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5th Semi-Annual Status Report

for

Roanoke Valley Area Ozone Early Action Compact Area

June-December 30, 2005

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PROJECT ORGANIZATION AND SUMMARY TO DATE

This report represents the 5th semi-annual status report for the Roanoke Valley Early Action Compact (EAC) area in Virginia. This area consists of the Cities of Roanoke and Salem, the Counties of Roanoke and Botetourt and the Town of Vinton. As such, this report documents the status and progress made towards the development and implementation of an Early Action Plan (EAP) to address ground level ozone pollution in the area. Specifically, this report covers the period from July 1 to Dec. 30, 2005.

The EAC process in the Roanoke Valley area began in the fall of 2002, with the formal development and signing of the Early Action Compact in December 2002. A series of required documents have been produced, culminating in the submission of the official EAP in March 2004. Provided below is listing and timeline of the products and documents provided by the Roanoke Valley EAC effort:

December 12, 2002 – Early Action Compact for the Roanoke Valley Region
June 16, 2003 – Potential local control list submission
June 30, 2003 – 1st annual status report for January to June 2003
December 31, 2003 – 2nd annual status report for July to December 2003
March 31, 2004 – Completed local Early Action Plan submitted to DEQ & EPA
December 31, 2005 – State Implementation Plan

These documents, along with other information concerning the EAC program and other EAC areas, can be viewed and retrieved from the following EPA web site:

http://www.epa.gov/ttn/naaqs/ozone/eac/index.htm

Efforts on the state and local levels have now moved towards the implementation of the emissions control measures and other actions committed to in the EAP.

The remainder of this status report documents the major actions, milestones, and events that have occurred since the submission of the 4th Semi Annual Status Report for the Roanoke Valley Area Ozone Early Action Compact Area, Jan.-June, 2005.

EVENTS SUMMARY (June to December 2005)

Provided below is a listing of major events held, and actions taken, during the period covered by this status report. These developments contribute to the implementation of the local Ozone Air Quality Improvement Plan and associated nonattainment implications:

Events Summary

6/29 Meeting with Virginia Tech, Valley Metro, Blacksburg Transit, Virginia Tech Parking Services, Virginia Tech Transportation Alternatives Coordinator. Discussion centered on reducing car use on college campuses, social and ecological impacts.

7/8 Association for Commuter Transportation net conference on outreach & marketing

8/11 Clean Commute Day Conference Call

8/17 Census Data Training for Transportation Planning

8/18-21 ACT International Conference

8/29 Exhibited at Chamber of Commerce After Hours

9/23 Meeting with Wachovia District Center Managers to promote alternative transportation

9/27 – 2:30 to 7:00 pm – Long-Range Plan display table including maps and LRTP CD-ROMS at VDOT Pre-allocation hearings, Salem VA.

9/28 Community Trans. Advisory Board (CTAB) Kick-off meeting

9/29 Commute Smart VA Meeting in Richmond

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10/4 Networking dinner with Fox, media relations and outreach

10/5 – APA Teleconference *"Planning Livable Communities for the Elderly and Adults with Disabilities"*

10/13 CTAB Meeting

10/19 Wachovia presentations to employees on ridesharing

10/25 Wachovia Day-long Exhibit to register employees for RIDE Solutions

10/21 Commuter Connections Meeting

10/27 VA Transportation Conferences

10/28 TDM Strategic Planning Meeting

11/3 Wachovia Team leaders Meeting so they can teach their employees about Ride Solutions

11/17 Commute Smart VA Meeting

12/2 Association for Commuter Transportation chapter meeting

IMPLEMENTATION STATUS OF EARLY ACTION CONTROL MEASURES

This section describes the status of each emission control measure included in the early action plan and the schedule for the measure's implementation. Additional successes, which were not anticipated at the adoption of the plan, are highlighted in yellow. These represent steps above and beyond what is called for in the Ozone EAP.

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Local Controls

Section I of III "Heavy Duty Diesel and Diesel Equipment Strategies"

1) Reduce Locomotive Idling, Implemented

The intention of this measure is to increase operating efficiency and reduce emissions from Transportation activities. Norfolk Southern Railway Company has implemented an operating policy to reduce emissions from idling locomotives as allowable by ambient conditions being greater than 32 degrees.

Norfolk Southern Railway Company's contact for this measure is:
Gibson Barbee
Engineer Environmental Design
540-981-5185

Identify types of controls and enforcement:

Conservative Assumption *#1:* 2002 Base Year- NS has been working on idle reductions prior to 2005, such that benefits may have occurred earlier.

Conservative Assumption #2: 20 switching units operated in the five county Roanoke maintenance area that have a utilization rate of 55%. This number is further reduced by 20% for times the unit is not immediately switched off or ambient temperature is less then 32 degrees Fahrenheit.

The measure was implemented in Summer 2003.

Results Estimated from Conservative Assumptions #1 and #2 above:

55% utilization, 45% not utilized and therefore turned off and not idling.
[45% * (24 hours / day) * 365] = 3,942 hours not idling and turn off annually

[3,942 * (1-.2)] = 3,153.6 hours not idling including 20% safety factor per unit.

Each locomotive is therefore not idling an average of 3,154 hours annually. Assuming 20 units at 5 gallons diesel fuel per hour equates as follows (most burn closer to 6 gallons per hour such that again a safety factor is present):

3,153.6 hours * 5 gal/ hour * 20 units historically operated within the Valley = 315,360 gal diesel not combusted.

2) Limiting Idling Times for School Busses, Implemented

Local School Systems (City of Roanoke, City of Salem, County of Roanoke and County of Botetourt) have agreed to limit idling times for school busses through internal policy and management.

3) Retrofit Roanoke County School Busses, On Schedule/ Implemented

Diesel engine retrofits have proceeded along schedule and are over 90% implemented (two units from being completed). The equipment for the remaining two units has not been received by Roanoke County. Questions concerning the Roanoke County School Bus retrofit program can be directed to Danny Carrol at 540-387-6577

Diesel engine retrofits for the City of Roanoke school busses were began in July 2004 and are on going. Each School district has responsibility for monitoring and maintaining their retrofit schedule. The City has agreed to retrofit a total of 102 school busses by 2007.

4) City of Roanoke - Purchase of 5 Bio Diesel Compatible Solid Waste Trucks

In 2003 the City of Roanoke began purchasing bio diesel compatible solid waste trucks. From 2003 to this reporting period the City purchased five trucks. For the June-December 2005 period, one additional truck has been added to the fleet. The implementation for this measure will be completed by 2007.

5) City of Roanoke – Purchase of Ethanol Compatible Vehicles

IN 2003 the City of Roanoke purchased eleven sedans and station wagons that are ethanol compatible. By 2007 the city will purchase an additional fifteen-ethanol compatible vehicles. During the June-December 2005 reporting period, one ethanol compatible vehicle was purchased. Implementation of this measure will be completed in 2007.

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6) City of Roanoke – Purchase of 9 Bio Diesel Trucks

In 2003, City of Roanoke purchased nine new trucks that will operate using bio-diesel fuel. By 2007, City of Roanoke will purchase an additional twelve bio-diesel fuel compatible
vehicles.

7) City of Roanoke – Purchase of 2 Hybrid Electric Vehicles, On Schedule

The City of Roanoke purchased 1 hybrid Ford Escape for evaluation. Future purchases are projected to follow prior to 2007.

8) County of Roanoke – Purchase of Low Emission Vehicles, Implemented

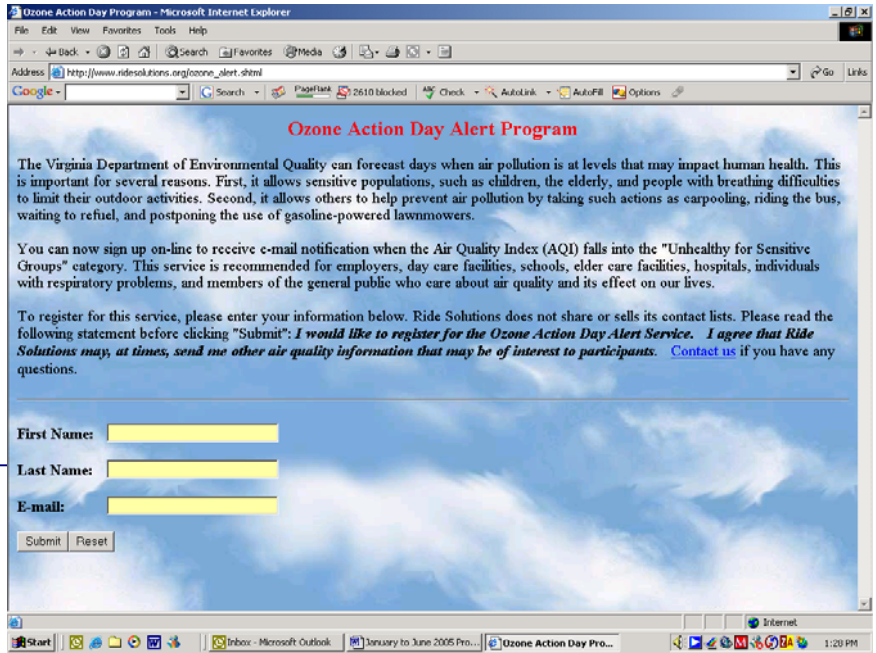
In The County of Roanoke purchased **5 (five) hybrid electric vehicles**: 2 Honda Civic, 1 Toyota Prius, and 2 Ford escape Hybrids. Future purchases are projected to follow prior to 2007.

9) County of Roanoke – Fleet Management Education and Training, Implemented

The County of Roanoke has completed this strategy, which resulted in the production of a training video so that new hires could be trained on the County's fleet management policy regarding Air Quality. Approximately 220 individuals have received the training as of November 2005.

Additional Success – Staff Training/ Air Quality Video

The resulting Staff Training/ Air Quality Video is also useful as a public education tool. As such, the video has been played extensively on the local access channel RVTV 3. This tool supplements the general public education components of the Ozone EAP.

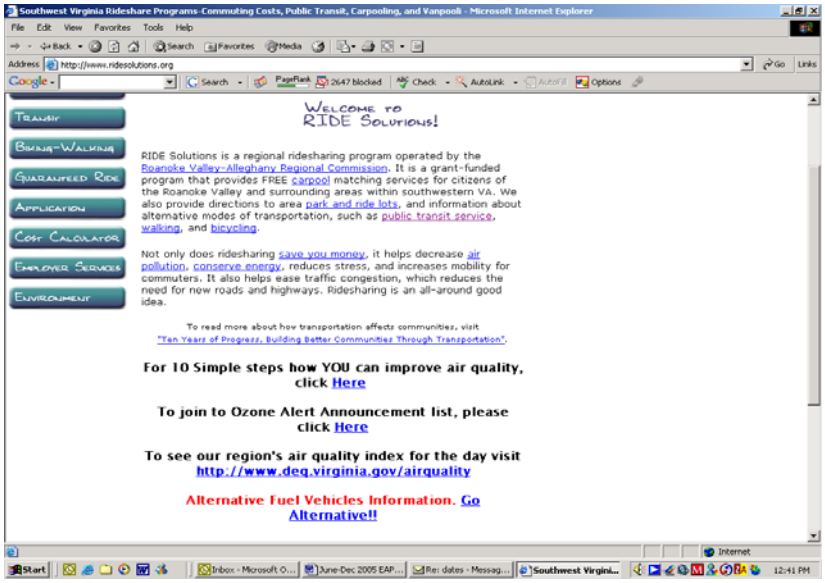


Section II of III "Air Quality Action Day, Public Education and Stationary Sources Strategies."

Air Quality Action Day, On Schedule

Fortunately, there has not been an Air Quality Action Day since the development of this strategy in early 2004. Nonetheless, the initial contact database has grown to over 350 first line contacts in the public and private sectors. These contacts are responsible for forwarding the message within their organizations. Here is an image of the web page where individuals and businesses can register to be on the Ozone Alert Listserv. The Air Quality Index is reported to participating organizations when the AQI is forecasted to reach unhealthy levels.

The RIDE Solutions Program of the Roanoke Valley-Alleghany Regional Commission is charged with managing the Air Quality Action Day program. Organizations and citizens can enroll for the Action Day notification list from the RIDE Solutions homepage, or by calling the RIDE Solutions office. In addition, the following media organizations have agreed to report Air Quality Action Days during their local programming:



WBDJ 7 (CBS)
K92 (Radio)
WSLS 10 (NBC)
Adelphia (Cable)
RVTV (Local Access)
Cox (Cable)
WVTF (Radio)
WFIR (Radio)
VIBE100 (Radio)
Roanoke Civic Center (Marquee Variable Message Sign)
Roanoke Times (Newspaper)
Clear Channel (Radio System)
Local on the 8s (Weather Channel)
National Public Radio

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RIDE Solutions has also added an additional feature to its services to lower SOV drivers in the region. Commuters who are looking for more temporary or one trip carpool matches can now use the RIDE Solutions bulletin board for carpool matching. It encourages citizens to actively seek out ways in which they can reduce traffic and air pollutions. This forum also provides individuals with more flexibility in this mobility. The Ridesolutions bulletin board can be viewed at: http://rvarc.myfreeforum.org/forum2.php&sid=c3d45a73bd578d4dddbef949286d66cc. Or it can be accessed from the Regional Commission's homepage at http://www.rvarc.org. From June to November 2005, RIDE Solutions received over 300 information requests and over 100 new members.

The Ozone Early Action Plan also has an official website (www.rvarc.org/work/eap.htm.) The Air Quality Action Day program is the lynchpin of the public involvement component in the Ozone EAP. An image of an "Air Quality Action Day" test email is provided on the next page.

