Ozone Early Action Plan
Northern Shenandoah Valley

December 28, 2003

Mr. John M. Daniel, Director
Air Division
Virginia Department of Environmental Quality
629 East Main Street, 8th Floor
Richmond, VA 23219

RE: Ozone Early Action Plan for Northern Shenandoah Valley
December 31th Progress Report Submittal to USEPA

Dear Mr. Daniel:

This submittal is intended to fulfill the December 31, 2003 milestone requirement as outlined in the Early Action Compact for The Northern Shenandoah Valley Region in the Commonwealth of Virginia. Per the April 4, 2003 memorandum by Ms. Lydia N. Wegman, Director of the Air Quality Strategies and Standards Division of USEPA, the following elements are included.

- A list of control measures still under consideration for adoption by the local area as part of the March 2004 submission;
- Likely implementation dates for the local control measures that are under consideration;
- Current assessment of the amount of emissions reductions expected to be achieved through implementation of the local control measures;
- The geographical area in which each control measure is anticipated to apply;
- Updates from the June 16, 2003 Progress Report;
    - Progress in developing the stakeholder process, including the roles and responsibilities of various stakeholder groups, a list of stakeholders, and a brief summary of stakeholder meetings;
    - Progress on evaluating and selecting emission reduction measures for the local control strategy, including stakeholder involvement in the development of the initial list of control measures;
    - Describe public outreach activities;
    - Provide an update on modeling/technical planning activities.

The Winchester-Frederick County Economic Development Commission has taken the lead in organizing EAP efforts, with the assistance of Wilbur Smith Associates, a transportation and air quality planning consulting firm. We have also have continued our conversations with other EAC areas.

If you have any questions regarding our submittal, please contact me at (540) 665-0973.

Sincerely,

Patrick Barker

Patrick Barker, AICP
Executive Director

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Ozone Early Action Plan
Northern Shenandoah Valley

2nd Semi-Annual Status Report

for

The Northern Shenandoah Valley Ozone Early Action Compact Area

December 31, 2003

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Summary of Progress

Presented here is the 2nd semi-annual status report on the activities and progress involved in the effort to develop an ozone early action plan for the Northern Shenandoah Valley area of Virginia. This project is designed to produce cleaner air in the area in a proactive manner in order to bring the area into compliance with the federal 8-hour ozone standard.

While the first half of 2003 involved numerous Air Quality Improvement Task Force education exercises, the second half of 2003 saw the Task Force focus on the technical and practical feasibility of a broad spectrum of potential local control measures. Task Force members were able to cull the list of potential control strategies to a manageable level and spent substantial time evaluating measures with the most promise for implementation in the Winchester-Frederick County area. In September, the Task Force identified 25 potential emissions control strategies and asked their consultants Wilbur Smith Associates and Environ International Corporation to evaluate these strategies.

The technical evaluation of the proposed emissions control strategies was performed by Environ staff during September and October. The scope of work for this effort included:

- Performing a preliminary screening on all emission control measures identified by the Air Improvement Task Force and ranking these measures based on their approximate contribution levels to the VOC and NO_X emission inventories, as well as past experience in program effectiveness and feasibility;

- Preparing a technical memorandum presenting the ranking of the emissions control strategies, as well as documenting the data, methodology and assumptions used in developing the ranking after completing the initial screening of control measures;

- Recommending the top ten emissions control strategies (with input from the Air Improvement Task Force) and to perform more in depth analyses. This step would include cost-effectiveness analysis, using in-house data and information, as well as relevant data obtained from technical publications related to those selected emissions control strategies. The cost and emission benefits associated with each control strategy used in the cost effectiveness analysis are based on the best available data and engineering estimates. The feasibility assessment is based on past program experience and engineering judgment;

- Preparing a report presenting the results of the cost effectiveness analysis and feasibility assessment of the selected control strategies, as well as documenting the data, methodology, and assumptions used in the cost-effectiveness analysis and feasibility assessment.

The resulting evaluation and information prepared by Environ assisted the Air Improvement Task Force members in focusing their efforts on those strategies that could be effective and also practically implemented in the area. Following is a general discussion of these measures. A summary of the potential local control measures is presented in Appendix C. The full report is available, upon request.

Phase I Measures

The Air Improvement Task Force decided that implementation of emissions reduction measures would be divided into two Phases. The Phase I measures would be implemented in the entire early action area (Winchester City & Frederick County) as quickly as possible, but before the end of 2005. These measures have the greatest public acceptance and will provide important foundation for any future efforts.

1. **Ozone Action Days/Public Awareness**

This measure is actually a combination of several measures that had been evaluated earlier as individual measures including:

- General Public Awareness Program
- School-based Public Awareness Program
- Education and Promotion Campaign
- Employer-based Ozone Action Days
- Area Sources Ozone Action Days
- Dynamic Message Signs
- Video Monitor Deployment
- Lawn and Garden Equipment Usage Restrictions for State/Local Governments

These measures would be implemented in a coordinated response to a forecast of high ozone concentrations from the DEQ. An area specific forecasting tool is currently being developed for this purpose. Task Force members felt that many of these activities should be undertaken in a coordinated effort. In addition, the small emissions reductions associated with the individual components were even more difficult to quantify.

The emissions reduction benefits estimated from the combined Ozone Action Days/Public Awareness program was approximately 0.80 tpd for NOx and 1.14 tpd for VOC. The Task Force members felt that a strong program to raise public understanding and awareness would be a key to successful air quality improvement efforts.

2. VMT Reduction Programs

The Air Improvement Task Force combined a number of individual measures to create a category of strategies designed to reduce vehicle miles of travel (VMT). These include:

- Enhanced/expanded Northern Shenandoah Valley Regional Commission Ridesharing Program
- Bicycle and Pedestrian Accommodation
- Green Space Preservation
- Promotion of Mixed Use Development
- Promotion of Telecommuting

The existing ridesharing program operated by the Northern Shenandoah Valley Regional Commission provides an excellent starting point for encouraging and promoting car and van pooling in the region. A combination of the other sub-measures will be aimed at improving community walkability and bicycle usage, as well as reducing or eliminating those trips, which are unnecessary. The combined impact of these programs is estimated to be approximately 0.28 tpd for NOx and 0.38 tpd for VOC. While the

projected emissions reductions are relatively small, the Task Force felt that the long-term benefits for both air and community quality of life were important.

3. Open Burning Restrictions

Establishing open burning restrictions for land clearing activities has the potential to reduce combustion sources in the emissions inventories. While this type of rule is sometimes difficult to enforce, the reduction of related fire hazards along with the reduction of visible smoke and resulting air quality benefits were deemed important by the Task Force. The emissions impact of proposed open burning restrictions is estimated to be approximately 0.002 tpd NOx and 0.004 tpd VOC.

4. Engine Idling Restrictions

The Air Improvement Task Force focused early on restrictions for engine idling, due in part to the heavily traveled I-88 corridor in Frederick County, which has a high percentage of heavy truck travel. A large amount of idling emissions are generated from heavy-duty diesel vehicles that are parked at truck stops, rest areas and to a lesser extent, distribution centers. While Virginia already has an anti-idling regulation, it is anticipated that the EAC area will consider a more stringent version. The estimated emissions reduction for this measure is 0.15 tpd NOx and 0.005 tpd VOC.

5. School Bus/Heavy Duty Fleets Retrofits

Retrofitting heavy duty diesel engines with emissions control technologies, such as EGR systems, or after treatment devices is an emissions control measure that shows promise for the Winchester-Frederick County area. In fact, the availability of funding to support the retrofit of school buses will give implementation of this measure a positive boost.

While details regarding incentives for fleet conversions have not been worked out, based on the experience in other communities that have implemented such measures, the estimated benefits are approximately 0.08 tpd NOx and 0.04 tpd VOC. The Task Force was also very interested in this strategy because of the additional potential benefits associated with reduction of particulate emissions.

6. Voluntary Industrial Reductions

The emissions reduction benefits are sometimes difficult to quantify for this measure, however, the Task Force felt that an initial voluntary approach seeking industrial reductions is a reasonable and practical way for an Early Action Compact Area to begin. In addition, this strategy would help increase awareness of the pollution problem and establish a relationship between local government and area industry. The estimated emissions reduction potential for these types of measures for the area is 0.04 tpd NOx and 0.34 tpd VOC.

Phase II Measures

Phase II measures represent the contingency portion of the local air quality plan. One or more of these measures could be implemented after 2005, in response to continuing exceedances of the ozone standard or a shortfall in anticipated emission reductions from Phase I of the plan. These measures would require more lead-time for implementation as well as additional work with expanded groups of stakeholders.

7. OTC Portable Container Rule

This measure is part of a suite of measures designed to reduce VOC emissions. The portable container rule would reduce emissions that result from either spillage or permeation. Additional benefits include potential reduction of water contamination and reduction of potential fire hazards. The estimated emissions reduction benefits from this measure are 0.004 tpd VOC.

8. OTC Architectural/Industrial Maintenance Coatings Rule

This rule basically requires reformulated coatings to meet lower VOC content limits than under the current federal rule. Manufacturers would be required to assume the primary responsibility to produce coatings that meet or exceed VOC content limits for sale and use at the retail and wholesale levels. The estimated emissions benefits from this measure are approximately 1.14 tpd VOC.

9. OTC Mobile Equipment Repair and Refinishing Rule

This strategy requires lower VOC content for paints and use of improved transfer efficiency application and cleaning equipment. The rule would apply to primarily small businesses that apply refinishing materials to a variety of mobile equipment repair and refinishing facilities. The approximate emissions reduction for this strategy is estimated to be 0.37 tpd VOC.

10. Solvent Cleaning Operations Rule

This rule establishes hardware and operating requirements for vapor cleaning machines used to clean metal parts; and also includes volatility restrictions for cold cleaning solvents. Degreasing and solvent cleaning operations are performed by many commercial and industrial facilities. The estimated emissions benefit for this rule is 0.37 tpd VOC

11. Truck Stop Electrification

This measure is a companion strategy to the Engine Idling Restrictions discussed earlier as part of Phase I. Promoting the electrification of truck stops, rest areas and distribution centers would help reduce unnecessary engine idling. The availability of electrical hook ups would allow powering of cab/sleeper appliances or auxiliary devices without running the engine. The Task Force believes that this measure shows great promise, but may be costly to implement and therefore is scheduled for post 2005. The estimated emissions reduction for this measure is approximately 0.15 tpd NOx.

State & Federal Control Measures

In addition to the local control measures identified in the preceding discussion, there several state and federal actions that have or will produce substantial ozone precursor emission reductions both inside and outside of the Northern Shenandoah Valley area (Appendix D) These reductions are aimed at reducing local emissions and the movement (transport) of pollution into the area. These measures, when combined with the local control program, are expected to lower area ozone concentrations to the level at or below the ozone standard.

At the state level, three significant actions have been taken. First, in response to EPA's call for the reduction of NO_X emissions from large combustion sources (i.e., the NO_X SIP Call), the state has adopted and will implement a program to significantly reduce emissions on NO_X as part of a regional program to reduce ozone transport. This program alone is predicted to reduce ozone forming NO_X emissions by up to 30,000 tons per ozone season in Virginia. Secondly, the state opted into the National Low Emission Vehicle program that began to require less polluting vehicles in the state, beginning in 1999. To address local emissions, the state has recently adopted Reasonably Available Control Technology (RACT) controls for industries in the area, to further reduce the local contribution to ozone formation. The emission reduction expected from RACT in the area is currently being evaluated on a source-by-source basis. Compliance with the RACT rule will be required by the end of 2005

On the federal level, numerous EPA programs have been or will be implemented to reduce ozone pollution. These programs cover all the major categories of ozone generating pollutants and are designed to assist many areas to come into compliance with the federal ozone standard. A brief description of these measures is provided below:

Stationary & Area Source Controls: In addition NO_X SIP Call program, the EPA has developed a number of control programs to address smaller "area" sources of emissions that are significant contributors to ozone formation. These programs reduce emissions from such sources as industrial/architectural paints, vehicle paints, metal cleaning products, and selected consumer products.

Motor Vehicle Controls: The EPA continues to make significant progress in reducing motor vehicle emissions. Several federal programs have established more stringent engine and associated vehicle standards on cars, sport utility vehicles, and large trucks. These programs combined are expected to produce progressively larger emission reductions over the next twenty years as new vehicles replace older ones.

Non-Road Vehicle & Equipment Standards: The category of "non-road" sources that covers everything from lawn & garden equipment to aircraft, has become a significant source of air pollutant emissions. In response, EPA has adopted a series of control measures to address these sources. These programs include engine emission standards for lawn & garden equipment, construction equipment, boat engines, and locomotives.

All these measure have been developed to address both the creation of ozone producing emissions in the local area, as well as reducing the movement of ozone into the area as a comprehensive approach to reducing ozone levels. A full summary of these state and federal measures is presented in Attachment D.

Air Quality Technical Support Activities

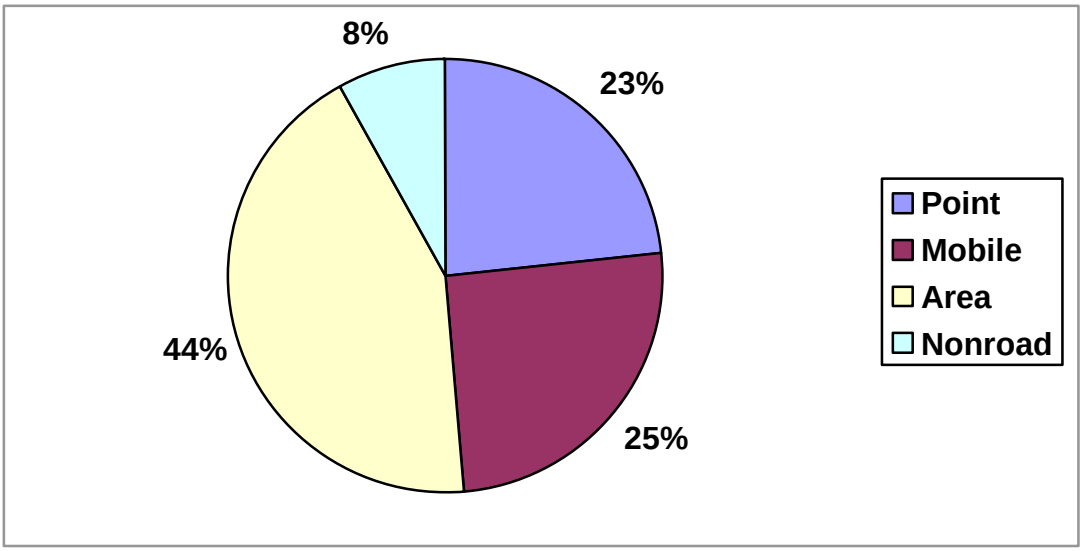
In the first status report, the technical discussion described the process generally used to evaluate air pollution problems and the tools used to do this evaluation. The report then went on to present the base year air pollutant emissions inventory for a typical ozone season day during calendar year 1999. This base year was selected because of the availability of comprehensive emissions inventory through the National Emissions Inventory (NEI) data base maintained by EPA, which has also served as the data source for the photochemical modeling domain that is part of the technical analysis needed to support the EAP process.

For comparison purposes, and to document any trend of emissions in the Northern Shenandoah Valley area, a typical ozone season day emissions inventory for calendar year 2002 is summarized in this status report. As in the previous status report, the major source categories used to present this inventory data are:

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

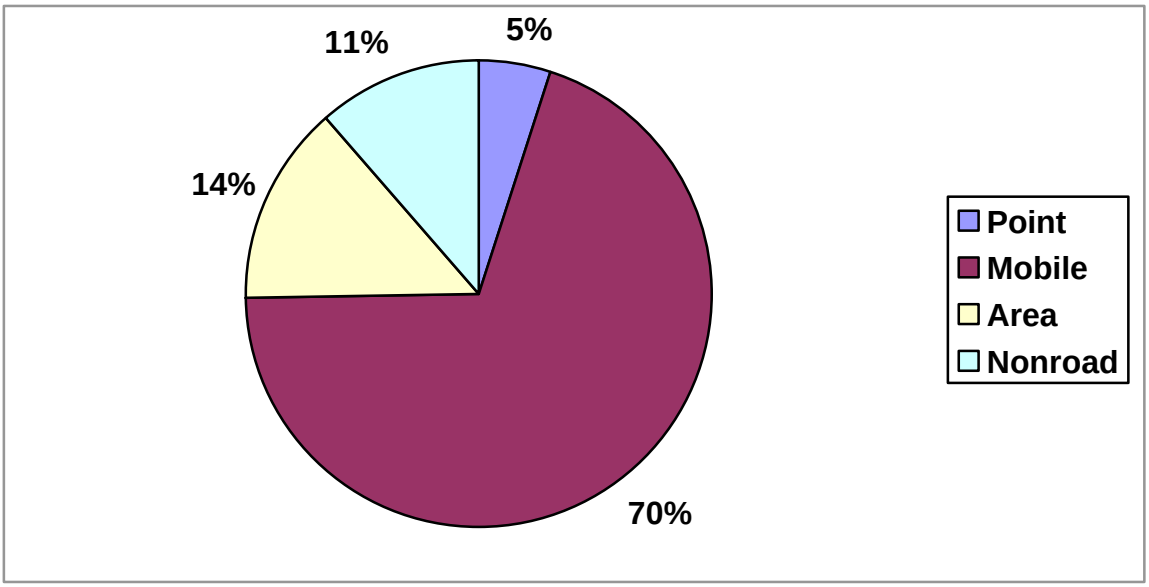
Summaries of the local interim (2002) inventories for the two major ozone precursors, volatile organic compounds (VOC) and oxides of nitrogen (NO_X) are presented below. The emissions from Winchester City and Frederick County are combined to produce a single summary of area emissions. Figure 1 and the associated data table presents the VOC emissions summary and Figure 2 (and table) presents the NO_X emissions summary.

Figure 1: Northern Shenandoah Valley Emissions Inventory – 2002 Ozone Season Daily Emission of Volatile Organic Compounds (VOC)



Summary of the Northern Shenandoah Valley Baseline VOC Emissions Inventory for Calendar Year 2002	
Major Source Categories	Emissions (tons/day)
Major Stationary Point Sources	
25 individual facilities (7 in Winchester, 18 in Frederick) - Description: Includes several printing, plastics, and mineral products industries. No utilities in the project area.	5.70 tpd
On-Road Mobile Sources	
Motor Vehicles on all 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.	6.25 tpd
Area Sources	
Use of solvent-based products – Description: paints, cleaners, consumer products, & others.	8.03 tpd
Gasoline distribution & Marketing – Description: Gasoline storage & transfer operation at terminals and service stations	1.93 tpd
All Others – description: Open burning, landfills, & others	0.65 tpd
Non-Road Mobile Sources	
Non-road equipment – Description: lawn & garden, construction, recreational vehicles and boats.	1.91 tpd
All others – Description: Locomotives & aircraft	0.05 tpd
Total	**24.52 tpd**

Figure 2: Northern Shenandoah Valley Emissions Inventory – 2002 Ozone Season Daily Emission of Oxides of Nitrogen (NO_X)



Summary of the Northern Shenandoah Valley Baseline NO_X Emissions Inventory for Calendar Year 2002	
Major Source Categories	Emissions (tons/day)
Major Stationary Point Sources	
25 individual facilities (7 in Winchester, 18 in Frederick) - Description: Includes several printing, plastics, and mineral products industries. No utilities in the project area.	0.93 tpd
On-Road Mobile Sources	
Motor Vehicles on Interstates - **Description**: local and through traffic on the I-81 corridor. Large percentage of heavy-duty diesel trucks. Also, vehicle traffic on all other public roads from major arterials to local roads.	13.02 tpd
Area Sources	
Fuel Consumption – Description: Fuel consumption for heating, cooling, and other purposes in all sectors.	2.38 tpd
All Others – description: Open burning, landfills, & others	0.22 tpd
Non-Road Mobile Sources	
Non-road equipment – Description: lawn & garden, construction, recreational vehicles and boats.	1.95 tpd
All others – Description: Locomotives & aircraft	0.15 tpd
Total	**18.65 tpd**

In terms of air pollutant emissions trends, the total level of ozone precursor emissions in the early action area have remained relatively constant between 1999 and 2002, with a slight increase in VOC emissions and a slight decrease in NO_X emissions. It is expected that emissions will begin to decrease at a quicker pace in the near future due to the state and federal emission reduction measures described earlier, along with the local control program to be implemented through the early action plan. The 2007 base case and control case emissions inventories are currently under development and will be presented in detail in the next semi-annual status report.

