State of Ohio Environmental Protection Agency
Division of Air Pollution Control

Cincinnati-Hamilton, OH
[OH-KY-IN]

DRAFT
Eight-Hour Ozone Attainment Demonstration

State Implementation Plan

Prepared by:
The Ohio Environmental Protection Agency
Division of Air Pollution Control

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Acknowledgement

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Section One

Background

The Clean Air Act Amendments of 1990 (CAAA) defines five ozone nonattainment area classifications for areas that exceed the National Ambient Air Quality Standard (NAAQS) based on the severity of the ozone levels. They are, in order of increasing severity, marginal, moderate, serious, severe, and extreme. Attainment dates and plan submission requirements depend on the classification designation for each area.

In April 2004, the United States Protection Agency (U.S. EPA) designated a nine county area in the Cincinnati-Hamilton, OH area as basic nonattainment for ozone under the eight-hour standard. The Cincinnati-Hamilton ozone nonattainment area includes Lawrenceburg Township in Dearborn County, Indiana, the Kentucky counties of Boone, Campbell and Kenton, and the Ohio counties of Butler, Clermont, Clinton, Hamilton and Warren. The Ohio-Kentucky-Indiana Regional Council of Governments (OKI) serves as the designated metropolitan planning organization (MPO) for all of the nonattainment area, except Clinton County, Ohio. OKI Clinton County is outside of the MPO area, but is part of the ozone nonattainment area. Figure 1 shows the monitoring network for the area and Figure 2 shows the various boundaries within the nonattainment area.

Figure 1: The Cincinnati-Hamilton, OH area monitoring network outlined in red

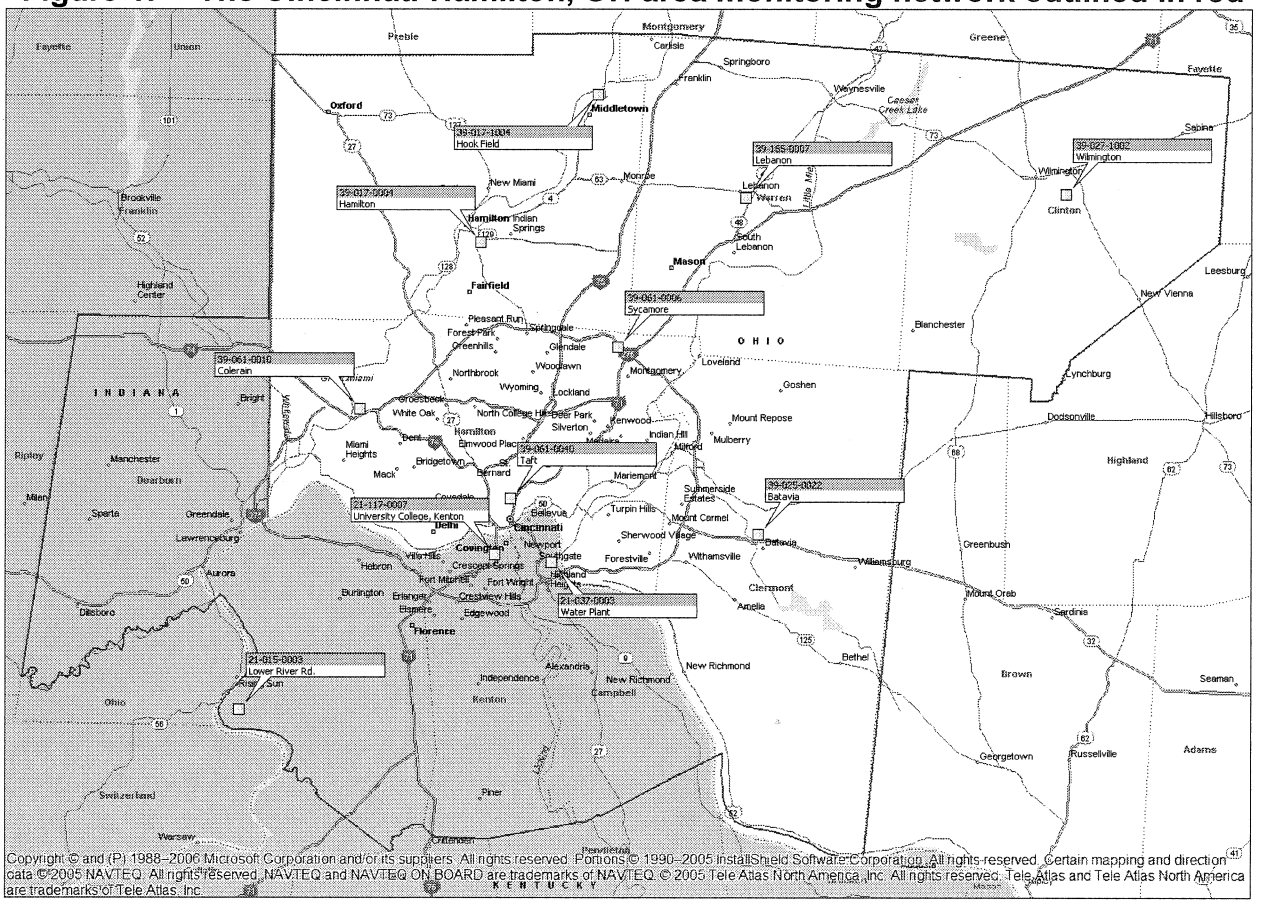
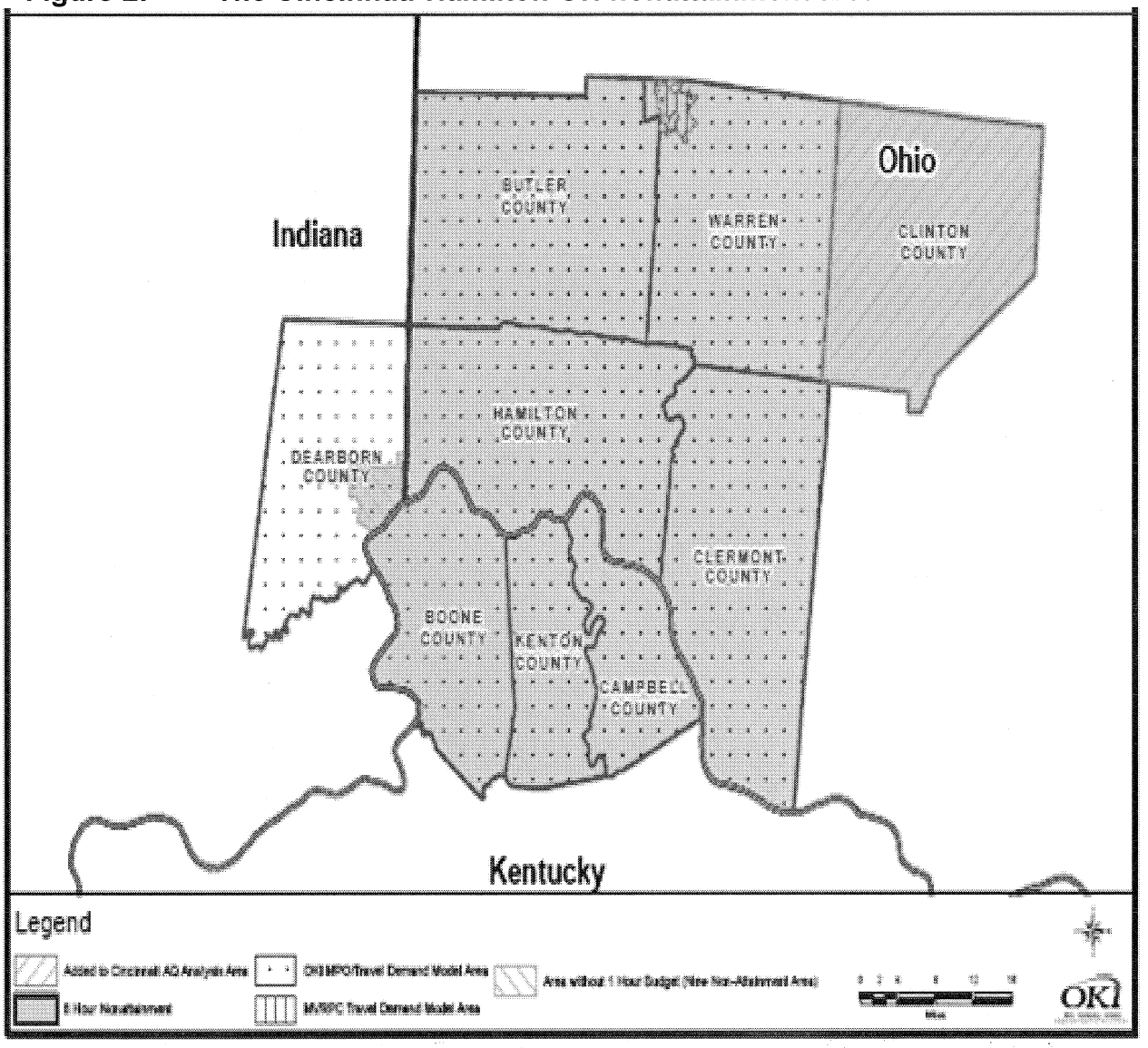