11) Early Morning or Late Evening Refueling, Implemented

All local governments have agreed to, and implemented, this program. Some local governments, such as the City of Salem, have even turned off their fuel pumps during daytime hours from May to October. Many private sector organizations have also voluntarily agreed not to refuel their vehicles between 8:30 and 4:30 pm during the Ozone season. The Commonwealth has also agreed to close pumps on predicted ozone action days. Private sector participants include:

Goodwill Industries	Addecco Staffing
Salem Avalanche	Workforce Staffing
Workman Oil	Echostar
COX Communications	RADAR
Roanoke Times	Spee-Dee Oil Change
Southern Soft Cloth Auto Wash	Roanoke/Botetourt Fitness Club
Liberty Cab	Roanoke Downtown Sports Club
Yellow Cab	Cardinal Bicycles
Valley Metro	Peddlers Bicycles

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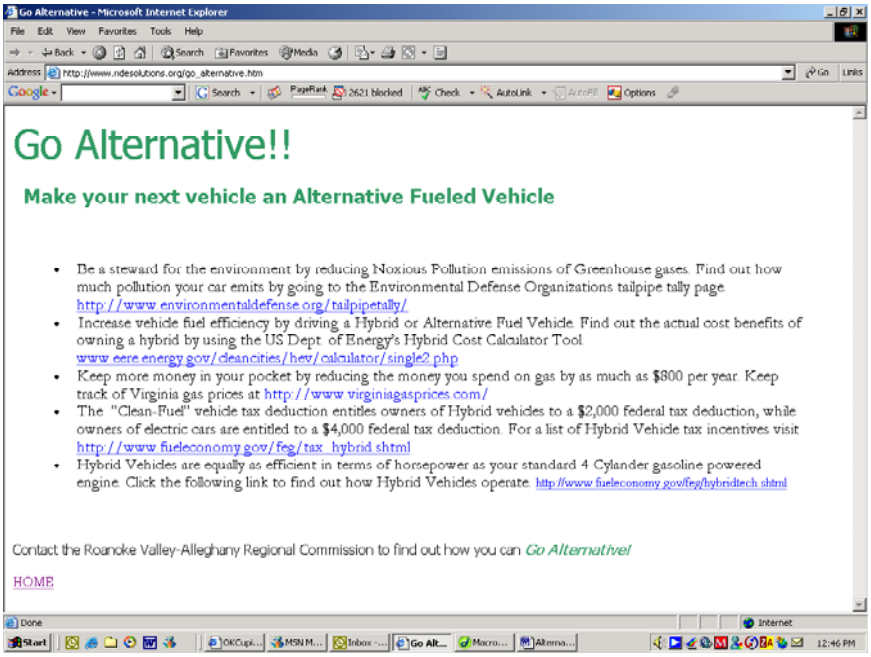
Blue Ridge Home and Garden Magazine	East Coasters
Blue Ridge Outdoors	Air-Lee Dry Cleaners
Hooptie Ride Limousine Service	Safe Kids Coalition
Breathe Roanoke Asthma Coalition	Roanoke Biz2Biz
Wachovia Regional Headquarters	

Promotion of Alternative Fuel Vehicles, Implemented



This strategy is designed to encourage citizens to consider air quality when purchasing a new vehicle. Staff has chosen not to promote one brand or make of vehicle over another. In background research for this strategy, staff discovered that hybrid electric vehicles were in fairly high demand, indicating that fuel economy and/or environmental concerns are present in some consumer's purchasing behavior.

13) Media and Public Relations Concerning Air Quality Action Days, Implemented

This strategy is the direct complement of strategy #10. Various local media outlets have agreed to alert the public on Air Quality Action Days. As of June 2005 the following media outlets are participating in the program:

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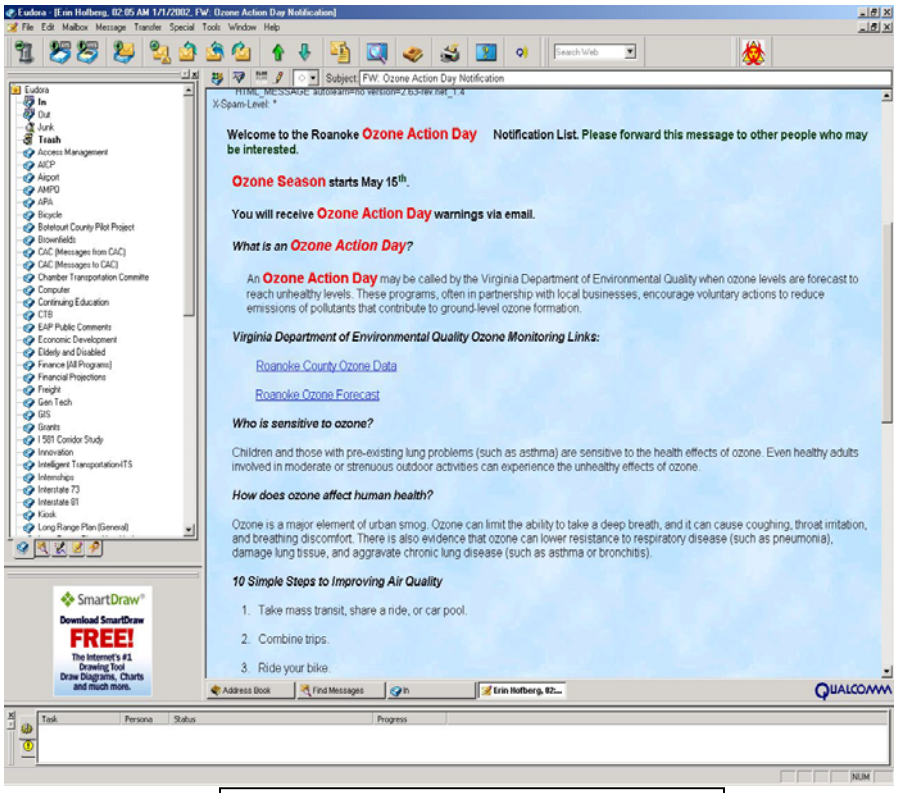
WBDJ 7 (CBS)
K92 (Radio)
WSLS 10 (NBC)
Adelphia (Cable)
RVTV (Local Access)
Cox (Cable)
WVTF (Radio)
WFIR (Radio)
VIBE100 (Radio)
Roanoke Civic Center (Marquee Variable Message Sign)
Roanoke Times (Newspaper)
Clear Channel (Radio System)
Local on the 8s (Weather Channel)



Air Quality Action Day Test

In addition, the media has featured air quality interviews and featured segments, as well as providing public service announcements to educate the public of air quality issues. The RIDE Solutions Coordinator, Erin Hofberg, was interviewed by WVTF News Radio twice, and conducted two television interviews, on News Channel 10 and Abriendo Puertas, between January and June 2005. To date, there have been a total of four television news stories featuring the Ozone EAP and RIDE Solutions program. For an up-to-date DVD with air quality related local news coverage contact Erin Hofberg at
540-342-9393.

Additional Public Outreach Efforts include:

TV Commercials:

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FOX 130 spots
WB 120 spots
WDBJ- 7, 4 weeks, 100 spots

Radio:
Clear Channel
2 months 100 spots

Print:
Roanoke Times year-long advertising contract

Bus Advertising with RADAR 4 months on the bus

Exhibits/Meetings:
2 Chamber of Commerce, Business After Hours
Wachovia

VDOT Public Hearing Sept. 27, 2005

Interviews:
6/13 NPR Interview
7/20 Abriendo Puertas, Mark McCaskill
8/1 Roanoke Times article on the Smart Way Bus sService
8/16 Ride Solutions interview for Roanoke Times Article
8/16 Ch. 10 interview with Michelle Jarbo on Gas Prices
10/11 NPR interview with Dutchie Morelli on Carpooling

Cold Calling:
10/14 RARAR Market research Reports, spoke with 350 citizens

14) Public Transit Incentives, On Schedule/ In Negotiation

Valley Metro - Valley Metro's Operations, Maintenance, and Administrative facility is located at 1108 Campbell Avenue SE. The Campbell Court Transportation Center is located in the heart of downtown Roanoke at 17 Campbell Avenue SW, and is a modern intermodal facility which provides connections between Valley Metro, The Smart Way, the Ferrum Express (weekend college service) and Greyhound. Valley Metro runs 16 routes in Roanoke, Salem, and

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Vinton. Valley Metro can be contacted by the public at (540) 982-2222, with a live operator available between the hours of 5:45am and 8:15pm, Monday through Saturday. The office number is (540) 982-0305 and office hours are Monday through Friday, 7:30am to 4:30pm.

From June to October 2005 Valley Metro and RIDE Solution distributed over 300 free bus passes throughout the region to encourage transit ridership and alternative transportation.

Valley Metro Summer Youth Pass

The Greater Roanoke Transit System (Valley Metro) has inaugurated a $20 Summer Youth Pass starting in the summer of 2005. This pass allowed youth, who are enrolled in school during the regular school year, unlimited fixed transit rides during the summer break. The motivation for this pass is to allow working age youth to find summer employment without having to rely on a private vehicle. The program seeks to encourage the development of a familiarity with public transportation that could carry over into adult hood.

VM youth/summer program utilized radio (K-92FM) and the Roanoke Times newspaper for the initial program start up by using a series of 3 (60 second) commercials during the week just before the sale of the passes began. Utilized Radio for follow-up rebate program. The person-to-person contacts to promote the program included three different visits to Summer Youth Group sessions at the main branch of the Roanoke City Library.

The CTC solicited a local restaurant chain (Subway) to co-sponsor the program. They offered a 10% discount at 8 restaurant locations, in the form of a coupon on the back of the RIDE-ON bus pass. The following information was submitted to the Roanoke City Council, and to the media as a press release, at the end of the sales portion of the program in July. Sales ended on July 15th, but the passes were utilized through August 31st. The "rebate" portion of the program continues through December 2005, whereby children are able to turn in their used "RIDE-ON" pass to receive a twenty dollar discount on the Valley Metro Basic Monthly pass.

Here is a copy of the release:

Four Thousand Three Hundred Sixty Dollars worth of Summer Youth Passes were sold. This means that Two Hundred Eighteen area youths, between the ages of 6 and 18, had the opportunity to spend the summer learning to navigate our local

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public transportation system, by learning about Valley Metro time points & making transfers, ...with many heading out to summer jobs!
As an added incentive to continue bus ridership, Valley Metro is offering the youths who purchased a RIDE-ON Summer Youth Pass the opportunity to turn it in for a half-price offer on one regular basic monthly Valley Metro bus pass. This offer will be good between September 1st and December 31st of this year.

TRANSIT RIDERSHIP

June - December 2005

	June	July	August	September	October*	November*	December*
Valley Metro	167,729	168,623	177,900	181,049	182,000	182,000	182,000
Smart Way	1966	2195	2593	3889	4100	4250	4250
Ride On Youth Summer Program	5239	5944	5824	N/A	N/A	N/A	N/A
Total Ridership	174934	176762	186317	184938	186100	186250	186250

*Projected ridership based on historical trends.

15) Bicycle Infrastructure and Amenities, On Schedule

The *Bikeway Plan for the Roanoke Valley Area MPO* was developed with input from local governments and interested citizens. The *Bikeway Plan for the Roanoke Valley Area MPO* was adopted by the Roanoke Valley Area Metropolitan Planning

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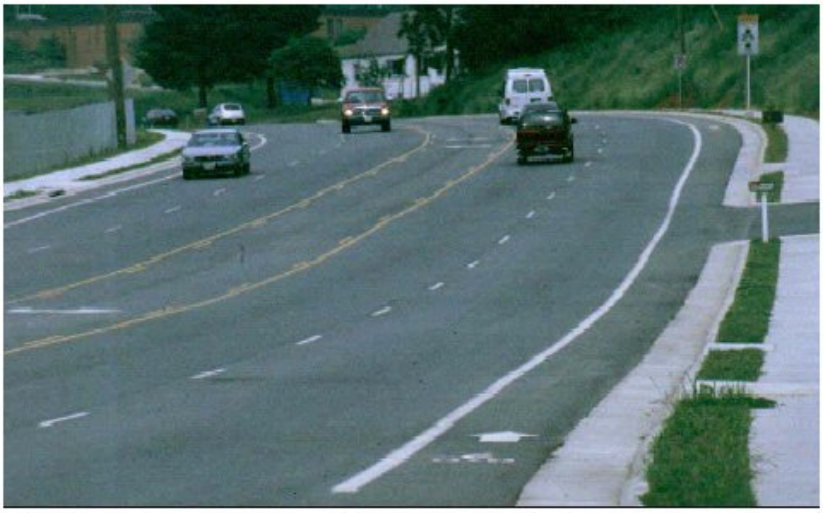
Organization in August 2005 and replaces the 1997 *Bikeway Plan for the Roanoke Valley*. The plan implementation began in 2005 and will continue through 2007.

The *Bikeway Plan for the Roanoke Valley Area MPO* represents a coordinated effort by the Roanoke Valley Area MPO and local jurisdictions to facilitate development of a regional transportation network that accommodates and encourages bicycling as an alternative mode of travel and as a popular form of recreation in the MPO study area.



Bike lane along Hardy Road in the Town of Vinton.

The *Bikeway Plan for the Roanoke Valley Area MPO* provides a coordinated and strategic approach to the development of a regional bicycling network that provides greater connectivity between activity centers and cultural resources such as greenways, public areas, downtown areas, commercial centers, employment concentrations, educational institutions, transit facilities, scenic corridors, and other points of interest in the MPO study area. The regional network outlined in this plan will also facilitate inter-jurisdictional connectivity between localities.

The Bikeway Plan should also facilitate the long-range transportation planning process, the Ozone Early Action Plan and the allocation of limited funding for bicycle and pedestrian improvements. This plan should be used in concert with local, regional, state, and national plans and/or policies including the VDOT Policy for Integrating Bicycle and Pedestrian Accommodations and the VTrans2025 Statewide Bicycle and Pedestrian Plan, as well as continued public involvement in the transportation planning process.

In an attempt to promote the Bikeway Plan, staff has provided the Roanoke County Board of Supervisors and the Vinton Town Council with a presentation overview of the plan and an outline for future implementation. Additional outreach materials, the Bikeway Plan and other information can be found at the Roanoke Valley-Alleghany Regional Commission's Bicycle and Pedestrian Planning web-site www.rvarc.org/bike.