Air Quality Modeling

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

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

The specific Virginia early action-modeling plan is discussed below:

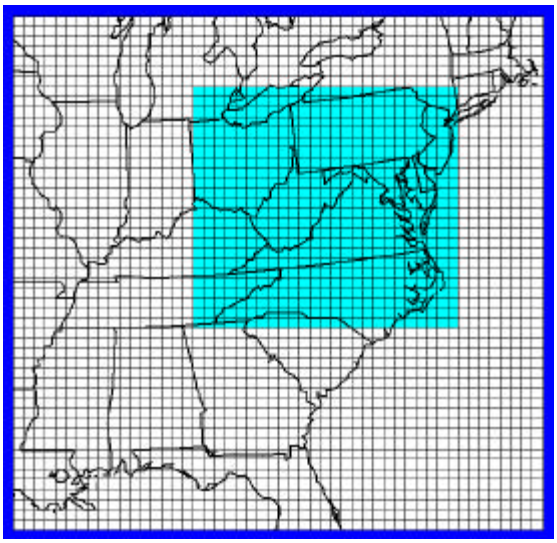
Model and Domain Selection

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

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

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

Figure 3: Early Action Modeling Domain of 36 km & 12 km Resolution



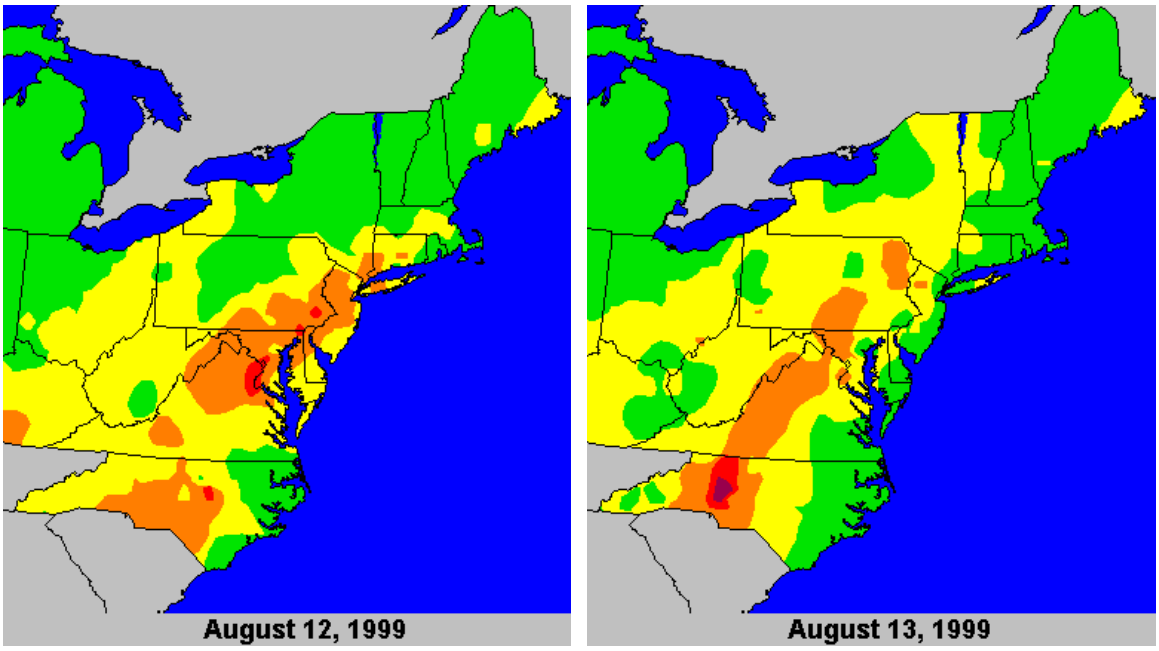
Episode Selection

One of the key aspects of a modeling analysis of a particular area and air pollution problem is to select one or more representative episodes to model. The selection process should reflect one or more of the prevailing meteorological and emissions conditions that produce higher levels of

ozone in the subject area. An additional consideration for this project is that EPA guidance requires that the baseline emission inventory and subsequent episode(s) selected for an early action plan are no older than 1999. Finally, since three states are developing plans in the same general area, an episode common to all three was selected.

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

Figure 4: The Ozone Episode of August 12th & 13th, 1999



Episode Meteorological Conditions

August 12th – The surface weather map 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 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. Surface and 1500 meter 48-hour back trajectories for Roanoke ending that afternoon indicated that air passed over the Ohio River Valley and West Virginia. The evening surface weather map 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.

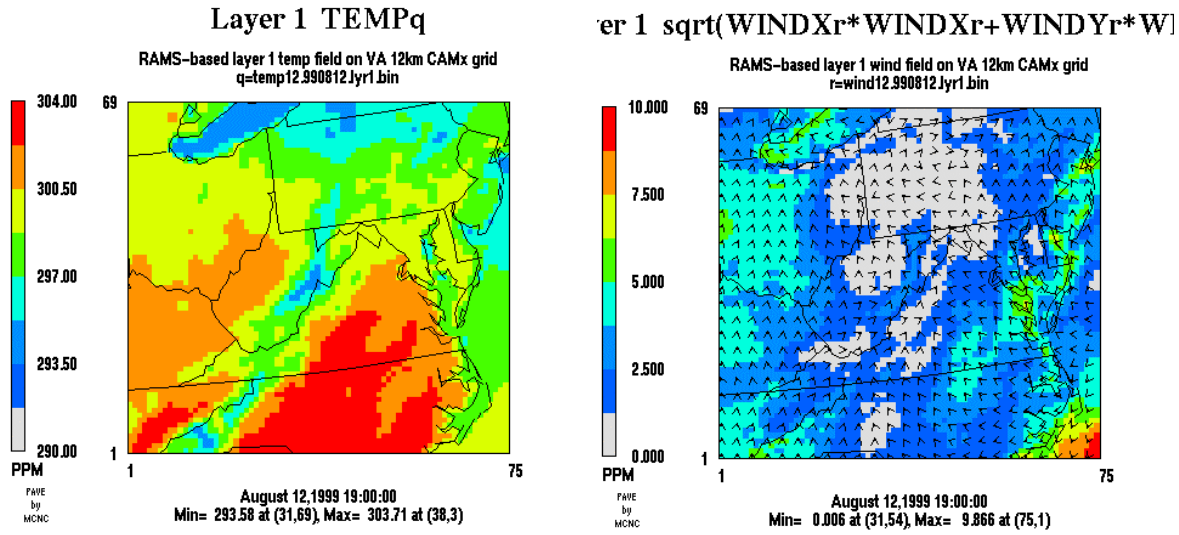
August 13th – The surface weather map on the morning of August 13th indicated the trough extended from Washington, D.C. through central Virginia into central North and South Carolina. Again, higher dew point temperatures and southerly winds east of the trough indicated maritime air. Lower dew points and calm winds west of the trough indicated the presence of a continental air mass. Forty- eight hour surface and 1500 back trajectories for Roanoke ending that afternoon originated from the Great Smokey Mountains region of northeastern Tennessee and north central Tennessee, respectively. The surface trough separating the maritime air from the continental air persisted into the evening. High temperatures reached the mid-to-upper 90s in the region.

Modeling Progress to Date

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

As of the date of this document, the DEQ has obtained the necessary meteorological data for the 1999 episode and has successfully completed the processing of the data through the MM5 meteorological model. Several MM5 runs were required to adequately simulate the relatively complex meteorological conditions that existed during the selected ozone episode as previously described.

Figure 5: Meteorological Modeling – Selected Results for Temperature and Winds

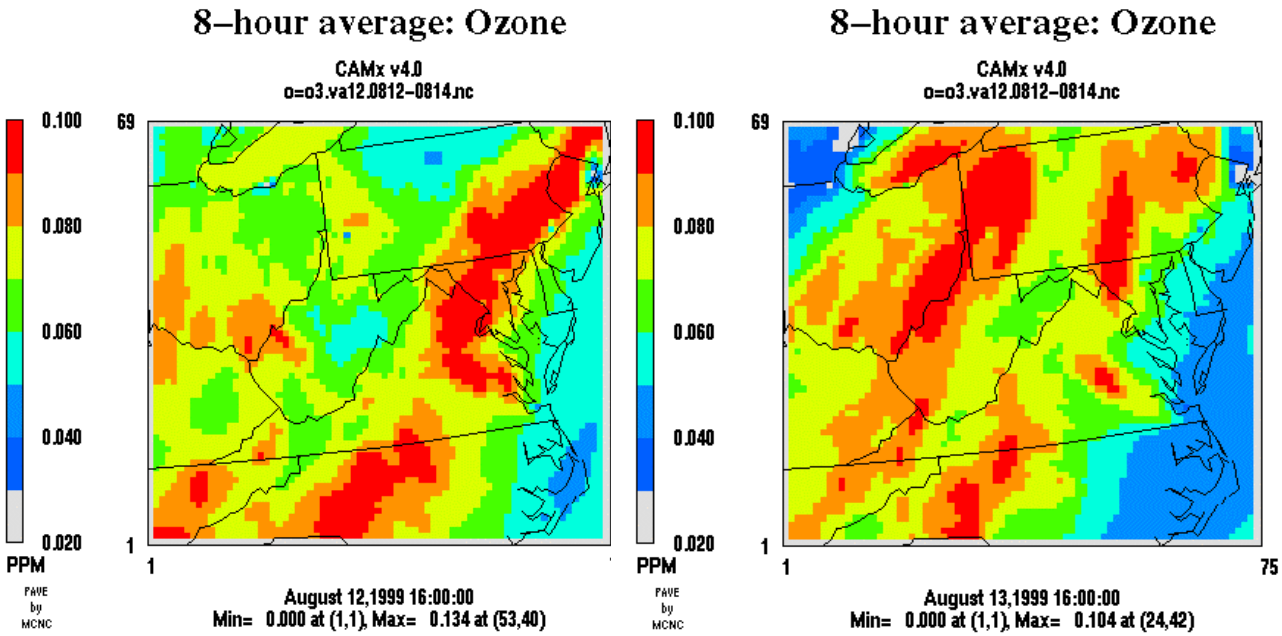


Emissions data for 1999 from all state in the modeling domain has also been obtained from the NEI. This emissions data has been supplemented with state specific data from Virginia and

West Virginia. The conversion of this data to SMOKE input files and the preprocessing of this data through the SMOKE emission model has also been completed. Several problems were encountered during the processing of the emissions data that delayed the commencement of base case modeling efforts. The most difficult problem dealt with the EPA requirement that all EAC modeling efforts used MOBILE6-based emissions for mobile sources. To do this we had to use the latest draft version of the SMOKE emissions preprocessor (Version 1.5). Numerous problems were encountered in attempting to install and run the mobile emissions through this version of the emissions model. Ultimately, the DEQ contracted the developers of SMOKE (Carolina Environmental Program to solve these problems and process the emissions data through this latest version of the emissions preprocessor. With this external assistance, the emissions preprocessing step has also been completed (end of September 2003).

Once all the preprocessing steps were completed, the regional photochemical modeling exercise was begun. After several runs using the CMAQ model were completed, it became obvious that the performance of the model was not up to EPA standards using the selected episode. After internal consultations, it was decided to change photochemical models from CMAQ to the Comprehensive Air Quality Model with Extensions (CAMx). The modeling platform was thus changed to use this alternative air quality model. After several runs using CAMx, base case modeling results were produced that meet or exceed EPA's acceptance criteria for model performance.

Figure 6: CAMx Photochemical Model Results – Base Case Modeling



With the base case modeling step coming to a close, attention has now moved on to the development of the future case (2007) projected emissions inventory. This inventory is currently under development and should be completed by the end of the calendar year. Once this is completed, modeling will begin on the future base case and control scenarios. It is now anticipated that the entire modeling project will be completed on time by the end of March 2004.

APPENDIX A

Northern Shenandoah Valley Air Improvement Task Force
List of Members

American Lung Association of Virginia
Ms. Dona Reynolds

Berkeley County Development Authority
Mr. Bob Crawford

City of Winchester - Planning
Tim Youmans

Clark County
John Sours

County of Frederick - Planning
Eric Lawrence

County of Frederick
Lynda J. Tyler

D.K. Industrial Services Corp.
Dave Kollar

Environmental Protection Agency
Kathleen Anderson
David Arnold
David Cole
Walter Wilkie

Franklin County E.D. Office
Mike Ross

Global Stone – Chemstone Corp.
Spencer C. Stinson

H.N. Funkhouser and Co.
Bob Claytor

Lear Corporation (Winchester)
Chuck Raymont

Lord Fairfax Environmental Health District
Kelly Vanover

National Park Service
Holly Salazar

Northern Shenandoah Valley Regional Commission
Stephen W. Kerr

Piedmont Environmental Council
Dan Holmes

Potomac Conservancy
Jim Lawrence

Shenandoah County
Susie Hill

Shenandoah National Park
Christi Gordon

Shenandoah Valley Manufacturers' Assn.
Jeff Rezin

Sierra Club – Virginia Chapter
Patricia DeZern

Virginia Dept. of Environmental Quality
Tom Ballou
John Daniel
Jim Sydnor

Virginia Dept. of Transportation
Any Costello
Michael Gray

Winchester Common Council
J. Stephen Bauserman

Winchester Industrial Development Authority
Jim Deskins

Winchester – Frederick County Economic Development Commission
Patrick Barker
Ken Jones

Winchester – Frederick County C. of C.
Susan Knowles
Patrick Coughlin

Citizens:
Jim Giraytys
Barbara Van Osten

APPENDIX B

Northern Shenandoah Valley Air Improvement Task Force Meeting Summaries

Northern Shenandoah Valley Air Improvement Task Force Meeting
February 4, 2003
Meeting Summary

The Air Improvement Task Force convened on Tuesday, February 4 to continue discussions on development of an Ozone Early Action Plan. The meeting was facilitated by Patrick Barker, Executive Director of Winchester – Frederick County Economic Development Commission.

The first item of business was distribution of a revised Task Force roster and consideration of a mission statement for the group. Discussions then focused on obtaining professional assistance in developing the EAP.

Status of the Request for Proposals (RFP) was discussed and an RFP Review Committee was selected with representatives from each major group including local government, state government, business, community, public health and environmental interests.

The Virginia DEQ made a presentation entitled "Air Quality Modeling 101" and "Modeling Emissions Inventory 101 to give Task Force members some background and understanding needed for the EAP.

An additional Task Force sub group meeting would be held on February 11 to consider consultant proposals. It was concluded that a professional consultant to assist the group should be brought on board as soon as possible.

The next regularly scheduled Task Force meeting would be on March 4, 2003.

Northern Shenandoah Valley Air Improvement Task Force Meeting
March 4, 2003
Meeting Summary

The primary focus for the March 4th meeting of the Air Improvement Task Force was selection of a consultant to provide professional assistance in development of the ozone EAP. A discussion took place of those consultants which had submitted proposals and those that would be invited to make an oral presentation the following week at the offices of the Winchester – Frederick County Economic Development Commission.

In addition, the Virginia Department of Environmental Quality made another "101" presentation, this time on emissions control strategies. Preliminary discussions of the types and effectiveness of various categories of controls were discussed.

The next meeting was set for April 10, 2003.

Northern Shenandoah Air Improvement Task Force Meeting
April 10, 2003
Meeting Summary

The Air Improvement Task Force members met at 10 a.m. at the Grafton School in Winchester. The 18 attendees met with representatives of Wilbur Smith Associates, a transportation/air quality consulting firm selected to assist them in development of their Ozone Early Action Plan (EAP).

Tom Ballou of the Virginia Department of Environmental Quality (VDEQ) kicked off the meeting with a discussion of new guidance from US EPA which provides more detail into the requirements for June 2003 EAP milestones. Mr. Ballou also discussed progress in developing emissions inventories and state strategies for nonattainment areas, which could be extended to Winchester Frederick County. VDEQ also reported that they are preparing to include the Winchester Frederick County area for ozone forecasts in the future, conceivably as early as next year.

Task Force members discussed pending US EPA deadlines and actions which must take place to meet those deadlines.

Amy Costello of the Virginia Department of Transportation (VDOT) discussed some of the initiatives that her department is now undertaking or planning to undertake which could have an impact on air quality in the region. VDOT will be putting together a list of these initiatives for the Task Force for possible inclusion in the June 16th submittal to US EPA.

Stephen Kerr, of the Northern Shenandoah Valley Regional Commission (NSVRC) discussed a wide variety of travel demand management (TDM) strategies that have been undertaken in the area. Mr. Kerr will be compiling a list of these initiatives for the Task Force.

Each member of the Task Force described their roles in this process and their initial issues of concern and assumptions regarding air quality improvement in the Winchester area. The group then had a general discussion of the nature of the emissions problem in the area and type and scope of emissions reduction strategies that might be appropriate. The discussion focused on voluntary measures, trucks in the I-81 corridor, transit usage, car pooling, land use issues and community education and involvement.

The consultant team provided a draft master list of control strategies that have been considered in other nonattainment areas as well as a summary of local strategies being considered in 4 locations with similar ozone problems.

Prior to the next meeting, the consultant team will evaluate strategies based on their preliminary suitability for implementation in the Winchester-Frederick County area and provide a list of these strategies to the Task Force.

It was determined that a public meeting designed to educate and inform area citizens of the air pollution problem and the need for action should be held as soon as possible. Tentative dates of May 7 for the next Task Force meeting and May 8 for the Public Meeting were set. EDC staff will be securing locations for these upcoming meetings.

Northern Shenandoah Valley Air Improvement Task Force Meeting
May 7, 2003
Meeting Summary

The Winchester - Frederick County Air Quality Task Force met at 10 a.m. at the Grafton School in Winchester to continue discussions regarding the Ozone Early Action Plan (EAP). Fifteen Members were in attendance as well as representatives from the Virginia Department of Transportation and National Park Service via teleconference. The meeting was facilitated by Carla Berroyer of Wilbur Smith Associates.

The Task Force discussions focused on a preliminary draft of potential local emissions control strategies that had been prepared by the Consultant based on input from the last meeting and information available from other areas developing plans. The following potential measures were discussed:

- Ozone Action Days

Several Task Force members expressed support for such a program. Tom Ballou representing the Virginia Department of Environmental Quality (VDEQ) informed the group that his agency may be in a position to provide forecasts of potential violation days within a year or so. Discussions also included the need for a local sponsor and the possible use of surrogate measures if actual forecasts are not available.

