Modeling Protocol:
2005 Basecase Technical Details

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1. INTRODUCTION

The purpose of this document is to provide technical details relating to photochemical modeling done to support State Implementation Plans for ozone, PM2.5, and regional haze using the 2005 base year. Information relevant for the 2005 basecase is presented in this document. Documents that relate to a conceptual description of ozone, PM2.5, and regional haze in the Upper Midwest are available on the organization website: www.ladco.org.

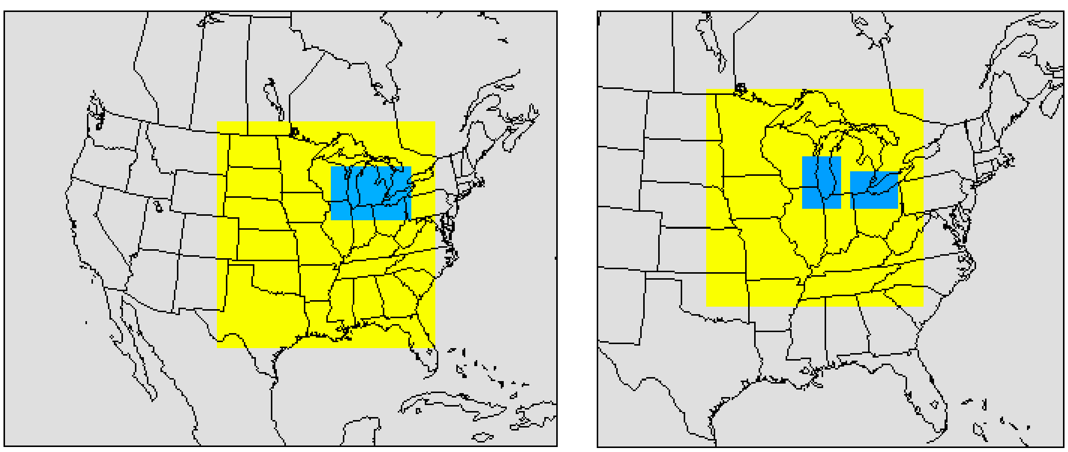
The computing platforms are Intel-based PCs running variations of the Linux operating system. The Portland Group (PGI) Fortran compiler is used to create all executables.

2. METHODOLOGY

Grid Projection and Domains (same as 2002 protocol)

All models are applied with a Lambert projection centered at (-97, 40) and true latitudes at 33 and 45. The 36 km photochemical modeling domain consists of 97 cells in the X direction and 90 cells in the Y direction covering the central and eastern United States with 36 km grid cells (Figure 2.1; Table 2.1). The 2-way nested 12 km photochemical domain covers most of the upper Midwest region. A 2-way nested 4 km photochemical domain is situated over the lower portion of Lake Michigan and over Detroit-Toledo-Cleveland.

Figure 2.1 Modeling Domains: Meteorological (left), photochemical (right)



The 36 km meteorological modeling domain covers the entire continental United States (Figure 2.1; Table 2.1). The 12 km meteorological domain covers most of the central and eastern United States and the 4 km domain covers the lower portion of the Great Lakes. CAMx4 is applied with the vertical atmosphere resolved with 16 layers up to approximately 15 kilometers above ground level.

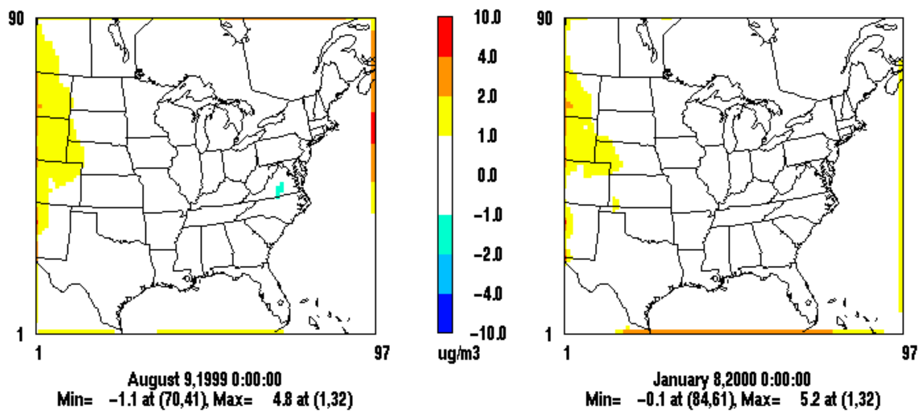
Table 2.1 Modeling Domains

Grid	Cell Size	XY Origin (km)	NX, NY
Emissions	36 km	(-2628., -1980.)	147, 111
Meteorological	4 km	(576., 108.)	214, 142
Meteorological	12 km	(-648., -1260.)	193, 199
Meteorological	36 km	(-2952., -2304.)	165, 129
Photochemical	36 km	(-900., -1620.)	97, 90
Photochemical (lm)	4 km	(608., 140.)	83, 128
Photochemical (detcle)	4 km	(1040., 176.)	74, 56
Photochemical/Emissions	12 km	(-48., -552.)	131,131

The photochemical model is not being applied to the entire 36 km Continental U.S. domain to maximize resources. A sensitivity study was conducted to compare winter and summer episode averaged PM2.5 concentrations between a Continental U.S. domain and Central/Eastern U.S. domain using clean boundary conditions released with the CMAQ model. The episode average differences in PM2.5 were less than 1 ug/m3 in the Midwest RPO States and neighboring States (Figure 2.2).

Figure 2.2 Continental Domain – Central/Eastern U.S. Domain Episode Average

PM2.5 Difference Plots for Summer (left) and Winter (right) episodes



Meteorological Inputs

The meteorological input data for 2005 modeling are developed with the National Center for Atmospheric Research (NCAR) 5th generation Mesoscale Model (MM5) version 3.6 (Dudhia, 1993; Grell et al, 1994) by Alpine Geophysics, LLC under contract from the Midwest Ozone Group. MM5 physics options and configurations for the 2005 simulations are the same as used for 2002 simulations (McNally and Schewe, 2006; Baker et al, 2007c). Important MM5 parameterizations and physics options include mixed phase (Reisner 1) microphysics, Kain-Fritsch 2 cumulus scheme, Rapid Radiative Transfer Model, Pleim-Chang planetary boundary layer (PBL), and the Pleim-Xiu land surface module. Analysis nudging for temperature and moisture is only applied above the boundary layer. Analysis nudging of the wind field is applied above and below the boundary layer.

MM5 performance for 2005 was evaluated by Alpine Geophysics for the Midwest Ozone Group and independently by Lake Michigan Air Directors Consortium. Performance for 2005 is considered comparable to 2002 performance and appropriate for regulatory modeling (Baker et al, 2007).

The meteorological fields output by MM5 are prepared for use by the photochemical model with processing utilities. These programs translate certain meteorological parameters from the MM5 grid to the photochemical grid. Additionally, these processors estimate parameters such as vertical diffusivity coefficients that are not explicitly output by MM5. The MM5CAMx version 4.4 utility is used to translate MM5 output to CAMx input. The vertical diffusivity coefficients are based on the O'Brien 1970 vertical diffusivity algorithm. This scheme takes the PBL height output by MM5 and creates a well-mixed atmosphere inside the PBL. The minimum vertical diffusivity coefficient is 0.1 m^2/s. A landuse-weighted vertical diffusivity coefficient (maximum of 1.0 m^2/s in a completely urban grid cell) is assigned to all grid cells up to approximately 150 meters above ground (model layer 3).

The vertical resolution used in MM5 consists of 34 sigma layers that represent the terrain following atmosphere up to 100 millibars. Figure 2.7 displays each vertical layer in terms of sigma level, pressure (millibars), height above ground level (meters) and layer thickness (meters). The relationship to the layer structure used in the photochemical models is also shown. The photochemical model layer structure avoids layer collapsing in the lower boundary layer to better resolve the mixing depth.

Figure 2.7 Vertical Layer Structure

k(MM5)	sigma	p(mb)	depth(m)	k(PCM)	depth(m)
34	0.000	100	1841	16	5597
33	0.050	145	1466		
32	0.100	190	1228		
31	0.150	235	1062		
30	0.200	280	939	15	2549
29	0.250	325	843		
28	0.300	370	767		
27	0.350	415	704	14	2533
26	0.400	460	652		
25	0.450	505	607		
24	0.500	550	569		
23	0.550	595	536	13	1522
22	0.600	640	506		
21	0.650	685	480		
20	0.700	730	367	12	634
19	0.740	766	266		
18	0.770	793	259	11	428
17	0.800	820	169		
16	0.820	838	166	10	329
15	0.840	856	163		
14	0.860	874	160	9	318
13	0.880	892	158		
12	0.900	910	78	8	155
11	0.910	919	77		
10	0.920	928	77	7	153
9	0.930	937	76		
8	0.940	946	76	6	151
7	0.950	955	75		
6	0.960	964	74	5	148
5	0.970	973	74		
4	0.980	982	37	4	37
3	0.985	987	37	3	37
2	0.990	991	36	2	36
1	0.995	996	36	1	36
--SURF--	1	1000	0	--SURF--	--SURF--

A compromise in the upper troposphere is met by employing layer collapsing to reduce computational effort and still maintain some upper troposphere resolution for long-range transport. The layer structure chosen for a modeling application should be capable of adequately resolving the diurnal variations in the boundary layer growth and mixing, long-range transport processes, wind shear, as well as transport to and from the free troposphere.

Emissions Inputs

Emissions developed for the 2005 basecase and future year inventories projected from 2005 are discussed in the “Base M/Round 5 Emissions Report” (LADCO, 2007). Anthropogenic emissions are developed for a weekday, Saturday, and Sunday for each month of 2005. On-road motor vehicle emissions were developed for a January and July weekday, Saturday, and Sunday. On-road motor vehicle emissions for other months are interpolated between the January and July estimates. On-road and biogenic volatile organic carbon (VOC) emissions are speciated for the CB05 chemical speciation profile (Environ CB05 report). All other sectors of the inventory are speciated for the CB-IV chemical speciation profile (Carter, 1996). CB-IV emissions are useable with CB05 chemistry (Environ CB05 report).

The Model of Emissions of Gases and Aerosols from Nature (MEGAN) was recently developed as the next generation emission model for biogenic emissions of gases and aerosols (Guenther and Wiedinmyer, 2006). MEGAN has been implemented into the CONsolidated Community Emissions Processing Tool (CONCEPT) emissions modeling framework (Wilkinson, 2006). Biogenic emissions are estimated for each day of the simulation using the MEGAN model as implemented in CONCEPT (Baker, 2007d). MEGAN explicitly outputs import biogenic secondary organic aerosol pre-cursor species including monoterpenes and sesquiterpenes that are used by the CAMx SOA chemistry module.

MEGAN groups plants and area coverages by plant functional type (PFT) rather than treating plant species explicitly as in the BIOME (and BEIS) models. Total emissions are the sum of emissions estimated for each PFT in a given grid cell. PFTs include broadleaf trees, fine leaf evergreen trees, fine leaf deciduous trees, shrubs, grass, and crops. Plant functional type data has been gridded to a scale of 30 seconds by 30 seconds and made available with the MEGAN model (Guenther et al, 2006). Soil wilting point data and leaf area index are also gridded to the same scale and used as input to MEGAN.

Volatile organic compounds are speciated to the Carbon Bond 2005 chemical speciation profile. Inputs to the biogenic model include hourly satellite photosynthetically activated radiation (PAR) and 15 m (above ground level) temperature data output from MM5 (Pinker and Laszlo, 1992). Other inputs to MEGAN include plant functional type (PFT) emission factors, PFT area coverage, soil wilting point data, leaf area index, and additional meteorological variables including soil moisture. Soil moisture estimated by MM5 for the 1 m soil depth is used as input to MEGAN because it represents the plant root layer.

Landuse (same as 2002 protocol)

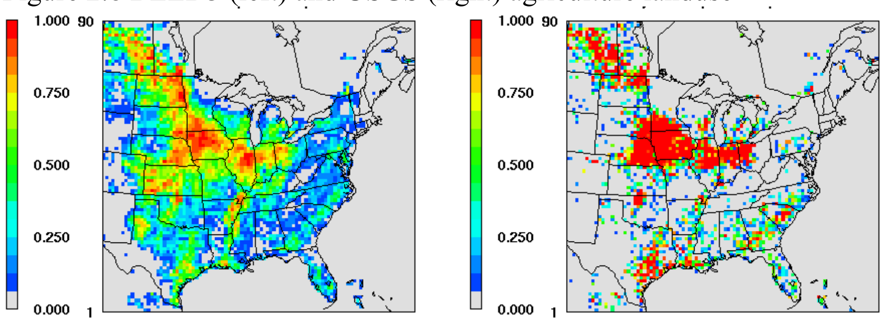
The photochemical model uses 11 land use categories to describe the surface. The land use file is based on BELD3 1 km data (US EPA, 2006; Kinnee et al. 1997; Kinnee et al. *in press*). The 1 km data was aggregated to the appropriate grid resolution for photochemical modeling. Surface roughness varies by season and land use category and are taken from EPA’s AERMET User’s Guide (EPA, 2004; ENVIRON, 2007).

Table 2.3 Landuse categories

Category	Landuse
1	Urban
2	Agricultural
3	Rangeland
4	Deciduous forest
5	Coniferous forest
6	Mixed forest
7	Water
8	Mixed agriculture/forest
9	Non-forested wetlands
10	Mixed agriculture/range
11	Rocky with low shrubs

USGS data was previously used for landuse information. The BELD3 was chosen because it incorporates the USGS data with other sources of information such as satellite data. A spatial comparison of the agriculture (category 2) landuse fractions are shown below.

Figure 2.8 BELD3 (left) and USGS (right) agriculture landuse



Drought Stress and Snow Cover (same as 2002 protocol)

The Palmer Drought Severity Index (PDSI) is an indicator of unusual excess or deficient moisture. The PDSI is calculated for 350 climatic divisions in the United States and Puerto Rico. PDSI data is available for each week of a calendar year and is obtained from the National Weather Service Climate Prediction Center (National Weather Service, 2005). The dry deposition calculations for non-water landuse categories are impacted by vegetative response to drought stress (ENVIRON, 2007).

Snow cover is also input to CAMx4 for the deposition scheme. Three-hourly snow cover data for each grid cell is extracted from MM5 output files. If snow exists in a grid cell, the deposition characteristics of the landuse are switched from “winter” to “winter with snow.” This switch has an impact on surface resistances for dry deposition, surface roughness, and chemistry due to the ultraviolet albedo being changed to the maximum class (ENVIRON, 2007).

Photolysis Rates (same as 2002 protocol)

Many chemical reactions in the atmosphere are started by the photolysis of certain trace gases. Photochemical models require these rates be input to accurately estimate these reactions. CAMx4 is applied with day specific photolysis rate look-up tables.

The Tropospheric Ultraviolet-Visible (TUV) radiation model is used to calculate photolysis rates based on solar zenith angle, height above ground, ultraviolet albedo of the ground, atmospheric turbidity, and total ozone column density. The TUV generates rates for each day as a function of 11 heights, 10 solar zenith angles, 5 ozone column values, 5 albedo values, and 3 turbidity values (ENVIRON, 2007; NCAR, 2006).

The ozone column data is derived from daily TOMS satellite observations (NASA, 2006). The albedo data varies by month and is based on over 10 years of TOMS satellite reflectivity observations. Actinic flux is estimated using the discrete ordinate algorithm. The two-stream delta-Eddington method is also available in the TUV model, but was not selected because the discrete ordinate approach is more accurate.

A sensitivity application with CMAQ using TOMS derived photolysis rates and rates based on seasonal average ozone column showed differences in ozone up to 3 ppb and differences in sulfate ion up to 1.5 ug/m^3. These differences suggest day specific ozone column data from satellites should be used rather than seasonal averages and that accurate photolysis rates are important for ozone and particulate matter applications.

For those days that do not have TOMS ozone column data, the data from the previous day is used instead. This option is more realistic than defaulting to a seasonal average, which may create a rather large discontinuity between the missing day and adjoining simulation days.

Initial and Boundary Conditions (same as 2002 protcol)

Boundary conditions represent pollution inflow into the model from the lateral edges of the grid and initial conditions provide an estimation of pollution that already exists. In the past a spin-up period of two to three days was used to eliminate initial condition effects for ozone modeling.

CAMx4 source apportionment runs show ozone attributed to initial concentrations does not exceed 5 ppb anywhere in the domain by the 7^{th} day of the episode; ozone modeling episodes will be spun up with 11 days. The monitors used in model performance evaluation are far enough away from the boundaries that boundary influence is considered minimal.

CAMx4 particulate source apportionment (PSAT) runs show PM2.5 sulfate ion, nitrate ion, and ammonium ion contributions from initial concentrations fall below 0.05 $\mu g/m^3$ by the seventh day of the episode. PM2.5 elemental carbon, PM2.5 soil, and coarse mass have less than 1 ng/m^3 contribution from initial concentrations on the first day of the model episode everywhere in the modeling domain. Since gas phase chemistry is coupled with particulate formation, the annual simulations have two weeks of spin-up to minimize initial condition influence.

The initial and boundary conditions are based on monthly averaged species output from an annual (calendar year 2002) application of the GEOS-CHEM global chemical transport model (Jacob et al, 2005; Bey et al, 2001). Boundary conditions vary by month and in the horizontal and vertical direction. Where an initial or boundary concentration is not specified for a pollutant the model will default to a near-zero concentration.