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16) School Based Public Education, Implemented/ Ongoing

RIDE Solutions provides K-12 education classes with the intention of fostering air quality awareness in youth. This program is in correspondence to the Standards of Learning (SOL) Life Sciences Section LS.12 that states that, "The student will investigate and understand the relationship between ecosystem dynamics and human activity. Key concepts include environmental issues such as air quality." In this K-12 education program, RIDE Solutions educates the students about their affects on the environment and what they can do to help improve air quality. Specifically, Ride Solutions staff would speak on the key concepts of:

a) environmental issues of water supply, air quality, energy production and waste management;
b) food production and harvest;
c) change in habitat size, quality, or structure;
d) change in species competition; and
e) population disturbances and factors that threaten or enhance species survival.

It is anticipated that Ride Solutions staff will be invited to teach lessons in several Roanoke area middle schools in the spring of 2006. As of yet, Sylvia Shelton, Science Department Chair for Christiansburg Middle School, has already confirmed interest in setting a date for Ride Solutions to teach a class on afore mentioned topics.

In June and July 2005, Ride Solutions staff contacted approximately 50 daycares, preschools and summer camps in the Roanoke area to register them for the Ozone Early Action Plan. These groups would then receive an e-mail in the event that the Ozone level reaches an unsafe limit. Such knowledge on behalf of childcare facilities are mandated by the Department of Social Services. All organizations that provided information to Ride Solutions staff will receive recognition by the Roanoke Valley-Alleghany Regional Commission as being part of the Ozone Early Action Plan.

Alpha Christian Child Care Center
Bonsack Baptist Church Preschool
Calvary Child Care
Cave Spring United Methodist Weekday Preschool

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Child Care Network Young World
Children's Center, Ministry of Shenandoah Baptist Church
Children's Discovery Center
Child's World
Church Court Christian Day School
Colonial Avenue Preschool
Community School
Copper Hill Child Care
Country Bear Day School
Covenant Presbyterian Preschool
Downtown Learning Center
Evangel Childcare
Evelyn's Home Away From Home
Faith Christian School
First Presbyterian Church Pre-School
Glad Tidings Christian School and Day Care
Good Shepherd Lutheran Church
Grace Academy
Grandin Court Baptist Preschool
Little Angels Learning Center
Lynn Haven Preschool
Mineral Springs Christian School
New Vista Montessori School
Noah's Landing Preschool
North Cross School
Penn Forest Christian Church
Preston Oaks Montessori School
Raleigh Court Presbyterian Preschool
Raleigh Court United Methodist Preschool
Roanoke Valley Montessori School
St Anne's Episcopal Day School
St Elizabeth's Episcopal Day School
St Philip Lutheran Pre-Kindergarten
Salem Montessori School
Second Presbyterian Preschool
Shepherd's Care Day School
South Roanoke United Methodist Church Week Day Pre-School
Southview United Methodist Church
Thrasher Memorial United Methodist Pre-School

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Vinton Day Nursery & Vinton Christian Academy
Windsor Hills United Methodist Church Day School

17) Tree Canopy/ Urban Forestry, On Schedule

This strategy is on schedule and enjoying increased popularity. A summary of recent urban forestry activity follows:

- City of Roanoke: on schedule according to "City Urban Forestry Plan" and planted 38 trees for the June-December 2005 reporting period.
- Town of Vinton: planted 28 full grown trees and gave out 500 seedlings for the June-December 2005 reporting period.
- County of Roanoke: on schedule to plant 100 trees this year (70 planted for the June-December 2005 reporting period)
- Friends of the Blue Ridge Parkway are also planting trees along the parkway in the region. The number of trees planted during this reporting period has yet to be determined.

18) Roanoke to Blacksburg Public Transit, Implemented

The Smart Way service between Roanoke and Blacksburg has been successfully implemented. The transit line makes 10 runs a day between the Roanoke and New River Valleys. The fare is $3.00. The RIDE Solutions program was responsible for the public transit survey research for this service. RIDE Solutions staff provided the Customer Satisfaction and Ridership Study for the Smart Way Bus. The findings from June projected to December 2005 are provided in the chart below.

SMART WAY SURVEY DATA
June - December 2005*

Very Satisfied	59%
Somewhat Satisfied	35%
Don't Know / Don't Care	5%
Somewhat Unsatisfied	1%
Very Unsatisfied	0%

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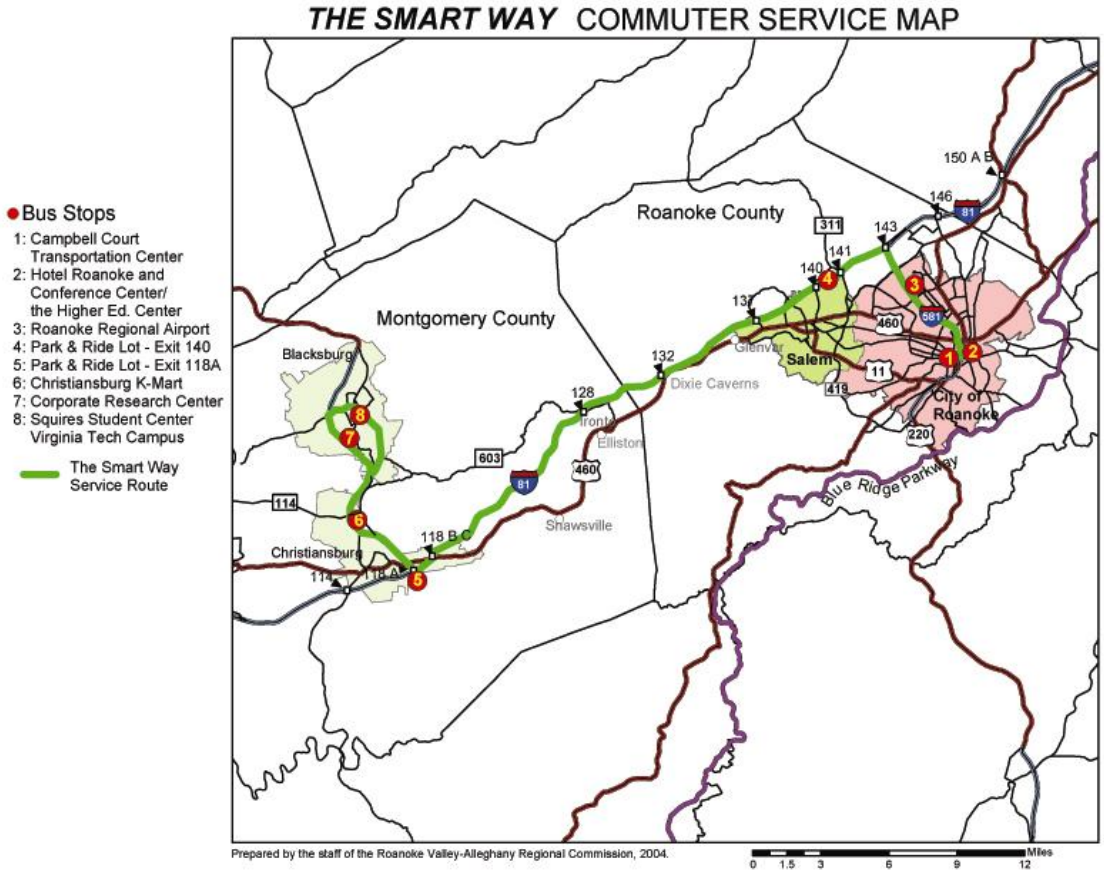
* projected survey results based on historical data.



19) Open Burning, Implemented

The Fire Marshals of each locality are considering air quality status when issuing open burning permits. Some localities have a general ban on open burning.

Section III of III "Lawn and Garden Equipment Strategies."

Replacement of Gasoline Golf Equipment with Electric, On Schedule

Regional Commission staff are working with local retailers to provide citizens with information on lawnmower trade-ins and purchasing electric mowers. A list of participating retailers is included below. The Regional Commission has also developed this flyer to educate and encourage citizens to consider alternatives to

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gas powered lawn and garden equipment. The flyer will be distributed to retailers in the region.

Is Your Old Lawn Mower Breaking Down??

Trade-in your old gasoline powered lawnmower for a newer, more efficient and environmentally friendly electric lawn mower. Recycling your old lawn mower ensures that the lawnmower will be discarded in an environmentally friendly fashion and you may even be entitled to a small monetary stipend towards the purchase of a new lawn mower.

Participating Lawn Mower Recycling Centers:

Anderson Tractor Lawn and Garden Center
21200 Virgil H Goode Hwy Rocky Mount, VA 334-2040

The Farm Store
3112 Lee Hwy, Troutville, VA 966-4522

C&R Lawn Mower Shop
7401 Hardy Rd. Hardy, VA 890-2275

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Vinton Saw and Mower Service
1227 E Washington Ave. Vinton, VA 342-6999

Second Time Around

2921 Shenandoah Ave NW, Roanoke 342-2102

Additional Regional Success - Cradle 2 Cradle

Summary description of control measure & how it is intended to reduce emissions

Note the C2C Home Competition is a partnership between Smith-Lewis Architecture, the Roanoke Redevelopment Housing Authority, City of Roanoke and others. Information can be found at www.c2c-home.org

The C2C housing competitions is based on environmental design concepts presented in the book "Cradle to Cradle" by noted UVA Professor William McDonough. A housing design competition has held using sites in the City of Roanoke. The competition attracted over 200 entries from an international pool of architects and designers.

Currently, construction drawings are being prepared for the 8 houses announced at the May 24, 2005 groundbreaking.

Identify affected companies, localities, facilities, and contact information

Immediate affected locality: City of Roanoke

Contact information:

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C2C HOME c/o Smith Lewis Architecture
18 W. Kirk Avenue
Roanoke, Virginia 24011

info@c2c-home.org

Identify types of controls and enforcement:

Voluntary program that was not included in the original Ozone EAP

Identify implementation date:

May 24, 2005

Identify Results:

Eight homes (various winning designs) are slated for construction.

Media Coverage:

The following links to media coverage can be accessed at:

http://www.c2c-home.org/coverage.htm
Blue Ridge Home and Garden (September 2004)
Environmental Construction + Design (January 2005)
Environmental Construction + Design (April 2004)
Environmental Construction + Design (March 2005)
Interiors & Sources (May 2004)
Interiors & Sources (September 2004)
Leading Architecture Magazine (September 2004)
Roanoke Times Article (August 4, 2004)
Roanoke Times Article (October 3, 2004)

Roanoke Times Article (May 24, 2005)

Roanoke Times Horizon Editorial (August 21, 2005)

Press Releases
Media Advisor - Groundbreaking Ceremony (May 2005)
Media Advisory - A Ground Breaking Idea is Breaking Ground (May 2005)
World Acclaimed Designers Jury C2C Home Winners (January 2005)

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World Acclaimed Designers Select C2C Home Winners (January 2005)

Resources/funding:

Most committed resources are from private sector and non-profit groups. There is local government support through the City of Roanoke. Resources are expected to be adequate for the constructions of the initial eight houses announced at the May 24, 2005 groundbreaking.

Additional information:

See http://www.c2c-home.org/index.htm

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Roanoke Clean Air Plan

Roanoke Ozone Early Action Area

State Air Quality & Program Update

December 31, 2005

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Roanoke Ozone Early Action Area Plan
State Air Quality & Program Update – December 31, 2005

Introduction

Provided in this report is a status of the state efforts to assist the Roanoke Ozone Early Action Compact (EAC) Area in implementing the commitments contained in the Early Action Plan for the area. This plan was submitted as a State Implementation Plan (SIP) by the Virginia Department of Environmental Quality (VADEQ) on December 20, 2004 on behalf of the Commonwealth and the localities participating in the EAC process.

Since the formal submission of this plan, great strides have been made at the local, state, and regional levels to both implement control measures and produce emission reductions in ozone precursor pollutants. In turn, these controls and emission reductions have continued to translate into cleaner air for the Roanoke area and throughout Virginia.

To demonstrate this progress in term of improved air quality, reduced emissions and pollutant transport, and the implementation of controls, the following discussed in the remainder of this report:

- Recent air quality improvement trends and observed reductions in regional ozone transport
- Updated 2005 emissions inventory demonstrating progress towards 2007 attainment goals.
- Implementation of regional and state programs contributing to the EAP process.
- Summary and status of control measures implemented as part of the Roanoke EAP.