Figure 2: The Cincinnati-Hamilton OH nonattainment area



This attainment demonstration is based on the 2005 base year eight-hour ozone emission inventory which is an inventory of 2005 actual volatile organic compounds (VOC), oxides of nitrogen (NOx) and carbon monoxide (CO) emissions from sources in the Cincinnati-Hamilton area. The amount of VOC emissions reduction that the area must achieve attainment by 2008 is determined from 2005 base year emissions levels after accounting for any growth in emissions between the base year 2005 and the projected attainment year 2008. In effect, the plan to implement control measures that will, by 2008, not only reduce 2005 emission levels but also reduce additional emissions that will be produced as a result of economic growth. The plan must show that expected emissions reductions from federal and state control measures to be implemented by 2008 are enough to meet attainment of the eight-hour ozone standard.

Section Two

Ambient Air Quality

In accordance with the CAAA, three complete years of ozone monitoring data are required to demonstrate attainment at a monitoring site. The eight-hour primary and secondary ozone ambient NAAQS are met at an ambient air quality monitoring site when the three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentration is less than or equal to 0.08 ppm. When this occurs, the site is said to be in attainment. Three significant digits must be carried in the computations. Because the third decimal digit, in ppm, is rounded, 0.084 ppm is the largest concentration that is less than or equal to 0.08 ppm. Therefore, for the purposes of this plan, the eight-hour standard is considered to be 0.085 ppm. Values below 0.085 ppm meet the standard, values equal to or greater than 0.085 ppm exceed the standard. These data handling procedures are applied on an individual basis at each monitor in the area. An area is in compliance with the eight-hour ozone NAAQS if, and only if, every monitoring site in the area meets the NAAQS. An individual site's three-year average of the annual fourth highest daily maximum eight-hour average ozone concentration is also called the site's design value. The air quality design value for the area is the highest design value among all sites in the area. [*Source: "U.S. EPA-454/R-98-017, "Guideline on Data Handling Conventions for the eight-hour Ozone National Ambient Air Quality Standard" December 1998*]

Table 1 shows the Cincinnati-Hamilton, OH area monitoring data for 2004 – 2006 and Table 2 shows the associated Kentucky area monitoring data for 2004 – 2006. This data was retrieved from the U.S. EPA Air Quality System (AQS) database. The AQS contains ambient air pollution data collected by U.S. EPA, state, local and tribal air pollution control agencies from thousands of monitoring stations. Data from the AQS is used to assess air quality, assist in attainment/nonattainment designations, evaluate state implementation plans for nonattainment areas, perform modeling for permit review analysis, and other air quality management functions.

The AQS database is updated monthly by states and local environmental agencies that operate the monitoring stations. The states provide the monitoring data to U.S. EPA as required by the CAAA. See Appendix A for the AQS database reports used for Tables 1 and 2 below.

Table 1: Monitoring Data for Cincinnati-Hamilton, OH area 2004 –2006

Data source: U.S. EPA Air Quality System (AQS)
http://www.epa.gov/ttn/airs/airsaqs/index.htm