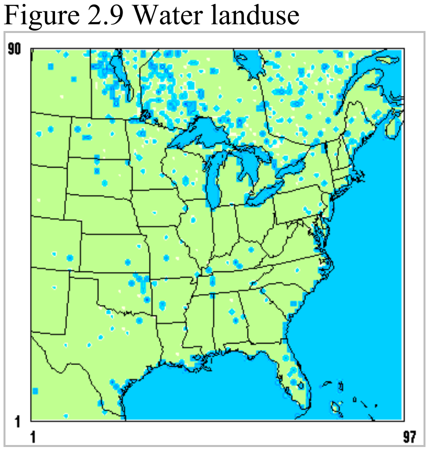
A study applying CMAQ with monthly averaged and 3-hr GEOS-CHEM initial and boundary conditions showed almost no change in model performance for any PM2.5 species. The error for total PM2.5 and each of the chemical species differed by less than 0.04 ug/m^3 at IMPROVE and EPA STN monitor sites (Morris et al, 2004b). Considering the need to model multiple annual simulations and potential issues related with inconsistencies between in-flows and out-flows between the GEOS-CHEM meteorology and the MM5 simulation used for regional modeling, the monthly averaged concentrations are used to support photochemical modeling applications.

Quality Assurance of Model Inputs (same as 2002 protocol)

The model input files are checked for reasonableness to ensure they accurately represent the underlying data used to create the files. The checks described in this document are steps that are in addition to the extensive QA done in the emission inventory compilation process, EMS emissions modeling, and MM5 modeling process.

The landuse files are converted to a CAMx4 output file format and directly viewed in PAVE over a political map. An example of the water landuse category is shown in the figure in this section.

Figure 2.9 Water landuse



The initial and boundary conditions processor outputs an ASCII file showing the specie concentration at each vertical layer. This is visualized in EXCEL to make sure the data is correctly mapped in the vertical direction. The initial and boundary concentration files themselves are also directly viewed in PAVE and the spatial representation is checked. The ozone column, albedo, and turbidity data are kept in ASCII files. Each file is checked to ensure the data looks spatially reasonable and that bad data did not get included in the file.

The emissions inputs are extensively checked for appropriateness. The steps taken in manipulating EMS-2003 output files to CAMx4 input files and the quality assurance of those files are detailed in "Emissions Processing and QA" (Baker, 2004b). Each emission file is checked for spatial and temporal agreement with EMS-2003 and for reasonableness. Additionally, the mass for each species is totaled by State and over the entire modeling domain and compared to EMS-2003 QA reports.

The MM5 output used to support the photochemical modeling is extensively evaluated from a meteorological perspective. An additional layer of quality assurance is done by evaluating model performance of the air quality model input meteorological data at several monitor locations. This is done for temperature, relative humidity, wind speed, and wind direction.

Photochemical model simulations also provide a level of quality assurance since deficiencies in emissions and meteorological inputs will be apparent in the photochemical model performance.

Photochemical Model Configuration

The Comprehensive Air Quality Model with Extensions (CAMx) version 4.50 uses state of the science routines to model particulate matter formation and removal processes over a large modeling domain (Nobel et al. 2002; Tanaka et al. 2003; Chen et al. 2003; Morris, Mansell, Tai, 2004). The model is applied with ISORROPIA inorganic chemistry, SOAP organic chemistry, regional acid deposition model (RADM) aqueous phase chemistry, and the carbon-bond 2005 (CB05) gas phase chemistry module (ENVIRON, 2007; Nenes et al, 1998; ENVIRON, 2007). CAMx4 is applied using the PPM horizontal transport scheme and an implicit vertical transport scheme with the fast CMC chemistry solver (ENVIRON, 2007). The chemical mechanism 6 is selected for the 2005 simulations, which includes additional PM2.5 secondary organic aerosol formation (ENVIRON, 2006; ENVIRON 2007). An updated dry deposition scheme that is based on AEROMOD is chosen for the 2005 simulations. This scheme uses gridded monthly leaf area index to adjust dry deposition velocities (Kemball-Cook et al, 2007).

CAMx4 models PM particles in the fine and coarse size fraction. There is no mechanism in the model to transfer mass between these 2 size sections. The particle density and diameter does not change from specie specific input values during a model simulation for either particle size bin.

The photochemical model is initiated at midnight Eastern Standard Time and run for 24 hours for each episode day. The summer 2005 simulation is initiated on June 2 and run through September 15. The annual simulation is run separately by calendar quarter and is initiated 2 weeks prior to each quarter: December 17 (2004), March 15, June 15, and September 15. The base and future year scenarios submitted as support for the annual PM2.5 standard will be using a horizontal grid resolution of 12 km. The modeling to support the 8-hr Ozone NAAQS will be at 12 km horizontal resolution over the entire upper Midwest with optional 2-way nested 4 km grids over the lower portion of Lake Michigan and over the Detroit-Toledo-Cleveland region.

Future year simulations will be applied with the same model configuration as for the base case simulation. All inputs except for emissions will be the same in the future year and base year simulations to assess changes in ozone, visibility, and PM2.5 due to control strategies and future growth. The terms base case and base line emissions inventories are one in the same, both referring to day specific biogenics and monthly weekday, Saturday, Sunday anthropogenic emissions.

Plume-in-Grid and Nesting

The GREASD sub-grid plume treatment option is being applied in CAMx4 for the summer season 12 km ozone simulations. This option is selected to improve the model treatment of large NOx plumes being released near Lake Michigan and Lake Erie. Sources included for the plume-in-grid treatment include any source near the Great Lakes with NOx emissions greater than 12 tons per day for any day of the summer in 2005 and 6 tons per day in future year scenarios.

At high grid resolutions of 4 km or finer, sub-grid scale treatment of plumes should not be applied since the fine grid appropriately captures the small scale physical and chemical processes.

Nested grids are useful to keep computational and data management resources acceptable while addressing important model application issues such as complex terrain, land-sea or land-lake breezes, and spatial emission gradients. They may also be useful to keep large point source plumes in smaller grid cells in lieu of having explicit sub-grid scale plume treatments.

CAMx4 allows for the inclusion of a fine grid within the coarse grid in a 2-way nesting mode. The 2-way nesting mode allows for interaction between the larger coarse grid with the smaller fine grid. This improves pollutant transport around the boundaries of the fine grid since a parcel of air may move from the fine grid, out to the coarse grid, and back into the fine grid depending on the shifting wind fields. This re-circulation is impossible in 1-way nesting applications.

Probing Tools

Probing tools are valuable from a scientific and regulatory perspective for one-atmosphere modeling. Use of source apportionment is more desirable for regulatory applications than the use of the "zero-out" approach to determine geographic and emissions sector culpability for long-term modeling simulations. Zeroing out emissions for large regions such as entire States fundamentally changes the atmospheric chemistry and makes interpretation of the results difficult.

An option in CAMx is employed to force elevated point sources into particular regions rather than placement based on coordinates and the 12 km geographic region map. This ensures that elevated emissions are placed in the appropriate geographic region and not incorrectly grouped with another region when a grid cell contains the boundary for more than one region. A good example of this is the Ohio River Valley where many large stationary point sources exist along State boundaries and could be grouped into the wrong region based on the 12 km grid cell source region map. This option improves the confidence in the source apportionment results for stationary point sources.

Ozone

CAMx is a state of the science photochemical model that contains a variety of ozone source apportionment tools, including the original ozone source apportionment tool (OSAT) and the anthropogenic pre-cursor culpability assessment (APCA) tool. The APCA tool assesses regional and emission sector contribution to ozone formation and provides information that is most policy relevant. When ozone is formed under VOC limited conditions due to biogenic VOC + anthropogenic NOx then OSAT attributes it to the biogenic VOC sources. When ozone is formed under NOx-limited conditions due to biogenic VOC + anthropogenic NOx then OSAT attributes it to the anthropogenic NOx sources. APCA is designed to provide more control strategy relevant information and recognizes that there are source categories such as biogenics that can not be controlled so the model only attributes ozone to biogenics when it is due to the interaction of biogenic VOC + biogenic NOx. In the case where ozone formed to biogenic VOC + anthropogenic NOx under VOC-limited conditions, OSAT attributes it to biogenic VOC, but APCA redirects the attribution to anthropogenic NOx. In NOx-limited conditions both OSAT and APCA attribute the ozone to anthropogenic NOx (ENVIRON, 2007). The APCA tool is chosen to track ozone contribution for this modeling study.

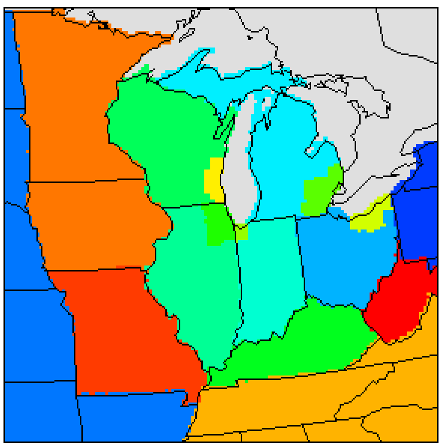
The source apportionment data is the average contribution over all modeled hours where predicted ozone at the monitor is greater than a threshold concentration value. Two different thresholds are used to examine different distributions of high modeled 8-hour ozone: 75 and 85 ppb (Baker, 2007). The geographic regions tracked for ozone contribution are listed in Table 2.4

and shown graphically in Figure 2.10 over the 12 km modeling domain. The contribution from the lateral and top boundaries of the model is also tracked for each receptor location.

Table 2.4 Complete list of source regions tracked for ozone contribution

Canada	Illinois Chicago non-attainment (NA) Counties
Northeast States (MANE-VU)	Detroit NA Counties
Central/Western States (CENRAP+ WRAP)	Indiana Chicago NA Counties
Ohio	Cleveland NA Counties
Michigan	Milwaukee NA Counties
Indiana	Southeast States (VISTAS)
Illinois	Minnesota+Iowa
Wisconsin	Missouri
Kentucky	West Virginia

Figure 2.10 Source regions tracked in the 12 km grid domain



Six emissions source sectors are tracked for contribution to ozone: onroad mobile, offroad mobile, area, electrical generating units, non-electrical generating units, and biogenics. Offroad mobile emissions include sources such as construction equipment, locomotives, commercial marine vessels, and airports. Two distinct groups of stationary point sources are tracked for contribution to ozone: electrical generating units and non-electrical generating units.

Particulate Matter and Visibility

The Particulate Source Apportionment Tool (PSAT) tracks contributions of PM2.5 sulfate ion, nitrate ion, ammonium ion, elemental carbon, and primary emissions of organic aerosol, soil, and coarse mass. Secondary organic aerosol tracking is also part of the tool but not employed for this study due to resource constraints. Secondary organic aerosol contributions from biogenic and anthropogenic sources are part of the standard CAMx output and included in the analysis.

Source apportionment results will be estimated on an annual average basis and on a daily 24-hr basis to be relevant to the annual and 24-hr PM2.5 NAAQS. The 24-hr average source apportionment results for the 20% worst and 20% best days at the Class I area receptors will be converted to light extinction then averaged together using the latest IMPROVE Steering Committee recommended equation (IMPROVE, 2006). Contributions from initial conditions are quantified to determine an optimal amount of spin-up time required to minimize the impacts from initial concentrations.

The geographic regions tracked for contribution are listed in Table 2.5 and shown graphically in Figure 2.11. The contribution from the lateral and top boundaries of the model is also tracked for each receptor location.

Figure 2.11 Model domain and source regions tracked with PSAT

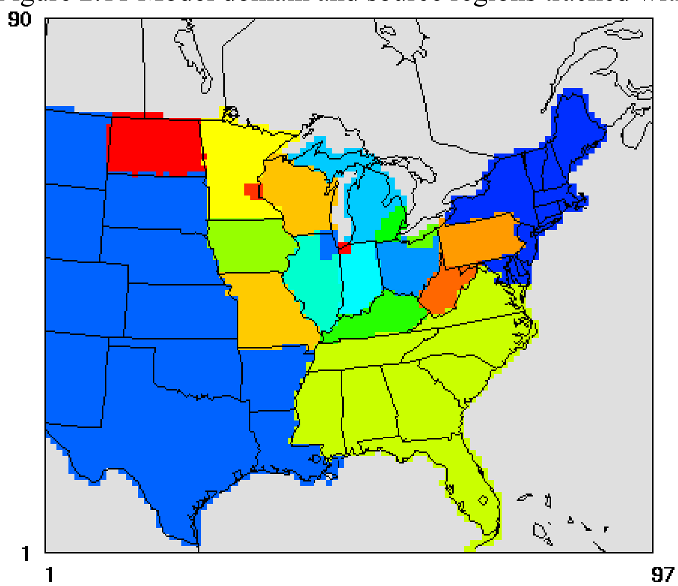


Table 2.5 Complete list of source regions tracked for contribution

Canada	Illinois Chicago non-attainment (NA) Counties
Northeast States (MANE-VU)	Detroit NA Counties
Central/Western States (CENRAP+ WRAP)	Indiana Chicago NA Counties
Ohio	Cleveland NA Counties
Michigan	Milwaukee NA Counties
Indiana	Southeast States (VISTAS)
Illinois	Minnesota
Wisconsin	Minneapolis-St. Paul
Kentucky	West Virginia
Iowa	North Dakota
Missouri	

Seven emissions source sectors are tracked for contribution to particulate matter: onroad mobile, offroad mobile, area, electrical generating units, non-electrical generating units, agricultural ammonia, and biogenics.

3. Model Performance Evaluation (same as 2002 protocol)

State Implementation Plans will include modeling the impacts of emission control scenarios with 3-D Eulerian photochemical transport models. Model performance is typically evaluated on an operational basis and rarely to support a diagnostic (dynamic) assessment. Operational evaluations for ozone modeling purposes include matching model estimates with observation data for ozone, nitrogen oxides (NO_X), and total volatile organic compounds (VOC). Operational evaluations for PM2.5 and visibility modeling purposes include matching model estimates with observation data for chemically speciated PM2.5 and important pre-cursor species including sulfur dioxide, nitric acid, and ammonia.

A diagnostic evaluation assesses how appropriately the modeling system responds to emissions adjustments. Since the modeled attainment demonstration includes modeling current and future year emissions it is important to have confidence that the model will predict concentrations appropriately when emissions change (US EPA, 2007). This type of evaluation includes modeling two different ozone episodes that are separated by enough years that large emissions differences exist. The diagnostic evaluation is an important assessment to make in addition to an operational evaluation because it is directly linked to the end use of the model, which is modeling the change in ozone concentrations after emissions adjustments.

A comparison between observed and estimated ozone for the summers of 2002 and 2005 is useful for a diagnostic assessment because high quality emission inventories were developed for each year and a large NO_X emissions reduction occurred between these years due in part to NO_X SIP Call compliance. Modeling two full summer seasons provides an opportunity to make another diagnostic evaluation which assesses model performance for high ozone by day of the week (Baker, 2007b). Emissions change substantially from weekday to weekend and having two full summers provides enough days with high ozone on each day of the week to make this type of evaluation useful.

The photochemical modeling applications are designed to support the development of regional control strategies for PM2.5 and Regional Haze. EPA guidance states that an attainment test for either standard will require the use of chemically speciated PM relative reduction factors (US EPA, 2007). Additionally, the model will be used to assess improvements in PM2.5 concentrations and visibility as a result of changes in emissions. These prominent end-uses of the modeling applications make comprehensive evaluations important. Clearly, reliance on model performance for PM2.5 total mass would be misleading since it is likely that the model and ambient data could estimate the same total mass but very different chemical composition. This scenario would compromise the development and interpretation of potential regulatory control strategies (Baker, 2004d).

The species to be compared to monitor concentrations include ozone, total VOC, NOX, SO2, NH3, HNO3, and speciated PM2.5 (see Table 3.1). Initially, scatter-plots of point-to-point relationships for all monitors in the domain for all episode days will be used for analysis for PM. This will allow for identification of gross model over or under-prediction by specie. Gas and aerosol data are taken from a variety of monitor networks for comparison to modeled estimates: IMPROVE, EPA Speciation Trends (STN), AIRS, and PAMS. The data is obtained directly from the VIEWS website and from the AFS database; a comparison of the monitor species to model species is shown below. PM2.5 ammonium ion is only measured at EPA Speciation Trends locations so the model performance for this chemical specie is dominated by, but not limited to, urban measurement locations.

Table 3.1 Species mapping between modeled and observed species (observed species from the VIEWS website)

	IMPROVE	STN	CAMx4 species
Sulfate aerosol	SO4f	SO4f	PSO4
Nitrate aerosol	NO3f	NO3f	PNO3
Ammonium aerosol		NH4f	PNH4
Organic aerosol	OCf*FACTOR FACTOR = 1.6 rural 2.1 urban	OCf*FACTOR FACTOR = 1.6 rural 2.1 urban	SOA1+SOA2+ SOA3+SOA4+ SOA5+POA
Elemental carbon	ECf	ECf	PEC
Soil/Crustal	SOILf	SOIL = 2.2*ALf + 2.49*SIf+1.63*CAf+ 2.42*FEf+1.94*TIf	FCRS
PM2.5 other	MF-RCFM	MF-(RCFM)	FPRM
Coarse mass	CM_calculated		CPRM+CCRS
PM2.5	MF	MF	PSO4+PNO3+PNH4+POA+ SOA1+SOA2+SOA3+SOA4+ SOA5+PEC+NA+PCL+ FPRM+FCRS
Re-constructed fine mass	RCFM	RCFM = SO4f+NO3f+ NH4f+OCf*FACTOR+ ECf+(SOIL)	1.375*PSO4+1.29*PNO3+ POA+SOA1+SOA2+SOA3+ SOA4+SOA5+PEC+NA+ PCL+FPRM+FCRS
Re-constructed bext	aerosol_bext		fRH*[4.125*PSO4+ 3.87*PNO3]+4*(SOA1+SOA2+ SOA3+SOA4+SOA5+POA)+ 10*PEC+NA+PCL+FPRM+FCRS+ 0.6*(CPRM+CCRS)

Model performance evaluation plots and metrics will be based on matching predictions and observations in time and space. There will not be any averaging over multiple-cell regions to match with an observation value. Qualitative evaluation will be done largely through graphical comparison of predictions and observations using spatial plots, time series plots, and scatter plots. The US EPA modeling guidance recommends against using any bright-line evaluation of performance metrics to determine whether the modeling is satisfactory (US EPA, 2007).

