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**MARYLAND DEPARTMENT OF THE ENVIRONMENT**  
**Air & Radiation Management Administration**

**Modification to the Phase II Attainment Plan  
for the Baltimore Nonattainment Area and Cecil County:  
Revising the Mobile Source Emission Budgets**

**PROPOSED**

**November 9, 1999**

**Air and Radiation Management Administration  
2500 Broening Highway \* Baltimore, Maryland 21224  
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# **Modification to the Phase II Attainment Plan for the Baltimore Nonattainment Area and Cecil County: Revising the Mobile Source Emission Budgets**

## **Executive Summary**

Under the 1990 Clean Air Act Amendments, the Baltimore region and Cecil County were classified as severe nonattainment areas with respect to the National Ambient Air Quality Standard for ozone. The Clean Air Act requires that severe ozone nonattainment areas submit an attainment plan that includes a photochemical modeling demonstration that the area will comply with the federal ozone standard by 2005.

On April 28, 1998, Maryland submitted an attainment plan for the Baltimore Nonattainment Area and Cecil County entitled *Phase II Attainment Plan for the Baltimore Region and Cecil County* (Phase II Attainment Plan). This plan included local and regional modeling and weight of evidence demonstrations that these areas would be likely to achieve compliance with the federal ozone standard if pollution transported from areas outside these nonattainment areas was reduced.

Maryland participated in the Ozone Transport Assessment Group (OTAG) process to identify a suite of regional strategies that would reduce transport across the eastern half of the United States. These regional measures when combined with federal, state and local measures already included in the Phase II Attainment Plan were likely to result in achieving compliance with the ozone standard in 2005. On November 7, 1997, EPA proposed federal regulations, called *Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone* (NOx SIP Call), based upon the OTAG recommendations, which required 22 states to cut emissions to reduce transport. This rule was adopted on October 27, 1998, but then was stayed on May 25, 1999 by the U. S. Court of Appeals for the District of Columbia.

On August 17, 1998, Maryland submitted a supplement to the Phase II Attainment Plan which included additional modeling of these regional strategies performed by EPA as part of the NOx SIP Call. This additional analysis supported Maryland's conclusion that control measures included in the Phase II Attainment Plan combined with the regional measures identified in the OTAG process would likely result in compliance with the federal ozone standard. Maryland committed to implementing these regional strategies in the Phase I and II Attainment Plans and has done so.

The control measures contained in the Phase II Attainment Plan submitted April 28, 1998 include: Enhanced Inspection/Maintenance, Tier 1, Reformulated gasoline Phase I and II, Stage II, Landfills, Open burning, Surface cleaning/degreasing, Architectural coatings, Consumer products, Auto refinishing, Nonroad diesel engine standards, Nonroad gasoline

engine standards, Marine engine standards, Railroad locomotive standards, Expandable polystyrene reasonably available control technology (RACT), Yeast production RACT, Commercial bakeries RACT, Screen printing, Federal air toxics, Graphic arts, Enhanced rule compliance, State air toxics, Heavy Duty Diesel Engine rule, NOx RACT, and NOx Phase II and III.

The purpose of this modification to the Phase II Attainment Plan is to revise the motor vehicle emission budgets. Motor vehicle emissions budgets must be established for the attainment year and reflect all control programs used in the attainment demonstration. Motor vehicle emission budgets must be adequate for the purpose of determining whether transportation plans and improvement programs conform to the Phase II Attainment Plan.

On April 28, 1998, when the Phase II Attainment Plan was submitted, Maryland had adopted regulations for all control strategies in the Plan except the NLEV program and regulations requiring NOx reductions from major sources equivalent to the NOx SIP Call requirements. Hence, the motor vehicle emission budgets did not contain all mobile control programs used in the attainment demonstration. This modification to the Phase II Attainment Plan incorporates reductions from the NLEV program into the motor vehicle emission budgets for the Baltimore Nonattainment Area and Cecil County, and revises the methodology used to estimate mobile source emissions in the Baltimore Nonattainment Area.

Using the criteria established in the federal transportation conformity rule at 40 CFR 93.118(e)(4) and federal guidance regarding motor vehicle emission budgets in attainment plans, the motor vehicle emission budgets for the Baltimore Nonattainment Area for 2002 are 54.0 tons/day VOC and 112.6 tons/day NOx, and for 2005, the budgets are 48.6 tons/day VOC and 104.1 tons/day NOx. The motor vehicle emission budgets for Cecil County for 2002 are 2.7 tons/day VOC and 6.3 tons/day NOx, and for 2005, are 2.5 tons/day VOC and 5.8 tons/day NOx.