- Public Education and Information Program

The discussion centered around the importance of such a program to the EAP efforts and the need to increase public understanding of the air quality problems the area is experiencing. There was support for beginning public education activities at the earliest possible time.

- Ridesharing/Carpooling Programs

The group discussed the existing rideshare program in the area, Valley Commuter Assistance, and the potential for activities designed to enhance or expand on this service to the public.

- Parking Management

Members discussed a variety of parking control or management measures, expressing interest in the provision of preferential parking for alternative fuel vehicles and car pool vehicles. There was little support for reduction or elimination of parking.

- Bicycle/Pedestrian Measures

Discussions focused on a variety of bicycle related activities now being contemplated in the area as well as other bicycle/pedestrian measures that may be considered in the future. It was generally felt that these were positive measures, despite limited air quality benefits

- Employer Based Programs

Task Force Members expressed interest in pursuing a variety of employer-based programs, primarily on a voluntary basis. The discussion included rideshare promotion, telecommuting and other employer incentives and disincentives.

- Other Potential Measures

  A brief discussion was held regarding other potential measures including area source controls, transit promotion, land use measures, traffic flow improvements, intelligent transportation systems (ITS) projects, “Green Building” initiatives and institutional measures. These potential measures would be more specific and refined for the next discussion.

Other items of discussion included the need to get state approval for most actions, other than voluntary actions, that would be contemplated on the local level. The group also expressed an interest in breaking into subcommittees after deciding the preliminary emissions reduction strategies, so that smaller groups could focus on specific strategies and their implementation issues.

Concern was expressed that the required US EPA schedule meant that the initial list of potential local control strategies must be developed by the next meeting of the Task Force. The Consultant will be preparing a refined list of local control strategies for this meeting. VDEQ will be providing information on their key activities supporting the EAP and VDOT will be providing information on projects planned in the area that may have a positive impact on emissions as well as VDOT policies that have been implemented in non-attainment areas.

An opportunity for public and stakeholder involvement was identified as the Local Government Forum, being held by the Northern Shenandoah Valley Regional Commission (NSVRC) on May 22, 2003. A presentation of Ozone Early Action Plan activities was tentatively planned for that forum.

The next meeting of the Task Force will be held on June 4, 2003 at 10 a.m.

Northern Shenandoah Valley Air Improvement Task Force Meeting
June 4, 2003
Meeting Summary

The Air Improvement Task Force met at 10 a.m. at the Grafton School in Winchester to continue discussions regarding the Ozone Early Action Plan for the area. 21 members were in attendance. The meeting was facilitated by Tim White of Wilbur Smith Associates.

The primary topic of discussion at this meeting was continued refinement of the listing of potential control strategies for the June 16th milestone submittal to US EPA. The draft list of strategies was modified to include several additional strategies recommended by Tom Ballou of Virginia DEQ.

The group also discussed a proposed public relations campaign and the possibility of obtaining funding for these efforts from the Virginia Department of Transportation. Patrick Barker presented a draft calendar for the proposed campaign.

Discussions also began on forming subcommittees for further refinement of the emissions control strategies. Under consideration are the formation of a Communications/Public Involvement subcommittee and a technical Review subcommittee. Each subcommittee would have a representative of government, business and the environmental community.

Initial steps are also being taken to establish a website for the Ozone Early Action Plan.

It was decided that the July meeting would be for local government officials and that the regular meeting of the Air Improvement Task Force would postponed until August.

Northern Shenandoah Valley Air Improvement Task Force Meeting
August 6, 2003
Meeting Summary

The Northern Shenandoah Air Improvement Task met at 10 a.m. on August 6 at the Grafton School in Winchester. Fifteen Task Force members were present and two joined by teleconference. The meeting was begun with a brief summary of recent actions, including the June 16th submittal to US EPA and the June 30 Progress Report to US EPA. Carla Berroyer of Wilbur Smith Associates, consultant to the Task Force explained the actions that need to take place within the next few months in order to satisfy the terms of the Early Action Compact (EAC).

Mr. Patrick Barker, Executive Director of the Winchester Economic Development Commission described a public awareness campaign that has already begun for the Ozone Action Days Program and detailed a press event that took place on August 4th. Local media representatives were introduced to the Ozone Action Days procedures and future media involvement and contacts were discussed.

Ms. Kathleen Anderson of US EPA, Region III gave a brief perspective from her agency's standpoint via teleconference. Ms. Anderson stressed that Early Action Plans must show an investment in strategies that will contribute to a reduction in ozone levels, even if the initial regional modeling does not indicate nonattainment of the 8 hour standard. The Early Action Compact process is not part of the Clean Air Act and the environmental community will be looking for serious strategies to address reduction of emissions. She also indicated that many EAC areas were initially focusing on mobile and area source emissions control strategies.

Mr. Tom Ballou of the Virginia Department of Environmental Quality (VDEQ) then brought the Task Force up to date on state and regional measures taking shape in the battle to improve air quality. In particular, he pointed out that the regional NOX control program for large utilities would be starting up next summer requiring between 50% and 70% NOX reductions from these large emitters. He also indicated that some local ordinances that might be considered in the Winchester-Frederick County area would have to be approved by the State Pollution Control Board.

The remainder of the meeting focused on an exercise to prioritize potential control strategies that had been submitted to US EPA on June 16th. Poster size enlargements of the control strategies listing were placed around the meeting room. Each Task Force member was given 10 stickers and asked to place a sticker next to the strategies that they felt best met the following criteria:

- Would contribute to a quantifiable emissions reduction.
- Would be feasible and/or realistic to implement by 2004 – 2007.

The Task Force them broke into two groups and discussed various aspects of the measures, including cost effectiveness, technical feasibility, public acceptance, implementation and whether or not a particular measure should be forwarded for further review.

A new list based on the results of this meeting will be prepared for the next Task Force meeting in September.

Northern Shenandoah Valley Air Improvement Task Force Meeting
September 3, 2003
Meeting Summary

The Northern Shenandoah Air Improvement Task Force met at 10 a.m., 9-3-03 at Grafton School in Winchester. The meeting participants focused on discussing and refining local emissions reduction strategies. The meeting was facilitated by Tim White of Wilbur Smith Associates, who provided each member with a questionnaire designed to initiate discussion of the strategies. Following is a summary of the questions posed to the Task Force and consensus approach, if it was reached.

Ozone Action Days

- Establish a program coordinator?
    - Duties
        - Public relations (tools/resources needed?)
        - Media relations (tools/resources needed?)
        - Coordinated outreach effort – public, industry, etc.
        - Liaison with press
        - Organize various programs
            - Ridefinders
            - Employer programs
            - Local government programs
    - Use VDOT funds?
    - How is the effort funded in the future?
    - Communications Subcommittee will meet about this position and develop a recommendation for the task force to consider at the next meeting.
    - What agency should house the coordinator?
        - Northern Shenandoah Regional Commission – most credible and already has funding sources available such as VDOT CMAQ funds and rural transportation grants
            - Full-time transportation planner will be filled soon
            - New clerical position will also be filled
        - Economic Development Commission
    - Can existing staff handle the program? Depends on the duties, but maybe so
    - Is a funding source(s) needed / available? Yes
        - CMAQ and other MPO grants may be options

* Lung Association supported a statewide event about ozone clean commute day last year – some resources and information from that campaign can be used

- Establish a program for employers? Yes
    - Working with DEQ
    - October 28 at 5:30 PM – Virginia Environmental Excellence Program – presentation on voluntary E2 and E3 programs (companies invited to Chamber of Commerce) – only 5 other states with a program as advanced as in Virginia
    - What industry is willing to do and can afford to do?
        - E2 & E3 programs need to focus on air (long-term program)
    - Will outreach to local employers be a part of this? Yes
    - Will there be any incentives?
        - Just recognition for reaching certain levels of cleanliness

        - VDEQ working to adjust laws that negatively impact the environment (regulatory flexibility)
        - Priority parking at offices
    - What types of actions do you want employers to take?
        - "Share a Ride with a Friend" Program – started by MPO soon
        - # registered ridesharing participants - ~ 800 people
        - # vanpools – Steve to provide
        - % workers commute – 18-20%
        - # manufactures E2 & E3 – Jeff to provide
        - home-based industry work force survey – Patrick will provide a copy
- Establish a program for area sources? Yes
    - Which area sources will be targeted?
        - Construction equipment
        - Other sources may be mobile
        - Will be a combination of voluntary and mandatory measures
        - Look at voluntary versus mandatory measures – what is the difference in the reductions? WSA to provide comparison (develop a range of reductions)
    - Frederick County and Winchester local governments need to lead by example – use VDOT standards as a starting point!
- Should Ozone Action Days measures be
    - All voluntary? Combination
    - Which types of actions could/should be mandatory?
        - Mandatory as much as possible under regulations (Dillon Rule)
        - Use VDOT as example for mandatory measures
        - Open burning mandatory (land clearing for open construction) – backyard not mandatory

Public Information and Education

- Will the same person coordinate Action Days and Public Information?
    - Probably not, but will depend on position
    - Communications Subcommittee will discuss and provide recommendation
- Will school-based programs be geared toward some grades?
    - All grades
    - SOL for air quality already included in Virginia tests
    - Website will have link for teachers
- What organizations might be willing to play a role?
    - Communications Subcommittee will investigate and report back
- What would be a reasonable budget? Don't know
- Would paid efforts be supplemented with volunteer efforts? Yes
    - www.italladdsup.com (Jeff Rezin recommended this site)
    - copying/mailing – industries could share the burden – also help with Powerpoint presentations at schools
    - local access TV programs

Bicycle / Pedestrian Measures

- How much funding do you think will be realistically available for bicycle projects?
    - Not certain – will pursue all available options
    - TEA 21 enhancement grants

    - Regional bicycle/ped. Plan – need connectivity (adopted by local jurisdictions into the Comp. Plan) – when VDOT does projects in the areas impacted by the plan, bicycles and pedestrians have to be considered in the design
- Does Task Force believe that additional bike paths or lanes may be constructed during the next 5 years?
    - Jim Lawrence not present – Check with County Planning and PDC
    - Patrick will provide information on the Winchester Green Circle – design and construction projects identified
    - Also, Redbud Run Greenway may provide information

Ridesharing/Carpooling

- How much funding is expected to be available for these activities on an annual basis?
    - $55,000 per year from VDRPT (can and will ask for more funding based on justification)
- Has NSVRC estimated the number of participants?
    - ~800 participants regionally – not broken out for Frederick County and Winchester
    - 14 vanpools registered at PDC (many, many more that are unregistered)
    - ? private vanpools
    - No other information on how this program has affected commute trips

Heavy Vehicle Measures

- Are engine idling restrictions for school buses and trucks expected to be mandatory?
    - Seek mandatory restrictions – no limits on mandating from a regulatory standpoint
    - 2 truck stops in Frederick County
        - Flying J (does more business in one day than Highpoint does in one month)
        - Highpoint
    - Winchester-Frederick County school buses
- Can Task Force comment on what type of incentives might encourage truck stop electrification?
    - First find out the universe
    - Look into merits
    - VDOT on program? Plans to equip VDOT rest areas?

Area/Stationary Sources

- Will open burning restrictions regulations be phased in by January 2006? Yes
    - Phasing ordinance is all that is needed – does not affect backyards
- Will restrictions be in place countywide? County and city wide

Lawn and Garden Equipment

- Lawn and garden equipment restrictions would be mandatory for state and local government? Definitely! – need to set example
- Voluntary for private businesses and citizens? Yes
- Area incentives envisioned for promoting low emission equipment? No

Other

- Patrick will send out list of State Rules
- Needs to be a two-pronged approach
    - Short term strategies
    - Long term strategies

Northern Shenandoah Valley Air Improvement Task Force Meeting
October 30, 2003
Meeting Summary

The Northern Shenandoah Valley Air Improvement Task Force met at the Grafton School in Winchester, Virginia at 9 a.m. on October 30, 2003. Twenty Task Force Members and media observers were in attendance. The meeting was opened by Patrick Barker, Executive Director of the Winchester-Frederick County Economic Development Commission. He was assisted by Carla Berroyer and Tim White of Wilbur Smith Associates (WSA). Environ Corporation staff, subconsultant to WSA joined the meeting via teleconference.

Mr. David Souten of Environ opened with a discussion of the emissions control strategies evaluation his firm is performing. Preliminary screening was performed on the list of potential control strategies selected by the Task Force. The list included 25 different strategies, including VOC measures based on the Virginia DEQ emissions regulations, seven transportation control measures, three heavy-duty vehicle measures, three area/stationary source measures, two ITS measures, two land use measures and one lawn and garden equipment measure.

Mr. Souten further explained that the screening criteria for control strategies were based on the approximate contribution levels to the VOC and/or NOX inventories and past experiences with program effectiveness and feasibility. Projects were ranked based on criteria that included technical feasibility, potential emissions reductions, timeframe considerations, and EPA acceptance. Mr. Souten then discussed the rankings and rationale for each measure evaluated with the Task Force.

Task Force Members engaged in a lively discussion of the screening results. It was decided that that the group would recommend measures that deserved additional evaluation from Environ. In addition, the Group also divided control measures into Phase 1 and Phase 2 categories. Phase 1 controls would be recommended for implementation by 2005 or sooner as part of the required Early Action Plan. Phase 2 controls would be considered for implementation after 2005.

Phase 1 controls included:

- Ozone Action Days/Public Awareness
- Vehicle Miles of Travel Reduction Programs
- Open Burning Restrictions
- Engine Idling Restrictions
- School Bus Engine Retrofits
- Voluntary Industrial Reduction Program

Phase 2 controls included:

- Ozone Transport Commission (OTC) Portable Fuel Container Rule
- OTC Architectural/Industrial Maintenance Coatings Rule
- OTC Mobile Equipment Repair and Refinishing Rule
- OTC Solvent Cleaning Operations Rule
- Truckstop Electrification

The recommendations of the Air Improvement Task Force will be made to the Winchester Common Council and the Frederick County Board of Supervisors in November.

The group also discussed plans for an open-house style event in December designed to share information with the public and local elected officials.

Northern Shenandoah Valley
Air Improvement Task Force
December 17, 2003
Meeting Summary

The Northern Shenandoah Valley Air Improvement Task Force met at10 a.m. at the Holiday Inn in Winchester Virginia. The focus of the meeting was discussion of the air quality modeling for the region being conducted by the Virginia DEQ as well as a discussion of emissions control strategies still under consideration.

Mr. Tom Ballou, from VDEQ, made a powerpoint presentation describing the status of the air quality modeling effort. Most of the base case modeling has been finished, but future case modeling, and modeling of the local emissions control strategies selected by the Task Force will not be done until January. Mr. Ballou also discussed recent findings from a University of Maryland study which concluded that the Winchester-Frederick County area receives significant ozone transport from other regions. The study also concluded that ozone concentrations were relatively easy to predict in this area and that the Mid-Atlantic weather is conducive to ozone formation. Mr. Ballou indicated that a combination of national, regional and local efforts would be needed to reach attainment.

A number of questions were posed regarding the location of the existing ozone monitor in the area. Task Force members were concerned that the placement of this monitor could be contributing to recorded exceedences. Ms. Ballou presented a brief overview of how monitor sites are evaluated. Mr. Ballou reported that there is actually better monitor coverage in this area than in other parts of the state. VDEQ participates in an annual review of monitors sites with US EPA, where potential site problems can be discussed.

The remainder of the Air Improvement Task Force meeting included a discussion of the pros and cons of the EAC process. The meeting was then adjourned for a Local Government Open House on Air Quality.

Northern Shenandoah Valley Early Action Compact
Local Government Open House
December 17, 2003
Meeting Summary

Local Government Officials from the City of Winchester and Frederick County attended an Open House designed to answer questions regarding the status of the Ozone Early Action Compact. The Open House was held at the Holiday Inn, Winchester and lunch was provided. The meeting was begun by Mr. Patrick Barker, Executive Director of the Winchester – Frederick County Economic Development Commission, who made a brief presentation on the value of the Ozone Early Action Compact to the area. After Mr. Barker's presentation, Ms. Carla Berroyer of Wilbur Smith Associates presented the refined list of emissions reduction strategies recommended by the Air Improvement Task Force. An update on the status of modeling required for the Ozone Early Action Compact was presented by Mr. Tom Ballou. An open discussion on aspects of all three presentations occurred. While local officials expressed a desire for more definitive information on the area's emissions and need for action, most participants voiced general support for the EAC process.

APPENDIX C

List of Emission Reduction Strategies Still Under Consideration
Northern Shenandoah Valley Ozone Early Action Plan
Winchester – Frederick County

Based on stakeholder consultation and taking into consideration available resources and political constraints, the following control measures under consideration can be reasonably implemented. It is anticipated these measures under consideration will assist Winchester – Frederick County in achieving and/or maintaining the 8-hour ozone standard by 2007.