3.1 Particulate Matter and Regional Haze

The components of the visibility equation match up very closely to the prominent chemical forms of PM2.5: nitrate ion, sulfate ion, ammonium ion, organic carbon, elemental carbon, and soil (US EPA, 2007). Since these modeling applications will support PM2.5/Haze rules, model performance will be most rigorous for each of these PM2.5 species and coarse mass.

One of the problems related to PM model performance evaluation involves matching inconsistent monitor methodologies and model specie definition. Additionally, speciated measurements rarely add up to measurements of total fine mass. This unexplained fraction is usually attributed to the retention of water on the weighed samples (Timin, 2002). Other problems with comparing speciation samples and FRM measurements include volatilization of nitrate and positive and negative organic carbon artifacts (Timin, 2002).

Organic material is typically estimated from organic carbon using a 1.4 factor, which is based on the assumption that carbon accounts for 70% of the organic mass. Recent literature recommends a factor of 1.6 ± 0.2 for urban aerosol and 2.1 ± 0.2 for non-urban areas that would see more aged aerosol (Turpin and Lim, 2001; IMPROVE, 2006). These factors are applied to the observation data based on landuse type before being compared to model output. These factors may also be used to reduce modeled estimates of organic material to organic carbon.

Performance metrics used to describe model performance for PM2.5 species include mean bias, gross error, fractional bias, and fractional error (Table 3.2) (US EPA, 2007; Boylan et al, 2006). The bias and error metrics are used to describe performance in terms of the measured concentration units (μg/m^3). Even though the distribution of PM2.5 is log-normal, the data is not transformed for this analysis. The model attainment tests outlined by EPA for the PM2.5 NAAQS and Regional Haze rule require relative reduction factors to be applied to actual concentrations and not transformed concentrations. No minimum value is used to eliminate data points for the purposes of this analysis.

Table 3.2. Model Performance Metrics.

Mean Bias	$= \frac{1}{N \times M} \sum_{i=1}^{N} \sum_{j=1}^{M} (P_i^j - O_i^j)$
Gross Error	$= \frac{1}{N \times M} \sum_{i=1}^{N} \sum_{j=1}^{M} \mid P_i^j - O_i^j \mid$
Fractional Bias	$= \frac{1}{N \times M} \sum_{i=1}^{N} \sum_{j=1}^{M} \left(2 \times \frac{P_i^j - O_i^j}{P_i^j + O_i^j} \right)$
Fractional Gross Error	$= \frac{1}{N \times M} \sum_{i=1}^{N} \sum_{j=1}^{M} \left\| 2 \times \frac{P_i^j - O_i^j}{P_i^j + O_i^j} \right\|$

*P=model prediction; O=observation; N=number of days; M=number of monitors

Fractional bias and fractional error metrics are useful for comparison of model performance between species that tend to have large concentrations and those with small concentrations. It also helps compare performance of the same specie if concentrations are very large in some seasons and very small in others. The fractional metrics are best when close to 0 and worst when close to 2.

3.2 Ozone

Hourly running 8-hour averaged surface ozone observations from EPA's AIRS database are matched to hourly running 8-hour averaged layer 1 (30 m height) model estimates for evaluation. Only monitors in the 12 km modeling domain are included in the analysis. Model performance evaluation plots and metrics are based on matching predictions and observations in time and space. EPA has suggested several statistical metrics to describe model performance and include mean normalized bias error (MNBE) and mean normalized gross error (MNGE) (see Table 3.3) (US EPA, 2007).

This modeling system is used to support regulatory applications, so the model performance analysis reflects this end-use of the modeling results. It is well known that ozone data tends to follow a log-normal distribution and for the purposes of scientific evaluations the data is often log-transformed before evaluation (Hogrefe et al, 2003). Observations and predictions used in the attainment test may not be transformed, so the data used for model performance evaluation will likewise not be transformed.

Table 3.3 Model Performance Metric Definitions.

Metric	Equation
Mean Normalized Bias Error (MNBE)	$= \frac{1}{N \times M} \sum_{i=1}^{N} \sum_{j=1}^{M} \left(\frac{P^j - O_i^j}{O_i^j} \right)$
Mean Normalized Gross Error (MNGE)	$= \frac{1}{N \times M} \sum_{i=1}^{N} \sum_{j=1}^{M} \left\| \frac{P_i^j - O_i^j}{O_i^j} \right\|$

**P=model prediction; O=observation; N=number of days; M=number of monitors*

These metrics have traditionally been calculated when the observation value exceeds a certain minimum value, often 60 ppb for 1-hour ozone evaluation (Hogrefe et al, 2003). The MNBE and MNGE will be estimated using 3 different minimum 8-hour ozone thresholds: 20, 40, and 60 ppb. The 60 ppb minimum threshold level excludes prediction-observation pairs that are not of direct regulatory importance since the 8-hour ozone attainment test only applies to days with high ambient concentrations (US EPA, 2007). The 20 and 40 ppb minimum thresholds are included in the evaluation to get a better idea about how well the model is performing at predicting diurnal formation and removal processes and for days between high ozone episodes.

The metrics are estimated for all stations in the 12 km modeling domain for each day of the summer episode. The episode average metrics are estimated from the daily metrics.

3.3 Deposition

Wet deposition is measured at several monitoring networks and is also output by the photochemical model. The National Trends Network (NTN) and the Atmospheric Integrated Research Monitoring Network (AIRMoN) make up the National Atmospheric Deposition Program (NADP). NTN sites collect weekly measurements of wet deposition fluxes of sulfate and nitrate anions and the ammonium cation. NADP network stations measure wet deposition as mass per volume (mg/L) and the model outputs mass per area (g/ha or mole/ha). CAMx4 wet deposition output is matched to NTN/NADP measurement data in units of kg/km^2 according to the details outlined below.

The calculations used to convert CAMx wet deposition output to compare to NTN/NADP network data:

SPECIE_WD (g/ha) * (1 ha / 2.5 acres) * (1 acre / 0.0040469 km^2) * (1 kg / 1000 g)

The calculations used to convert NTN/NADP data to compare with CAMx output data:

SPECIES (mg/L) * (1 L / 1,000,000 mm^3) * precipitation in mm * (1 mm^2 / 0.000000000001 km^2) * (1 g / 1000 mg) * (1 kg / 1000 g)

The table below outlines the matching of observed species to CAMx output species.

Table 3.4 Observed and Modeled Wet Deposition		
	NADP/NTN	CAMx4
Sulfate	SO4	PSO4_WD + SULF_WD
Nitrate	NO3	PNO3_WD + HNO3_WD
Ammonium	NH4	PNH4_WD + NH3_WD
Crustal	Ca + Cl + Mg +K + Na	FCRS_WD + FPRM_WD

4. Attainment Tests

Visibility

Visibility may be estimated by two similar methods that relate light extinction to ambient PM2.5 concentrations (FLAG, 2000; US EPA, 2007). Visibility will be estimated using the new equation recommended by the IMPROVE steering committee (IMPROVE, 2006). The new and old equations produce very similar estimates of light extinction in the upper Midwest. The new equation will be emphasized for the SIP modeling demonstration due to its more up to date science.

The equation shown below relates PM2.5 specie concentrations to light extinction. Additional factors of f(RH) are included that change the light scattering of sulfate and nitrate based on climatologically averaged relative humidity.

β_{ext} = 2.2*f_SRH*[small sulfate] + 2.4*f_S(RH)*[small nitrate] + 4.8*f_LRH*[large sulfate] + 5.1*f_L(RH)*[large nitrate]+ 2.8*[small OCM] + 6.1*[large OCM] + 10*EC + 1*SOIL + 0.6*CM + 1.7*f_{SS}(RH)*SS + $\beta_{rayleigh}$

Bext	Estimated extinction coefficient (Mm-1)
Sulfate	Sulfate associated with ammonium (SO4*1.375)
Nitrate	Nitrate associated with ammonium (NO3*1.29)
OCM	Organic carbon Mass
EC	Elemental carbon
SOIL	Inorganic primary PM2.5 (soil, crustal, other)
CM	Coarse fraction particulate matter
SS	Sea salt
$\beta_{rayleigh}$	Light scattering due to Rayleigh scattering (site specific)
fRH	Relative humidity adjustment factor

The apportionment of sulfate, nitrate, and organic carbon mass into small and large size fractions is shown below using 'X' as a placeholder for these species.

$$\text{Large X} = ([\text{Total X}] / [20\ \text{ug/m3}]) * [\text{Total X}], \text{ where } [\text{Total X}] < 20\ \text{ug/m3}$$

$$\text{Large X} = [\text{Total X}], \text{ where } [\text{Total X}] \geq 20\ \text{ug/m3}$$

$$\text{Small X} = [\text{Total X}] - [\text{Large X}]$$

The fRH values are long-term averages that are site and month specific (US EPA, 2003a; US EPA 2003b; FLAG, 2000). The light scattering due to Rayleigh is site specific (IMPROVE, 2006). The NO_2 component to the light extinction equation is not included since it is not measured at Class I areas in the upper Midwest. The visibility equation is expressed as an extinction coefficient (β_{ext}) and is converted to deciviews using the equation below.

$$\text{Deciview} = 10\ln(\beta_{ext} / \beta_{rayleigh})$$

The reasonable progress test to determine the relationship between current and future year visibility is expressed in deciview units. The changes in deciview between the current and future year strategy is the reasonable progress test and is shown below.

$$\text{Change in Deciview} = 10\ln[(\beta_{ext})_{future} / (\beta_{ext})_{base}]$$
- or -
$$\text{Change in Deciview} = \text{Deciview}_{base} - \text{Deciview}_{future}$$

Visibility will be estimated for key Class I area in the Midwest for the base year and various future year scenarios. The changes in visibility between the base line and future year will be assessed using procedures in U.S. EPA's modeling guidance document (US EPA, 2007).

1. The visibility in deciviews will be ranked from high to low at each Class I area for the calendar years 2000-2004 using the monthly and site specific fRH values and the more recent IMPROVE light extinction equation.
2. The mean deciviews for the 20% days with the best and the 20% days with the worst visibility is estimated for each Class I area for each year of the 2000-04 baseline period.
3. The mean observed extinction coefficient for the days during the modeling period (2005) with the 20% best and 20% worst visibility will be calculated.
4. The mean predicted extinction coefficient for the corresponding 20% best and 20% worst days of the modeling period of the base case and future year strategy will be calculated using monthly site specific fRH values.
5. The relative reduction factor for the 20% best and 20% worst group of days for each site for each of the particulate matter species in the light extinction equation are estimated.
6. The relative reduction factors are multiplied by daily measured PM data during the 2000-04 baseline to estimate future daily values of these species.
7. These future daily PM estimates are used to estimate light extinction for each of the previously identified 20% best and 20% worst days of monitored data. Light extinction is converted to deciviews and the mean value for the best and worst days for each year of the baseline period is estimated.
8. The 5 mean deciview values for the worst and best days (one from each of the 5 years) are averaged together for a mean value for the best and worst days.
9. The future year mean deciview values in step 8 are compared to the observed values from step 2. The differences are compared to established goals for reasonable progress to determine if reasonable progress is demonstrated.

Annual PM2.5 Standard

Progress in meeting the annual PM2.5 standard will be assessed by application of the procedures outlined by the U.S. EPA modeling guidance document (US EPA, 2007). The major steps of this attainment test are outlined below:

1. Chemically speciated IMPROVE and STN PM2.5 data from 2001-2005 is spatially interpolated to match the grid domain and resolution used for the photochemical modeling. Spatial fields are developed for each PM2.5 chemical species for each season using the SAS statistical software package PROC KRIG function (EPA, 2004b).
2. The estimated fractional composition of each species by quarter is multiplied by the 5 year weighted average 2001-2006 FRM quarterly mean concentrations at each FRM monitor, resulting in estimated quarterly mean ambient concentrations of PM2.5

components sulfate, nitrate, ammonium, elemental carbon, organic carbon, particle bound water, and crustal material.

3. Estimate the modeled quarterly mean concentration for each chemical component of PM2.5 in the base year and future scenarios.
4. Calculate quarterly relative reduction factors for sulfate, nitrate, elemental carbon, organic carbon, and crustal material. The RRF is the ratio of the future year to the base year.
5. Quarterly specific RRFs are multiplied by the quarterly average species concentration from step 2 to estimate future case quarterly average concentrations for each of the PM2.5 species.
6. Calculate the quarterly average future scenario concentrations for ammonium and particle bound water using estimated ambient concentrations of sulfate, nitrate, and degree of sulfate neutralization. Particle bound water is estimated with an empirical equation.
7. Sum the quarterly future species concentrations to estimate the future quarterly average PM2.5 concentration.
8. The annual average future scenario concentration is the average of the 4 future year quarterly average PM 2.5 concentrations.
9. Compare value to annual NAAQS standard of 15 ug/m^3. If value is ≤ 15 ug/m^3 then the test is passed.

Organic carbon mass is estimated using a mass balance approach (EPA, 2006). The organic carbon spatial fields are only used to supply a minimum value for OCM when OCM estimated by mass balance is less than OC*1.4*0.7. A spatial field of the degree of sulfate neutralization is developed to estimate PM2.5 ammonium. Particle bound water is estimated using an empirical equation with spatially interpolated PM2.5 sulfate ion, FRM equivalent PM2.5 nitrate ion, and FRM equivalent PM2.5 ammonium ion (EPA, 2006).

Ozone

Progress in meeting the 8-hour ozone standard will be assessed in part using the modeled attainment test outlined by the U.S. EPA's "Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-hour Ozone, PM2.5, and Regional Haze" (US EPA, 2007). The attainment test is only applicable to monitors with design values ≥ 75 ppb. The major steps of the attainment test are described below:

1. Calculate the 8-hour ozone design value at each monitor location; the design value used in the attainment test is the average of 3 consecutive 3 year averaged design values: 2003-2005, 2004-2006, and 2005-2007.
2. Apply the photochemical model to a current year and future year to estimate a monitor specific relative reduction factor.
3. Calculate the future year design value by multiplying the monitor-specific observed design value by the monitor-specific relative reduction factor.
4. If the future year design value is ≤ 84 ppb then the test is passed at that monitor location.

The highest 8 hour daily maximum predicted in the 3x3 (or 7x7 for 4 km modeling) group of cells surrounding and including the cell in which the monitor is located will be used in the attainment test. The attainment test will be applied to all days during the summer of 2005 that meet the meet the inclusion criteria for the relative reduction factor calculation (US EPA, 2007). An episode day must have a peak 8-hr ozone model prediction > 85 ppb at a specific monitor or near the monitor (definition of near mentioned above) to be included in the attainment test. If there are less than 10 days of estimated peak 8-hr ozone at a monitor then the threshold for inclusion to the relative reduction factor is decreased until the number of days equals 10 or the threshold goes below 70 ppb (US EPA, 2007). If there are less than 4 days in the relative reduction factor calculation then the attainment test is not applied for that monitor.

Unmonitored Area Analysis

An un-monitored area analysis is an additional review to identify areas that might exceed the 8-hr ozone or annual PM2.5 NAAQS if monitors were present (US EPA, 2007). This analysis uses interpolated spatial fields of ambient concentrations and photochemical model estimated concentrations to develop "model adjusted spatial fields of observations" (US EPA, 2007). The model adjusted spatial fields are developed for the base year. Future year concentrations are estimated by applying RRFs to the base year model adjusted spatial field.

8-hr Ozone NAAQS

1. Ambient 8-hr ozone design values are interpolated to create the ambient spatial field. The design values are the 2003-2005 8-hr ozone design values.
2. The ambient spatial field is adjusted using gridded ozone seasonal average base year model output gradients.
3. Gridded RRFs are applied to the adjusted spatial field developed in step 2.
4. If any grid cell exceeds 84 ppb then that grid cell is predicted to exceed the 8-hr ozone NAAQS in the future scenario.

Annual PM2.5 NAAQS

1. Quarterly PM2.5 chemical species are interpolated to create the ambient spatial fields.
2. The ambient spatial field is adjusted using gridded ozone seasonal average base year model output gradients.
3. Quarterly gridded RRFs for each PM2.5 species are applied to the adjusted spatial field developed in step 2.
4. If any grid cell exceeds 15 ug/m3 then that grid cell is predicted to exceed the annual PM2.5 NAAQS in the future scenario.

US EPA intends to provide software that incorporates monitor observation data and CAMx output to generate the gridded future year 8-hr ozone and annual PM2.5 estimates (US EPA, 2007). This software will be used to apply the un-monitored area analysis.

24-hr PM2.5 Standard

Progress in meeting the new 24-hr PM2.5 standard will be assessed by application of the procedures outlined by the U.S. EPA document "Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze" (US EPA, 2007). The major steps of this attainment test are outlined below:

1. Chemically speciated IMPROVE and STN PM2.5 data from 2001-2005 is spatially interpolated to match the grid domain and resolution used for the photochemical modeling. Spatial fields are developed for each PM2.5 chemical species for each season using the SAS statistical software package PROC KRIG function (EPA, 2004b). Rather than interpolating seasonal averages, the top 15% of reconstructed PM2.5 mass samples are used as the basis of the chemically speciated data used for seasonal spatial fields.

