

**Commonwealth of Pennsylvania  
Department of Environmental Protection**



**Revision to the State Implementation  
Plan  
for the  
Pittsburgh – Beaver Valley Area**

Revised Highway Vehicle Emissions Budgets

**April 2004**

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## INTRODUCTION

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This document is a proposed revision to the maintenance plan contained in the State Implementation Plan (SIP) for the Pittsburgh-Beaver Valley area (Allegheny, Armstrong, Beaver, Butler, Fayette, Washington and Westmoreland Counties). In May 2001, Pennsylvania submitted a request to the U.S. Environmental Protection Agency (EPA) redesignate the Pittsburgh – Beaver Valley Moderate Ozone Nonattainment area to maintenance/attainment. The request contained a plan that demonstrated that the area would maintain the one-hour ozone standard for 10 years (2011). The request also contained emission inventories for years of significance to the redesignation process. On October 19, 2001 (66 Fed. Reg. 53094), the EPA approved the plan and redesignated the area to maintenance.

Subsequently, all analyses conducted for purposes of demonstrating that the area's transportation plan conformed to the SIP used the highway emissions inventories contained in the 2001 plan as the transportation "budget." Specifically, volatile organic and nitrogen oxides emissions generated by planned changes in the transportation system could not exceed these budgets.

On January 29, 2002, EPA revised the methodology by which highway emissions are to be calculated, officially releasing MOBILE6 (67 Fed. Reg. 4254). The transportation conformity rule (40 CFR Part 93) requires that conformity analyses be based on the latest motor vehicle emissions model approved by EPA. The formal release of MOBILE6 established a grace period of at most two years before MOBILE6 is required for new conformity analyses in most cases. Therefore, the grace period expired January 29, 2004.

DEP is proposing to amend the Pittsburgh – Beaver Valley area maintenance plan to provide updated transportation conformity budgets in order to provide consistent methodology between the SIP and future conformity analyses. This SIP revision also contains documentation demonstrating that the updated conformity budgets are consistent with maintenance of the one-hour standard.

The Department convened a public hearing on the proposal on April 7, 2004 following a 30 day comment period announced in the March 6, 2004 *Pennsylvania Bulletin* [34 Pa.B. 1395] and advertised for three days in a major Pittsburgh area newspaper. No comment was received during either the public comment period or the public hearing.

## AMBIENT AIR QUALITY

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### **What is ozone?**

Maintaining concentrations of ground-level ozone below the health-based standard is important because ozone is a serious human health threat, and also can cause damage to important food crops, forests, and wildlife. Ozone in the troposphere, also called ground-level ozone, should not be confused with stratospheric ozone – located in the upper atmosphere – which protects the earth by blocking out damaging solar radiation.

Repeated exposure to ozone pollution may cause permanent damage to the lungs. Even when ozone is present in low levels, inhaling it triggers a variety of health problems including chest pains, coughing, nausea, throat irritation, and congestion. It can also worsen bronchitis, heart disease, emphysema, and asthma, and reduce lung capacity. Asthma is a significant and growing threat to children and adults. Ozone can aggravate asthma, causing more asthma attacks, increased use of medication, more medical treatment and more frequent visits to hospital emergency clinics. Healthy people also experience difficulty in breathing when exposed to ozone pollution. Because ozone pollution usually forms in hot weather, anyone who spends time outdoors in the summer may be affected, particularly children, the elderly, outdoor workers and people exercising. Children are most at risk from exposure to ozone because they are active outside, playing and exercising, during the summertime when ozone levels are highest. Ozone interferes with the ability of plants to produce and store food, making them more susceptible to disease, insects, other pollutants, and harsh weather. It damages the foliage of trees and other plants, ruining the landscape of cities, parks and forests, and recreation areas. One of the key components of ozone, nitrogen oxides, contributes to fish kills and algae blooms in sensitive waterways, such as the Chesapeake Bay.

Ozone is not emitted directly to the atmosphere, but is formed by photochemical reactions between volatile organic compounds (VOCs) and oxides of nitrogen (NO<sub>x</sub>) in the presence of sunlight. The long, hot, humid days of summer are particularly conducive to ozone formation, so ozone levels are of concern primarily during the months of May through September. The primary sources of man-made VOCs and NO<sub>x</sub>, the ozone precursors, are the evaporation of fuels and solvents (gasoline and consumer products), combustion of fuels (motor vehicles, power plants and non-road engines), and industrial processes.

### **Ozone Concentrations in the Pittsburgh – Beaver Valley Area**

This document does not supersede the ambient air quality analysis provided in the 2001 maintenance plan, which showed that the ozone design value is predicted to remain below the standard through 2011.