Measure Under Consideration	Description of Measure	Non-Modeled Estimate of Emission Reductions (Year 2007 tpd)	Proposed Date for Implementation	Area of Implementation
Phase I (To be implemented before 2005)				
Ozone Action Days/Public Awareness	Public Awareness Program School-based Public Awareness Program Education and Promotion Campaign Employers-based Ozone Action Days Program Ozone Action Days for Area Sources Dynamic Message Signs Video Monitor System Deployment Lawn and Garden Equipment Usage Restrictions by Local Government	Combined Measures: 0.80 NOx 1.14 VOC	2004 2004 2004 2004 2003 2004 2004	City of Winchester & Frederick County
Vehicle Miles Traveled Reduction Programs	Enhance/Expand existing Northern Shenandoah Valley Reg. Commission Ridesharing Program Bicycle and Pedestrian Accommodation Promote Green space preservation Promote Mixed Use Development Promote Telecommuting	Combined measures: 0.28 NOx 0.38 VOC	2004 2004 2004 2004 2004	City of Winchester & Frederick County
Open Burning Restrictions	Adopt restrictions that prohibit open burning associated with land clearing and construction activities	0.002 NOx 0.004 VOC	2004	City of Winchester & Frederick County
Engine Idling Restrictions	Adopt truck and school bus engine idling restrictions	0.15 NOx 0.005 VOC	2005	City of Winchester & Frederick County

Measure Under Consideration	Description of Measure	Non-Modeled Estimate of Emission Reductions (Year 2007 tpd)	Proposed Date for Implementation	Area of Implementation
School Bus and Heavy Duty Fleets Retrofit	Retrofit school buses and heavy duty diesel engines	0.08 NOx 0.04 VOC	Phase-in 2005	City of Winchester & Frederick County
Voluntary Industrial Reductions	Implement emissions reductions through P2, EMS or EE agreements	0.04 NOx 0.34 VOC	Phase-in 2004	City of Winchester & Frederick County
Phase II (To be Implemented beyond 2005)				
OTC Portable Fuel Container Rule	Specifies performance standards for portable fuel containers and/or spouts, which reduce emissions from storage, transport, and refueling activities	0.004 VOC	post 2005	City of Winchester & Frederick County
OTC Architectural/Industrial Maintenance Coatings Rule	Requires reformulated coatings to meet lower VOC content limits than the current federal rule	1.14 VOC	post 2005	City of Winchester & Frederick County
OTC Mobile Equipment Repair and Refinishing Rule	Requires lower VOC contents for paints and use of improved transfer efficiency application and cleaning equipment	0.37 VOC	post 2005	City of Winchester & Frederick County
Solvent Cleaning Operations Rule	Establishes hardware and operating requirements for vapor cleaning machines used to clean metal parts. Volatility restrictions for cold cleaning solvents.	0.37 VOC	post 2005	City of Winchester & Frederick County
Truck Stop Electrification	Development of incentives to encourage electrification at truck stops to reduce engine idling	0.15 NOx VOC not estimated	post 2005	City of Winchester & Frederick County

APPENDIX D

State & Regional/National Ozone Precursor Control Measures that Support the Northern Shenandoah Valley Ozone Early Acton Plan

Emission Control Measure & Description	**Program Status** Implemented	Start	**Pollutant Controlled**	**Emissions Reductions**
STATIONARY POINT & AREA SOURCE CONTROLS				
Regional NO_X controls to reduce the transport of ozone ("NO_X SIP Call") **Description:** Emission rate & reduction requirements for large utility and industrial boilers. To be regionally implemented in most eastern states.	Federal rule & State regulation	2004	NO_X	Up to 30,000 tons per ozone season in VA (may vary due to trading)
Emission control area regulations for existing sources: Presumptive RACT requirements for existing stationary sources. Controls vary based on industrial activity and emission potential	State regulation	2005	VOC & NO_X	70 to 80% reduction based on industry type
Lower solvent paints for industrial purposes **Description:** National rule that requires lower solvent (VOC) content in architectural & industrial maintenance coatings.	Federal rule	2000	VOC	20% from uncontrolled levels
Lower solvent consumer products **Description:** National rule that requires lower solvent (VOC) content in a number of consumer products.	Federal rule	2000	VOC	10% from uncontrolled levels
Lower solvent industrial cleaning products **Description:** National rule that requires lower solvent (VOC) content in products used for various metal cleaning operations.	Federal rule	2002	VOC	10% from uncontrolled levels
Lower solvent refinishing products for motor vehicles **Description:** National rule that requires lower solvent (VOC) content in vehicle refinishing paints.	Federal rule	2002	VOC	36% from uncontrolled levels

ON-ROAD MOTOR VEHICLE CONTROLS				
National Low Emission Vehicle (NLEV) standards **Description:** National rule that requires more stringent light-duty vehicle tailpipe standards earlier than 2004	Regional agreement & state rule	1999	VOC & NO_X	70% cleaner than Tier 1 vehicles
Tier 2 motor vehicle emission standards **Description:** More stringent vehicle tailpipe standards for light duty cars, trucks, & SUVs along with lower fuel sulfur content requirements.	Federal rule	2004	VOC & NO_X	65% cleaner than NLEV vehicles
Heavy-duty diesel Truck engine standards **Description:** More stringent tailpipe standards for heavy-duty diesel truck engines along with lower fuel sulfur content requirements.	Federal rule	2004 and 2007	VOC & NO_X	40% cleaner engines in 2004 90% cleaner engines in 2007
OFF-ROAD VEHICLE & EQUIPMENT CONTROLS				
Phase 1 & 2 engine standards for small gasoline-powered engines **Description:** Emission standards for various small gasoline-powered off-road equipment engines used in lawn & garden, and light construction equipment.	Federal rule	1997 & 2002	VOC	30% in 2005
Engine standards for diesel-powered engines **Description:** Emission standards for various heavy-duty diesel-powered off-road equipment engines used for a variety of purposes such as construction & agriculture.	Federal rule	2002	NO_X	25% reduction in new engines by 2005
Engine standards for gasoline-powered marine engines **Description:** Emission standards for recreational marine vessel gasoline-powered engines.	Federal rule	1998	VOC	25% reduction in new engines by 2005
Engine standards for large gasoline-powered engines **Description:** Emission standards for various large gasoline-powered off-road equipment engines.	Federal rule	2000	VOC & NO_X	20% reduction of both pollutants by 2005
Engine standards for locomotive engines **Description:** Tiered emission standards for new or remanufactured locomotive engines implemented between 2001 & 2005.	Federal rule	2001 to 2005	VOC & NO_X	30% reduction by 2005

Revised Final Report

EVALUATION OF EMISSION CONTROL STRATEGIES UNDER CONSIDERATION FOR THE WINCHESTER-FREDERICK COUNTY EARLY ACTION PLAN

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December 15, 2003

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1. INTRODUCTION

BACKGROUND

The Northern Shenandoah Valley area of Virginia (Winchester-Frederick County) voluntarily entered into the Ozone Early Action Program (OEAP) on December 2002, and signed an Early Action Compact (EAC) that sets measurable milestones for developing and implementing an Early Action Plan (EAP), with a goal to reduce ground-level ozone concentrations in the EPR that would comply with the 8-hour ozone standard by December 31, 2007, and to continue to maintain the standard until at least 2012. The key milestone dates for the Northern Shenandoah Valley EAC are shown in Table 1-1.

Table 1-1. Key milestone dates for the Northern Shenandoah Valley EAC.

Date	Item
December 31, 2002	EAC Signed
June 16, 2003	List of Candidate Local Control Measures
June 30, 2003	Progress Report
January 31, 2004	Preliminary EAP Submitted & Local Emission Reduction Strategies Selected
March 31, 2004	Final Revisions to Local Emission Reduction Strategies Completed Submission of Final EAP
December 31, 2004	EAP adopted
December 31, 2005	Local emission reduction strategies implemented no later than this date
June 30, 3006	Semi-Annual status reports on implementation of measures and assessment of air quality improvement begin on this date
December 31, 2007	Attainment of the 8-hour standard no later than this date

Since signing the EAC, the Northern Shenandoah Valley Air Quality Improvement Task Force has held several meetings including one to prepare and discuss a master list of potential control strategies for the EAP considerations.

As part of the EAP preparation, ENVIRON has been contracted by Wilbur Smith Associates (WSA) to review, evaluate and prioritize this master list of potential emission control strategies.

SCOPE OF WORK

The scope of work for ENVIRON in this project is to:

- Perform a preliminary screening on all emission control measures in the emission control strategies list by ranking the control measures based on their approximate contribution levels to the VOC and/or NOx emission inventories, and past experience in program effectiveness and feasibility for these measures;

- Prepare a technical memo presenting the ranking of the emission control strategies, as well as documenting the data, methodology and assumptions used in developing the ranking after completing the initial screening of control strategies;

- Recommend the top ten emission control strategies from the emission control strategies list to perform further cost-effectiveness analyses, using in-house data and information, as well as relevant data obtained from technical publications related to those selected emission control strategies to assess the cost-effectiveness and implementation feasibility of the strategies. The cost and emission benefits associated with each control strategy used in the cost-effectiveness analysis will be based on the best available data and engineering estimates, and the feasibility assessment will be based on past program experience and engineering judgment;

- Prepare a report presenting the results of the cost-effectiveness analysis and feasibility assessment of the selected control strategies, as well as documenting the data, methodology, and assumptions used in the cost-effectiveness analysis and feasibility assessment.

REPORT ORGANIZATION

Following this introductory section, Section 2 of this report presents the results of the initial screening analysis that was submitted to WSA as a technical memorandum on October 22, 2003. Section 3 presents the results of the cost-effectiveness analyses and feasibility assessments of the final selected control strategies. Section 4 lists the references for the report.

2. SCREENING ANALYSIS OF CONTROL STRATEGIES[1]

INTRODUCTION

This section presents the results of an initial screening of the emission control strategies for the Winchester-Frederick County's Ozone Early Action Plan (EAP), and recommends the top ten control strategies for performing further cost-effectiveness analyses based on the screening assessment, as outlined in ENVIRON's work plan submitted to WSA on September 24, 2003 (ENVIRON, 2003).

SCREENING APPROACH

Preliminary screening was performed on a list of emission control strategies under consideration for Winchester-Frederick County that was provided by WSA. The emission control strategies list, dated September 3, 2003, consists of a total of 25 emission control measures, including seven VOC measures based on Virginia Department of Environmental Quality (VDEQ)'s VOC emission regulations, seven transportation control measures (TCMs), three heavy-duty vehicle (HDV) measures, three area/stationary sources measures, two intelligent transportation systems (ITS) measures, two land use measures, and one lawn and garden equipment measure.

To the extent that data and/or information were available, ENVIRON estimated the approximate range of potential emission impacts for the control strategies based on their emission contribution and control effectiveness or efficiency. Further work, carried out in the next phase of this effort and reported in Section 3, provides improved emissions estimates for those measures where broad estimates are given in this section, and also provided estimates for those measures identified in this section for which inadequate information currently exists to give an emissions reduction potential estimate.

The screening criteria for the control strategies was based on their approximate contribution levels to the VOC and/or NOx emission inventories[2], and past experience in program effectiveness and feasibility for these measures. The criteria included technical feasibility, potential emission reductions, timeframe consideration, and EPA acceptance, in terms of quantifiable and enforceable emission reductions. Ranking ranges from Good, Fair or Poor

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[1] This section was based on a technical memorandum to WSA, dated October 22, 2003, that was prepared as an interim deliverable of the project to document the results of the initial screening analysis of the emission control strategies, as well as recommended the top ten control strategies for further cost effectiveness analysis.

[2] Although it is well established that both oxides of nitrogen (N0x) and certain volatile organic compounds (VOCs) contribute in the complex photochemical formation of ozone in the lower atmosphere, it is very often much more cost effective to control one of these ozone precursors rather than the other or both. This is because one of these two precursors can be the limiting component, and thus reductions of that one component will be more effective than reductions of the other or both. The determination of whether N0x or VOCs are limiting in a certain situation depends upon many factors, and can be determined with some confidence only through complex photochemical modeling. Since such modeling was not done priority to this study (although it is currently underway by VDEQ), and thus such insight not available, ENVIRON was directed to treat both NOx and VOC as equally important in the emissions reductions and in the cost effectiveness evaluations. In reality this may not be the case.

for EPA Acceptance, Timeframe, and Cost-Effectiveness criteria, and ranges from High, Medium or Low for Emission Impact and Final Ranking criteria[3]. After assigning the ranking for each control strategy, we recommended the top ten control strategies based on their overall Ranking criterion of "High" and "Medium".

EMISSION INVENTORY

The VDEQ provided the emission inventories that were used in the screening analysis, and the calendar year 2007 emission inventory was used in the analysis. The summarized 2007 emission inventory for the WFC is shown in Table 2-1, and detailed emission inventories are shown in Appendix A.

Table 2-1. 2007 Emission inventory for the WFC.

Distribution	VOC (tpd)	NOX (tpd)
Point	7.74	0.94
Mobile	4.38	9.34
Area	10.84	2.73
Nonroad	2.90	2.14
TOTAL	25.85	15.15

RELATED STUDIES AND REFERENCES

Information on past experience of control measures was based on the EPA Transportation Control Measure and Congestion Mitigation Air Quality Program reports, the Sacramento Air Quality Management District (SMAQMD)'s Clean Air Plan Updates report, and EAP's for San Antonio and Dallas-Fort Worth, Texas, Triad, North Carolina, Tulsa, Oklahoma, and Tennessee, as well as emission control options that are being considered in Los Angeles, San Joaquin Valley, and San Francisco, CA.

SCREENING RESULTS

Detailed initial screening results for the control strategies are provided in Appendix B. Each of the control strategies is discussed and ranked as follows:

[3] For example, if a particular control strategy is technically feasible/real, quantifiable, permanent, enforceable and surplus, the control strategy is then ranked "Good" on the EPA Acceptance criterion. If a particular control strategy will provide substantial emission reduction based on the emission contribution for the affected source and control effectiveness or efficiency, the control strategy is then ranked "High" on the Emission Impact criterion. If a particular control strategy was implemented and achieved emission reductions meeting the EAC's timeframe, the control strategy is then ranked "Good" on the Timeframe criterion. If the cost-effectiveness of a particular control strategy is less than $50K per ton of NOx and/or VOC emissions reduced, the control strategy is then ranked "Good" on the Cost-Effectiveness criterion. Finally, the overall ranking, Ranking criterion, is based on the rankings for all the other criteria.

WFC 1: Petroleum Liquid Storage

Petroleum and petroleum product storage contributes to about 2.04[4] tons per day of VOC emissions in the Winchester-Frederick County. Many counties in Virginia are already subject to State Rule 4-37 to control emissions from bulk terminals and bulk gasoline plants. The control technologies are commercially available and have been implemented elsewhere. The potential VOC emission reductions vary from 50 to 90%, based on the sources and applicable standards (i.e. potential of 1 to 1.8 tons per day of VOC reduction).

While the control strategy is technically sound, the State Air Pollution Control Law prohibits VDEQ from requiring Stage I vapor recovery in any area other than official nonattainment areas. Therefore, VDEQ cannot regulate this source category in Winchester-Frederick County. This control strategy is ranked "Low" for this reason.

EPA Acceptable:	Good
Emission Impact:	High
Timeframe:	Poor
Cost-Effectiveness:	Fair to Good
Ranking:	Low

WFC 2: Cutback Asphalt

While State Rule 4-10 is to control particulate emissions or visibility, limiting the use or application of liquefied cutback asphalt in paving and maintenance operations on highways, parking lots and driveways would reduce some VOC emissions. The potential emissions impact for this control strategy is low, and the benefits are difficult to quantify.

EPA Acceptable:	Good
Emission Impact:	Low
Timeframe:	Good
Cost-Effectiveness:	NA
Ranking:	Low

WFC 3: Consumer Products Rule

Consumer solvent utilization contributes to about 0.83 tons per day of VOC emissions in the Winchester-Frederick County. Regulating approximately 80 consumer product categories with more stringent VOC content limits than the current federal rule would reduce some of the consumer solvent utilization VOC emissions. The VOC impact is estimated to be about 5 to 35% at an estimated cost-effectiveness value of $800 per ton of VOC emissions.

EPA Acceptable:	Good
Emission Impact:	Medium

[4] High significant figures are used in this memo for some cases to accommodate smaller emission inventory values for some sources.

Timeframe: Good
Cost-Effectiveness: Good
Ranking: Medium

WFC 4: OTC Portable Fuel Container Rule

Petroleum and petroleum product transport contributes to about 0.019 tons per day of VOC emissions in Winchester-Frederick County. Establishing or specifying performance standards for portable fuel containers and/or spouts would reduce VOC emissions from storage, transport, and refueling activities. Significant percentage reduction (about 75%) could be achieved at an estimated cost-effectiveness value of $500 to 2,300 per ton of VOC emissions.

EPA Acceptable: Good
Emission Impact: Low
Timeframe: Good
Cost-Effectiveness: Good
Ranking: Medium

WFC 5: OTC Architectural/Industrial Maintenance Coatings Rule

Solvent utilization for surface coating contributes to about 5.7 tons per day of VOC emissions in Winchester-Frederick County. Requiring reformulated coatings to meet lower VOC content limits than the current federal rule would substantially reduce the VOC emissions in this source. Depending on the standards, the VOC emissions could be reduced by 3 to 40% at an estimated cost-effectiveness value of $6k to $20k per ton of VOC emissions.

EPA Acceptable: Good
Emission Impact: High
Timeframe: Good
Cost-Effectiveness: Good
Ranking: High

WFC 6: OTC Mobile Equipment Repair and Refinishing Rule

Mobile equipment repair and refinishing is part of solvent utilization for surface cleaning. The fraction for this source should be fairly small as compared to architectural/industrial maintenance coating. Requiring lower VOC contents for paints and use of improved transfer efficiency applications and cleaning equipment would reduce some VOC emissions.

EPA Acceptable: Good
Emission Impact: Low
Timeframe: Good
Cost-Effectiveness: Good
Ranking: Medium

WFC 7: OTC Solvent Cleaning Operations Rule

Solvent cleaning operations contribute to about 0.56 tons per VOC emissions as part of the degreasing solvent utilization source in the Winchester-Frederick County. Establishing hardware and operating requirements for vapor cleaning machines used to clean metal parts would reduce about 40 to 80% of this emission source.

EPA Acceptable:	Good
Emission Impact:	Low
Timeframe:	Good
Cost-Effectiveness:	Good
Ranking:	Medium

WFC 8: Ozone Action Days

Establishing an Ozone Action Days Program to discourage unnecessary trips, and promote transit usage and other actions in the Winchester-Frederick County would potentially reduce some of the emissions contributed by light-duty vehicles and trucks, which are estimated to be about 4.0 tons of VOC per day and 3.0 tons of NOx per day. The potential emissions impact for this control strategy is generally low at about 1 to 1.5%, and the benefits are difficult to quantify and enforce.

EPA Acceptable:	Fair
Emission Impact:	Low
Timeframe:	Good
Cost-Effectiveness:	Good
Ranking:	Low

WFC 9: Public Awareness Program

Establishing a program to educate the public regarding the health effects of air pollution and actions they can take to help reduce it would potentially reduce some emissions, mostly mobile and area source emissions. The potential emissions impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce.

EPA Acceptable:	Fair
Emission Impact:	Low
Timeframe:	Good
Cost-Effectiveness:	Good
Ranking:	Low

WFC 10 School-Based Public Awareness Programs

Similar to WFC 9, establishing a program for use in local schools to educate children and their parents regarding air pollution would potentially reduce some emissions, mostly mobile and

area sources emissions. The potential emissions impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce.

EPA Acceptable: Fair
Emission Impact: Low
Timeframe: Good
Cost-Effectiveness: Good
Ranking: Low

WFC 11: Enhance and/or Expand existing NSVRC Ridesharing Program

Increasing rideshare promotion efforts for the Valley Commuter Assistance Program through the Governor's Congestion Relief Program for Northern Virginia would potentially reduce some of the emissions contributed by light-duty vehicles and trucks, which are estimated to be about 4.0 tons of VOC per day and 3.0 tons of NOx per day. The potential emissions impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce. Some studies reported about 2.5% effectiveness at an estimated cost-effectiveness value of $20k per ton of VOC+NOx emissions.

EPA Acceptable: Fair
Emission Impact: Low
Timeframe: Good
Cost-Effectiveness: Good
Ranking: Low

WFC 12: Education and Promotion Campaign

Establishing a program to promote bicycling and walking as alternatives to short single occupant trips would potentially reduce some of the emissions contributed by light-duty vehicles and trucks, which are estimated to be about 4.0 tons of VOC per day and 3.0 tons of NOx per day. The potential emissions impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce.

EPA Acceptable: Fair
Emission Impact: Low
Timeframe: Good
Cost-Effectiveness: Good
Ranking: Low

WFC 13: Bicycle and Pedestrian Accommodation

Adopting a policy of accommodating bicycle and pedestrian usage in street design and modernization, developing a regional bicycle plan, providing bicycle racks to promote usage, building additional bicycle paths and/or lanes, and investigating improving pedestrian facilities would potentially reduce some of the emissions contributed by light-duty vehicles and trucks,

which are estimated to be about 4.0 tons of VOC and 3.0 tons of NOx per day. The potential emission impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce. Some studies estimated a cost-effectiveness value of $130k per ton of VOC+NOx emissions.

EPA Acceptable: Fair
Emission Impact: Low
Timeframe: Fair
Cost-Effectiveness: Poor
Ranking: Low

WFC 14: Employer-Based Programs Ozone Action Days

Developing an employer-based program of strategies for Ozone Action Days would reduce some of the emissions contributed by light-duty vehicles and trucks, which are estimated to be about 4.0 tons of VOC and 3.0 tons of NOx per day. The potential emissions impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce. Depending on the level of company participation and district mandates, some studies estimated about a 10 to 15% emission reductions at a cost-effectiveness value of about $3.5k to 5.5k per ton of VOC+NOx emissions.

