

**D R A F T**

**PLAN TO IMPROVE AIR QUALITY IN THE  
WASHINGTON, DC-MD-VA REGION**

**State Implementation Plan (SIP) for 8-Hour Ozone Standard  
Demonstrating Reasonable Further Progress for 2008**

**and**

**Moderate Area Attainment Demonstration**

**and**

**2002 Base Year Inventory**

**for the**

**WASHINGTON DC-MD-VA NONATTAINMENT AREA**

**Prepared by:**

**Metropolitan Washington Council of Governments**

**for the**

**District of Columbia Department of Environment**

**Maryland Department of the Environment**

**and the**

**Virginia Department of Environmental Quality**

**on behalf of the Metropolitan Washington Air Quality Committee**

**February 27, 2007**

## TABLE OF CONTENTS

<b>1. EXECUTIVE SUMMARY .....</b>	<b>1-1</b>
<b>1.1 Background .....</b>	<b>1-3</b>
<b>1.2 The Ozone Problem .....</b>	<b>1-4</b>
<b>1.3 The SIP Process.....</b>	<b>1-5</b>
<b>1.4 Rate of Progress Demonstrated in Previous One-Hour Ozone SIPs.....</b>	<b>1-5</b>
<b>1.5 8-Hour Ozone SIP: 2002-2008 Reasonable Further Progress Plan.....</b>	<b>1-5</b>
<b>1.6 Establishment of a Budget for Transportation Mobile Emissions .....</b>	<b>1-6</b>
<b>1.7 Attainment Demonstration .....</b>	<b>1-7</b>
<b>1.8 Analysis of Reasonably Available Control Measures (RACM) .....</b>	<b>1-7</b>
<b>1.9 Contingency Measures.....</b>	<b>1-8</b>
<b>1.10 Document Contents.....</b>	<b>1-8</b>
<b>2.0 INTRODUCTION AND OVERVIEW .....</b>	<b>2-1</b>
<b>2.1 Clean Air Act Background.....</b>	<b>2-1</b>
<b>2.2 Eight-hour Ozone Standard.....</b>	<b>2-2</b>
<b>2.3 SIP Requirements for Moderate Nonattainment Areas.....</b>	<b>2-2</b>
<b>2.4 Rate of Progress Demonstrated in Previous SIPs .....</b>	<b>2-3</b>
<b>2.5 Comparability of 8-hour Inventories to Previous State Implementation Plans..</b>	<b>2-3</b>
<b>2.6 Sources of Ozone in the Metropolitan Washington Region .....</b>	<b>2-5</b>
<b>2.7 The Effects of Ozone .....</b>	<b>2-11</b>
<b>2.8 Frequency of Violation of Federal Health Standard for Ozone .....</b>	<b>2-12</b>
<b>2.9 The Metropolitan Washington Air Quality Committee (MWAQC).....</b>	<b>2-14</b>
<b>2.10 Interstate Air Quality Council.....</b>	<b>2-15</b>
<b>2.11 State Commitment/Implementation Assurances .....</b>	<b>2-15</b>
<b>2.12 Submittal of the Plans.....</b>	<b>2-15</b>
<b>2.13 Sanctions .....</b>	<b>2-16</b>
<b>2.14 Reasonable Further Progress Requirements.....</b>	<b>2-16</b>
<b>2.15 2009 Attainment Demonstration .....</b>	<b>2-17</b>
<b>2.16 Analysis of Reasonably Available Control Measures (RACM).....</b>	<b>2-17</b>
<b>2.17 Contingency Measures.....</b>	<b>2-18</b>
<b>3.0 THE 2002 BASE-YEAR INVENTORY.....</b>	<b>3-1</b>
<b>3.1 Background and requirements .....</b>	<b>3-1</b>
<b>3.2 Total Emissions by Source .....</b>	<b>3-4</b>
<b>3.2.1 Point .....</b>	<b>3-4</b>
<b>3.2.2 Area .....</b>	<b>3-4</b>
<b>3.2.3 Mobile.....</b>	<b>3-5</b>
<b>3.2.4 Nonroad .....</b>	<b>3-5</b>
<b>3.2.5 Biogenic.....</b>	<b>3-7</b>
<b>4.0 THE 2008 AND 2009 PROJECTED INVENTORIES .....</b>	<b>4-1</b>
<b>4.1 Growth Projection Methodology .....</b>	<b>4-2</b>
<b>4.1.1 Growth Projection Methodology for Point Sources: EGAS .....</b>	<b>4-2</b>
<b>4.1.2 Growth Projection Methodology: Area Sources.....</b>	<b>4-2</b>