Data is certified

SITE ID	COUNTY	ADDRESS	YEAR	%OBS	1st 8-HR	2nd 8-HR	3rd 8-HR	4th 8-HR	2004-2006 AVERAGE
39-017-0004	Butler	Schuler & Bender	2004	100	.090	.081	.078	.075	
39-017-0004	Butler	Schuler & Bender	2005	100	.098	.098	.088	.086	
39-017-0004	Butler	Schuler & Bender	2006	99	.087	.082	.082	.079	0.08
39-017-1004	Butler	Hook Field Airport	2004	100	.087	.079	.078	.076	
39-017-1004	Butler	Hook Field Airport	2005	100	.106	.091	.089	.088	
39-017-1004	Butler	Hook Field Airport	2006	100	.085	.084	.077	.076	0.08
39-023-0001	Clark	5171 Urbana	2004	100	.088	.084	.080	.079	
39-023-0001	Clark	5171 Urbana	2005	99	.095	.090	.087	.086	
39-023-0001	Clark	5171 Urbana	2006	100	.091	.081	.077	.076	.0.08
39-023-0003	Clark	5400 Spangler	2004	99	.080	.079	.077	.073	
39-023-0003	Clark	5400 Spangler	2005	99	.096	.087	.084	.081	
39-023-0003	Clark	5400 Spangler	2006	99	.087	.081	.078	.074	0.076
39-057-0006	Greene	541 Ledbetter Rd.	2004	100	.084	.081	.075	.075	
39-057-0006	Greene	541 Ledbetter Rd.	2005	100	.090	.089	.083	.083	
39-057-0006	Greene	541 Ledbetter Rd.	2006	100	.085	.082	.081	.079	0.079
39-061-0006	Hamilton	11590 Grooms Rd.	2004	98	.084	.078	.076	.076	
39-061-0006	Hamilton	11590 Grooms Rd.	2005	100	.101	.095	.095	.089	
39-061-0006	Hamilton	11590 Grooms Rd.	2006	100	.084	.084	.082	.081	0.082
39-061-0010	Hamilton	6950 Ripple Rd.	2004	100	.085	.084	.077	.075	
39-061-0010	Hamilton	6950 Ripple Rd.	2005	100	.113	.093	.087	.085	
39-061-0010	Hamilton	6950 Ripple Rd.	2006	100	.098	.092	.082	.081	0.08
39-061-0040	Hamilton	250 WM Howard Taft	2004	100	.078	.078	.077	.076	
39-061-0040	Hamilton	250 WM Howard Taft	2005	98	.095	.091	.090	.087	
39-061-0040	Hamilton	250 WM Howard Taft	2006	99	.089	.080	.079	.078	0.08
39-109-0005	Miami	3825 North SR. 589	2004	99	.080	.079	.075	.075	
39-109-0005	Miami	3825 North SR. 589	2005	100	.085	.081	.081	.079	
39-109-0005	Miami	3825 North SR. 589	2006	99	.088	.076	.074	.073	0.075
39-113-0033	Montgomery	1404 Webster St.	2004	98	.073	.071	.068	.067	
39-113-0033	Montgomery	1404 Webster St.	2005	100	.095	.085	.082	.082	
39-113-0033	Montgomery	1404 Webster St.	2006	100	.084	.077	.074	.071	0.073
39-165-0007	Warren	416 Southeast St.	2004	100	.087	.085	.083	.081	
39-165-0007	Warren	416 Southeast St.	2005	98	.101	.101	.096	.092	
39-165-0007	Warren	416 Southeast St.	2006	100	.092	.090	.088	.086	0.086
								Highest Average	**0.086 ppm**

Table 2: Monitoring Data for the Kentucky portion of the Cincinnati-Hamilton, OH area 2004 –2006

Data source: U.S. EPA Air Quality System (AQS)
http://www.epa.gov/ttn/airs/airsaqs/index.htm

Data is not certified

SITE ID	COUNTY	ADDRESS	YEAR	%OBS	1st 8-HR	2nd 8-HR	3rd 8-HR	4th 8-HR	2004-2006 AVERAGE
21-015-0003	Boone	KY 338 & Lower River Rd.	2004	100	.077	.071	.070	.070	
21-015-0003	Boone	KY 338 & Lower River Rd.	2005	95	.082	.082	.082	.082	
21-015-0003	Boone	KY 338 & Lower River Rd.	2006	100	.072	.072	.072	.071	0.074
21-037-0003	Campbell	700 Alexandria PK	2004	97	.084	.078	.076	.076	
21-037-0003	Campbell	700 Alexandria PK	2005	100	.106	.097	.091	.090	
21-037-0003	Campbell	700 Alexandria PK	2006	***					
21-117-0007	Kenton	1401 Dixie Hwy	2004	95	.081	.076	.075	.073	
21-117-0007	Kenton	1401 Dixie Hwy	2005	99	.091	.088	.087	.084	
21-117-0007	Kenton	1401 Dixie Hwy	2006	97	.082	.081	.079	.075	0.077
								Highest Average	**0.077 ppm**

*** **Data from March 1 thru March 13. Only 12 valid days of data.**

Section Three

Emissions Inventory

Due to the length of this section, below is a summary of its subsections.

- Background
- Mobile source emission estimations and budgets
- 15 percent plan
- Growth and control

Background

U.S. EPA's guidance requires the submittal of a comprehensive inventory of ozone precursor emissions (VOC and NO_x) representative of the base year. Ohio also must demonstrate that the improvement in air quality between the year that violations occurred and the year that attainment is forecast based on permanent and enforceable emission reductions.

The point source data are taken from Ohio's annual emissions reporting program. The 2005 periodic inventory has been identified as the preferred data base for state implementation plan (SIP) development and does coincide with nonattainment air quality in the Cincinnati-Hamilton area.

While a non-insignificant component of ozone and its precursors are transported into this region from outside areas, this information does provide some indication of the impact from Ohio sources near the nonattainment area (Appendix D). The emissions are decreasing substantially in response to regional and national programs affecting many electric generating units (EGUs) such as the Acid Rain program and the NO_x SIP Call. Other sectors of the inventory also impact ozone formation, but large regional sources such as EGUs have a substantial impact on the formation of ozone.

Ohio EPA prepared a comprehensive inventory for the Cincinnati-Hamilton area including area, mobile, and point sources for precursors of ozone (VOCs and NO_x) for base year 2005. The information below describes the procedures Ohio EPA used to generate the 2005 base inventories. These inventories were provided to the Midwest Regional Planning Organization (Midwest RPO) and have been processed to develop summer day emissions for use in the air quality analyses. These processed modeling inventories have been identified as the correct iteration of the inventory for use in the attainment demonstration.

- Area sources were taken from the Ohio 2005 periodic inventory submitted to U.S. EPA. These projections were made from the U.S. Department of Commerce Bureau of Economic Analysis (BEA) growth factors, with some updated local information.

- Mobile source emissions were calculated from MOBILE6.2 produced emission factors by the MPO and the Ohio Department of Transportation (Ohio DOT). Projected emissions beyond December 31, 2005 do not include reductions associated with the E-Check program.

- Point source information was compiled from Ohio EPA's 2005 annual emissions inventory database and the 2005 U.S. EPA Air Markets acid rain database[1].

- Biogenic emissions are not included in these summaries, but were included in the ambient air quality modeling.

- Non-road emissions were generated using U.S. EPA's National Mobile Inventory Model (NMIM) 2005 application. To address concerns about the accuracy of some of the categories in U.S. EPA's non-road emissions model, MIDWEST RPO contracted with two (2) companies to review the base data and make recommendations. One of the contractors also estimated emissions for three (3) non-road categories not included in U.S. EPA's non-road model. Emissions were estimated for aircraft, commercial marine vessels and railroads. Recreational motorboat population and spatial surrogates (used to assign emissions to each county) were significantly updated. The populations for the construction equipment category were reviewed and updated based upon surveys completed in the Midwest and the temporal allocation for agricultural sources also was updated.