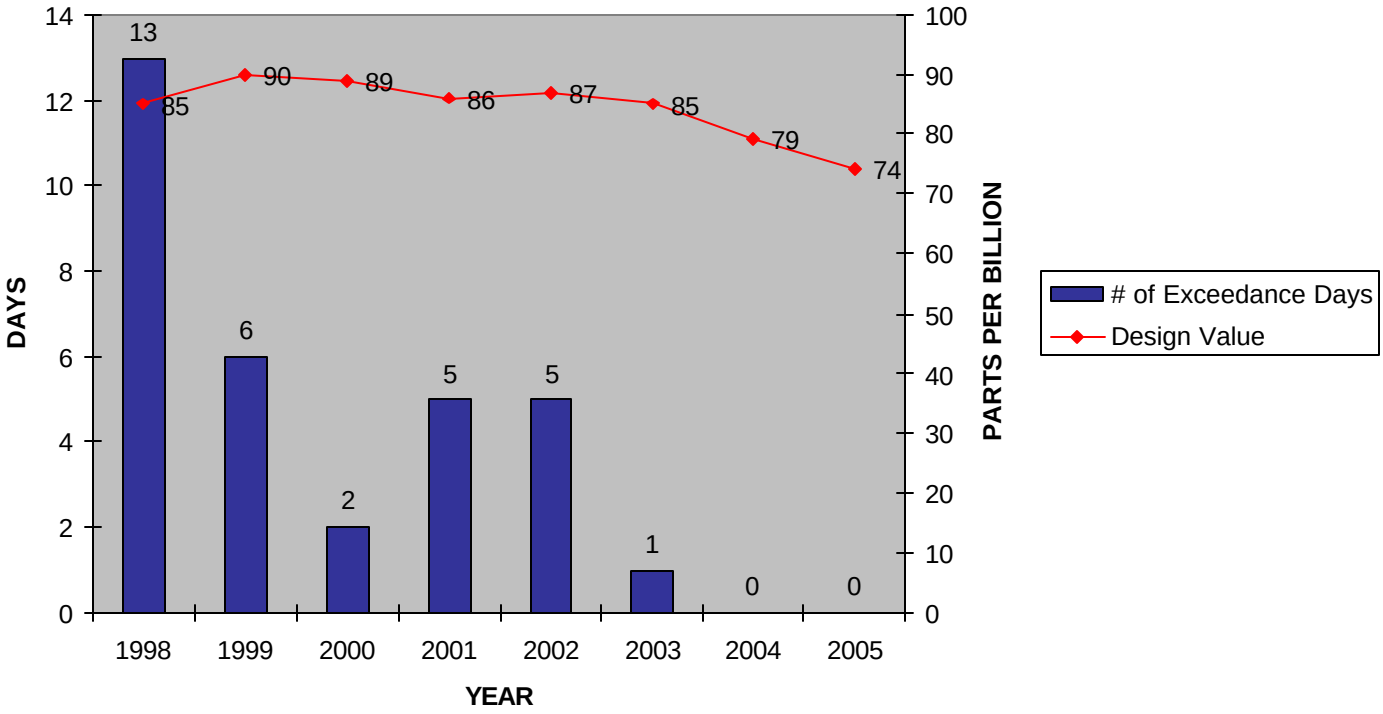
Air Quality Update

As 2005 comes to a close, ozone air quality continues to improve in the Roanoke area. This is demonstrated by the fact that the area recorded no exceedances of the 8-hour ozone standard during 2005 and represents the second consecutive year of clean ozone data. The improvement of air quality continued in 2005 despite weather more conducive to ozone formation than in previous years. This trend in air quality improvement is documented below from highs recorded in the late 1990s. As a result, the Roanoke area is now in compliance with the 8-hour ozone standard.

Table 1 – Roanoke Ozone Exceedance & Design Value Trends

YEAR	*# OF EXCEEDANCE*	*3-YEAR DESIGN VALUE*
1998	13	**85 Parts Per Billion (PPB)**
1999	6	**90 PPB**
2000	2	**89 PPB**
2001	5	**86 PPB**
2002	5	**87 PPB**
2003	1	**85 PPB**
2004	0	**79 PPB**
2005	0	**74 PPB**

Figure 1 – Roanoke Ozone Exceedance & Design Value Trends



Of equal or even more importance than the local ozone air quality improvement in Roanoke is the trends being observed in the reduction of ozone being transported in to Virginia and the EAC areas. Small areas like Roanoke and Winchester, with relatively small local ozone precursor pollutant emissions are significantly impacted by the regional pollutant load of ozone that is generated in upwind areas and transported into these areas by typical summer weather patterns.

To track and analyze the influence of transported ozone, Virginia has a long standing high-altitude monitor in the Shenandoah National Park

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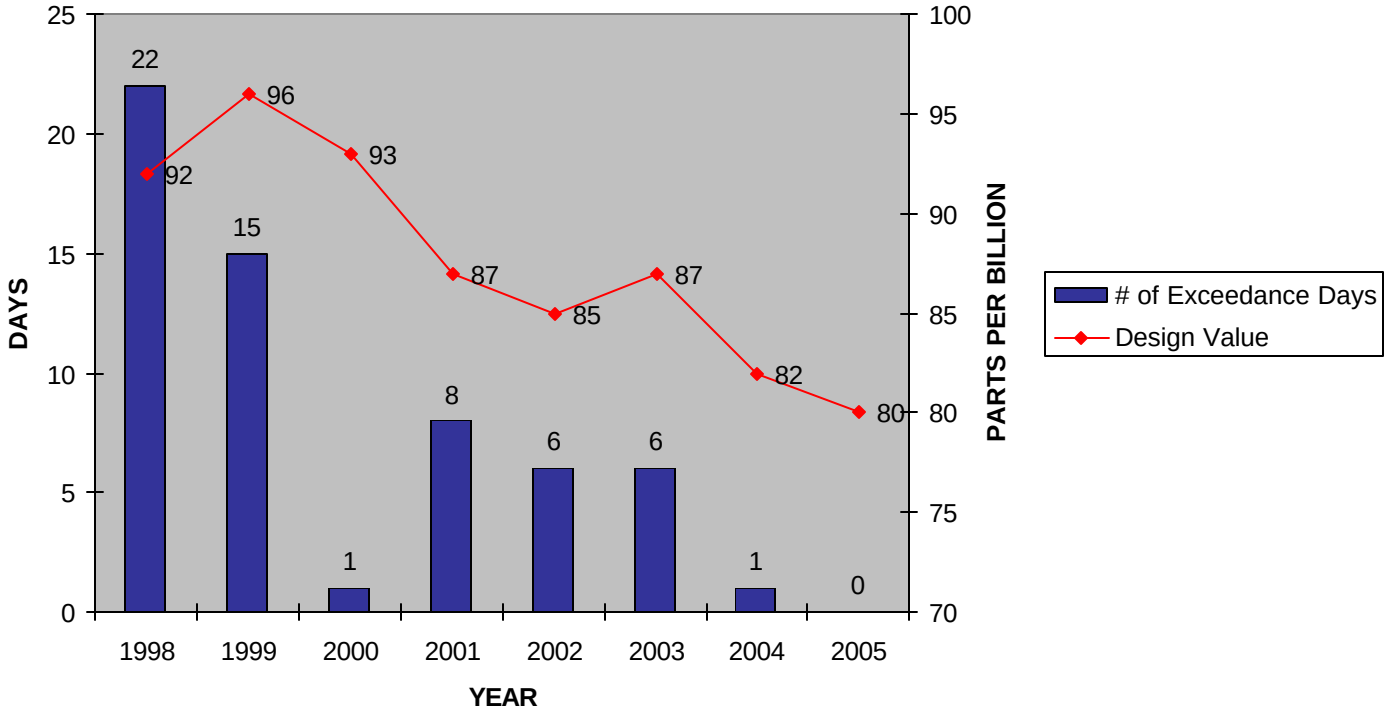
(SNP) at Big Meadows. It is well accepted that high ozone values observed at this monitor is reflective of pollution being transported into Virginia from areas west of this monitoring station. As shown in the graph below, ozone air quality has also improved significantly at the SNP monitor.

Figure 2 – Big Meadow (SNP) Ozone Exceedance & Design Value Trends



To investigate this reduction in transported pollution, the following analysis was performed. The table and charts presented below and on the next page show that the average ozone levels measured at Big Meadows during ozone exceedance days has dropped from 1998 to 2005 by approximately 15 ppb.

Table 2 – Range of Big Meadows Hourly Average Concentrations

YEAR	AVERAGE CONCENTRATION RANGES
1998	69 TO 80 PPB
1999	65 TO 76 PPB
2000	67 TO 74 PPB
2001	68 TO 75 PPB
2002	58 TO 70 PPB
2003	70 TO 77 PPB
2004	56 TO 69 PPB
2005	54 TO 63 PPB

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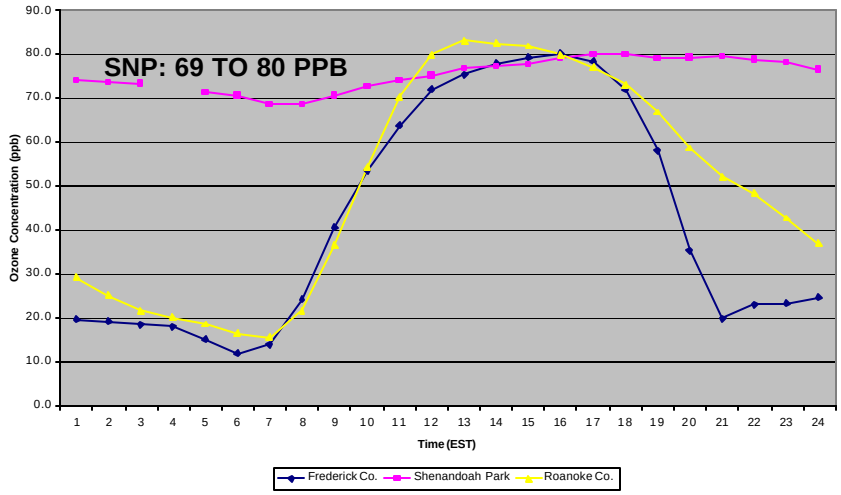
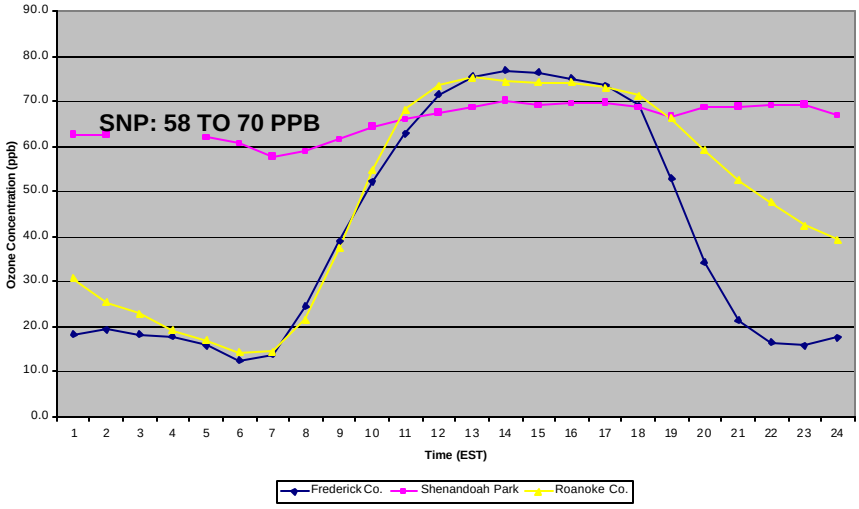
Figure 3-5: Reduction in Ozone Transport (1998, 2002, & 2005)

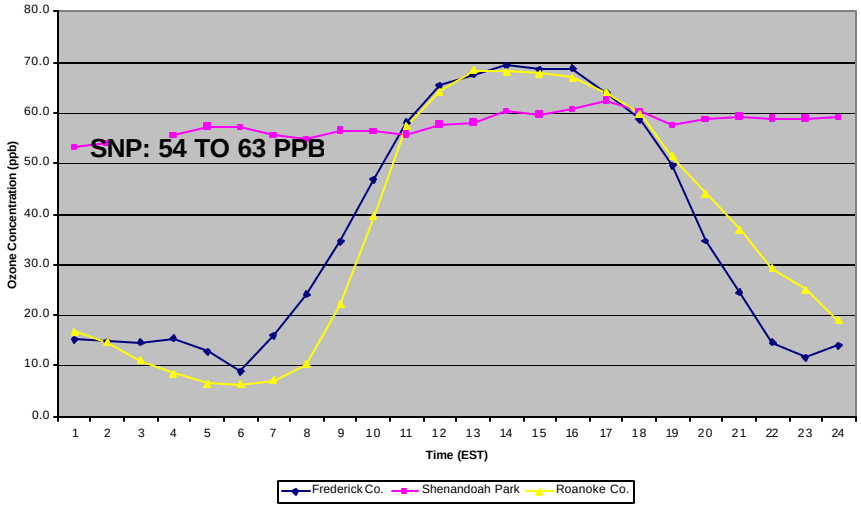
Hourly Ozone Concentration (1998 8- hr Exceedance Days)



Hourly Ozone Concentration (2002 8-hr Exceedance Days)



Hourly Ozone Concentration (2005 8-hr Exceedance Days)



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This reduction is the regional ozone load is most likely due to the numerous control programs implemented to reduce ozone precursor emissions on the state and national levels. Most significant of these, the regional reduction of Oxides of Nitrogen (NO_X) emissions from power plants that was specifically designed to reduce the transport of ozone from one area to another. Information on the reductions achieved by this program is presented in Section 3 of this report.

Emissions Inventory Update

To demonstrate that the Roanoke area is making good progress towards the emissions reductions committed to in the EAP, an updated 2005 emissions inventory for the area has been developed and is presented below along with a comparison to the 1999, 2002, and 2007 emissions inventories previously developed to support the planning process.