There continue to be no violations of the one-hour ozone standard in the Pittsburgh – Beaver Valley Area.

An exceedance of the standard occurs when the concentration, averaged over a rolling one-hour period, is more than 124 parts per billion. A violation of the one-hour standard occurs if four exceedances occur at the same monitor during a rolling three-year period. The one-hour ozone design value of a monitor is the fourth highest daily one-hour maximum over three years. If there is more than one monitor, the highest design value determines the design value for the entire area.

There are currently thirteen ozone monitors in Pittsburgh – Beaver Valley area. The current design values (2001-03) for these monitors range from 108 (Murrysville) to 120 (Kittanning and Harrison Township) and are below the standard of 124. The area design value for the three-year period of 2001 to 2003 is 120. Ambient air quality information is reported to EPA as required. Ozone air quality information is available from DEP at [www.dep.state.pa.us](http://www.dep.state.pa.us), keyword: ozone.

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## **MAINTENANCE PLAN REVISIONS**

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### **Revision to permanent and enforceable control measures and contingency measures.**

The Commonwealth began implementing Onboard Diagnostics (OBD) as a part of the Commonwealth's vehicle inspection and maintenance (I/M) program in four counties of the Pittsburgh-Beaver Valley area (Allegheny, Beaver, Washington and Westmoreland) in January 2004. The program will employ OBD on all 1996 and newer vehicles with a weight of 8,500 pounds and under. These vehicles previously received a tailpipe test. All other vehicles will continue to receive the tests that they had previously received. Subject vehicles are those 25 years old and newer. A separate State Implementation Plan revision was submitted to EPA for approval on January 31, 2004.

### **Establishment of New Transportation Conformity Budget**

The highway emission inventory contained in the maintenance plan approved in 2001 was prepared with MOBILE5, the approved EPA model at the time.

There are a number of reasons MOBILE5 and MOBILE6 emission estimates differ. Depending on the year modeled, some changes drive the estimates down; others drive the estimates up. There is a tendency for MOBILE6 emission estimates to be higher than MOBILE5 in early years and lower in later years. Each new version of MOBILE reflects the collection and analysis of new test data. It also incorporates changes in vehicle, engine, and emission control system technologies; and improved understanding of in-use emissions levels and the factors that influence them. MOBILE6 incorporates updated information on basic emission rates, more realistic driving patterns, separation of starting and running emissions, improved correction factors, and changing fleet composition. It also includes impacts of new regulations promulgated since the release of the previous version of MOBILE (MOBILE5b).

In addition to the availability of MOBILE6, more recent vehicle fleet information has become available since the submission of Pennsylvania’s original motor vehicle emissions budgets. EPA guidance requires MOBILE model emissions estimates to be based on the latest planning assumptions. For this reason, Pennsylvania is using the following updated data inputs:

- Vehicle mixes based on 2002 Pennsylvania Department of Transportation (PENNDOT) truck percentages and MOBILE6 defaults for 2007 and 2011;
- Vehicle age distributions recalculated using MOBILE6 vehicle type definitions;
- Daily minimum/maximum temperatures and humidity;
- Growth rates based on data from 1996 through 2002;
- 2002 traffic data and information, including seasonal adjustments and Vehicle Miles Traveled (VMT);
- 2001 hourly pattern data; and
- Implementation of an enhanced vehicle emission inspection program beginning in January 2004.

Section 176(c) of the Clean Air Act (CAA), 42 U.S.C. § 7506(c), provides a mechanism by which federally funded or approved highway and transit plans, programs and projects are determined not to produce new air quality violations, worsen existing violations or delay timely attainment of national air quality standards. EPA regulations issued under section 176(c) of the CAA to implement “transportation conformity” provide that motor vehicle emission “budgets” cannot be exceeded by emissions produced by the planned transportation system. The motor vehicle budget represents the highway-generated portion of Pennsylvania’s total emissions for an area from on-road mobile sources. Transportation agencies in Pennsylvania are responsible for making timely transportation conformity determinations. The Southwestern Pennsylvania Commission (SPC) holds that responsibility for the Pittsburgh-Beaver Valley area. The Federal Highway Administration approves these determinations after EPA concurs.

The Commonwealth is proposing the following transportation conformity budgets. Once EPA approves these budgets as “adequate”, these budgets would supersede previous budgets and would be the applicable budgets to use for subsequent conformity determinations.