Mobile Source Emission Forecast Process

OKI Travel Demand Model

Transportation system performance is estimated using the OKI Travel Demand Model Versions 7.3. The OKI Travel Demand Model is composed of TRANPLAN programs, CUBE Voyager programs and a series of FORTRAN programs written by OKI. It is a state of the practice model that uses the standard 4 phase sequential modeling approach of trip generation, distribution, modal choice and assignment. The model uses demographic and land use data and capacity and free-flow speed characteristics for each roadway segment in the network to produce a "loaded" highway network with forecasted traffic volumes with revised speeds based on specified speed/capacity relationships.

Travel analysis zones are the basic geographic unit for estimating travel in the OKI model. The OKI region is subdivided into 1608 traffic analysis zones to permit detail as well as manageability. A variety of socioeconomic data items are used in the OKI transportation planning process. These data are used primarily to forecast future travel patterns by serving as independent variables in OKI trip generation equations. The following categories of planning data are utilized:

[1] http://www.epa.gov/airmarkets/acidrain

Population (household and group quarter)
Households
Household vehicles
Employment (by employment category and zone of work)
Labor force participation (by zone of residence)
Area type

See Appendix B for additional information on the OKI Travel Demand Model.

Emission Factor Model

OKI utilizes U.S. EPA's emissions model MOBILE6.2 to develop emission factors for VOC, NOx and PM2.5. The MOBILE6.2 input file contains local parameters, developed through consultation with Ohio DOT and Ohio EPA, for temperature, fuel programs and fuel characteristics. Details about each data set and how it was used is documented in the "OKI document titled, **"Mobile Source Emissions Inventory for the Cincinnati Ozone Nonattainment Area"** dated, June 2007 (revised). The local parameters are combined with the VMT tables from the OKI Travel Demand Model to produce one set of emission factors measured in grams per mile for the appropriate calendar year (from 1952-2050). These emission factors are then multiplied by VMT. The methodologies incorporated into MOBILE6.2 for estimating emissions are based on methods and research conducted by U.S. EPA. OKI's development of MOBILE6.2 input values were guided by U.S. EPA's document *"Technical Guidance on the Use of MOBILE6 for Emission Inventory Preparation", January 2002*, and from Ohio EPA's Division of Air Pollution Control. MOBILE6.2 input and output files are provided in Appendix B.

Analysis Years
Analysis years for this attainment demonstration include 2005 and 2008 to meet the requirements specified by the CAAA and U.S. EPA. The travel demand model presents the transportation system conditions for these years.

Mobile Source Emission Inventory and Budget

Tables 3 and 4 contain the mobile source emission inventory for the entire Cincinnati-Hamilton ozone nonattainment area. An additional safety margin may be added to the 2008 inventory for the purpose of establishing an MVEB. The addition of a safety margin would not interfere with the SIP's purpose of demonstrating attainment of the NAAQS. The emission estimates are derived from the most recent travel demand model and MOBILE6.2. Appendix B contains data tables and graphs of these emissions.

Please note the 2005 analysis shows results with an Inspection/Maintenance (I/M) program (Ohio only) while the 2008 analysis does not include an I/M program.

Table 3: Mobile Source Emissions by state for the Cincinnati-Hamilton area Eight-hour ozone nonattainment area in tons per day (tpd)

Nonattainment Area	2005	2008
Indiana - Dearborn Twp.		
	0.95	0.72
	1.46	1.09
Kentucky – Boone, Kenton, Campbell Co.		
	10.28	9.91
	25.74	21.36
Ohio – Butler, Clermont, Hamilton, Warren		
	52.10	41.53
	102.08	83.44
Ohio - Clinton Co.		
	2.98	2.41
	5.18	4.17
OH VOC TOTAL	**55.08**	**43.94**
OH NOx TOTAL	**107.26**	**87.61**
Nonattainment Area VOC TOTAL	**66.30**	**54.57**
Nonattainment Area NOx TOTAL	**134.46**	**110.06**

Table 4: Mobile Source Emissions Inventory for the Indiana and Ohio Portions of the Cincinnati-Hamilton Ozone Nonattainment Area (tpd)

Data source: OKI modeling section and Ohio DOT Modeling and Forecasting Section

	2005	2008
VOC (tons/day)	56.03	44.66
NOx (tons/day)	108.72	88.70

Motor Vehicle Emission Budget (MVEB)

The MVEB is the total of all motor vehicle emissions identified in the SIP that an area can produce and still achieve the SIP's purpose of demonstrating attainment or maintenance of the NAAQS. The development of the MVEB is based upon the emissions inventory in the SIP. Motor vehicle emissions inventories are based upon the number of vehicles in the region, vehicle age, the rate of fleet turnover to newer and cleaner vehicles, seasonal temperatures in the area and other factors. The MVEB acts as a ceiling on transportation plan and transportation improvement program emissions. Table 5 below contains the motor vehicle emissions budgets for the Ohio and Indiana portion of the Cincinnati-Hamilton area.

Ohio EPA's initial Base M (2005) CAMx modeling results indicated a worst case future design value in the Cincinnati-Hamilton ozone nonattainment area of 84 ppb. All but three of the eleven monitoring locations in the four Ohio and three Kentucky counties are projected to have future year (2008) design values below 80 ppb. In an effort to accommodate future variations in travel demand models (TDM) and vehicle miles traveled forecast when no change to the network is planned, Ohio EPA, together with the Ohio Department of Transportation and the local metropolitan planning organization, Ohio Kentucky Indiana Council of Governments are requesting that a three percent cushion be added to the motor vehicle budget for the Ohio and Indiana portions of this nonattainment area.

A three percent cushion is appropriate because; 1) There is an acknowledged one to two percent potential variation in VMT forecast and potential estimated mobile source emissions due to expected modifications to TDM and mobile emissions models. 2) Air quality modeling indicates that a three percent increase in projected mobile source emissions will still provide for modeled attainment of the Cincinnati-Hamilton area.

Ohio EPA is currently relying on the latest available Base M 2008 modeling results as well as source apportionment results previously performed for the Cincinnati-Hamilton area, these results are provided in the "Cincinnati Regional Anthropogenic Precursor Culpability Assessment (APCA) Results" (Appendix D). Mobile source emissions from the entire grid contribute approximately 20 ppb to the design value forecast for this area. A three percent increase in this impact would result in an approximate 0.6 ppb to the forecast future design value. This is a conservative estimate since some of the mobile source impact originates from Northern Kentucky and other areas where the budget is not being increased.