EPA Acceptable: Fair
Emission Impact: Fair
Timeframe: Good
Cost-Effectiveness: Good
Ranking: Medium

WFC 15: Engine Idling Restrictions

Adopting truck and school bus engine idling restrictions would reduce some of the emissions contributed by the heavy-duty vehicles and school buses, which is estimated to be 0.16 tons per day for VOC emissions, and 5.1 tons per day for NOx emissions in the Winchester-Frederick County. Some studies reported that about 2 to 4% emission reductions could be achieved via engine idling restrictions, at an estimated cost-effectiveness value of $10k to $300k per ton of VOC+NOx emissions, depending on retrofitting technologies used.

EPA Acceptable: Good
Emission Impact: Fair
Timeframe: Good
Cost-Effectiveness: Fair to Good
Ranking: Medium

WFC 16: School Bus and Heavy Duty Fleets Retrofit

Retrofitting school buses and heavy-duty diesel fleets with emission control technologies, such as EGR systems, aftertreatment devices, cleaner engines or fuels would reduce some of the emissions contributed by the heavy-duty vehicles and school buses, which is estimated to be 0.16 tons per day for VOC emissions, and 5.1 tons per day for NOx emissions in the Winchester-Frederick County. The effectiveness of control technologies varies from 5 to 30% for NOx reduction, 10 to 50% or more for VOC reduction, and 5 to 90% or more for PM reduction.

EPA Acceptable:	Good
Emission Impact:	High
Timeframe:	Good
Cost-Effectiveness:	Fair to Good
Ranking:	High

WFC 17: Electrify Truck Stops

Similar to WFC 15, developing incentives to encourage electrification at truck stops would reduce some of the emissions contributed by the heavy-duty vehicles, which is estimated to be 0.16 tons per day for VOC emissions, and 5.0 tons per day for NOx emissions in the Winchester-Frederick County. Some studies reported that about 2 to 4% emission reductions could be achieved using electrify truck stop strategy, at an estimated cost-effectiveness value of $10k to $300k per ton of VOC+NOx emissions.

EPA Acceptable:	Good
Emission Impact:	Fair
Timeframe:	Good
Cost-Effectiveness:	Fair to Good
Ranking:	Medium

WFC 18: Ozone Action Days Program for Area Sources

Discouraging gasoline powered lawn mowing and leaf blowing on Ozone Action Days would reduce some non-road emissions from lawn and garden equipment, which is estimated to be about 2.1 tons per day of VOC emissions, and 0.18 tons per day of NOx emissions in the Winchester-Frederick County. The potential emissions impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce.

EPA Acceptable:	Fair
Emission Impact:	Low
Timeframe:	Good
Cost-Effectiveness:	Good
Ranking:	Low

WFC 19: Voluntary Industrial Reductions

Implementing voluntary industrial reductions through some EPA voluntary programs, such as Pollution Prevention Pay (P2) and Environmental Management System (EMS) would potentially reduce some emissions contributed by industrial point sources, which is about 6.7 tons of VOC per day, and 0.82 tons of NOx per day in the Winchester-Frederick County. However, the potential emissions impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce.

EPA Acceptable:	Fair
Emission Impact:	Low
Timeframe:	Good
Cost-Effectiveness:	Good
Ranking:	Low

WFC 20: Open Burning Restrictions

Establishing open burning regulations for land clearing activities would potentially reduce the open burning of the area source in the emission inventories, which are 0.37 tons of VOC per day, and 0.15 tons of NOx per day. The potential emissions impact for this control strategy is low, and the benefits are difficult to quantify and enforce.

EPA Acceptable:	Fair
Emission Impact:	Low
Timeframe:	Good
Cost-Effectiveness:	Good
Ranking:	Low

WFC 21: Dynamic Message Signs

Deploying dynamic message signs in the I-81 corridor and other key locations in the county would reduce some emissions from the mobile source emission inventories, which are about 4.4 tons of VOC per day, and 9.3 tons of NOx per day. The potential emissions impact for this control strategy is low, and the benefits are difficult to quantify. Some studies estimated that 1 to 2% of emission reductions can be achieved with this type of intelligent transportation system control strategy, at an estimated cost-effectiveness value of $3.5k per ton of VOC+NOx emissions.

EPA Acceptable:	Fair
Emission Impact:	Low
Timeframe:	Good
Cost-Effectiveness:	Good
Ranking:	Low

WFC 22: VMS Deployment

Like WFC 21, installing video cameras to monitor traffic flow at two locations to reduce incident duration and resulting congestion would reduce some emissions from the mobile source emission inventories, which are about 4.4 tons of VOC per day, and 9.3 tons of NOx per day. The potential emissions impact for this control strategy is low, and the benefits are difficult to quantify. Some studies estimated that 1 to 2% of emission reduction can be achieved with this type of intelligent transportation system control strategy, at an estimated cost-effectiveness value of $3.5k per ton of VOC+NOx emissions.

EPA Acceptable:	Fair
Emission Impact:	Low
Timeframe:	Good
Cost-Effectiveness:	Good
Ranking:	Low

WFC 23: Mixed Use Development

Developing a plan to encourage mixed use and compact development that is conducive to walking, biking and transit use would potentially reduce emissions contributed by light-duty vehicles and trucks, which are estimated to be about 4.0 tons of VOC per day and 3.0 tons of NOx per day. The potential emissions impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce.

EPA Acceptable:	Fair
Emission Impact:	Low
Timeframe:	Poor
Cost-Effectiveness:	Good
Ranking:	Low

WFC 24: Green Space Preservation

Developing a plan to preserve green space within the county and city would potentially reduce emissions contributed by light-duty vehicles and trucks, which are estimated to be about 4.0 tons of VOC per day and 3.0 tons of NOx per day. The potential emissions impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce.

EPA Acceptable:	Fair
Emission Impact:	Low
Timeframe:	Poor
Cost-Effectiveness:	Good
Ranking:	Low

WFC 25: Lawn and Garden Equipment Usage Restrictions by Local and State Governments

Developing strategies to reduce emissions from lawn and garden equipment, and restricting mowing on predicted code orange and red ozone days by local and state governments would reduce some non-road emissions from lawn and garden equipment, which is estimated to be about 2.1 tons per day of VOC emissions, and 0.18 tons per day of NOx emissions in the Winchester-Frederick County. The potential emissions impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce.

EPA Acceptable:	Fair
Emission Impact:	Low
Timeframe:	Good
Cost-Effectiveness:	Good
Ranking:	Low

PRELIMINARY RECOMMENDED CONTROL STRATEGIES FOR COST-EFFECTIVENESS ANALYSIS

Based on the screening assessments, ENVIRON recommended the following control strategies for performing further cost-effectiveness analysis based on the technical merits, which particularly eliminated most of the TCM and ozone action days strategies, as outlined in the screening approaches (i.e. potential emission reduction, technically feasible/real, quantifiable, permanent, enforceable and surplus etc.)

WFC 3: Consumer Products Rule
WFC 4: OTC Portable Fuel Container Rule
WFC 5: OTC Architectural/Industrial Maintenance Coatings Rule
WFC 6: OTC Mobile Equipment Repair and Refinishing Rule
WFC 7: OTC Solvent Cleaning Operations Rule
WFC 14: Employer-Based Programs Ozone Action Days
WFC 15: Engine Idling Restrictions
WFC 16: School Bus and Heavy Duty Fleets Retrofit
WFC 17: Electrify Truck Stops
WFC 20: Open Burning Restrictions[5]

The final selected control strategies are, however, different from these recommended strategies as WSA and WFC's Air Quality Improvement Task Force requested ENVIRON to include some TCM and ozone action days control strategies. The final selected control strategies and the results of the cost-effectiveness analyses of these selected strategies are presented in Section 3.

[5] While it is ranked "Low", the "Open Burning Restriction" control strategy is recommended as one of the top ten strategies at the request of VDEQ as it is already working with another Virginia county on a model rule for this strategy, which could easily be adopted by Winchester-Frederick County.

3. COST-EFFECTIVENESS ANALYSIS OF FINAL SELECTED CONTROL STATEGIES

INTRODUCTION

After presenting and discussing the results of the screening analysis and the recommended control strategies, WSA and WFC's Air Quality Improvement Task Force requested that ENVIRON include a few ozone action days, public awareness and TCM control strategies in the final selected control strategies, and to perform further cost effectiveness analyses.

The final selected control strategies are divided into two phases, with Phase I control strategies to be implemented by 2005 or earlier, and Phase II control strategies to be implemented after 2005.

Also, the first two Phase I control strategies, namely **WFC I-1: Ozone Actions Days/Public Awareness** and **WFC I-2: VMT Reduction Programs,** combine several measures that were analyzed previously as individual measures. The results of the cost effectiveness analyses for these final selected control strategies are presented in this section.

PHASE I (2005 OR EARLIER)

WFC I-1: Ozone Actions Days/Public Awareness

- General Public Awareness Program
- School-based Public Awareness Program
- Education and Promotion Campaign
- Employer-based Ozone Action Days
- Area Sources Ozone Action Days
- Dynamic Message Signs
- Video Monitor Deployment
- Lawn and Garden Equipment Usage Restrictions for State and Local Governments

WFC I-2: VMT Reduction Programs

- Enhance/expand Northern Shenandoah Valley Regional Commission Ridesharing Program
- Bicycle and Pedestrian Accommodation
- Green Space Preservation
- Mixed Use Development
- Telecommuting

WFC I-3: Open Burning Restrictions

WFC I-4: Engine Idling Restrictions

WFC I-5: School Bus/Heavy Duty Fleets Retrofits

WFC I-6: Voluntary Industrial Reductions

PHASE II (POST 2005)

WFC II-1: OTC Portable Fuel Container Rule

WFC II-2: OTC Architectural/Industrial Maintenance Coatings Rule

WFC II-3: OTC Mobile Equipment Repair and Refinishing Rule

WFC II-4: OTC Solvent Cleaning Operations Rule

WFC II-5: Truck Stop Electrification

WFC I-1: Ozone Actions Days/Public Awareness

Control Measure Description

This control strategy consists of several ozone action days and public awareness programs, and intelligent transportation systems to reduce ozone emissions during the ozone episodic periods. These programs include the following:

- General Public Awareness Program
- School-based Public Awareness Program
- Education and Promotion Campaign
- Employer-based Ozone Action Days
- Area Sources Ozone Action Days
- Dynamic Message Signs
- Video Monitor Deployment
- Lawn and Garden Equipment Usage Restrictions for State and Local Governments

The ozone action days and public awareness programs included in this strategy would reduce some of the emissions mostly contributed by light-duty vehicles and trucks, lawn & garden equipment, and area sources, which are estimated to be about 18.11 tons of VOC and 14.21 tons of NOx per day. The potential emissions impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce. This is consistent with the conclusions of the Tennessee EAC, San Francisco Bay Area MTC (Tennessee, 2003), and data from Sacramento Air Quality Management District (SMAQMD)'s Clean Air Plan Update (SMAQMD, 2003).

As part of it's Clean Air Plan Update, SMAQMD evaluated some educational based TCM control strategies. The evaluated education-based (i.e. general public or school-based awareness programs) programs included programs such as displaying air quality data on billboards, providing public education on ozone emission in schools and small businesses, conducting community outreach, providing education on fueling practices and information on fuel costs. The evaluated ITS included programs such as providing traffic information (such as dynamic message signs and video monitoring systems). In general, the estimated emission benefits from these programs were lower, ranging from 1 to 2%. The average of this range was used in the emission reduction calculation.

The reported cost associated with ozone action days and public awareness programs range from $50,000 to $100,000 per program, and the cost-effectiveness values for these type of programs range from $3,000 to $5,500 per ton of VOC + NOx emissions reduced (SMAQMD, 2003).

For the ITS system, SMAQMD estimated a cost-effectiveness value of about $35,000 per ton of VOC + NOx emissions reduced. A report by Hagler Bailey for the EPA, documenting a review of costs and emissions information for 24 congestion mitigation and air quality (CMAQ) improvement program (CMAQ) projects, indicated that an arterial street signal interconnect cost about $214,000 for 21.1 tons of VOC + NOx emission reduction at a cost-effectiveness value of $10,000 per ton of VOC + NOx emissions reduced (CMAQ, 1999).

Targeted Emission Inventory (Calendar Year 2007)

WFC I-1: Ozone Action Days and Public Awareness	Source	Estimated EI (tpd)	
		VOC	NOx
Public Awareness Program	Mobile/Nonroad/Area	18.11	14.21
School-Based Public Awareness Programs	Mobile/Nonroad/Area	18.11	14.21
Education and Promotion Campaign	Mobile; LDVs/Ts	3.95	2.93
Employer-based Ozone Action Days	Mobile; LDVs/Ts	3.95	2.93
Area Sources Ozone Action Days	Nonroad - L&G	2.12	0.18
Dynamic Message Signs	Mobile	4.38	9.34
Video Monitor System Deployment	Mobile	4.38	9.34
Lawn & Garden Equipment Usage Restriction for State & Local Governments	Nonroad - L&G	2.12	0.18

Emission Reductions (in Calendar Year 2007)

WFC I-1: Ozone Action Days and Public Awareness	Control %		NOx Impact	VOC Impact
	High	Low		
Public Awareness Program	2%	1%	0.213	0.27
School-Based Public Awareness Programs	2%	1%	0.213	0.27
Education and Promotion Campaign	2%	1%	0.044	0.06
Employer-based Ozone Action Days	2%	1%	0.044	0.06
Area Sources Ozone Action Days	2%	1%	0.003	0.03
Dynamic Message Signs	2%	1%	0.140	0.07
Video Monitor System Deployment	2%	1%	0.140	0.07
Lawn & Garden Equipment Usage Restriction for State & Local Governments	2%	1%	0.003	0.03
Total			0.80	0.86

Implementation

Implementing Agency: VDEQ, local governments, and Virginia Department of Transportation, general public and industries.

Barriers	Opportunities
Difficult to quantify benefits	Trip reduction programs can reduce traffic congestion and related stress
Limited level of participation	High visibility
Participation is voluntary	Good public relation
Do not guarantee changes	Improved road safety and traffic flow
Incremental benefits for the rideshare program could be minimum	
Higher implementation cost for dynamic message sign & video monitoring system	

Timeframe

2005 or Earlier	Post 2005
X	

Cost Effectiveness

WFC I-1: Ozone Action Days and Public Awareness	Cost/Cost Effectiveness
Public Awareness Program	$3k ton VOC+NOx
School-Based Public Awareness Programs	$3k ton VOC+NOx
Education and Promotion Campaign	$3k ton VOC+NOx
Employer-based Ozone Action Days	$3.5 to 5.5k/ton VOC+NOx
Area Sources Ozone Action Days	NA
Dynamic Message Signs	$35k/ ton VOC+NOx
Video Monitor System Deployment	$35k/ ton VOC+NOx
Lawn & Garden Equipment Usage Restriction for State & Local Governments	vary

WFC I-2: VMT Reduction Programs

Control Measure Description

This control strategy consists of several TCM and land use measures to reduce VMT traveled. These programs include the following:

- Enhance/expand Northern Shenandoah Valley Regional Commission Ridesharing Program
- Bicycle and Pedestrian Accommodation
- Green Space Preservation
- Mixed Use Development
- Telecommuting

Increasing rideshare promotion efforts for the Valley Commuter Assistance Program through the Governor's Congestion Relief Program for Northern Virginia or telecommuting program would potentially reduce some of the emissions contributed by light-duty vehicles and trucks, which are estimated to be about 4.0 tons of VOC per day and 3.0 tons of NOx per day. The potential emissions impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce. The SMAQMD study reported about 2.5% effectiveness at an estimated cost-effectiveness value of about $20,000 per ton of VOC+NOx emissions (SMAQMD, 2003). The CMAQ report also presented the cost of emission reductions from five ride-sharing programs in California, Georgia, Maryland, and Texas, and the cost effectiveness values ranged from about $11,000 to $80,000 per ton of VOC+NOx emissions reduced (CMAQ, 1999).

Adopting a policy of accommodating bicycle and pedestrian usage in street design and modernization, developing a regional bicycle plan, providing bicycle racks to promote usage, building additional bicycle paths and/or lanes, and investigating improving pedestrian facilities would potentially reduce some of the emissions contributed by light-duty vehicles and trucks, which are estimated to be about 4.0 tons of VOC and 3.0 tons of NOx per day. The potential emission impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce. SMAQMD estimated a cost-effectiveness value of $130,000 per ton of VOC+NOx emissions reduced (SMAQMD, 2003). The CMAQ report also presented the cost of emission reductions from two bicycle and pedestrian projects in Philadelphia, PA and in Illinois, and the cost effectiveness values ranged from about $21,000 to $102,000 per ton of VOC+NOx emissions reduced (CMAQ, 1999).

Developing a plan to preserve green space within the county and city or a plan to encourage mixed use and compact development that is conducive to walking, biking and transit use would potentially reduce emissions contributed by light-duty vehicles and trucks, which are estimated to be about 4.0 tons of VOC per day and 3.0 tons of NOx per day. The potential emissions impact for these control strategies is generally low, the benefits are difficult to quantify and enforce, and the implementation timing for these strategies is poor. The SMAQMD study estimated that the cost effectiveness for this type of land-use planning and development strategy was about 11 million dollars per ton of VOC+NOx emissions reduced (SMAQMD, 2003).

Targeted Emission Inventory (Calendar Year 2007)

WFC I-2: VMT Reduction Programs	Source	Estimated EI (tpd)	
		VOC	NOx
Enhance and/or Expand existing NSVRC Ridesharing Program	Mobile; LDVs/Ts	3.95	2.93
Bicycle and Pedestrian Accommodation	Mobile; LDVs/Ts	3.95	2.93
Green Space Preservation	Mobile; LDVs/Ts	3.95	2.93
Mixed Use Development	Mobile; LDVs/Ts	3.95	2.93
Telecommuting	Mobile; LDVs/Ts	3.95	2.93

Emission Reductions (in Calendar Year 2007)

WFC I-2: VMT Reduction Programs	Control %		NOx Impact	VOC Impact
	High	Low		
Enhance and/or Expand existing NSVRC Ridesharing Program	4%	1%	0.07	0.10
Bicycle and Pedestrian Accommodation	2%	1%	0.04	0.06
Green Space Preservation	2%	1%	0.04	0.06
Mixed Use Development	2%	1%	0.04	0.06
Telecommuting	4%	1%	0.07	0.10
Total			0.28	0.38

Implementation

Implementing Agency: VDEQ, local businesses and governments, department of transportation and general public.

