State of Ohio Environmental Protection Agency
Division of Air Pollution Control

State of Ohio

Fine Particulate ($PM_{2.5}$) State Implementation Plan for Ohio's Nonattainment Areas

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Division of Air Pollution Control

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Acronyms and Abbreviations

AQS	Air Quality System, repository of ambient air quality data from over 10,000 monitors, 5000 of which are currently active.
CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CAMx	Comprehensive Air quality Model with eXtensions, modeling system for the integrated assessment of gaseous and particulate air pollution
CARB	California Air Resources Board
CFR	Code of Federal Regulations
CO	Carbon Monoxide
DERG	Diesel Emission Reduction Grant
EGU	Electric Generating Unit
FHWA	Federal Highway Administration
FR	Federal Register
FRM	Federal Reference Method
ICI Boilers	Industrial, Commercial and Institutional Boilers
KY	Kentucky
LADCO	Lake Michigan Air Directors Consortium
LRTP	Long Range Transportation Plan
MAR	Marine, Aircraft, Rail. Emissions from commercial marine, aircraft and locomotive sources
MPO	Metropolitan Planning Organization
MRPO	Midwest Regional Planning Organization
NAAQS	National Ambient Air Quality Standard
NH_3	Ammonia
NMIM	National Mobile Inventory Model
NOACA	Northeast Ohio Areawide Coordinating Agency
NOx	Oxides of Nitrogen; typically, NO and NO_2
NSR	New Source Review
OAC	Ohio Administrative Code
OC	Organic Carbon
ODOT	Ohio Department of Transportation
OH	Ohio
Ohio EPA	Ohio Environmental Protection Agency
PM	Particulate Matter
$PM_{2.5}$	Particulate matter having an aerodynamic diameter of 2.5 microns or less
PM_{10}	Particulate matter having an aerodynamic diameter of 10 microns or less
PPM	Parts Per Million
RACT	Reasonably Available Control Technology
RFP	Reasonable Further Progress
SIP	State Implementation Plan

SO_2	Sulfur Dioxide
SOA	Secondary Organic Aerosol
TIP	Transportation Improvement Program
TPD	Tons per Day
TPY	Tons per Year
U.S. EPA	United States Environmental Protection Agency
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds
WOE	Weight of Evidence
WV	West Virginia
WVDAQ	West Virginia Division of Air Quality
WVDOT	West Virginia Department of Transportation
WWW	Wood-Washington-Wirt Interstate Planning Commission

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Section One

Background

The United States Environmental Protection Agency (U.S. EPA) revised the National Ambient Air Quality Standards (NAAQS) for particulate matter in July 1997. It replaced the existing PM_{10} standard with a health based $PM_{2.5}$ standard and retained the PM_{10} standard as a "coarse" standard protecting welfare. The revised NAAQS were challenged in the U.S. Court of Appeals for the District of Columbia Circuit (the D.C. Circuit). On May 14, 1999, the D.C. Circuit held that U.S. EPA's construction of the Clean Air Act (CAA), in setting the 1997 standards for particulate matter (PM) and ozone was an unconstitutional delegation of power.

The Department of Justice and the U.S. EPA filed a petition with the United States Supreme Court in December 1999 for review of the decision of the D.C. Circuit. The Supreme Court held that the U.S. EPA's approach to setting the NAAQS was in accordance with the CAA and did not constitute an unconstitutional delegation of authority. The Supreme Court also held that the CAA requires the U.S. EPA to set standards at levels necessary to protect the public health and welfare, without considering the economic costs of implementing the standards.

The D.C. Circuit heard arguments in this remanded case in December 2001, and issued its decision on March 26, 2002. The D.C. Circuit rejected the claims that the Agency had acted arbitrarily in setting the levels of the standards. This last decision by the D.C. Circuit gave U.S. EPA a clear path to move forward with the implementation of the $PM_{2.5}$ standards.

On April 5, 2005, U.S. EPA promulgated the initial $PM_{2.5}$ nonattainment areas for the $PM_{2.5}$ standards across the country. Unlike Subpart 2 of the CAA Amendments of 1990 which defined five ozone nonattainment classifications for areas that exceed the NAAQS based on the severity of the ozone levels, $PM_{2.5}$ designations are simply labeled "nonattainment." The CAA Amendments requires states with $PM_{2.5}$ nonattainment areas to submit a plan within three years of the effective date of the designations (April 5, 2008) detailing how the $PM_{2.5}$ standards will be attained by April 5, 2010.

The NAAQS are air quality standards for pollutants that pose public health risks. High levels of $PM_{2.5}$ can contribute to a number of health impacts, including premature mortality, aggravation of respiratory and cardiovascular disease, lung disease, decreased lung function, asthma attacks and other cardiovascular impacts. Much of what constitutes $PM_{2.5}$ is not directly emitted to the atmosphere, but is formed in the atmosphere by a chemical reaction between sulfur dioxide, oxides of nitrogen and organic and elemental carbon. Consequently, in order to reduce $PM_{2.5}$ concentrations, regulators need to bring about reductions of SO_2, NOx, and primary particulates until it can be demonstrated that the $PM_{2.5}$ standards will be met.

This document is the $PM_{2.5}$ State Implementation Plan (SIP) for all of the nonattainment areas in the State of Ohio. All or part of twenty seven counties in Ohio, were designated nonattainment for the $PM_{2.5}$ standard in the designation rulemaking effective on April 5, 2005 (70 FR 944). Figure 1 shows the $PM_{2.5}$ monitoring network statewide.

Section Two

State Implementation Plan Approval and Clean Air Act Requirements

Section 110 of the CAA delineates general SIP requirements and Part D contains requirements applicable to Subpart 1 nonattainment areas.

Programs for emissions limitations, permitting, emissions inventories and statements, ambient monitoring, attainment demonstration strategies, and contingency measures are included in the Ohio SIP.

Subpart 110(a)(2)(D) requires that SIPs contain certain measures to prevent sources in a state from significantly contributing to air quality problems in another state. Ohio has met the requirements of the federal Clean Air Interstate Rules (CAIR) to reduce NOx and sulfur dioxide (SO_2) emissions contributing to downwind states. On February 1, 2008, U.S. EPA approved Ohio's CAIR, which can be found in Ohio Administrative Code (OAC) Chapter 3745-109 (See Appendix E).

Because air emissions travel across state boundaries, reducing the emissions from sources in Ohio also will reduce fine particulate pollution and ground-level ozone pollution in other areas of the county, and vice versa. Ohio's fine particle air quality will improve because of reductions of SO_2 and NOx in Alabama, Georgia, Illinois, Indiana, Kentucky, Michigan, Pennsylvania, Tennessee and, West Virginia. Ohio's ground-level ozone air quality will improve because of reductions of NOx in Illinois, Indiana, Kentucky, Michigan and, Missouri

Ohio administers a New Source Review (NSR) permitting program for major and modified sources of particulate matter in nonattainment areas under Ohio's permit program. Permits to install cannot be issued unless the applicant can demonstrate that increased emissions from the new or modified source will not result in a violation of the NAAQS.

In 1972, 1980, and 1991, Ohio promulgated rules requiring reasonably available control measures for particulate emissions from stationary sources. Best available technology has been required for all new sources locating in Ohio since January 1974. In addition, Ohio EPA promulgated NOx SIP Call rules (OAC Chapter 3745-14), CAIR (OAC Chapter 3745-109), and NOx Reasonably Available Control Technology rules (OAC Chapter 3745-110) over the past four years (Appendix E).

U.S. EPA's NOx SIP Call required 22 states to pass rules that would result in significant emission reductions from large electric generating units (EGUs), industrial boilers, and cement kilns in the eastern United States. Ohio promulgated these rules in 2001. Ohio developed the NOx Budget Trading Program rules in OAC Chapter 3745-14 (Appendix E) in response to the SIP Call. OAC Chapter 3745-14 regulates 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 NOx emissions from non-

EGUs, compared to historical levels. This cap will stay in place through 2008, at which time Ohio's CAIR program will supersede it.

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 the U.S. EPA Clean Air Markets website, quantify the gradual NOx reductions that have occurred in Ohio as a result of Title IV of the 1990 CAA Amendments and the beginning of the NOx SIP Call Rule. Beginning in 2004, the NOx SIP call rules, account for a reduction of approximately 31 percent of all NOx emissions Statewide, compared to previous uncontrolled years.

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

Section Three

Monitoring and Ambient Air Quality Data

Section 110(a)(2)(B) of the federal CAA requires a monitoring strategy for measuring, characterizing, and reporting $PM_{2.5}$. The Ohio EPA maintains a comprehensive network of $PM_{2.5}$ air quality monitors throughout Ohio with the primary objective being to determine compliance with the $PM_{2.5}$ NAAQS. Figure 1 shows Ohio's $PM_{2.5}$ monitoring network.

Figure 1: Ohio's FRM Fine Particulate Matter ($PM_{2.5}$) Monitoring Network

In accordance with the CAA Amendments, three complete years of monitoring data are required to demonstrate attainment at a monitoring site. The $PM_{2.5}$ primary and secondary ambient air quality standards are met at an ambient air quality monitoring site when the three-year average of the annual average is less than 15.0µg/m3 and the three year average of the 98th percentile of the 24-hour concentrations is less than 65µg/m3. When this occurs, the area is said to be in attainment. These data handling procedures are applied on an individual basis at each monitor in the area. An area is in compliance with the $PM_{2.5}$ NAAQS only if every monitoring site in the area meets the NAAQS. An individual site's 3-year average of the annual average concentrations 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.