While Ohio EPA believes that this is sufficient to support the requested increase, Ohio EPA will be conducting additional air quality modeling which will include the adjusted on-road mobile emissions as well as any additional corrections and modifications that may be necessary due to the constant review and evaluation of the model inputs.

Table 5: Ohio-Indiana MVEB <u>including a 3 percent cushion</u>

	2008
VOC (tons/day)	46.00
NO_x (tons/day)	91.36

2005 Base Year Inventory

The nonattainment plan provisions in the CAAA require states in nonattainment areas to submit to U.S. EPA a current inventory of actual emissions from all sources of relevant pollutants. This inventory is to be used as the basis for determining required emissions reductions.

The 2005 base year inventory is categorized into EGU point, Non-point, Area, Non-road and On-road. VOC, NO_x and CO are the ozone precursor emissions reported for each category in the 2005 base year inventory. Because CO is only marginally reactive on producing ozone, the CO component of the 2005 base year inventory does not figure into the attainment demonstration. Therefore, only VOC and NO_x components of the 2005 base year inventory are included. The results of Ohio's 2005 base year Inventory are summarized in Tables 6 through 19 for VOC and NOx emissions for the Cincinnati-Hamilton OH-KY-IN nonattainment area. The values in all of the tables are reported in tons per summer day (tpd). The peak ozone season for Ohio is defined as June 1 through August 31.

The on-road values are provided by OKI, and Ohio DOT (Clinton County). The data sources for all other values are provided by Midwest RPO and can be viewed at: http://www.ladco.org/tech/emis/basem/baseM_reports.htm.

Ohio

Table 6: Butler County (tpd)

Butler County						
VOC	2005	2008		NOx	2005	2008
EGU	0.03	0.02		EGU	3.88	3.76
Non-EGU	3.64	3.67		Non-EGU	12.03	10.8
Non-Road	6.88	5.67		Non-Road	10.25	8.75
Area	11.96	12.17		Area	2.15	2.27
On-Road	9.63	7.79		On-Road	18.78	15.55
TOTAL	**32.14**	**29.32**		**TOTAL**	**47.09**	**41.13**

Table 7: Clermont County (tpd)

Clermont County						
VOC	2005	2008		NOx	2005	2008
EGU	0.49	0.53		EGU	42.96	26.8
Non-EGU	0.24	0		Non-EGU	0.15	0.24
Non-Road	4.33	3.49		Non-Road	5.03	4.61
Area	6.98	7.13		Area	1.65	1.7
On-Road	6.50	5.46		On-Road	12.67	10.9
TOTAL	**18.54**	**16.61**		**TOTAL**	**62.46**	**44.25**

Table 8: Clinton County (tpd)

Clinton County						
VOC	2005	2008		NOx	2005	2008
EGU	0	0		EGU	0	0
Non-EGU	0	0		Non-EGU	0	0
Non-Road	1.78	1.69		Non-Road	2.26	1.99
Area	3.24	3.22		Area	0.42	0.44
On-Road	2.42	2.41		On-Road	3.45	4.09
TOTAL	**7.44**	**7.32**		**TOTAL**	**6.13**	**6.52**

Table 9: Hamilton County (tpd)

Hamilton County						
VOC	2005	2008		NOx	2005	2008
EGU	0.28	0.28		EGU	15.23	8.51
Non-EGU	2.66	2.54		Non-EGU	6.72	6.3
Non-Road	17.46	13.92		Non-Road	20.57	17.94
Area	33.04	33.16		Area	5.19	5.44
On-Road	28.59	22.36		On-Road	56.26	45.16
TOTAL	**82.03**	**72.26**		**TOTAL**	**103.97**	**83.35**

Table 10: Warren County (tpd)

Warren County						
VOC	2005	2008		NOx	2005	2008
EGU	0	0		EGU	0	0
Non-EGU	0.53	0.51		Non-EGU	2.68	2.88
Non-Road	4.8	5.63		Non-Road	6.1	5.42
Area	8.4	8.7		Area	1.15	1.2
On-Road	7.37	5.93		On-Road	14.38	11.83
TOTAL	**21.1**	**20.77**		**TOTAL**	**24.31**	**21.33**

Indiana

Table 11: Dearborn County (tpd)

Dearborn County						
VOC	2005	2008		NOx	2005	2008
EGU	0.32	0.33		EGU	25.31	16.33
Non-EGU	2.91	3.10		Non-EGU	5.09	4.72
Non-Road	0.82	0.67		Non-Road	1.26	1.15
Area	2.07	2.10		Area	0.26	0.27
On-Road*	0.95	0.72		On-Road	1.46	1.09
TOTAL	**7.07**	**6.92**		**TOTAL**	**33.38**	**23.56**

*Please note: On-road emissions are for only the nonattainment area of Lawrenceburg Twp., while the other sector emissions are for all of Dearborn County.

Kentucky

Table 12: Boone County (tpd)

Boone County						
VOC	2005	2008		NOx	2005	2008
EGU	0.15	0.17		EGU	2.63	1.41
Non-EGU	2.23	2.42		Non-EGU	0.22	0.21
Non-Road	5.43	4.67		Non-Road	12.96	12.85
Area	8.13	8.58		Area	4.99	5.21
On-Road	3.96	3.78		On-Road	9.87	8.09
TOTAL	**19.9**	**19.62**		**TOTAL**	**30.67**	**27.77**

Table 13: Campbell County (tpd)

Campbell County						
VOC	2005	2008		NOx	2005	2008
EGU	0	0		EGU	0	0
Non-EGU	0.49	0.53		Non-EGU	0.53	0.15
Non-Road	1.77	1.49		Non-Road	6.33	6.09
Area	4.77	4.88		Area	1.41	1.46
On-Road	2.29	2.27		On-Road	5.71	4.85
TOTAL	**9.32**	**9.17**		**TOTAL**	**13.98**	**12.55**

Table 14: Kenton County (tpd)

Kenton County						
VOC	2005	2008		NOx	2005	2008
EGU	0	0		EGU	0	0
Non-EGU	0.7	0.74		Non-EGU	0.05	0
Non-Road	2.33	1.84		Non-Road	8.43	7.86
Area	8.53	8.72		Area	4.17	4.34
On-Road	4.02	3.86		On-Road	10.16	8.42
TOTAL	**15.58**	**15.16**		**TOTAL**	**22.81**	**20.62**

Table 15: Ohio portion total VOC and NO_x emissions (tpd)

	2005	2008
VOC	161.25	146.28
NOx	243.96	196.58

Table 16: Indiana portion total VOC and NO_x emissions (tpd)