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## **Modification to the Phase II Attainment Plan for the Baltimore Nonattainment Area and Cecil County: Revising the Mobile Source Emission Budgets**

### **I. Background**

Under the 1990 Clean Air Act Amendments, the Baltimore region and Cecil County were classified as severe nonattainment areas with respect to the National Ambient Air Quality Standard for ozone. By November 1994, the Clean Air Act required that severe ozone nonattainment areas submit an attainment plan that included a photochemical modeling demonstration that the area would comply with the federal ozone standard by 2005. In a memorandum dated March 2, 1995, Mary Nichols, Assistant Administrator of the U. S. Environmental Protection Agency (EPA), provided an extended schedule for submitting attainment demonstrations in two phases for serious and severe ozone nonattainment areas. The extended schedule was contingent upon participation in the Ozone Transport Assessment Group and adoption of regional control measures such as the National Low Emission Vehicle (NLEV) Program and regional nitrogen oxides (NO<sub>x</sub>) reductions from utilities and other large NO<sub>x</sub> sources.

On April 28, 1998 Maryland submitted an attainment plan for the Baltimore Nonattainment Area and Cecil County entitled *Phase II Attainment Plan for the Baltimore Region and Cecil County*. This plan included local and regional modeling and weight of evidence demonstrations that these areas would be likely to achieve compliance with the federal ozone standard if pollution transported from areas outside these nonattainment areas was reduced. Maryland participated in the Ozone Transport Assessment Group (OTAG) process to identify a suite of regional strategies that would reduce transport across the eastern half of the United States. These regional measures, when combined with federal, state and local measures already included in the Phase II Attainment Plan were likely to result in achieving compliance with the ozone standard in 2005.

On November 7, 1997, EPA proposed federal regulations called *Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone* (NO<sub>x</sub> SIP Call) based upon the OTAG recommendations, which required 22 states to cut emissions to reduce transport. This rule was adopted on October 27, 1998, but then stayed on May 25, 1999 by the U. S. Court of Appeals for the District of Columbia. On August 17, 1998, Maryland submitted a supplement to the Phase II Attainment Plan which included additional modeling of these regional strategies performed by EPA as part of the NO<sub>x</sub> SIP Call. This additional analysis supported Maryland's conclusion that control measures included in the Phase II Attainment Plan combined with the regional measures identified in the OTAG process would likely result in compliance with the federal ozone standard.

The control measures contained in the Phase II Attainment Plan submitted April 28, 1998 include: Enhanced Inspection/Maintenance (Enhanced I/M), Tier 1, Reformulated

gasoline Phase I and II, Stage II, Landfills, Open burning, Surface cleaning/degreasing, Architectural coatings, Consumer products, Auto refinishing, Nonroad diesel engine standards, Nonroad gasoline engine standards, Marine engine standards, Railroad locomotive standards, Expandable polystyrene reasonably available control technology (RACT), Yeast production RACT, Commercial bakeries RACT, Screen printing, Federal air toxics, Graphic arts, Enhanced rule compliance, State air toxics, Heavy Duty Diesel Engine rule, NOx RACT, and NOx Phase II and III.

On April 28, 1998, when the Phase II Attainment Plan was submitted, Maryland had adopted regulations for all control strategies in the Plan except the NLEV program and regulations requiring NOx reductions from major sources equivalent to the NOx SIP Call requirements. Hence, the motor vehicle emission budgets did not contain all mobile control programs used in the attainment demonstration. Maryland adopted regulations requiring participation in the NLEV effective March 22, 1999. Maryland adopted a series of regulations requiring NOx control on major sources that result in reductions equal to those required in the NOx SIP Call. These NOx regulations became effective prior to October 31, 1999. This modification to the Phase II Attainment Plan incorporates reductions from the NLEV program into the motor vehicle emission budgets for the Baltimore Nonattainment Area and Cecil County, and revises the methodology used to estimate mobile source emissions in the Baltimore Nonattainment Area.

On April 30, 1999 EPA forwarded draft guidance to the states concerning criteria for motor vehicle emission budgets included in attainment plans. Under this guidance, EPA requested that, if necessary, states revise the motor vehicle emission budgets in attainment plans to include NLEV and the Heavy Duty Diesel Engine rule and submit any needed revisions to EPA by December 31, 1999.

## **II. Motor Vehicle Emission Budgets for the Phase II Attainment Plan**

In the Baltimore Nonattainment Area and Cecil County, motor vehicle emission budgets established in the Phase II Attainment Plan are based on implicit motor vehicle emission budgets. An implicit motor vehicle emission budget is derived by projecting the level of onroad mobile source emissions for the appropriate milestone year or attainment year including the emission reductions from all mobile source control measures identified in the plan. The budgets in this modification were developed using this procedure and include the following control programs: the Federal Motor Vehicle Control Program, Tier 1, reformulated gasoline Phase I and II, enhanced inspection/maintenance program, NLEV program, and heavy duty diesel engine 2 g standard (HDDE2g).