Barriers	Opportunities
Difficult to quantify benefits	Good social and community values
Limited level of participation	Long term environmental impact and associated social benefits for better land-use and bicycle/pedestrian programs
Participation is voluntary	Potential on energy conservation and security
Do not guarantee changes	Improved bicycle and pedestrian safety

Timeframe

2005 or Earlier	Post 2005
X	

Cost Effectiveness

WFC I-2: VMT Reduction Programs	Source	Cost/Cost Effectiveness
Enhance and/or Expand existing NSVRC Ridesharing Program	Mobile; LDVs/Ts	$11-80k/ton of VOC+NOx
Bicycle and Pedestrian Accommodation	Mobile; LDVs/Ts	$21 to 130k/ton of VOC+NOx
Green Space Preservation	Mobile; LDVs/Ts	$11,000k/ton of VOC+NOx
Mixed Use Development	Mobile; LDVs/Ts	$11,000k/ton of VOC+NOx
Telecommuting	Mobile; LDVs/Ts	$11-80k/ton of VOC+NOx

WFC I-3: Open Burning Restriction

Control Measure Description

This control strategy would require establishing open burning regulations for land clearing activities. VDEQ is working with another Virginia county on a model rule on the open burning restriction. Therefore, this control strategy could be easily adopted by Winchester-Frederick County. Virginia Rule 9 VAC 5-40-5620 prohibits open burning with exemptions listed in Rule 9 VAC 5-40-5630.

Establishing open burning regulations for land clearing activities would potentially reduce the open burning emissions of the area source emission inventories, which are 0.37 tons of VOC per day, and 0.15 tons of NOx per day. The potential emissions benefits for this control strategy is low, and the benefits are difficult to quantify and enforce. Assuming that 90% of compliance rate, the potential emission reductions would be about 0.14 tons for NOx emissions, and 0.34 tons for VOC emissions. SMAQMD estimated that the cost-effectiveness for control open burning during ozone season to be about $200 per ton of VOC+NOx emissions reduced (SMAQMD, 2003).

Targeted Emission Inventory (Calendar Year 2007)

WFC I-3: Open Burning Restrictions	Source	Estimated EI (tpd)	
		VOC	NOx
	Area	0.37	0.15

Emission Reductions (in Calendar Year 2007)

WFC I-3: Open Burning Restrictions	Control %		NOx Impact	VOC Impact
	High	Low		
	90%	90%	0.138	0.335

Implementation

Implementing Agency: VDEQ, local governments and businesses, and general public.

Barriers	Opportunities
Difficult to quantify benefits	Reduce fire related hazards or accidents
Need to develop and implement rule	Reduce visible smoke
Difficult to enforce, especially in rural areas	Encourage proper disposal of hazardous wastes

Timeframe

2005 or Earlier	Post 2005
X	

Cost Effectiveness

WFC I-3: Open Burning Restrictions	Source	Cost/Cost Effectiveness
	Area	$200/NOx+VOC ton

WFC I-4: Engine Idling Restrictions

Control Measure Description

Adopting truck and school bus engine idling restrictions would reduce some of the emissions contributed by heavy-duty vehicles and school buses, which is estimated to be 0.16 tons per day for VOC emissions, and 5.1 tons per day for NOx emissions in Winchester-Frederick County.

Implementation of this control strategy would require the use of idling reduction devices. The idle-limiting devices could range from systems that automatically shut down an engine after a specific time, to stop/start systems that automatically stop and start the engine as necessary to maintain engine and cab temperature and battery voltage within pre-set limits. This control could also incorporate the use of alternative power systems, such as auxiliary power units, thermal storage systems, and truck stop electrification, to supply power for cab and on-board appliance functions as necessary (see **WFC II-5: Electrify Truck Stops**).

Idling emissions from HD diesel vehicles are generally from intercity tractor-trailers that are parked at truck stops, rest areas, ports, and to a lesser extent, distribution centers, if idling emissions are not regulated. Even though it is not encouraged or even illegal, extensive truck idling can found at some truck stops or rest areas for heating or cooling cab/sleeper compartments, powering cab/sleeper appliances or auxiliary devices, and in some ports for waiting in line to deliver or pick-up goods. Many studies reported that intercity tractor-trailers idle an average of about 6 hours per day. However, most engine manufacturers recommend that engines run for roughly 3 to 5 minutes for engine warm-up and cool down.

Many states, including the State of Virginia, adopted some kind of anti-idling regulations. Rule VAC § 46.2-1224.1 prohibits any buses, except school and transit buses, to idle more than 10 minutes when unattended, parked or stopped. This regulation is more lenient than many anti-idling regulations adopted by other states that generally prohibit any vehicles to idle for more than 3 to 5 minutes (see Appendix C). Expanding Virginia's anti-idling rule, or adopting more stringent anti-idling regulations, to all diesel vehicles would reduce some idling emissions from these vehicles. In most cases, idling longer than 5 minutes is expected to be eliminated reducing idling emissions by 50 to 75%. CARB estimated that vehicle idling is responsible for about 3 to 5% of exhaust emissions, so a reduction of 50 to 75% would result in about a 2 to 4% reduction.

The average cost of an automatic shut-off installation is expected to be about $1,200 to $2,000, which includes automatic restart or a pre-heater feature for winter operation to prevent engine block freezing (CARB, 2003). The cost for auxiliary power units range from $1,000 to $3,000 for direct-fired heaters (providing heat only), to $5,000 to $7,000 for auxiliary power units that provide combined cab heat/AC, electric power, and heat to engine and fuel (CARB, 2003 and http://www.epa.gov/otaq/retrofit/idlingtech.htm).

However, the U.S. EPA estimated that a truck driver could save more than $3,600 per year in fuel and $300 per year in maintenance costs by eliminating truck stop idling (http://www.epa.gov/otaq/retrofit/idling.htm).

For about 2 to 4% emission reduction, the estimated cost-effectiveness value was about $51,000 per ton of VOC+NOx emissions reduced.

Targeted Emission Inventory (Calendar Year 2007)

WFC I-4: Engine Idling Restrictions	Source	Estimated EI (tpd)	
		VOC	NOx
	Mobile; HDDTs/School Buses	0.16	5.07

Emission Reductions (in Calendar Year 2007)

WFC I-4: Engine Idling Restrictions	Source	Control %		NOx Impact	VOC Impact
		High	Low		
	Mobile; HDDTs/School Buses	4%	2%	0.15	0.005

Implementation

Implementing Agency: VDEQ, local governments and businesses, truck stop operators, Virginia Department of Transportation, and fleet operators.

Barriers	Opportunities
To be an effective program, regulations or laws need to be developed most effectively at the State level to enable and fund such a program and effectively enforce it	Reducing ozone precursor emissions, as well as particulate emissions, in congested city streets; reducing school children exposure to diesel pollutants; reducing truck drivers exposure to diesel pollutants
	Fuel saving and energy conservation

Timeframe

2005 or Earlier	Post 2005
X	

Cost Effectiveness

WFC I-4: Engine Idling Restrictions	Source	Cost/Cost Effectiveness
	Mobile; HDDTs/School Buses	$51k/ton VOC+NOx

WFC I-5: School Bus/Heavy Duty Fleets Retrofits

Control Measure Description

Retrofitting school buses and heavy-duty diesel fleets with emission control technologies, such as EGR systems, aftertreatment devices, cleaner engines or fuels would reduce some of the emissions contributed by heavy-duty vehicles and school buses, which is estimated to be 0.16 tons per day for VOC emissions, and 5.1 tons per day for NOx emissions in Winchester-Frederick County.

This control strategy includes encouraging school districts, fleet owners and operators to retrofit emission-reduction devices to reduce VOC and NOx diesel exhaust emissions. The primary purpose of these devices is to significantly reduce NOx and VOC emissions but often PM retrofit devices are included in many NOx or VOC retrofit devices.

The common aftertreatment strategy for controlling VOC emissions is the use of diesel oxidation catalyst (DOC). The EPA indicated that DOC would provide 50% VOC emission reduction and 20% PM emissions reduction[1]. The cost for DOCs is estimated to be about $1,000 to $3,000.

For reducing NOx emissions, the strategies include retarded engine timing modification, Exhaust Gas Recirculation (EGR), lean NOx catalyst, and Selective Catalytic Reduction (SCR). Examples of verified and/or demonstrated emission reduction effectiveness for NOx control strategies are shown in the following table.

Emission Control Device	NOx Control Effectiveness
Retard timing (Example Vendor: Cleaire's Flash and Catch)	25%
EGR (Example Vendor: STT Emtec System)	Up to 50%
Lean NOx reduction catalyst (Example Vendor: Cleaire's Longview)	25%
SCR (Example Vendors: Extengine's ADEC; Argillon's SiNOx)	90%

The NOx control retrofits will not by themselves reduce PM emissions and may increase PM emissions. Often a NOx control device is accompanied by a particulate control device in a package offered by the vendor. This is especially true for retard timing and EGR NOx control technologies. The major control cost for these NOx retrofit devices includes both capital costs and operational costs. The capital cost for installation of these systems is shown in the table below, based on vendor and contract information available from State incentive programs.

Emission Control Device	NOx Capital Cost
Retarded timing (Cleaire's Flash and Catch)	$13,000 *
EGR (STT Emtec System)	$15,000 to $21,000 *
Lean NOx reduction catalyst (Cleaire's Longview)	$5,000 to $10,000 *
SCR	$10,000 to $45,000 **

*Includes a particulate filter and thus requires low sulfur fuel. These methods also include a fuel economy penalty of less than 5% with a lower penalty for EGR than retarded timing or lean NOx catalysts.

[1] http://www.epa.gov/otaq/retrofit/documents/f03016.pdf

** Not including a particulate filter, but requires area refueling not included in this cost.

For some retrofit strategies, it is required to have low sulfur fuel, so the cost of low sulfur fuel needs to be included in the cost of the strategy.

SMAQMD estimated that the cost-effectiveness values for this control strategy was about $12,000 to $15,000 per ton of VOC+NOx emissions reduced (SMAQMD, 2003).

The Winchester Public Schools and the Frederick County Public Schools have partnered with the VDEQ, the EPA, and the Winchester-Frederick County Economic Development Commission in a voluntary program to reduce emissions from diesel school buses, using engine ECM flashing and/or diesel oxidation catalysts (DOCs).

Targeted Emission Inventory (Calendar Year 2007)

WFC I-5: School Bus and heavy duty fleets Retrofit	Source	Estimated EI (tpd)	
		VOC	NOx
	Mobile; HDDTs/School Buses	0.16	5.07

Emission Reductions (in Calendar Year 2007)

WFC I-5: School Bus and heavy duty fleets Retrofit	Source	Control %		NOx Impact	VOC Impact
		High	Low		
	Mobile; HDDTs/School Buses	50%	30%	0.08	0.04

Implementation

Implementing Agency: VDEQ, local governments and businesses, school districts, and fleet operators.

Barriers	Opportunities
Funding issue - the method used to implement these control strategies included funded incentive programs using both special funds (e.g. Texas Emission Reduction Program and the California Carl Moyer Program) and the use of Congestion Mitigation and Air Quality funds available for retrofit and clean vehicle purchases. Clean School Bus USA Program is also one of the funding sources for this strategy.	Reducing ozone precursor emissions, as well as particulate emissions, in congested city streets; reducing school children exposure to diesel pollutants; reducing truck drivers exposure to diesel pollutants

Timeframe

2005 or Earlier	Post 2005
X	

Cost Effectiveness

WFC I-5: School Bus and heavy duty fleets Retrofit	Source	Cost/Cost Effectiveness
	Mobile; HDDTs/School Buses	$12k -$15k/ton NOx+VOC

WFC I-6: Voluntary Industrial Reductions

Control Measure Description

Implementing voluntary industrial reductions through some EPA voluntary programs, such as Pollution Prevention (P2) program and Environmental Management System (EMS) would potentially reduce some emissions contributed by industrial point sources, which is about 6.7 tons of VOC per day, and 0.82 tons of NOx per day in Winchester-Frederick County. However, the potential emissions impact for this control strategy is generally low, and the benefits are difficult to quantify and enforce.

A report submitted to EPA on the evaluation of the Small Business Development Center's pollution prevention pilot (SBDC Pilot P2) project indicated that the program in the eastern part of Virginia generated limited interest from the industry. The study concluded that, while there were some continuous program elements in the Virginia SBDC, no strong SBDC contribution to the state's environment assistance efforts emerged from the pilot project (SBDC, 2001). The report listed the cost of several SBDC P2 projects in the states of Iowa, Texas, Virginia, Wisconsin, Pennsylvania, and Vermont, and the cost for these P2 programs ranged from about $200,000 to $280,000.

Assuming a 5% program effectiveness, this control strategy would reduce the point source VOC and NOx emissions by 0.34 and 0.04 tons per day, respectively. The cost effectiveness value was about $600 per ton of VOC+NOx emissions reduced using the average project cost of the SBDC pilot projects.

Targeted Emission Inventory (Calendar Year 2007)

WFC I-6: Voluntary Industrial Reductions	Source	Estimated EI (tpd)	
		VOC	NOx
	Point	6.74	0.82

Emission Reductions (in Calendar Year 2007)

WFC I-6: Voluntary Industrial Reductions	Source	Control %		NOx Impact	VOC Impact
		High	Low		
	Point	5%	5%	0.04	0.34

Implementation

Implementing Agency: VDEQ, and local governments and businesses.

Barriers	Opportunities
Difficult to quantify benefits	Increase awareness of air pollution
Limited level of participation	Establish government and industry relationship
Participation is voluntary	

Do not guarantee changes	

Timeframe

2005 or Earlier	Post 2005
X	

Cost Effectiveness

WFC I-6: Voluntary Industrial Reductions	Source	Cost/Cost Effectiveness
	Point	$0.6k/ ton NOx+VOC

WFC II-1: OTC Portable Fuel Container Rule

Control Measure Description

The OTC portable fuel container spillage control model rule is designed to reduce the amount of VOC emissions emitted into the environment from portable fuel containers either through spillage or permeation losses. According to CARB, portable fuel containers used for refueling lawn and garden equipment and other devices are a significant source of VOC emissions (http://www.arb.ca.gov/pfc/facts/sep99_facts.htm).

Petroleum and petroleum product transport contributes to about 0.019 tons per day of VOC emissions in Winchester-Frederick County. Establishing or specifying performance standards for portable fuel containers and/or spouts would reduce VOC emissions from storage, transport, and refueling activities. CARB estimated that the incremental cost for portable fuel containers and/or sprouts that are equipped with an automatic shut-off device was about $6 to $11. Significant reduction of about 75% could be achieved with the use of these portable fuel containers at an estimated cost-effectiveness value of about $5,000 per ton of VOC emissions reduced. Assuming that one quarter of the petroleum transport VOC emissions is contributed by portable fuel containers, a 75% control would provide a VOC emissions reduction of 0.004 tons per day in the WFC.

Targeted Emission Inventory (Calendar Year 2007)

WFC II-1: OTC Portable Fuel Container Rule	Source	Estimated EI (tpd)	
		VOC	NOx
	Area	0.02	NA

Emission Reductions (in Calendar Year 2007)

WFC II-1: OTC Portable Fuel Container Rule	Source	Control %		NOx Impact	VOC Impact
		High	Low		
	Area	75%	75%	No	0.004

Implementation

Implementing Agency: VDEQ and local governments and businesses.

Barriers	Opportunities
Difficult to quantify benefits	Reduce gasoline spillage
Need to develop, implement and enforce rule	Reduce water contamination
Difficult lead time to phase out old containers or sprouts	Reduce potential fire hazards

Timeframe

2005 or Earlier	Post 2005

	X

Cost Effectiveness

WFC II-1: OTC Portable Fuel Container Rule	Source	Cost/Cost Effectiveness
	Area	$5k/ton VOC

WFC II-2: OTC Architectural/Industrial Maintenance Coatings Rule

Control Measure Description

This strategy requires reformulated coatings to meet lower VOC content limits than the current federal rule. Once it is adopted, the rule requires that manufacturers assume the primary responsibility to produce coatings that meet or exceed VOC content limits for sale and use at the retail and wholesale levels.

This strategy regulates the volatile organic compound content in coatings applied to stationary structures and their appurtenances (e.g., bituminous coatings and mastics, metallic pigmented coatings, quick-dry primers, sealers and undercoaters, non flat coatings, roof coatings non bituminous, and specialty primers, sealers and undercoaters etc.).

Solvent utilization for surface coatings contributes to about 5.7 tons per day of VOC emissions in Winchester-Frederick County. Requiring reformulated coatings to meet lower VOC content limits than the current federal rule would reduce VOC emissions in this source by about 20%. A 20% reduction in VOC emissions due to surface coating would provide about 1.1 tons per day of VOC emission reduction in the WFC.

The SMAQMD study estimated the cost effectiveness for this strategy ranged from $6,000 to $20,000 per ton of VOC emissions reduced.

Targeted Emission Inventory (Calendar Year 2007)

WFC II-2: OTC Architectural/Industrial Maintenance Coatings Rule	Source	Estimated EI (tpd)	
		VOC	NOx
	Area	5.70	NA

Emission Reductions (in Calendar Year 2007)

WFC II-2: OTC Architectural/Industrial Maintenance Coatings Rule	Source	Control %		NOx Impact	VOC Impact
		High	Low		
	Area	20%	20%	No	1.14

Implementation

Implementing Agency: VDEQ and local governments and businesses.

Barriers	Opportunities
Difficult to quantify benefits	Reduce exposure to VOC and associated toxic emissions
Need to develop, implement and enforce rule	
Need to implement rule across counties/cities/state to minimize influx of non-compliance products	

Timeframe

2005 or Earlier	Post 2005
	X

Cost Effectiveness

WFC II-2: OTC Architectural/Industrial Maintenance Coatings Rule	Source	Cost/Cost Effectiveness
	Area	$6k to 20k/ton of VOC

WFC II-3: OTC Mobile Equipment Repair And Refinishing Rule

Control Measure Description

This strategy requires lower VOC content for paints and use of improved transfer efficiency application and cleaning equipment. Once it is adopted, the rule would apply to mostly small businesses that apply refinishing materials to a variety of mobile equipment repair and refinishing facilities.

Mobile equipment repair and refinishing is part of solvent utilization for surface cleaning. The fraction for this source should be fairly small as compared to architectural/industrial maintenance coating. For this case, VOC emissions contributed by mobile equipment repair and refinishing was assumed to be 10% or 0.57 tons per day of the total VOC emissions from the surface coatings.

Requiring lower VOC content for paints and the use of improved transfer efficiency applications and cleaning equipment would reduce some VOC emissions. The OTC estimated that the use of high volume-low pressure spray guns or equivalent equipment could reduce paint use by about 50%, and the use of enclosed spray gun cleaners would reduce VOC emissions more than 80%.

Using an average percentage reduction of 65%, this strategy would reduce VOC emissions from mobile equipment repair and refinishing by about 0.37 tons per day.

The SMAQMD study estimated that the cost effectiveness value for this strategy was about $800 per ton of VOC emissions reduced (SMAQMD, 2003).

Targeted Emission Inventory (Calendar Year 2007)

WFC II-3: OTC Mobile Equipment Repair and Refinishing Rule	Source	Estimated EI (tpd)	
		VOC	NOx
	Area	0.57	NA

Emission Reductions (in Calendar Year 2007)

WFC II-3: OTC Mobile Equipment Repair and Refinishing Rule	Source	Control %		NOx Impact	VOC Impact
		High	Low		
	Area	80%	50%	No	0.37

Implementation

Implementing Agency: VDEQ and local governments and businesses.

Barriers	Opportunities
Need to develop, implement and enforce rule	Reduce exposure to VOC and associated toxic emissions
Need to implement rule across counties/cities/state to minimize influx of non-	

compliance products	

Timeframe

2005 or Earlier	Post 2005
	X

Cost Effectiveness

WFC II-3: OTC Mobile Equipment Repair and Refinishing Rule	Source	Cost/Cost Effectiveness
	Area	0.8k/ton of VOC

WFC II-4: OTC Solvent Cleaning Operations Rule

Control Measure Description

This measure requires establishing hardware and operating requirements for vapor cleaning machines used to clean metal parts and volatility restrictions for cold cleaning solvents.

