterioration of air quality or to protect visibility,"

The above regulation means that SIPs from upwind states are required to contain provisions that will prevent emissions from sources in those upwind states from interfering in any downwind state's attempt to reach the air quality standards required by the Clean Air Act.

3.4 Downwind Areas Affected by Emissions from Washington County, MD

Studies by the National Oceanographic and Atmospheric Administration (NOAA) show that air originating in Washington County may travel through Pennsylvania and New York into New England and Canada. For more details, please see Appendix H.

The 8-hour ozone episode of August 12th and 13th, 1999 is typical of what Washington County usually experiences during the course of an ozone season. During this episode, NOAA determined through computer modeling that air coming into Washington County was originating in areas to the west and south. On August 12th 1999 forward trajectories modeled by a NOAA Hysplit Model show that an air parcel leaving the low emissions area of Washington County headed north into Pennsylvania and New York. The August 12th morning and afternoon forward trajectories for Washington County are provided in Figures 9 and 10.

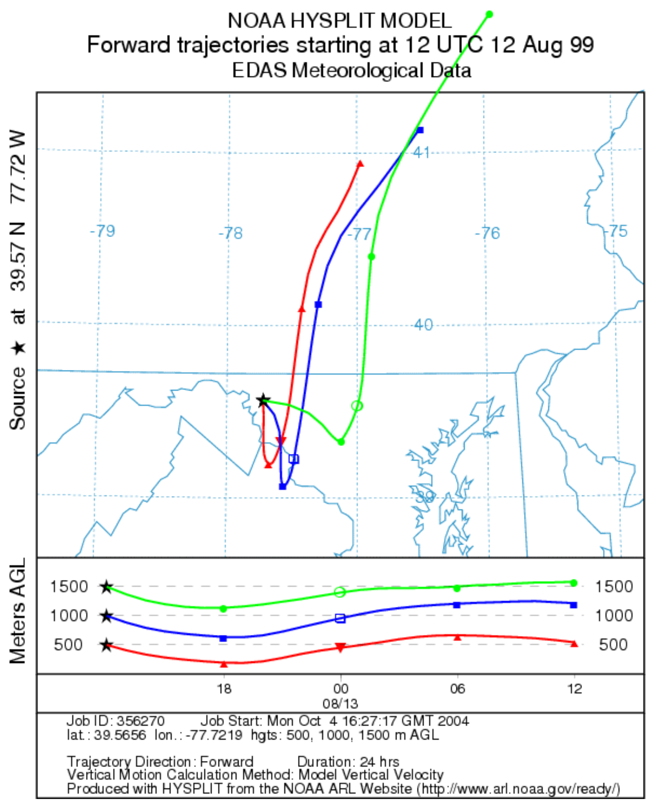


Figure 9: Forward Trajectories Starting at 12 UTC 12 August 1999

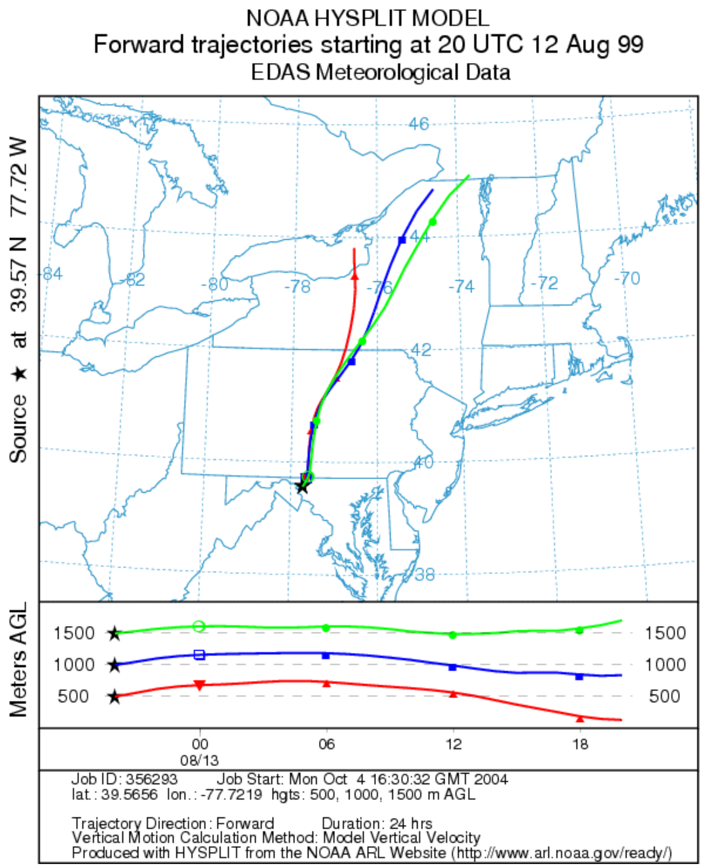


Figure 10: Forward Trajectories Starting at 20 UTC 12 August 1999

On the following day (August 13, 1999) NOAA modeled morning and afternoon forward trajectories showing that an air parcel leaving the low emissions area of Washington County headed northeast into Maine and Canada. This trajectory is shown in Figures 11 and 12.

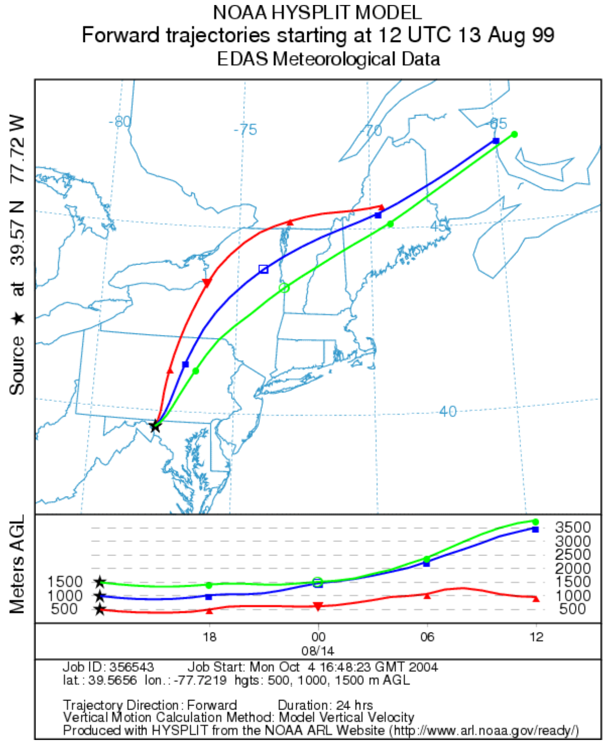


Figure 11: Forward Trajectories Starting at 12 UTC 13 August 1999

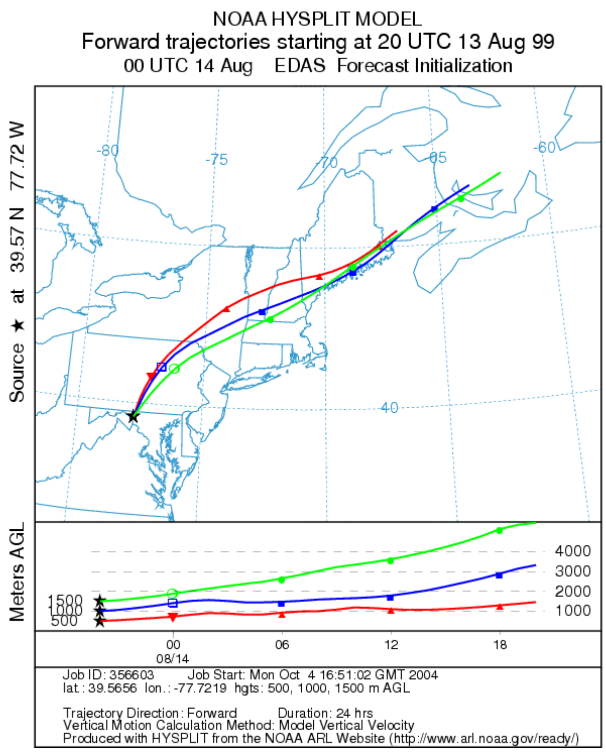


Figure 12: Forward Trajectories Starting at 20 UTC 13 August 1999

The list of control measures in Sections 3.2.1 through 3.2.5 will help Washington County address any significant contribution to downwind areas. Because Washington County is implementing control measures to reduce transport that are equal to or in many cases better than the control measures in the areas that they contribute to, MDE believes that Washington County has demonstrated that it has implemented sufficient control measures to reduce emissions and that this constitutes a showing that the "no significant contribution" test has been met.

4.0 TRADITIONAL AND NON-TRADITIONAL POLLUTION CONTROL EFFORTS FOR WASHINGTON COUNTY

Since the early 1970's, the MDE has been developing and implementing control programs to reduce emissions of VOC and NOx. These control efforts have required reductions from sources in all sectors of the inventory and ranged from traditional command and control regulations to voluntary programs focusing on reductions during very bad ozone events.

The existing air pollution controls being implemented in Washington County are already much more stringent than the existing pollution controls in neighboring states since Maryland is part of the Ozone Transport Region. The EAP Control Measures are scheduled to be implemented by the end of 2005 in Washington County. At this time, all control measures continue to be on schedule for implementation. Washington County has not experienced any problems or changes since March 2004 with the implementation schedule for these measures.

A summary table with all of the action plan measures with detailed descriptions, emission benefits, and current status for the following proposed control measures may be found in *Appendix D* of this document. *Appendix E* contains a comprehensive analysis of the transportation emissions reduction measures as well as references to the documentation used to support the analysis.

4.1 Early Action Plan Control Measures

The EAP control measures for Washington County are divided into two main categories: State and Local control measures and Federal control measures. They are further divided into four sub-categories: highway, area sources, off-road sources and stationary sources.

4.2 State and Local Measures

All control measures falling under the State and Local control measures category are either already in place or are scheduled to be implemented by end of 2005. Table 10 lists a summary of these measures and credits taken.

Table 10: State and Local Control Measures – Summary Table

	Emissions Reductions	
Measure	**VOC (kg/day)**	**NOx (kg/day)**
Ride-Matching/Commuter Connections	0.33	0.31
Park & Ride Lots	1.77	1.80
1. Telework Center 2. Telecommuting	0.19 2.87	0.22 3.12
Air Quality Action Days	Voluntary Program - No credit taken	

Clean Air Partners/Public Education Outreach	Voluntary Program - No credit taken	
Transit Programs in Washington County 1. County Commuter Bus Services (9 routes) 2. Turning Point Transit Services 3. Commuter Bus Service from Hagerstown to Shady Grove Metro Station	 5.30 0.43 1.65	 4.19 0.41 1.75
E-government/E-commerce Enhancements	1.59	0.31
Enterprise Zone Jobs Tax Incentive	1.59	1.85
Growth Management Program	13.24	15.42
Signal System Enhancements 1. US-40: Cleveland Avenue to Edgewood Road 2. MD-65 Doub Way to Henry Douglas Drive	 6.00 4.22	 1.81 1.27
Incident Management/Intelligent Transportation Systems (ITS) Highway Advisory Radio (3 locations)	17.59	7.99
On-Road Vehicle Acquisitions 1. Fleet Replacement (SHA - 2 vehicles) 2. Transit Fleet Replacement 3. Transit Engine Re-build 4. Fleet Replacement (MTA - 1 vehicle)	 0.01 - 0.02 1.49 0.00	 0.01 13.6 0.00 0.00
Vehicle Emissions Inspection Program (VEIP)	480.81	562.46
OTC Programs[8] 1. Consumer Products 2. Architectural and Industrial Maintenance 3. Portable Fuel Containers	 108.86 92.18 54.43	 0.00 0.00 0.00
Low Emissions Paint	26.28	0.00
Off-Road Vehicle Replacement	Credit not taken, as it is unquantifiable	
RACT Controls	0.00	1,312.31

Note: *Positive numbers imply reduction in emissions and negative numbers imply increase in emissions.*

4.2.1 Highway Sources

VMT & Trip Reduction Measures

A number of individual measures were selected to reduce vehicle miles traveled (VMT) and vehicle trips, thus reducing mobile source ozone emissions:

[8] PECHAN REPORT: Control Measure Development Support Analysis of Ozone Transport Commission Model Rules, March 31, 2001. http://www.otcair.org/document.asp?Fview=Report#

PROJECT TITLE:	**Ride-Matching/Commuter Connections**
DESCRIPTION:	Incentives and support for Car & Vanpool Programs. There are approximately 30 commuters participating in these programs in Washington County.
EMISSIONS REDUCTION:	VOC = 0.33 kg/day NOx = 0.31 kg/day
RESPONSIBLE AGENCY:	MWCOG & MTA
IMPLEMENTATION DATE:	IMPLEMENTED

PROJECT TITLE:	**Park & Ride Lots**
DESCRIPTION:	Existing Park & Ride Lots in the county (8 PNR Lots with 717 total parking spaces. Utilization rates as per Spring 2003 Park Ride Inventory).
EMISSIONS REDUCTION:	VOC = 1.77 kg/day NOx = 1.80 kg/day
RESPONSIBLE AGENCY:	MDOT
IMPLEMENTATION DATE:	IMPLEMENTED

PROJECT TITLE:	**Telework Center/Telecommuting**
DESCRIPTION:	1. Telework center in Hagerstown (32 workspaces at 60% utilization) 2. Telecommuting Outreach Program (home-based teleworkers)
EMISSIONS REDUCTION:	1. VOC = 0.19 kg/day NOx = 0.22 kg/day 2. VOC = 2.87 kg/day NOx = 3.12 kg/day
RESPONSIBLE AGENCY:	1. State/Federal Government 2. MWCOG
IMPLEMENTATION DATE:	IMPLEMENTED

PROJECT TITLE:	**Air Quality Action Days**
DESCRIPTION:	The Ozone Action Program currently in place in Baltimore and Washington DC will expand to Washington County. The Ozone Action Days program is a voluntary initiative by government, environmental groups, and business leaders working with the general public to take extra action to prevent air pollution when high ozone levels are predicted. Because ground level ozone forms under certain weather conditions, a regional team of meteorologists can predict days when ground-level ozone concentrations may exceed health standards. When the air quality is predicted to be poor in both the Baltimore and Washington areas, MDE will call for an Ozone Action Day. In the event of an Ozone Action Day, MDE and the Metropolitan Washington Council Of Governments will fax an air quality message to media outlets, government agencies and Ozone Action Day participants. In addition, daily forecasts and Ozone Action Day messages will be available on MDE's Ozone Forecast page and on the Air Quality Hotline. Washington County will create a web page that will contain information and links for air quality. There are many simple actions that people and businesses can take to help reduce air pollution on Ozone Action Days. Example Air Quality CODE RED day volunteer programs include: • Refuel cars after dusk and limit driving.

	• Put off any painting until later. • Don't use aerosol consumer products. • Avoid mowing lawns with gasoline-powered mowers. • Start charcoal with an electric or chimney-type fire starter instead of lighter fluid. • Take public transportation. • Try telecommuting.
EMISSIONS REDUCTION:	Voluntary Program – no credit taken.
RESPONSIBLE AGENCY:	MDE & Washington County
IMPLEMENTATION DATE:	By July 2005

PROJECT TITLE:	**Clean Air Partners/Public Education Outreach**
DESCRIPTION:	Clean Air Partners is a volunteer, nonprofit, public-private partnership chartered by the Metropolitan Washington Council of Governments (MWCOG) and the Baltimore Metropolitan Council (BMC) and will be expanded to include Washington County. The Partnership seeks to improve health and the quality of life in the region by educating the public to take voluntary action to reduce ground-level ozone and to reduce exposure to ozone. It will build and broaden awareness of how individuals contribute to air pollution while informing them about the adverse effects of ground level ozone. Transportation grants from the District of Columbia, MDOT, VDOT, and grants from private sector partners and MWCOG fund the operation. BMC, MDE and private sector partners contribute large amounts of in kind services.
EMISSIONS REDUCTION:	Voluntary Program – no credit taken.
RESPONSIBLE AGENCY:	MDE & Washington County
IMPLEMENTATION DATE:	Initial meeting held August 6, 2004. Fully implemented by June 2005.

PROJECT TITLE:	**Transit Programs in Washington County**
DESCRIPTION:	1. County Commuter bus services (9 routes) 2. Turning Point transit services. 3. Commuter bus service from Hagerstown to Shady Grove Metro Station.
EMISSIONS REDUCTION:	1. VOC = 5.30 kg/day NOx = 4.19 kg/day 2. VOC = 0.43 kg/day NOx = 0.41 kg/day 3. VOC = 1.65 kg/day NOx = 1.75 kg/day
RESPONSIBLE AGENCY:	Washington County / MTA
IMPLEMENTATION DATE:	IMPLEMENTED

PROJECT TITLE:	**E-government/E-commerce Enhancements**
DESCRIPTION:	
EMISSIONS REDUCTION:	VOC = 1.59 kg/day NOx = 0.31 kg/day
RESPONSIBLE	IVR/Permits Plus. Trips reduced or eliminated by using on-line and

AGENCY:	telecommunication services from MVA and Washington County's website. Washington County to implement services to assist permits and inspections.
IMPLEMENTATION DATE:	Website: On-going. Permits-Plus & Call-In: By Dec 2005 IMPLEMENTED / Permits-Plus is on schedule, working through privacy issues submitting sensitive information through the website.

PROJECT TITLE:	**Enterprise Zone Jobs Tax Incentive**
DESCRIPTION:	Tax incentives to eligible companies that expand or relocate operations within Washington Co. (Reduction in work trip length by employees included in this program).
EMISSIONS REDUCTION:	VOC = 1.59 kg/day NOx = 1.85 kg/day
RESPONSIBLE AGENCY:	Washington County
IMPLEMENTATION DATE:	IMPLEMENTED

PROJECT TITLE:	**Growth Management Program**
DESCRIPTION:	Hopewell Valley Promotion - policies that integrate transportation and land use decisions.
EMISSIONS REDUCTION:	VOC = 13.24 kg/day NOx = 15.42 kg/day
RESPONSIBLE AGENCY:	Washington County
IMPLEMENTATION DATE:	IMPLEMENTED

Traffic Flow Improvements

Projects included under this category are mainly focused on reducing idling emissions caused by congestion. These projects include any improvements made to roadway design, expansion or adding ITS to improve traffic conditions and traffic flow.

PROJECT TITLE:	**Signal System Enhancements**
DESCRIPTION:	State Highway Administration upgraded the signal systems on 2 corridors in Washington county which will improve traffic flow and reduce idling delay at intersections: 1. US-40: Cleveland Avenue to Edgewood Road. 2. MD-65: Doub Way to Henry Douglas Drive.
EMISSIONS REDUCTION:	1. VOC = 6.00 kg/day NOx = 1.81 kg/day 2. VOC = 4.22 kg/day NOx = 1.27 kg/day
RESPONSIBLE AGENCY:	SHA
IMPLEMENTATION DATE:	1. Implemented 2. FY 2004

PROJECT TITLE:	**Incident Management/Intelligent Transportation Systems (ITS)**
DESCRIPTION:	On-going and planned Incident Management programs by CHART in Washington County. 1. Highway Advisory Radio (3 locations)
EMISSIONS REDUCTION:	1. VOC = 17.59 kg/day NOx = 7.99 kg/day
RESPONSIBLE AGENCY:	MDOT – CHART
IMPLEMENTATION DATE:	1. IMPLEMENTED

On-road Vehicle Acquisitions/Replacements

PROJECT TITLE:	**On-Road Vehicle Acquisitions**
DESCRIPTION:	The following on-road vehicle replacements are scheduled in Washington County: 1. Fleet Replacement (SHA - 2 vehicles) 2. Transit fleet replacement (Bus replacement) a) Turning Point: one replacement. b) County Commuter: 5 scheduled replacement. 3. Transit engine re-built (Installation of Emissions Reduction Devices on Engine Re-build). County Commuter: 9 engine re-builds. (The state highway fleet replacement will be implemented at no cost to the county.) 4. Fleet Replacement (MTA – 1 vehicle)
EMISSIONS REDUCTION:	1. VOC = 0.01 kg/day NOx = 0.01 kg/day 2. VOC = - 0.02 kg/day NOx = 13.6 kg/day 3. VOC = 1.49 kg/day NOx = 0 kg/day 4. Credit not taken
RESPONSIBLE AGENCY:	SHA/MTA
IMPLEMENTATION DATE:	1. Two by 2005 2. a) By 2003 b) Two by 2004 & Three by 2005. 3. Three by 2003 & Three by 2004. 4. One truck in 2005

State Control Measures

PROJECT TITLE:	**Vehicle Emissions Inspection Program (VEIP)**
DESCRIPTION:	The Vehicle Emissions Inspection Program, mandated in Maryland and enforced by MDOT and MDE, includes an OBD II and IM240 program.
EMISSIONS REDUCTION:	VOC = 480.81 kg/day - 2007 NOx = 562.46 kg/day - 2007
RESPONSIBLE AGENCY:	MDE , MVA & Washington County
IMPLEMENTATION DATE:	IMPLEMENTED

4.2.2 Area Sources

Under the area sources are area-wide programs that affect the air quality in the entire region. The OTC programs and the Low Emissions Paint usage for line striping, affect only the VOC emissions in the region.