2. Estimate the observed 98th percentile value for each year of the 5 year baseline period. Additionally, the next highest concentration in each quarter is identified. This results in data for each year and site which contains one quarter that equals the 98th percentile and 3 quarters which are less than or equal to the 98th percentile.
3. The quarterly maximum daily concentration is multiplied by the fractional composition of PM2.5 species based on the spatial fields.
4. PM2.5 component specific relative reduction factors are estimated at each monitor for each quarter.
5. The component specific RRFs are multiplied by the observed values to estimate future year concentrations.
6. The quarterly components are summed to estimate the quarterly future year 98th percentile value.
7. The 3 consecutive future year 98th percentiles are averaged together to estimate 3 different future year design values. The 3 future year design values are averaged to estimate a single 5-year weighted average 24-hour design value.
8. If this 5 year weighted average 24-hour design value is less than 35 ug/m3 then the test is passed.

The relative reduction factor is only estimated for days with 24-hour average modeled PM2.5 greater than 35 ug/m3. If less than 10 days in a quarter meet this criteria, then the threshold is lowered until the number of days equals 10 or the threshold goes below 20 ug/m3. If there are less than 5 days in the RRF calculation then that quarter is not used for the estimation of the future year design value. If no quarter has more than 5 days included in the RRF calculation then the attainment test is not applied for that monitor.

5.0 Other Issues

Technology Transfer and Modeling Capacity Building

States that are part of the Midwest Regional Planning Organization and cooperating organizations have to opportunity to acquire a turn-key modeling system. This will include all the model inputs, scripts, and support documents to perform model simulations. States participate in an extensive sensitivity projects and preliminary strategy rounds which are designed in part to allow States to develop modeling expertise in-house.

The model input data will be available on an FTP site. The drawback is that transfer times will be long since the files are rather large, but the benefit is that as improvements and updates to input files, model code, and processing utilities become available they will immediately be available to everyone. This approach greatly reduces the resource burden involved with data distribution of media (i.e. hard drives or DLT tapes) via the mail system.

Where very large datasets need to be transferred USB/firewire drives will be sent via the mail system. A general figure where USB drives will be used for transfer instead of FTP would be 50+ gigabytes of data.

States and cooperating organizations will also participate in regular conference calls and face to face meetings to discuss problems, progress, and outline cooperative work objectives.

Ultimately, States that are inclined will be able to use the model inputs developed by the Midwest Regional Planning Organization as the basis for local emphasis modeling projects.

Data Management and Storage

The file storage requirements for annual modeling are large and data backup is an important consideration. Important files including raw emissions and meteorological files will be stored redundantly on multiple hard drives. Additionally, all the model inputs will have a redundant copy at each member State as they will be using them for model simulations as part of the technology transfer and capacity building.

REFERENCES

Baker, K. Meteorological Modeling Protocol For Application to PM2.5/Haze/Ozone Modeling Projects, 2004a. http://www.ladco.org/tech/photo/photochemical.html

Baker, K. Processing and Quality Assurance of Emissions Files for Photochemical Model Input, 2004b. http://www.ladco.org/tech/photo/photochemical.html

Baker, K. Fine Grid v. Coarse Grid results, presented at the National Regional Planning Organization Modeling Meeting, Denver, CO, 2004b.

Baker, K. Application of Multiple One-Atmosphere Air Quality Models Emphasizing PM2.5 Performance Evaluation, presented at the Air & Waste Management Association 2004 Annual Meeting, Indianapolis, IN, 2004d. http://www.ladco.org/tech/photo/photochemical.html

Baker, K. Ozone Source Apportionment Results for Receptors in Non-Attainment Counties in the Great Lakes Region. 2007. AWMA Annual Conference. Pittsburgh, PA.

Baker, K., Kenski, D. Diagnostic and Operational Evaluation of 2002 and 2005 Estimated 8-hr Ozone to Support Model Attainment Demonstrations. Presented at the 2007 CMAS Conference. Chapel Hill, NC. 2007b.

Baker, K., McNally, D., Ji, W. An Evaluation of an Annual 2005 MM5 Simulation to Support Photochemical and Emissions Modeling Applications. January 10, 2007. 2007c.

Baker, K. Peak 8-hr Ozone Model Performance when using Biogenic VOC estimated by MEGAN and BIOME (BEIS). Presented at the 2007 CMAS Conference. Chapel Hill, NC. October 2007. 2007d

Bey, I.; Jacob, D; Yantosca, R.; Logan, J.; Field, B.; Fiore, A.;Li, Q.; Liu, H.; Mickley, L.; Schultz, M. Global modeling of tropospheric chemistry with assimilated meteorology: Model description and evaluation, J. Geophys. Res., 106, 23,073-23,096, 2001.

Boylan, J. W., Odman, M. T., Wilkinson, J. G., Russell, A. G.: Integrated assessment modeling of atmospheric pollutants in the southern Appalachian Mountains: Part II. fine particulate matter and visibility. Journal of Air & Waste Management Association. 56; 12-22: 2006.

Carter, W.P.L. (1996) Condensed Atmospheric Photooxidation Mechanisms for Isoprene. Atmos. Environ., 30, 4275-4290.

Carter, W.P.L. 2000. Programs and Files Implementing the SAPRC-99 Mechanism and its Associates Emissions Processing Procedures for Models-3 and Other Regional Models. January 31, 2000. http://pah.cert.ucr.edu/~carter/SAPRC99.htm

Chen, K. S., Y. T. Ho, C. H. Lai and Y.-M. Chou (2003) Photochemical modeling and analysis of meteorological parameters during ozone episodes in Kaohsiung, Taiwan, Atmospheric Environment, 37(13), 1811-1823.

Dudhia, J. A nonhydrostatic version of the Penn State/NCAR mesoscale model: Validation tests and simulation of an Atlantic cyclone and cold front, Mon. Wea. Rev., 121, 1493-1513, 1993.

ENVIRON. Final Report: CAMx Secondary Organic Aerosol (SOA) Updates. Prepared for Lake Michigan Air Directors Consortium. Novato, CA. 2006.

ENVIRON International Corporation. 2007. User's Guide Comprehensive Air Quality Model with Extensions (CAMx4) Version 4.50. ENVIRON International Corporation, Novato, California. www.camx.com

FLAG. 2000. Federal Land Manager’s Air Quality Related Values Workgroup (FLAG) Phase I Report. http://www2.nature.nps.gov/ard/flagfiee/AL.doc

Gery, M.W.; Whitten, G.Z.; Killus, J.P.; Dodge, M.C. A photochemical kinetics mechanism for urban and regional scale computer modeling. Journal of Geophysical Research, 1989, 94, 12925–12956.

Grell, G. A.; Dudhia, J.; Stauffer, D. A description of the Fifth Generation Penn State/NCAR Mesoscale Model (MM5), NCAR Tech. Note, NCAR TN-398-STR, 138 pp., 1994.

Goebes MD, Strader R, Davidson CI. 2003. An ammonia emission inventory for fertilizer application in the United States. Atmospheric Environment 37, 2539-2550

Guenther, A and C. Wiedinmyer (2006). MEGAN User's Guide. acd.ucar.edu/~guenther/MEGAN/MEGANusersguide.pdf

Guenther, A., T. Karl, P. Harley, C. Wiedinmyer, P. Palmer and C. Geron (2006). Model of Emissions of Gases and Aerosols from Nature (MEGAN). bai.acd.ucar.edu/Megan/index.shtml

Guenther A.; Geron C.; Pierce T.; Lamb; Harley P.; Fall R. Natural emissions of non-methane volatile organic compounds; carbon monoxide, and oxides of nitrogen from North America, *Atmos. Environ*., **2000**, *34*, 2205-2230.

Hogrefe, C., G. Sistla, E. Zalewsky, W. Hao, and J.-Y. Ku (2003) An assessment of the emissions inventory processing systems EMS-2001 and SMOKE in grid-based air quality models, J. Air & Waste Management Assoc., 53(9): 1121-1129.

IMPROVE Steering Committee. Revised IMPROVE Algorithm for Estimating Light Extinction from Particle Speciation Data. http://vista.cira.colostate.edu/improve/Publications/GrayLit/gray_literature.htm Accessed August 22, 2006.

Jang, M.; Czoschke, N.M.; Lee, S.; Kamens, R.M. Heterogeneous atmospheric aerosol production by acid-catalyzed particle-phase reactions. Science, 298, 814-817, 2002.

Jacob, D.; Park, R.; Logan, J., Documentation and Evaluation Of The Geos-Chem Simulation for 2002 Provided to the Vistas Group. June 24, 2005. djacob@fas.harvard.edu.

Janssen, M.; Hua., C. Emissions Modeling System-95 User's Guide. 1998. http://www.ladco.org/emis/guide/ems95.html

Johnson, M. Meteorological Modeling Protocol: IDNR 2002 Annual MM5 Application, 2003.

Kemball-Cook, S., Emery, C, Yarwood, G, Working Draft Report: Improvements to the MM5-CAMx Interface for Wet Deposition and Performance Evaluation for 2002 Annual Simulations, 2004.

Kemball-Cook, S., Emery, C., Yarwood, G. Comparison of the AERMOD and CAMx dry deposition algorithms, implementation into CAMx, and initial test results. Technical Memorandum prepared for LADCO. September 6, 2007.

Kinnee, E., C. Geron, and T. Pierce (2004) Development of a 1-km resolved vegetation database for surface exchange modeling in North America, Ecological Applications, in press.

Kinnee, E., C. Geron, and T. Pierce (1997) United States land use inventory for estimating biogenic ozone precursor emissions. Ecological Applications, 7(1), 46-58.

LADCO. http://www.ladco.org/tech/photo/photochemical.html (Protocols/Documents section) and http://www.ladco.org/mrpo.html (Emissions section of RPO Projects) Accessed August 22, 2006.

McNally, D., Schewe, G. Evaluation of 36/12/4 km MM5 for Calendar Year 2005 Focused on the Upper Midwest. Prepared for the Midwest Ozone Group. November 22, 2006.

NCAR. National Center for Atmospheric Research. http://cprm.acd.ucar.edu/Models/TUV/ Accessed February 26, 2006.

NASA. Goddard Space Flight Center. http://jwocky.gsfc.nasa.gov/ (accessed January 23, 2006).

National Weather Service. Climate Prediction Center. See http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/palmer_drought/wpdanote.shtml (accessed October 1, 2005)

Nenes A, Pandis SN, Pilinis C. 1998. ISORROPIA: A new thermodynamic equilibrium model for multiphase multicomponent inorganic aerosols. Aquat.Geoch. 4: 123-152.

Morris, R.E., G. Mansell, and E. Tai. (2004) Air Quality Modeling Analysis for the Denver Early Action Ozone Compact. Prepared for Denver Regional Air Quality Council, Denver, CO.

Morris, R., Koo, B., Lau, S., McNalley, D., Tesche, T., Tonnesen, G., Wang, Z., Chien, C. Initial Phase II 2002 CMAQ Operational Model Performance Evaluation. Presented at the VISTAS TAWG Meeting, September 2004 (2004b). http://pah.cert.ucr.edu/vistas/vistas2/docs.shtml

Nobel, C. E., E. C. McDonald-Buller, Y. Kimura, K .E. Lumbley, and D. T. Allen (2002) Influence of Population Density and Temporal Variations in Emissions on the Air Quality Benefits of NOx Emission Trading, Environmental Science & Technology, 36, 3465-3473.

Pinder RW, Strader R, Davidson CI, Adams PJ. 2004. A temporally and spatially resolved ammonia emission inventory for dairy cows in the United States. Atmospheric Environment 38, 3747-3756.

Pinker, R.T. and I. Laszlo (1992) Modeling surface solar irradiance for satellite applications on a global scale. J. Appl. Meteor., 31, 194-211.

Strader, R, Peckney, NJ, Pinder, RW, Adams, PJ, Goebes, M, Ayers, J, Davidson, CI. 2005. The CMU Ammonia Emission Inventory. Available at http://www.cmu.edu/ammonia

Strader, R., Lurmann, F., Pandis, S.N.: Evaluation of secondary organic aerosol formation in winter. Atmos. Environ. 33; 4849-4863: 1999.

Tanaka, P. L., D. T. Allen, E. C. McDonald-Buller, S. Chang, Y. Kimura, C. B. Mullins, G. Yarwood, and J. D. Neece (2003) Development of a chlorine mechanism for use in the CAMx regional photochemical model, J. Geophys. Res., 108(D4), 4145.

Timin, B., Jang, C., Dolwick, P., Possiel, N., Braverman, T., 2002. Operational Evaluation and Comparison of CMAQ and REMSAD- An Annual Simulation. 1st Annual CMAS Conference, Research Triangle Park, NC.

Tonnesen, G.; Wang, Z.; Lents. J.; Gemmill, D.; Morris, R. Modeling Protocol and Quality Assurance Plan for the WRAP Visibility Modeling Project, 2001.

Turpin, B.J., and Lim, H.-J., 2001: Contributions to PM2.5 mass concentrations: revisiting common assumptions for estimating organic mass. Aerosol. Sci. Technol., 35, 602-610.

Wilkinson, J.; Loomis, C.; Emigh, R.; McNalley, D.; Tesche, T., 1994. Technical Formulation Document: SARMAP/LMOS Emissions Modeling System (EMS-95). Final Report prepared for Lake Michigan Air Directors Consortium (Des Plaines, IL) and Valley Air Pollution Study Agency (Sacramento, CA).

U. S. Environmental Protection Agency, Guidance for Tracking Progress Under the Regional Haze Rule, EPA-454/B-03-004, Office of Air Quality Planning and Standards, Research Triangle Park, NC, 2003a.

U. S. Environmental Protection Agency, Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Program, EPA-454/B-03-005, Office of Air Quality Planning and Standards, Research Triangle Park, NC, 2003b.

U.S. Environmental Protection Agency, User's Guide for the AERMOD Meteorological Preprocessor (AERMET), EPA-454/B-03-002, Office of Air Quality Planning and Standards, Research Triangle Park, NC, 2004.

U. S. Environmental Protection Agency, Developing Spatially Interpolated Surfaces and Estimating Uncertainty, EPA-454/R-04-004, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC, 2004 (2004b).

U. S. Environmental Protection Agency. See http://www.epa.gov/ttn/chief/net/2002inventory.html (accessed March 2, 2006).

U. S. Environmental Protection Agency. See http://www.epa.gov/ttn/chief/emch/biogenic/ (accessed August 9, 2006). 2006b.

U. S. Environmental Protection Agency, Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze. April 2007. EPA -454/B-07-002.

Wesely, M.L. 1989. Parameterization of Surface Resistances to Gaseous Dry Deposition in Regional-Scale Numerical Models. *Atmos. Environ.*, **23**, 1293-1304.

Wiedinmyer, C., Greenberg, J., Guenther, A., Hopkins, B., Baker, K., Geron, C., Palmer, P. I., Long, B. P., Turner, J. R., Petron, G., Harley, P., Pierce, T., Lamb, B., Westberg, H., Baugh, W., Koerber, M., Janssen, M. (2005), Ozarks Isoprene Experiment (OZIE): Measurements and modeling of the ‘‘isoprene volcano,’’ J. Geophys. Res., 110, D18307, doi:10.1029/2005JD005800.

Wilkinson, J. Implementation of the model of emissions of gases and aerosols from nature (MEGAN) into the concept modeling framework. June 16, 2006.AG-TS-90/236

Zaveri, R.A. and L. K Peters. 1999. A new lumped structure photochemical mechanism for large-scale applications. *J. Geophys. Res*., 104, 30: 387-30,415.