Table 1 provides a summary of the annual average $PM_{2.5}$ monitoring data for 2003 through 2007 for all of Ohio's $PM_{2.5}$ monitoring sites (see Tables 1 and 2 in Appendix A for a summary of all the annual and 24-hour $PM_{2.5}$ monitoring data for 2003 – 2007). The nonattainment areas' design values have trended downward as emissions have declined due to improvements in both mobile sources and point sources. These data were retrieved from the U.S. EPA Air Quality System (AQS) database (Appendix A – Ohio $PM_{2.5}$ monitoring data report). 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 manage other air quality management functions.

The AQS database is updated monthly by states and local environmental agencies that operate the monitoring stations. States provide the monitoring data to U.S. EPA as required by the CAA Amendments.

Table 1. Annual Average $PM_{2.5}$ Data (2003 – 2007) in Ohio's Nonattainment Areas.

SITE ID	2003	2004	2005	2006	2007	Average '03-'05	Average '04-'06	Average '05-'07	TOTAL Design Values
39-017-0003	15.4	14.1	19.0	14.1	15.4	16.17	15.73	16.17	16.02
39-017-0016	15.8	14.7	17.9	14.0	14.9	16.13	15.53	15.60	15.76
39-017-0017	14.7	14.2	17.2			15.37			15.37
39-017-1004	15.0	13.6	16.9	13.4	14.6	15.17	14.63	14.97	14.92
39-023-0005	14.1	13.5	16.7	13.1	14.3	14.77	14.43	14.70	14.63
39-025-0022			15.7	12.7	14.0			14.13	14.13
39-035-0013	16.7					16.70			16.70
39-035-0027	15.4	15.6	17.3	13.0	14.5	16.10	15.30	14.93	15.44
39-035-0034	13.4	12.6	16.3	11.5	13.6	14.10	13.47	13.80	13.79
39-035-0038	17.6	17.5	19.2	14.9	16.3	18.10	17.20	16.80	17.37
39-035-0045	16.4	15.3	19.3	14.1	15.3	17.00	16.23	16.23	16.49
39-035-0060	17.2	16.4	19.4	15.0	15.9	17.67	16.93	16.77	17.12
39-035-0065	15.6	15.2	18.6	13.1	15.8	16.47	15.63	15.83	15.98
39-035-0066	13.9	11.7				12.80			12.80
39-035-1002	13.9	13.2	16.8	11.6	14.6	14.63	13.87	14.33	14.28
39-049-0024	16.4	15.0	16.4	13.6	14.5	15.93	15.00	14.83	15.26
39-049-0025	15.5	14.6	16.5	13.8	14.7	15.53	14.97	15.00	15.17
39-049-0081	14.9	13.6	14.6	12.9	13.1	14.37	13.70	13.53	13.87
39-057-0005	9.5	12.1	15.5	11.9	13.3	12.37	13.17	13.57	13.03
39-061-0006			16.6	13.3	14.6			14.83	14.83
39-061-0014	17.0	15.9	19.8	15.5	16.5	17.57	17.07	17.27	17.30
39-061-0040	15.5	14.6	17.5	13.6	15.1	15.87	15.23	15.40	15.50
39-061-0041	15.3	14.6	15.8			15.23			15.23
39-061-0042	16.7	16.0	19.1	14.9	15.9	17.27	16.67	16.63	16.86
39-061-0043	15.7	14.9	16.9	14.5	14.9	15.83	15.43	15.43	15.57
39-061-7001	16.0	15.3	18.4	14.4	15.1	16.57	16.03	15.97	16.19
39-061-8001	17.3	16.4	20.0	15.9	16.1	17.90	17.43	17.33	17.56
39-081-0016	17.7								
39-081-0017	15.2	15.9	16.4	13.8	16.2	15.83	15.37	15.47	15.56
39-081-1001	17.3	16.2	18.1	14.6	15.6	17.20	16.30	16.10	16.53
39-085-1001	12.7	11.6	15.0			13.10			13.10
39-085-3002				11.5	13.9				
39-087-0010	14.3	13.7	17.0	14.4	15.0	15.00	15.03	15.47	15.17
39-093-0016	13.1	12.9	16.4	11.5	10.1	14.13	13.60	12.67	13.47
39-093-2003									
39-093-3002	11.8	11.8	14.7	11.4	12.9	12.77	12.63	13.00	12.80
39-103-0003			15.2	11.9	12.7			13.27	13.27
39-113-0014									
39-113-0031	14.4	13.9	16.8	13.1		15.03	14.60		14.82
39-113-0032	15.9	14.5	17.4	13.6	15.6	15.93	15.17	15.53	15.54
39-133-0002	12.7	12.5	15.0	12.0	13.7	13.40	13.17	13.57	13.38
39-145-0013	14.7	13.0	16.2	14.3	14.0	14.63	14.50	14.83	14.66
39-151-0017	16.8	15.5	17.8	14.6	15.9	16.70	15.97	16.10	16.26
39-151-0020	15.0	14.1	16.4	11.9	14.4	15.17	14.13	14.23	14.51
39-153-0017	15.4	15.0	16.4	13.5	14.5	15.60	14.97	14.80	15.12
39-153-0023	14.2	13.9	15.7	12.8	13.7	14.60	14.13	14.07	14.27
39-165-0007					14.0				

2007 data has not been certified

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

Section Four

Emissions Inventory

Rule 40 CFR 51.1002 (c) requires pollutants contributing to $PM_{2.5}$ concentrations to be part of the state's emission inventory for the SIP. Ohio's main $PM_{2.5}$ components are primary particles (organic carbon, crustal material, and elemental carbon), SO_2 and NOx, which are included in this analysis. Volatile organic compounds (VOCs) and ammonia (NH_3) are not included in the emission inventory (and modeling inventories) since they are not part of Ohio's current attainment strategy for $PM_{2.5}$. VOCs contributions to $PM_{2.5}$ are still being investigated; therefore, control measures for these compounds will not be included in this SIP revision (although controls for VOCs have been implemented for ozone nonattainment). Also NH_3 emission estimates and atmospheric chemistry are uncertain; therefore, Ohio is not including ammonia controls in this SIP revision.

U.S. EPA's guidance requires Ohio to submit statewide emission inventories for direct $PM_{2.5}$ emissions and emissions of $PM_{2.5}$ precursors. Ohio must also submit any additional emission inventory information needed to support an attainment demonstration and a Reasonable Further Progress (RFP) plan necessary to ensure expeditious attainment of the NAAQS.

While a portion of the total $PM_{2.5}$ and its precursors are transported into this region from outside areas these emission inventories provide some indication of the impact from Ohio sources near the nonattainment area (Appendix C). The emissions are decreasing substantially in response to regional and national programs affecting many EGUs, such as the Acid Rain program, the NO_x SIP Call, and the CAIR. Other sectors of the inventory also impact particulate formation, but large regional sources such as EGUs have a substantial impact on the formation of $PM_{2.5}$ due to their high NOx and SO_2 emissions.

Ohio EPA prepared a comprehensive inventory for Ohio including area, mobile, and point sources for both primary $PM_{2.5}$ and its precursors for the 2005 base year. The information below describes the procedures Ohio EPA used to generate the 2005 base year inventory. These inventories were provided to the Midwest Regional Planning Organization (MRPO) and have been processed to develop average day emissions for use in the air quality modeling analyses.

- 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 growth factors, with some updated local information.

- Mobile estimates for the nonattainment areas were prepared by the MPOs throughout the State in coordination with the Ohio Department of Transportation (ODOT). (See Section Five.)

- 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.

- 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, the MRPO contracted with two companies to review the base data and make recommendations. One of the contractors also estimated emissions for three non-road categories not included in U.S. EPA's non-road model. Emissions were estimated for commercial marine vessels, aircraft, and railroads (MAR). The 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 by LADCO, and the temporal allocation for agricultural sources also was updated.

Ohio's 2005 emission inventory is shown in Appendix A (Tables 3 and 4). These tables show annual emissions per county in the nonattainment areas and annual emissions statewide. Appendix A also shows emission inventories projected for 2009 (Table 5 and 6), which support Ohio's attainment demonstration. The future year (2009) emission projections were estimated using the methods described in the E. H. Pechan & Associates reports for LADCO (see Appendix B).

Section Five

Transportation Conformity

The general process for developing on-road mobile source emissions inventories involves applying emission factors to estimates of vehicle miles traveled (VMT) within Ohio's nonattainment areas. Emission factors are generated with the U.S. EPA's Mobile6.2 model. The VMT estimates are created using travel forecasting models maintained by MPO's in coordination with ODOT. Emissions are computed by roadway segment as the products of the VMT and the appropriate Mobile6.2 emission factor. Roadway segment emissions are summed over the entire nonattainment area to compute the total amounts emissions of volatile organic compounds (VOC), carbon monoxide (CO), nitrogen oxides (NOx), fine particulates ($PM_{2.5}$), sulfur dioxide (SO_2), and ammonia (NH_3) (see Appendix F – ODOT Technical Memorandum).