PROJECT TITLE:	**OTC Programs**
DESCRIPTION:	1. Consumer Products (CP): Beginning in January 2005, the rule will establish limits, expressed as percent VOC by weight, upon the concentration of VOCs contained in approximately 80 categories and subcategories of consumer products. 2. Architectural and Industrial Maintenance (AIM): The rule sets specific VOC content limits (in grams/liter) for 46 AIM coating categories. It requires compliance with the limits by January 1, 2005. In most cases, these limits are more stringent than existing Federal AIM rules. 3. Portable Fuel Containers (PFC): The regulation applies to new gas cans and spouts sold in Maryland starting January 1, 2003. The rule applies to any person or entity that sells, supplies, offers for sale, or manufactures for sale gas cans and/or spouts; and is intended to reduce VOC emissions from storage, transport, and refueling activities.
EMISSIONS REDUCTION:	1. VOC = 108.86 kg/day NOx = 0 kg/day 2. VOC = 92.18 kg/day NOx = 0 kg/day 3. VOC = 54.43 kg/day NOx = 0 kg/day
RESPONSIBLE AGENCY:	MDE
IMPLEMENTATION DATE:	IMPLEMENTED

PROJECT TITLE:	**Low Emissions Paint**
DESCRIPTION:	Use low emissions yellow and white paint for markings on roadways in county.
EMISSIONS REDUCTION:	VOC = 26.28 kg/day NOx = 0 kg/day
RESPONSIBLE AGENCY:	MDOT/SHA
IMPLEMENTATION DATE:	IMPLEMENTED

4.2.3 Off-Road Sources

PROJECT TITLE:	**Off-Road Vehicle Replacement**
DESCRIPTION:	Landfill vehicle replacements in Washington County include a Dozer and a Compactor in 2002 and a Tractor Mower in 2004.
EMISSIONS REDUCTION:	Credit not taken, as it is unquantifiable.
RESPONSIBLE AGENCY:	Washington County
IMPLEMENTATION DATE:	Two in 2002 and One in 2004.

4.2.4 Stationary Sources

PROJECT TITLE:	**RACT Controls (for R.Paul Smith/ Allegheny Energy)**
DESCRIPTION:	The entire state of Maryland in located in the Northeast Ozone Transport Region (OTR) and is subject to RACT controls for major stationary sources.
EMISSIONS REDUCTION:	VOC = 0.00 kg/day NOx = 1312.31 kg/day
RESPONSIBLE AGENCY:	MDE
IMPLEMENTATION DATE:	IMPLEMENTED

Table 11: RACT Emissions Reductions for Washington County Sources

RACT credit can only be taken for post-1999 controls. Other companies (on which RACT rules apply), which were included in the 1999 inventory, can be found in the weight of evidence section of this report.

COMPANY	VOC (tpy)	NOX (tpy)
R. Paul Smith/Allegheny Energy	0	528 tpy (1312.31 kg/ day)

4.3 Federal Control Measures

This section identifies the control measures implemented and regulated at the federal level. They include engine standards, fuel requirements, and stationary source controls that will be implemented by 2005 or phased-in implementation schedule completed by 2007. The federal control measures will apply to Washington County and the entire state of Maryland. Below is a summary table followed by brief description of each measure with estimated emission benefits.

Table 12: Federal Control Measures – Summary Table

Measure	Emissions Reductions	
	VOC (kg/day)	NOx (kg/day)
NLEV	81.65	99.79
Tier II	780.18	2,821.35
HDE Standard	0.00	172.37
Phase I & II Engine Standards	Credit not taken. Expected VOC benefit = 30% reduction by 2005.	

Engine Standards for Diesel Powered Engines	Credit not taken. Expected NOx benefit = 25% reduction in new engines by 2005.
Engine Standards for Gasoline Powered Marine Engines	Credit not taken. Expected VOC benefit = 25% reduction in new engines by 2005.
Engine Standards for Large Gasoline Powered Engines	Credit not taken. Expected VOC benefit = 20% reduction by 2005. Expected NOx benefit = 20% reduction by 2005.
Engine Standards for Locomotive Engines	Credit not taken. Expected VOC benefit = 30% reduction by 2005. Expected NOx benefit = 30% reduction by 2005.
NOx SIP Call	Credit not taken. Expected NOx benefit = 23% reduction by 2007.

Highway Sources

PROJECT TITLE:	**NLEV**
DESCRIPTION:	Under the National Low Emission Vehicle program auto manufacturers have agreed to comply with tailpipe standards that are more stringent than EPA can mandate prior to model year 2004. The NLEV program was instituted by the OTC states in 2001. Maryland opted into the program in 1999, two years prior to the OTC adoption.
EMISSIONS REDUCTION:	VOC = 81.65 kg/day NOx = 99.79 kg/day
RESPONSIBLE AGENCY:	EPA/FHWA
IMPLEMENTATION DATE:	IMPLEMENTED

PROJECT TITLE:	**TIER II**
DESCRIPTION:	Tailpipe standards are set at an average standard of .07 grams per mile for NOx for all classes of passenger vehicles beginning in 2004. Vehicles weighing less than 6,000 pounds will be phased-in to this standard between 2004 and 2007. Beginning in 2004, the nation's refiners and importers of gasoline will have the flexibility to manufacture gasoline with a range of sulfur levels as long as all of their production is capped at 300 ppm. By 2006, refiners will meet a 30 ppm average sulfur level with a maximum cap of 80 ppm.
EMISSIONS REDUCTION:	VOC = 780.18 kg/day NOx = 2821.35 kg/day
RESPONSIBLE AGENCY:	EPA/FHWA
IMPLEMENTATION DATE:	IMPLEMENTED

PROJECT TITLE:	**HDE Standard**
DESCRIPTION:	A PM emissions standard of .01 grams per brake-horsepower-hour for new heavy-duty engines is scheduled to take full effect in the 2007 model year. In addition, refiners will be required to start producing diesel fuel for use in highway vehicles with a sulfur content of no more than 15 ppm, beginning on June 1, 2006.
EMISSIONS REDUCTION:	VOC = 0 kg/day NOx = 172.37 kg/day
RESPONSIBLE AGENCY:	EPA/FHWA
IMPLEMENTATION DATE:	By 2007

Off-Road Sources

The off-road sources include federally regulated programs that have been implemented, at no cost to the county, between 1997 and 2007. The emissions reductions are federal estimates and are not included in the overall summary sheets because they are not quantified.

PROJECT TITLE:	**Phase I & II Engine Standards**
DESCRIPTION:	Phase I emission standards for non-road, handheld and non-handheld engines operating at or below 19 kW took effect in model year 1997. Phase II standards for non-road, non-handheld Class I and II engines operating at or below 19 kW will be phased in beginning in model year 2002 and will be complete by 2007.
EMISSIONS REDUCTION:	Credit not taken. Expected VOC benefit = 30% Reduction by 2005
RESPONSIBLE AGENCY:	EPA – Federal Rule
IMPLEMENTATION DATE:	1997 & 2002

PROJECT TITLE:	**Engine Standards for Diesel Powered Engines**
DESCRIPTION:	A three-tiered process, beginning in 1996 and continuing through 2008, will increase emissions standards for non-road diesel powered engines used for a variety of purposes such as construction & agriculture.
EMISSIONS REDUCTION:	Credit not taken. Expected NOx benefit = 25% Reduction in new engines by 2005
RESPONSIBLE AGENCY:	EPA – Federal Rule
IMPLEMENTATION DATE:	1996, 2001, & 2006.

PROJECT TITLE:	**Engine Standards for Gasoline Powered Marine Engines**
DESCRIPTION:	Outboard engine standards began in 1998 and will be phased in through 2006. Inboard standards were set in 2000. Auxiliary Marine engines that operate at less than 25hp were subject to emission standards beginning in 1997. A

	second phase of emission standards for these engines will be phased in between 2001 and 2005. Auxiliary engines that operate above 25hp will need to meet the requirements for the same size land-based non-road spark-ignition engines.
EMISSIONS REDUCTION:	Credit not taken. Expected VOC benefit =25% reduction in new engines by 2005
RESPONSIBLE AGENCY:	EPA – Federal Rule
IMPLEMENTATION DATE:	1997, 1998, 2000 & 2001

PROJECT TITLE:	**Engine Standards for Large Gasoline Powered Engines**
DESCRIPTION:	A two-tiered standard with Tier 1 beginning in 2004 and Tier 2 beginning in 2007. These standards will regulate non-road gasoline powered engines rated over 19kW.
EMISSIONS REDUCTION:	Credit not taken. Expected VOC benefit = 20% Reduction by 2005 Credit not taken. Expected NOx benefit = 20% Reduction by 2005
RESPONSIBLE AGENCY:	EPA – Federal Rule
IMPLEMENTATION DATE:	2004 & 2007

PROJECT TITLE:	**Engine Standards for Locomotive Engines**
DESCRIPTION:	A three-tiered emission standard for new or remanufactured locomotive engines.
EMISSIONS REDUCTION:	Credit not taken. Expected VOC benefit = 30% Reduction by 2005 Credit not taken. Expected NOX benefit = 30% Reduction by 2005
RESPONSIBLE AGENCY:	EPA – Federal Rule
IMPLEMENTATION DATE:	1973, 2002, & 2005

Stationary Sources

PROJECT TITLE:	**NOx SIP Call**
DESCRIPTION:	This federal rule and state regulation will be implemented to further reduce NOx emissions from major NOx sources. In Maryland these regulations affect electric generators, paper mills, cement plants, and large internal combustion engines located at natural gas pumping stations. Under these regulations, the NOx control systems are to be installed by 2003 to meet a NOx emissions budget established by EPA by 2007. This phase III NOx reduction program is projected to reduce NOx emissions by 23 percent from 1995 levels.
EMISSIONS REDUCTION:	Credit not taken. Expected NOx benefit = 23% Reduction by 2007.
RESPONSIBLE AGENCY:	Federal Rule & State Regulation
IMPLEMENTATION DATE:	2003

4.4 RACT Emissions Reductions Weight of Evidence Analysis

Maryland has been very aggressive with its emission control program for ozone. As part of the Ozone Transport Region, the MDE has historically implemented as many regulations as possible statewide and Washington County has been heavily regulated. One of the regulations that has been applied to Washington County is RACT or Reasonable Available Control Measures Technology. Stationary sources (above 25tpy in size) have been subject to the RACT rule since the late 1990's and many of the specific rules have been phased in over time. The list of RACT sources are all located in Washington County and the emission reductions listed next to the source name are reductions created via the state RACT rules. While MDE is not taking specific credit in this SIP for these source controls, the MDE showcases these reductions to support a weight of evidence demonstration that there are indeed emission reductions on-going in Washington County above the measures listed as a control in this SIP.

PROJECT TITLE:	**RACT Controls**
DESCRIPTION:	The entire state of Maryland in located in the Northeast Ozone Transport Region (OTR) and is subject to RACT controls for major stationary sources. The sources located in Washington County that are subject to RACT can be found in Table below along with their tons per year emissions benefits.
EMISSIONS REDUCTION:	VOC = 869.9 kg/day NOx = 2152.4 kg/day
RESPONSIBLE AGENCY:	MDE
IMPLEMENTATION DATE:	1997-2001
STATUS:	IMPLEMENTED

RACT Emissions Reductions for Washington County Sources

COMPANY	**VOC (tpy)**	**NOX (tpy)**
Amcor/Stevens	60	
Fil-Tec	60	
Fleetwood	10	
Garden State Tanning	45	
Engineered Polymer	30	
Rayloc	10	
Rust Oleum	5	
Mack Trucks, Inc.	30	20
St. Lawrence Cement		846
Xerxes Corporation	90	
Phoenix Color - Tandy Drive	40	

5.0 CONTINGENCY CONTROL MEASURES

The MDE will track the attainment status of the 8-hour ozone NAAQS in the Washington County EAC Area and analyze any exceedances of the 8-hour ozone standard (including the contribution from upwind states) that will occur after December 2005, in accordance with the procedures of 40 CFR, Chapter 1, Part 51, Appendix V.

After the 4th exceedance of the eight-hour ozone NAAQS occurs within a three year timeframe, Maryland would initiate the following schedule to assist in the attainment of the ozone NAAQS in Washington County by December 31, 2007:

1) Within 2 weeks – MDE will notify Washington County and other stakeholders of the violations and will schedule an initial work group meeting concerning contingency measures.
2) Within 6 weeks- MDE will convene a stakeholder group to evaluate the selection and implementation of the contingency measures. The stakeholder group will be composed of interested state and local government agencies; business, environmental and health representatives; citizens and other interested parties.
3) Within 12 weeks- A public meeting will be held on the proposed contingency measures.
4) Within 18 weeks- MDE/ Stakeholders will meet to consider public comments and to finalize contingency measures for submission to EPA.

Each control measure is described in more detail below.

5.1 Government Memo of Understanding

PROJECT TITLE:	**Government Memo of Understanding**
DESCRIPTION:	A government Memo of Understanding (MOU) can be used to encourage flextime work schedules for employees in the county. Incentives can also be offered to employers who agree to voluntarily adjust work schedules in order to reduce peak travel.
EMISSIONS REDUCTION:	VOC = 4.57 kg/day NOx = 4.24 kg/day
RESPONSIBLE AGENCY:	Washington County/MDE
IMPLEMENTATION DATE:	Before December 2007

5.2 Fuel Programs

PROJECT TITLE:	**Fuel Programs**
DESCRIPTION:	Fuel program options include reformulated gasoline (RFG) or low Reid vapor pressure (RVP) programs. Currently, both Washington DC and Baltimore areas mandate federal RFG. A low RVP program would be state regulated and would mandate low RVP of 7.8psi or 7.2psi for the summer ozone season. Both fuel options have significant emissions benefits, VOC and NOx for RFG and VOC for low RVP. The state and county could only select one fuel program from the two options.

EMISSIONS REDUCTION:	**Low RVP (7.8 – 7.2)** VOC = 208.65 – 444.52 kg/day NOx = 18.14 – 27.22 kg/day
RESPONSIBLE AGENCY:	MDE
IMPLEMENTATION DATE:	Before December 2007

5.3 Diesel Vehicle Emissions Controls

PROJECT TITLE:	**Diesel Vehicle Emission Controls**
DESCRIPTION:	Washington County will support state regulated diesel vehicle emissions controls. A large percentage of heavy-duty diesel trucks operate on the interstates and to local businesses in Washington County are not registered in the county or in Maryland. Therefore, any diesel controls will have to be regulated at the state or regional level. Possible diesel emission controls include: ▪ Vehicle idling policies/restrictions (Maryland currently has a 5 minute idling limit). There are 6 commercial truck stops with a total of 365 parking spaces and one rest area/welcome center in Washington county. Moreover, truck idling at warehouses, distribution centers, etc., during truck loading/unloading can also be targeted. ▪ Voluntary public outreach programs ▪ Opacity Testing: Most of the recent activity is in the area of diesel emissions. Maryland has a diesel smoke inspection program that is conducted by the Maryland State Police. This random roadside smoke opacity test requires a failed vehicle to be repaired and retested within 30 days. The program is seeing about a 70 % improvement in smoke levels on failed vehicles that have been retested.
EMISSIONS REDUCTION:	VOC = 3.24 - 6.48 kg/day NOx = 102.60 – 205.20 kg/day
RESPONSIBLE AGENCY:	Washington County/MDE
IMPLEMENTATION DATE:	Before December 2007

5.4 Gas Can Replacement

PROJECT TITLE:	**Gas Can Replacement**
DESCRIPTION:	650 Old gas cans will be exchanged for new CARB compliant cans that are designed to reduce spillage and evaporative emissions. In addition to reducing VOC emissions, these exchange programs also create public awareness. In an unprecedented public outreach and emission reduction effort, the Maryland Department of Transportation, partnered with the Maryland Department of Environment, and the Home Depot, exchanged 4,392 cans at 12 Home Depot locations across the D.C. nonattainment area of Maryland. In addition, 1,823 cans were exchanged during county household hazardous waste collection events. Similar programs can be easily implemented in Washington County.

EMISSIONS REDUCTION:	VOC = 4.10 kg/day NOx = 0.00 kg/day
RESPONSIBLE AGENCY:	Washington County/MDE
IMPLEMENTATION DATE:	Before December 2007

5.5 Lawnmower Replacement

PROJECT TITLE:	**Lawnmower Replacement**
DESCRIPTION:	100 old gasoline powered lawnmowers will be exchanged for new electric mowers, resulting in VOC and NOx benefits. Lawnmower exchanges have been a very popular and successful tool for raising public awareness as well as offering both VOC and NOx reductions. High polluting, old gasoline powered mowers are exchanged for electric mowers which have zero emissions. The Maryland Department of Transportation, partnered with MDE, Black & Decker and Home Depot, held a lawnmower exchange event for the D.C. nonattainment area in June of 2004. 662 gasoline-powered lawnmowers were replaced with electric mowers. MDE and MDOT, having sponsored successful events in the past, can provide logistical support for implementation in Washington County.
EMISSIONS REDUCTION:	VOC = 1.18 kg/day NOx = 0.03 kg/day
RESPONSIBLE AGENCY:	Washington County/MDE
IMPLEMENTATION DATE:	Before December 2007

5.6 Scheduled Control Measures by FY 2007

The following control measures have already been scheduled for implementation in FY 2006 & FY 2007.

PROJECT TITLE:	**Incident Management/Intelligent Transportation Systems (ITS)**
DESCRIPTION:	Planned Incident Management programs by CHART in Washington County: CCTV (2 locations) and Dynamic Message Signs (1 location)
EMISSIONS REDUCTION:	VOC = 19.86 kg/day NOx = 8.97 kg/day
RESPONSIBLE AGENCY:	MDOT – CHART
IMPLEMENTATION DATE:	By 2007
STATUS:	On Schedule

PROJECT TITLE:	**On-Road Vehicle Acquisitions**
DESCRIPTION:	The following on-road vehicle replacements are scheduled in Washington County: 1. Fleet Replacement (SHA - 5 vehicles) 2. Transit fleet replacement (County Commuter): 7 scheduled bus replacement 3. Fleet Replacement (MTA – 3 vehicles)
EMISSIONS REDUCTION:	1. VOC = 0.08 kg/day NOx = 0.07 kg/day 2. VOC = -0.03 kg/day (Increase) NOx = 21.67 kg/day 3. TBD
RESPONSIBLE AGENCY:	SHA/MTA
IMPLEMENTATION DATE:	1. Five by 2007 2. Five by 2006 & Three by 2007. 3. Two cars in 2007 & One SUV in 2007
STATUS:	1. On Schedule 2. On Schedule 3. On Schedule

6.0 MARYLAND, VIRGINIA, And WEST VIRGINIA EARLY ACTION COMPACT MODELING

The purposes of this section are to document the CAMx modeling results for the Early Action Compact (EAC) projects of Virginia, West Virginia and Maryland and to present the calculation of relative reduction factors and future year 8-hour ozone design values associated with monitors in the concerned EAC areas. This modeling project covers five EAC areas in Virginia, West Virginia and Maryland. The Virginia Department of Environmental Quality is the lead agency in conducting this modeling study. The August 8-18, 1999 ozone episode was selected and used for the EAC modeling project. The Comprehensive Air quality Model with extensions version 4.02 (CAMx) model was selected and used for the modeling project. The National Center for Atmospheric Research (NCAR)/ Penn State Mesoscale Model, MM5, was employed to provide spatial and temporal distribution of meteorological fields to the CAMx air quality model. The MM5 simulation was performed with 3 nested domains, with respective grid resolution of 108 km, 36 km, and 12 km. The Sparse Matrix Operator Kernel Emissions (SMOKE) emissions model was used to process emission inventories into the formatted emission files required by the CAMx air quality model.