	2005	2008
VOC	7.07	6.92
NOx	33.38	23.65

Table 17: Kentucky portion total VOC and NOx emissions (tpd)

	2005	2008
VOC	44.8	43.95
NOx	67.46	60.94

Table 18: Cincinnati-Hamilton, OH nonattainment area Total VOC and NOx (tpd)

	2005	2008
VOC	213.12	197.15
NOx	344.8	281.17

Table 19: Cincinnati-Hamilton, OH area 2005 and 2008 projected VOC and NOx decrease (tpd)

	2005	2008	Projected Decrease
VOC	213.12	197.15	15.97
NOx	344.8	281.17	63.63

Growth and Control

2008 Projected Level of VOC Emissions

The 2008 projected level of VOC emissions is the maximum amount of anthropogenic (human-caused) VOC emissions allowed in 2008 under the rate of progress requirement. In Ohio, this is the maximum amount of anthropogenic VOC emissions that are allowed in the Cincinnati-Hamilton area in 2008. Ohio calculates its 2008 projected level to be 197.15 tons per summer day of VOC emissions.

The 7.8 RVP VOC emissions reductions that are expected to occur between 2005 and 2008 are determined using the on-road mobile source emissions modeling software, MOBILE6.2. The VOC emissions reductions that will occur between 2005 and 2008 as a result of the 7.8 RVP regulations are determined by subtracting the 2005 adjusted base year inventory of on-road mobile source emissions from the 2005 base year inventory of on-road mobile source emissions.

2008 Growth Factors and the 2008 Current Control Projection Inventory

The growth and control assumptions used in the Cincinnati-Hamilton area 2008 projections for the attainment demonstration for most source categories were based on E.H. Pechan & Associates, Inc. (Pechan) reports dated June 30, 2004 and December 29, 2005 with the exception of the EGU and on-road categories. The

latest network VMT and planning assumptions supplied by OKI were used for the on-road projections and will serve as the basis for the conformity budgets for this area. The latest IPM 3.0 information was used to estimate the expected EGU emissions for this inventory.

In order to determine the total amount of VOC emissions reductions required by 2008, future emissions levels must be estimated. For this purpose, 2008 growth factors are developed for the various source categories of emissions based on economic indicators. The 2005 baseline emissions are multiplied by these growth factors, and the resulting inventory is called the 2008 Current Control Projection Inventory (CCPI). The 2008 CCPI is an estimation of the amount of VOC emissions that will occur in 2008 if no new emission control measures are implemented between 2005 and 2008. This section contains a discussion of how the total VOC emissions reduction requirement is determined.

The 2008 CCPI of VOC's for the Cincinnati-Hamilton area is summarized in Table 20 below. Also included for comparison purposes in this table is the 2005 baseline inventory.

Table 20: Summary of 2008 CCPI VOC Emissions for the Cincinnati-Hamilton nonattainment area (tpd)

	2005 VOC Baseline	2008 VOC Projection
EGU	1.27	1.34
Non-EGU	13.4	13.51
Non-road	45.6	39.07
Area	87.12	88.66
On-road	65.74	54.57
TOTAL	**213.13**	**197.15**

The EGU point, Non-EGU, Non-road source portions of the 2008 CCPI are initially created by multiplying 2005 baseline emissions values by the appropriate growth factors. The on-road mobile source emissions are projected by multiplying emission factors generated using the MOBILE6.2 software by projected 2008 vehicle miles traveled (VMT).

Section Four

Clean Air Act Requirements

As required by Section 172 of the 1990 CAA Amendments and subsequent federal rule makings, in the mid-1990's Ohio promulgated rule requiring Reasonably Available Control Technology (RACT) for emissions of VOCs. There were no specific rules required by the CAA such as RACT for existing sources beyond statewide rules. Statewide RACT rules have been applied to all new sources locating in Ohio since that time. The Ohio rules are found in OAC Chapter 3745-21.

The U.S. EPA NO_x SIP Call required 22 states to pass rules that would result in significant emission reductions from large EGUs, industrial boilers, and cement kilns in the eastern United States. Ohio passed this rule in 2001. Beginning in 2004, this rule accounts for a reduction of approximately 31 percent of all NO_x emissions state-wide compared to previous uncontrolled years. The other 21 states also have adopted these rules.

U.S. EPA and Ohio EPA performed modeling that indicated this area would attain the eight-hour ozone standard with the implementation of the NO_x SIP Call. Controls for EGUs formally commenced May 31, 2004. Emissions covered by this program have been generally trending downward since 1998 with larger reductions occurring in 2002 and 2003. Data taken from U.S. EPA Clean Air Markets Web site, quantifies the gradual NO_x reductions that have occurred in Ohio as a result of Title IV of the 1990 CAA Amendments and the beginning of the NO_x SIP Call Rule. Ohio developed the NO_x Budget Trading Program rules in OAC Chapter 3745-14 in response to the SIP Call. OAC chapter 3745-14 regulated EGUs and certain non-EGUs under a cap and trade program based on an 85 percent reduction of NOx emissions from EGUs and a 60 percent reduction of NO_x emissions from non-EGUs, compared to historical levels. This cap will stay in place through 2008, at which time U.S EPA's Clean Air Interstate Rule (CAIR) program will supersede it.

U.S. EPA's rule to control nitrogen oxides from specific source categories (40 CFR Parts 51, 72, 75 and 96, published on October 17, 1998 and referred to as the NO_x SIP Call) has significantly reduced emissions from large electric generating units (EGUs), industrial boilers, and cement kilns. Ohio's NO_x Budget Trading Program Rule was approved on May 25, 2004 Ohio Administrative Code (OAC) Chapter 3745-14. It is expected that this downward trend will continue as the above programs continue and some form of CAIR is implemented.

On April 21, 2004, U.S. EPA published Phase II of the NO_x SIP Call that establishes a budget for large (greater than 1 ton per day emissions) stationary internal combustion engines. Ohio EPA's proposed rule OAC 3745-14-12 addresses stationary internal combustion engines, all used in natural gas pipeline transmissions. An 82 percent NO_x reduction from 1995 levels is anticipated. Completion of the compliance plan is expected by May 1, 2006 and the compliance demonstration will begin May 1, 2007. The 2007 controlled NO_x emissions will be 599 tons per day.

Tier II Emission Standards for Vehicles and Gasoline Sulfur Standards

In February 2000, U.S. EPA finalized a federal rule to significantly reduce emissions from cars and light trucks, including sport utility vehicles (SUVs). Under this proposal, automakers will be required to sell cleaner cars, and refineries will be required to make cleaner, lower sulfur gasoline. This rule will apply nationwide. The federal rules will phase in between 2004 and 2009. U.S. EPA has estimated that NO_x emission reductions will be approximately 77 percent for passenger cars, 86 percent for smaller SUVs, light trucks, and minivans, and 65 to 95 percent reductions for larger SUVs, vans, and heavier trucks. VOC emission reductions will be approximately 12 percent for passenger cars, 18 percent for smaller SUVs, light trucks, and minivans, and 15 percent for larger SUVs, vans, and heavier trucks.