Appendix G

Attainment Test Results for All
Southern Indiana and Northern Kentucky
$PM_{2.5}$ Monitors

Bonita & St. John (ID 390170003)

Observed Quarterly Mean $PM_{2.5}$/Quarterly Mean Composition

Pollutant (percent of total mass)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	26.91	37.69	37.3	28.4
NO3	24.02	0.86	0	12.06
OC	18.92	19.54	12.09	21.86
EC	3.52	4.29	3.19	5.49
Soil	2.11	3.83	2.69	4.56
NH4	15.63	12.77	11.39	13.06
pbw	8.89	13.04	11.73	8.85

Quarterly Mean Composition for each Component of $PM_{2.5}$

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
SO4	4.0446	5.4914	7.6726	3.7687	5.2
NO3	3.6102	0.1253	0.0000	1.6004	1.3
OC	2.8437	2.8470	2.4869	2.9008	2.8
EC	0.5291	0.6251	0.6562	0.7285	0.6
Soil	0.3171	0.5580	0.5533	0.6051	0.5
NH4	2.3492	1.8606	2.3429	1.7331	2.1
pbw	1.3362	1.8999	2.4129	1.1744	1.7
Quarterly FRM Mean (total mass)	15.03	14.57	20.57	13.27	

Relative Response Factors (RRFs) for each component

Pollutant	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	0.8566	0.6544	0.6126	0.8015
NO3	1.0437	0.8878	0.9588	0.9678
OC	0.9661	1.0582	1.0654	1.0186
EC	0.8876	0.907	0.9044	0.8739
Soil	1.1976	1.1716	1.2471	1.221
NH4	0.9318	0.7147	0.6871	0.8649
pbw	0.9171	0.6768	0.6364	0.8506

Projected Future Quarterly Species Estimates

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	TOTAL
SO4	3.4646	3.5936	4.7002	3.0206	3.7
NO3	3.7680	0.1112	0.0000	1.5488	1.4
OC	2.7473	3.0127	2.6496	2.9548	2.8
EC	0.4696	0.5669	0.5935	0.6367	0.6
Soil	0.3798	0.6538	0.6901	0.7388	0.6
NH4	2.1890	1.3298	1.6098	1.4989	1.7
pbw	1.2254	1.2859	1.5355	0.9989	1.3
TOTAL	14.24	10.55	11.78	11.40	

Fairfield (ID 390170016)

Observed Quarterly Mean $PM_{2.5}$/Quarterly Mean Composition

Pollutant (percent of total mass)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	26.85	37.36	37.22	28.05
NO3	23.78	0.26	0	12.74
OC	19.0	20.71	12.1	22.91
EC	3.5	4.86	3.09	5.51
Soil	2.29	3.01	1.99	3.52
NH4	15.83	12.66	11.78	13.48
pbw	8.74	13.35	12.61	8.9

Quarterly Mean Composition for each Component of $PM_{2.5}$

Pollutant (μg/m^3)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
SO4	3.9282	5.4172	7.3956	3.8064	5.1
NO3	3.4790	0.0377	0.0000	1.7288	1.3
OC	2.7797	3.0030	2.4043	3.1089	2.8
EC	0.5121	0.7047	0.6140	0.7477	0.6
Soil	0.3350	0.4365	0.3954	0.4777	0.4
NH4	2.3159	1.8357	2.3407	1.8292	2.1
pbw	1.2787	1.9358	2.5056	1.2077	1.7
Quarterly FRM Mean (total mass)	14.63	14.5	19.87	13.57	

Relative Response Factors (RRFs) for each component

Pollutant	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	0.8104	0.6331	0.577	0.7754
NO3	1.0886	1.0155	1.0923	0.9857
OC	0.961	1.0798	1.082	1.0235
EC	0.8969	0.9228	0.9099	0.8876
Soil	1.4146	1.3785	1.537	1.4007
NH4	0.9077	0.6968	0.6441	0.846
pbw	0.8687	0.6307	0.5734	0.8172

Projected Future Quarterly Species Estimates

Pollutant (μg/m^3)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	TOTAL
SO4	3.1834	3.4296	4.2673	2.9515	3.5
NO3	3.7873	0.0383	0.0000	1.7041	1.4
OC	2.6713	3.2426	2.6014	3.1819	2.9
EC	0.4593	0.6503	0.5587	0.6637	0.6
Soil	0.4739	0.6016	0.6077	0.6691	0.6
NH4	2.1022	1.2791	1.5076	1.5475	1.6
pbw	1.1108	1.2209	1.4367	0.9870	1.2
TOTAL	13.79	10.46	10.98	11.70	

Middletown – Wilwood (ID 390170017)

Observed Quarterly Mean $PM_{2.5}$/Quarterly Mean Composition

Pollutant (percent of total mass)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	26.91	37.69	37.3	27.55
NO3	24.02	0.86	0	11.7
OC	18.92	19.54	12.09	21.21
EC	3.52	4.29	3.19	5.32
Soil	2.11	3.83	2.69	4.42
NH4	15.63	12.77	11.39	12.66
pbw	8.89	13.04	11.73	8.58

Quarterly Mean Composition for each Component of $PM_{2.5}$

Pollutant (µg/m^3)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
SO4	4.1791	5.4537	7.5831	3.8928	5.3
NO3	3.7303	0.1244	0.0000	1.6532	1.4
OC	2.9383	2.8274	2.4579	2.9970	2.8
EC	0.5467	0.6208	0.6485	0.7517	0.6
Soil	0.3277	0.5542	0.5469	0.6245	0.5
NH4	2.4273	1.8478	2.3156	1.7889	2.1
pbw	1.3806	1.8869	2.3847	1.2124	1.7
Quarterly FRM Mean (total mass)	15.53	14.47	20.33	14.13	

Relative Response Factors (RRFs) for each component

Pollutant	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	0.8566	0.6544	0.6126	0.8015
NO3	1.0437	0.8878	0.9588	0.9678
OC	0.9661	1.0582	1.0654	1.0186
EC	0.8876	0.907	0.9044	0.8739
Soil	1.1976	1.1716	1.2471	1.221
NH4	0.9318	0.7147	0.6871	0.8649
pbw	0.9171	0.6768	0.6364	0.8506

Projected Future Quarterly Species Estimates

Pollutant (µg/m^3)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	TOTAL
SO4	3.5798	3.5689	4.6454	3.1201	3.7
NO3	3.8933	0.1105	0.0000	1.6000	1.4
OC	2.8387	2.9920	2.6186	3.0527	2.9
EC	0.4852	0.5630	0.5865	0.6569	0.6
Soil	0.3924	0.6493	0.6820	0.7626	0.6
NH4	2.2618	1.3206	1.5910	1.5472	1.7
pbw	1.2662	1.2770	1.5176	1.0312	1.3
TOTAL	14.72	10.48	11.64	11.77	

Middletown – Hook Field Airport (ID 390171004)

Observed Quarterly Mean $PM_{2.5}$/Quarterly Mean Composition

Pollutant (percent of total mass)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	26.91	37.69	37.3	28.4
NO3	24.02	0.86	0	12.06
OC	18.92	19.54	12.09	21.86
EC	3.52	4.29	3.19	5.49
Soil	2.11	3.83	2.69	4.56
NH4	15.63	12.77	11.39	13.06
pbw	8.89	1304	11.73	8.85

Quarterly Mean Composition for each Component of $PM_{2.5}$

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
SO4	3.6140	5.2012	7.1616	3.5784	4.9
NO3	3.2259	0.1187	0.0000	1.5196	1.2
OC	2.5410	2.6965	2.3213	2.7544	2.6
EC	0.4727	0.5920	0.6125	0.6917	0.6
Soil	0.2834	0.5285	0.5165	0.5746	0.5
NH4	2.0991	1.7623	2.1869	1.6456	1.9
pbw	1.1939	1.7995	2.2522	1.1151	1.6
Quarterly FRM Mean (total mass)	13.43	13.8	19.2	12.6	

Relative Response Factors (RRFs) for each component

Pollutant	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	0.8566	0.6544	0.6126	0.8015
NO3	1.0437	0.8878	0.9588	0.9678
OC	0.9661	1.0582	1.0654	1.0186
EC	0.8876	0.907	0.9044	0.8739
Soil	1.1976	1.1716	1.2471	1.221
NH4	0.9318	0.7147	0.6871	0.8649
pbw	0.9171	0.6768	0.6364	0.8506

Projected Future Quarterly Species Estimates

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	TOTAL
SO4	3.0958	3.4037	4.3872	2.8681	3.4
NO3	3.3669	0.1054	0.0000	1.4706	1.2
OC	2.4548	2.8535	2.4731	2.8056	2.6
EC	0.4196	0.5370	0.5539	0.6045	0.5
Soil	0.3394	0.6192	0.6441	0.7015	0.6
NH4	1.9559	1.2595	1.5026	1.4232	1.5
pbw	1.0950	1.2179	1.4333	0.9485	1.2
TOTAL	12.73	10.00	11.00	10.82	

Batavia – 400 Clermont Dr. (ID 390250022)

Observed Quarterly Mean $PM_{2.5}$/Quarterly Mean Composition

Pollutant (percent of total mass)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	28.02	38.65	38.61	29.52
NO3	21.85	0.62	0	11.24
OC	19.5	19.42	12.18	22.55
EC	4.0	4.29	2.98	5.71
Soil	2.35	03.43	2.66	3.74
NH4	15.39	12.91	11.71	13.07
pbw	8.89	13.26	11.98	9.16

Quarterly Mean Composition for each Component of $PM_{2.5}$

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
SO4	3.6230	5.2680	7.7490	3.4037	5.0
NO3	2.8252	0.0845	0.0000	1.2960	1.1
OC	2.5214	2.6469	2.4445	2.6000	2.6
EC	0.5172	0.5847	0.5981	0.6584	0.6
Soil	0.3039	0.4675	0.5339	0.4312	0.4
NH4	1.9899	1.7596	2.3502	1.5070	1.9
pbw	1.1495	1.8073	2.4044	1.0561	1.6
Quarterly FRM Mean (total mass)	12.93	13.63	20.07	11.53	

Relative Response Factors (RRFs) for each component

Pollutant	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	0.7873	0.6097	0.565	0.7364
NO3	1.1635	1.0597	1.1361	1.041
OC	0.9545	1.0656	1.0677	1.0155
EC	0.9034	0.9463	0.9475	0.8945
Soil	1.2513	1.2113	1.3257	1.2576
NH4	0.8934	0.6589	0.6087	0.8228
pbw	0.8212	0.5989	0.56	0.7672

Projected Future Quarterly Species Estimates

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	TOTAL
SO4	2.8524	3.2119	4.3782	2.5065	3.2
NO3	3.2871	0.0896	0.0000	1.3491	1.2
OC	2.4066	2.8206	2.6100	2.6403	2.6
EC	0.4672	0.5533	0.5667	0.5889	0.5
Soil	0.3802	0.5663	0.7077	0.5423	0.5
NH4	1.7778	1.1594	1.4306	1.2399	1.4
pbw	0.9440	1.0824	1.3465	0.8103	1.0
TOTAL	12.12	9.48	11.04	9.68	

Cincinnati – Grooms Rd. (ID 390610006)

Observed Quarterly Mean $PM_{2.5}$/Quarterly Mean Composition

Pollutant (percent of total mass)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	26.85	37.36	37.22	28.05
NO3	23.78	0.26	0	12.74
OC	19.0	20.71	12.1	22.91
EC	3.5	4.86	3.09	5.51
Soil	2.29	3.01	1.99	3.52
NH4	15.83	12.66	11.78	13.48
pbw	8.74	13.35	12.61	8.9

Quarterly Mean Composition for each Component of $PM_{2.5}$

Pollutant (µg/m^3)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
SO4	3.8933	4.9315	7.8162	3.5259	5.0
NO3	3.4481	0.0343	0.0000	1.6014	1.3
OC	2.7550	2.7337	2.5410	2.8798	2.7
EC	0.5075	0.6415	0.6489	0.6926	0.6
Soil	0.3321	0.3973	0.4179	0.4425	0.4
NH4	2.2954	1.6711	2.4738	1.6944	2.0
pbw	1.2673	1.7622	2.6481	1.1187	1.7
Quarterly FRM Mean (total mass)	14.5	13.2	21.0	12.57	

Relative Response Factors (RRFs) for each component

Pollutant	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	0.8104	0.6331	0.577	0.7754
NO3	1.0886	1.0155	1.0923	0.9857
OC	0.961	1.0798	1.082	1.0235
EC	0.8969	0.9228	0.9099	0.8876
Soil	1.4146	1.3785	1.537	1.4007
NH4	0.9077	0.6968	0.6441	0.846
pbw	0.8687	0.6307	0.5734	0.8172

Projected Future Quarterly Species Estimates

Pollutant (µg/m^3)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	TOTAL
SO4	3.1551	3.1221	4.5099	2.7340	3.4
NO3	3.7536	0.0349	0.0000	1.5785	1.3
OC	2.6476	2.9519	2.7494	2.9475	2.8
EC	0.4552	0.5920	0.5904	0.6148	0.6
Soil	0.4697	0.5477	0.6423	0.6198	0.6
NH4	2.0835	1.1644	1.5934	1.4335	1.6
pbw	1.1009	1.1114	1.5184	0.9142	1.2
TOTAL	13.67	9.52	11.60	10.84	

Cincinnati – Seymour & Vine St. (ID 390610014)

Observed Quarterly Mean $PM_{2.5}$/Quarterly Mean Composition

Pollutant (percent of total mass)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	26.85	35.83	37.22	26.08
NO3	23.78	0.25	0	11.84
OC	19.0	19.86	12.1	21.3
EC	3.5	4.66	3.09	5.12
Soil	2.29	2.89	1.99	3.28
NH4	15.83	12.15	11.78	12.54
pbw	8.74	12.8	12.61	8.28

Quarterly Mean Composition for each Component of $PM_{2.5}$

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
SO4	4.4115	5.8510	7.6785	3.9824	5.5
NO3	3.9071	0.0408	0.0000	1.8080	1.4
OC	3.1217	3.2431	2.4962	3.2525	3.0
EC	0.5751	0.7610	0.6375	0.7818	0.7
Soil	0.3762	0.4719	0.4105	0.5009	0.4
NH4	2.6009	1.9841	2.4302	1.9149	2.2
pbw	1.4360	2.0902	2.6014	1.2644	1.8
Quarterly FRM Mean (total mass)	16.43	16.33	20.63	15.27	

Relative Response Factors (RRFs) for each component

Pollutant	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	0.8104	0.6331	0.577	0.7754
NO3	1.0886	1.0155	1.0923	0.9857
OC	0.961	1.0798	1.082	1.0235
EC	0.8969	0.9228	0.9099	0.8876
Soil	1.4146	1.3785	1.537	1.4007
NH4	0.9077	0.6968	0.6441	0.846
pbw	0.8687	0.6307	0.5734	0.8172

Projected Future Quarterly Species Estimates

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	TOTAL
SO4	3.5750	3.7043	4.4305	3.0880	3.7
NO3	4.2532	0.0415	0.0000	1.7821	1.5
OC	3.0000	3.5019	2.7009	3.3289	3.1
EC	0.5158	0.7022	0.5800	0.6939	0.6
Soil	0.5322	0.6506	0.6310	0.7015	0.6
NH4	2.3608	1.3825	1.5653	1.6200	1.7
pbw	1.2474	1.3183	1.4917	1.0332	1.3
TOTAL	15.48	11.30	11.40	12.25	

Cincinnati – Howard Taft (ID 390610040)

Observed Quarterly Mean $PM_{2.5}$/Quarterly Mean Composition

Pollutant (percent of total mass)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	26.85	37.36	37.22	28.05
NO3	23.78	0.26	0	12.74
OC	19.0	20.71	12.1	22.91
EC	3.5	4.86	3.09	5.51
Soil	2.29	3.01	1.99	3.52
NH4	15.83	12.66	11.78	13.48
pbw	8.74	13.35	12.61	8.9

Quarterly Mean Composition for each Component of $PM_{2.5}$

Pollutant (µg/m^3)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
SO4	3.7671	5.3425	7.6562	3.4978	5.1
NO3	3.3363	0.0372	0.0000	1.5887	1.2
OC	2.6657	2.9615	2.4890	2.8569	2.7
EC	0.4911	0.6950	0.6356	0.6871	0.6
Soil	0.3213	0.4304	0.4093	0.4389	0.4
NH4	2.2209	1.8104	2.4231	1.6810	2.0
pbw	1.2262	1.9091	2.5939	1.1098	1.7
Quarterly FRM Mean (total mass)	14.03	14.3	20.57	12.47	

Relative Response Factors (RRFs) for each component

Pollutant	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	0.8104	0.6331	0.577	0.7754
NO3	1.0886	1.0155	1.0923	0.9857
OC	0.961	1.0798	1.082	1.0235
EC	0.8969	0.9228	0.9099	0.8876
Soil	1.4146	1.3785	1.537	1.4007
NH4	0.9077	0.6968	0.6441	0.846
pbw	0.8687	0.6307	0.5734	0.8172

Projected Future Quarterly Species Estimates

Pollutant (µg/m^3)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	TOTAL
SO4	3.0528	3.3823	4.4176	2.7122	3.4
NO3	3.6319	0.0378	0.0000	1.5660	1.3
OC	2.5617	3.1979	2.6931	2.9240	2.8
EC	0.4404	0.6413	0.5783	0.6099	0.6
Soil	0.4545	0.5933	0.6292	0.6148	0.6
NH4	2.0160	1.2615	1.5607	1.4221	1.6
pbw	1.0652	1.2040	1.4873	0.9070	1.2
TOTAL	13.22	10.32	11.37	10.76	

Cincinnati – Winneste Ave. (ID 390610041)

Observed Quarterly Mean $PM_{2.5}$/Quarterly Mean Composition

Pollutant (percent of total mass)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	26.85	37.36	37.22	28.05
NO3	23.78	0.26	0	12.74
OC	19.0	20.71	12.1	22.91
EC	3.5	4.86	3.09	5.51
Soil	2.29	3.01	1.99	3.52
NH4	15.83	12.66	11.78	13.48
pbw	8.74	13.35	12.61	8.9

Quarterly Mean Composition for each Component of $PM_{2.5}$

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
SO4	4.2074	5.3425	7.2579	3.5343	5.1
NO3	3.7263	0.0372	0.0000	1.6052	1.3
OC	2.9773	2.9615	2.3595	2.8867	2.8
EC	0.5485	0.6950	0.6026	0.6943	0.6
Soil	0.3588	0.4304	0.3881	0.4435	0.4
NH4	2.4806	1.8104	2.2971	1.6985	2.1
pbw	1.3696	1.9091	2.4590	1.1214	1.7
Quarterly FRM Mean (total mass)	15.67	14.3	19.5	12.6	

Relative Response Factors (RRFs) for each component

Pollutant	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	0.8104	0.6331	0.577	0.7754
NO3	1.0886	1.0155	1.0923	0.9857
OC	0.961	1.0798	1.082	1.0235
EC	0.8969	0.9228	0.9099	0.8876
Soil	1.4146	1.3785	1.537	1.4007
NH4	0.9077	0.6968	0.6441	0.846
pbw	0.8687	0.6307	0.5734	0.8172

Projected Future Quarterly Species Estimates

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	TOTAL
SO4	3.4097	3.3823	4.1878	2.7405	3.4
NO3	4.0565	0.0378	0.0000	1.5823	1.4
OC	2.8612	3.1979	2.5530	2.9545	2.9
EC	0.4919	0.6413	0.5483	0.6162	0.6
Soil	0.5076	0.5933	0.5964	0.6212	0.6
NH4	2.2516	1.2615	1.4796	1.4369	1.6
pbw	1.1897	1.2040	1.4100	0.9164	1.2
TOTAL	14.77	10.32	1078	10.87	