Table 3 – Roanoke Area Emissions Inventories and Trends

Source Category	1999 (Baseline)	2002 (Interim)	2005 (Current Year)	2007 (Control Case)
Volatile Organic Compound (VOC) Emissions in tons/day				
Point Sources	4.551	3.518	2.710	3.927
Area Sources	18.845	19.360	14.590	15.300
Non-road Sources	6.063	5.922	4.718	4.352
Mobile Sources	18.074	16.071	12.600	10.813
Totals:	**47.533**	**44.871**	**34.618**	**34.392**
Oxides of Nitrogen (NO_X) Emissions in tons/day				
Point Sources	9.312	7.231	6.430	7.086
Area Sources	5.091	5.254	3.590	5.293
Non-road Sources	7.877	8.036	5.201	6.424
Mobile Sources	31.036	28.336	25.500	19.481
Totals:	**53.316**	**48.857**	**40.721**	**38.284**

Figure 4 – Roanoke Area Emissions Inventory Trends

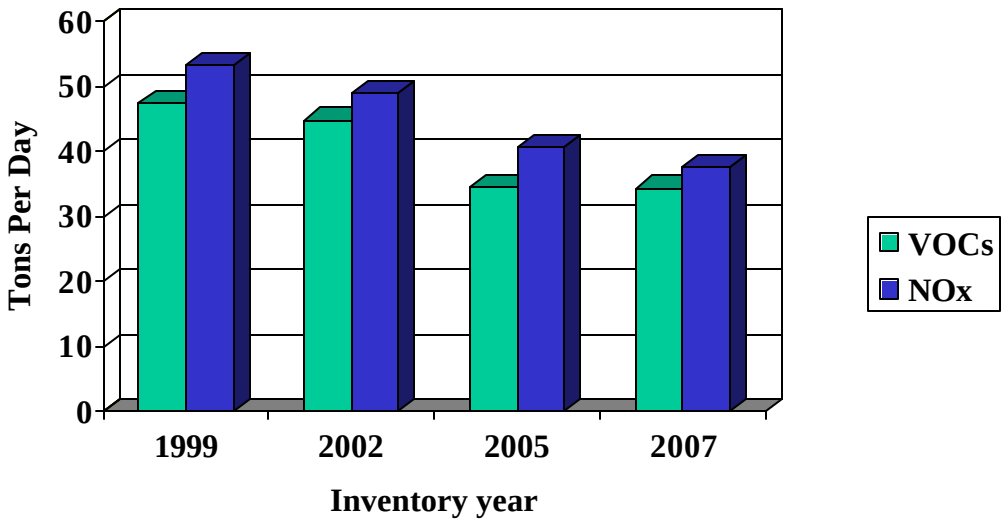

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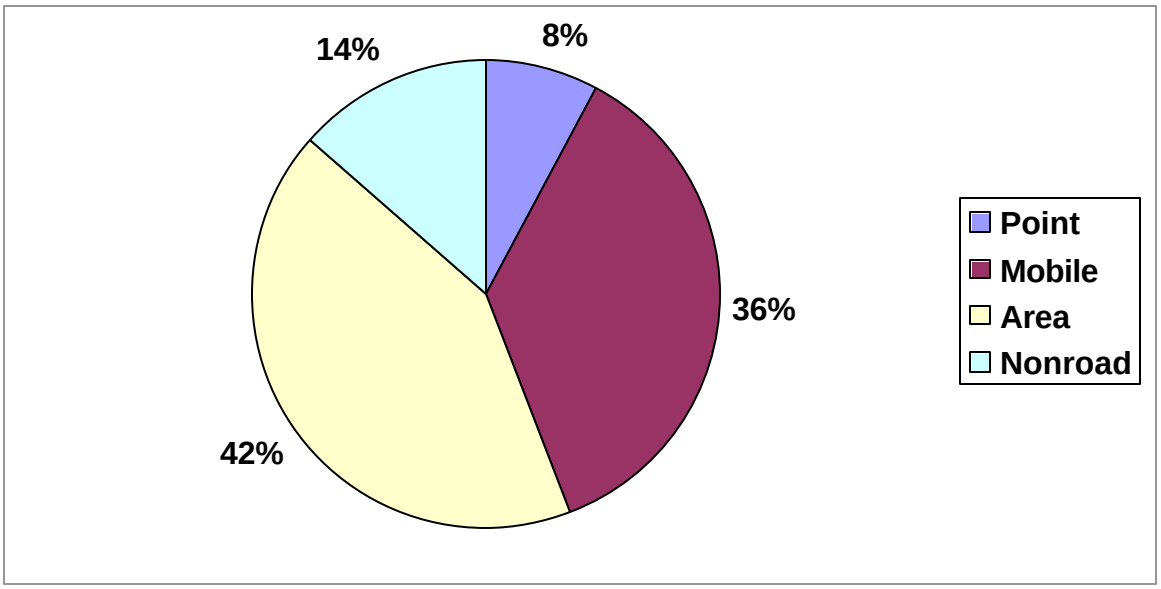
Figure 5 - 2005 Baseline Ozone Season Daily Emissions of Volatile Organic Compounds (VOC)



Summary of the Roanoke Valley Current VOC Emissions Inventory for Calendar Year 2005	
Major Source Categories	Emissions (tons/day)
Major Stationary Point Sources	
28 individual facilities (Botetourt: 7, Roanoke Co.: 12, Roanoke City: 5, Salem City: 4) - Description: Includes cement production, metal works, minerals production, gas terminals.	2.71 tpd
On-Road Mobile Sources	
Motor Vehicles on Public Roads – **Description**: local and through traffic on the I-81 corridor. Large percentage of heavy-duty diesel trucks. Also, vehicle traffic on all other public roads from major arterials to local roads.	12.6 tpd
Area Sources	
Use of Solvent-based Products – Description: paints, cleaners, consumer products, & others. Gasoline Distribution & Marketing – Description: Gasoline storage & transfer operation at terminals and service stations Others – description: Open burning, landfills, & others	14.59 tpd
Non-Road Mobile Sources	
Non-road Equipment – Description: lawn & garden, construction, recreational vehicles. Others – Description: Locomotives, aircraft, boats	4.718 tpd
Total	**34.62 tpd**

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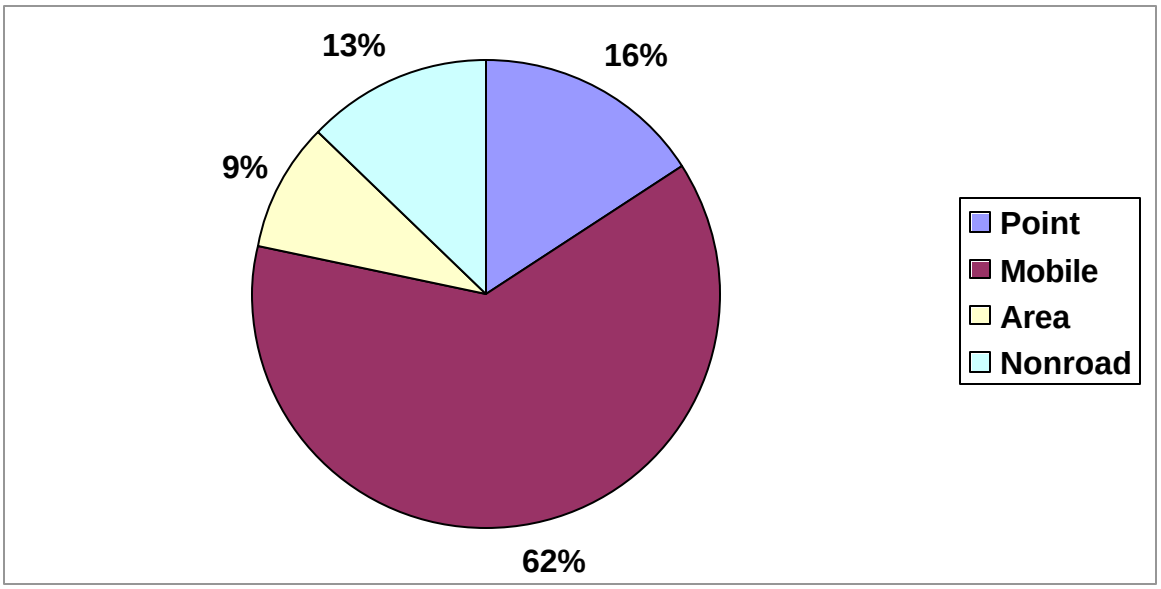
Figure 6 - 2005 Baseline Ozone Season Daily Emissions of Oxides of Nitrogen (NO_X)



Summary of the Roanoke Valley Current NOX Emissions Inventory for Calendar Year 2005	
Major Source Categories	Emissions (tons/day)
Major Stationary Point Sources	
28 individual facilities (Botetourt: 7, Roanoke Co.: 12, Roanoke City: 5, Salem City: 4) - Description: Includes cement production, metal works, minerals production, gas terminals.	6.43 tpd
On-Road Mobile Sources	
Motor Vehicles on Public Roads – **Description**: local and through traffic on the I-81 corridor. Large percentage of heavy-duty diesel trucks. Also, vehicle traffic on all other public roads from major arterials to local roads.	25.50 tpd
Area Sources	
Use of Solvent-based Products – Description: paints, cleaners, consumer products, & others. Gasoline Distribution & Marketing – Description: Gasoline storage & transfer operation at terminals and service stations Others – description: Open burning, landfills, & others	3.59 tpd
Non-Road Mobile Sources	
Non-road Equipment – Description: lawn & garden, construction, recreational vehicles. Others – Description: Locomotives, aircraft, boats	5.20 tpd
Total	**40.72 tpd**

The Roanoke area is well on its way to achieving the emissions reductions needed to meet the attainment year (2007) goals. In fact, 2005 emissions levels are within 0.23 tons per day of VOC and 2.44 tons per day of NO_X of the 2007attainment emissions level goals.

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Regional/State Programs Update

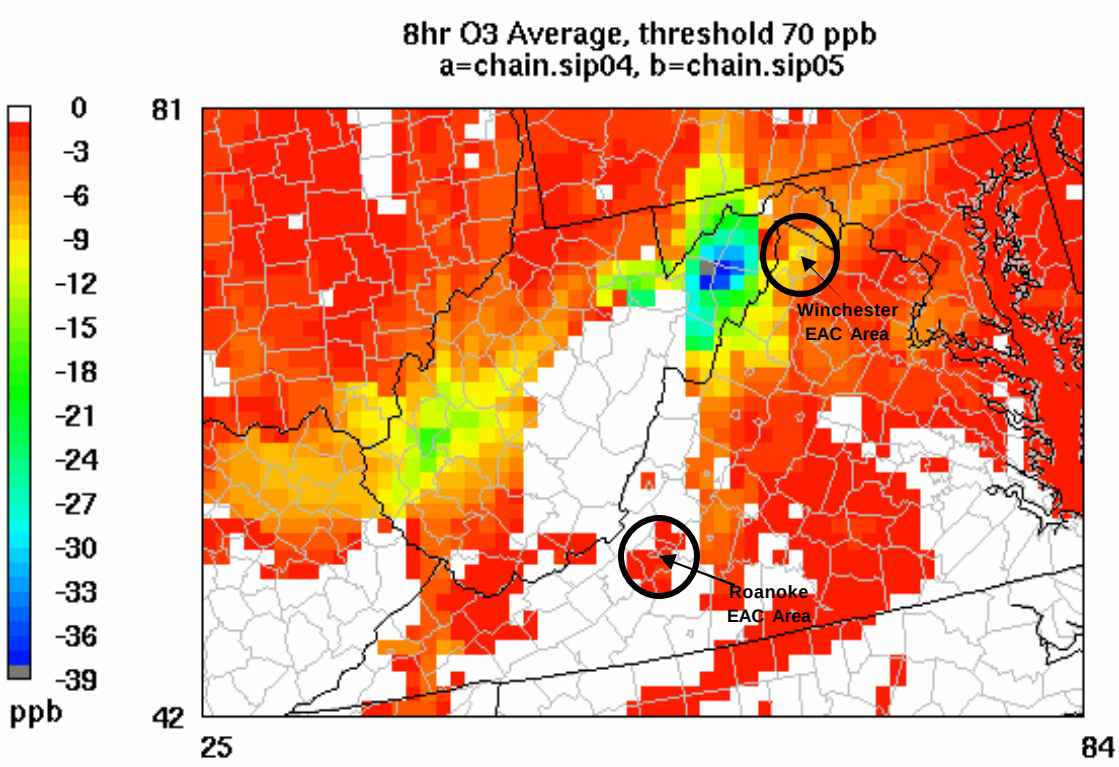
The Virginia Department of Environmental Quality (VADEQ) has implemented several control measures to assist the Roanoke area in achieving its air quality goals.

1. Regional Reduction of NO_X Emissions (SIP Call)

The most significant of these programs has been the regional program to reduce NO_X emissions from power plants and large industrial boilers. This regional program, commonly known as the "NO_X SIP Call", was established by the EPA to address the transport of ozone and precursor emissions in the eastern United States. Virginia, along with 22 other state became subject to this rule which now covers over 2,500 combustion unit in the control area.

To assess the impact of this program on the Roanoke area, a limited modeling analysis was performed by the VADEQ to determine the benefits of emissions reductions from selected power plants within close proximity of the EAC area. The results of this analysis shows that the reductions achieved at the four selected power plants alone have a significant impact on predicted ozone values in the Roanoke area as shown in concentration difference map below:

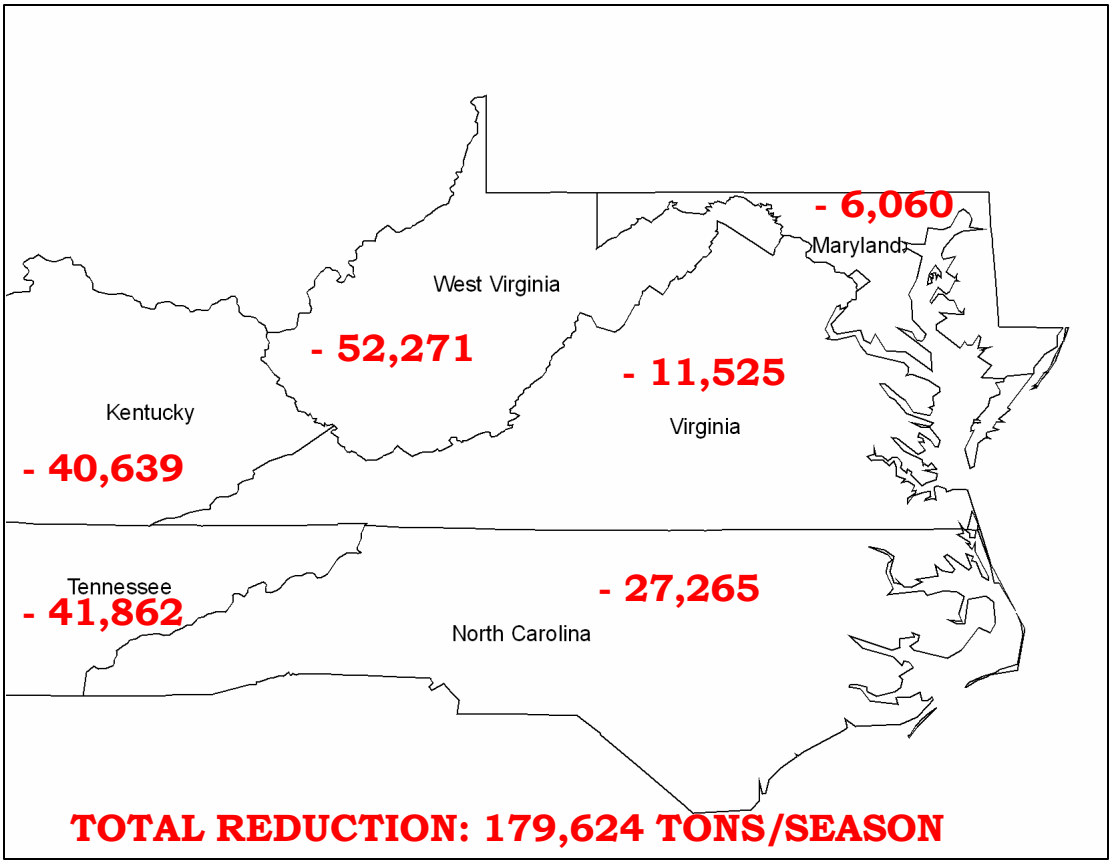
Figure 7 – Ozone Reductions from Local Power Plant Controls



Reduction in emissions from the four selected power plants alone since 2002 have produced ozone concentration reduction of up to 3 parts per billion in the Roanoke area (see Appendix A for a detailed modeling report.. Time and resource constraints did not allow for a more comprehensive modeling analysis of the SIP Call impacts on the EAC areas and Virginia in general. However, the EPA report "Evaluating Ozone Control Programs in the Eastern United States – 2004" estimates much larger reductions in average ozone concentrations in Virginia of 7 to 23% from 1997 to 2004 with much of this reduction coming since 2002 and the implementation of the SIP Call requirements. These estimates are consistent with the analysis of the reduction of the regional ozone load present in Section 1 of this document that shows a 10 to 15 ppb reduction in transported ozone in Virginia from 1998 to 2005.