**Table 1: Revised Transportation Conformity Budgets**

|                                   | 2004       | 2007       | 2011       |
|-----------------------------------|------------|------------|------------|
| Vehicle Miles Traveled/summer day | 62,116,769 | 64,959,815 | 68,841,004 |
| VOC kg/summer day                 | 67,157     | 54,813     | 41,444     |
| VOC tons/summer day               | 74.03      | 60.42      | 45.68      |
| NOx kg/summer day                 | 127,576    | 100,127    | 69,932     |
| NOx tons/summer day               | 140.63     | 110.37     | 77.09      |

**Appendix 1** contains technical information on the preparation of these budgets, including an explanation of methodology, summary tables and input parameters.

## Revised Highway Budgets Are Consistent With Maintenance of the One-Hour Standard

The plan submitted in 2001 demonstrated that emissions projected to 2011 would remain below the emissions in the “attainment year” 1999. The year 1999 was chosen as it was in the three-year period used to demonstrate attainment of the one-hour ozone NAAQS. In addition, 2007 was used as an interim year between 2001 and 2011. Baseline emissions estimates from 1990 were also compared to 1999 emissions.

Because MOBILE6 estimates higher highway emissions in earlier years, the highway emission estimates for all years were recalculated to show the most current estimate of emissions for that year.

Tables 2 and 3 compare highway vehicle emissions estimated using MOBILE5 versus estimates using MOBILE6.

Table 2: Highway Vehicle VOC Emissions Estimates by Year and MOBILE Version

| Year | MOBILE5 Estimates<br>(tons per summer day) | MOBILE6 Estimates<br>(tons per summer day) |
|------|--|--|
| 1990 | 176  | 193.56                                     |
| 1999 | 109.65                                     | 104.25                                     |
| 2007 | 98.22                                      | 60.42                                      |
| 2011 | 102  | 45.68                                      |

Table 3: Highway Vehicle NOx Emissions Estimates by Year and MOBILE Version

| Year | MOBILE5 Estimates<br>(tons per summer day) | MOBILE6 Estimates<br>(tons per summer day) |
|------|--|--|
| 1990 | 223  | 232.99                                     |
| 1999 | 171.05                                     | 182.73                                     |
| 2007 | 129.12                                     | 110.37                                     |
| 2011 | 115.02                                     | 77.09                                      |

Tables 4 and 5 show emission inventories by sector. The tables use the same years as were used in the original 2001 maintenance plan and substitute the new MOBILE6 highway emissions estimates.

**Table 4: VOC Emissions in tons per summer day**

|         | 1990   | 1999   | 2007   | 2011   |
|---------|--------|--------|--------|--------|
| Point   | 96     | 34     | 36     | 38     |
| Area    | 128    | 130    | 136    | 142    |
| Nonroad | 82     | 64     | 42     | 37     |
| Highway | 193.56 | 104.25 | 60.42  | 45.68  |
| TOTAL   | 499.56 | 332.25 | 274.42 | 262.68 |

**Table 5: NOx Emissions in tons per summer day**

|         | 1990   | 1999   | 2007   | 2011   |
|---------|--------|--------|--------|--------|
| Point   | 555    | 282    | 199    | 199    |
| Area    | 18     | 10     | 10     | 10     |
| Nonroad | 83     | 75     | 67     | 60     |
| Highway | 232.99 | 182.73 | 110.37 | 77.09  |
| TOTAL   | 888.99 | 549.73 | 386.37 | 346.09 |

Total projected emissions for 2007 and 2011 are estimated to be below emissions for 1999, thus demonstrating that the revised inventories are consistent with maintenance. These projections use the estimates from previous submissions for point, area and non-road sources. Examination of emission trends for these sources indicate that they will not increase. See Appendix 2.

### **Establishing a 2004 Motor Vehicle Emissions Budget**

Highway vehicle emissions estimates were calculated for 2004 using the MOBILE6 methodology described in Appendix 1. While the corresponding 2004 point, area and non-road sector inventories were not calculated, the Department believes that the general emissions trends in those sectors from 1990 to 2011 support using the 2004 MOBILE6 calculations to establish a 2004 highway vehicle emissions budget.

Assuming linear trends for the years 1999 through 2007 and 1999 through 2011 for all emissions (point, area and non-road), interpolation of the emissions for 2004, using both sets of endpoints and the new MOBILE6 highway vehicle emissions estimates, results in overall 2004 emissions less than the 1999 attainment year.

Adoption of a 2004 highway vehicle emissions budget with MOBILE6 derived estimates results in a lower highway vehicle budget than what is already in place or would be established

using MOBILE5. With regard to air quality for 2004, it is a more protective budget and is consistent with the maintenance goals for the area.