4.1.3	Growth Projection Methodology: Nonroad Sources .....	4-5
4.1.4	Growth Projection Methodology: Onroad Sources .....	4-8
4.1.5	Biogenic Emission Projections .....	4-8
4.2	Offset Provisions and Point Source Growth.....	4-8
4.3	Actual vs. Allowable Emissions in Development of the 2008 and 2009 Projected Emissions Inventories .....	4-9
4.4	Projection Inventory Results .....	4-9
4.5	Emission Reductions from Control Measures.....	4-12
4.6	2008 Controlled Emissions for Reasonable Further Progress.....	4-14
4.7	2009 Controlled Emissions for Attainment .....	4-16
5.0	2008 REASONABLE FURTHER PROGRESS REQUIREMENTS .....	5-1
5.1	Introduction.....	5-1
5.1.1	Rate of Progress Demonstrated in Previous State Implementation Plans.....	5-1
5.2	Guidance for Calculating Reasonable Further Progress (RFP) Emission Target Levels .....	5-2
5.2.1	2008 VOC and NO <sub>x</sub> Target Levels.....	5-3
5.2.2	Calculation of 2008 Target Levels.....	5-3
5.3	Compliance with 2008 Reasonable Further Progress Requirements.....	5-6
5.4	Compliance with 2008 Reasonable Further Progress Requirements.....	5-7
6.	CONTROL MEASURES .....	6-1
6.1	Point Source Controls.....	6-1
6.2	Area Source Controls .....	6-11
6.3	Nonroad Source Controls.....	6-38
6.4	On-road Source Controls .....	6-47
6.5	Voluntary Bundle.....	6-57
7.	REASONABLY AVAILABLE CONTROL MEASURES (RACM) ANALYSIS .....	7-1
7.1	RACM Analysis.....	7-1
7.1.1	Analysis Overview and Criteria .....	7-1
7.1.2	Implementation Date .....	7-2
7.1.3	Enforceability .....	7-2
7.1.4	Technological Feasibility .....	7-2
7.1.5	Economic Feasibility and Cost Effectiveness .....	7-3
7.1.6	Substantial and Widespread Adverse Impacts .....	7-3
7.1.7	De Minimis Threshold .....	7-3
7.1.8	Advancing Achievement of 84 ppb Standard.....	7-4
7.1.9	Intensive and Costly Effort .....	7-4
7.2	RACM Measure Analysis.....	7-4
7.2.1	Analysis Methodology.....	7-4
7.2.2	Analysis Results.....	7-5
7.3	RACM Determination .....	7-5

<b>8. MOBILE SOURCE CONFORMITY .....</b>	<b>8-1</b>
<b>8.1 Mobile Emissions Budget and the Washington Area</b>	
Transportation Conformity Process .....	8-2
<b>8.2 Budget Level for On-Road Mobile Source Emissions .....</b>	<b>8-2</b>
8.2.1 RFP Year Mobile Budgets.....	8-3
8.2.2 Attainment Year Mobile Budgets.....	8-3
<b>8.3 Transportation Control Measures (TCMs) and TERMS.....</b>	<b>8-3</b>
<b>8.4 Trends in Mobile Emissions.....</b>	<b>8-4</b>
<b>9.0 MODERATE AREA PLAN COMMITMENTS.....</b>	<b>9-1</b>
9.1 Schedules of Adopted Control Measures.....	9-1
9.2 Stationary Source Threshold Revisions.....	9-12
9.3 New RACT Rules Applicability.....	9-13
9.4 Revision of New Source Review (NSR) Regulations.....	9-14
<b>10.0 ATTAINMENT DEMONSTRATION AND WEIGHT OF EVIDENCE .....</b>	<b>10-1</b>
<b>10.1 Modeling Study Overview: Background and Objectives.....</b>	<b>10-1</b>
10.1.1 Relationship to Regional Modeling Protocols .....	10-2
10.1.2 Conceptual Model .....	10-3
<b>10.2 Domain and Database Issues .....</b>	<b>10-3</b>
10.2.1 Episode Selection.....	10-3
10.2.2 Size of the Modeling Domain .....	10-3
10.2.3 Horizontal Grid Size.....	10-4
10.2.4 Vertical Resolution.....	10-4
10.2.5 Initial and Boundary Conditions.....	10-4
10.2.6 Meteorological Model Selection and Configuration .....	10-5
10.2.7 Emissions Model Selection and Configuration.....	10-5
10.2.8 Air Quality Model Selection and Configuration.....	10-5
10.2.9 Quality Assurance .....	10-6
<b>10.3 Model Performance Evaluation.....</b>	<b>10-6</b>
10.3.1 Diagnostic and Operational Evaluation.....	10-7
10.3.2 Summary of Model Performance .....	10-10
<b>10.4 Attainment Demonstration .....</b>	<b>10-10</b>
10.4.1 Modeling Attainment Test .....	10-11
10.4.2 Unmonitored Area Analysis.....	10-12
10.4.3 Emissions Inventories .....	10-13
10.4.4 Attainment Modeling Results .....	10-13
<b>10.5 Weight of Evidence Analysis.....</b>	<b>10-14</b>
10.5.1 Trend in 8-Hour Ozone Design Value.....	10-14
10.5.2 Trend in Exceedance Count Across All Monitors .....	10-15
10.5.3 Trend in Nitrogen Dioxide Levels .....	10-15
10.5.4 Trend in Carbon Monoxide Levels .....	10-16
10.5.5 Trend in VOC and NOx Emissions.....	10-17
10.5.6 Spatial Extent of NAAQS Violations.....	10-20
10.5.7 Trend in 8-Hour Ozone Exceedance Days and High Temperature Days..	10-21
10.5.8 Trend in Meteorology Adjusted Ozone Levels.....	10-22