As can be predicted, these reductions in ozone are being driven by the significant reduction of NO_X emissions in the SIP Call control area. To document these reductions, an assessment of NO_X emissions and emissions reductions has also been performed for Virginia and surrounding states using data from the EPA Clean Air Markets Division. The results of this analysis are presented below:

Figure 8 – NO_X Emissions Reductions from 2002 to 2005



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As can be seen by this analysis, significant NO_X emissions reductions are being achieved through the SIP Call program that is certainly contributing to the improvement in air quality being observed throughout the region and specifically in the EAC areas.

2. National Low Emissions Vehicle Program

The National Low Emissions Vehicle (NLEV) program is a voluntary clean vehicle program established by the EPA through national regulation on December 16, 1997. Due to the voluntary nature of the program, it was contingent upon agreement by a number of Northeast states and the major automobile manufacturers. Virginia opted into this program for lower vehicle emissions standards, beginning with model year 1999 vehicles and subsequently adopted a state NLEV regulation, 9 VAC 5 Chapter 200, which became effective on April 14, 1999.

This program along with the federal motor vehicle control programs, have and continue to provide substantial emissions reductions in Virginia that will assist areas like Roanoke in meeting air quality standards and goals.

3. Existing Source Controls and NO_X RACT

To address local point source emissions, the state extended certain exiting source and Reasonably Available Control Technology (RACT) regulations to the Roanoke area to reduce the local contribution to ozone formation. These regulations were adopted by the Air Pollution Control Board in October 2003 and became effective on March 23, 2004. Compliance with these regulations was then required by November 15, 2005. These regulations mainly apply to two categories of sources which are described below.

A number of state regulations (Chapter 40) regarding exiting sources of the Volatile Organic Compound (VOC) have been extended to the Roanoke area. These regulations are as follows:

Article 5 - Synthesized Pharmaceutical Products Manufacturing Operations
Article 6 – Rubber Tire Manufacturing Operations
Article 11 – Petroleum Refinery Operations
Article 24 – Solvent Metal Cleaning Operations Using Non-Halogenated Solvents
Article 25 – Volatile Organic Compound Storage and transfer Operations
Article 26 – Large Appliance Coating Application Systems
Article 27 – Magnet Wire Coating Application Systems
Article 28 – Automobile and light Duty Truck Coating Application Systems
Article 29 – Can Coating Application Systems
Article 30 – Metal Coil Coating Application Systems
Article 31 – Paper and Fabric Coating Application Systems
Article 32 – Vinyl Coating Application Systems
Article 33 – Metal Furniture Coating Application Systems

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Article 34 – Miscellaneous Metal Parts and Products Coating Application Systems
Article 35 – Flatwood Paneling Coating Application Systems
Article 37 – Petroleum Liquid Storage and Transfer Operations
Article 39 – Asphalt Paving Operations (Cutback Asphalt Restrictions)

Once these regulations became effective, the VADEQ regional office identified 33 point sources in the Roanoke area that were potentially subject to one or more these regulations (not including gasoline service stations). These sources were subsequently notified of the potential applicability of these regulations by letter dated March 12, 2004.

As a result of this notification process, eight sources were determined to be exempt from these rules. The remaining sources have been determined to be in compliance with the applicable rule(s) and/or have permits which include VOC control requirements equal to or more stringent that the Chapter 40 requirements. Compliance with these regulations is specific to the individual process and regulation and mainly relies on VOC content limitations and/or emission reduction requirements. The estimate of about 1 ton per day of cumulative reductions from these requirements remains valid. The reductions from cutback asphalt restriction also remain valid (0.005 tons per day).

In addition to these controls, the gasoline bulk terminal requirements of Article 37 were also extended to Bedford County which is adjacent to the Roanoke EAC area. There are five bulk terminal facilities located in this County and all five have been issued State Operating Permits which include the Article 37 requirement. Furthermore, all these facilities are now in compliance with these requirements that provide additional VOC reductions above and beyond those claimed in the Roanoke EAP.

The second part of the control requirements involved case by case RACT determinations for major sources of NO_X. Three point sources in the Roanoke area were identified as being subject to this requirement which resulted in source specific RACT determinations and permits that were submitted to the EPA and approved as separate SIP revisions as part of the overall EAP SIP. The current compliance status of these three facilities is as follows:

<u>Roanoke Cement:</u> A RACT permit was issued to this source on December 22, 2004. As of November 15, 2005, the emissions from the RACT applicable unit have been reduced by a combination of process controls and good combustion practices. During the first scheduled plant shutdown, the source will install low NO_X burners.

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Roanoke Electric Steel: A RACT permit was issued to this source on December 22, 2004. This permit required that NO_X emissions from the source be controlled through a combination of proper operation and maintenance, and low NO_X burners. The source is currently in compliance with all the conditions of this RACT permit.

Norfolk Southern Railroad: A RACT permit was issued to this source on December 22, 2004. This permit required that NO_X emissions from the source be controlled by meeting a 0.4 lbs/mmBtu emission rate for the power plant boilers at the facility. The facility has recently completed source testing to demonstrate compliance with this permit requirement. The results of this testing will be provided to the VADEQ in the near future.

Due to the fact that many of the requirements of these RACT permits did not become effective until late 2005, annual and seasonal emissions estimates resulting from these requirements are not yet available. However, it should be noted that total point source NOX emissions in the Roanoke area are already below the projected 2007 post control attainment levels as presented in the emission inventory section of this report.

4. Enhanced Ozone Forecasting tool for the Roanoke Area

One of the main components of the local early action program is a the establishment of an zone action days program. This program requires a combination of mandatory and voluntary action by local governments and residents to reduce ozone precursor producing activities and emissions. In order to implement such a program, daily air quality forecasts are needed. To support this program, the VADEQ has completed the following actions to enhance the ozone forecast and health advisory program for the Roanoke area:

- The VADEQ contracted with Sonoma Technologies Inc. to develop an enhanced ozone forecasting tool for various areas in Virginia, including the Roanoke area. This work has been completed.
- An additional meteorologist has been hired to support the VADEQ air quality forecast and advisory program.
- The forecasts for the Roanoke area have been updated to reflect the 8-hour ozone standard. In addition, daily forecasts for fine particulate matter are now being issued for the Roanoke area all year.
- The Roanoke area has been updated on the VADEQ air quality forecast webpage, and on the EPA's AIRNOW national forecast

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webpage to reflect these changes. These sites are shown in the figures below:

Figure 8 – VADEQ Air Quality Forecast Page

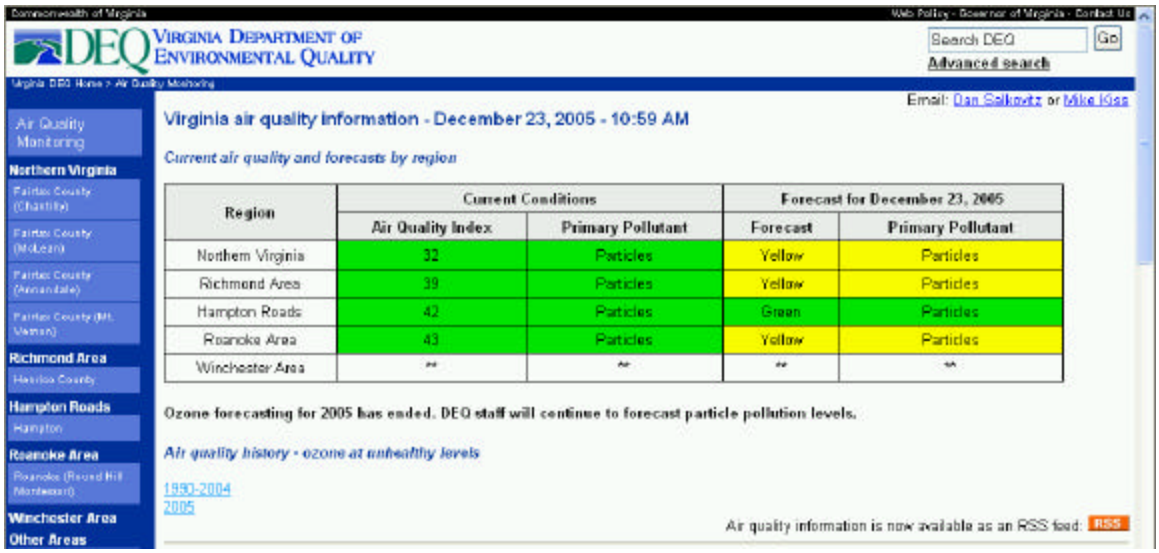
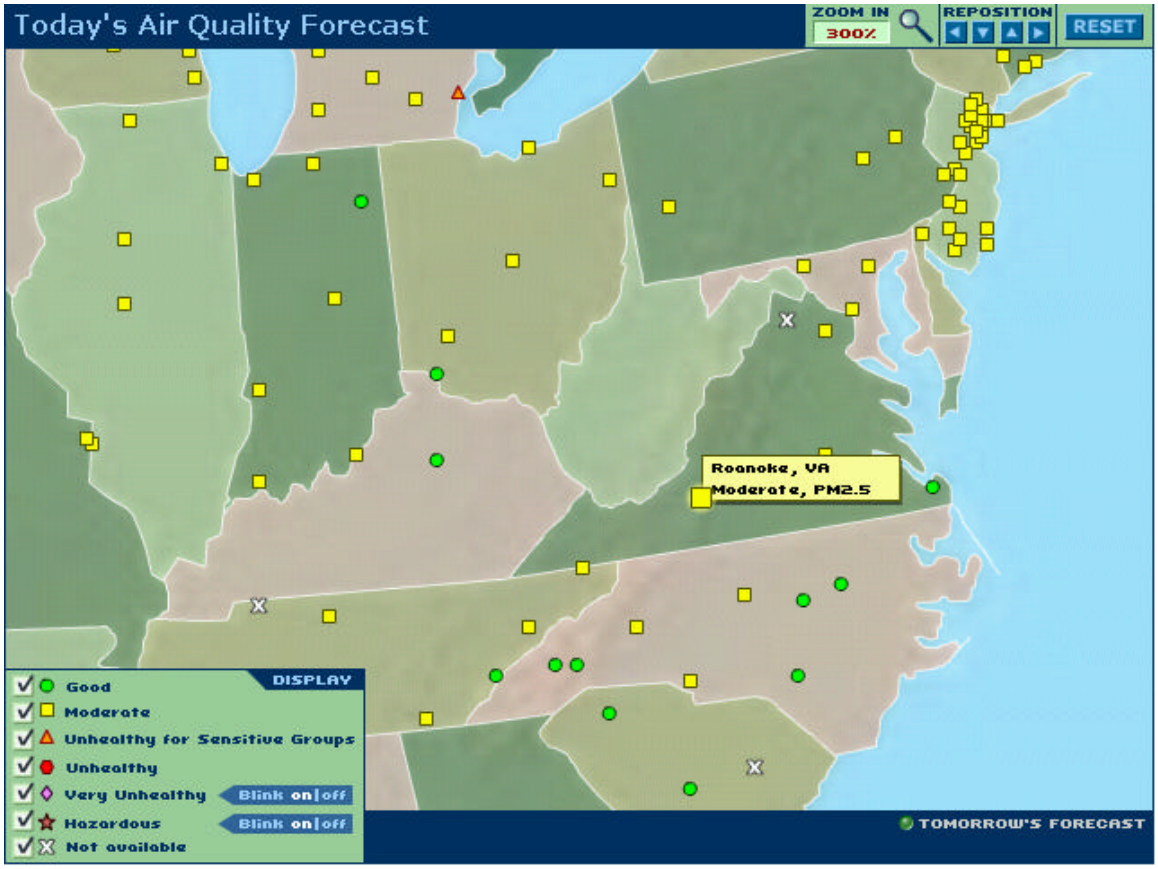


Figure 9 – EPA AIRNOW Air Quality Forecast Page



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5. School Bus Emissions Control Retrofit Program

As part of a EPA/VADEQ funded and administered program, Roanoke County and the City of Roanoke have completed projects to retrofit a significant number of school buses with emission control technologies. The results of these projects are as follows:

Roanoke County: 100 school buses retrofitted with diesel oxidation catalysts (DOC) at a total cost of $144,000.

Roanoke City: 121 school buses retrofitted with DOC. The electronic control modules (ECMs) on 19 buses have also been reprogrammed to further reduce NO_X emissions. Total cost of the project was $150,000.