The CAMx base case model performance has been evaluated using statistical and graphical metrics for both 36 km and 12 km resolution modeling domains. The CAMx photochemical model meets or exceeds established U.S. EPA performance criteria for attainment demonstrations. In some cases such as large urban areas, finer resolution of 4 km grid cells may be required to better account for local emission and ozone variations. However, after further evaluation and discussion, it was decided that 4 km grid resolution for this modeling exercise was not warranted because:

1. This and other regional modeling efforts have shown that there is much less local variation in predicted ozone levels in "rural" areas and that finer resolution is not needed.
2. Local ozone and emissions gradients (variations) in the EAC areas are relatively small.

The 2007 future emission inventories were developed for the modeling domains. The future year CAMx runs were performed with the same model configuration and meteorological fields developed for the base case runs. Relative reduction factors and future year 8-hour ozone design values at four monitors were calculated in accordance with the U.S. EPA's *Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS (1999)* and the U.S. EPA's *Protocol for Early Action Compacts (2003).* The results indicate that the attainment test is passed at all five monitors representing five EAC areas in three states during this modeling episode.

6.1 INTRODUCTION

In December of 2002, the Commonwealth of Virginia, the State of West Virginia, the State of Maryland, along with the local jurisdictions involved, signed and submitted ozone Early Action Compacts (EACs) to the U.S. EPA. The compacts were in turn signed by the EPA to complete the approval process. The purposes of the EACs are to defer the effective date of nonattainment designations for the involved local areas if violations of the 8-hour ozone NAAQS occur in the future. The EACs cover the following geographic areas:

The Roanoke, Virginia Metropolitan Statistical Area (Botetourt County, Roanoke County, Roanoke City, Salem City, and the Town of Vinton)
The Northern Shenandoah Valley Jurisdictions of Frederick County and Winchester City
Washington County, Maryland
Berkley County, West Virginia
Jefferson County, West Virginia

The EAC processes require photochemical dispersion modeling demonstrations to show attainment of the 8-hour ozone standard by December 2007.

The lead agency in the EAC modeling process for the above mentioned EAC areas is the Virginia Department of Environmental Quality (DEQ). Providing assistance to the DEQ are Roanoke/Alleghany Regional Commission (RVARC), local governments, the Maryland Department of Environment, the West Virginia Division of Air Quality, U.S. EPA and the University of North Carolina. The modeling study follows *Air Quality Modeling Analysis for Virginia, West Virginia and Maryland Early Action Ozone Compacts: Modeling Protocol, Episode Selection, and Domain Definition* prepared by Virginia Department of Environmental Quality.

This section documents the photochemical modeling study results for 1999 base case and 2007 future case for the EAC areas and demonstrates attainment of the 8-hour ozone standards by all the above mentioned EAC areas by December 2007.

6.2 Episode Days for Modeling

DEQ recommended eleven episode days for simulations based on the observations of elevated 8-hour ozone concentrations. The episode days are from August 8 to August 18, 1999 wherein high ozone concentrations were measured in the six EAC areas. August 12 and August 13 are selected as primary episode days for 8-hour ozone attainment demonstration.

The ozone episode of August 12-13, 1999 was typical of a regional episode in the area. Eight-hour average ozone concentrations peaked at 85 ppb and 87 ppb at Frederick County and Vinton, Virginia, respectively on August 12th. The eight-hour average at Vinton reached 91 ppb on August 13th. Both concentrations were close to the 2001-2003 eight-hour average design values (85 ppb at both locations). Highest eight-hour averages occurred in Northern Virginia, peaking at 115 ppb on August 12th.
August 12th:

The surface weather map (Figure 13) on the morning of August 12th indicated a trough of low pressure extending from coastal New England, through the Delmarva region into central Virginia. South and east of the trough, surface winds were generally from the southeast and higher dew point temperatures, indicative of maritime air. West of the trough, surface winds were calm or light and variable with lower dew point temperatures, indicative of ozone-conducive continental air. Haze ("∞") was reported over a large area from Maine into Tennessee and Georgia. Surface winds remained light into the afternoon. Forty-eight hour 500 and 1500 meter back trajectories for Roanoke and Winchester (18z, 2:00 pm EDT; Figures 14 and 15) ending that afternoon indicated that air passed over the Ohio River Valley and West Virginia; a typical high ozone, regional air flow pattern. The evening (00z, August 13, 8:00 pm EDT, August 12) surface weather map (Figure 16) indicated the trough of low pressure separating maritime from continental air persisted from New England southwestward through Maryland and Richmond, extending into central North Carolina. Maximum temperatures east of the trough were around 90 degrees. West of the trough, high temperatures reached into the low to mid 90s.

August 13th:

The surface weather map on the morning of August 13th (Figure 17) indicated the trough extended from Washington, DC through central Virginia into central North and South Carolina. Again, higher dew point temperatures and southerly winds east of the trough indicated maritime air. Lower dew points and calm winds west of the trough indicated the presence of a continental air mass. Forty-eight hour 500 and 1500 meter back trajectories for Roanoke (Figure 18) ending that afternoon originated from the Great Smokey Mountains region of northeastern Tennessee and north central Tennessee, respectively. Forty-eight hour 500 and 1500 meter back trajectories for Winchester ending that afternoon are shown in Figure 19. The 500 meter trajectory originated in West Virginia, stagnating and looping over west-central Virginia. The 1500 meter trajectory passed over the Ohio River Valley and West Virginia. The surface trough separating the maritime air from the continental air persisted into the evening (Figure 20). High temperatures reached the mid-to-upper 90s in the region.

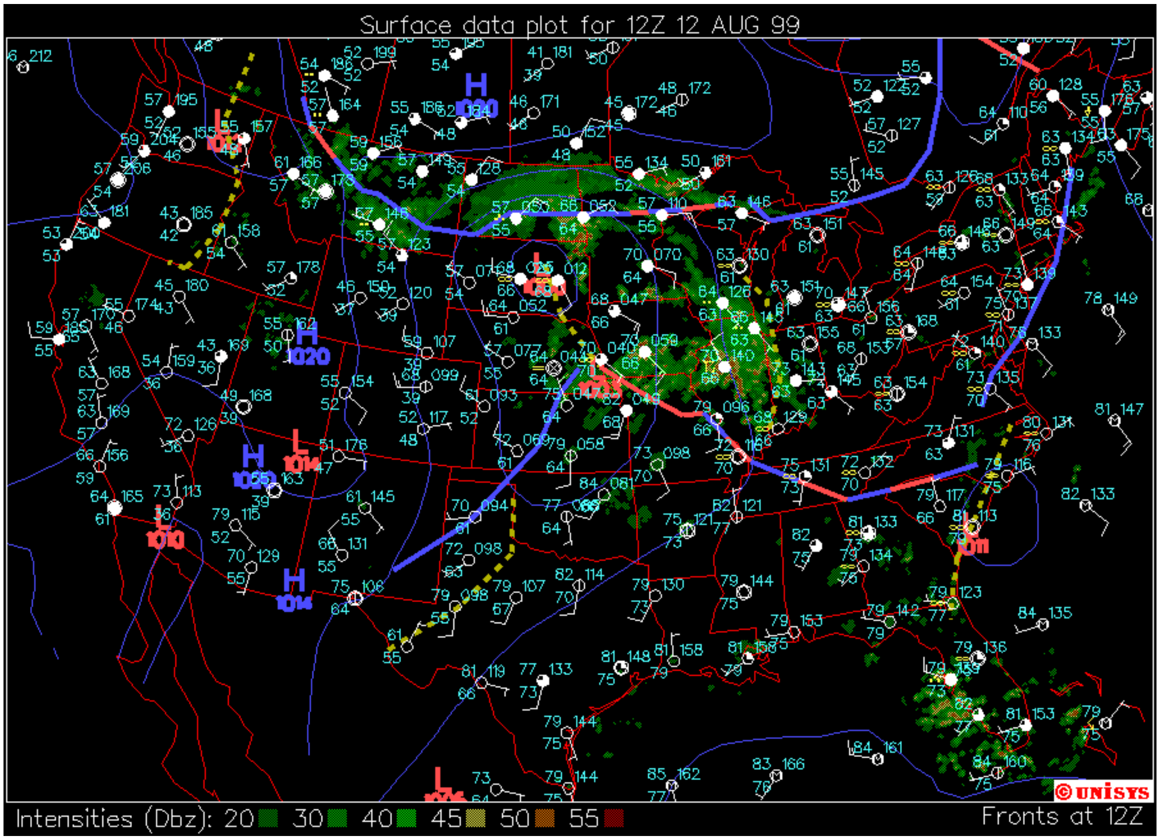


Figure13: Surface data plot for 12z, August 12, 1999.

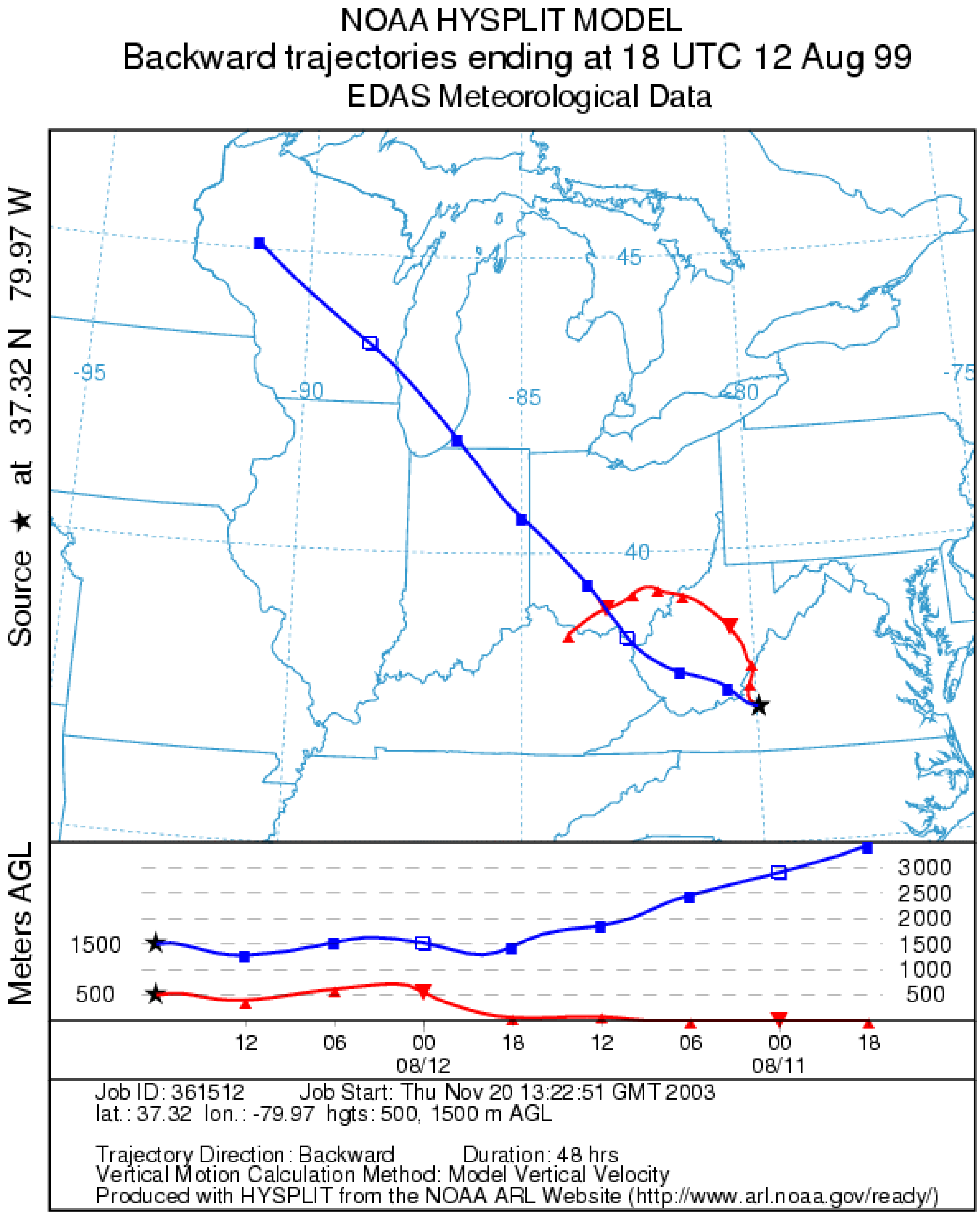


Figure 14: 48-hour NOAA HYSPLIT model back trajectory for Roanoke, 18z, August 12, 1999.

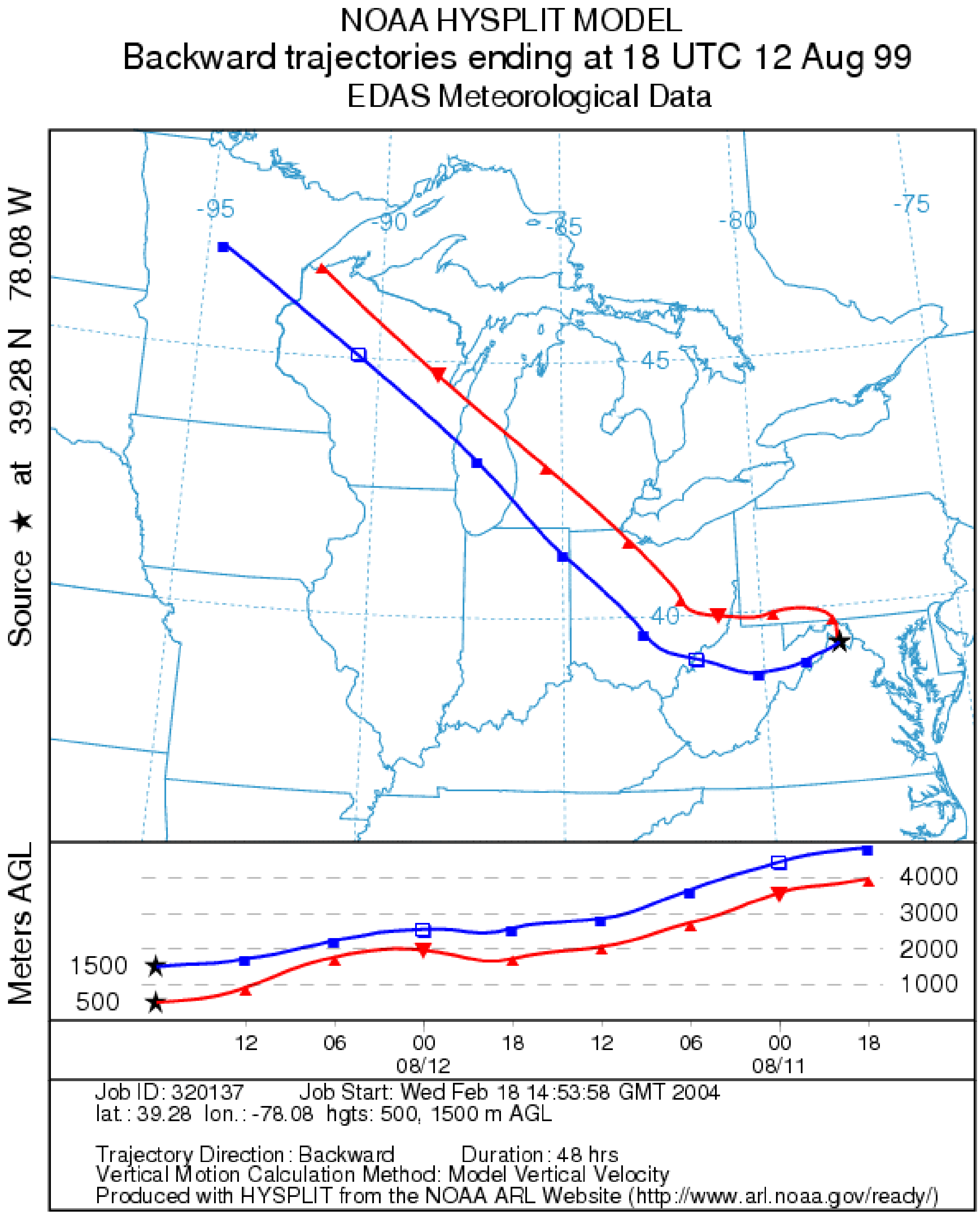


Figure 15: 48-hour NOAA HYSPLIT model back trajectory for Winchester, 18z, August 12, 1999.

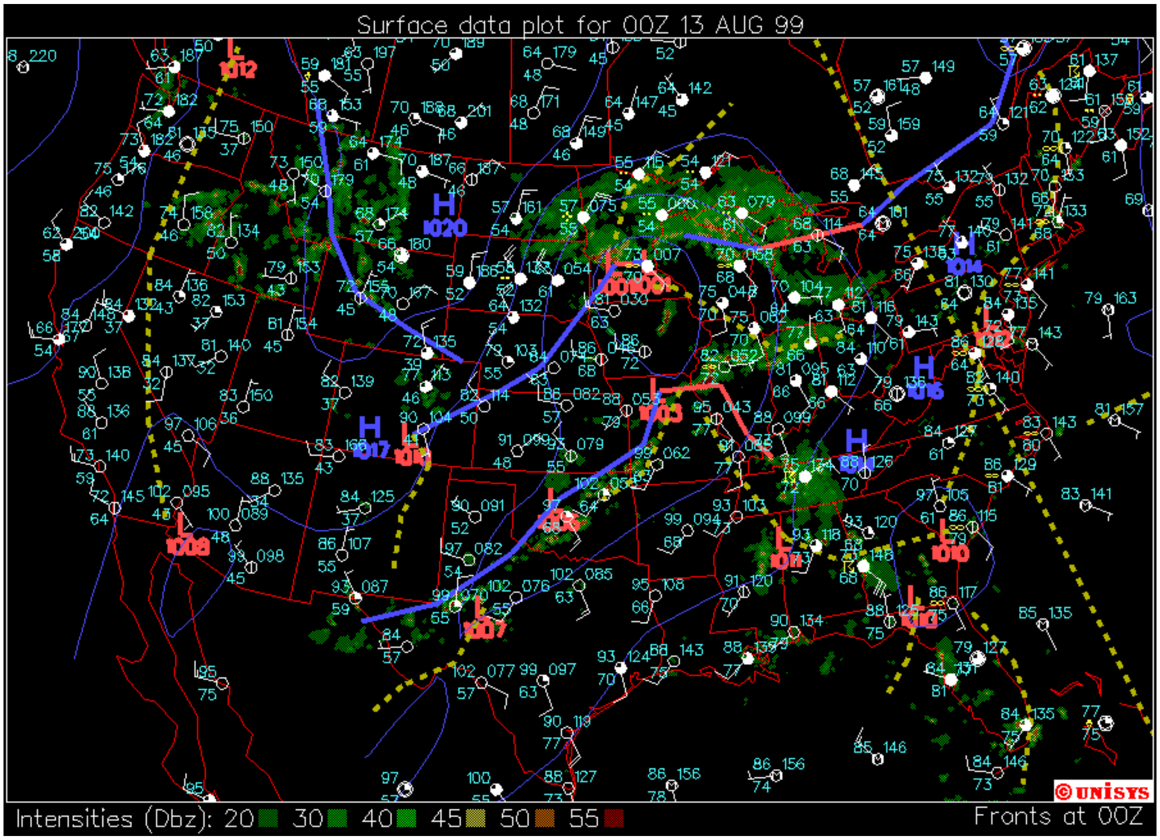


Figure 16: **Surface data plot for 00z, August 13, 1999.**

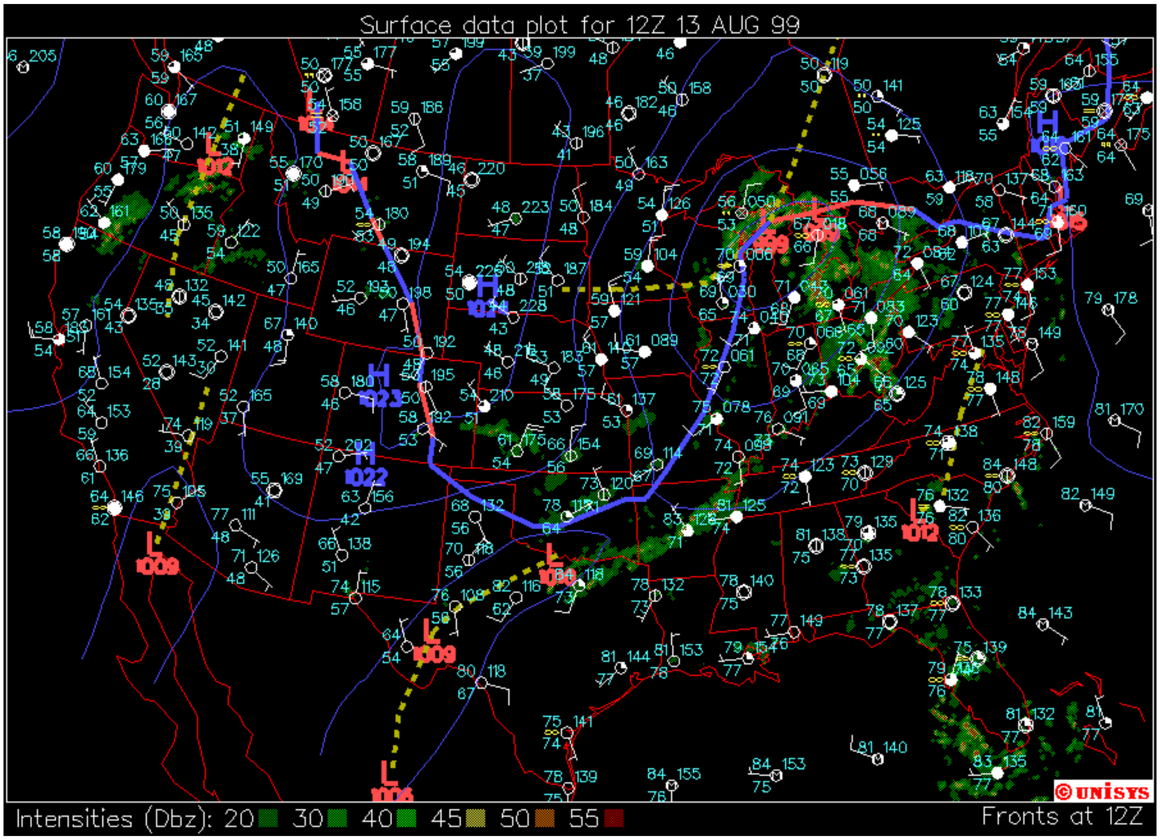


Figure 17: Surface data plot for 12z, August 13, 1999.