Transportation conformity is required by the CAA section 176(c) (42 U.S.C. 7506(c)) to ensure that federal funding and approval are given to highway and transit projects that are consistent with ("conform to") the air quality goals established by a state air quality implementation plan (SIP). Conformity, for the purpose of the SIP, means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment or interfere with maintenance of the NAAQS. The federal requirements apply to areas designated as nonattainment for one or more NAAQS, or which have been redesignated to attainment with federally approved air quality maintenance plans.

For $PM_{2.5}$, the pollutant itself and all its various precursors typically would require analysis. However, as noted in the implementation rule, ammonia and volatile organic compounds - while recognized as such precursors - are not considered as significant overall to the $PM_{2.5}$ nonattainment problem. Therefore, they are not considered as attainment plan precursors for SIP development purposes. Further, other pollutants/precursors may be considered significant overall, but the highway contribution to those emissions may be insignificant. In that case, the federal Transportation Conformity rule allows such pollutant/precursors to be exempt from conformity analysis under certain circumstances[1].

[1] 40CFR93.109(k). *Areas with insignificant motor vehicle emissions.* Notwithstanding the other paragraphs in this section, an area is not required to satisfy a regional emissions analysis for §93.118 and/or §93.119 for a given pollutant/precursor and NAAQS, if EPA finds through the adequacy or approval process that a SIP demonstrates that regional motor vehicle emissions are an insignificant contributor to the air quality problem for that pollutant/precursor and NAAQS. The SIP would have to demonstrate that it would be unreasonable to expect that such an area would experience enough motor vehicle emissions growth in that pollutant/precursor for a NAAQS violation to occur. Such a finding would be based on a number of factors, including the percentage of motor vehicle emissions in the context of the total SIP inventory, the current state of air quality as determined by monitoring data for that NAAQS, the absence of SIP motor vehicle control measures, and historical trends and future projections of the growth of motor vehicle emissions.

The federal Transportation Conformity Rule (40 C.F.R. 93.100-160) provides the process by which the air quality impacts of transportation plans, transportation improvement program, and transportation projects are analyzed. The agency preparing the plans, programs, or projects must analyze the emissions expected from such proposals in accordance with the Transportation Conformity Rule (40 U.S.C. §7506).

For the purposes of transportation conformity, the emission budget is a cap on the total emissions allocated to on-road vehicles. Estimates of on-road motor vehicle emissions are projected for the attainment year to assess emission trends and to ensure continued compliance with the $PM_{2.5}$ NAAQS. On-road emissions include those from all vehicles driven on public roadways. These emission budgets are used to determine whether transportation plans and projects conform to the SIP. Estimated on-road mobile emissions of primary $PM_{2.5}$ and NOx must not exceed the emission budget contained in the attainment plan. The emissions estimates for this sector reflect appropriate and up-to-date assumptions about vehicles mile traveled, socioeconomic variables, fuels used, weather inputs, and other planning assumptions.

During Interagency Consultation meetings between U.S. EPA (Region 5), ODOT, and Ohio MPOs, it was agreed that Ohio's $PM_{2.5}$ Motor Vehicle Emissions Budgets (MVEB) will be calculated with a 5% buffer.

In addition, LADCO performed a sensitivity run as part of Round 5 (2005 base year) with motor vehicle emissions increased by 10% in the five LADCO States[2]. The model results showed a maximum increase of 0.2μg/m^3 $PM_{2.5}$ concentration and an average increase of 0.1μg/m^3 $PM_{2.5}$ concentration. (Table 1 in Appendix F shows monitor-by-monitor differences in Ohio.) These sensitivity run results show that the highest $PM_{2.5}$ reading monitor in Ohio (St. Tikhon monitor in Cuyahoga County) has a $PM_{2.5}$ increase of 0.2μg/m^3. It was concluded that because the sensitivity run was performed with a 10% increase in motor vehicle emissions, a 5% increase in the mobile budget still demonstrates attainment. In addition, Ohio EPA believes that the St. Tikhon monitor is more impacted by other local sources than mobile sources. (See Section Six.)

Table 2 contains the mobile source emission inventory estimates derived from the travel demand model and Mobile6.2. The 2005 analysis data for the Dayton-Springfield and Cincinnati-Hamilton nonattainment areas, show emissions with an Inspection/Maintenance (I/M) program (Ohio only), while the 2009 analysis does not include such program. The transportation emission budgets for conformity are provided in Table 3. The "Requested Motor Vehicle Emissions Budget" columns on Table 3 include the 5% buffer for all nonattainment Ohio areas.

[2] LADCO states are Indiana, Illinois, Michigan, Ohio and Wisconsin.

Table 2. Mobile Source Emission Inventories for Ohio $PM_{2.5}$ Nonattainment Areas

NONATTAINMENT AREA	COUNTY	Annual totals (Tons per Year)			
		PM2.5		NOx	
		2005	2009	2005	2009
Steubenville-Weirton	Jefferson	25.47	18.85	1,602.94	1,151.25
Wheeling	West Virginia - Ohio, Marshall	26.15	21.86	1,579.36	1,293.96
	Ohio - Belmont	33.60	24.25	2,081.57	1,448.62
	Total	59.75	46.11	3,660.94	2,742.58
Dayton-Springfield	Clark, Greene, Montgomery	336.53	248.20	20,490.74	14,728.12
Columbus	Delaware, Fairfield, Franklin, Licking, Coshocton (partial)	718.70	557.84	45,363.25	34,497.31
Cleveland/Akron	Cuyahoga, Lake, Lorain, Medina, Portage, Summit, Ashtabula (part	1,069.44	779.15	60,909.11	41,479.50
Cincinnati-Hamilton	Indiana - Dearborn	8.84	6.12	497.76	359.72
	Ohio - Butler, Clermont, Hamilton, Warren	600.10	433.84	34,706.18	26,647.50
	Total	608.94	439.96	35203.94	27007.22
Canton-Massilion	Stark	124.10	84.17	7,272.33	4,860.34
Parkersburg-Marietta	Washington	*	*	*	*
Huntington-Ashland	Lawrence, Scioto, Adams (partial), Galia (partial)	*	*	*	*

Data Souce: OTS-Ohio Department of Transportation and Ohio Metropolitan Planning Organizations

* Insignificant contribution

Table 3. Transportation Conformity Budgets for Ohio's $PM_{2.5}$ Nonattainment Areas

Nonattainment Areas	Annual totals (tpy) 2009 Requested Motor Vehicle Emission Budget	
	PM2.5	Nox
Steubenville-Weirton	19.80	1208.81
Wheeling (WV- Ohio and Marshall; OH - Belmont)	48.42	2879.71
Dayton-Springfield	260.61	15464.52
Columbus	585.73	36222.18
Cleveland/Akron	818.11	43553.48
Cincinnati-Hamilton (IN - Dearborn; OH - Butler, Clermont, Hamilton, Warren)	461.96	28357.58
Canton-Massilion	88.38	5103.36
Parkersburg-Marietta (OH - Washington)	*	*
Huntington-Ashland (OH - Lawrence, Scioto, Adams (part), Galia (part))	*	*

Data Souce: OTS-Ohio Department of Transportation and Ohio Metropolitan Planning Organizations

2009 Budget assumes a 5 % increase over 2009 emissions estimate

* Insignificant Contribution

While the $PM_{2.5}$ nonattainment areas summarized above do have significant contributions to the overall total of primary $PM_{2.5}$ and the precursors generated by on-road mobile sources, Ohio EPA believes that the Parkersburg-Marietta and the Huntington-Ashland areas are not significantly impacted by on-road mobile emissions as compared to other source emissions; in addition, mobile source emissions in these areas are expected to decrease. Therefore, for the reasons outlined below, the Ohio EPA is herein making findings that the regional highway emissions of $PM_{2.5}$, NOx, and SO_2 are insignificant contributors to the nonattainment problems of the Parkersburg-Marietta and the Huntington-Ashland areas. These findings will become final if U.S. EPA concurs and approves this SIP.

Parkersburg-Marietta Nonattainment Area

a) The regional highway pollutant/precursor emissions constitute a relatively small fraction of the overall emissions as shown in the table below.

Table 4. Parkersburg-Marietta 2002 Base Year Emission Inventory (tpy)

Emission Source	County	NOx	$PM_{2.5}$	SO_2
Area	Pleasants, WV	171	152	86
	Wood, WV	578	987	1,225
	WV Total	749	1139	1311
	Washington, OH	188	317	40
	Area total	937	1,456	1,351
Non-Road	Pleasants, WV	837	36	41
	Wood, WV	1,399	60	112
	WV Total	2,236	96	153
	Washington, OH	1,669	84	92
	Non-Road total	3,905	180	245
On-Road	Pleasants, WV	194	3	9
	Wood, WV	2,473	41	102
	WV Total	2,667	44	111
	Washington, OH	2,424	42	112
	On-Road total	5,091	86	223
Point	Pleasants, WV	20,896	853	65,791
	Wood, WV	939	215	4,502
	WV Total	21,835	1,068	70,293
	Washington, OH	33,588	681	0
	Point total	55,423	1,749	70,293
TOTALS	WV Total	27,487	2,347	71,868
	OH Total	**37,869**	**1,124**	**244**
	Nonattainment Area Total	**65,356**	**3,471**	**72,112**
	On Road Total/Nonattainment Area Total	**7.80%**	**2.50%**	**0.30%**
	OH On-road/Nonattainment Area Total	**3.70%**	**1.20%**	**0.15%**