6. Stage I Vapor Recovery Control at Service Stations

Section 9 VAC 5-40-5200 B. 3.of Article 37 of the Chapter 40 VOC regulations specifically requires the installation and use of Stage I vapor control and recovery systems at services stations in Roanoke County and the Cities of Roanoke and Salem. Compliance with this rule was previously estimated to be nearly 100%. A final compliance review is currently underway and will be completed prior to the next ozone season.

Control Program and Measures Summary

In general, the Roanoke area and its state and federal partners have been very successful in implementing the commitments contained in the Early Action Plan. A summary of the control measures and estimated reductions in 2007 is presented below. No changes have occurred in the emission reduction estimates since the 2004 SIP. Appendix b of the 2004 SIP submission provides detailed descriptions of these measures and the methods used to calculate the predicted emissions reductions.

Control Measures & Estimated Emissions Reductions (2007)

Emissions Control Measures	VOC (tpd)	NO_X (tpd)	Modeled
State/Federal Area Source Controls			
Stage I Vapor Recovery at Gasoline Service Stations (Federally Enforceable)	1.756	0.000	YES
Architectural Products – Federal Rule (Federally Enforceable)	0.372	0.000	YES
Consumer Products – Federal Rule (Federally Enforceable)	0.178	0.000	YES
Metal Cleaning Solvents – Federal Rule (Federally Enforceable)	0.163	0.000	YES
Motor Vehicle Refinishing – Federal Rule (Federally Enforceable)	0.158	0.000	YES

Cutback Asphalt – State Rule (Federally Enforceable)	0.005	0.000	YES
Emissions Control Measures	**VOC (tpd)**	**NO_X (tpd)**	**Modeled**
Subtotals:	**2.632**	**0.000**	
Federal Non-Road Source Controls			
Small Gasoline Engine Standards – Federal Rule (Federally Enforceable)	1.681	0.059	YES
Diesel Engine Standards – Federal Rule (Federally Enforceable)	0.158	0.969	YES
Locomotive Engine Standards – Federal Rule (Federally Enforceable)	0.000	1.112	YES
Large Gasoline Engine Standards – Federal Rule (Federally Enforceable)	0.146	0.546	YES
Recreational Engine Standards – Federal Rule (Federally Enforceable)	0.015	0.000	YES
Subtotals:	**1.995**	**2.686**	
Federal Mobile Source Controls			
Previous Motor Vehicle Standards – Federal Rule (Federally Enforceable)	6.343	7.600	YES
Tier 2 Vehicle Standards – Federal Rule (Federally Enforceable)	0.917	3.799	YES
Heavy Duty Diesel Standards – Federal Rule (Federally Enforceable)	0.001	0.156	YES
Subtotals:	**7.261**	**11.555**	
State/Local Early Action Plan Controls			
Existing Source CTG RACT Controls – State Rule (Federally Enforceable)	1.098	0.790	YES
Ozone Action Days Program – State/Local (Mandatory/Voluntary)	0.918	0.611	YES
Open Burning Restrictions – Local (Mandatory/Voluntary)	0.564	0.238	NO
All Other Local Programs – Local (Voluntary)	0.020	0.228	NO
Subtotals:	**2.580**	**1.639**	
TOTALS:	**14.468**	**1.588**	

Appendix B of this report contains a summary table of the main control measures implemented in the Roanoke area. More on the local implementation of measures are provided in the local area status report for December 2005.

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Modeling Analysis of Ground Level Ozone Concentration Changes in Virginia Early Action Compact Areas by Controlling NO_x Emissions from Selected Utilities

Virginia Department of Environmental Quality

December 15, 2005

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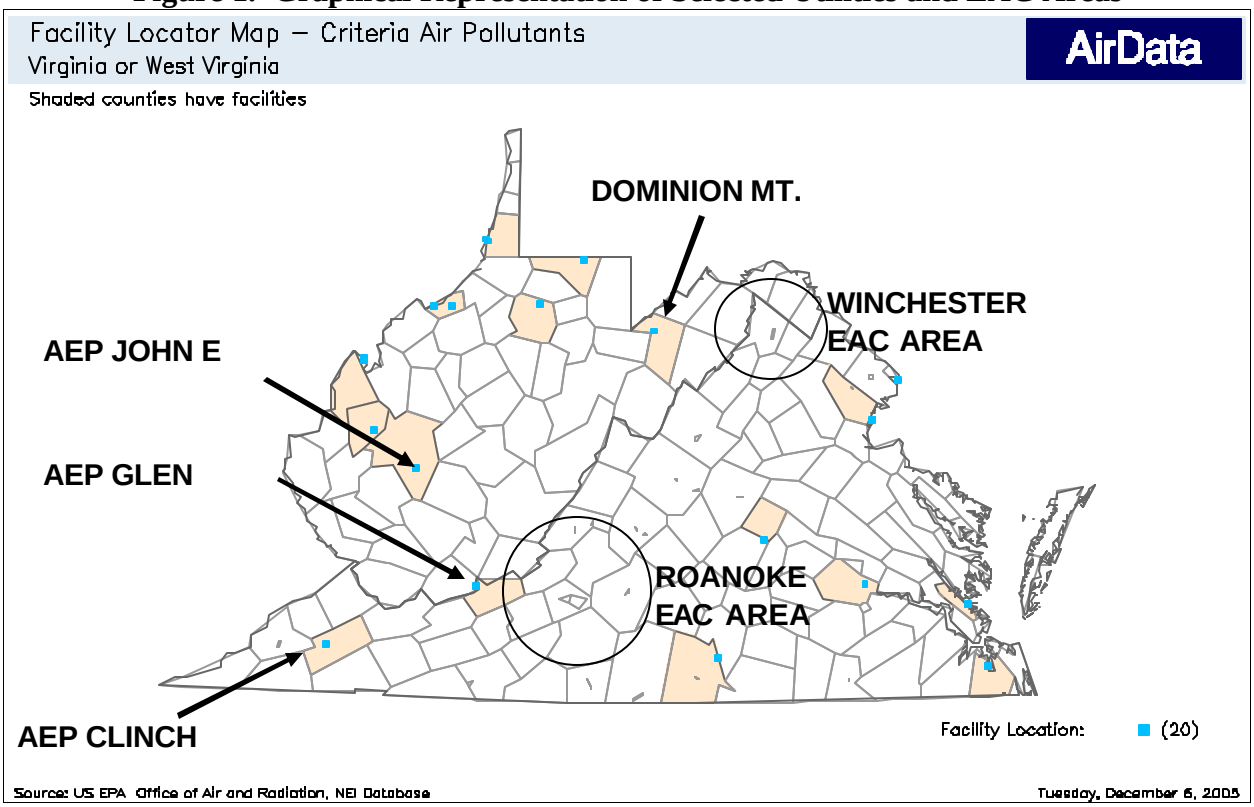
I. Background

The purpose of this report is to document and present modeling results detailing ground level ozone concentration changes in the two Virginia Early Action Compact (EAC) resulting from the reduction of nitrogen oxide (NOx) emissions for four utility sources in close proximity to these areas (see Figure 1).

Figure 1. Graphical Representation of Selected Utilities and EAC Areas



A substantial reduction in NOx emissions has occurred at these facilities from 2002 to 2005 of over 28,000 tons per season or 185 ton per day. Table 1 provides a detailed description of the reductions that have occurred:

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Table 1. Emissions Reductions from Four Selected Utilities in Close Proximity to EAC Areas

STATE	FACILITY_ NAME	UNIT ID	SUM_OP_ TIME	MONTHS	2002 NOXER	2002 HEAT INPUT	2002 OZONE SEASON NOX EMISSIONS	2002 AVERAGE OSD NOX EMISSIONS	2005 NOXER	2005 HEAT INPUT	2005 OZONE SEASON NOX EMISSIONS	2005 AVERAGE OSD NOX EMISSIONS
VA	AEP Clinch River	1	3099.75	5	0.585	5282308	1599.96	10.46	0.33	5387369	885.80	5.79
VA	AEP Clinch River	2	3257	5	0.593	5528659	1692.76	11.06	0.30	5847099	885.80	5.79
VA	AEP Clinch River	3	3624.5	5	0.482	6151674	1525.84	9.97	0.32	4463966	723.40	4.73
VA	AEP Glen Lyn	51	3168.75	5	0.433	1270533	276.42	1.81	0.36	1035208	187.30	1.22
VA	AEP Glen Lyn	52	3310.5	5	0.391	1422184	282.73	1.85	0.35	1139050	197.10	1.29
VA	AEP Glen Lyn	6	3672	5	0.641	5319313	1733.38	11.33	0.47	6006352	1403.10	9.17
WV	Dominion Mount Storm	1	3415.5	5	0.603	18218462	5546.43	36.25	0.05	17854646	468.25	3.06
WV	Dominion Mount Storm	2	3477.5	5	0.676	19499663	6648.79	43.46	0.05	17378895	468.25	3.06
WV	Dominion Mount Storm	3	3442.25	5	0.587	17105061	5074.07	33.16	0.09	16962680	726.90	4.75
WV	AEP John E Amos	1	3463.0	5	0.560	20183538	5722.30	37.40	0.03	23735285	412.26	2.69
WV	AEP John E Amos	2	3409.0	5	0.490	20250589	4970.80	32.49	0.03	21781870	378.34	2.47
WV	AEP John E Amos	3	2722.0	5	0.120	27532306	1615.10	10.56	0.09	35564322	1539.20	10.06
						147764290	36688.59	239.79		157156742	8275.70	54.09
											-28412.89	**-185.71**

II. Modeling Domain and Database Issues

A. Episode Selection

The procedures for selecting the episodes sought to achieve a balance between good science and regulatory needs and constraints. Modeling episodes, once selected, influence technical and policy decisions for many years. Clearly, both the direct and implicit procedures used in selecting episodes warrant full consideration.

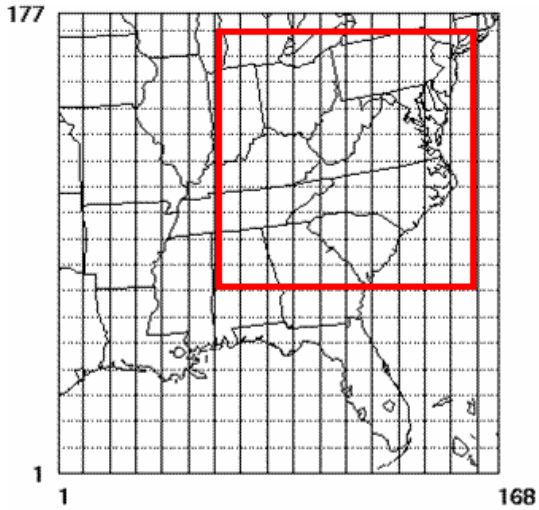
The episode periods of June 6-July 5, 2002 and July 27-August 16, 2002 were modeled for this exercise. The policy and technical criteria that influenced the selection of these episodes include:

1. The episode periods reflect a variety of meteorological conditions which frequently correspond with observed 8-hour daily maxima greater than 84 ppb at multiple monitoring sites in Virginia.
2. The episode periods have observed 8-hour daily maximum concentrations close to the average 4th high 8-hour daily maximum ozone concentrations in each of the EAC areas.
3. The episode periods have the necessary air quality/meteorological data bases readily available.
4. The episode periods contain a sufficient number of days to assess the effect of controls being applied at the selected utilities.

B. Size of the Modeling Domain

The boundaries of the CMAQ modeling domain are illustrated in Figure 2. The red boundary is an interim 12-km boundary that utilizes boundary conditions from the surrounding VISTAS domain:

Figure 2. 12-km Modeling Domain Boundaries



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C. Horizontal Grid Resolution

A coarse grid continental United States (US) domain with a 36-km horizontal grid resolution was used to initialize the 12-km grid. The domain is described in detail in the Modeling Protocol for the VISTAS Phase II Regional Haze Modeling (ENVIRON - May 6, 2004). The CMAQ domain is nested in the MM5 domain. A larger MM5 domain was selected to provide a buffer of 8 to 9 grid cells around each boundary of the CMAQ 36 km domain. This is designed to eliminate any errors in the meteorology from boundary effects in the MM5 simulation at the interface of the MM5 model. The buffer region used here exceeds the EPA suggestion of at least a 5 grid cell buffer at each boundary.

The horizontal grid size for the refined domain for this modeling exercise is 12-km. This grid resolution is generally considered adequate by the Environmental Protection Agency (EPA) for regulatory modeling applications. The accuracy of the CMAQ modeling results using a smaller grid cell size (4-km) was evaluated. The analysis did not support the use of the finer 4-km resolution for this study, particularly due to the increased computer costs, run times and data base management needs associated with the finer grid scales.

D. Vertical Resolution

The CMAQ vertical structure is primarily defined by the vertical grid used in the MM5 modeling. The MM5 model employed a terrain following coordinate system defined by pressure, using 34 layers that extend from the surface to the 100 mb. In order to adequately parameterize cloud and precipitation processes, the top of the modeling domain was set at the 100 mb level (~14,662 meters).

The layer averaging scheme adopted for CMAQ is designed to reduce the computational cost of the CMAQ simulations. The effects of layer averaging based on the VISTAS modeling analysis was found to have a relatively minor effect on the model performance metrics when both the 34 layer MM5 and a 19 layer CMAQ models were compared to ambient monitoring data.

E. Meteorological Model Selection

The Pennsylvania State University/National Center for Atmospheric Research (PSU/NCAR) Mesoscale Meteorological Model (MM5) was selected for this application using the VISTAS model configuration. MM5 is a nonhydrostatic, prognostic meteorological model routinely used for urban- and regional-scale photochemical regulatory modeling studies.

Results of detailed performance evaluations of the MM5 modeling system in regulatory air quality application studies have been widely reported in the literature (i.e., Emery et

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al. 1999; Tesche et al., 2000, 2003) and many have involved comparisons with other prognostic models such as RAMS and SAIMM. The MM5 enjoys a far richer application history in regulatory modeling studies compared with RAMS or other models. Furthermore, in evaluations of these models in over 60 recent regional scale air quality application studies since 1995, it has been generally found that MM5 tends to produce somewhat better photochemical model inputs than alternative models. For these reasons MM5 was selected as the meteorological modeling system for this modeling application.