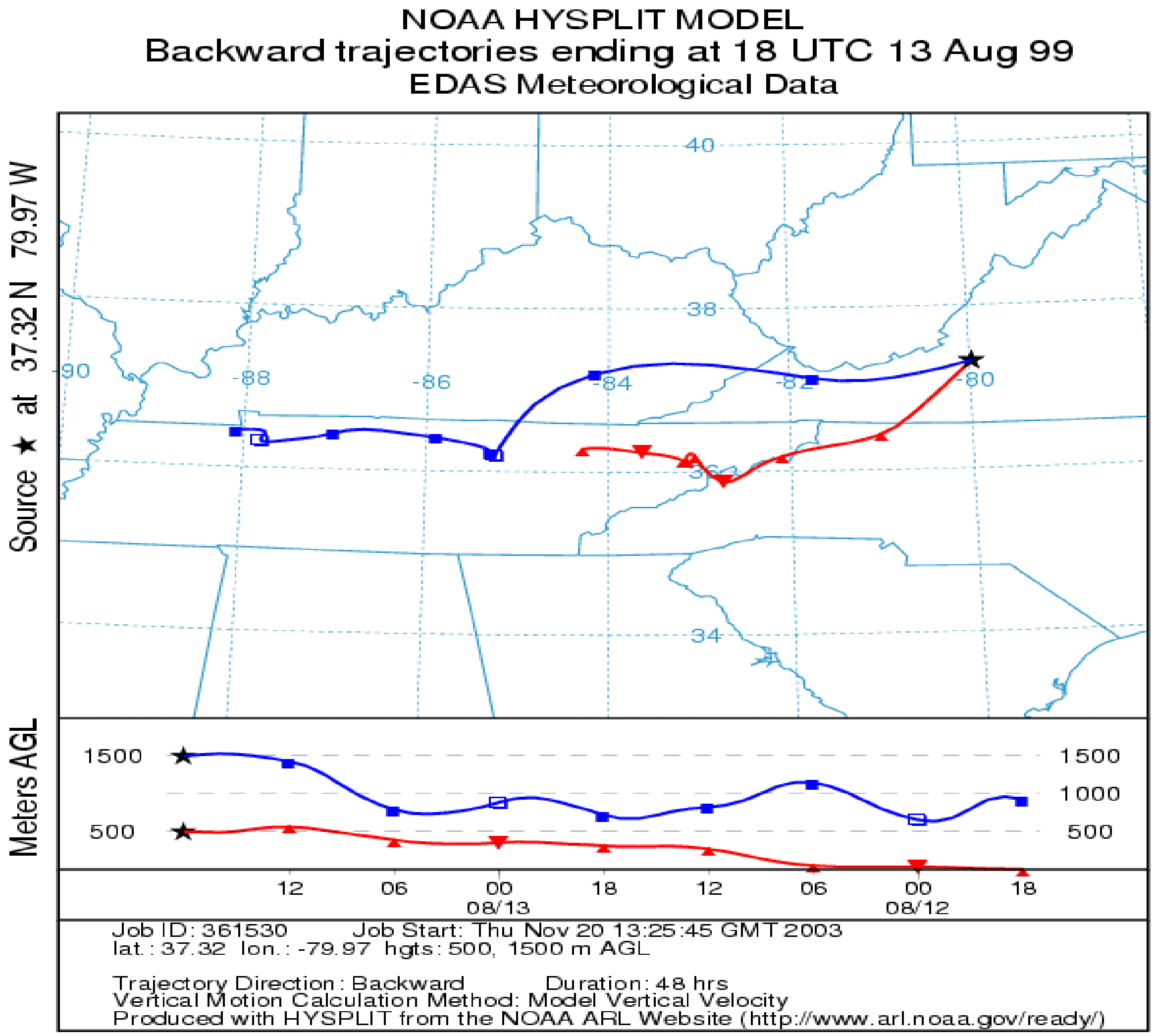


Figure 18: 48-hour NOAA HYSPLIT model back trajectory for Roanoke, 18z, August 13,1999.

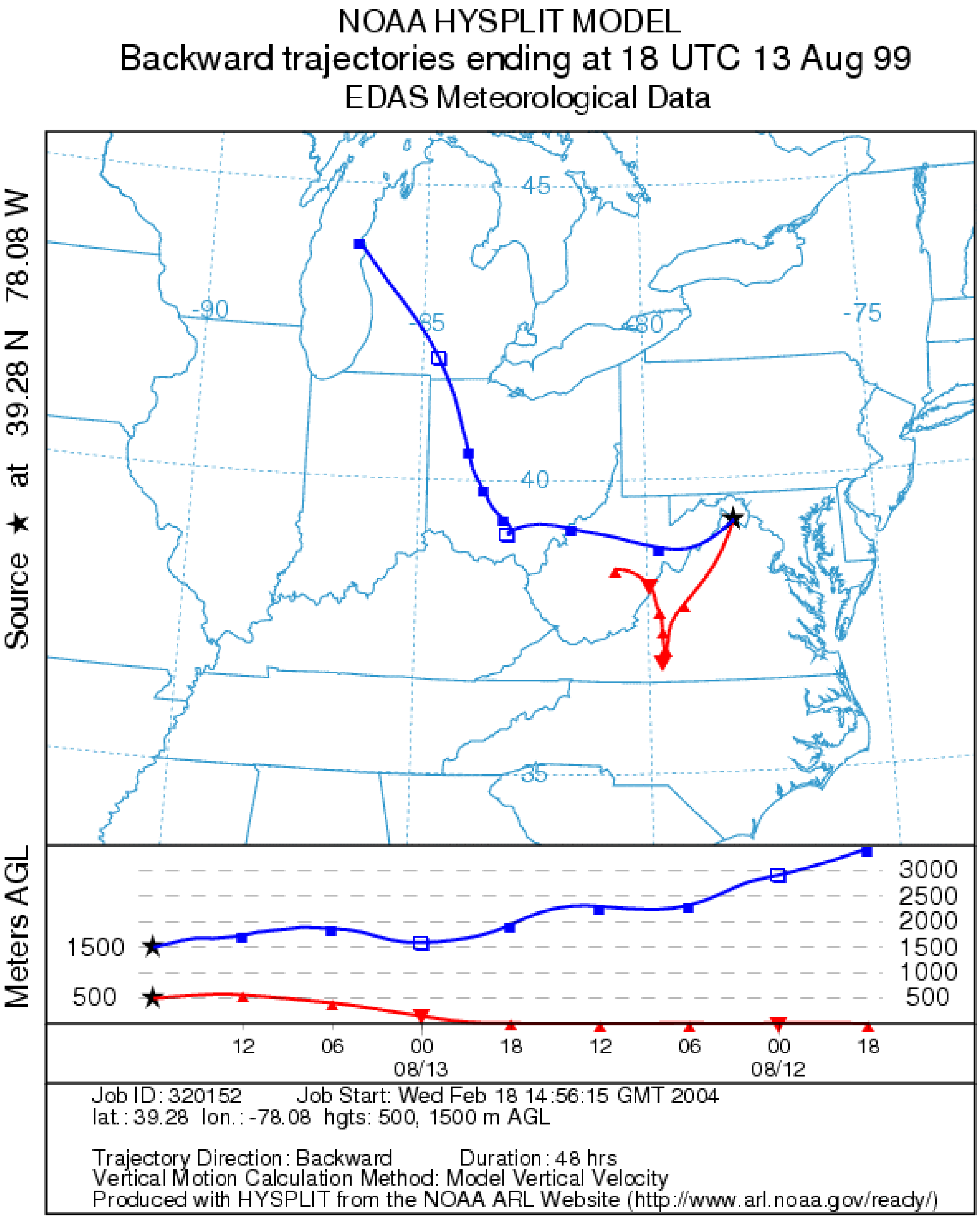


Figure 19: **48-hour NOAA HYSPLIT model back trajectory for Winchester, 18z, August 13, 1999.**

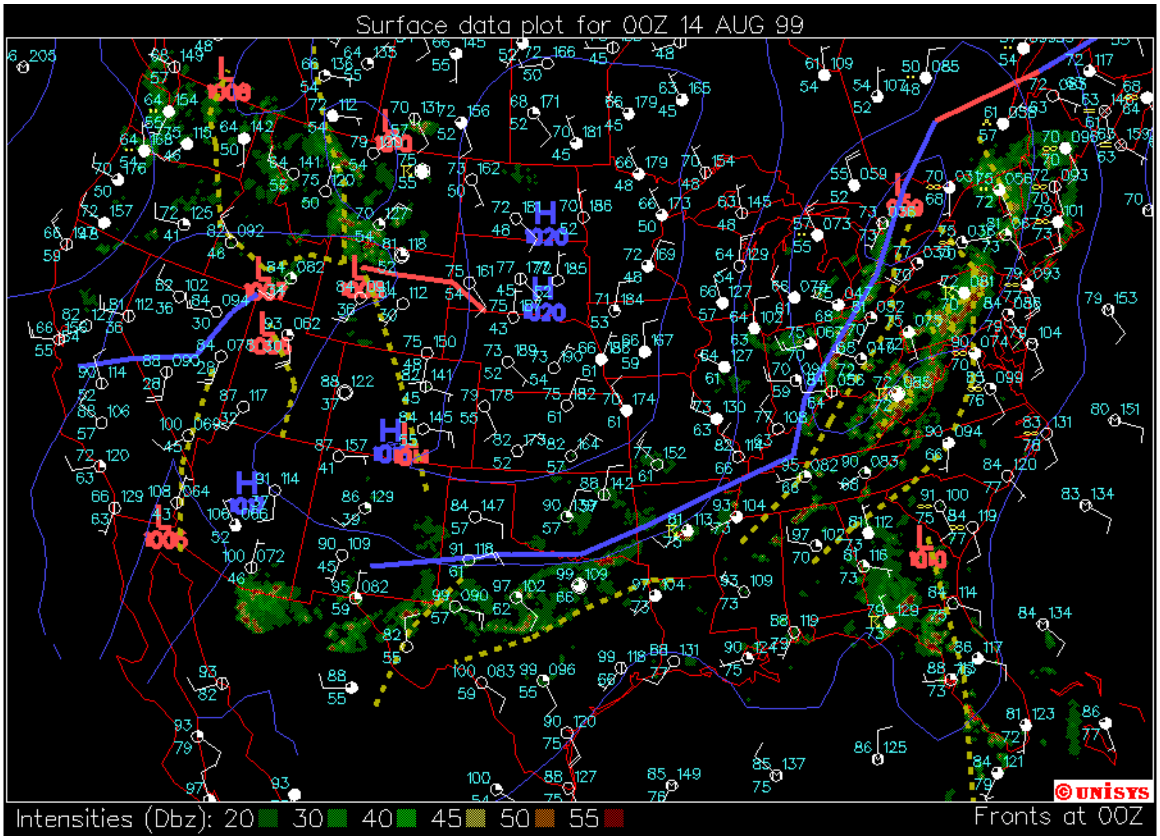


Figure 20: **Surface data plot for 00z, August 14, 1999.**

6. 3 Emission Inventory and Processing

6.3.1 Emission Inventories

Emission inventories were required for both of the 36 km and the 12 km resolution modeling domains. Base case point source emissions including appropriate stack parameters (stack height, stack diameter, exit temperature and exit velocity), annual county-level area source emissions data including off-road sources, and on-road mobile sources were obtained from the EPA 1999 NEI Version 2 database. The 1999 NEI Version 2 data are in Microsoft Access database format. DEQ developed a converter and converted 1999 NEI Version 2 data into SMOKE IDA format. Biogenic emissions were prepared using SMOKE version 1.5 that includes a version of the Biogenic Emissions Inventory System. DEQ's MM5 meteorological modeling results and existing land use database from previous modeling studies were used for biogenic emissions calculation. The photochemical model ready emissions files were developed for the modeling domains for both the 1999 base year and the 2007 future year. The State of North Carolina provided 2007 future year 2007 emissions inventories. Updated 2007 future-year emission inventories for the EAC areas in Virginia and Maryland were developed by DEQ and MDE.

6.3.2 Emissions Processing

The Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system was used to process the EAC emission inventories into the formatted emission files required by the CAMx air quality model. SMOKE supports area, mobile, and point source emission processing and biogenic emissions modeling. The emissions processing used in this EAC modeling study includes the steps of chemical speciation, temporal allocation and spatial allocation of emissions data. These steps are necessary so pollutant data can be converted to chemical model species needed for the CAMx model. These steps also involves converting the county based emissions information to the grid-cell based emissions information and the conversion of daily temporal emissions data to hourly data required by the CAMx model.

The SMOKE model was run for the episode from August 8 to August 18, 1999 using MM5 meteorological modeling results for the same time period. In addition to the temporal allocation of pollutant data, the hourly plume rise was calculated for the point source emissions for CAMx modeling. After the speciation, temporal allocation and spatial allocation processes were finished, emissions data of point, area, mobile and biogenic sources were merged into gridded hourly emissions. Figure 21 shows gridded maximum ground level NOx emissions in the 12 km resolution domain during the episode. Figure 22 shows gridded maximum NOx emissions at layer 5, which is roughly

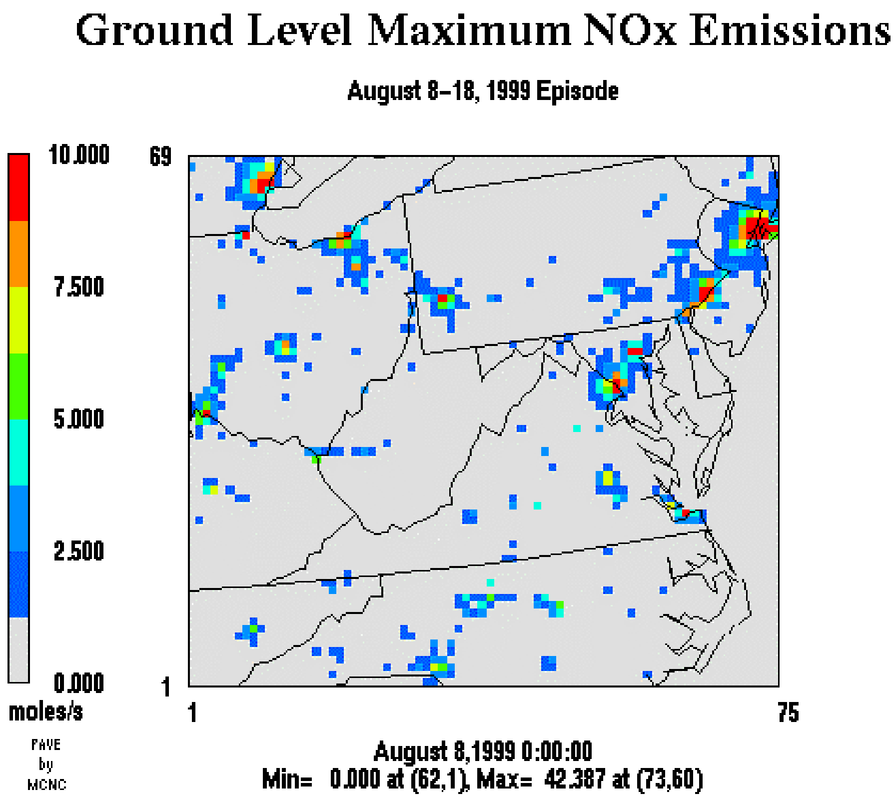


Figure 21: Gridded Maximum Ground Level NOx emissions as processed by SMOKE 300 meters above ground level

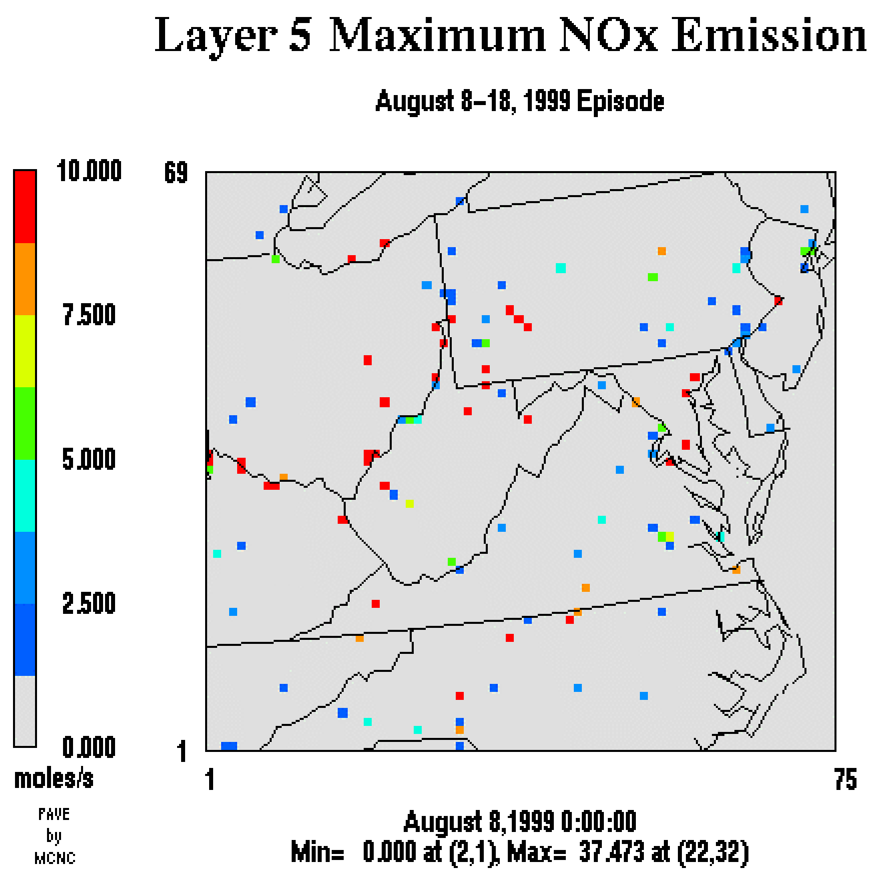


Figure 22: Gridded Maximum Layer 5 NOx Emissions

6.3.3 Biogenic Emissions Modeling

The biogenic emissions were modeled by using SMOKE, which includes a version of the Biogenic Emissions Inventory System 3 (BEIS3) that estimates VOC emissions from vegetation and nitric oxide emissions from soils. Apart from the land use data, the biogenic emissions depend on the meteorological conditions, in particular the air temperature, incoming solar radiation, wind speed and humidity. Those atmospheric variables were provided for each grid cell of the modeling domain by the MM5 simulation results. SMOKE BEIS3 was run for the entire episode from August 8 to August 18, 1999. Figure 23 shows gridded maximum biogenic VOC emissions in the 12 km resolution domain. Figure 24 shows gridded maximum biogenic NOx in the 12 km resolution domain.