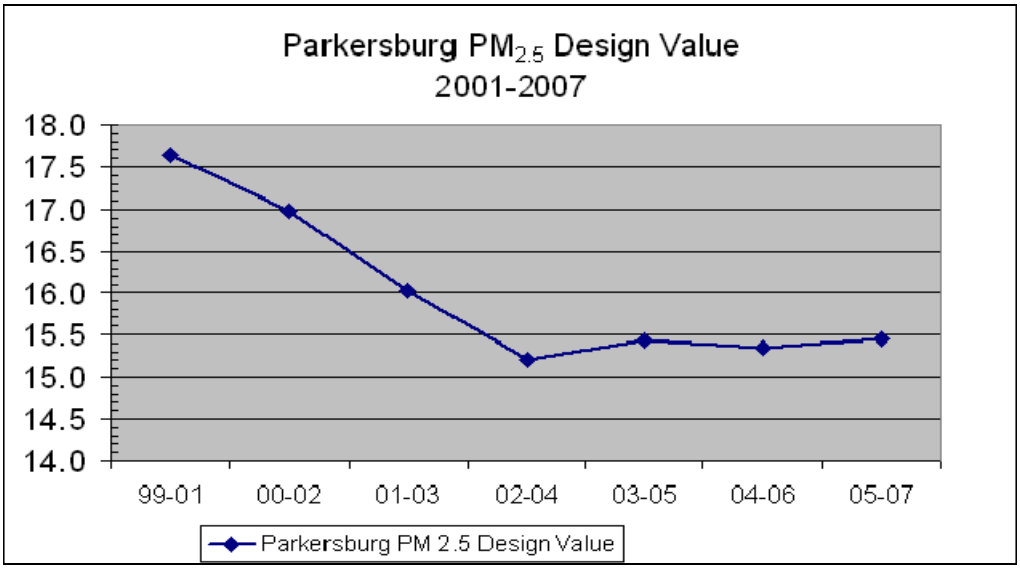
Data Source: West Virginia Department of Environmental Protection

From the 2002 Base Year Emission Inventory in Table 4 it can be determined that the total NOx mobile emission contribution is 7.8% of the total NOx emissions in the whole nonattainment area and that the total $PM_{2.5}$ and total SO_2 mobile emission contributions in the nonattainment area are 2.5% and 0.3%, respectively. Moreover, Ohio's mobile emission contributions in the whole nonattainment area are 3.7% for NOx, 1.2% for $PM_{2.5}$, and, 0.15% for SO_2.

On the other hand, point sources account for most of the emissions in this area. The total NOx point source contribution is 84.8% of the total NOx emissions in the whole nonattainment area, and the total $PM_{2.5}$ and total SO_2 point source contributions in the nonattainment area are 50.3% and 97.4%, respectively. From these results, the Ohio EPA has determined that the regional highway emissions contribution, as a percent of the total emission inventory, in the Parkersburg-Marietta area is insignificant.

b) The closest monitor ($PM_{2.5}$), located in Wood County, West Virginia shows that the current air quality (year 2007) has a design value of 15.4µg/m^3. This value is slightly higher that the 15.3µg/m^3 design value upon which the nonattainment designation is based. The graph below shows the level of $PM_{2.5}$ concentrations from the year 2001 to date. The values dropped from 17.6µg/m^3 in 2001 to 17.0µg/m^3 and 16.0µg/m^3 in 2002 and 2003, respectively. This may be attributed to an overall decrease in sulfates from SO_2 reductions mandated by the Acid Rain Program and implementation of controls for the NOx SIP Call rules. The design values then fluctuated from 15.2 to 15.4µg/m^3 during the 2004-2007 period. This fluctuation is due to the year-to-year variability in $PM_{2.5}$ which is common to many monitoring sites. Overall, the $PM_{2.5}$ concentrations have improved since the beginning of the decade. The area is designated as attainment for all other criteria pollutants.

Graph 1. Parkersburg-Marietta $PM_{2.5}$ Design Values



Data Source: West Virginia Department of Environmental Protection

Given the relatively small contribution of mobile emissions to the total emission inventory, mobile emissions are not likely to contribute significantly to the local $PM_{2.5}$ ambient concentrations.

c) Historically there have been no Parkersburg-Marietta area SIP requirements for motor vehicle control measures. The Washington County portion of the area is subject to Transportation Conformity for the 8-hour ozone standard and budgets for NOx and Volatile Organic Compounds (VOC). Further, the entire nonattainment area is currently subject to Transportation Conformity for the $PM_{2.5}$ standards. Emission analysis has been mandatory for annual mobile emissions of direct PM and NOx. However, upon approval of this SIP submittal, no mobile emissions analysis will be required under the annual $PM_{2.5}$ standards. Mobile analysis of ozone precursors would continue to be mandatory and $PM_{2.5}$ hot-spot analyses would continue to apply for required projects under 40 CFR 93.116 and 93.123(b) of the Transportation Conformity rule.

d) There is no reason to expect motor vehicle emissions growth that would lead to a $PM_{2.5}$ NAAQS violation. The Wood-Washington-Wirt (WWW) Interstate Planning Commission has estimated emissions to calendar year 2025 to confirm this. The transportation air quality conformity analysis for the WWW area took into account all the regional capacity projects, which are scheduled for implementation through the transportation plan horizon year and for the year Transportation Improvement Plan (TIP). The PM conformity tests were performed for calendar years 2002, 2009, 2015, and 2025. For each of those years, vehicle miles traveled (VMT) and speed were developed by the Federal Functional Class codes within Wood County (WV) and Washington County (OH), which are derived from the regional traffic model assignments that are made for each of those years. Pursuant to the Transportation Conformity interim tests, NOx and direct PM were evaluated.

The WWW study area covers the Parkersburg-Marietta metropolitan area, which includes Parkersburg in West Virginia and Marietta and Belpre in Ohio as the major urban areas, the entire Wood County, and part of Washington County (including the townships of Belpre, Dunham, Fearing, Marietta, Muskingum, Newport, and Warren). The metropolitan area has a population of 151,000, of which 87,000 live in the urban area (Census 2000). The area of study has 571.6 square miles, with Wood County representing 376.9 square miles and the seven Ohio townships representing 194.7 square miles.

2009 socio-economic factors of the zones within the study area were forecasted including average autos/household per zone, number of households per zone, and numbers of retail, non-retail, and service employees per zone. Input files were developed for modeling mobile emissions with the Mobile6.2 software by using the VMT split by functional class. The assumptions related to the derivation of model inputs were developed as part of an interagency consultation process involving: WVDAQ, WVDOT, WWWIPC, FHWA, ODOT, Ohio EPA, and U.S. EPA.

The results of the Mobile6.2 analysis yield mobile emissions rates that can be used along with the VMT by functional class of roadways to derive estimates of total mobile source emissions for NOx and $PM_{2.5}$. The conformity results are represented in Table 5. The conformity rule requires the region's LRTP to conform to the SIP before FHWA approves the funding of future projects. The conformity evaluation is determined by the process outlined in the conformity rule. The WWW $PM_{2.5}$ nonattainment area has demonstrated conformity with the $PM_{2.5}$ transportation conformity rule using the base year interim emission test.

Table 5. Mobile Source Emission Growth

YEAR	NOx (TPD)	PM2.5 (TPD)	NOx (annual)	% Change from base year	PM2.5 (annual)	% Change from base year
2002	6.54	0.13	2387.10	-	47.45	-
2009	4.23	0.08	1543.95	-35.3%	29.20	-38.5%
2015	2.44	0.06	890.60	-62.7%	21.90	-53.8%
2025	1.37	0.05	500.05	-79.1%	18.25	-61.5%

Data Souce: WWWIPC and WVDAQ

The forecast shows that significant decreases in mobile emissions are expected for all analysis years, for both NOx and direct PM. Federal heavy duty diesel engine standards and low sulfur fuel requirements are also expected to yield substantial SO_2 emission reductions commensurate with those shown above.

Finally, the Ohio EPA reiterates its conclusion that mobile emissions of $PM_{2.5}$, NOx, and SO_2 are insignificant contributors to the nonattainment problem for the Parkersburg-Marietta area; and, therefore, the area should be exempt from transportation conformity evaluation under 40CFR93.109(k).

Huntington-Ashland Nonattainment Area

a) The regional highway pollutant/precursor emissions constitute a relatively small fraction of the overall emissions as shown in the table below.

From the 2002 Base Year Emission Inventory in Table 6 it can be determined that the total NOx mobile emission contribution is 6.18% of the total NOx emissions in the whole nonattainment area and that the total $PM_{2.5}$ and total SO_2 mobile emission contributions in the nonattainment area are 2.63% and 0.15%, respectively. Moreover, Ohio's mobile emission contributions in the whole nonattainment area are 2.93% for NOx, 1.27% for $PM_{2.5}$, and 0.07% for SO_2.

On the other hand, the point source emissions account for most of the emissions in this area. The total NOx point source contribution is 86% of the total NOx emissions in the whole nonattainment area, and the total $PM_{2.5}$, and total SO_2 point source contributions in the nonattainment area are 45.7% and 98.8%, respectively. From these results, the Ohio EPA has determined that the regional highway emission contribution as a percent of the total emission inventory from the Huntington-Ashland area is insignificant.