Degreasing and solvent cleaning operations are performed by many commercial and industrial facilities. Solvents are used for surface preparation for further processing and cleaning after manufacturing. Degreasing is widely used by automotive repair and maintenance facilities and by manufacturing facilities. Solvent is also used by coating operations for cleaning of coating application equipment such as spray guns, brushes, etc (**WFC II-3: OTC Mobile Equipment Repair and Refinishing Rule**).

Solvent cleaning operations contribute to about 0.56 tons per VOC emissions as part of the degreasing solvent utilization source in Winchester-Frederick County. Establishing hardware and operating requirements for vapor cleaning machines used to clean metal parts would reduce about 60 to 70% of this emission source, or about 0.37 tons per day.

The SMAQMD study estimated that the cost effectiveness value for this strategy was about $800 per ton of VOC emissions reduced (SMAQMD, 2003).

Targeted Emission Inventory (Calendar Year 2007)

WFC II-4: OTC Solvent Cleaning Operations Rule	Source	Estimated EI (tpd)	
		VOC	NOx
	Area	0.56	NA

Emission Reductions (in Calendar Year 2007)

WFC II-4: OTC Solvent Cleaning Operations Rule	Source	Control %		NOx Impact	VOC Impact
		High	Low		
	Area	70%	60%	No	0.37

Implementation

Implementing Agency: VDEQ and local governments and businesses.

Barriers	Opportunities
Need to develop, implement and enforce rule	Reduce exposure to VOC and associated toxic emissions
Need to implement rule across counties/cities/state to minimize influx of non-compliance products	

Timeframe

2005 or Earlier	Post 2005
	X

Cost Effectiveness

WFC II-4: OTC Solvent Cleaning Operations Rule	Source	Cost/Cost Effectiveness
	Area	0.8k/ton of VOC

WFC II-5: Truck Stop Electrification

Control Measure Description

Similar to **WFC I-4: Engine Idling Restriction**, truck stop electrification would reduce some of the emissions contributed by heavy-duty vehicles and school buses, which is estimated to be 0.16 tons per day for VOC emissions, and 5.1 tons per day for NOx emissions in Winchester-Frederick County. This control strategy could incorporate the use of truck stop electrification to supply power for cab and on-board appliance functions as necessary.

Idling emissions from HD diesel vehicles are generally from intercity tractor-trailers that are parked at truck stops, rest areas, ports, and to a lesser extent, distribution centers, if idling emissions are not regulated. Even though it is not encouraged or even illegal, extensive truck idling can sometimes be found at some truck stops or rest areas, mainly for heating or cooling cab/sleeper compartments, powering cab/sleeper appliances or auxiliary devices, and in some ports for waiting in line to deliver or pick-up goods. Many studies reported that intercity tractor-trailers idle an average of about 6 hours per day. However, most engine manufacturers recommend that engines run for roughly 3 to 5 minutes for engine warm-up and cool down.

Many states, including the State of Virginia, adopted some kind of anti-idling regulations. Rule VAC § 46.2-1224.1 prohibits any buses, except school and transit buses to idle more than 10 minutes when unattended, parked or stopped. This regulation is more lenient than many anti-idling regulations adopted by other states that generally prohibit any vehicles to idle for more than 3 to 5 minutes (see Appendix C). Expanding the Virginia anti-idling rule, or adopting more stringent anti idling regulations to all diesel vehicles would reduce some idling emissions from these vehicles. In most cases, idling longer than 5 minutes is expected to be eliminated reducing idling emissions by 50 to 75%. CARB estimated that vehicle idling is responsible for about 3 to 5% of exhaust emissions, so a reduction of 50 to 75% would result in about a 2 to 4% reduction.

One of the truck stop electrification technologies is that provided by IdleAire[2]. The IdleAire truck stop electrification system provides a cooling or heating ventilation connection to the truck cab through the passenger side window. Based on the Tennessee EAP study, the initial capital cost of a truck stop parking space, for 100 HD diesel trucks, that is equipped with an IdleAire truck stop electrification system in Knox County, Tennessee, was about one million dollars (Tennessee, 2003). The estimated cost effectiveness value for that program was about $1,700 per ton of NOx emission reduced (Tennessee, 2003).

Targeted Emission Inventory (Calendar Year 2007)

WFC II-5: Electrify Truck Stops	Source	Estimated EI (tpd)	
		VOC	NOx
	Mobile; HDDTs	0.16	4.94

Emission Reductions (in Calendar Year 2007)

WFC II-5: Electrify Truck Stops	Source	Control %		NOx Impact	VOC Impact
		High	Low		
	Mobile; HDDTs	4%	2%	0.15	Yes; small

[2] http://www.epa.gov/otaq/retrofit/idlingtech.htm

Implementation

Implementing Agency: VDEQ, local governments and businesses, truck stop operators, Virginia Department of Transportation, and fleet operators.

Barriers	Opportunities
To be an effective program, regulations or laws need to be developed most effectively at the State level to enable and fund such a program and effectively enforce it	Reducing ozone precursor emissions, as well as particulate emissions in truck stops; reducing truck drivers exposure to diesel pollutants
	Fuel saving and energy conservation

Timeframe

2005 or Earlier	Post 2005
	X

Cost Effectiveness

WFC II-5: Electrify Truck Stops	Source	Cost/Cost Effectiveness
	Mobile; HDDTs	$1.7k/ton NOx

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APPENDIX A

Detailed 2007 Emission Inventories for WFC

Table A-1. Area source emission inventories.

			Emissions (tpd)					
			1999		2002		2007	
County	SCC1_DESC	SCC3_DESC	NOX	VOC	NOX	VOC	NOX	VOC
Wincheste	Industrial Processes	Food and Kindred Products: SIC 20		0.0280		0.0285		0.0292
	Miscellaneous Area Sources	Other Combustion	0.0110	0.0170	0.0114	0.0176	0.0120	0.0186
	Solvent Utilization	Degreasing		0.2840		0.2862		0.2849
		Dry Cleaning		0.0000		0.0000		0.0000
		Graphic Arts		0.1420		0.1428		0.1427
		Miscellaneous Non-industrial: Commercial		0.6640		0.6861		0.7250
		Miscellaneous Non-industrial: Consumer		0.5490		0.5673		0.5994
		Surface Coating		4.1940		4.2261		4.2078
	Stationary Source Fuel Combustion	Commercial/Institutional	0.0330	0.0010	0.0344	0.0010	0.0370	0.0011
		Industrial	1.0430	0.0580	1.0733	0.0597	1.1258	0.0626
		Residential	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Storage and Transport	Petroleum and Petroleum Product Storage		1.5490		1.6125		1.7241
		Petroleum and Petroleum Product Transport		0.0130		0.0137		0.0149
	Waste Disposal, Treatment, and Recovery	Landfills	0.0200	0.0200	0.0207	0.0207	0.0218	0.0218
		Leaking Underground Storage Tanks		0.0000		0.0000		0.0000
		On-site Incineration	0.0220	0.0510	0.0227	0.0527	0.0240	0.0557
		Open Burning	0.1100	0.2800	0.1142	0.2906	0.1205	0.3067
		TSDFs		0.0000		0.0000		0.0000
		Wastewater Treatment		0.0000		0.0000		0.0000
Total			1.2390	7.8500	1.2767	8.0053	1.3411	8.1946
Frederick	Industrial Processes	Food and Kindred Products: SIC 20		0.0110		0.0112		0.0115
	Miscellaneous Area Sources	Other Combustion	0.0000	0.0010	0.0000	0.0010	0.0000	0.0011
	Solvent Utilization	Degreasing		0.2770		0.2791		0.2779
		Dry Cleaning		0.0000		0.0000		0.0000
		Graphic Arts		0.0560		0.0563		0.0563
		Miscellaneous Non-industrial: Commercial		0.0620		0.0641		0.0677
		Miscellaneous Non-industrial: Consumer		0.2140		0.2211		0.2336
		Surface Coating		1.4880		1.4994		1.4929
	Stationary Source Fuel Combustion	Commercial/Institutional	0.0830	0.0030	0.0866	0.0031	0.0930	0.0034
		Industrial	1.1580	0.0650	1.1916	0.0669	1.2499	0.0702
		Residential	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Storage and Transport	Petroleum and Petroleum Product Storage		0.2850		0.2967		0.3172
		Petroleum and Petroleum Product Transport		0.0040		0.0042		0.0046
	Waste Disposal, Treatment, and Recovery	Landfills	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		Leaking Underground Storage Tanks		0.0000		0.0000		0.0000
		On-site Incineration	0.0160	0.0390	0.0165	0.0403	0.0175	0.0426
		Open Burning	0.0300	0.0600	0.0311	0.0623	0.0329	0.0657
		TSDFs		0.0000		0.0000		0.0000
		Wastewater Treatment		0.0000		0.0000		0.0000
840 Total			1.2870	2.5650	1.3259	2.6057	1.3933	2.6446
Grand Total			2.5260	10.4150	2.6026	10.6110	2.7344	10.8392

Table A-2. Year 2007 On-road source emission inventories.

		FREDERICK COUNTY						WINCHESTER CITY				Grand Tota
	SPEED	13	39	40	47	50	55	13	26	27	50	
						NOx						
	HDDBS	0.0020	0.0007	0.0049	0.0101	0.0185	0.0870	0.0009	0.0007	0.0017	0.0003	0.1267
	HDDBT	0.0014	0.0005	0.0035	0.0072	0.0132	0.0621	0.0006	0.0005	0.0011	0.0002	0.0902
	HDDV2b	0.0035	0.0013	0.0084	0.0175	0.0318	0.1496	0.0015	0.0011	0.0028	0.0004	0.2179
	HDDV3	0.0011	0.0004	0.0027	0.0056	0.0103	0.0484	0.0005	0.0004	0.0009	0.0001	0.0705
	HDDV4	0.0014	0.0005	0.0033	0.0068	0.0124	0.0584	0.0006	0.0004	0.0011	0.0002	0.0852
	HDDV5	0.0007	0.0002	0.0016	0.0033	0.0061	0.0284	0.0003	0.0002	0.0006	0.0001	0.0415
	HDDV6	0.0043	0.0016	0.0104	0.0215	0.0406	0.1902	0.0018	0.0014	0.0035	0.0006	0.2759
	HDDV7	0.0078	0.0028	0.0188	0.0392	0.0739	0.3460	0.0033	0.0025	0.0064	0.0010	0.5018
	HDDV8a	0.0105	0.0043	0.0284	0.0586	0.1200	0.5483	0.0043	0.0037	0.0094	0.0016	0.7892
	HDDV8b	0.0435	0.0183	0.1216	0.2498	0.5164	2.3473	0.0180	0.0159	0.0401	0.0069	3.3779
	HDGB	0.0001	0.0001	0.0005	0.0011	0.0018	0.0074	0.0000	0.0001	0.0001	0.0000	0.0113
	HDGV2b	0.0076	0.0046	0.0305	0.0602	0.1024	0.4212	0.0031	0.0035	0.0091	0.0014	0.6438
	HDGV3	0.0003	0.0002	0.0012	0.0023	0.0039	0.0159	0.0001	0.0001	0.0003	0.0000	0.0243
	HDGV4	0.0001	0.0001	0.0005	0.0010	0.0017	0.0068	0.0000	0.0001	0.0001	0.0000	0.0104
	HDGV5	0.0003	0.0002	0.0014	0.0027	0.0046	0.0188	0.0001	0.0002	0.0004	0.0001	0.0287
	HDGV6	0.0007	0.0004	0.0029	0.0057	0.0097	0.0401	0.0003	0.0003	0.0008	0.0001	0.0612
	HDGV7	0.0004	0.0002	0.0014	0.0028	0.0047	0.0194	0.0001	0.0002	0.0004	0.0001	0.0296
	HDGV8a	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001
	HDGV8b	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	LDDT12	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0004
	LDDT34	0.0004	0.0002	0.0009	0.0009	0.0013	0.0022	0.0003	0.0002	0.0004	0.0000	0.0069
	LDDV	0.0002	0.0001	0.0004	0.0004	0.0006	0.0010	0.0001	0.0001	0.0001	0.0000	0.0030
	LDGT1	0.0092	0.0046	0.0283	0.0265	0.0345	0.0506	0.0067	0.0072	0.0118	0.0002	0.1796
	LDGT2	0.0405	0.0199	0.1228	0.1144	0.1488	0.2175	0.0298	0.0316	0.0518	0.0008	0.7779
	LDGT3	0.0183	0.0089	0.0553	0.0513	0.0667	0.0972	0.0131	0.0138	0.0227	0.0003	0.3477
	LDGT4	0.0104	0.0050	0.0312	0.0289	0.0375	0.0545	0.0076	0.0079	0.0130	0.0002	0.1962
	LDGV	0.0768	0.0361	0.2230	0.2065	0.2681	0.3903	0.0604	0.0627	0.1026	0.0015	1.4280
	MC	0.0007	0.0005	0.0020	0.0038	0.0024	0.0014	0.0005	0.0006	0.0032	0.0000	0.0151
NOx Total		0.2423	0.1116	0.7059	0.9283	1.5321	5.2104	0.1542	0.1555	0.2848	0.0160	9.3410
						VOC (tpd)						
	HDDBS	0.0002	0.0000	0.0003	0.0005	0.0007	0.0028	0.0001	0.0001	0.0001	0.0000	0.0048
	HDDBT	0.0001	0.0000	0.0001	0.0002	0.0003	0.0012	0.0000	0.0000	0.0000	0.0000	0.0019
	HDDV2b	0.0004	0.0001	0.0005	0.0008	0.0013	0.0050	0.0001	0.0001	0.0002	0.0000	0.0085
	HDDV3	0.0001	0.0000	0.0002	0.0003	0.0004	0.0016	0.0000	0.0000	0.0001	0.0000	0.0027
	HDDV4	0.0001	0.0000	0.0002	0.0003	0.0005	0.0019	0.0001	0.0000	0.0001	0.0000	0.0032
	HDDV5	0.0001	0.0000	0.0001	0.0001	0.0002	0.0009	0.0000	0.0000	0.0000	0.0000	0.0016
	HDDV6	0.0004	0.0001	0.0006	0.0010	0.0016	0.0060	0.0002	0.0001	0.0003	0.0000	0.0102
	HDDV7	0.0008	0.0002	0.0011	0.0018	0.0028	0.0108	0.0003	0.0002	0.0005	0.0000	0.0185
	HDDV8a	0.0009	0.0002	0.0012	0.0021	0.0033	0.0126	0.0004	0.0002	0.0006	0.0000	0.0216
	HDDV8b	0.0039	0.0008	0.0052	0.0087	0.0140	0.0536	0.0016	0.0010	0.0024	0.0002	0.0914
	HDGB	0.0003	0.0000	0.0003	0.0005	0.0008	0.0031	0.0001	0.0000	0.0001	0.0000	0.0052
	HDGV2b	0.0068	0.0014	0.0090	0.0154	0.0248	0.0947	0.0025	0.0014	0.0034	0.0003	0.1597
	HDGV3	0.0003	0.0001	0.0003	0.0006	0.0009	0.0036	0.0001	0.0000	0.0001	0.0000	0.0061
	HDGV4	0.0002	0.0000	0.0003	0.0005	0.0008	0.0031	0.0001	0.0000	0.0001	0.0000	0.0051
	HDGV5	0.0003	0.0001	0.0005	0.0008	0.0014	0.0052	0.0001	0.0001	0.0002	0.0000	0.0087
	HDGV6	0.0007	0.0002	0.0010	0.0017	0.0028	0.0108	0.0002	0.0001	0.0003	0.0000	0.0180
	HDGV7	0.0004	0.0001	0.0005	0.0009	0.0014	0.0053	0.0001	0.0001	0.0002	0.0000	0.0089
	HDGV8a	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	HDGV8b	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	LDDT12	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0004
	LDDT34	0.0003	0.0001	0.0006	0.0005	0.0006	0.0009	0.0002	0.0002	0.0003	0.0000	0.0036
	LDDV	0.0001	0.0000	0.0002	0.0002	0.0002	0.0003	0.0001	0.0001	0.0001	0.0000	0.0013
	LDGT1	0.0200	0.0063	0.0390	0.0342	0.0429	0.0599	0.0140	0.0103	0.0168	0.0002	0.2437
	LDGT2	0.0687	0.0218	0.1338	0.1176	0.1474	0.2060	0.0482	0.0355	0.0580	0.0007	0.8377
	LDGT3	0.0465	0.0154	0.0948	0.0834	0.1046	0.1461	0.0302	0.0230	0.0376	0.0005	0.5821
	LDGT4	0.0218	0.0072	0.0444	0.0391	0.0490	0.0685	0.0142	0.0108	0.0177	0.0002	0.2730
	LDGV	0.1702	0.0515	0.3156	0.2746	0.3437	0.4790	0.1322	0.0945	0.1542	0.0018	2.0174
	MC	0.0034	0.0012	0.0050	0.0091	0.0053	0.0029	0.0023	0.0018	0.0098	0.0000	0.0409
VOC Total		0.3471	0.1068	0.6547	0.5949	0.7519	1.1859	0.2475	0.1798	0.3032	0.0042	4.3759

Table A-3. Non-road lawn and garden emission inventories.

			1999		2002		2007	
			NOX	VOC	NOX	VOC	NOX	VOC
Winchester	Lawn and Garden Equipment	2-Stroke	0.0000	0.6600	0.0000	0.7132	0.0000	0.8116
	Lawn and Garden Equipment	4-Stroke	0.1100	0.6200	0.1189	0.6700	0.1353	0.7624
Total			0.1100	1.2800	0.1189	1.3832	0.1353	1.5740
Frederick	Lawn and Garden Equipment	2-Stroke	0.0000	0.2800	0.0000	0.2861	0.0000	0.2966
	Lawn and Garden Equipment	4-Stroke	0.0400	0.2400	0.0409	0.2452	0.0424	0.2542
Total			0.0400	0.5200	0.0409	0.5314	0.0424	0.5508
Grand Total			0.1500	1.8000	0.1597	1.9146	0.1776	2.1249

Table A-4. Point source emission inventories.

	Emissions (tpd)			
	1999	2002	2005	2007
NOx				
Winchester	0.6230	0.6891	0.7640	0.8111
Frederick	0.1220	0.1265	0.1284	0.1314
Total	0.7450	0.8156	0.8924	0.9425
VOC				
Winchester	4.1010	4.5744	5.0357	5.2909
Frederick	1.9180	2.1648	2.3478	2.4481
Total	6.0190	6.7391	7.3835	7.7390

APPENDIX B

Detailed Results for the Initial Screening Analysis

The results of the screening analysis for the control strategies are presented in Tables B-1 to B-3. Table B-1 presents information or data on parameters such as control sources, estimated emission inventories, feasibility, quantifiable, enforceable, and timeframe consideration for the control strategies. Table B-2 presents information or data on the emission reduction impacts, and estimated/reported cost-effectiveness values for the control strategies. Table B-3 provides some references on studies and reports that are relevant to the control strategies.

Table B-1. Preliminary screening results of the control strategies for the Winchester-Frederick County's EAP (Part 1).