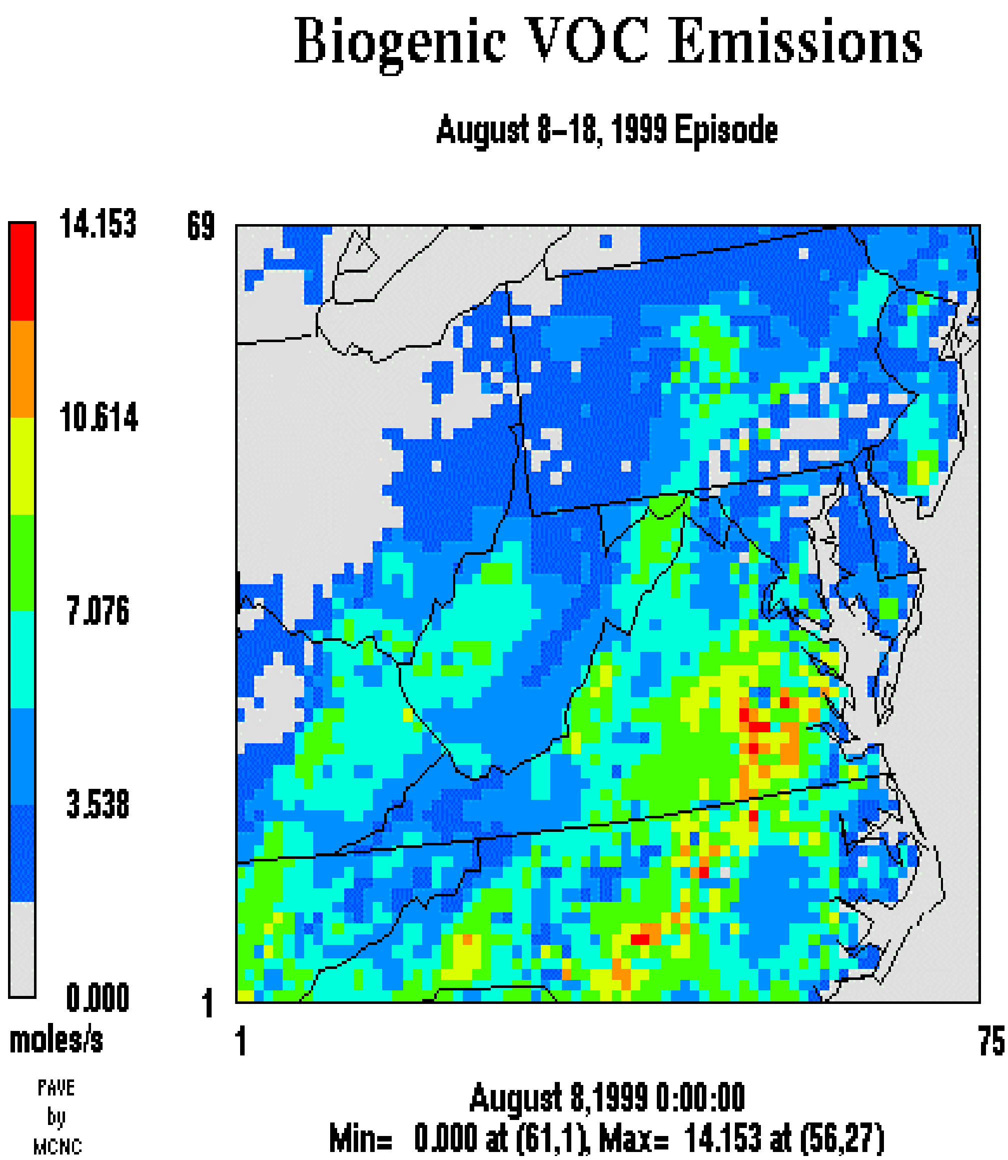


Figure 23: Gridded maximum biogenic VOC emissions as modeled by SMOKE

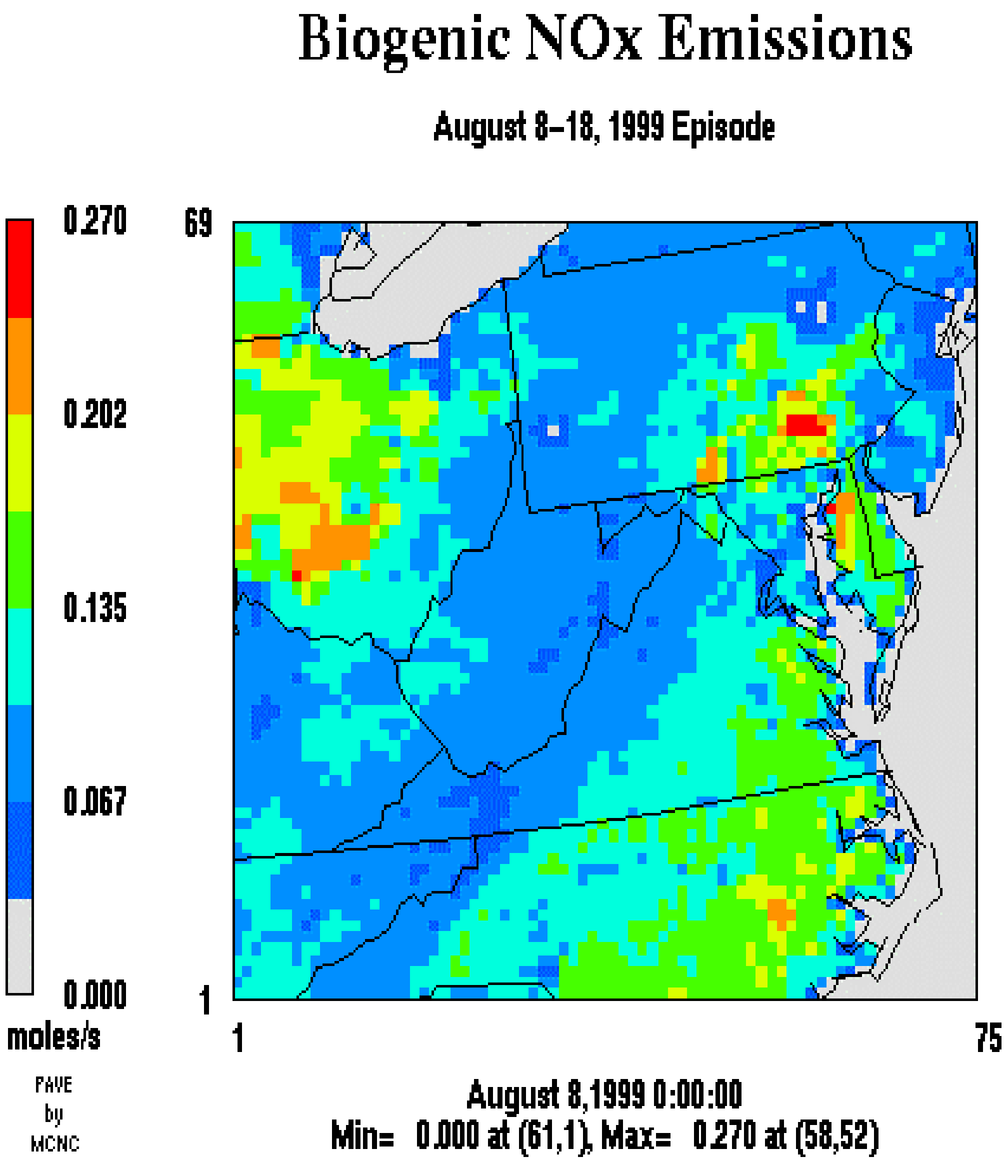


Figure 24: Gridded maximum biogenic NOx emissions as modeled by SMOKE

6.4 Meteorology Modeling

6.4.1 Numerical Configuration

The Penn State/NCAR Mesoscale Model, MM5, was employed to provide spatial and temporal distribution of meteorological fields to the CAMx air quality model. MM5 has been applied to a broad range of studies, including air quality simulations. The MM5 simulation was performed with 3 nested domains, with respective grid resolutions of 108 km, 36 km, and 12 km. Figure 25 shows the MM5 modeling domains for this EAC study.

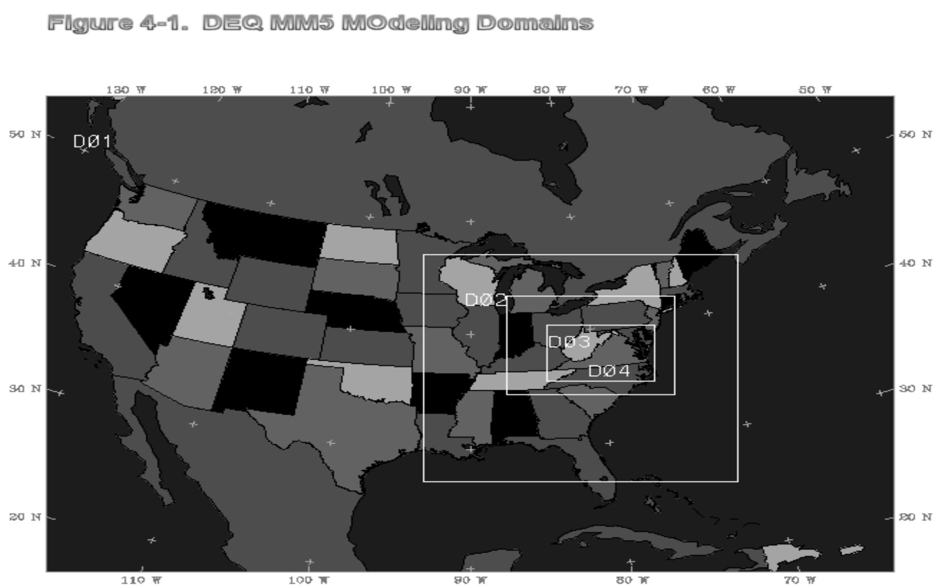


Figure 25: DEQ MM-5 Modeling Domains

It can be seen that the 12 km resolution domain covers the entire state of Virginia and Mid-Atlantic states. The predominant types of meteorological data used in this study were surface and upper air meteorological measurements reported by the National Weather Service (NWS), and large-scale (i.e., regional/global) analysis databases developed by the National Center for Environmental Prediction (NCEP). Both types of data are archived by, and currently available from, the National Center for Atmospheric Research (NCAR). Measurement data include surface and aloft wind speed, wind direction, temperature, moisture, and pressure. Hourly surface data are usually available from many Class I airports, i.e., larger-volume civil and military airports operating 24-hour per day. The standard set of upper air data is provided by rawinsonde soundings launched every 12 hours from numerous sites across the continent. The typical spacing of rawinsonde site is approximately 300 km. The New York State Department of Environmental Conservation has kindly retrieved all necessary above-mentioned data from NCAR and sent the data to DEQ.

Table 13 shows the vertical grid structure of the MM5 model. The EAC MM5 simulations were conducted on DEQ's Linux Cluster system consisting of 6 computing nodes with 12 CPUs. The Distributed Memory Parallel Option was employed using the MPICH message-passing software to provide fast turnaround. The paralleling processing of MM5 has shortened run time by 10 times over previous MM5 executions on Sun Enterprise systems. A period of 240 hours was simulated for the EAC episode from August 8 to August 18, 1999. The first 12 hours were considered as the warm-up period, followed by 205 hours of prediction, which included the 48-hour ozone episode from August 12 to August 13, 1999.

6.4.2 MM5 Simulation Results and Statistical Evaluation

This section shows some MM5 predicted meteorological fields and statistical evaluation results. The METSTAT statistical evaluation package, developed by Environ, is used to compare the modeled temperature, humidity and wind fields with observed data.

METSTAT computes a set of statistical quantities, including bias, gross error, and root mean square error (RMSE, total, systematic, and unsystematic). Figure 27 shows the meteorological stations used by METSTAT statistical calculation.

6.4.2.1 Temperature

Figure 26 shows MM5 predicted 12 km domain temperature field on August 12, 1999 at 1900 hours GMT. In general, MM5 predicted temperature fields agree well with observed data at most meteorological

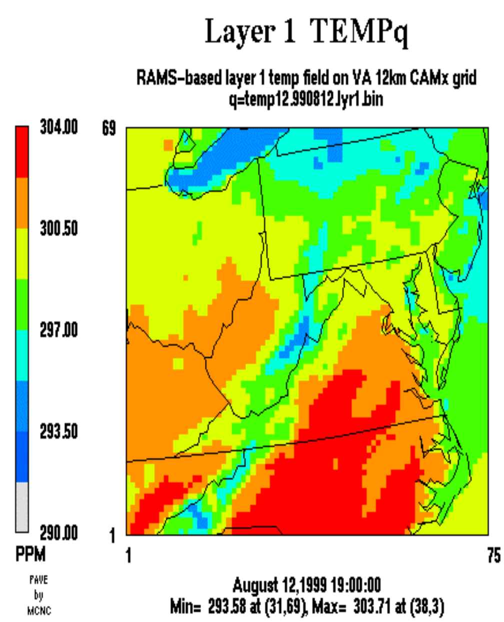


Figure 26: MM5 Temperature Field

Table 13: Vertical Grid Structures of MM5, CAMx and SMOKE

MM5 Layer K	Sigma	CAMx/SMOKE Layer	Interface Heights (m)
35	0.000	15	12821
34	0.050	15	
33	0.100	15	
32	0.150	15	
31	0.200	15	
30	0.250	15	
29	0.300	15	
28	0.350	15	
27	0.400	14	5812
26	0.440	14	
25	0.480	14	
24	0.520	14	
23	0.560	13	3874
22	0.600	13	
21	0.640	13	
20	0.670	12	2747
19	0.700	12	
18	0.730	11	2185
17	0.760	11	
16	0.785	10	1698
15	0.810	10	
14	0.835	9	1275
13	0.855	9	
12	0.875	8	950
11	0.895	8	
10	0.910	7	675
9	0.925	7	
8	0.940	6	444
7	0.950	6	
6	0.960	5	294
5	0.970	5	
4	0.980	4	146
3	0.086	3	102
2	0.992	2	58
1	0.996	1	29
0	1.000		

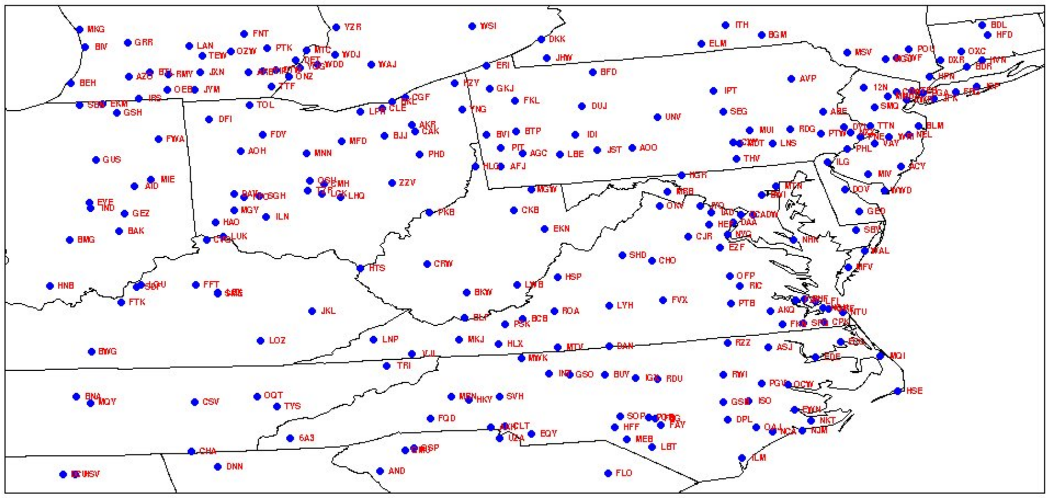


Figure 27: Meteorological observation stations observation sites within the 12 km modeling domain during the episode.

Figure 28 shows METSTAT 12 km domain hourly temperature statistics for the August 8 to August 18, 1999 episode. The three RMSE legends in the second graph represent RMSE total, RMSE systematic and RMSE unsystematic.

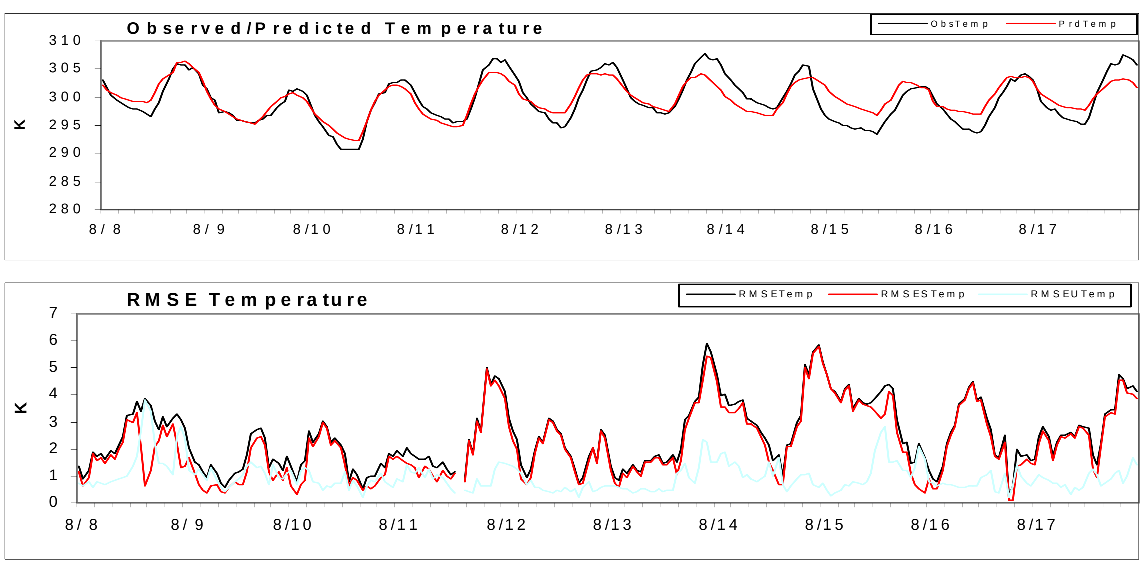


Figure 28: METSTAT hourly temperature statistics

6.4.2.2 Humidity

Figure 29 shows METSTAT 12 km domain hourly humidity statistics for the August 8 to August 18, 1999 episode. The predicted humidity fields agree reasonably well with observed humidity fields.