Heavy-Duty Diesel Engines

In July 2000, U.S. EPA issued a final rule for Highway Heavy Duty Engines, a program which includes ultra low sulfur diesel fuel standards. This rule applies to heavy-duty gasoline and diesel trucks and buses. It is anticipated that this rule will result in significant reductions in NO_x from diesel trucks and buses, a large sector of the mobile sources NO_x inventory.

Clean Air Non-road Diesel Rule

In May 2004, U.S. EPA issued the Clean Air Non-road Diesel Rule. This rule applies to diesel engines used in industries such as construction, agriculture, and mining. It also contains a cleaner fuel standard similar to the highway diesel program. The new standards will cut emissions from non-road diesel engines by more than 90 percent. Non-road diesel equipment, as described in this rule, currently accounts for 47 percent of diesel particulate matter (PM) and 25 percent of NO_x from mobile sources nationwide. Sulfur levels will be reduced in non-road diesel fuel by 99 percent from current levels, from approximately 3,000 parts per million (ppm) now to 15 ppm in 2010. New engine standards take effect, based on engine horsepower, starting in 2008. Together, these rules will substantially reduce local and regional sources of ozone precursors.

New Source Review

Ohio has a long standing and fully implemented New Source Review (NSR) program. This is addressed in OAC Chapter 3745-31. The chapter includes provisions for the Prevention of Significant Deterioration (PSD) permitting program in OAC 3745-31-01 to 3745-31-20. Ohio's PSD program was conditionally approved on October 10, 2001 (66 FR 51570) and received final approval on January 22, 2003 (68FR 2909) by U.S. EPA as part of the SIP.

Any facility that is not listed in the 2005 emission inventory, or for the closing of which credit was taken in demonstrating attainment, will not be allowed to construct, reopen, modify, or reconstruct without meeting all applicable permit rule requirement. The review process will be identical to that used for new sources. Ohio EPA will implement NSR through the approved major nonattainment NSR program.

Section Five

Control Strategies

Ohio EPA and the Midwest Regional Planning Organization have been evaluating regional air quality and the impact of alternative emission reduction scenarios through the use of photochemical grid models, most notably, the Comprehensive Air Model with Extensions (CAMx), over the past several years. The CAMx model was used to evaluate future air quality assuming growth and control consistent with Pechan reports, dated 2004 and 2005 (Appendix C) also incorporating on the books controls such as the Clean Air Interstate Rule (CAIR) and the Federal Motor Vehicle I Program, Maximum Achievable Control Technology (MACT) and enforcement settlements for large utilities and petroleum refineries.

Ohio EPA has evaluated several control options which would reduce ozone precursors in the Cincinnati-Hamilton area. Many of these options have been collectively identified as the "LADCO White Papers", which are located at: http://ladco.org/Regional_Air_Quality.html. The initial analyses of these program options was compiled and submitted during the justification of a waiver under CAA Section 211 (c)(4)(C) to use 7.8 Reid Vapor Pressure (RVP) gas in this area as part of the E-Check automobile inspection and maintenance program. After review of these options, the following control programs were incorporated as part the control strategy included in the attainment demonstration. (Appendix G)

7.8 RVP Gasoline:
This rule is fully state-adopted and is effective one year following approval of a waiver by U.S. EPA under CAA Section 211 (c)(4)(C). Given the May 25, 2007 final approval (72 FR 29269) by U.S. EPA, the 7.8 RVP gasoline will be in place for the 2008 ozone season. (Appendix G)

High Volume, Low Pressure Autobody Repair Facilities:
This rule is an effective state rule which has been effective since the 2006 ozone season. U.S. EPA approved this revision into the SIP on March 30, 2007.

Cold Cleaner Degreaser Operations:
This rule is an effective state rule which has been effective since the 2006 ozone season. U.S. EPA approved this revision into the SIP on March 30, 2007.

Portable Fuel Containers:
This rule is an effective state rule which has a compliance date of July 1, 2007. U.S. EPA approved this revision into the SIP on March 30, 2007. (Appendix F)

In addition, rules addressing architectural and industrial maintenance coatings and consumer products were adopted statewide with initial compliance dates prior to the 2008 ozone season.

Architectural and Industrial Maintenance (AIM) Coatings:
This rule has been adopted by the State of Ohio and is being submitted as part of this package. Compliance is January 1, 2008. (Appendix F)

Consumer and Commercial Products (CP):
This rule has been adopted by the State of Ohio and is being submitted as part of this package. This rule has compliance dates of March 15, 2008 and January 1, 2009. (Appendix F)

Section Six

Attainment Demonstration

The demonstration of attainment relies on the initial modeling design value (three consecutive three year average of the 4th highest concentrations). The only modeling design value in the Cincinnati-Hamilton area exceeding the standard is from the Lebanon monitor in Warren County, northeast of Cincinnati. The current applicable design value for a 2005 based calculation at this site is 88.2 ppb. Since the 2007 ozone season is part of the calculation, and this season is still in progress, the current design value for the 2005-2007 period is the average of the 2005 and 2006 4th high concentrations. At this point in time, this is a conservative estimate, but the final calculation will be revisited once the 2007 ozone season is complete.

Emissions Inventory:
Ohio EPA, as part of the Midwest RPO, participated in the development of emissions inventories, meteorological data bases, photochemical model development and control strategy development to address the regional eight-hour ozone nonattainment areas. The Cincinnati-Hamilton nonattainment area is a CAA Subpart 1 basic nonattainment area with an attainment date of June 15, 2009. This dictated that the modeling demonstration be performed for the 2008 ozone season with the planned control strategies and growth assumptions consistent with the expectations for that year.

Emission inventories developed for this demonstration were based on the 2005 inventory developed by Ohio EPA and submitted as part of this package. These inventory components addressing point, area on-road and non-road emissions were supplied to U.S. EPA and the Midwest RPO. Inventories for the other Midwest RPO states have also been supplied to U.S. EPA and to Midwest RPO for processing into modeling data sets. Inter RPO protocols provided a mechanism whereby all state inventories which were processed by their respective RPO would be shared with each RPO in order for comprehensive data base development.

Emissions Processing:
The emissions processing program CONsolidated Community Emissions Processing Tool (CONCEPT) is utilized to provide temporal profiles and speciation profiles to the various emission sources. This is a necessary step to generate hourly emissions information which is consistent with the daily, weekly and monthly variation in the operation of specific source types as well as provide more precise reactivity information to the photochemical grid model from state data which are annual average, generic (i.e. VOC) emissions totals. A summary of the emissions processing is contained in Appendix D.