The motor vehicle emission budgets for the Baltimore Nonattainment Area were prepared in conjunction with Transportation Steering Committee staff and the Maryland Department of Transportation. The emissions estimates were derived using travel data from the TP+ transportation model and average speed estimates supplied by the Transportation Steering Committee staff through a process described below. Emission factors were developed using MOBILE5b, the EPA approved mobile emissions model. The factors developed include the following controls: Federal Motor Vehicle Control

Program (FMVCP), reformulated gasoline Phase I and II, enhanced I/M, Tier 1, NLEV, and the HDDE2g rule and were based on 1999 vehicle fleet characteristics. Detailed analysis parameters for the MOBILE5b model runs can be found in Appendix A.

The Transportation Planning Division of the Baltimore Metropolitan Council (BMC), which serves as staff to the Transportation Steering Committee (TSC), applies a traditional four step travel model (trip generation, trip distribution, mode choice, and trip assignment) with feedback from trip assignment to trip distribution in redistributing Home-Based Work (HBW) trips. The model was developed in the TP+ software environment. The staff has made significant changes to the regional travel demand model during the past three years, which have provided a more reliable model for future year projections. The main enhancements to the model were an enhanced zonal structure and highway networks and new trip attraction rates. With these changes in the modeling equations and updates to the highway network characteristics, the model is better positioned to analyze and produce conformity results.

Motorized vehicle trips for 8 trip purposes (Home-Based Work, Home-Based Shop, Home-Based Other, Home-Based School, Work Based Other, Other Based Other, and Light and Heavy trucks) are generated at the production end using inputs of household size stratified by vehicle availability for 4 area types (City Center, Urban, Suburban, and Rural). Regression equations using inputs of employment and number of households are used to develop motorized attractions. Motorized vehicle trips are distributed using a standard gravity model using uncongested travel time for non-work purposes and am peak period congested skims for HBW. Home-based trips are split into auto drivers, auto passengers, and transit riders using inputs of travel time and cost for transit and highway, parking cost, and median household income. An additional logit model is executed in developing auto shares (SOV, HOV2, HOV3, HOV4+) for the HBW purpose. Assignment of the vehicle trip tables is completed for 5 time periods (2 peak and 3 off peak).

The travel demand model consisting of 1,326 Transportation Analysis Zones (TAZs) was developed for Baltimore City and the surrounding 5 jurisdictions in the Baltimore region and 4 neighboring jurisdictions from the Washington Region. The travel model was validated in 1999 against 1996 conditions as documented in *Baltimore Region Travel Demand Model 1996 Validation*. Trip generation and trip distribution have been calibrated against a 1993 Household Travel Survey and a 1996 Baltimore Regional Transit Study is being used to revise the mode choice model.

Since the application of NLEV affects both the 2002 budget and the 2005 budget, and both budgets will be used in future conformity analyses, both budgets have been modified. The explicit motor vehicle emission budgets for the Baltimore Nonattainment Area for 2002 are 54.0 tons/day VOC and 112.6 tons/day NOx, and for 2005, the budgets are 48.6 tons/day VOC and 104.1 tons/day NOx.

The motor vehicle emission budgets for Cecil County were prepared in conjunction with the Maryland Department of Transportation. The projected traffic volumes developed for Cecil County were based on the Upper Eastern Shore MINUTP transportation planning

model. This model, developed by the Maryland State Highway Administration consists of Cecil, Kent and Queen Anne's Counties in Maryland and New Castle County in Delaware. Land use inputs to the model were provided by the Wilmington Area Planning Council (WILMAPCO). The model was calibrated for the base year. The model develops traffic volumes through a four step process. Following a review of the model outputs, the outputs are input into a d-base program to produce network and trip ends data for use in the MOBILE5b model. Emission factors were developed using MOBILE5b, the EPA approved mobile emissions model. The factors developed include the following controls: FMVCP, reformulated gasoline Phase I and II, enhanced I/M, Tier 1, NLEV, and HDDE2g and were based on 1996 vehicle fleet characteristics. Detailed analysis parameters can be found in Appendix B.

Since the application of NLEV affects both the 2002 budget and the 2005 budget, and both budgets will be used in future conformity analyses, both budgets have been modified. The explicit motor vehicle emission budgets for Cecil County for 2002 are 2.7 tons/day VOC and 6.3 tons/day NOx, and for 2005, are 2.5 tons/day VOC and 5.8 tons/day NOx.

### **III. Consultation**

The conformity rule requires air quality planning agencies to develop a consultation process with state departments of transportation and local officials. This process fosters understanding of the development process for air quality plans and transportation plans between the agencies. The Maryland Department of the Environment (MDE) adopted regulations, COMAR 26.11.26, governing consultation between the Maryland Departments of Transportation and the Environment and the Transportation Steering Committee with respect to the development of air quality plans and transportation plans. This modification to the Phase II Attainment Plan and the motor vehicle emission budgets in it were developed in accordance with the consultation rule.