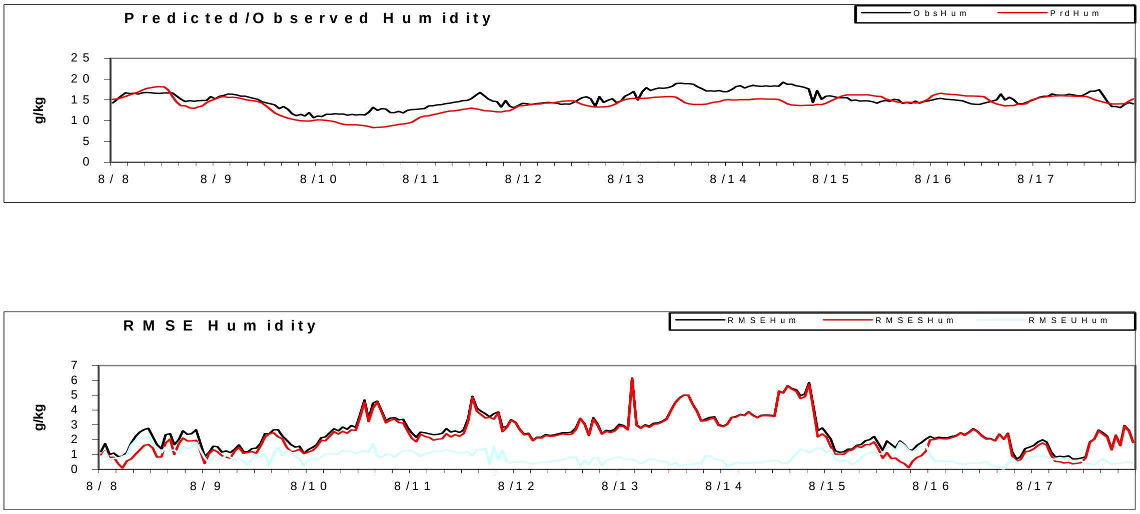


Figure 29: METSTAT 12 km domain hourly humidity statistics

6.4.2.3 Wind Fields

Figure 30 shows predicted surface wind on August 12, 1999 at 19:00 GMT. The wind field agrees reasonably well with observed wind field at that hour.

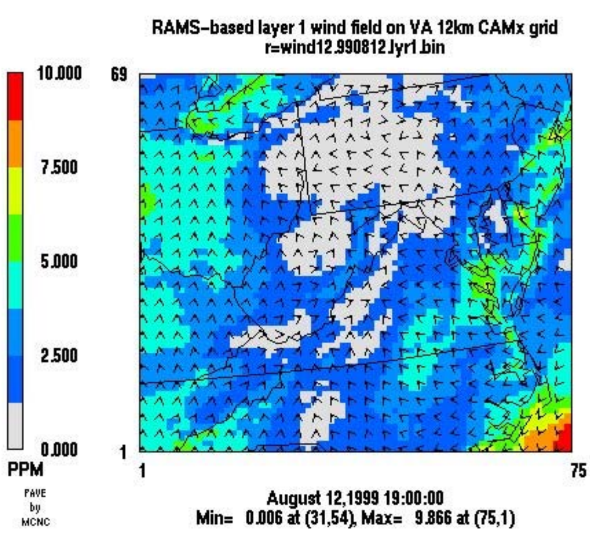


Figure 30: MM5 Predicted Surface Wind

Figure 31 shows METSTAT 12 km domain hourly wind statistics for the August 8 to August 18, 1999 episode.

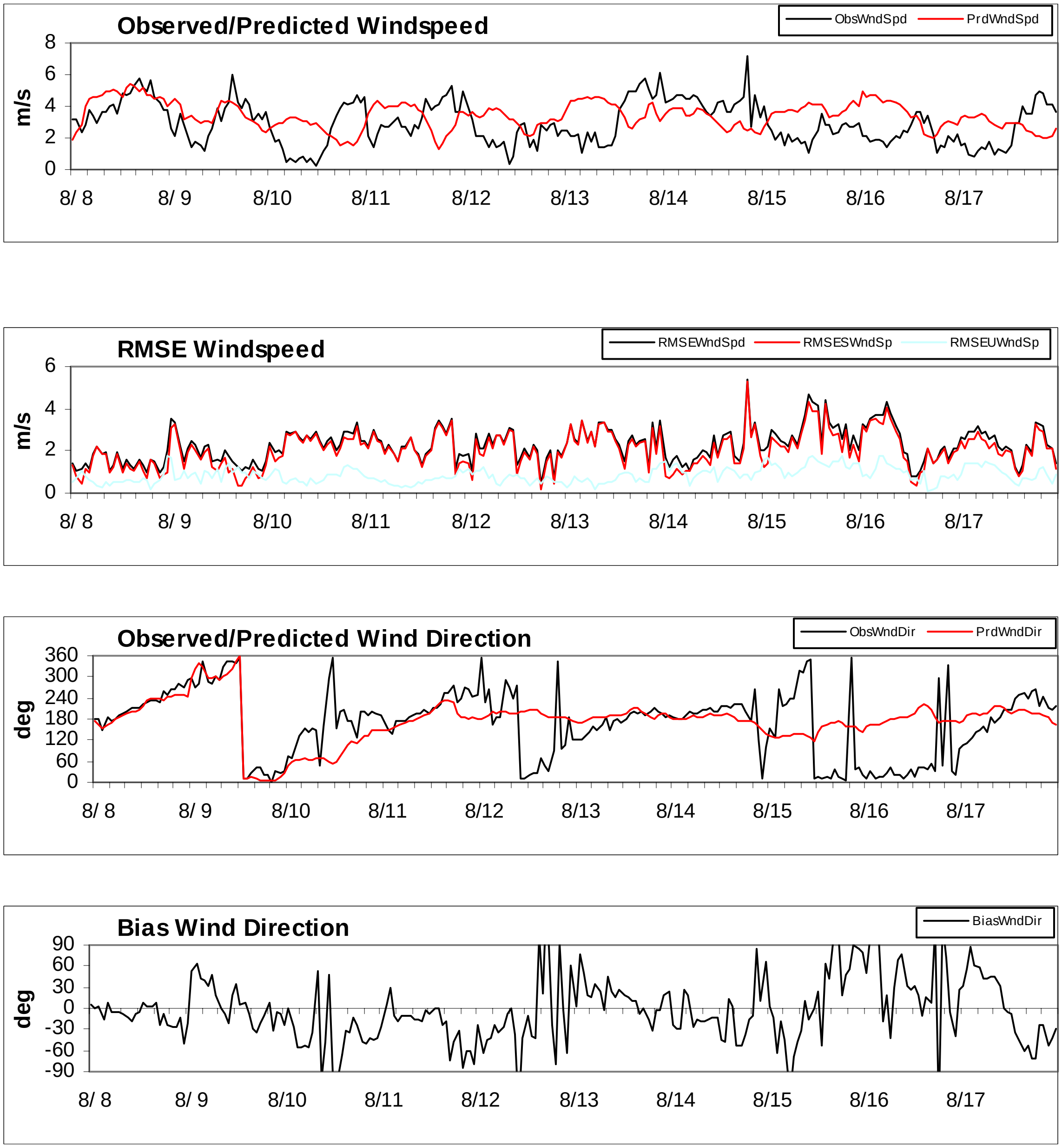


Figure 31: METSTAT 12 km domain wind statistics

During the episode, the simulated wind speed is in proper magnitude compare to the observed wind. Wind direction prediction performed fairly well from 8th to 15th even though abrupt wind direction changes were not captured during the 12th and 13th of the episode.

6.4.2.4 Planetary Boundary Layer Depth

Figure 32 through 35 shows Planetary Boundary Layer depth for August 12 and August 13, 1999 at 10AM and 2 PM hours. The PBL depth is also called mixing height. The mixing height values during the episode are in reasonable magnitude.

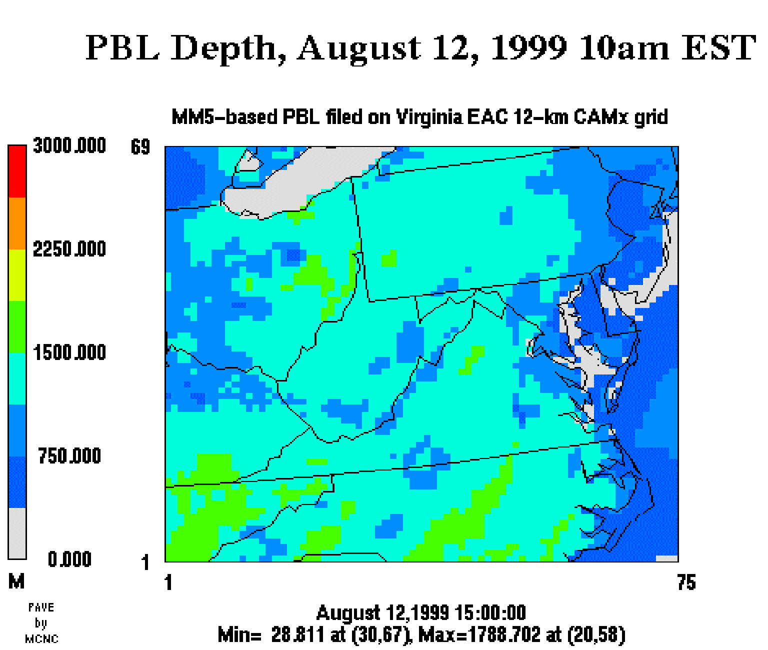


Figure 32: PBL Depth, August 12, 1999 10AM EST

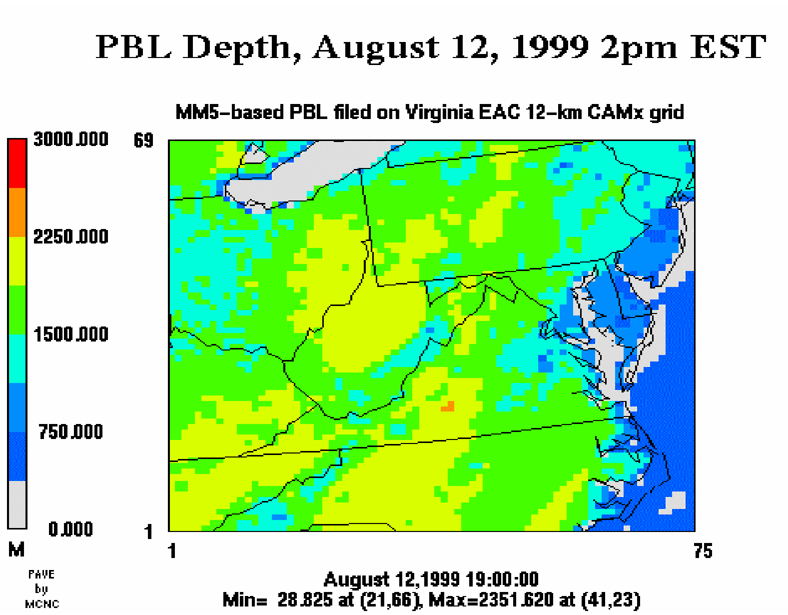


Figure 33: PBL Depth, August 12, 1999 2PM EST

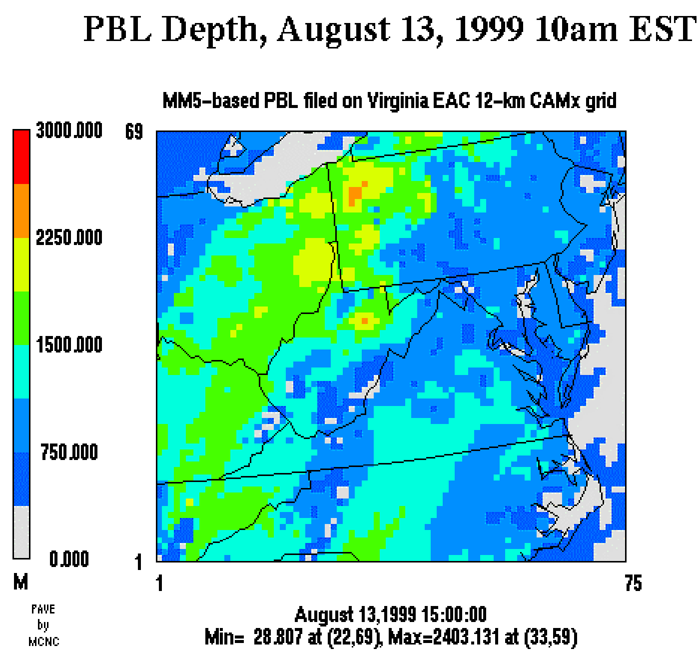


Figure 34: PBL Depth, August 13, 1999 10AM EST

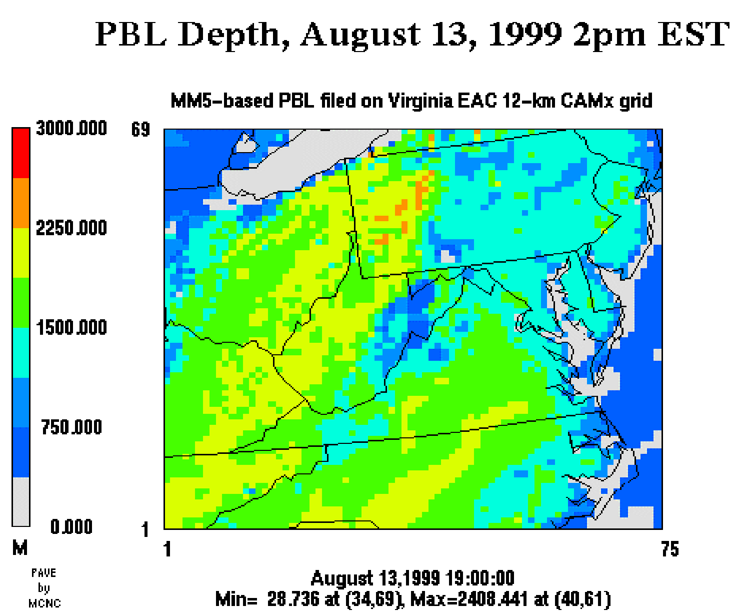


Figure 35: PBL Depth, August 13, 1999 2PM EST

6.5 Ozone Modeling

6.5.1 CAMx Model Configuration

The Eulerian photochemical model, CAMx modeling system was employed to simulate ozone concentration in the EAC modeling domains. The following is a list of model configuration parameters:

36/12 km grid August 8 – August 18, 1999 period
CB-IV chemistry with CMC fast solver
PPM advection solver
Wet and dry deposition
TUV photolysis rates
TOMS ozone column with default LULC albedo and haze

Figure 36 shows the AEC CAMx 36 km and 12 km modeling domains.

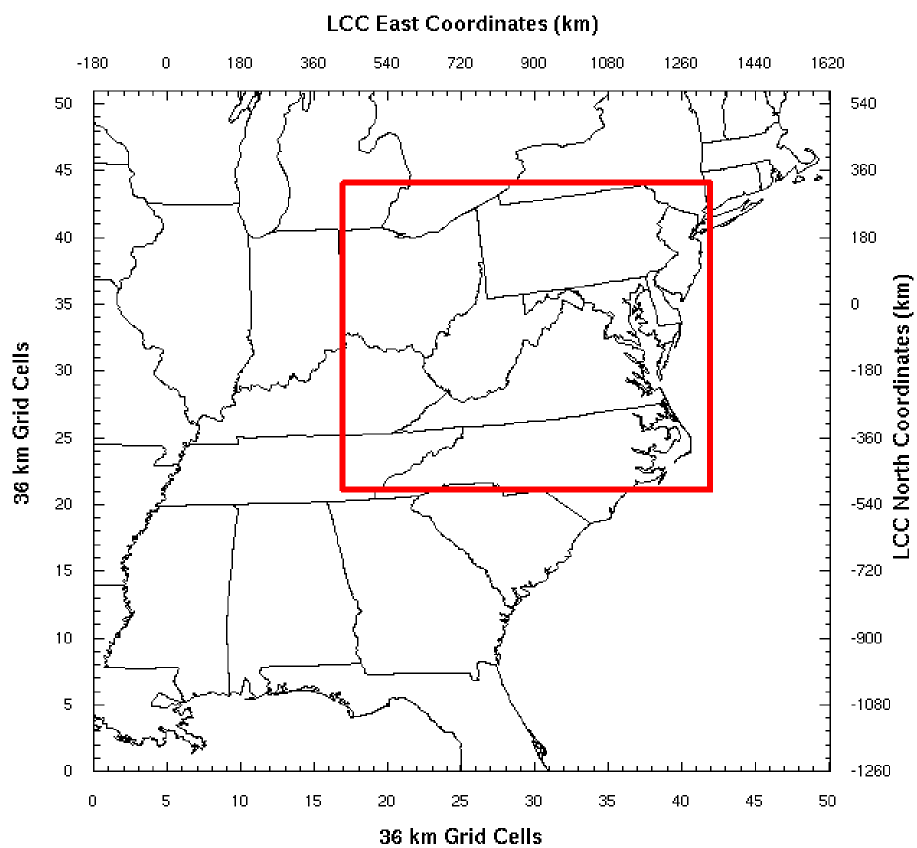


Figure 36: EAC CAMx 36 km and 12 km Modeling Domains

6.5.2 Model Performance Evaluation

Generally, predicted 8-hour ozone concentration agreed very well with observed values at most monitors in the 12 km domain. Figure 37 and Figure 38 show time series of observed and predicted 8-hour ozone concentrations from August 11 to August 14, 1999 at the Vinton (Roanoke County) and Frederick monitors. Daytime simulations showed good agreement with the observations. Night-time ozone concentrations were systematically over-predicted. However, night-time ozone concentration was not the main focus of this study. Figure 39 shows a scatter plot of predicted versus observed ozone concentration for all Virginia sites. Over 90% of predicted values fell within the ±50% bias lines. Most of the predicted values outside the ±50% region were due to night-time over-predictions.

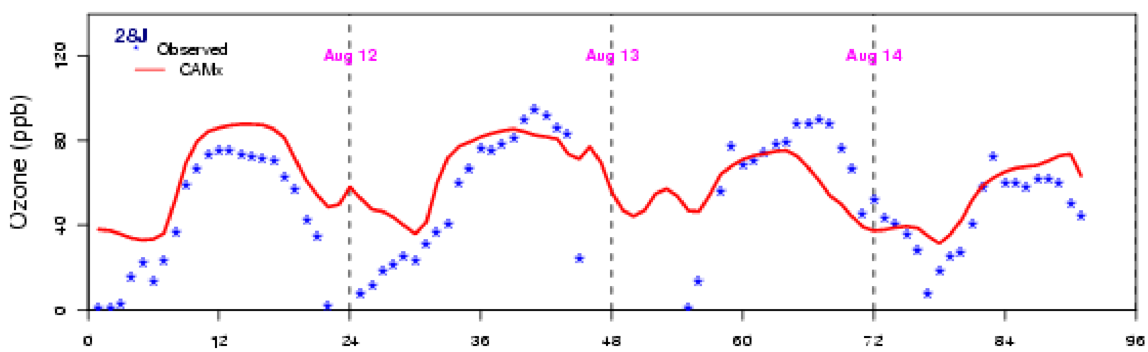


Figure 37: Time series of observed and simulated 8-hour ozone concentration at Frederick (Frederick/Winchester City)

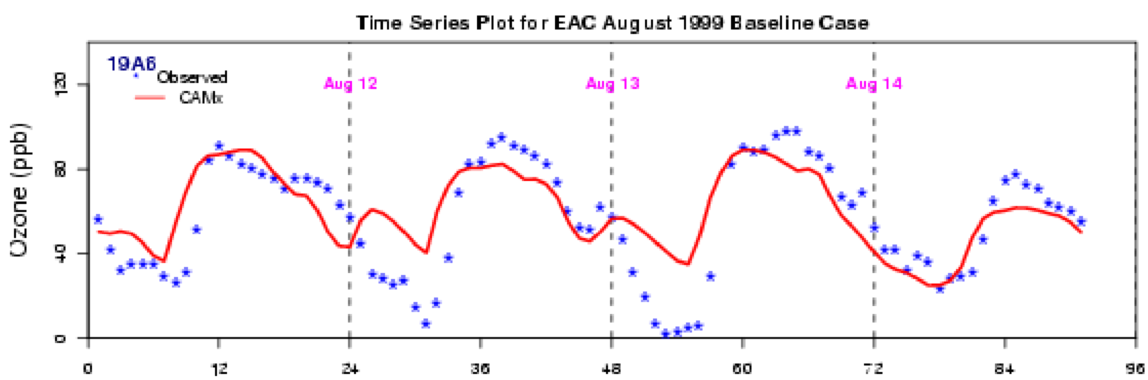


Figure 38: Time series of observed and simulated 8-hour ozone concentration at Vinton (Roanoke MSA)

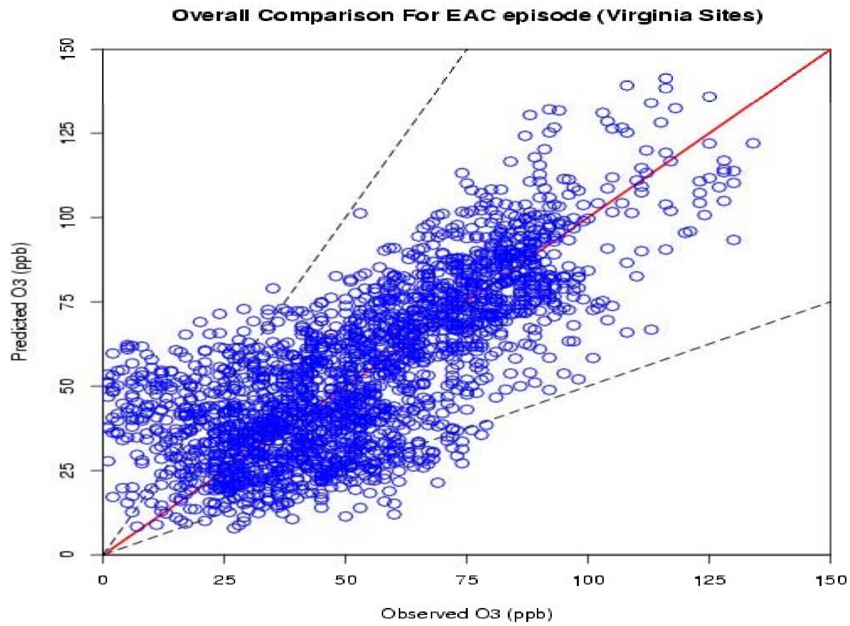


Figure 39: Scatter plot of observed and predicted ozone concentration for Virginia sites

Table 14 and Table 15 provides model performance metrics for August 12 and August 13, 1999 for major performance criteria. For Virginia sites, all performance goals were met for both episode days. For the entire 12 km domain, all performance goals were met for both episode days except the Normalized Bias for the 13th. It was decided based the performance metrics that the model is acceptable for future year modeling for the August 1999 episode.