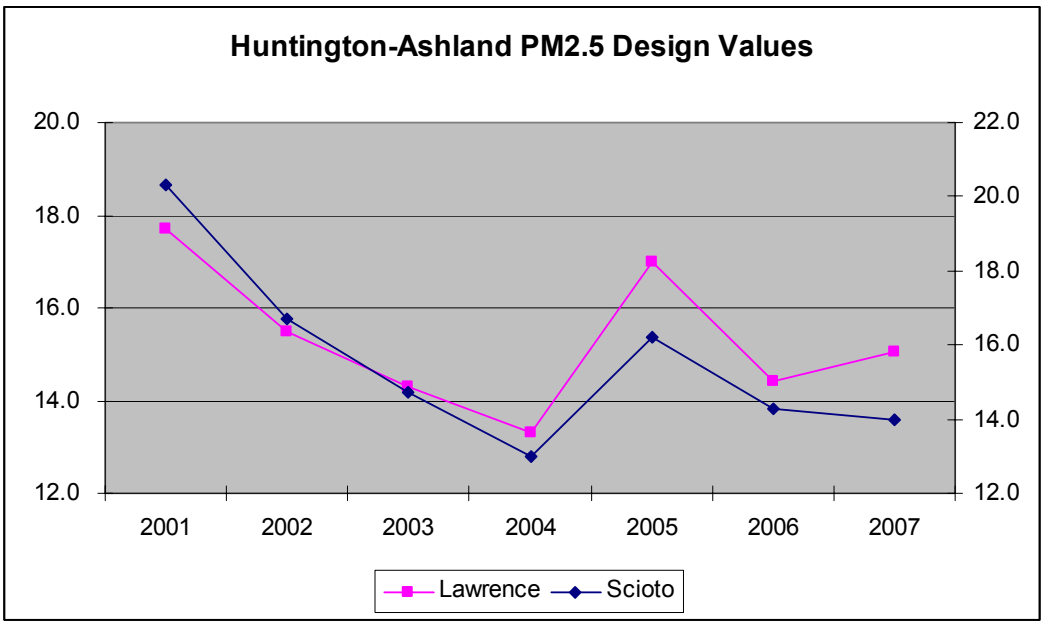
Table 6. Huntington-Ashland 2002 Base Year Emission Inventory (tpy)

Emission Source	County	NOx	PM2.5	SO_2
Area	Boyd, KY	40	712	542
	Lawrence, KY	87	216	96
	KY Total	127	928	638
	Cabell, WV	716.3	865	1420
	Mason, WV	349.1	391	119
	Wayne, WV	174.2	523	479
	WV Total	1,239.70	1779	2018
	Adams, OH	112	315	43
	Gallia, OH	112	226	37
	Lawrence, OH	216	163	70
	Scioto, OH	220	337	77
	OH Total	660	1041	227
	Area total	2,026.70	3,748.00	2,883.00
Non-Road	Boyd, KY	3,319.00	131	482
	Lawrence, KY	726.4	30	85
	KY Total	4,045.40	161	567
	Cabell, WV	1,957.60	82	112
	Mason, WV	1,544.70	70	83
	Wayne, WV	3,049.60	125	162
	WV Total	6,552.00	277	356
	Adams, OH	494	25	45
	Gallia, OH	538	22	45
	Lawrence, OH	1,037.00	36	86
	Scioto, OH	1,706.00	71	137
	OH Total	3,775.00	154	313
	Non-Road total	14,372.40	592.00	1,236.00
On-Road	Boyd, KY	1,213.00	21	54
	Lawrence, KY	785	14	30
	KY Total	1,998.00	35	84
	Cabell, WV	2,987.70	48	122
	Mason, WV	701.1	12	32
	Wayne, WV	1,089.30	18	48
	WV Total	4,778.20	79	203
	Adams, OH	917	17	44
	Gallia, OH	864	16	42
	Lawrence, OH	2,336.00	38	112
	Scioto, OH	1,991.00	36	96
	OH Total	6,108.00	107	294
	On-Road total	12,884.20	221.00	581.00
Point	Boyd, KY	7,045.80	1,256	9,711
	Lawrence, KY	17,129.00	335	48,874
	KY Total	24,174.80	1,591	58,585
	Cabell, WV	246.5	319	124
	Mason, WV	26,815.10	237	85418
	Wayne, WV	3,313.00	50	288
	WV Total	30,374.70	607	85830
	Adams, OH	54,917.00	952	137,241
	Gallia, OH	68,963.00	670	106,286
	Lawrence, OH	0	0	0
	Scioto, OH	755	30	25
	OH Total	124,635.00	1652	243,552
	Point total	179,184.50	3,850.00	387,967.00
TOTALS	KY Total	30,345	2,715	59,874
	WV Total	42,945	2,742	88,407
	OH Total	**135,178**	**2,954**	**244,386**
	Nonattainment Area Total	**208,468**	**8,411**	**392,667**
	On Road Total/Nonattainment Area Total	**6.18%**	**2.63%**	**0.15%**
	OH On-road/Nonattainment Area Total	**2.93%**	**1.27%**	**0.07%**

Data Source: Kentucky Department of Air Quality.

b) The monitors ($PM_{2.5}$) in the Ohio side of the Huntington-Ashland area are located in Lawrence and Scioto Counties, and show current air quality (year 2007) levels, of 16.0µg/m^3 and 14.0µg/m^3, respectively. The graph below shows the level of $PM_{2.5}$ concentrations from the year 2001 to date. In general, there has been an overall decrease in the monitoring values for both monitors, which may be attributed to an overall decrease in sulfates from SO_2 reductions mandated by the Acid Rain Program and implementation of controls from the NOx SIP Call rules. Overall, the $PM_{2.5}$ concentrations have improved since the beginning of the decade. The area is designated as attainment for all other criteria pollutants.

Graph 2. Huntington-Ashland $PM_{2.5.}$ Design Values



Given the relatively small contribution of mobile emissions to the total emission inventory, mobile emissions are not likely to contribute significantly to the local $PM_{2.5}$ ambient concentrations.

c) The entire Huntington-Ashland area is currently subject to Transportation Conformity for the $PM_{2.5}$ standards. Emission analysis has been mandatory for annual mobile emissions of direct PM and NOx and, upon approval of this SIP submittal, no mobile emissions analysis will be required under the annual $PM_{2.5}$ standard. However, $PM_{2.5}$ hot-spot analyses would continue to apply for required projects under 40 CFR 93.116 and 93.123(b) of the Transportation Conformity rule.

Finally, the Ohio EPA reiterates its conclusion that mobile emissions of $PM_{2.5}$ are insignificant contributors to the nonattainment problem for the Huntington-Ashland area; and, therefore, this area should be exempt from transportation conformity evaluation under 40CFR93.109(k).

Section Six

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 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 State of Ohio.

The WOE approach used in this SIP includes a variety of data sources to make the demonstration that Ohio's $PM_{2.5}$ nonattainment areas will attain the NAAQS by 2010. The Ohio EPA believes that this approach is the most scientifically defensible approach because it relies on not one method, such as modeling, but multiple sources of information.

Appendix D includes analyses performed by the MRPO on behalf of the member states, including Ohio (LADCO - Technical Support Document Section Four: Attainment Demonstration for Ozone and $PM_{2.5}$). While the analyses are not conclusive, the data generally indicate an expected continual improvement in air quality. Ambient air quality trends, emissions trends, and statistical analyses utilizing meteorological weighting can provide additional insight into expected future air quality. An extremely powerful piece of evidence is the current trend in ambient $PM_{2.5}$ concentrations throughout Ohio and throughout the Midwest. With the exception of 2005, ambient concentrations are continuing to lower in response to regional control strategies such as the acid rain program, the NOx SIP call, and early reductions associated with the Clean Air Interstate Rules. The "Overview of Regional Planning Activities" (Appendix D) presentation provides regional emissions tables, $PM_{2.5}$ ambient trends, and other related information.

Fine Particulate Matter

In 1997, the U.S. EPA developed new NAAQS for fine particulate matter. The U.S. EPA designated nine areas (twenty seven counties) in Ohio as nonattainment. The three-year average concentrations for 2003-2005 showed thirty-one monitors reading violations of the annual $PM_{2.5}$ standard. Air quality in the whole State of Ohio is improving based on 2004-2006 data, where nineteen monitors show violations of the NAAQS. In general, these monitors are located in areas with a history of particulate matter problems associated with local industrial sources. Ohio EPA believes that the most effective attainment strategy is to focus on local emission reductions from sources in this area while national programs will control secondary regional pollutants.
Fine particulate matter is a complicated mixture of ammonium sulfate, ammonium nitrate, organic carbon, elemental carbon, soil (or crustal material) and other particles. $PM_{2.5}$ is composed of primary (directly emitted) and secondary (formed in the atmosphere) particles. Our understanding of how much $PM_{2.5}$ is primary versus

secondary, and how fast secondary formation takes place is limited. Current speciation analyses of ambient monitoring data indicate that $PM_{2.5}$ concentrations result from both primary emissions (e.g., crustal matter, elemental carbon, and much of organic carbon) and secondary formation (e.g., ammonium sulfate, ammonium nitrate, and some organic carbon).

Few monitoring sites in Ohio have speciation monitors. Lack of speciated $PM_{2.5}$ data at most locations makes identification of specific local source contributors very difficult. One must make assumptions based on source proximity to neighboring monitors that do have detailed data available.