Cincinnati – West 8th St. (ID 390610042)

Observed Quarterly Mean $PM_{2.5}$/Quarterly Mean Composition

Pollutant (percent of total mass)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	26.85	37.0	37.22	28.04
NO3	23.78	0.26	0	12.73
OC	19.0	20.51	12.1	22.9
EC	3.5	4.81	3.09	5.51
Soil	2.29	2.98	1.99	3.5.2
NH4	15.83	12.54	11.78	13.48
pbw	8.74	13.22	12.61	8.9

Quarterly Mean Composition for each Component of $PM_{2.5}$

Pollutant (µg/m^3)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
SO4	0.8104	0.6331	0.577	0.7754	5.5
NO3	1.0886	1.0155	1.0923	0.9857	1.4
OC	0.961	1.0798	1.082	1.0235	3.0
EC	0.8969	0.9228	0.9099	0.8876	0.7
Soil	1.4146	1.3785	1.537	1.4007	0.4
NH4	0.9077	0.6968	0.6441	0.846	2.2
pbw	0.8687	0.6307	0.5734	0.8172	1.9
Quarterly FRM Mean (total mass)	15.13	15.83	21.83	14.23	

Relative Response Factors (RRFs) for each component

Pollutant	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	0.8104	0.6331	0.577	0.7754
NO3	1.0886	1.0155	1.0923	0.9857
OC	0.961	1.0798	1.082	1.0235
EC	0.8969	0.9228	0.9099	0.8876
Soil	1.4146	1.3785	1.537	1.4007
NH4	0.9077	0.6968	0.6441	0.846
pbw	0.8687	0.6307	0.5734	0.8172

Projected Future Quarterly Species Estimates

Pollutant (µg/m^3)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	TOTAL
SO4	3.2922	3.7081	4.6882	3.0939	3.7
NO3	3.9167	0.0418	0.0000	1.7856	1.4
OC	2.7626	3.5058	2.8580	3.3352	3.1
EC	0.4750	0.7026	0.6138	0.6959	0.6
Soil	0.4901	0.6503	0.6677	0.7016	0.6
NH4	2.1740	1.3832	1.6564	1.6228	1.7
pbw	1.1487	1.3199	1.5784	1.0350	1.3
TOTAL	14.26	11.31	12.06	12.27	

Sharonville – 254 Kemper Rd. (ID 390610043)

Observed Quarterly Mean $PM_{2.5}$/Quarterly Mean Composition

Pollutant (percent of total mass)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	26.85	37.36	37.22	28.05
NO3	23.78	0.26	0	12.74
OC	19.0	20.71	12.1	22.91
EC	3.5	4.86	3.09	5.51
Soil	2.29	3.01	1.99	3.52
NH4	15.83	12.66	11.78	13.48
pbw	8.74	13.35	12.61	8.9

Quarterly Mean Composition for each Component of $PM_{2.5}$

Pollutant (µg/m^3)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
SO4	3.7859	5.2192	7.6562	3.7671	5.1
NO3	3.3530	0.0363	0.0000	1.7110	1.3
OC	2.6790	2.8932	2.4890	3.0768	2.8
EC	0.4935	0.6789	0.6356	0.7400	0.6
Soil	0.3229	0.4205	0.4093	0.4727	0.4
NH4	2.2320	1.7686	2.4231	1.8104	2.1
pbw	1.2323	1.8650	2.5939	1.1953	1.7
Quarterly FRM Mean (total mass)	14.1	13.97	20.57	13.43	

Relative Response Factors (RRFs) for each component

Pollutant	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	0.8104	0.6331	0.577	0.7754
NO3	1.0886	1.0155	1.0923	0.9857
OC	0.961	1.0798	1.082	1.0235
EC	0.8969	0.9228	0.9099	0.8876
Soil	1.4146	1.3785	1.537	1.4007
NH4	0.9077	0.6968	0.6441	0.846
pbw	0.8687	0.6307	0.5734	0.8172

Projected Future Quarterly Species Estimates

Pollutant (µg/m^3)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	TOTAL
SO4	3.0681	3.3043	4.4176	2.9210	3.4
NO3	3.6501	0.0369	0.0000	1.6865	1.3
OC	2.5745	3.1241	2.6931	3.1491	2.9
EC	0.4426	0.6265	0.5783	0.6568	0.6
Soil	0.4568	0.5797	0.6292	0.6622	0.6
NH4	2.0260	1.2324	1.5607	1.5316	1.6
pbw	1.0705	1.1763	1.4873	0.9768	1.2
TOTAL	13.29	10.08	11.37	11.58	

Norwood – Sherman Ave. (ID 390617001)

Observed Quarterly Mean $PM_{2.5}$/Quarterly Mean Composition

Pollutant (percent of total mass)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	26.85	37.36	37.22	28.05
NO3	23.78	0.26	0	12.74
OC	19.0	20.71	12.1	22.91
EC	3.5	4.86	3.09	5.51
Soil	2.29	3.01	1.99	3.52
NH4	15.83	12.66	11.78	13.48
pbw	8.74	13.35	12.61	8.9

Quarterly Mean Composition for each Component of $PM_{2.5}$

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
SO4	3.9389	5.6152	7.9279	3.7587	5.3
NO3	3.4885	0.0391	0.0000	1.7072	1.3
OC	2.7873	3.1127	2.5773	3.0699	2.9
EC	0.5135	0.7305	0.6582	0.7383	0.7
Soil	0.3359	0.4524	0.4239	0.4717	0.4
NH4	2.3223	1.9028	2.5091	1.8063	2.1
pbw	1.2822	2.0065	2.6859	1.1926	1.8
Quarterly FRM Mean (total mass)	14.67	15.03	21.3	13.4	

Relative Response Factors (RRFs) for each component

Pollutant	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	0.8104	0.6331	0.577	0.7754
NO3	1.0886	1.0155	1.0923	0.9857
OC	0.961	1.0798	1.082	1.0235
EC	0.8969	0.9228	0.9099	0.8876
Soil	1.4146	1.3785	1.537	1.4007
NH4	0.9077	0.6968	0.6441	0.846
pbw	0.8687	0.6307	0.5734	0.8172

Projected Future Quarterly Species Estimates

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	TOTAL
SO4	3.1921	3.5550	4.5744	2.9145	3.6
NO3	3.7976	0.0397	0.0000	1.6827	1.4
OC	2.6786	3.3611	2.7886	3.1421	3.0
EC	0.4605	0.6741	0.5989	0.6554	0.6
Soil	0.4752	0.6236	0.6515	0.6607	0.6
NH4	2.1079	1.3259	1.6161	1.5281	1.6
pbw	1.1138	1.2655	1.5401	0.9746	1.2
TOTAL	13.83	10.85	11.77	11.56	

Fort Thomas – Alexandria Park (ID 210370003)

Observed Quarterly Mean $PM_{2.5}$/Quarterly Mean Composition

Pollutant (percent of total mass)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	26.85	37.36	37.22	28.05
NO3	23.78	0.26	0	12.74
OC	19.0	20.71	12.1	22.91
EC	3.5	4.86	3.09	5.51
Soil	2.29	3.01	1.99	3.52
NH4	15.83	12.66	11.78	13.48
pbw	8.74	13.35	12.61	08.9

Quarterly Mean Composition for each Component of $PM_{2.5}$

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
SO4	3.1683	5.1818	7.3063	3.0771	4.7
NO3	2.8060	0.0361	0.0000	1.3976	1.1
OC	2.2420	2.8725	2.3752	2.5132	2.5
EC	0.4130	0.6741	0.6066	0.6044	0.6
Soil	0.2702	0.4175	0.3906	0.3861	0.4
NH4	1.8679	1.7559	2.3124	1.4788	1.9
pbw	1.0313	1.8516	2.4753	0.9763	1.6
Quarterly FRM Mean (total mass)	11.8	13.87	19.63	10.97	

Relative Response Factors (RRFs) for each component

Pollutant	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	0.8104	0.6331	0.577	0.7754
NO3	1.0886	1.0155	1.0923	0.9857
OC	0.961	1.0798	1.082	1.0235
EC	0.8969	0.9228	0.9099	0.8876
Soil	1.4146	1.3785	1.537	1.4007
NH4	0.9077	0.6968	0.6441	0.846
pbw	0.8687	0.6307	0.5734	0.8172

Projected Future Quarterly Species Estimates

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	TOTAL
SO4	2.5676	3.2806	4.2157	2.3860	3.1
NO3	3.0547	0.0366	0.0000	1.3776	1.1
OC	2.1546	3.1017	2.5700	2.5723	2.6
EC	0.3704	0.6220	0.5519	0.5365	0.5
Soil	0.3823	0.5755	0.6004	0.5409	0.5
NH4	1.6955	1.2235	1.4894	1.2510	1.4
pbw	0.8959	1.1678	1.4194	0.7979	1.1
TOTAL	11.12	10.01	10.85	9.46	

Covington – University College (ID 211170007)

Observed Quarterly Mean $PM_{2.5}$/Quarterly Mean Composition

Pollutant (percent of total mass)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	26.85	37.36	37.22	28.05
NO3	23.78	0.26	0	12.74
OC	19.0	20.71	12.1	22.91
EC	3.5	4.86	3.09	5.51
Soil	2.29	3.01	1.99	3.52
NH4	15.83	12.66	11.78	13.48
pbw	8.74	13.35	12.61	8.9

Quarterly Mean Composition for each Component of $PM_{2.5}$

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
SO4	3.3106	5.0810	7.4068	3.1697	4.7
NO3	2.9321	0.0354	0.0000	1.4396	1.1
OC	2.3427	2.8166	2.4079	2.5888	2.5
EC	0.4316	0.6610	0.6149	0.6226	0.6
Soil	0.2824	0.4094	0.3960	0.3978	0.4
NH4	1.9518	1.7218	2.3442	1.5232	1.9
pbw	1.0776	1.8156	2.5094	1.0057	1.6
Quarterly FRM Mean (total mass)	12.23	13.6	19.9	11.3	

Relative Response Factors (RRFs) for each component

Pollutant	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SO4	0.8104	0.6331	0.577	0.7754
NO3	1.0886	1.0155	1.0923	0.9857
OC	0.961	1.0798	1.082	1.0235
EC	0.8969	0.9228	0.9099	0.8876
Soil	1.4146	1.3785	1.537	1.4007
NH4	0.9077	0.6968	0.6441	0.846
pbw	0.8687	0.6307	0.5734	0.8172

Projected Future Quarterly Species Estimates

Pollutant ($\mu g/m^3$)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	TOTAL
SO4	2.6829	3.2168	4.2737	2.4577	3.2
NO3	3.1919	0.0359	0.0000	1.4190	1.2
OC	2.2513	3.0413	2.6053	2.6497	2.6
EC	0.3871	0.6099	0.5595	0.5526	0.5
Soil	0.3994	0.5643	0.6087	0.5571	0.5
NH4	1.7717	1.1997	1.5099	1.2887	1.4
pbw	0.9361	1.1451	1.4389	0.8219	1.1
TOTAL	11.62	9.81	11.00	9.75	

December 13, 2007

MOBILE SOURCE EMISSIONS INVENTORY FOR THE CINCINNATI PM2.5 NONATTAINMENT AREA

This report was prepared for the Indiana Department of Environmental Management, the Kentucky Division for Air Quality and the Ohio Environmental Protection Agency. The Cincinnati PM2.5 nonattainment area includes a portion of Dearborn County Indiana, the counties of Boone, Campbell, Kenton in Kentucky, and the counties of Butler, Clermont, Hamilton, and Warren in Ohio. This report includes emission estimates for the years 2005, 2008, 2009 and 2018 and was generated to support the attainment SIPs for the annual PM2.5 standard. The travel demand model VMT estimates and MOBILE6.2 emission factors were originally developed in support of the 8-hour Ozone SIP in June 2007. Please refer to the June 2007 OKI Report "Mobile Source Emissions Inventory for the Cincinnati Ozone Nonattainment Area" for additional details on methodology. 2005, 2008 and 2018 model input and output files are fully documented in that report. Those model runs included direct PM2.5, NOx and SO2 emission information as part of the output, however the 2009 analysis year, and SO2 mobile emissions for all analysis years were not previously documented. Tables 1, 2 and 3 show daily mobile source emissions for the Cincinnat nonattainment area. Tables 4, 5 and 6 show annual mobile source emissions.

Table 1

Daily Mobile Source Emissions Inventory for the Indiana and Ohio Portions of the Cincinnati PM2.5 Nonattainment Area (tons per day)

	2005	2008	2009	2018
PM2.5	2.21	1.71	1.61	0.94
NOx	103.54	84.53	79.43	30.90
SO2	2.09	0.50	0.52	0.57

Table 2

Daily Mobile Source Emissions Inventory for the Kentucky Portion of the Cincinnati PM2.5 Nonattainment Area (tons per day)

	2005	2008	2009	2018
PM2.5	0.44	0.35	0.33	0.20
NOx	25.74	21.36	20.13	8.90
SO2	0.51	0.13	0.13	0.15

Table 3

Daily Mobile Source Emissions by State/County for the Cincinnati PM2.5 Nonattainment Area (tons per day)

State	2005	2008	2009	2018
Indiana				
Dearborn NA				
PM2.5	0.03	0.02	0.02	0.01
NOx	1.46	1.09	1.06	0.43
SO2	0.03	0.01	0.01	0.01
Kentucky				
Boone				
PM2.5	0.17	0.13	0.13	0.07
NOx	9.87	8.09	7.99	3.14
SO2	0.20	0.05	0.05	0.05
Campbell				
PM2.5	0.10	0.08	0.07	0.05
NOx	5.71	4.85	4.48	2.18
SO2	0.11	0.03	0.03	0.04
Kenton				
PM2.5	0.18	0.14	0.13	0.08
NOx	10.16	8.42	7.67	3.58
SO2	0.20	0.05	0.05	0.06
OKI KY Total				
PM2.5	0.44	0.35	0.33	0.20
NOx	25.74	21.36	20.13	8.90
SO2	0.51	0.13	0.13	0.15
Ohio				
Butler				
PM2.5	0.33	0.26	0.24	0.14
NOx	18.78	15.55	14.56	5.73
SO2	0.39	0.09	0.10	0.11
Clermont				
PM2.5	0.22	0.18	0.16	0.11
NOx	12.67	10.90	9.92	4.50
SO2	0.26	0.06	0.07	0.08
Hamilton				
PM2.5	0.98	0.74	0.69	0.39
NOx	56.26	45.16	42.33	15.86
SO2	1.13	0.27	0.27	0.29
Warren				
PM2.5	0.25	0.19	0.19	0.11
NOx	14.38	11.83	11.58	4.38
SO2	0.29	0.07	0.08	0.08
OKI OH Total				
PM2.5	1.77	1.36	1.28	0.74
NOx	102.08	83.44	78.38	30.47
SO2	2.06	0.49	0.51	0.56
NA Area Total				
PM2.5	2.23	1.73	1.62	0.95
NOx	129.28	105.88	99.56	39.80
SO2	0.83	0.20	0.21	0.24

Table 4

Annual Mobile Source Emissions Inventory for the Indiana and Ohio Portions of the Cincinnati PM2.5 Nonattainment Area (tons per year)

	2005	2008	2009	2018
PM2.5	749.70	580.72	545.70	319.60
NOx	35203.94	28739.18	27007.22	10504.98
SO2	711.42	170.33	176.47	194.64

Table 5

Annual Mobile Source Emissions Inventory for the Kentucky Portion of the Cincinnati PM2.5 Nonattainment Area (tons per year)

	2005	2008	2009	2018
PM2.5	149.60	118.66	111.86	67.66
NOx	8751.60	7261.38	6844.54	3026.00
SO2	173.36	42.83	44.55	51.95

Table 6

Annual Mobile Source Emissions by State/County for the Cincinnati PM2.5 Nonattainment Area (tons per year)

State	2005	2008	2009	2018
Indiana				
Dearborn NA				
PM2.5	8.84	6.46	6.12	3.40
NOx	497.76	370.94	359.72	145.86
SO2	10.30	2.37	2.51	2.64
Kentucky				
Boone				
PM2.5	57.12	44.88	44.54	23.80
NOx	3355.80	2749.58	2715.24	1067.94
SO2	66.79	16.30	17.77	18.39
Campbell				
PM2.5	32.98	26.86	24.82	16.66
NOx	1941.06	1649.00	1521.84	740.52
SO2	38.66	9.81	9.95	12.80
Kenton				
PM2.5	59.50	46.92	42.50	27.20
NOx	3454.74	2862.80	2607.46	1217.54
SO2	67.91	16.71	16.83	20.77
OKI KY Total				
PM2.5	149.60	118.66	111.86	67.66
NOx	8751.60	7261.38	6844.54	3026.00
SO2	173.36	42.83	44.55	51.95
Ohio				
Butler				
PM2.5	110.84	86.70	81.60	47.94
NOx	6384.18	5287.68	4949.72	1947.52
SO2	130.93	31.79	32.81	36.65
Clermont				
PM2.5	73.78	59.84	54.74	37.06
NOx	4306.44	3704.30	3371.78	1531.36
SO2	87.23	21.96	22.10	28.41
Hamilton				
PM2.5	331.84	250.58	233.58	130.90
NOx	19128.06	15354.06	14390.50	5392.06
SO2	384.30	90.43	93.34	99.44
Warren				
PM2.5	83.64	64.94	63.92	36.04
NOx	4887.50	4022.20	3935.50	1488.18
SO2	98.65	23.78	25.70	27.51
OKI OH Total				
PM2.5	600.10	462.06	433.84	251.94
NOx	34706.18	28368.24	26647.50	10359.12
SO2	701.11	167.97	173.96	192.00
NA Area Total				
PM2.5	758.54	587.18	551.82	323.00
NOx	43955.54	36000.56	33851.76	13530.98
SO2	282.32	68.97	72.76	82.10