10.5.9	Alternative Design Value Calculation Techniques .....	10-24
10.5.10	Additional Weight of Evidence: Voluntary Action Campaigns .....	10-28
10.5.11	Summary and Conclusions of Attainment Demonstration .....	10-30
10.5.12	Procedural Requirements .....	10-32
<b>11.0</b>	<b>Contingency Plan .....</b>	<b>11-1</b>
11.1	Contingency Measures for the 2008 RFP Demonstration.....	11-1
11.1.1	Background .....	11-1
11.1.2	Required Reductions .....	11-1
11.1.3	Identified Contingency Measures.....	11-1
11.1.4	Portable Fuel Containers Rule: Phase I and Phase II.....	11-3
11.1.5	Regional NOx Transport Requirements.....	11-5
11.2	Contingency Measures for the Attainment Demonstration .....	11-7
11.2.1	Background .....	11-7
11.2.2	Required Reductions .....	11-7
11.2.3	Identified Contingency Measures.....	11-7
11.2.4	Tier 2 Motor Vehicle Emission Regulations.....	11-9
11.2.5	Phase I and Phase II Emissions Standards for Gasoline-Powered Non-Road Utility Engines .....	11-10
11.2.6	Emissions Standards for Diesel-Powered Non-Road Utility Engines of 50 or More Horsepower.....	11-11
11.2.7	Emissions Standards for Spark Ignition Marine Engines .....	11-13
11.2.8	Emissions Standards for Large Spark Ignition Engines .....	11-14
11.2.9	Portable Fuel Containers Rule: Phase I and Phase II.....	11-15

**List of Appendices**

- A. Membership Rosters for MWAQC, TAC and AQPAC**
- B. Base Year 2002 Inventory and Documentation**
- C. Point Source Inventories and Projections**
- D. Round 7.0 Cooperative Forecast Projections  
Area and Nonroad Source Inventories and Projections**
- E. MOB6.2.13 Inventories and Documentation**
- F. Transportation Control Measures**
- G. Attainment Modeling Demonstration and Documentation**
- H. Voluntary Commitment Letters and other Documentation**
- I. RACM Documentation**