In addition to the complexity of the $PM_{2.5}$ mixture, quantification of $PM_{2.5}$ emissions is still evolving. Techniques for measuring these emissions are still being evaluated and debated by the U.S. EPA. Much of the current inventory cannot be measured directly. Instead estimates are made through other methods such as factoring total PM emissions (which include total suspended solids and PM_{10}), or use of activity levels and emission factors. This adds to the complexity of determining local source contributions.

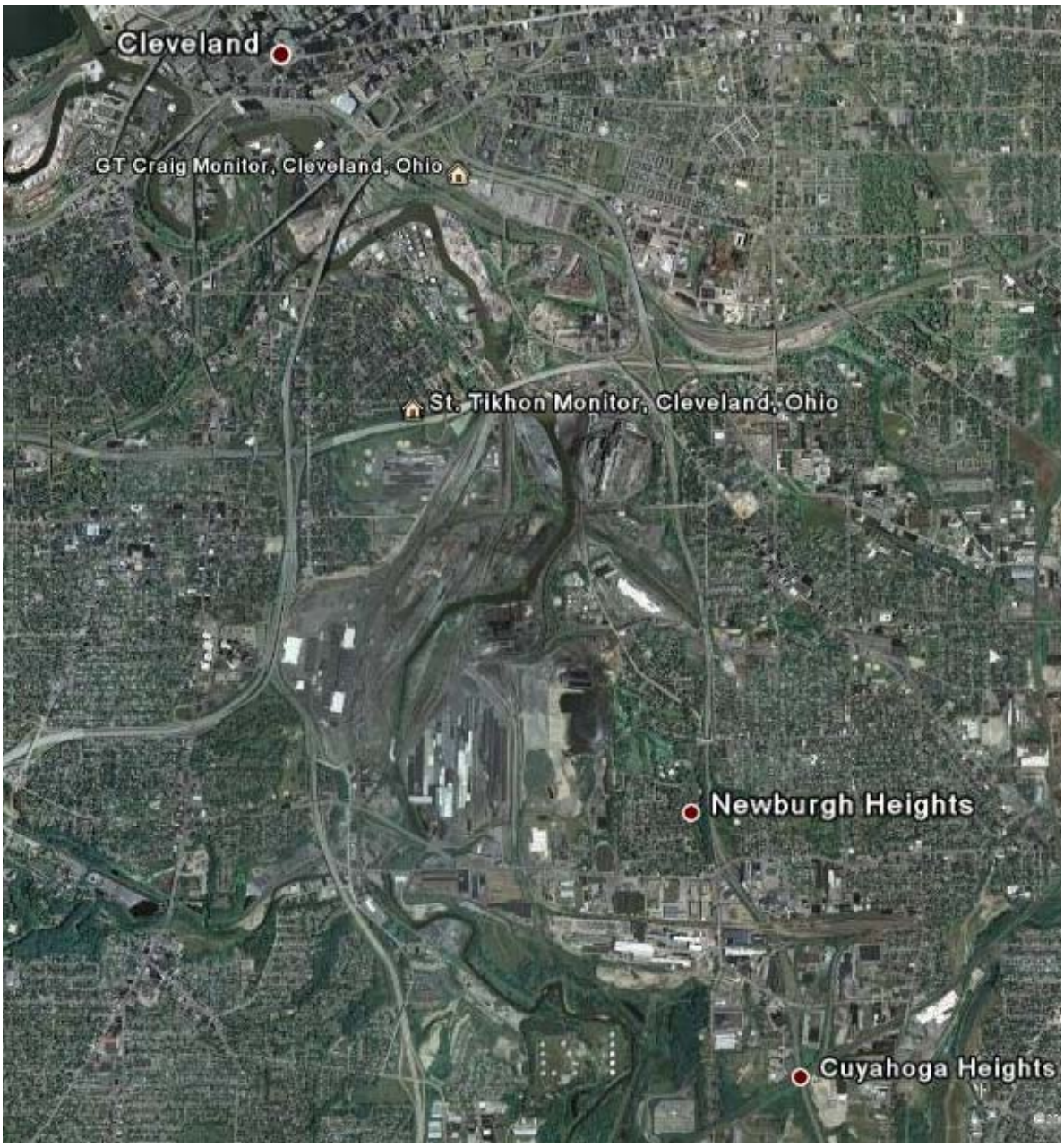
Emissions

Significant emission reductions in the Midwest (which already take into account expected economic growth and increase in travel) are expected from national controls including CAIR and additional motor vehicle reductions (Tier 2, the Diesel Rule, and low-sulfur fuel requirements). These reductions will ensure that areas in Ohio that are currently attaining the NAAQS will remain in compliance.

While these reductions are already having a significant, positive impact in Ohio and will continue to do so in the future, we cannot assume that they will result in attainment at Ohio's highest reading monitors (St. Tikhon and GT Craig, both in the Cleveland area), which are still exceeding the annual standard. Additional reductions in the vicinity of these sites will be needed.

These monitors are located in the industrialized core of Cleveland (see Figure 2), which contains a complex array of emission sources. There are twenty Title V facilities and approximately one hundred ninety minor sources in a two-kilometer radius from both monitors.

Figure 2. High Reading Monitors in the Cleveland Area



U.S. EPA has cited the Mittal, Inc. iron and steel mill in Cleveland with violations of the CAA and the Ohio SIP for the control of particulate emissions. The enforcement action, for which Ohio EPA is a party, involves the following emission units: the blast furnace bleeder valves, slag processing, and the C5 blast furnace and the C6 bell-less top blast furnace. It is likely that additional particulate controls will be installed for these emissions units as part of the settlement of the enforcement action.

Negotiations with Mittal, Inc. began in November, 2007, and both sides are currently involved in discussions regarding the technical/engineering aspects of additional controls, including feasibility and cost-effectiveness. The current goal is to reach a settlement with the company regarding injunctive relief before the end of 2008 and to have the Consent Decree entered by the court in early 2009. It is anticipated that substantial $PM_{2.5}$ reductions will occur as a result of the injunctive relief in the Consent Decree.

A number of other industrial facilities (Title V and minor sources) in the area surrounding the St. Tikhon and GT Craig monitors have either closed or scaled back their operations since 2005. These changes may be contributing to the relatively rapid decrease in $PM_{2.5}$ levels observed at these industrial monitoring sites.

In addition to the on-road mobile emission reductions previously mentioned (Section Five), significant reductions are also expected from off-road mobile sources. Over the next two years, several mobile diesel reduction projects will take place in all of Ohio's nonattainment areas.

Ohio's Diesel Emission Reduction Grant Program (DERG), conceived in Ohio's budget bill H.B. 66, earmarked $19.8 million over the biennium to reduce diesel emissions. The DERG program is available for all public diesel engine fleets and private diesel engine fleets (with public partnership) that have at least 20% matching funds and that operate their updated equipment in Ohio nonattainment and maintenance counties at least 65% of the time. Under the DERG, public fleets include, but are not limited to, school buses, mass transit vehicles, trash trucks, government fleets, etc. Private fleets include, but are not limited to, long and short haul trucks, switcher locomotives, and non-road construction equipment. Non-road vehicles or construction equipment must be working on a surface transportation construction project within an Ohio nonattainment or maintenance area to be eligible. The DERG program leverages private investment in equipment with public resources to ensure that equipment has the best available technology to reduce particulate emissions.

Besides the DERG program, there also are several State and federal programs targeting diesel emission reductions. The Ohio EPA Clean Diesel School Bus Fund Retrofit Program is funded by enforcement penalties and is designed to reduce children's exposure to diesel exhaust from school buses. This program focuses on retrofit existing school buses with devices and/or cleaner fuels that reduce pollution, reduce school bus idling, and improve air quality in Ohio, particularly in counties that are not currently meeting the standards for fine particulates ($PM_{2.5}$). Priority is given to projects from school districts located in nonattainment areas. (See Appendix D – Bus Grant Awards 2006-2008.)

For fiscal year 2008, Congress appropriated funds for the first time under the Energy Policy Act (2005) to help reduce harmful emissions from heavy duty diesel engines. Through the National Clean Diesel Campaign, the EPA will award grants to assist its eligible partners in building diesel emission reduction programs across the country that

improve air quality and protect public health. For fiscal year 2008, the amount of funding available is $49.2 million. The Clean Diesel funding is divided in two programs, the National Clean Diesel program and the State Clean Diesel Grant program.

U.S. EPA's Midwest Clean Diesel Initiative will request proposals for approximately $5 million in federal fiscal year 2008 funds. These funds are part of the National Clean Diesel Program ($49.2 millions appropriated in federal fiscal year 2008). Through this program, U.S. EPA Region 5 anticipates awarding 10 - 20 cooperative agreements ranging from $100,000 to $750,000, subject to availability of funds and the quality of proposals received.

The State Clean Diesel Grant Program makes funds directly available to States interested in establishing new diesel emission reduction programs. Approximately $14.8 million is available for state activities to achieve significant reductions in diesel emissions. The State Clean Diesel Grant Program is an allocation process which allows states to build programs that reduce diesel emissions from the existing fleet. Ohio EPA will deposit State Clean Diesel Grant Program monies into the Ohio Clean Diesel School Bus Fund, to fund school bus retrofits with diesel emission control equipment from the U.S. EPA or CARB verified technology lists. One hundred percent of the federal funds received will be awarded for retrofits, as administrative costs for the program are provided by the Ohio EPA Division of Air Pollution Control and Office of Environmental Education. Applicant school districts must have an anti-idling or other pollution reduction policy in place to be eligible to receive grants. In awarding grants, Ohio EPA gives priority to applicant school districts in nonattainment areas for $PM_{2.5}$ and to proposals that will achieve the greatest $PM_{2.5}$ reductions most cost-effectively.