Virginia State - Winchester-Frederick County

	Measure Under Consideration	Source	Estimated EI (tpd) VOC	Estimated EI (tpd) NOx	Feasibility	Quantifiable	Enforceable	Timeframe
VDEQ VOC Regulations (Area Source)								
WFC -1	Petroleum Liquid Storage	Area	2.0414	NA	Yes	Yes	Yes	Yes
WFC -2	Cutback Asphalt	Area	0.0197	NA	Yes	Yes	Yes	Yes
WFC – 3	Consumer Products Rule	Area	0.8330	NA	Yes	Yes	Yes	Yes
WFC - 4	OTC Portable Fuel Container Rule	Area	0.0194	NA	Yes	Yes	Yes	Yes
WFC - 5	OTC Architectural/Industrial Maintenance Coatings Rule	Area	5.7007	NA	Yes	Yes	Yes	Yes
WFC – 6	OTC Mobile Equipment Repair and Refinishing Rule	Area	0.5701	NA	Yes	Yes	Yes	Yes
WFC – 7	OTC Solvent Cleaning Operations Rule	Area	0.5628	NA	Yes	Yes	Yes	Yes
Episodic Measures (Multiple Sources)								
WFC – 8	Ozone Action Days	Mobile; LDVs/Ts	3.9539	2.9294	Yes	No	No	Yes
Public Information and Education (Multiple Sources)								
WFC – 9	Public Awareness Program	Multiple	18.11	14.21	Yes	No	No	Yes
WFC – 10	School-Based Public Awareness Programs	Multiple	18.11	14.21	Yes	No	No	Yes
Ridesharing/Carpooling (Mobile Sources)								
WFC - 11	Enhance and/or Expand existing NSVRC Ridesharing Program	Mobile; LDVs/Ts	3.9539	2.9294	Yes	No	No	Yes
Bicycle/Pedestrian Measures (Mobile Sources)								
WFC – 12	Education and Promotion Campaign	Mobile; LDVs/Ts	3.9539	2.9294	Yes	No	No	Yes
WFC - 13	Bicycle and Pedestrian Accommodation	Mobile; LDVs/Ts	3.9539	2.9294	Yes	No	No	Yes
Employer-Based Programs (Multiple Sources)								
WFC - 14	Ozone Action Days	Mobile; LDVs/Ts	3.9539	2.9294	Yes	No	No	Yes
Heavy Vehicle Measures (Mobile Sources)								
WFC – 15	Engine Idling Restrictions	Mobile; HDDTs/School Buses	0.1623	5.0716	Yes	Yes	Yes	Yes
WFC – 16	School Bus and heavy duty fleets Retrofit	Mobile; HDDTs/School Buses	0.1623	5.0716	Yes	Yes	Yes	Yes
WFC – 17	Electrify Truck Stops	Mobile; HDDTs	0.1575	4.9449	Yes	Yes	Yes	Yes
Area/Stationary Source Measures (Multiple Sources)								
WFC – 18	Ozone Action Days Program for Area Sources	Multiple	NA	NA	Yes	No	No	Yes
WFC – 19	Voluntary Industrial Reductions	Point	6.7391	0.8156	Yes	No	No	Yes
WFC – 20	Open Burning Restrictions	Area	0.3724	0.1533	Yes	No	No	Yes
Intelligent Transportation Systems (Mobile Sources)								
WFC – 21	Dynamic Message Signs	Mobile	4.3759	9.3410	Yes	No	No	Yes
WFC – 22	VMS Deployment	Mobile	4.3759	9.3410	Yes	No	No	Yes
Land Use Measures (Multiple Sources)								
WFC – 23	Mixed Use Development	Mobile; LDVs/Ts	3.9539	2.9294	Yes	No	No	No
WFC – 24	Green Space Preservation	Mobile; LDVs/Ts	3.9539	2.9294	Yes	No	No	No
Lawn and Garden Equipment (Non-road Mobile Sources)								
WFC - 25	Reduce emission from lawn and garden equipment used by local and state go	Nonroad Mobile; L&G	2.1249	0.1776	Yes	Yes/No	Yes/No	Yes

Table B-2. Preliminary screening results of the control strategies for the Winchester-Frederick County's EAP (Part 2).

Virginia State - Winchester-Frederick County						
Measure (	**Measure Under Consideration**	**NOx Impact**	**VOC Impact**	**PM Impact**	**Cost Effectiveness**	**Proposed Date**
VDEQ VOC Regulations (Area Source)						
WFC -1	Petroleum Liquid Storage	No	Yes; 50-90% Red.	No	15k-60k /VOC ton	
WFC -2	Cutback Asphalt	No	Yes - small	Yes		
WFC – 3	Consumer Products Rule	No	Yes - 5-35%	No	$800/VOC ton	
WFC - 4	OTC Portable Fuel Container Rule	No	Yes - 75%	No	$500-$2300/VOC ton	Jun-05
WFC - 5	OTC Architectural/Industrial Maintenance Coatings Rule	No	Yes; 3-40%	No	$6 to 20k/VOC ton	Jun-05
WFC – 6	OTC Mobile Equipment Repair and Refinishing Rule	No	Yes; 40-80%	No	Vary depends on controls	Jun-05
WFC – 7	OTC Solvent Cleaning Operations Rule	No	Yes; 40-80%	No	Vary depends on controls	Jun-05
Episodic Measures (Multiple Sources)						
WFC – 8	Ozone Action Days	Yes; 1-1.5%	Yes; 1-1.5%	Yes - small	$3.5 to 5.5k/ton VOC+NOx	
Public Information and Education (Multiple Sources)						
WFC – 9	Public Awareness Program	Yes - small	Yes - small	Yes - small	$3.5 to 5.5k/ton VOC+NOx	Jun-04
WFC – 10	School-Based Public Awareness Programs	Yes - small	Yes - small	Yes - small	$3.5 to 5.5k/ton VOC+NOx	Sep-04
Ridesharing/Carpooling (Mobile Sources)						
WFC - 11	Enhance and/or Expand existing NSVRC Ridesharing Program	Yes; 2.5%	Yes; 2.5%	Yes - small	$19k/ton VOC+NOx	2005
Bicycle/Pedestrian Measures (Mobile Sources)						
WFC – 12	Education and Promotion Campaign	Yes - small	Yes - small	Yes - small	$129k/ton VOC+NOx	Jun-04
WFC - 13	Bicycle and Pedestrian Accommodation	Yes - small	Yes - small	Yes - small	$129k/ton VOC+NOx	June 2004 & Jan 2005
Employer-Based Programs (Multiple Sources)						
WFC - 14	Ozone Action Days	Yes; vary (10-15%)	Yes; vary (10-15%	Yes; small	$3.5 to 5.5k/ton VOC+NOx	Jun-04
Heavy Vehicle Measures (Mobile Sources)						
WFC – 15	Engine Idling Restrictions	Yes; vary (2-4%)	Yes; small	Yes; vary (2-4%)	$10k -$300k/ton VOC+NOx	Jan-05
WFC – 16	School Bus and heavy duty fleets Retrofit	Yes; vary	Yes; vary	Yes; vary	$10k -$300k/ton VOC+NOx	2005
WFC – 17	Electrify Truck Stops	Yes; vary (2-4%)	Yes; small	Yes; vary (2-4%)	$10k -$300k/ton VOC+NOx	2005
Area/Stationary Source Measures (Multiple Sources)						
WFC – 18	Ozone Action Days Program for Area Sources	Yes - small	Yes - small	Yes - small	NA	Jun-04
WFC – 19	Voluntary Industrial Reductions	Yes - small	Yes - small	Yes - small	NA	
WFC – 20	Open Burning Restrictions	Yes - small	Yes - small	Yes - small	$200/NOx+VOC ton	Jun-05
Intelligent Transportation Systems (Mobile Sources)						
WFC – 21	Dynamic Message Signs	Yes - (1~2%)	Yes - (1~2%)	Yes - (1~2%)	$35k/ ton VOC+NOx	Jul-07
WFC – 22	VMS Deployment	Yes - (1~2%)	Yes - (1~2%)	Yes - (1~2%)	$35k/ ton VOC+NOx	Jan-04
Land Use Measures (Multiple Sources)						
WFC – 23	Mixed Use Development	Yes - small	Yes - small	Yes - small	$10,000K/ton VOC+NOx	Jan-06
WFC – 24	Green Space Preservation	Yes - small	Yes - small	Yes - small	NA	Jan-06
Lawn and Garden Equipment (Non-road Mobile Sources)						
WFC - 25	Reduce emission from lawn and garden equipment used by local and s	Yes-small	Yes	Yes-small	vary	Jun-04

Table B-3. Preliminary screening results of the control strategies for the Winchester-Frederick County's EAP (Part 3).

Virginia State - Winchester-Frederick County		
Measure (	**Measure Under Consideration**	**Related Measures**
VDEQ VOC Regulations (Area Source)		
WFC -1	Petroleum Liquid Storage	SMAQMD: D-28, SN-57, SN-58; SCAQMD 2003 SIP; CARB Clean Air Plan
WFC -2	Cutback Asphalt	SMAQMD: SN-112;TNRCC and Houston SIP
WFC – 3	Consumer Products Rule	SMAQMD: SN-17; SCAQMD 2003 SIP; CARB Clean Air Plan; Texas EAP- measure 40
WFC - 4	OTC Portable Fuel Container Rule	SMAQMD: D-26, D-27
WFC - 5	OTC Architectural/Industrial Maintenance Coatings Rule	SMAQMD: D-6; CARB Clean Air Plan
WFC – 6	OTC Mobile Equipment Repair and Refinishing Rule	SMAQMD: D-7, D-8
WFC – 7	OTC Solvent Cleaning Operations Rule	SMAQMD: D-7, D-8
Episodic Measures (Multiple Sources)		
WFC – 8	Ozone Action Days	SMAQMD: TCM-159, TCM-46, TCM-104v2; TRIAD EAC- D8 to D12
Public Information and Education (Multiple Sources)		
WFC – 9	Public Awareness Program	SMAQMD: TCM-113, TCM-195; SCAQMD AQMP2003
WFC – 10	School-Based Public Awareness Programs	SMAQMD: TCM-145
Ridesharing/Carpooling (Mobile Sources)		
WFC - 11	Enhance and/or Expand existing NSVRC Ridesharing Program	SMAQMD: TCM-174
Bicycle/Pedestrian Measures (Mobile Sources)		
WFC – 12	Education and Promotion Campaign	SMAQMD: TCM-201v2; EPA S98002, S98003
WFC - 13	Bicycle and Pedestrian Accommodation	SMAQMD: TCM-201v2, TCM-314; CARB Clean Air Plan; EPA S98002; TRIAD EAC- E2,E3
Employer-Based Programs (Multiple Sources)		
WFC - 14	Ozone Action Days	SMAQMD: TCM-123, TCM-208, TCM-104v2
Heavy Vehicle Measures (Mobile Sources)		
WFC – 15	Engine Idling Restrictions	SMAQMD: ONMS-45; South Coast Air Plan; TRIAD EAC- i8; Texas EAP
WFC – 16	School Bus and heavy duty fleets Retrofit	SMAQMD: ONMS-52v2, ONMS-61, ONMS-62; South Coast Air Plan; TRIAD EAC- i5, i6
WFC – 17	Electrify Truck Stops	SMAQMD: ONMS-45; TRIAD EAC- i7
Area/Stationary Source Measures (Multiple Sources)		
WFC – 18	Ozone Action Days Program for Area Sources	SMAQMD: OFMS-42; NCT-COG 1999-2000 (Dallas-Ft Worth): Measure 20; HGAC
WFC – 19	Voluntary Industrial Reductions	SBDC Pilot P2 project - limited interest in VA state; EPA final report on EMS pilot programs
WFC – 20	Open Burning Restrictions	SMAQMD: SN-54; SMAQMD 501/Placer Rule 102; TRIAD EAC- G2
Intelligent Transportation Systems (Mobile Sources)		
WFC – 21	Dynamic Message Signs	SMAQMD: TCM-179v2; SCAQMD 2003 SIP; EPA S98007; TRIAD EAC-AB1
WFC – 22	VMS Deployment	SMAQMD: TCM-197v2;EPA S98007
Land Use Measures (Multiple Sources)		
WFC – 23	Mixed Use Development	SMAQMD: LU-4; TCM-201v2
WFC – 24	Green Space Preservation	SMAQMD: LU-219/246; TRIAD EAC- F4
Lawn and Garden Equipment (Non-road Mobile Sources)		
WFC - 25	Reduce emission from lawn and garden equipment used by local and s	SMAQMD: OFMS-42, OFMS-37; H-GAC; SCAQMD AQMP2003; SMALL OFF-RD-1,2; TRIAD EAC- K5

APPENDIX C

Anti-Idling Regulations in the States

Summary of State Anti-Idling Regulations

EPA420-S-03-002
February 2003

State	Citation	Applicability	Idling Time Limit	Exemptions	SIP
AZ	AZ ST § 11-876	Heavy duty diesel vehciles >14,000 lbs.	5 minutes	• Emergency vehicles • Traffic conditions • Need for driver to sleep in vehicle • Necessary for equipment (refrigeration)	Not in SIP
CA	CA HLTH & S § 40720	Marine terminals or ports processing 100,000+ containers/year	30 minutes	• Acts of God • Strikes • State/Federal emergencies • Unavoidable/unforseeable event	Not in SIP
CO (Denver)	Denver Municipal Code Sec. 4-43	Any motor vehicle	10 minutes in any one hour	• Ambient temperature <20º F for previous 24 hours • Ambient temperature <10º F • Emergency vehicles • Traffic conditions • Vehicle is being repaired/serviced • Take-off power for auxiliary uses • Vehicles engaged in traffic operations	Not in SIP
CT	Sec. 22a-174-18(a)(5)	Mobile source engine	3 consecutive minutes	• Traffic conditions • Mechanical difficulties • Heating/cooling when necessary • Bring engine to OEM recommended operating temperature • Ambient temperature <20º F • Vehicle is being repaired/serviced • Aircraft, locomotives, marine vessels, lawnmowers, snow blowers, and small home appliances	In SIP

Source: California Air Resources Board and EPA

State	Citation	Applicability	Idling Time Limit	Exemptions	SIP
CT	Non regulatory school bus policy	School buses	Shut off engine immediately unless leaving within 3 minutes; AM start-up idling restricted to time recommended to reach engine operating temperature or defrost windows	• To operate safety equipment • To maintain safe temperature for children with special needs • Ambient temperature <20º F	Not in SIP
HI	§ 11-60.1-34	All motor vehicles	No specified time	• Vehicle is being repaired/serviced • Necessary for auxiliary equipment built onto vehicle • Loading/unloading passengers - not to exceed 3 minutes • Build up op pressure/cooling down of engine - not to exceed 3 minutes	Not in SIP
MD	§ 22-402	Motor vehicles	5 minutes	• Traffic conditions • Mechanical difficulties • Necessary for auxiliary equipment installed on vehicle • To bring vehicle up to OEM's recommended engine operating temperature	In SIP
DC	Title 20, Reg 900.1	Diesel/gasoline vehicles	3 minutes	• Necessary for auxiliary equipment installed on vehicle • To operate AC for 15 minutes on bus with 12 or more people • To operate heating equipment when temperature is <32º F	Not in SIP
MA	Chapter 90, Sec. 16A	Motor vehicles	5 minutes	• Vehicle is being repaired /serviced • Delivery vehicles in which engine power is necessary • Vehicles in operation for which associate power need is required	In SIP

Source: California Air Resources Board and EPA

State	Citation	Applicability	Idling Time Limit	Exemptions	SIP
MN	§ 123B.885	Diesel school buses	N/A (must minimize to extent practical the idling of school bus engines)	None	Not in SIP
MN (St. Cloud)	Section 706	Motor vehicles (within specified 2 block area of city)	5 minutes	N/A	Not in SIP
MO (St. Louis)	Ordinance 64749D	Motor vehicles	10 minutes	• Emergency vehicles	Not in SIP
MT (Lewis & Clark county)	Rule 3.101	Diesel or locomotive engine operating when health department declares air quality is poor	2 hours in any 12 hour period	• When a Board of Health variance is granted	Not in SIP
NV	NAC 445B.576	Diesel truck or bus	15 minutes	• When a variance is issued • Emergency vehicles • Removal of snow • Used to repair or maintain other vehicles • Traffic conditions • During repair/maintenance • Emission is treated and contained by method approved by commission • Engine must idle to perform a specific task (e.g., drilling)	Not in SIP
NH	Env-A 1101.05	Diesel/gasoline vehicle	5 minutes >32º F 15 minutes >-10º F & <32º F No limit <-10º F and no nuisance created	• Traffic conditions • Emergency vehicles • Takeoff power for auxiliary uses • Vehicle is being repaired/serviced • Operated solely to defrost windshield	Not in SIP

Source: California Air Resources Board and EPA

State	Citation	Applicability	Idling Time Limit	Exemptions	SIP
NJ	7:27-14.2	Diesel powered motor vehicles	3 minutes 30 minutes for permanent vehicle at business 15 minutes for vehicle stopped for >= 3 hours	• Emergency vehicles in an emergency situation • Emergency vehicle of GVWR >18,000 lbs transporting property on public road • Diesel bus while loading/unloading • Traffic conditions • When auxiliary power is needed for other equipment or climate control • Being inspected by State/Federal inspector • Vehicle is being repaired/serviced • Detach/exchange trailer • Light duty diesel vehicles	In SIP
NY	§ 217-3.2, 3.3	Diesel bus or truck	5 minutes	• Traffic conditions • If regulation already exists to maintain conditions for passenger comfort • During maintenance • To provide power for auxiliary purpose • Emergency vehicles • Mining/quarrying on own property • Temperature <25° F if motionless for 2 hours • Diesel waiting to undergo a roadside emission inspection • Hybrid electric engine charging batteries	Not in SIP
NY (NYC)	NYC Code § 24-163	Motor vehicles	3 minutes	• Emergency motor vehicles • Loading/unloading • Temperature <40° F	Not in SIP
PA	52 P.S. & 701-223-A	Diesel powered equipment	N/A	None	Not in SIP

Source: California Air Resources Board and EPA

State	Citation	Applicability	Idling Time Limit	Exemptions	SIP
PA (Philad.)	Reg. IX	Heavy duty diesel vehicles >8,500 lbs, or passenger carrying capacity >12	2 minutes 0 minutes for layovers 5 minutes <32º F 20 minutes <20º F 20 minutes for buses with AC and non-openable windows and >75º F	None	Not in SIP
TX (Houston/ Galveston)	Sec 114.500-114.509	Diesel/gasoline motor vehicles GVWR >14,000 lbs	5 minutes April 1 - Oct 31 30 minutes for heat/AC for transit and school buses	• Traffic conditions • Vehicle is being repaired/serviced • Solely to defrost windshield • Power source necessary for mechanical operation other than propulsion • Airport ground service equipment • Emergency vehicles • Owner of vehicle rented or leased to another who is not employed by the owner	In SIP
UT (Salt Lake City)	Health Dept. Reg. #28.6.8	Diesel vehicles	15 minutes	• Supply power to a refrigeration unit • Supply heat/AC to sleeper cab • Emergency vehicles	Not in SIP
VA	§ 46.2-1224.1, 9 VAC 5-40-5670B&C	Buses when unattended, parked, or stopped	10 minutes	• Traffic conditions • Vehicle is being repaired/serviced • School buses • Public transit buses	In SIP

Source: California Air Resources Board and EPA