## List of Tables

Table A Summary of Control Strategies .....	1-2
2-1 Top Ten Sources of VOC .....	2-9
2-2 Top Ten Sources of NOx .....	2-10
3-1 2002 Base Year Ozone Season VOC Inventory .....	3-1
3-2 2002 Base Year Ozone Season NOx Inventory .....	3-2
3-3 2002 Base Year Ozone Season CO Inventory .....	3-2
3-4 2002 Base Year Annual VOC Inventory .....	3-3
3-5 2002 Base Year Annual NOx Inventory .....	3-3
3-6 2002 Base Year Annual CO Inventory .....	3-4
4-1 2002-2008 Growth Factors .....	4-2
4-2 2002-2009 Growth Factors .....	4-3
4-3 Nonroad Model Common Inputs .....	4-6
4-4 Nonroad Model State Specific Inputs .....	4-6
4-5 2008 Projected Uncontrolled VOC Emissions .....	4-10
4-6 2008 Projected Uncontrolled NOx Emissions .....	4-10
4-7 2009 Projected Uncontrolled VOC Emissions .....	4-11
4-8 2009 Projected Uncontrolled NOx Emissions .....	4-11
4-9 2008 Projected Controlled VOC Emissions .....	4-14
4-10 2008 Projected Controlled NOx Emissions .....	4-15
4-11 2009 Projected Controlled VOC Emissions .....	4-16
4-12 2009 Projected Controlled NOx Emissions .....	4-17
5-1 2002 Reasonable Further Progress Base Year Inventory .....	5-4
5-2 2002 Reasonable Further Progress Adjusted-Year Inv .....	5-5
5-3 2008 RFP Adjusted Year Inventory .....	5-5
5-4 Calculation of Non-Creditable Emissions Reductions .....	5-5
5-5 Calculation of VOC Target Level for 2008 .....	5-6
5-6 Comparison of 2008 Controlled and Target Inventories .....	5-6
5-6 Calculation of VOC and NOx Reductions for RFP Contingency .....	5-7
6-1 2008 NOx Point Source Reductions for Maryland .....	6-6
6-2 2009 NOx Point Source Reductions for Maryland .....	6-6
6-3 2008 NOx Point Source Reductions for Virginia.....	6-7
6-4 2009 NOx Point Source Reductions for Virginia.....	6-7
6-5 2008 NOx Point Source Reductions for District .....	6-8
6-6 2009 NOx Point Source Reductions for District .....	6-8
6-7 Point Source NOx Reductions Summary, 2008, 2009 .....	6-9
6-8 Summary of Emission Reductions for Voluntary Bundle .....	6-59

6-9. Summary of Benefits EERE Programs .....	6-61
6-10 Summary of Benefits of Regional Wind Power Purchase .....	6-64
6-11 Projected Annual Generation and Avoided Emissions from the DC RPS Tier 1 Sources .....	6-69
6-12 Summary of Voluntary Measures Initial Survey Responses .....	6-71
6-13 Projected Annual Reductions from Energy Efficiency Programs .....	6-81
7-1 Potential RACM Measures .....	7-6
9-1 District Schedule of Adopted Control Measures.....	9-1
9-2 Maryland Schedule of Adopted Control Measures 9-5	
9-3 Maryland Non-CTG RACT 9-8	
9-4 Virginia Schedule of Adopted Control Measures.....	9-9
9-5 Schedule of Stationary Source Revisions.....	9-12
9-6 New RACT Rules Applicability .....	9-13
9-7 Schedule for Revision of NSR Regulations .....	9-14
10-1 Washington Designations for 8-hour Ozone Standard .....	10-2
10-2 Washington, DC-MD-VA Statistics for 8-hour Ozone .....	10-7
10-3 Individual Site Statistics for 8-hour Ozone (40 ppb cutoff) .....	10-8
10-4 Individual Site Statistics for 8-hour Ozone (60 ppb cutoff) .....	10-8
10-5 Modeling Attainment Test Using EPA Preferred Methodology .....	10-11
10-6 Temperature and 8-hour Ozone Exceedances .....	10-21
10-7 Methodologies for Calculating Baseline Design Values .....	10-25
10-8 Methodologies for Calculating Relative Response Factors .....	10-26
10-9 Future Design Value Ranges .....	10-27
11-1 Calculation of Contingency Measure Requirements .....	11-1
11-2 Contingency Measures for 2008 Reasonable Further Progress .....	11-2
11-3 Calculation of 2009 Contingency Measure Requirement .....	11-7
11-4 Contingency Measures for Attainment Demonstration .....	11-8

### **List of Figures**

2-1 Washington, DC-MD-VA 8-Hr Ozone Nonattainment Region .....	2-4
2-1 Conditions for Ozone Formation .....	2-6
2-3 Gradual Build-up of Ozone Levels .....	2-7
2-4 Estimates of Population At Risk .....	2-11
2-5 Ozone Exceedance Days, 1987-2006 .....	2-13
10-1 Location of Ozone Monitors in the Washington Region .....	10-9
10-2 Trend in 8-Hour Ozone Design Values .....	10-14
10-3 Trend in Monitored Exceedances .....	10-15
10-4 Trend in NO <sub>x</sub> Annual Average Concentrations .....	10-16
10-5 Trend in 2 <sup>nd</sup> High 1-Hour CO Concentrations .....	10-17

10-6 VOC Emissions by Source ..... 10-18  
10-7 NOx Emissions by Source ..... 10-19  
10-8 Comparison of NAA Zones, 1990-2005..... 10-20  
10-9 8-Hour Ozone Exceedances and High Temperature Days ..... 10-22  
10-10 Meteorology Adjusted Ozone Season Averages ..... 10-23

DRAFT