Monitoring

For the purpose of WOE, monitoring data support the Ohio EPA assessment that attainment of the annual $PM_{2.5}$ standard will be achieved in the whole State by 2009. $PM_{2.5}$ levels in the nonattainment areas have been on a downward path for a number of years, and this trend is expected to continue. Since 2000-2002, $PM_{2.5}$ concentrations at all sites in the State have steadily declined. The three-year average concentration for all sites dropped 1.24µg/m^3 (on average) between the 2000-2002 and 2004-2006 time periods.

In general, $PM_{2.5}$ in Ohio is comprised largely of sulfates, nitrates, and OC, with small contributions from elemental carbon and crustal material. Various analyses of both local and regional monitoring data all indicate that Ohio's nonattainment problem is caused by a combination of regional transport and local emissions from sources in the vicinity of the monitors showing violations of the NAAQS.

Three source apportionment studies were performed using speciated $PM_{2.5}$ monitoring data and statistical analysis methods (Hopke, 2005, STI, 2006, and STI, 2008). The studies show that a large portion of $PM_{2.5}$ mass consists of secondary, regional impacts, which cannot be attributed to individual facilities or sources (e.g., secondary sulfate,

secondary nitrate, and secondary organic aerosols). Nevertheless, wind analyses provide information on likely source regions. Regional - or national - scale control programs may be the most effective way to deal with these impacts. U.S. EPA's CAIR, for example, will provide for substantial reductions in SO_2 emissions over the eastern half of the U.S., which will reduce sulfate (and $PM_{2.5}$) concentrations and improve visibility levels. The source apportionment studies also show that a smaller, yet significant portion of $PM_{2.5}$ mass is due to emissions from nearby (local) sources. Local (urban) excesses occur in many urban areas for organic and elemental carbon, crustal matter, and, in some cases, sulfate. The statistical analysis methods help to identify local sources and quantify their impact.

These source apportionment studies applied statistical methods (i.e., Positive Matrix Factorization) using multiple years of speciated $PM_{2.5}$ monitoring data to identify several source factors, which are named based on their chemical profiles (e.g., coal combustion is associated with high sulfate mass, soil with aluminum, silicon, and calcium mass, and diesel emissions with high elemental carbon mass). The monitoring data were collected at the G.T. Craig and Tikhon monitoring sites in Cleveland (which are the historically high reading monitors in the area). Some of the results from these studies are:

- On average, as much as ¾ of the $PM_{2.5}$ mass in Cleveland is regional in nature. This is likely an upper estimate of the regional impact and was derived by comparing annual average concentrations over the past five years at an upwind rural site (Lorain site = 12.5µg/m^3) to those monitors at GT Craig and Tikhon (17µg/m^3).

- Secondary sulfate from coal combustion is the largest source, comprising about 35% of the mass at GT Craig monitor and 25% at the Tikhon monitor. Seasonal trends show highest values in summer. Most of the sulfate is attributable to regional transport. There is also a local contribution, given the sulfate excess at GT Craig (compared to Tikhon). Although further analysis is warranted, possible sources of interest include barge traffic on the Cuyahoga River and operations at the Port of Cleveland.

- Secondary nitrate from coal combustion is also a large contributor, comprising about 20%. Seasonal trends show the highest values in the winter. Transport patterns on high nitrate days in Cleveland (and Detroit) all cross in northwestern Ohio, where there are elevated ammonia emissions. Further study is needed to assess whether particle nitrate formation in Cleveland is ammonia - or nitric acid-limited, and what are the likely contributing sources.

- Trace metals were analyzed to identify industrial sources, such as smelting (copper, zinc, and iron), steelmaking (iron, manganese), and metal plating (chromium, nickel). Total industrial source impacts were on the order of 15 - 20%. Examination of wind data identified the impact from steelmaking operations located due south of the Tikhon site, and a zinc source located on the east side of the Cuyahoga River.

- Carbon factors contributed about 25-30%. The studies pointed towards the importance of mobile sources for this factor, but had difficulty in separating the spark-ignition (gasoline) and compression-ignition (diesel) mobile source impacts at the Cleveland sites. Higher organic and elemental carbon levels were found in Cleveland compared to an upwind rural site, suggesting the importance of both regional and local emission sources. Elemental carbon was higher at Craig (compared to Tikhon), due to impacts from nearby roadways. It is expected that the on-going University of Wisconsin study will provide better definition of organic carbon sources, including mobile source impacts.

- Source contributions on high $PM_{2.5}$ days (e.g., daily average > 30 ug/m3) are similar to those over all days, with a tendency for higher sulfate and nitrate impacts.

From the Howard Taft monitor data, in the Cincinnati area, it can be determined that organic mass is important to $PM_{2.5}$, composing, on average, 31% of $PM_{2.5}$ mass. Organic mass and secondary organic aerosol (SOA) are important on the highest $PM_{2.5}$ concentration days, which occur primarily in summer and fall. SOA and mobile sources account for most of the organic mass; mobile sources are probably from local sources, while SOA may be a combination of local and regional sources. Industrial sources are also important, and burning is also evident; these sources are also likely a combination of contributions from local and regional sources.

It was also determined that the soil factor has a larger portion of the mass than in other cities and accounts for more mass than composition implies. Large soil influence is likely due to heavy construction activity near the site. The Positive Matrix Factorization also has organic carbon and elemental carbon (consistent with construction equipment emissions). In general, organic carbon apportionment for the Cincinnati data was somewhat different than for the other cities, in part because the soil factor had the biggest organic mass among the sites, and no burning factor was found. The mobile factor accounted for 35% of the organic mass, and the diesel factor contribution was 20%. The results for the diesel factor were more uncertain at this site than at other sites. Organic mass was higher in the sulfate and zinc related industrial factors compared to the industrial factors at the other sites. It is not clear why this occurs.

Determining the source of local organic carbon emissions is difficult. Results of source apportionment studies conducted to date are not definitive due to data limitations, and there are still many unanswered questions. More definitive studies are necessary to be able to identify the sources of organic carbon excess, especially at the Cleveland area.

Modeling

For the purpose of WOE, photochemical and dispersion modeling support the Ohio EPA estimation that attainment of the annual $PM_{2.5}$ standard will be achieved by 2010 at the monitors currently exceeding the NAAQS, and that monitors that are meeting the

standard will remain in attainment of the annual standard. The most recent combination of photochemical modeling and local scale controls will show attainment of the standard at all the State $PM_{2.5}$ monitors, except at the St. Tikhon monitor in Cuyahoga County.

Extensive photochemical modeling (CAMx) has been conducted by LADCO to address $PM_{2.5}$. LADCO's Technical Support Document (Appendix D) describes modeling parameters, testing of the model, and predicted reductions in this pollutant in future years.

LADCO used air quality modeling and other information to determine whether existing ("on the books") controls would be sufficient to provide for attainment of the NAAQS for ozone and $PM_{2.5}$ and if not, what additional emission reductions would be necessary for attainment. Table 10 from LADCO's Technical Support Document (Appendix D) shows the modeled $PM_{2.5}$ levels at several monitors in Ohio. The table shows two modeling scenarios. Round 5/Base M (2005 base year) is a more recent version than Round 4/Base K (2002 base year). As said before, the Round 5 modeling demonstrated that all monitors with the exception of the St. Tikhon monitor show attainment by the 2010 attainment date.

The highest monitors in the Round 5 modeling (base year 2005) have the following 2009 values:

Site	Value
Cleveland-St. Tikhon	15.2
Cleveland-GT Craig	15.0
Cincinnati - Seymour	14.5
Cincinnati - Taft Ave	12.8
St. Bernard	14.7
Steubenville	12.8
Mingo Junction	13.5

Section Seven

Attainment Demonstration Strategy

As shown before, on the books controls demonstrate attainment of the annual $PM_{2.5}$ standard throughout Ohio, except for one monitor in the Cleveland area (St. Tikhon monitor). It is also recognized that the new 24-hour $PM_{2.5}$ standard will not be attained in several areas by the expected attainment date with the existing control strategies. This is why Ohio will continue to develop strategies, in an effort to reduce emissions from the high emission/concentration areas within the State.

Based on the results of technical analysis performed by LADCO and based on programs and controls already implemented in $PM_{2.5}$ nonattainment areas, no single program or plan can be relied upon to demonstrate attainment. It is important to recognize that some programs or controls (i.e. diesel emission reduction initiatives) that will contribute to air quality improvement and attainment do not necessarily lend themselves to regulatory action and that control in certain parts of the nonattainment areas will contribute very little towards attainment.

The approach to demonstrate attainment for fine particulate should be a multifaceted strategy. In general, the components for the attainment demonstration strategy for $PM_{2.5}$ are:

a) Implementation of national controls.
b) Implementation of local controls.
c) Areas of progress and continued study.

National Controls

- Mobile Sources:

  Mobile sources are recognized as a significant contributor to $PM_{2.5}$ levels in both attainment and nonattainment areas. The contribution of mobile sources to $PM_{2.5}$ levels will be reduced throughout the region and nation as a result of several new federal requirements. These requirements affect both vehicle design as well as fuel specifications. It is estimated that the following programs will reduce $PM_{2.5}$ mobile source emissions by over 51 percent between 2002 and the attainment year, 2010.