### **IV. Conclusions**

The goal of this modification to the Phase II Attainment Plan is to establish motor vehicle emission budgets for the Phase II Attainment Plan for the Baltimore Nonattainment Area and Cecil County that can be used as attainment plan motor vehicle emission budgets. The motor vehicle emission budget for the attainment plan must allow the nonattainment area to meet its rate of progress requirements and, as directed in the April 30, 1999 letter from EPA, must include reductions from the NLEV program and the HDDE2g rule. The budgets have been established using all mobile control measures included in previously submitted rate of progress plans as well as NLEV and HDDE2g. Although the motor vehicle emission budgets for the Baltimore region have increased for 2002 and 2005, the Baltimore region continues to meet its rate of progress target levels. Since the modified motor vehicle emission budgets for Cecil County are lower than those in the Phase II Attainment Plan, it is evident that Cecil County can continue to meet its rate of progress target levels.

**APPENDIX A**

**MOBILE SOURCE DATA  
FOR THE BALTIMORE NONATTAINMENT AREA**

**Maryland Department of the Environment**  
**Mobile Sources Control Program**

10/18/99

**Baltimore Area TP Plus Modeling Data Emission Analysis**  
**Highway Network Data for 2002 and 2005**

Milestone Yr.	2002	2005
Trans Model	TP Pls	TP Pls
Year RegMix	1999	1999
HDDV RegMix		
Stab Exh VOC	27.6	25.4
Cold Exh VOC	10.3	9.6
Hot Exh VOC	2.6	2.3
SubTot Exh VOC	40.5	37.3
SubTot Evap VOC	16.9	14.0
Total VOC	57.4	51.3
Refueling VOC	3.3	2.6
<b>Tot NonRef VOC</b>	<b>54.1</b>	<b>48.7</b>
Stab Exh NOx	105.9	97.8
Cold Exh NOx	5.1	4.8
Hot Exh NOx	1.9	1.7
<b>Total Exh NOx</b>	<b>112.9</b>	<b>104.3</b>
VMT - mi mls	68.16	70.46
AvgSpd- mph	44.44	44.50

Note: **All Scenarios modeled with 1999 Reg Mixes modified with MOBILE6 default values for HDDVs, unless otherwise specified.**

Emissions are expressed in tons per day (summer weekday).

All the analyses include controls such as Stage II, Tier1, RFG, IM240, NLEV and the new HDE Rule modeled using MOBILE5b.

## **MOBILE5b INPUT/OUTPUT FILES FOR THE BALTIMORE NONATTAINMENT AREA**

MOBILE5b input and output files used in the development of the motor vehicle emission budget for the Baltimore Nonattainment Area are very extensive and have not been reproduced in hardcopy format for inclusion in this document. Hardcopy files of the input/output files can be viewed at the Maryland Department of the Environment. The input/output files can be obtained in electronic format by contacting:

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**APPENDIX B**

**MOBILE SOURCE DATA  
FOR CECIL COUNTY**

**Maryland Department of the Environment  
Mobile Sources Control Program**

**Wilmapco Region Conformity Analysis for Cecil County  
Milestone Year : 2002 and 2005**

New Scenarios		3	4
Emissions Type	Emissions Basis	2002 10/01/1999	2005 10/01/1999
Stab/AvgExh VOC	VMT	1.3	1.2
ColdExh VOC	VMT	0.6	0.6
HotExh VOC	VMT	0.2	0.1
SubTot Exh VOC	VMT	2.1	1.9
SubTot NRef Evp VOC	Evnt/VMT	0.6	0.6
Total NonRef VOC	Evnt+VMT	2.7	2.5
Stab/AvgExh NOx	VMT	5.9	5.4
ColdExh NOx	VMT	0.3	0.3
HotExh NOx	VMT	0.1	0.1
TotalExh NOx	VMT	6.3	5.8
VMT	mmiles/day	3382354	3507898
Average Speed	Mph	48.14	47.87

Note:

Dates under new scenarios 1, 2, 3, 4, and 5 refer to the date of Post-Processing during emission modeling.

All Emission Inventories modeled using MOBILE5B model except the 1990 Baseline Inventory.

Emission modeling reflects usage of the latest (1996) Motor Vehicle Registration and Gasoline Sales.

Emissions are expressed in tons per day (summer weekday).

All the analyses include controls such as Tier1, Stage II, RFG, IM240, NLEV and the new HDE Rule modeled using MOBILE5b .

## **MOBILE5b INPUT/OUTPUT FILES FOR CECIL COUNTY**

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