PM Output Reports

2005 MOBILE6.2 PM Output File (OH.PM)

PM emission factors do not vary by state. Ohio PM used for all scenarios.

```
***************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                              *
* Input file: OH.SCN (file 3, run 1).                                     *
***************************************************************************

* # # # # # # # # # # # # # # # # # # # # # # # # # #
* Ohio Emissions - CY20xx

* File 3, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # # #

                              Calendar Year:  2005
                                      Month:  July
               Gasoline Fuel Sulfur Content:   92. ppm
                 Diesel Fuel Sulfur Content:  317. ppm
                       Particle Size Cutoff:  2.50 Microns
                           Reformulated Gas:  No

       Vehicle Type:     LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
               GVWR:              <6000     >6000     (All)
                       ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
  VMT Distribution:    0.4050    0.3396    0.1270              0.0359    0.0006    0.0019    0.0845    0.0057    1.0000
 ---------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
               Lead:   0.0000    0.0000    0.0000    0.0000    0.0000    ------    ------    ------    0.0000    0.0000
              GASPM:   0.0039    0.0040    0.0042    0.0041    0.0549    ------    ------    ------    0.0142    0.0055
            ECARBON:   ------    ------    ------    ------    ------    0.1137    0.0412    0.1899    ------    0.0162
            OCARBON:   ------    ------    ------    ------    ------    0.0321    0.0593    0.0954    ------    0.0082
                SO4:   0.0011    0.0016    0.0016    0.0016    0.0033    0.0036    0.0061    0.0197    0.0004    0.0030
   Total Exhaust PM:   0.0050    0.0056    0.0058    0.0056    0.0582    0.1494    0.1066    0.3050    0.0146    0.0329
              Brake:   0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053
               Tire:   0.0020    0.0020    0.0020    0.0020    0.0022    0.0020    0.0020    0.0065    0.0010    0.0024
           Total PM:   0.0123    0.0129    0.0131    0.0130    0.0657    0.1567    0.1140    0.3169    0.0209    0.0406
                SO2:   0.0208    0.0267    0.0349    0.0289    0.0522    0.0688    0.1177    0.2813    0.0101    0.0479
                NH3:   0.1016    0.1013    0.1007    0.1012    0.0451    0.0068    0.0068    0.0270    0.0113    0.0923
 ---------------------------------------------------------------------------------------------------------------------
          Veh. Type:   GasBUS     URBAN    SCHOOL
                       ------    ------    ------
            VMT Mix:   0.0003    0.0009    0.0016
 ---------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
               Lead:   0.0000    ------    ------
              GASPM:   0.1208    ------    ------
            ECARBON:   ------    0.2993    0.3947
            OCARBON:   ------    0.2351    0.3101
                SO4:   0.0008    0.0327    0.0226
   Total Exhaust PM:   0.1215    0.5671    0.7275
              Brake:   0.0053    0.0053    0.0053
               Tire:   0.0030    0.0030    0.0030
           Total PM:   0.1299    0.5754    0.7358
                SO2:   0.0812    0.4668    0.3230
                NH3:   0.0451    0.0270    0.0270
 ---------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # # #
* Ohio Emissions - CY20xx

* File 3, Run 1, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # # #

                              Calendar Year:  2005
                                      Month:  July
               Gasoline Fuel Sulfur Content:   92. ppm
                 Diesel Fuel Sulfur Content:  317. ppm
                       Particle Size Cutoff:  2.50 Microns
                           Reformulated Gas:  No

       Vehicle Type:     LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
               GVWR:              <6000     >6000     (All)
                       ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
  VMT Distribution:    0.4050    0.3396    0.1270              0.0359    0.0006    0.0019    0.0845    0.0057    1.0000
 ---------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
               Lead:   0.0000    0.0000    0.0000    0.0000    0.0000    ------    ------    ------    0.0000    0.0000
              GASPM:   0.0039    0.0040    0.0042    0.0041    0.0549    ------    ------    ------    0.0142    0.0055
            ECARBON:   ------    ------    ------    ------    ------    0.1137    0.0412    0.1899    ------    0.0162
            OCARBON:   ------    ------    ------    ------    ------    0.0321    0.0593    0.0954    ------    0.0082
                SO4:   0.0011    0.0016    0.0016    0.0016    0.0033    0.0036    0.0061    0.0197    0.0004    0.0030
   Total Exhaust PM:   0.0050    0.0056    0.0058    0.0056    0.0582    0.1494    0.1066    0.3050    0.0146    0.0329
              Brake:   0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053
               Tire:   0.0020    0.0020    0.0020    0.0020    0.0022    0.0020    0.0020    0.0065    0.0010    0.0024
           Total PM:   0.0123    0.0129    0.0131    0.0130    0.0657    0.1567    0.1140    0.3169    0.0209    0.0406
                SO2:   0.0208    0.0267    0.0349    0.0289    0.0522    0.0688    0.1177    0.2813    0.0101    0.0479
                NH3:   0.1016    0.1013    0.1007    0.1012    0.0451    0.0068    0.0068    0.0270    0.0113    0.0923
 ---------------------------------------------------------------------------------------------------------------------
          Veh. Type:   GasBUS     URBAN    SCHOOL
                       ------    ------    ------
            VMT Mix:   0.0003    0.0009    0.0016
 ---------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
               Lead:   0.0000    ------    ------
              GASPM:   0.1208    ------    ------
```

```
          ECARBON:    ------    0.2993    0.3947
          OCARBON:    ------    0.2351    0.3101
              SO4:    0.0008    0.0327    0.0226
 Total Exhaust PM:    0.1215    0.5671    0.7275
            Brake:    0.0053    0.0053    0.0053
             Tire:    0.0030    0.0030    0.0030
         Total PM:    0.1299    0.5754    0.7358
              SO2:    0.0812    0.4668    0.3230
              NH3:    0.0451    0.0270    0.0270
 ------------------------------------------------------------------------------------------------------------------------
```

2008 MOBILE6.2 PM Output File (OH.PM)

```
***************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                              *
* Input file: OH.SCN (file 3, run 1).                                     *
***************************************************************************

* # # # # # # # # # # # # # # # # # # # # # # # # # # #
* Ohio Emissions - CY20xx

* File 3, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # # # #

                              Calendar Year:  2008
                                      Month:  July
               Gasoline Fuel Sulfur Content:   30. ppm
                 Diesel Fuel Sulfur Content:   43. ppm
                       Particle Size Cutoff:  2.50 Microns
                           Reformulated Gas:  No

     Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
             GVWR:               <6000     >6000     (All)
                      ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
 VMT Distribution:    0.3623    0.3705    0.1385              0.0357    0.0004    0.0020    0.0851    0.0055    1.0000
 ------------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
             Lead:    0.0000    0.0000    0.0000    0.0000    0.0000    ------    ------    ------    0.0000    0.0000
            GASPM:    0.0038    0.0038    0.0039    0.0038    0.0428    ------    ------    ------    0.0142    0.0049
          ECARBON:    ------    ------    ------    ------    ------    0.0671    0.0295    0.1336    ------    0.0115
          OCARBON:    ------    ------    ------    ------    ------    0.0189    0.0425    0.0675    ------    0.0058
              SO4:    0.0004    0.0005    0.0005    0.0005    0.0014    0.0004    0.0008    0.0027    0.0001    0.0007
 Total Exhaust PM:    0.0041    0.0043    0.0044    0.0043    0.0441    0.0865    0.0729    0.2037    0.0143    0.0229
            Brake:    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053
             Tire:    0.0020    0.0020    0.0020    0.0020    0.0022    0.0020    0.0020    0.0065    0.0010    0.0024
         Total PM:    0.0115    0.0116    0.0117    0.0116    0.0516    0.0938    0.0802    0.2155    0.0206    0.0306
              SO2:    0.0068    0.0088    0.0115    0.0095    0.0168    0.0085    0.0160    0.0379    0.0033    0.0112
              NH3:    0.1017    0.1016    0.1012    0.1015    0.0451    0.0068    0.0068    0.0270    0.0113    0.0925
 ------------------------------------------------------------------------------------------------------------------------
        Veh. Type:    GasBUS     URBAN    SCHOOL
                      ------    ------    ------
          VMT Mix:    0.0002    0.0009    0.0017
 ------------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
             Lead:    0.0000    ------    ------
            GASPM:    0.1035    ------    ------
          ECARBON:    ------    0.1525    0.3108
          OCARBON:    ------    0.1198    0.2442
              SO4:    0.0004    0.0044    0.0031
 Total Exhaust PM:    0.1039    0.2768    0.5580
            Brake:    0.0053    0.0053    0.0053
             Tire:    0.0030    0.0030    0.0030
         Total PM:    0.1123    0.2851    0.5664
              SO2:    0.0263    0.0627    0.0439
              NH3:    0.0451    0.0270    0.0270
 ------------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # # # #
* Ohio Emissions - CY20xx

* File 3, Run 1, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # # # #

                              Calendar Year:  2008
                                      Month:  July
               Gasoline Fuel Sulfur Content:   30. ppm
                 Diesel Fuel Sulfur Content:   43. ppm
                       Particle Size Cutoff:  2.50 Microns
                           Reformulated Gas:  No

     Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
             GVWR:               <6000     >6000     (All)
                      ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
 VMT Distribution:    0.3623    0.3705    0.1385              0.0357    0.0004    0.0020    0.0851    0.0055    1.0000
 ------------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
             Lead:    0.0000    0.0000    0.0000    0.0000    0.0000    ------    ------    ------    0.0000    0.0000
            GASPM:    0.0038    0.0038    0.0039    0.0038    0.0428    ------    ------    ------    0.0142    0.0049
          ECARBON:    ------    ------    ------    ------    ------    0.0671    0.0295    0.1336    ------    0.0115
          OCARBON:    ------    ------    ------    ------    ------    0.0189    0.0425    0.0675    ------    0.0058
              SO4:    0.0004    0.0005    0.0005    0.0005    0.0014    0.0004    0.0008    0.0027    0.0001    0.0007
 Total Exhaust PM:    0.0041    0.0043    0.0044    0.0043    0.0441    0.0865    0.0729    0.2037    0.0143    0.0229
            Brake:    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053
             Tire:    0.0020    0.0020    0.0020    0.0020    0.0022    0.0020    0.0020    0.0065    0.0010    0.0024
         Total PM:    0.0115    0.0116    0.0117    0.0116    0.0516    0.0938    0.0802    0.2155    0.0206    0.0306
              SO2:    0.0068    0.0088    0.0115    0.0095    0.0168    0.0085    0.0160    0.0379    0.0033    0.0112
              NH3:    0.1017    0.1016    0.1012    0.1015    0.0451    0.0068    0.0068    0.0270    0.0113    0.0925
 ------------------------------------------------------------------------------------------------------------------------
        Veh. Type:    GasBUS     URBAN    SCHOOL
```

```
                     ------    ------    ------
          VMT Mix:   0.0002    0.0009    0.0017
 ------------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
             Lead:   0.0000    ------    ------
            GASPM:   0.1035    ------    ------
          ECARBON:   ------    0.1525    0.3108
          OCARBON:   ------    0.1198    0.2442
              SO4:   0.0004    0.0044    0.0031
 Total Exhaust PM:   0.1039    0.2768    0.5580
            Brake:   0.0053    0.0053    0.0053
             Tire:   0.0030    0.0030    0.0030
         Total PM:   0.1123    0.2851    0.5664
              SO2:   0.0263    0.0627    0.0439
              NH3:   0.0451    0.0270    0.0270
 ------------------------------------------------------------------------------------------------------------------------
```

2009 MOBILE6.2 PM Output File (OH.PM)

```
***************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                              *
* Input file: OH.SCN (file 3, run 1).                                     *
***************************************************************************

* # # # # # # # # # # # # # # # # # # # # # # # # # # #
* Ohio Emissions - CY20xx

* File 3, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # # # #

                         Calendar Year:  2009
                                 Month:  July
           Gasoline Fuel Sulfur Content:   30. ppm
             Diesel Fuel Sulfur Content:   43. ppm
                   Particle Size Cutoff:  2.50 Microns
                       Reformulated Gas:  No

    Vehicle Type:     LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
            GVWR:              <6000     >6000     (All)
                    ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
 VMT Distribution:  0.3493    0.3797    0.1419              0.0358    0.0003    0.0021    0.0854    0.0054    1.0000
 ------------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
             Lead:  0.0000    0.0000    0.0000    0.0000    0.0000    ------    ------    ------    0.0000    0.0000
            GASPM:  0.0037    0.0037    0.0038    0.0037    0.0374    ------    ------    ------    0.0142    0.0047
          ECARBON:  ------    ------    ------    ------    ------    0.0543    0.0230    0.1140    ------    0.0098
          OCARBON:  ------    ------    ------    ------    ------    0.0153    0.0331    0.0577    ------    0.0050
              SO4:  0.0003    0.0005    0.0005    0.0005    0.0015    0.0004    0.0008    0.0027    0.0001    0.0006
 Total Exhaust PM:  0.0041    0.0042    0.0043    0.0042    0.0389    0.0701    0.0569    0.1744    0.0143    0.0201
            Brake:  0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053
             Tire:  0.0020    0.0020    0.0020    0.0020    0.0022    0.0020    0.0020    0.0065    0.0010    0.0024
         Total PM:  0.0114    0.0115    0.0116    0.0115    0.0464    0.0774    0.0643    0.1862    0.0206    0.0278
              SO2:  0.0068    0.0088    0.0115    0.0095    0.0167    0.0085    0.0161    0.0379    0.0033    0.0112
              NH3:  0.1017    0.1016    0.1013    0.1015    0.0451    0.0068    0.0068    0.0270    0.0113    0.0925
 ------------------------------------------------------------------------------------------------------------------------
        Veh. Type:  GasBUS     URBAN    SCHOOL
                    ------    ------    ------
          VMT Mix:  0.0002    0.0009    0.0018
 ------------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
             Lead:  0.0000    ------    ------
            GASPM:  0.0928    ------    ------
          ECARBON:  ------    0.1201    0.2929
          OCARBON:  ------    0.0944    0.2301
              SO4:  0.0005    0.0044    0.0031
 Total Exhaust PM:  0.0933    0.2189    0.5261
            Brake:  0.0053    0.0053    0.0053
             Tire:  0.0030    0.0030    0.0030
         Total PM:  0.1016    0.2272    0.5344
              SO2:  0.0262    0.0627    0.0439
              NH3:  0.0451    0.0270    0.0270
 ------------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # # # #
* Ohio Emissions - CY20xx

* File 3, Run 1, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # # # #

                         Calendar Year:  2009
                                 Month:  July
           Gasoline Fuel Sulfur Content:   30. ppm
             Diesel Fuel Sulfur Content:   43. ppm
                   Particle Size Cutoff:  2.50 Microns
                       Reformulated Gas:  No

    Vehicle Type:     LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
            GVWR:              <6000     >6000     (All)
                    ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
 VMT Distribution:  0.3493    0.3797    0.1419              0.0358    0.0003    0.0021    0.0854    0.0054    1.0000
 ------------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
             Lead:  0.0000    0.0000    0.0000    0.0000    0.0000    ------    ------    ------    0.0000    0.0000
            GASPM:  0.0037    0.0037    0.0038    0.0037    0.0374    ------    ------    ------    0.0142    0.0047
          ECARBON:  ------    ------    ------    ------    ------    0.0543    0.0230    0.1140    ------    0.0098
          OCARBON:  ------    ------    ------    ------    ------    0.0153    0.0331    0.0577    ------    0.0050
              SO4:  0.0003    0.0005    0.0005    0.0005    0.0015    0.0004    0.0008    0.0027    0.0001    0.0006
 Total Exhaust PM:  0.0041    0.0042    0.0043    0.0042    0.0389    0.0701    0.0569    0.1744    0.0143    0.0201
            Brake:  0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053
```

```
            Tire:    0.0020    0.0020    0.0020    0.0020    0.0022    0.0020    0.0020    0.0065    0.0010    0.0024
        Total PM:    0.0114    0.0115    0.0116    0.0115    0.0464    0.0774    0.0643    0.1862    0.0206    0.0278
             SO2:    0.0068    0.0088    0.0115    0.0095    0.0167    0.0085    0.0161    0.0379    0.0033    0.0112
             NH3:    0.1017    0.1016    0.1013    0.1015    0.0451    0.0068    0.0068    0.0270    0.0113    0.0925
-------------------------------------------------------------------------------------------------------------------------
       Veh. Type:    GasBUS     URBAN    SCHOOL
                     ------    ------    ------
         VMT Mix:    0.0002    0.0009    0.0018
-------------------------------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
            Lead:    0.0000    ------    ------
           GASPM:    0.0928    ------    ------
         ECARBON:    ------    0.1201    0.2929
         OCARBON:    ------    0.0944    0.2301
             SO4:    0.0005    0.0044    0.0031
  Total Exhaust PM:  0.0933    0.2189    0.5261
           Brake:    0.0053    0.0053    0.0053
            Tire:    0.0030    0.0030    0.0030
        Total PM:    0.1016    0.2272    0.5344
             SO2:    0.0262    0.0627    0.0439
             NH3:    0.0451    0.0270    0.0270
-------------------------------------------------------------------------------------------------------------------------
```