F. Emissions Model Selection

The Sparse Matrix Operator Kernel Emissions (SMOKE) Emissions Processing System was selected for application in this study using the VISTAS model configuration. SMOKE is principally an emission processing system and not a true emissions inventory preparation system in which emissions estimates are simulated from 'first principles'. This means that, with the exception of mobile and biogenic sources, its purpose is to provide an efficient, modern tool for converting emissions inventory data into the formatted emission files required by an air quality simulation model. SMOKE is the fastest emissions processing tool currently available to the air quality modeling community. The sparse matrix approach utilized throughout SMOKE permits both rapid and flexible processing of emissions data. The processing is rapid because SMOKE utilizes a series of matrix calculations instead of less efficient algorithms used in previous systems. The processing is flexible because the processing steps of temporal projection, controls, chemical speciation, temporal allocation, and spatial allocation have been separated into independent operations wherever possible. The results from these steps are merged together at a final stage of processing.

SMOKE supports area, mobile, fire, point and biogenic sources emission processing. The model can take on a variety of input formats from other emissions processing systems, including the Inventory Data Analyzer (IDA), Emissions Modeling System - 2003 (EMS-2003), and the Emissions Preprocessor System 2.x (EPS2.x). For biogenic emissions, SMOKE supports both gridded land use and county total land use data.

SMOKE (Version 2.1) was used for this study.

G. Air Quality Model Selection

EPA's Community Multiscale Air Quality (CMAQ) modeling system (Version 4.4) was selected for this study using the VISTAS model configuration. CMAQ is a 'one-atmosphere' photochemical grid model capable of addressing ozone and PM2.5 at a regional scale and is considered one of the preferred models for regulatory modeling applications.

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CMAQ is generally considered by the scientific community to meet the following prerequisites for photochemical modeling applications:

1. It has been received and been revised in response to a scientific peer review.
2. It is appropriate for the specific application on a theoretical basis.
3. It is being used with a data base which is adequate to support its application.
4. It has been shown to have performed well in past ozone modeling applications.
5. It is applied consistently with a protocol on methods and procedures.

Furthermore, several factors were considered as criteria for choosing CMAQ as a qualifying air quality model. These factors are:

1. Documentation and past track record of in similar applications;
2. Advanced science and technical features available in the modeling system;
3. Experience of staff; and
4. Required time and resources versus available time and resources.

Lastly, CMAQ has been thoroughly validated and tested for this modeling application to ensure acceptable performance. The model evaluation was conducted in accordance with EPA guidance.

H. Emissions Inventory

The 2002 base year emissions inventory from VISTAS was used for this analysis. VISTAS followed emission inventory guidance documents for developing inventories for point, area, mobile, and biogenic emissions.

IV. CMAQ Modeling Results

CMAQ modeling was first performed using the 2002 emissions provided in Table 1. The 2005 emissions in Table 1 were then substituted in the model and CMAQ was executed again using the identical model options.

Modeling results were post-processed and plotted and the ground level ozone concentration changes were evaluated. The benefits of the emissions reductions from the selected utilities on daily 8-hour ozone concentrations for the episode periods are presented in Figure 3. The figure was developed by first subtracting the base case concentrations from the control case concentrations for each 8-hour average where the ozone concentration exceeded 70 ppb in the 2002 base case. The maximum 8-hour ozone reduction was then plotted independently for each grid cell and a composite figure was developed. Therefore, Figure 3 is not a representation of a specific 8-hour period on a given day in the modeling period but rather a composite of the maximum emissions reductions.

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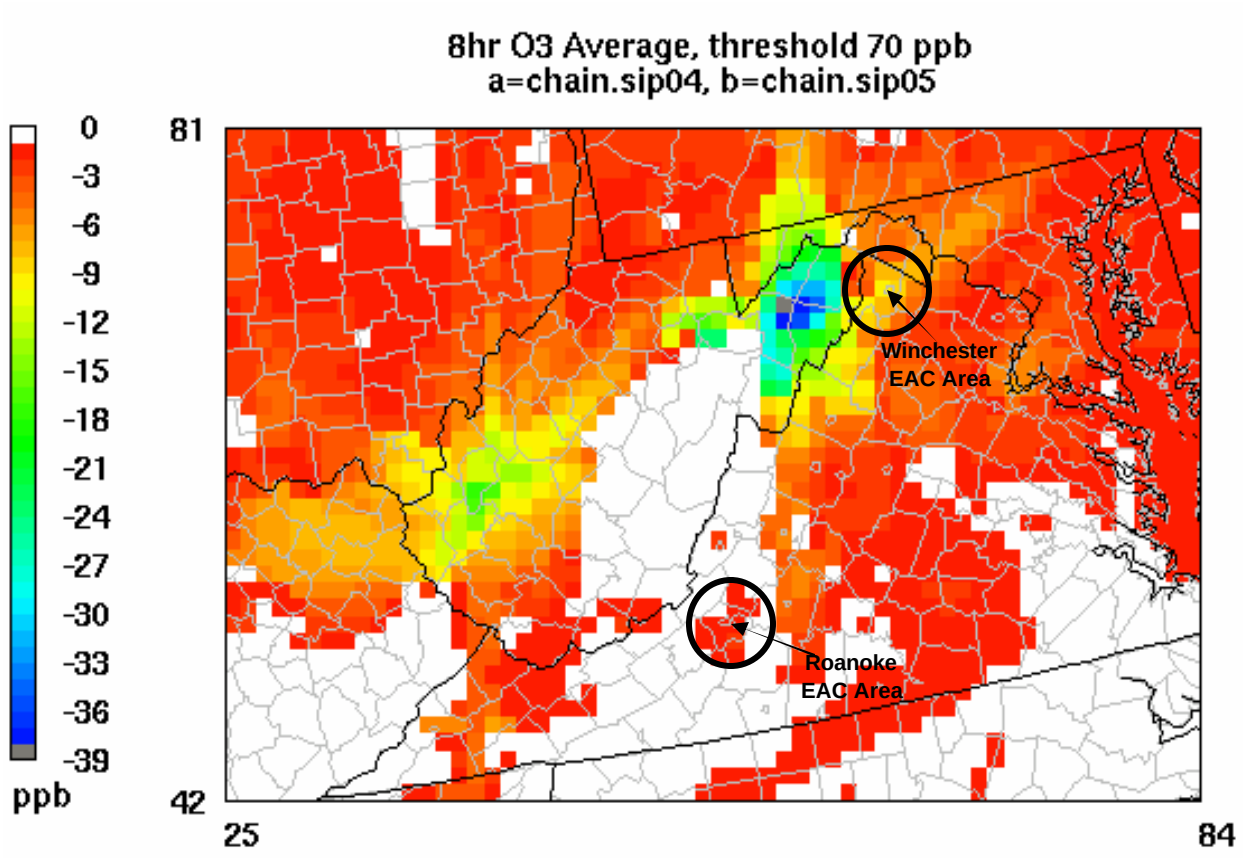
The 70 ppb threshold was selected because the goal of this exercise is to assess concentrations that approach or exceed the 85 ppb concentration that is used for attainment purposes. 70 ppb was selected in lieu of 85 ppb because there are very few 8-hour periods where ozone concentrations reach the 85 ppb level in the EAC areas. Utilization of the 70 ppb threshold provides for a more robust sample that can be used in evaluating the effectiveness of the emissions reductions.

Figure 3. Maximum Amount of Reduction in Each Grid Cell for Daily 8-Hour Average Ozone Exceeding 70 PPB



V. Summary and Conclusions

Table 5 presents a summary of the benefits associated with controls implemented at the four selected utilities.

EAC Area	Concentration Decreases (Benefit Range)
Winchester	-4 to -10 ppb
Roanoke	-1 to -3 ppb

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A. Control Measure	B. Summary Description of Measure	C. Program/Measure Status	D. Specific Implementation Date	E. VOC Reduction	F. NOx Reduction	G. Resources (FTE's, $$)	H. Additional Information
31 Roanoke area, VA (Effective date of nonattainment designation deferred)							
Reduce locomotive idling	Reduction of locomotive idling by the Norfolk Southern Railway Co.	Measure has been fully implemented at this time	May-05	0	0.153 TPD		
Limit idling-school buses	Limit on idling times for school buses through internal policy and management	Measure has been fully implemented at this time	May-05	0	0.003 TPD		
Retrofit 100 school buses-oxid catalyst	Retrofit of 100 school buses in Roanoke County	Retrofits over 90% completed; two units remaining	July, 2004	0.586 TPY	1.67 TPY	226,644	
Retrofit 102 xchool buses-oxid catalyst	Retrofit of 102 school buses in Roanoke City	Retrofiits began in July 2004 and are on going.	July, 2004	NQ	NQ		
Bio-diesel solid waste trucks-purchased	Purchase of bio-diesel trucks by Roanoke City	In 2003 the City of Roanoke began purchasing bio-diesel solid waste trucks. Five trucks have been purchased to June 2005. One additional truck purchased during this reporting period	2003 - Ongoing	0	0.27 TPY		
Ethanol alternative fuel vehicles	Purchase of ethanol alternative vehicles by Roanoke City	11 sedans and station wagons purchased since 2003. 15 additional vehicles expected to be purchased.	2003 - Ongoing	NQ	NQ		
Biodiesel ready trucks	Purchase of bio-diesel trucks by Roanoke City	9 new trucks purchased since 2003. Additional 12 trucks to be purchased.	2003 - Ongoing	NQ	NQ		
Hybrid vehicles	Purchase of hybrid vehicles by Roanoke City	One vehicle purchased. Second one to follow shortly.	Jun-05	<0.001 TPD	<0.001 TPD		
Low emissions vehicles	Purchase of low emissions vehicles	Five vehicles purchased in 2005. More to follow.	Jun-05	<0.001 TPD	<0.001 TPD		
Implement effective environmental driving	Develop training materials and video on air quality	220 Roanoke County employees trainee	Nov-05	NQ	NQ		
Public education: Air Quality Action Day	An area-wide program of mandatory and voluntary actionsto reduce ozone precursor emissions during predicted high ozone days	Program fully implemented	May-05	NQ	NQ	0.5 FTE	
Timing of refueling vehicles	Local and state commitments to limit refueling of vehicles during the ozone season. 14 private companies also participating in this program	Program fully implemented	May-05	NQ	NQ		
Promote alternative fuel vehicles	Promotion of alternative fuel vehicles as part of overal emission reduction program - web based	Program fully implemented	2005 - Ongoing	NQ	NQ		
Media/puiblic relations program	Public outreach and information program to educate and inform public on air quality issues and specific ozone action days - 13 media outlets participating	Program fully implemented	Jun-05	NQ	NQ		
Public transit incentives	Overall program to promote the use of various transit options	300 free bus passes distributed, discount summer youth pass program, substantial increase in transit ridership has been documented	May-05	NQ	NQ		
Bike Infrastructure and Amenities	Overall program to promote bicyle usage	Regional plan developed and currently being implemented	2005 - Ongoing	NQ	NQ		
Expand public education program	Outreach program to K-12 classes. Outreach to daycare, preschools, and summer camps	Materials produced and class arrangements being made. 50 participating daycares, preschools, and camps	2005 - Ongoing	NQ	NQ		
Tree planting program	Program to plant trees for environmental purposes	Minimum of 600 trees planted in 2005	2005 - Ongoing	NQ	NQ		
Mass transit to Blacksburg	Bus service between Roanoke and Blacksburg	Ridership up to 4,000 per mont	2004 - Ongoing	0.009 TPD	0.004 TPD	950,000	
Replace gas golf carts w/electric	Purhase/use electric golf carts at local courses	In progress	End of 2005		0.061 TPY		
Replace gas mowers w/electric	Program to purchase new or electric lawn mowers	Five lawn mower sales and recycling centers currently participating in this program	2005 - Ongoing	0.017 TPD	0.001 TPD		
Open burning ban -expanded	Restriction of open burning on an episodic and/or seasonal basis	Program fully implemented	May-05	0.56 TPD	0.24 TPD		
Mandatory Restriction lawn equipment usage during ozone action days	Mandatory restriction of landscaping activities by local and state agenies during high ozone days	Program fully implemented	May-05	0.366 TPD	0.094 TPD		
Voluntary Private Sector Restriction lawn equipment usage during ozone action days	Voluntary restriction of of landscaping activities by businesses and residents during high ozone days	Program fully implemented	May-05	0.072 TPD	0.016 TPD		
Cradle to Cradle Design Competition	Design and construction of environmentally friendly houses	Eight houses designed and slated for construction	2005 - Ongoing	NQ	NQ		
Regional Reduction in NOx emissions	Regional program to reduce ozone transport by reducing NOX emissions form power plants	Implemented by state regulation during 2004 ozone season	May 31, 2004	NQ	NQ		11,000 tons/per season reduced in VA between 2002 and 2005. Over 150,000 tps reduced in VA and adjacent states
National Low Emission Vehicle Program	Requirement for the sale of low emissions vehicles	Program fully implemented by state regulation	1999	NQ	NQ		
Stage1 Vapor Recovery	Requirement for use of Stage I vapor recovery equipment at gasoline service stations	Implemented in Roanoke County, and the Cities of Roanoke and Salem	May-04	640.9 TPY	NA		
CTG RACT -- CTG VOC RACT and NOx RACT	Expansion of existing source VOC control regulations and non-CTG RACT for major NOX sources	Implemented region-wide by state regulation	Nov-05	355.5 TPY	288.4 TPY		
State Cutback Asphalt Regulation	Restriction on the use of cutback asphalt	Implemented region-wide by state regulation	Nov-05	1.75 TPY	NA		
Enhanced Ozone Forecasting tool	Preparing daily ozone forecasts during the ozone	Program is fully implemented	May-05	NQ	NQ	70,000 & 1 FTE	

A. Control Measure	B. Summary Description of Measure	C. Program/Measure Status	D. Specific Implementation Date	E. VOC Reduction	F. NOx Reduction	G. Resources (FTE's, $$)	H. Additional Information
Comments:							