Table 14: O3 performance statistics for August 12, 1999

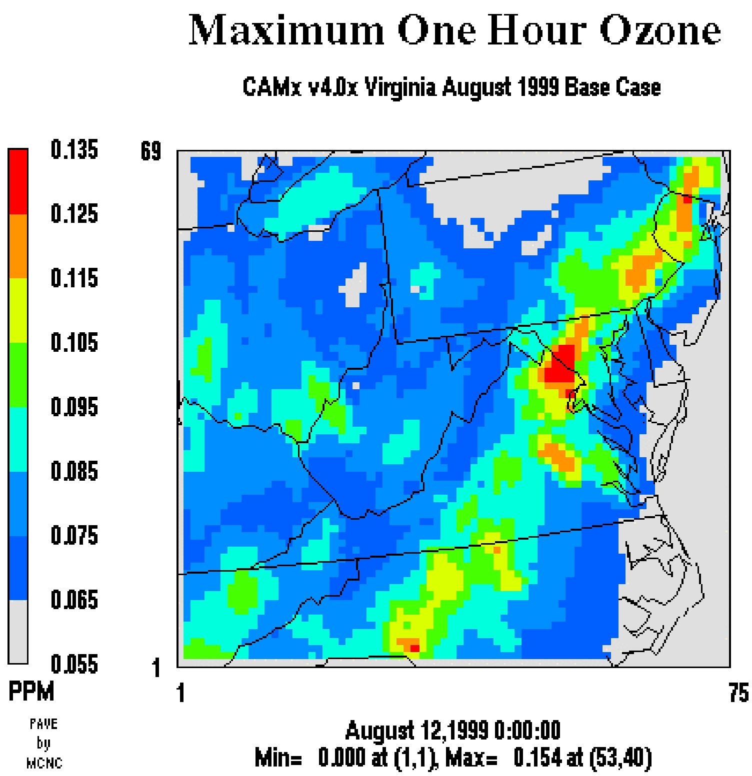
	(a) 12km (VA Sites)	(b) 12km (Whole Domain)	(c) EPA Criteria
Overall Absolute Peak			
Predicted peak	153.9 ppb	153.9 ppb	
Observed peak	134.0 ppb	143.0 ppb	
Unpaired bias	14.9 %	7.7 %	20.0 %
Peak Prediction (Normalized Bias)			
Paired in space	1.7 %	-1.3 %	
Paired space/time	-4.2 %	-8.7 %	
Peak Prediction (Normalized Error)			
Paired in space	12.9 %	13.9 %	
Paired space/time	11.1 %	16.7 %	

Average Concentration Prediction			
Normalized bias	1.3 %	0.6 %	15.0 %
Normalized error	17.4 %	16.6 %	35.0 %
Mean bias	0.9 ppb	-0.6 ppb	
Mean error	14.1 ppb	13.0 ppb	

Table 15: O3 performance statistics for August 13, 1999

	(a) 12km (VA Sites)	(b) 12km (Whole Domain)	(c) EPA Criteria
Overall Absolute Peak			
predicted peak	116.4 ppb	116.4 ppb	
observed peak	113.0 ppb	164.0 ppb	
unpaired bias	3.0 %	-29.0 %	20.0 %
Peak Prediction (Normalized Bias)			
paired in space	-3.4 %	-0.5 %	
paired space/time	-11.6 %	-9.0 %	
Peak Prediction (Normalized Error)			
paired in space	16.9 %	14.2 %	
paired space/time	22.9 %	17.6 %	
Average Concentration Prediction			
normalized bias	-6.7 %	-2.4 %	15.0 %
normalized error	16.5 %	17.3 %	35.0 %
mean bias	-6.5 ppb	-2.9 ppb	
mean error	13.1 ppb	13.0 ppb	

Figure 40 and Figure 41 shows 12 km domain predicted base year daily maximum1-hour and 8-hour ozone concentrations, respectively, for the 12th and 13th of the episode.



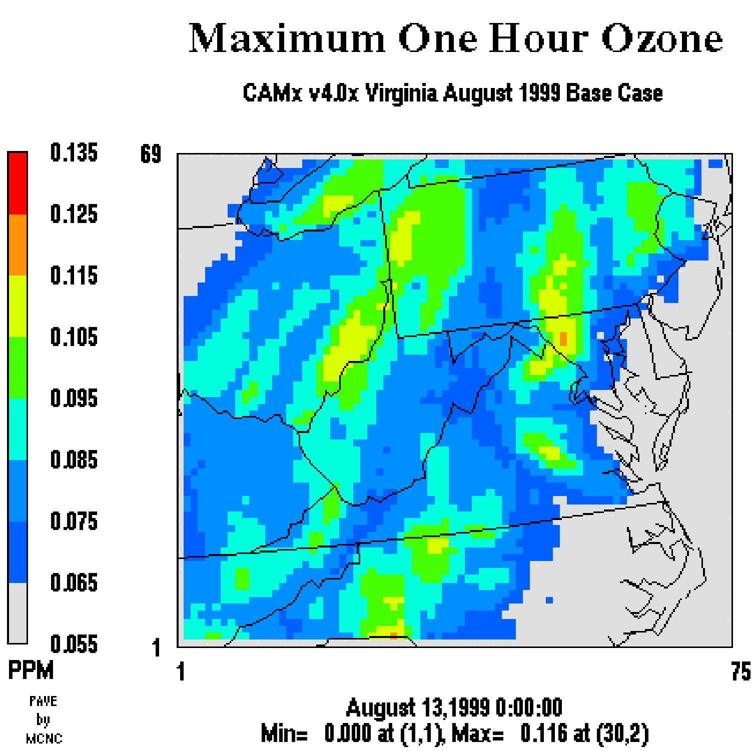


Figure 40 : CAMx predicted 1-hour daily maximum ozone concentrations

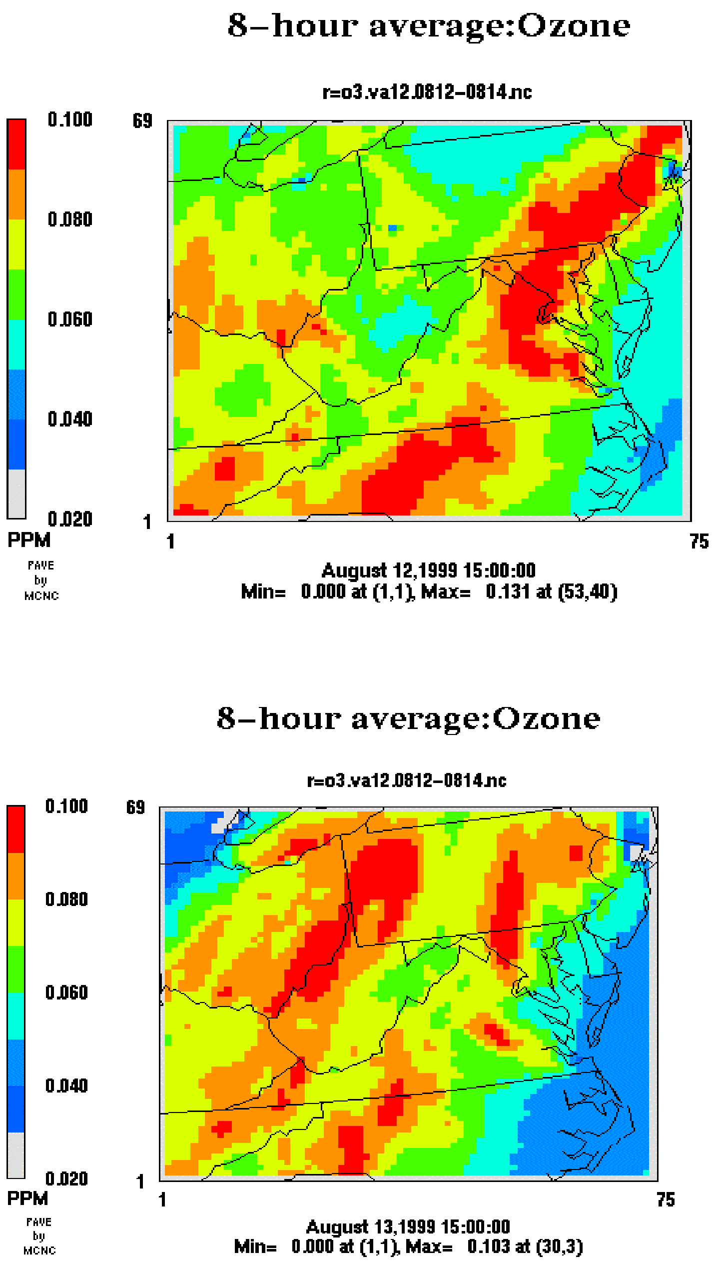


Figure 41: CAMx predicted 8-hour daily maximum ozone concentrations

Figure 42 and Figure 43 shows 12 km domain predicted future year daily maximum1-hour and 8-hour ozone concentrations, respectively, for the 12th and 13th of the episode.
All EAC local control measures have been quantified and included in the future year emission inventories.

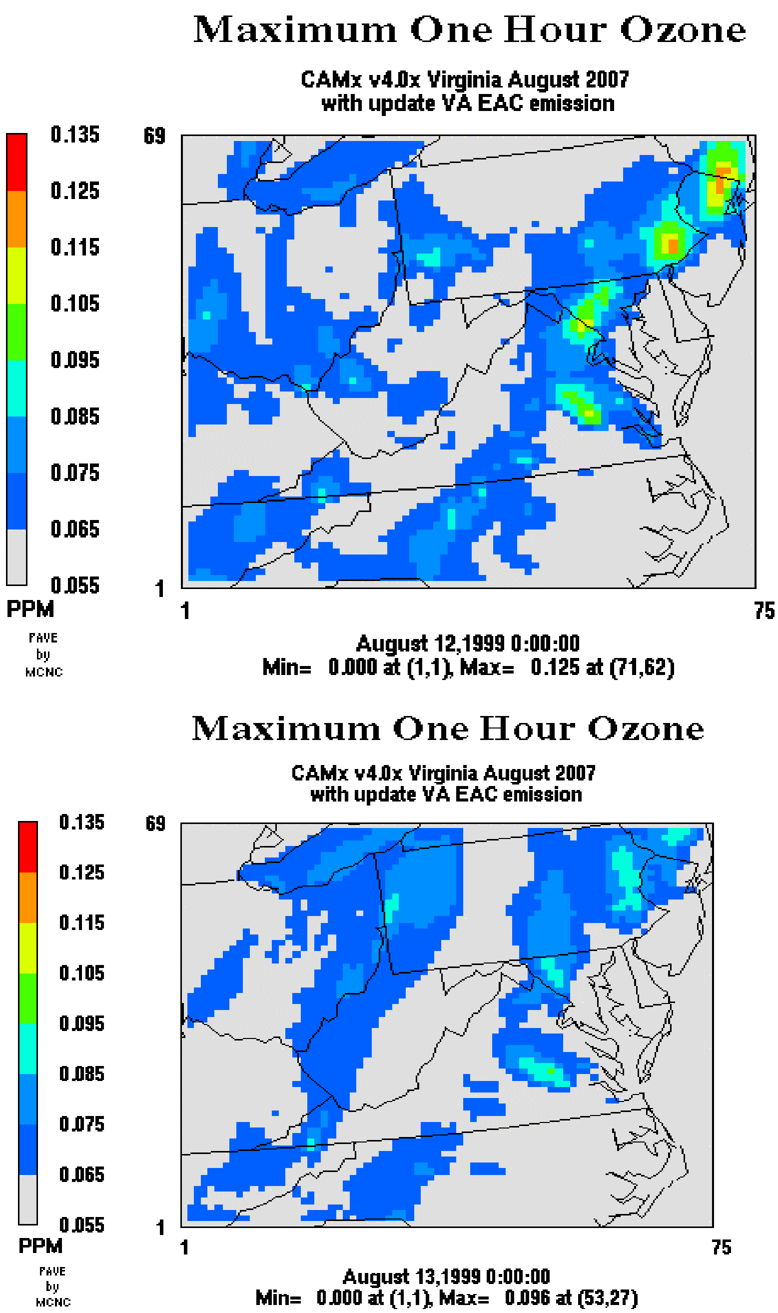
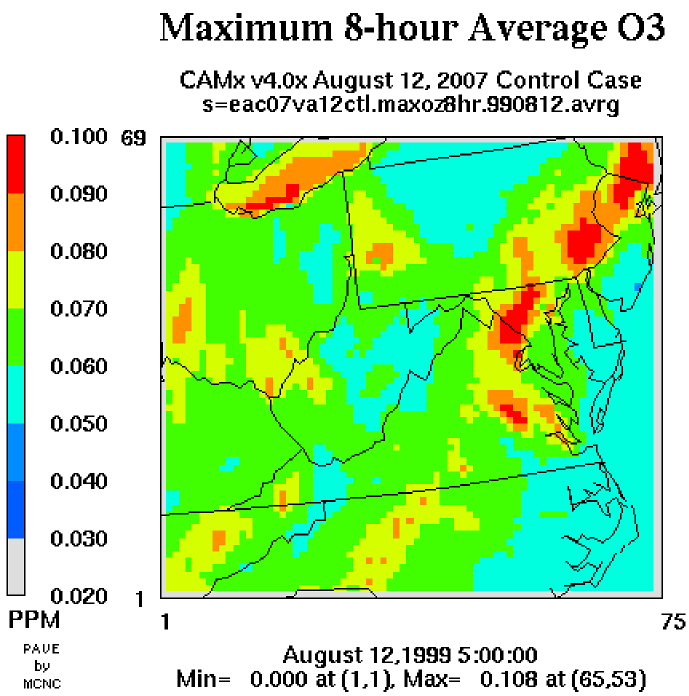


Figure 42: CAMx predicted future year 1-hour daily maximum ozone concentrations



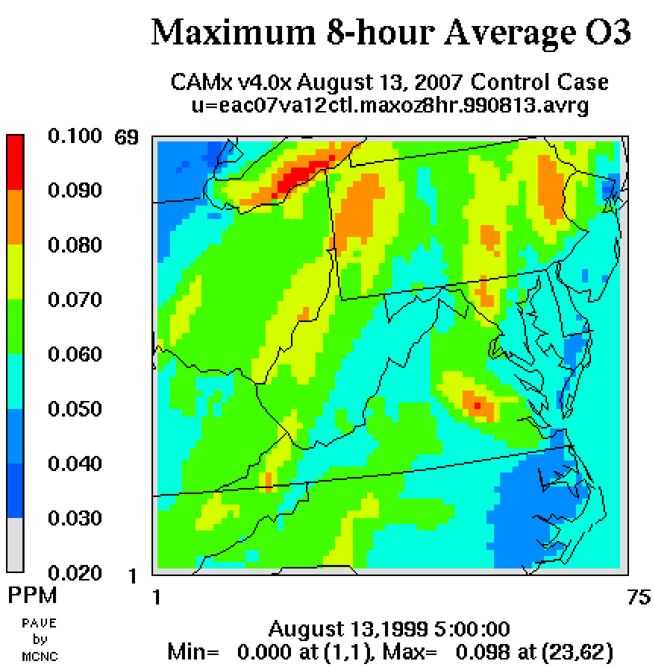


Figure 43: CAMx predicted future year 8-hour daily maximum ozone concentrations

6.6 Attainment Demonstration

Because EPA has not yet designated any region as non-attainment for 8-hour ozone, no formal requirement exists for an 8-hour attainment demonstration. However, EPA has developed draft procedures for using photochemical models to demonstrate attainment of the 8-hour ozone NAAQS. The critical elements in the demonstration of attainment under the 8-hour ozone NAAQS, established by the *Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS, U.S. EPA Office of Air Quality Planning and Standards, EPA-454/R-99-004, May 1999*, are the calculation of relative reduction factors (RRFs) and future design values (DVs). The RRFs and base-year Design Values are the basis for projecting future-year Design Values (DVF).

All episode days with modeled base year daily maximum 8-hour ozone concentration greater than or equal to 70 ppb will be use to calculate the RRF for the all monitors representing the five EAC areas in this study. Table 16 lists the monitors and their corresponding EAC areas.

Table 16: Monitors for calculating RRFs

Monitors and AIRS ID	EAC Areas
51-161-1004 Roanoke	Roanoke MSA, Virginia
51-069-0010 Frederick	Frederick/Winchester City, Virginia
51-069-0010 Frederick	Berkley County/Martinsburg City, West Virginia
51-069-0010 Frederick	Jefferson County, West Virginia
24-043-0009 Hagerstown	Washington County, Maryland

Figure 44 shows the spatial locations of the monitors listed in the above table.

6.6.1 Calculation Methodology for RRFs and DVs

The methodology calls for scaling base-year design values using RRFs from a photochemical model to future year design values. The calculation is carried out for each monitor. The attainment test is passed if all the future year scaled DVs are 84 ppb or less.

For each monitor (i) and modeling day (j) the maximum 8-hour ozone near the monitor is selected for the current ($O3C_{ij}$) and future-year ($O3F_{ij}$):

$$RRF_i = [\sum O3F_{ij}] / [\sum O3C_{ij}]$$

Attainment demonstration is done using monitor specific relative reduction factor (RRFi) that is the ration of the future-year to current-year 8-hour ozone estimates near the monitor:

$$DVF_i = RRF_i \times DVC_i$$

These current EPA procedures for using models to demonstrate attainment of the 8-hour ozone NAAQS will be in this study. In this chapter, the relative differences in the modeled 8-hour ozone estimates between 1999 base case simulation and 2007 control case simulation will be developed to scale their measured Design Value for comparison with the 84 ppb 8-hour ozone NAAQS. The attainment demonstration will be done using the above mentioned procedures for two EAC areas in Virginia, two EAC areas in West Virginia and one EAC area in Maryland.