To forecast future growth and control in the development of 2008 emission inventories, contractor assistance (E.H. Pechan reports dated 2004 and 2005, in Appendix C were used to generate growth and control values for application to each industrial source type, initially for the 2009 moderate area future year projections.

These same growth assumption rates were used to generate 2008 future year estimates for this analysis. On-road emission forecasts were based on travel demand information provided by the OKI or ODOT and were subsequently processed through the MOBILE6 emissions model. Non-road estimates were based on NMIM model estimates.

Meteorological Data:
Meteorological data sets were developed for the year 2005 and were processed using the MM5 meteorological processor consistent with the approach detailed in Baker, et al, 2005, contained in Appendix D.

Air Quality Model:
The Comprehensive Air Model with Extensions (CAMx) is an advanced photochemical grid model which can cover a large geographic are with multiple vertical layers and horizontal grid resolution from less than a kilometer to several kilometers. The model allows for various treatments of the chemical processes that convert precursor chemicals into ozone. The specific protocol under which the CAMx modeling was performed for this demonstration is contained in the Midwest Regional Planning Organization Modeling Protocol (2005) contained in Appendix D.

Performance Evaluation:
A model performance study was conducted to assess the ability of the model to replicate actual air quality. Even though the model is applied in a relative sense instead of an absolute sense, a model performance evaluation is necessary to determine if the model is operating properly and is providing the right answers for the right reasons. The summary of the evaluation is contained in Appendix D.

Air Quality Modeling Results:
Round 5 modeling results using the Base M 2005 inventory and grown 2008 emission inventories evaluated several control strategies, including those which simulated 'beyond CAIR' utility programs as well as the simulation of several industrial and area source control options identified in what have been labeled 'the LADCO White Papers'. These reports evaluated a series of candidate control options and identified various levels of control. The expected emission reductions and cost effectiveness of each of the options was then calculated.

The future year emissions assumed on the books controls, the replacement rules for the discontinued E-Check program (7.8 RVP gasoline, HVLP auto body paint requirements and cold cleaner degreasers), as well as statewide AIM coatings and Consumer Product requirements. The projected future 2008 design value at the worst case monitor in the nonattainment area is 84 ppb. As will be discussed in the weight of evidence section, the highest design value in the area is 86 ppb based on 2004-2006 air quality data.

As mentioned in the discussion of mobile source budgets, Ohio EPA intends to perform additional modeling explicitly incorporating the increased mobile source emissions associated with the addition of a three percent cushion to the on-road

mobile source budgets. It is anticipated that this modeling will corroborate the existing modeling results.

In addition, future modeling will incorporate the revised emission reductions associated with modifications to Ohio's AIM and Consumer Product rule in response to U.S. EPA's Memorandum "Emission Reduction Credit for Three Federal Rules for Categories of Consumer and Commercial Products under Section 183(e) of the Clean Air Act" (page four), dated May 30, 2007, (Appendix D) on emission reduction credits being allowed for these two rules as well as the federal aerosol coatings rules. This future modeling will also incorporate any adjustments needed to accommodate emission sources that shut down prior to the 2005 base year that would otherwise be eligible for use as major new source review offsets in nonattainment major new source review. These emissions will be added to the future year inventory to assure that the attainment demonstration can withstand this potential additional emissions load.

Weight of Evidence

The modeling analysis developed in support of this package resulted in predicted future year design values within the window identified by U.S. EPA as needing corroboratory evidence that the area should or should not be expected to attain the NAAQS by the attainment date. This additional evidence has been termed 'weight of evidence' (WOE) and utilizes ambient air quality data, ambient air quality trends, emissions trends, meteorologically adjusted ambient air quality trends and other data that would indicate the future air quality that should be expected for the Cincinnati-Hamilton area.

Appendix E is a composite of WOE analyses performed by the Midwest RPO on behalf of the member states, including Ohio. While the analyses are not conclusive, the data generally indicate a expected continual improvement in air quality. One specific piece of evidence that provides a strong indication that the NAAQS will be attained by June 15, 2009 is that the current design value for the data period 2004-2006 is 86 ppb at a monitor downwind of Cincinnati. This, coupled with model predictions of 2008 future year design values (worst case, 84 ppb) clearly demonstrate that the existing controls in conjunction with the additional strategies adopted by Ohio will be sufficient to attain the standard.

Section Seven

Contingency Measures

Contingency measures to be considered will be selected from a comprehensive list of measures deemed appropriate and effective at the time the selection is made. The selection of measures will be based on cost-effectiveness, emission reduction potential, economic and social considerations or other factors that Ohio EPA deems appropriate. Ohio EPA will solicit input from all interested and affected persons in the maintenance area prior to selecting appropriate contingency measures. Because it is not possible at this time to determine what control measure will be appropriate at an unspecified time in the future, the list of contingency measures outlined below is not comprehensive.

1) Tighten RACT on existing sources covered by U.S. EPA Control Technique Guidelines issued in response to the 1990 CAA.

2) Apply RACT to smaller existing sources.

3) Alternative fuel and diesel retrofit programs for fleet vehicle operations.

4) Require VOC or NO_x emission offsets for new and modified major sources.

5) Require VOC or NO_x emission offsets for new and modified minor sources.

6) Increase the ratio of emission offsets required for new sources.

7) Require VOC or NO_x controls on new minor sources (less than 100 tons).

No contingency measure shall be implemented without providing the opportunity for full public participation during which the relative costs and benefits of individual measures, at the time they are under consideration, can be fully evaluated. The following is a list of VOC and NO_x sources potentially subject to future controls.

NO_x RACT

- EGUs
- asphalt batching plants
- industrial/commercial and institutional boilers
- process heaters
- internal combustion engines
- combustion turbines
- other sources greater than 100 tons per year

VOC RACT

- stage I gasoline dispensing facilities (including pressure valves)
- automobile refinishing shops
- industrial solvent cleaning
- offset lithography
- industrial surface coating
- other sources greater than 50 tons per year

Section Eight

Public Participation

Ohio published notification for a public hearing and solicitation for public comment concerning the draft attainment demonstration and maintenance plan in the widely distributed county publications on June 18, 2007.

The public hearing to receive comments will be held on July 23, 2007 at the OKI Regional Council of Governments office located at 720 East Pete Rose Way, Suite 420, Cincinnati, Ohio. The public comment period will close on July 23, 2007. Comments received during the public comment period will be included with the final package. Appendix H will include a copy of the public notice, certifications of publication, and the transcript from the public hearing.

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