  - Tier 2 Emission Standards: There will be significant reductions in mobile source emissions (SO_2) from implementation of the Tier 2 program. The Tier 2 program requires manufacturers to produce vehicles that emit much lower levels of pollution than earlier generations.

- Diesel Rule: U.S. EPA estimates its new Diesel Rule will result in a 97 percent reduction in emissions from heavy-duty diesel trucks. As with gasoline vehicles, these reductions will occur throughout the entire country.

- Low Sulfur Gasoline and Diesel Fuel: Beginning in 2004, refineries began phasing in a new sulfur level for gasoline due to the new federal standard for fuel. This standard requires the average sulfur level to be no greater than 30 parts per million (ppm). This represents a 10 – fold reduction where average national levels in 2002 were 300 ppm. Also beginning in 2006, a new requirement for ultra low sulfur diesel fuel (150 ppm) began phasing in. As with gasoline, this represents an enormous decrease from the 380 ppm average measured in 2002.[3] These sulfur reductions are a key contributor to large scale vehicular emission reductions in SO_2.

- 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. 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 ppm now to 15 ppm in 2010. New engine standards take effect, based on engine horsepower, starting in 2008. Reductions in NOx and PM emissions from non-road diesel engines will provide enormous public health benefits. U.S. EPA estimates that by 2030, controlling these emissions would annually prevent 12,000 premature deaths, 8,900 hospitalizations, and one million work days lost.

- Stationary Sources:

  - Clean Air Interstate Rule (CAIR): In 2005, the U.S. EPA issued the Clean Air Interstate Rule (CAIR), a rule that will achieve the largest reduction in air pollution in more than a decade. CAIR will ensure that Americans continue to breathe cleaner air by dramatically reducing air pollution that moves across state boundaries. In 2015, CAIR will provide health and environmental benefits valued at more than 25 times the cost of compliance. CAIR will permanently cap emissions of sulfur dioxide (SO_2) and nitrogen oxides (NOx) in the eastern United States. When fully implemented, CAIR will reduce SO_2 emissions in these states by over 70 percent and NOx emissions by over 60 percent from 2003 levels. This will result in $85 to $100 billion in health benefits and nearly $2 billion in visibility benefits per year by 2015 and will substantially reduce premature mortality in the eastern United States. The benefits will continue to grow each year with further implementation.

3 "Boutique Fuels" and Reformulated Gasoline: Harmonization of Fuel Standards. CRS Report for Congress, 2006

Local Controls

- Diesel Emission Reduction Grant:

Despite the massive reduction in vehicular emissions as a result of on-board controls and cleaner fuels, a small portion of the vehicle population contributes disproportionately to the total amount of these emissions. Ohio's Diesel Emission Reduction Grant Program (DERG) will target public and private on-road and/or non-road diesel engine fleets over a period of two years (FY 2008 and FY 2009). The program will grant projects in $PM_{2.5}$ nonattainment areas. Grants for the first round are expected to be awarded by July 2008.

- Enforcement Programs:

  - Pierre Foods Inc.: Pierre Foods operates a meat processing facility located in the Cincinnati Area (Butler County). Pierre Foods cooks meat products that are later frozen and shipped to various clients, including schools and fast food restaurants. The facility operates ten cook lines that are air contaminant sources and have been issued permits to install. Pierre Foods is located approximately 7 miles away from a $PM_{2.5}$ high reading monitor.

    Findings and Orders were issued by Ohio EPA to the facility for emission violations of opacity and public nuisance standards. The enforcement settlement required the facility to install emission control devices that would reduce total particulate emissions on the order of 419 tons per year; in addition, the facility was required to pay the amount of $125,000 in settlement of Ohio EPA's claims for civil penalties.

  - Mittal Steel: Mittal Steel is located in the Cleveland area (Cuyahoga County) a few miles from both St. Tikhon and GT Craig monitors. Ohio EPA believes Mittal Steel is impacting the highest reading monitors in Cuyahoga County. USEPA identified violations centered mostly on increases in production (50% to 80%) without New Source Review (and the associated permitting and additional control of emissions). The increased production capacity also increased emissions of PM and SO_2.

    U.S. EPA has concentrated on three specific areas: the blast furnace bleeder valves, slag processing, and the C5 blast furnace and the C6 bell-less top blast furnace. U.S. EPA's current schedule is to have agreement with the company regarding injunctive relief by the end of this year (2008) and to have the Consent Decree entered in 2009. U.S. EPA has stated that they expect to see substantial $PM_{2.5}$ reductions as a result of the injunctive relief.

- Plant Closures and Changes in Operations:

  - Ford Motor Company, Cleveland Casting Plant: As part of its plan to improve its profitability, Ford Motor Company has decided to shut down its Cleveland Casting Plant (CCP). The plant will phase out its operations until it completely shuts down in 2010. The CCP is located approximately 8.5 miles away from the highest $PM_{2.5}$ reading monitor (St. Tikhon monitor) and 9.2 miles from the GT Craig monitor. It is expected that the production ramp down leading to the shutdown of CCP in 2010 will have a significant effect on total particulate emissions reductions.

    The CPP shutdown schedule is as follows:

    - Production at CCP will be reduced to a level to allow one of the cupolas to be permanently shut down no later than December 2008.
    - Production will be reduced to a level to allow mold lines to be permanently shut down by no later that December 2008.
    - All production activities will be shut down by December 2010.

Progress and Evaluation

- PM2.5 FRM and PM2.5 speciation monitoring network enhancement:

In order to improve the understanding of the $PM_{2.5}$ nonattainment problem in Ohio, with special emphasis in the Cleveland and Cincinnati areas, enhancements to the current monitoring network are needed. These improvements in the network will help Ohio to track progress towards attainment.

While the national and local controls will have a significant impact on $PM_{2.5}$ in Ohio, greater understanding of the excess organic carbon component is needed. Time and effort has been spent analyzing available organic carbon data. Having more $PM_{2.5}$ speciation monitors will allow the Agency to determine the type of pollutants present and, therefore, design specific control measures.

- Steel Plant Study (Arcelor-Mittal):

One of the control strategies Ohio EPA is likely to consider are additional emission controls at local sources that contribute to high PM2.5 levels. Special focus will be given to sources located in the Cleveland nonattainment area.

One of the largest contributors of high levels of $PM_{2.5}$ is the Arcelor-Mittal steel plant located in the Cleveland area (located one mile and two miles away from St. Tikhon monitor and GT Craig monitor respectively).

It will be necessary to characterize the $PM_{2.5}$ emissions from all of the processes at the steel plant, identify technically feasible control measures (including increased or improved monitoring for $PM_{2.5}$), estimate potential costs of additional controls, and determine the ambient air quality impacts of installing additional controls.

Section Eight

Reasonable Further Progress Requirements

Rule 40 CFR part 51.1009 requires a demonstration of Reasonable Further Progress (RFP); however, if a state submits an attainment demonstration showing attainment by 2009, the state is not required to submit a separate RFP plan. Ohio plans to reach attainment by 2009; and therefore, it will not be necessary to submit a separate RFP plan.

Section Nine

Contingency Measures

Rule 40 CFR part 51.1012 requires states to submit specific contingency measures to be undertaken if the areas fail to make reasonable further progress, or fail to attain the PM2.5 NAAQS by the attainment date.

Ohio will consider contingency measures 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.

The Northeast Ohio Areawide Coordinating Agency (NOACA) based on 12 months of work, studied and reviewed a series of emissions reductions strategies for Northeast Ohio (Cleveland nonattainment area) and the potential impact on air pollution precursors emitted by mobile sources and stationary sources. NOACA's work provided a series of recommendations for the annual fine particulate state implementation plan.

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 measures will be appropriate at an unspecified time in the future, the list of contingency measures outlined below is not comprehensive. Some of the contingency measures that were evaluated and would be considered are as follows:

1) Diesel reduction emission strategies.
2) Outdoor Wood-Fired Boilers Regulation
3) Alternative fuel (e.g., liquid propane and compressed natural gas) and diesel retrofit programs for fleet vehicle operations.
4) Tighter PM, SO_2 and NOx emission offsets for new and modified major sources.
5) Impact crushers located at recycle scrap yards – upgrade wet suppression.
6) Charbroiling operations at restaurants – reduce smoke dispersion.
7) Concrete manufacturing –upgrade wet suppression
8) NOx RACT – statewide:
   - ICI Boilers – SO_2 and NOx controls.
   - EGUs.
   - Process heaters.
   - Internal combustion engines.
   - Combustion turbines.
   - Other sources greater than 100 tpy

No contingency measure will be implemented without providing the opportunity for public participation during which the relative costs and benefits of individual measures, at the time they are under consideration, can be evaluated.

Section Ten

Public Participation

A public notice was published in the widely distributed county publications on August 7, 2008, announcing the opening of a 30-day public comment period. The public notice also announced that two Public Hearings will be held on September 16, 2008 at 7:00 P.M., at the Columbus Public Library - Hilliard Branch, 4772 Cemetery Road, Hilliard, Ohio and on September 17, 2008 at 6:30 P.M., at the Twinsburg Public Library - Meeting Room 1, 10050 Ravenna Road, Twinsburg, Ohio. The public notice, along with a copy of the SIP, including all appendices, was posted on the Ohio EPA website at http://www.epa.state.oh.us/dapc

For documentation of the public participation process see Appendix G.

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