Table 17: 8-Hour Ozone Design Values for **Virginia and West Virginia** EAC **Areas**

Virginia DEQ 1998-2000 4th Highest 8-hour Ozone Averages					
AIRS ID	County/City	1998	1999	2000	3 yr. Avg.
51-161-1004	Roanoke	99	89	81	**90**
51-069-0010	Frederick	98	85	79	**87**

Table 18: 8-Hour Ozone Design Values for Maryland EAC Areas

Virginia DEQ 1997-2000 4th Highest 8-hour Ozone Averages					
AIRS ID	County/City	1998	1999	2000	3 yr. Avg.
24-043-0009	Hagerstown	-	94	94	**94**

The following procedures are carried out in monitor design value scaling:

1. For each monitor, identify the corresponding cell and eight surrounding cells.
2. For each cell, find daily maximum 8-hour ozone values greater or equal to 70 ppb for the entire episode for both the base case and future case.
3.Average the daily maximum 8-hour ozone values across days with daily maximum 8-hour ozone greater or equal to 70 ppb for the base case and future case.
4. Calculate the average Relative Reduction Factors for these cells, and
5. Calculate the average future year Design Values for these cells.

Figure 44 shows the geophysical locations of the three monitors participating in RRF calculation and attainment test.

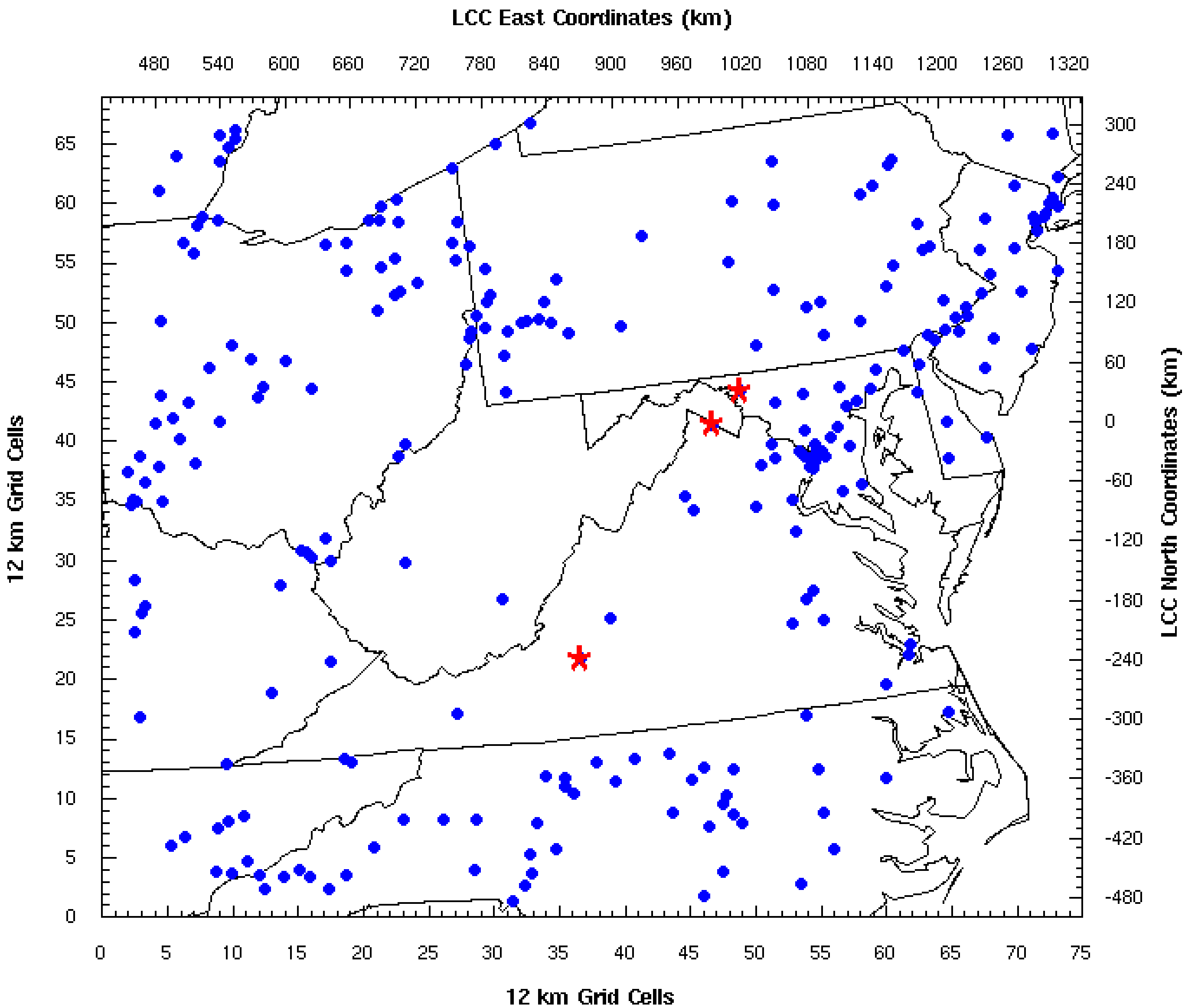


Figure 44: Spatial Locations of Monitors for RRFs Calculations and Attainment Demonstration of Virginia, West Virginia and Maryland EAC Areas.

6.6.2 8-Hour Ozone Attainment Demonstration of Virginia and West Virginia EAC Areas

County/City	AIRS ID	1998-2000 Design Value, ppb	2001-2003 Design Value, ppb	Current Design Value
Roanoke Co.	510410004	90	85	90
Frederick Co.	510870014	87	85	87

Table 19: Attainment Test Results for Monitors in the Virginia EAC Areas (Max 9 Grid Cells)

County/City	Modeled Average Base-Year (1999) Daily 8-hr Maximum O3 (ppb)	Modeled Average Future-Year (2007) Daily 8-hr Maximum O3 (ppb)	Relative Reduction Factor (RRF)	Current Design Value	2007 Future Design Value	Number of Analysis Days	Pass/Fail Status
Roanoke	82.93	65.72	0.793	90	71.4	5	PASS
Frederick	77.45	64.85	0.837	87	72.8	4	PASS

Nonattainment **Attainment**

6.6.3. 8-Hour Ozone Attainment Demonstration of Maryland EAC Area

Table 20: Attainment Test Results for Monitors in the Maryland EAC Area

County/City	Modeled Average Base-Year (1999) Daily 8-hr Maximum O3 (ppb)	Modeled Average Future-Year (2007) Daily 8-hr Maximum O3 (ppb)	Relative Reduction Factor (RRF)	Current Design Value	2007 Future Design Value	Number of Analysis Days	Pass/Fail Status
Washington	86.88	69.70	0.802	94	75.4	5	PASS

6.6.4 Summary

Table 19 and Table 20 has demonstrated that all concerned EAC areas in this study will attain the 8-hour ozone standard by 2007.

6.7 Justification for Usage of 12km Grid Cells

Model sensitivity tests performed by LADCO (Lake Michigan Air Directors Consortium) cited in EPA's draft 8-hour modeling guidance entitled, *Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS, EPA-454IR-99-004* comparing relative reduction factors in predicted 8-hour daily maxima near 272 sites in the eastern United States indicate generally small unbiased differences (< .04, in 95% of the comparisons) using a grid with 12 km vs. 4 km grid cells. This information when coupled with the fact that the Virginia EAC areas are located in relatively rural locations with small amounts of emissions along with local 12 km photochemical grid modeling that shows rather weak ozone gradients provides adequate justification for the 12 km grid resolution used modeled attainment demonstration.

7.0 MAINTENANCE FOR GROWTH

The EAP included a component to address emissions growth at least five years beyond December 31, 2007, ensuring that the area will remain in attainment of the 8-hour standard during that period. MDE examined the base year inventory and a forecasted 2012 scenario to examine emission trends for Washington County over time. 2012 was selected as the out year per USEPA guidance under the Early Action Compact Program.

MDE's calculations of future emissions of VOCs and NOx from stationary, area, non-road, and mobile sources demonstrate that future emissions will not exceed the level of the base year inventory (see tables below). MDE has included this analysis to address the concern relating to emissions growth. EAP guidance calls for an examination of emissions at least five years beyond December 31, 2007, reviewing whether the area will remain in attainment of the 8-hour standard during that period.

In this analysis MDE used Mobile6 to estimate mobile emissions. The remaining source emissions were grown out from the 1999 baseline inventory. No control programs were applied to the 2012 analysis years other than the mobile source sector. Even without applying control levels to the non-road, area, and stationary source sectors, the 2012 emission totals fall far below the 1999 inventory.

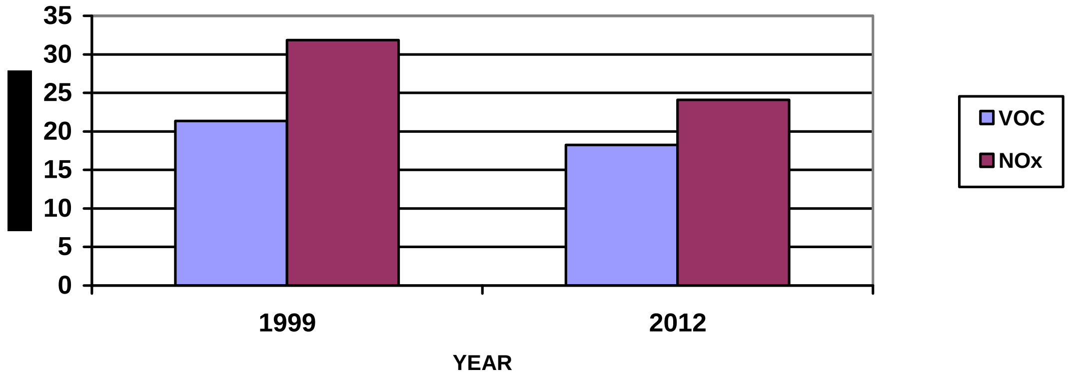
Attainment Year and Projected VOC Emissions Inventories for Washington County

Source Category	**1999 VOC Emissions (Tons per Day)**	**2012 Projected VOC Emissions (Tons per Day)**
On-road Mobile	10.79	4.02
Non-road Mobile	2.4	3.09
Area	6.47	8.62
Point	1.71	2.49
Total	**21.36**	**18.23**

Attainment Year and Projected NOx Emissions Inventories for Washington County

Source Category	**1999 NOx Emissions (Tons per Day)**	**2012 Projected NOx Emissions (Tons per Day)**
On-road Mobile	17.77	6.85
Non-road Mobile	4.54	6.02
Area	1.91	1.57
Point	7.6	9.65
Total	**31.83**	**24.09**

Base Year, Attainment Year, and Projection Year Emissions for Washington County



MDE predicted emissions from non-road mobile sources using the Nonroad 2002 model from EPA and grew them using the Economic Growth Analysis System (EGAS) model. EGAS multiplies equipment populations by appropriate growth rates. Growth in area source emissions was based on EGAS 4.0 model results. MDE projected future emissions from stationary sources by multiplying the 1999 base year inventory by EPA generated factors based on EGAS model results. Using EGAS model results to project emissions is consistent with EPA guidance on preparing emission projections.

7.1 Phase II Local Strategies

As part of the EAP, a second tier of strategies has been included in the plan for potential evaluation and implementation in the future. These strategies in Section 5.0 represent the contingency portion of the EAP. One or more of these strategies could be implemented after 2005, in response to continuing exceedances of the ozone standard or a shortfall in anticipated emission reductions from the action plan measures of the EAP. These strategies could also be implemented at any time after 2007 if the situations warranted or called for additional local emission reductions in response to worsening air quality or unexpected increases in local emissions. These measures would require more lead-time for implementation as well as additional work with expanded groups of stakeholders.

7.2 Other Air Quality Modeling Exercises

Although specific modeling of an additional future maintenance year has not been performed as part of this project, other recent modeling exercises performed by the EPA to support regional or national program provide some indication that many areas of the Country will attain the ozone standard in the near term. These same modeling exercises also indicate that most of these areas will remain in attainment for at least ten years after their projected attainment date. The latest of these EPA modeling projects, used to support the national “Clear Skies” legislation, indicates that most areas in Virginia and Maryland will attain the ozone standard by 2010 and will remain in attainment at least out to 2020, even without the implementation of the Clear Skies program.

8.0 EARLY ACTION COMPACT PUBLIC INVOLVEMENT AND HEARING

8.1 Stakeholder Process

The Washington County Department of Planning and Community Development, the lead County Department for the EAP effort continues to make available to each stakeholder all EAC documents including the Final EAP Report and solicits input on all documents, along with encouraging their participation in future events.

The County, in consultation with MDE, the Maryland Department of Transportation (MDOT) and Michael Baker Jr., Inc., will continue to develop a schedule of stakeholder activities including public meetings, conference calls, and anticipated availability of technical and other information (see Appendix I). If needed, stakeholders will be divided into sub-committees to address such issues as: public participation and information, inventory and modeling, review of named and potential emissions control measures by source, evaluation of emission control measures by source category or other sub-committees subsequently identified.

Washington County, together with MDE and MDOT, has worked hard on developing a stakeholder process for the EAC through invitations, open public meetings and other on-going committees and groups meetings. This process has generated air quality interest in the County and will result in a positive impact on future decision on nonattainment areas in Maryland. The EAC is discussed regularly at Hagerstown / Eastern Panhandle Metropolitan Planning Organization (MPO) meetings and the Attainment Plan Task Force Meetings.

8.2 Meetings

A number of meetings for the EAC were conducted throughout the EAC process to include stakeholder meetings, public hearings for the EAP Report, and presentations to the Washington County Board of Commissioners, who approved the final EAP report. Future meeting dates will be determined on a quarterly basis, unless the stakeholders request more frequent meetings. Below is a summary of the meetings:

Date	*Meetings/Actions*
April 22, 2003	MDE Briefed County Commissioners on EAC Process
August 6, 2003	Inter-agency Meeting
August 28, 2003	Inter-agency Meeting
October 15, 2003	MPO Meeting
November 18, 2003	MPO Meeting
December 16, 2003	Commissioners Meeting
December 22, 2003	Stakeholders Meeting
January 14, 2004	EAC Stakeholders meeting
January 20, 2004	Technical Modeling update
January 21, 2004	Inter-agency meeting
February 10, 2004	Commissioners meeting – update EAP
March 3, 2004	Inter-agency meeting – Incorporate comments to Final EAP Report
March 11, 2004	Technical Modeling update
March 16, 2004	Commissioners meeting – Approval of EAP
March 25, 2004	EAP Submittal to EPA
June 8, 2004	Inter-agency meeting
August 6, 2004	Inter-agency Meeting
June 23, 2004	Inter-agency Meeting
September 14, 2004	Inter-agency Meeting
October 12, 2004	Briefing of County Commissioners on Final EAC SIP
October 26, 2004	Inter-agency Meeting

8.3 Conference Calls

A number of conference calls have been held between state and local agencies, EPA and with adjacent states within the modeling domain. Local strategy meetings/calls between Washington County, MDE and MDOT were held on February 19 and 28, August 28, October 14 and December 4, 2003. Modeling calls between MD, VA and WVA were held on February 10, March 24 and 26, April 11, May 16, June 24, July 18, and December 12, 2003. EPA led conference calls for the EAP were held on March 17 and April 16, July 10, July 15, August 14, September 23, September 25, September 26, November 4 and December 17, 2003 and October 18, 2004.

8.4 Maryland Attainment Plan Task Force

The Attainment Plan Task Force (APTF) was organized in 1995 to develop strategies to meet the 15% rate of progress requirements. At the request of the Maryland General Assembly's Environmental Matters Committee, MDE established a task force consisting of representatives of the Maryland General Assembly, trade associations, chambers of commerce, health and environmental groups, local air quality planning associations and state executive agencies.

The APTF reconvened on several occasions during the spring of 2000 to provide input and guidance on the development of the Governor's recommendation for the 8-hour ozone boundary designations. Several court actions and additional EPA guidance required an update to the Governor's original recommendation by July 15, 2003. The APTF met during February and May 2003 to provide guidance and comments for this process. Multiple comments (several specific to the EAC process) from stakeholders were incorporated into the Governor's recommendation letter for the designation of 8-hour ozone nonattainment areas. Presentations for both meetings are available on the Maryland Department of the Environment's Website at http://www.mde.state.md.us/Programs/AirPrograms/air_planning/index.asp

The APTF met on December 9, 2003 to review data, technical reports, and EPA guidance to help in determining the recommendations for nonattainment boundaries for the fine particulate standards. During this meeting, stakeholders were once again briefed on Maryland's EAC efforts and encouraged to participate in the development of local control measures and the Early Action Plans to be submitted. Stakeholders were also apprised of EPA's December 3, 2003 response letter to the Governor's 8-hour ozone boundary recommendations.

On March 23, 2004, MDE reconvened the APTF at the Thomas V. Mike Miller, Jr. Senate Building, 11 Bladen Street, President's Conference Center West I, State House, Annapolis, Maryland to review the 8-hour ozone designation process and to be briefed by EPA on their decision-making process on establishing new boundaries for the 8-hour ozone standard.

8.5 Public Outreach

Washington County entered into a partnership with Clean Air Partners, a volunteer, nonprofit, public-private group chartered by the Metropolitan Washington Council of Governments. The partnership will help enable Washington County to develop similar public educational and outreach programs to those already effectively used in the Baltimore and Washington DC areas.

Washington County will also enter into the Air Quality Action Days (AQAD) Program currently in place in the Baltimore and Washington DC areas. The Maryland Department of the Environment developed new forecasting regressions and began forecasting ground level ozone and particles for Western Maryland, including Washington County, beginning May 1, 2004. Forecasts are prepared daily at 2:30 p.m. and distributed through fax and email, as well as being posted on a variety of web sites. Washington County will continue to enhance the dissemination of this information throughout the local Government agencies and will develop a variety of strategies to implement throughout the County in the event of an Air Quality Action Day. As the program progresses more local businesses and the public will be further educated and engaged to follow the daily forecast and take voluntary measures to reduce ozone pollution. The following table identifies the tentative schedule to for CAP and AQAD.

Clean Air Partners and Air Quality Action Days Tentative Timeline:

Date	***Item/Action***
July 21, 2004	Washington County staff met with Clean Air Partners (CAP) Managing Director to discuss joining CAP & Air Quality Action Day (AQAD).
August 2004	▪ Brief county agency on air quality issues. ▪ Invite AQAD representatives/MDE to brief county agencies on AQAD
Mid-August, 2004	Prepare AQAD voluntary measures for county agencies.
April/Early May 2005	Stakeholders meeting. Invite public/private businesses to join CAP and AQAD.

May 2005	Official start of AQAD/CAP for Washington County
June 2005	Implementation date for AQAD control measures.

Washington County will continue to develop appropriate pages on its website at www.washco-md.net, with links or references to other relevant sites (county, state and federal). Relevant information from stakeholder meetings, technical efforts and County decisions will also be posted on the website.

8.6 Public Hearings

Four public hearings were held during the EAC process to solicit comments and inputs form the local community. The first public meeting for the EAC was held on May 8, 2003 at 6:00 pm at the Washington County Administrative Annex at 80 Baltimore Street in Hagerstown. Advertisements were published in The Herald-Mail on April 29 and May 5, 2003. The meeting was held to discuss EPA's air quality standards and the Washington County EAC program. Subsequent public hearings were held on January 14,2004 and February 25, 2004 to gain further input about the EAP. Appendix I contains documentation of all meeting, advertisements, news articles and meeting attendees and list of invited stakeholders. Information pertaining to the EAC was also posted on the Washington County Government and MDE web sites.

Public hearing on the Washington County Early Action Compact Ozone State Implementation Plan was held on Wednesday, December 8, 2004, 1:00 PM at the Washington County Administrative Annex, Conference Room 1A, 80 W. Baltimore Street, Hagerstown, MD 21740.

Washington County 8- Hour Ozone Early Action Compact (EAC) State Implementation Plan (SIP)

SIP Revision 04-10

November 5, 2004

APPENDICES

<u>APPENDIX A</u>

December 31, 2002 Early Action Compact Agreement for Washington County

<u>APPENDIX B</u>

EAC Guidance Documents

APPENDIX C

EAC Memorandums

APPENDIX D

Summary of Washington County EAC Control Measure Options

APPENDIX E

Comprehensive Analysis of
Transportation Emissions Reduction Measures

APPENDIX F

Health and Ozone

APPENDIX G

History of the Early Action Compact

APPENDIX H

Regional Transport and 8-Hour Ozone

<u>APPENDIX I</u>

Documentation of Public Process