2018 MOBILE6.2 PM Output File (OH.PM)

```
****************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                               *
* Input file: OH.SCN (file 3, run 1).                                      *
****************************************************************************

* # # # # # # # # # # # # # # # # # # # # # # # # # #
* Ohio Emissions - CY20xx

* File 3, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # # #

                              Calendar Year:  2018
                                      Month:  July
               Gasoline Fuel Sulfur Content:   30. ppm
                 Diesel Fuel Sulfur Content:   43. ppm
                       Particle Size Cutoff:  2.50 Microns
                           Reformulated Gas:  No

     Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
             GVWR:               <6000     >6000     (All)
                      ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
 VMT Distribution:    0.2770    0.4319    0.1614              0.0359    0.0002    0.0024    0.0861    0.0051    1.0000
-------------------------------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
            Lead:    0.0000    0.0000    0.0000    0.0000    0.0000    ------    ------    ------    0.0000    0.0000
           GASPM:    0.0036    0.0034    0.0034    0.0034    0.0138    ------    ------    ------    0.0142    0.0036
         ECARBON:    ------    ------    ------    ------    ------    0.0103    0.0048    0.0220    ------    0.0019
         OCARBON:    ------    ------    ------    ------    ------    0.0029    0.0069    0.0113    ------    0.0010
             SO4:    0.0003    0.0005    0.0005    0.0005    0.0018    0.0004    0.0008    0.0026    0.0001    0.0007
  Total Exhaust PM:  0.0039    0.0039    0.0039    0.0039    0.0155    0.0136    0.0125    0.0359    0.0143    0.0072
           Brake:    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053
            Tire:    0.0020    0.0020    0.0020    0.0020    0.0022    0.0020    0.0020    0.0065    0.0010    0.0024
        Total PM:    0.0112    0.0113    0.0113    0.0113    0.0230    0.0210    0.0199    0.0477    0.0206    0.0149
             SO2:    0.0068    0.0088    0.0115    0.0096    0.0165    0.0084    0.0161    0.0377    0.0033    0.0114
             NH3:    0.1017    0.1017    0.1017    0.1017    0.0451    0.0068    0.0068    0.0270    0.0113    0.0925
-------------------------------------------------------------------------------------------------------------------------
       Veh. Type:    GasBUS     URBAN    SCHOOL
                     ------    ------    ------
         VMT Mix:    0.0001    0.0010    0.0019
-------------------------------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
            Lead:    0.0000    ------    ------
           GASPM:    0.0270    ------    ------
         ECARBON:    ------    0.0259    0.0401
         OCARBON:    ------    0.0204    0.0315
             SO4:    0.0013    0.0044    0.0031
  Total Exhaust PM:  0.0283    0.0506    0.0747
           Brake:    0.0053    0.0053    0.0053
            Tire:    0.0030    0.0030    0.0030
        Total PM:    0.0366    0.0590    0.0830
             SO2:    0.0254    0.0623    0.0440
             NH3:    0.0451    0.0270    0.0270
-------------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # # #
* Ohio Emissions - CY20xx

* File 3, Run 1, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # # #

                              Calendar Year:  2018
                                      Month:  July
               Gasoline Fuel Sulfur Content:   30. ppm
                 Diesel Fuel Sulfur Content:   43. ppm
                       Particle Size Cutoff:  2.50 Microns
                           Reformulated Gas:  No

     Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
             GVWR:               <6000     >6000     (All)
                      ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
 VMT Distribution:    0.2770    0.4319    0.1614              0.0359    0.0002    0.0024    0.0861    0.0051    1.0000
-------------------------------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
            Lead:    0.0000    0.0000    0.0000    0.0000    0.0000    ------    ------    ------    0.0000    0.0000
           GASPM:    0.0036    0.0034    0.0034    0.0034    0.0138    ------    ------    ------    0.0142    0.0036
         ECARBON:    ------    ------    ------    ------    ------    0.0103    0.0048    0.0220    ------    0.0019
```

OCARBON:	------	------	------	------	------	0.0029	0.0069	0.0113	------	0.0010
SO4:	0.0003	0.0005	0.0005	0.0005	0.0018	0.0004	0.0008	0.0026	0.0001	0.0007
Total Exhaust PM:	0.0039	0.0039	0.0039	0.0039	0.0155	0.0136	0.0125	0.0359	0.0143	0.0072
Brake:	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053
Tire:	0.0020	0.0020	0.0020	0.0020	0.0022	0.0020	0.0020	0.0065	0.0010	0.0024
Total PM:	0.0112	0.0113	0.0113	0.0113	0.0230	0.0210	0.0199	0.0477	0.0206	0.0149
SO2:	0.0068	0.0088	0.0115	0.0096	0.0165	0.0084	0.0161	0.0377	0.0033	0.0114
NH3:	0.1017	0.1017	0.1017	0.1017	0.0451	0.0068	0.0068	0.0270	0.0113	0.0925

Veh. Type:	GasBUS	URBAN	SCHOOL
VMT Mix:	0.0001	0.0010	0.0019

Composite Emission Factors (g/mi):

Lead:	0.0000	------	------
GASPM:	0.0270	------	------
ECARBON:	------	0.0259	0.0401
OCARBON:	------	0.0204	0.0315
SO4:	0.0013	0.0044	0.0031
Total Exhaust PM:	0.0283	0.0506	0.0747
Brake:	0.0053	0.0053	0.0053
Tire:	0.0030	0.0030	0.0030
Total PM:	0.0366	0.0590	0.0830
SO2:	0.0254	0.0623	0.0440
NH3:	0.0451	0.0270	0.0270

2009 MOBILE6.2 Input/Output Files for Indiana Portion of Nonattainment Area (2009 files not previously documented)

2009 VMT by Speed Bin (INSVMT.D)

```
SPEED VMT
1  1 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0135 0.0092 0.0000 0.0000 0.0000 0.0000 0.9773
1  2 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0047 0.0071 0.0081 0.0000 0.0000 0.0000 0.0000 0.9802
1  3 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0043 0.0066 0.0075 0.0000 0.0000 0.0000 0.0000 0.9817
1  4 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0108 0.0074 0.0000 0.0000 0.0000 0.0000 0.9817
1  5 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0105 0.0072 0.0000 0.0000 0.0000 0.0000 0.9822
1  6 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0112 0.0077 0.0000 0.0000 0.0000 0.0000 0.9811
1  7 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0109 0.0075 0.0000 0.0000 0.0000 0.0000 0.9816
1  8 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0105 0.0072 0.0000 0.0000 0.0000 0.0000 0.9823
1  9 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0101 0.0069 0.0000 0.0000 0.0000 0.0000 0.9830
1 10 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0097 0.0066 0.0000 0.0000 0.0000 0.0000 0.9837
1 11 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0094 0.0064 0.0000 0.0000 0.0000 0.0000 0.9842
1 12 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0078 0.0054 0.0000 0.0000 0.0000 0.0000 0.9868
1 13 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0077 0.0053 0.0000 0.0000 0.0000 0.0000 0.9870
1 14 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0093 0.0064 0.0000 0.0000 0.0000 0.0000 0.9844
1 15 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0094 0.0064 0.0000 0.0000 0.0000 0.0000 0.9842
1 16 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0089 0.0061 0.0000 0.0000 0.0000 0.0000 0.9850
1 17 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0100 0.0069 0.0000 0.0000 0.0000 0.0000 0.9831
1 18 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0087 0.0060 0.0000 0.0000 0.0000 0.0000 0.9853
1 19 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0103 0.0071 0.0000 0.0000 0.0000 0.0000 0.9826
1 20 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0114 0.0078 0.0000 0.0000 0.0000 0.0000 0.9807
1 21 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0109 0.0075 0.0000 0.0000 0.0000 0.0000 0.9815
1 22 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0115 0.0079 0.0000 0.0000 0.0000 0.0000 0.9806
1 23 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0117 0.0080 0.0000 0.0000 0.0000 0.0000 0.9802
1 24 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0122 0.0084 0.0000 0.0000 0.0000 0.0000 0.9794
2  1 0.0000 0.0000 0.0000 0.1797 0.0096 0.0940 0.0464 0.0844 0.5860 0.0000 0.0000 0.0000 0.0000 0.0000
2  2 0.0000 0.0000 0.0000 0.1896 0.0098 0.0939 0.0501 0.0808 0.5759 0.0000 0.0000 0.0000 0.0000 0.0000
2  3 0.0000 0.0000 0.0000 0.1972 0.0099 0.0945 0.0502 0.0817 0.5664 0.0000 0.0000 0.0000 0.0000 0.0000
2  4 0.0000 0.0000 0.0000 0.2265 0.0101 0.0881 0.0418 0.0828 0.5507 0.0000 0.0000 0.0000 0.0000 0.0000
2  5 0.0000 0.0000 0.0000 0.2338 0.0102 0.0874 0.0413 0.0828 0.5445 0.0000 0.0000 0.0000 0.0000 0.0000
2  6 0.0000 0.0000 0.0000 0.2207 0.0099 0.0869 0.0413 0.0816 0.5595 0.0000 0.0000 0.0000 0.0000 0.0000
2  7 0.0000 0.0000 0.0000 0.2412 0.0102 0.0846 0.0395 0.0812 0.5434 0.0000 0.0000 0.0000 0.0000 0.0000
2  8 0.0000 0.0000 0.0000 0.2459 0.0103 0.0855 0.0399 0.0821 0.5362 0.0000 0.0000 0.0000 0.0000 0.0000
2  9 0.0000 0.0000 0.0000 0.2423 0.0103 0.0866 0.0406 0.0827 0.5376 0.0000 0.0000 0.0000 0.0000 0.0000
2 10 0.0000 0.0000 0.0000 0.2583 0.0105 0.0850 0.0393 0.0825 0.5243 0.0000 0.0000 0.0000 0.0000 0.0000
2 11 0.0000 0.0000 0.0000 0.2458 0.0105 0.0879 0.0412 0.0838 0.5309 0.0000 0.0000 0.0000 0.0000 0.0000
2 12 0.0000 0.0000 0.0000 0.2281 0.0103 0.0913 0.0436 0.0852 0.5415 0.0000 0.0000 0.0000 0.0000 0.0000
2 13 0.0000 0.0000 0.0000 0.2276 0.0106 0.0956 0.0459 0.0882 0.5322 0.0000 0.0000 0.0000 0.0000 0.0000
2 14 0.0000 0.0000 0.0000 0.2148 0.0106 0.0989 0.0481 0.0898 0.5378 0.0000 0.0000 0.0000 0.0000 0.0000
2 15 0.0000 0.0000 0.0000 0.2346 0.0107 0.0957 0.0458 0.0887 0.5244 0.0000 0.0000 0.0000 0.0000 0.0000
2 16 0.0000 0.0000 0.0000 0.2361 0.0107 0.0942 0.0449 0.0877 0.5265 0.0000 0.0000 0.0000 0.0000 0.0000
2 17 0.0000 0.0000 0.0000 0.2287 0.0104 0.0917 0.0438 0.0856 0.5399 0.0000 0.0000 0.0000 0.0000 0.0000
2 18 0.0000 0.0000 0.0000 0.2554 0.0107 0.0892 0.0416 0.0853 0.5178 0.0000 0.0000 0.0000 0.0000 0.0000
2 19 0.0000 0.0000 0.0000 0.2201 0.0095 0.0805 0.0379 0.0770 0.5750 0.0000 0.0000 0.0000 0.0000 0.0000
2 20 0.0000 0.0000 0.0000 0.2112 0.0094 0.0819 0.0389 0.0775 0.5812 0.0000 0.0000 0.0000 0.0000 0.0000
2 21 0.0000 0.0000 0.0000 0.2481 0.0106 0.0887 0.0416 0.0847 0.5264 0.0000 0.0000 0.0000 0.0000 0.0000
2 22 0.0000 0.0000 0.0000 0.2143 0.0102 0.0941 0.0455 0.0864 0.5494 0.0000 0.0000 0.0000 0.0000 0.0000
2 23 0.0000 0.0000 0.0000 0.2130 0.0104 0.0966 0.0468 0.0881 0.5451 0.0000 0.0000 0.0000 0.0000 0.0000
2 24 0.0000 0.0000 0.0000 0.2051 0.0101 0.0947 0.0460 0.0863 0.5578 0.0000 0.0000 0.0000 0.0000 0.0000
```

2009 VMT by Facility (INFVMT.D)

```
VMT BY FACILITY
      1 0.244 0.539 0.211 0.006
        0.266 0.516 0.212 0.005
        0.269 0.508 0.217 0.005
        0.267 0.493 0.235 0.005
        0.266 0.489 0.240 0.005
        0.262 0.501 0.231 0.005
        0.258 0.491 0.246 0.005
        0.258 0.487 0.251 0.005
        0.266 0.483 0.246 0.005
        0.269 0.471 0.256 0.004
        0.274 0.475 0.247 0.004
        0.309 0.462 0.225 0.004
        0.298 0.467 0.232 0.004
        0.263 0.497 0.236 0.004
        0.254 0.490 0.252 0.004
        0.267 0.482 0.247 0.004
```

```
       0.264 0.491 0.241 0.005
       0.280 0.463 0.253 0.004
       0.302 0.479 0.213 0.005
       0.286 0.495 0.213 0.006
       0.254 0.485 0.256 0.005
       0.246 0.512 0.237 0.005
       0.235 0.519 0.242 0.005
       0.238 0.524 0.233 0.005
...
Identical distribution for all veh. types with the exception of diesel
transit buses
    26 0.010 0.949 0.035 0.002
       0.010 0.949 0.035 0.002
       0.010 0.949 0.035 0.002
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.010 0.949 0.035 0.002
       0.010 0.949 0.035 0.002
       0.010 0.949 0.035 0.002
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
       0.003 0.963 0.030 0.004
```

2009 MOBILE6.2 Input File (IN.SCN)

```
* Mobile6 file for Dearborn County, IN
* created 4/9/07, ajr post em62in.06c
*******************  Header Section  ************************
MOBILE6 INPUT FILE :
POLLUTANTS         : HC NOx CO
PARTICULATES       :
* PARTICULATES REPORTED IN *.PM FILE
REPORT FILE        : in.rpt
DATABASE OUTPUT    :
WITH FIELDNAMES    :
DATABASE EMISSIONS : 2211 1111 22
DAILY OUTPUT       :
EMISSIONS TABLE    : inemiss.tb1
RUN DATA
*******************  Run Section  ***************************
VMT BY HOUR        : INHVMT.D
SPEED VMT          : INSVMT.D
VMT BY FACILITY    : INFVMT.D
EXPAND BUS EFS     :
REBUILD EFFECTS    : 0.30
*******************  Summer Scenario Section  *********************
SCENARIO RECORD    : Indiana Emissions - CY20xx
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
SEASON             : 1
MIN/MAX TEMP       : 61.0 95.0
FUEL PROGRAM       : 1
FUEL RVP           : 9.0
PARTICLE SIZE      : 2.5
PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR      : 43
*******************  Annual Scenario Section  *********************
SCENARIO RECORD    : Indiana Emissions - CY20xx
```

```
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
MIN/MAX TEMP       : 47.0 64.0
FUEL PROGRAM       : 1
FUEL RVP           : 9.0
PARTICLE SIZE      : 2.5
PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR      : 43
*******************  End of Run  ***************************
END OF RUN
```

2009 MOBILE6.2 Output Report (IN.RPT)

```
***************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                              *
* Input file: IN.SCN (file 1, run 1).                                     *
***************************************************************************

* Reading Hourly VMT distribution from the following external
* data file: INHVMT.D

* Reading Hourly, Roadway, and Speed VMT dist. from the following external
* data file: INSVMT.D

* Reading Hourly Roadway VMT distribution from the following external
* data file: INFVMT.D

  Reading User Supplied ROADWAY VMT Factors

* # # # # # # # # # # # # # # # # # # # # # # # # # #
* Indiana Emissions - CY20xx

* File 1, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # # #
  M616 Comment:
             User has supplied post-1999 sulfur levels.

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
  M 48 Warning:
            there are no sales for vehicle class HDGV8b
 HDDV DEFEAT DEVICE EFFECTS ARE PRESENT. THE REBUILD FRACTION IS 0.30.

* Reading Ammonia (NH3) Basic Emissiion Rates
* from the external data file PMNH3BER.D

* Reading Ammonia (NH3) Sulfur Deterioration Rates
* from the external data file PMNH3SDR.D
  M111 Warning:
             The input dIesel sulfur level of  43.0 ppm exceeds
             the 2007 HDD Rule diesel sulfur limit of 15 ppm.

                  Calendar Year:  2009
                          Month:  July
                       Altitude:  Low
            Minimum Temperature:  61.0 (F)
            Maximum Temperature:  95.0 (F)
              Absolute Humidity:   75. grains/lb
               Nominal Fuel RVP:   9.0 psi
                  Weathered RVP:   8.5 psi
            Fuel Sulfur Content:   30. ppm

            Exhaust I/M Program:  No
               Evap I/M Program:  No
                    ATP Program:  No
               Reformulated Gas:  No

      Vehicle Type:      LDGV    LDGT12    LDGT34     LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
              GVWR:               <6000     >6000     (All)
                        ------   ------    ------    ------    ------    ------    ------    ------    ------    ------
  VMT Distribution:    0.3597    0.3800    0.1306              0.0360    0.0003    0.0019    0.0860    0.0055    1.0000
  -----------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
    Composite VOC :      0.979     1.005     1.711     1.186     1.510    0.250     0.526     0.477      3.34     1.072
    Composite CO  :      9.35     10.90     15.02     11.95     12.72     1.112     0.917     2.414     20.91    10.250
    Composite NOX :      0.638     0.796     1.180     0.894     2.557    0.597     0.925     8.840      1.21     1.547
  -----------------------------------------------------------------------------------------------------------------------
         Veh. Type:    GasBUS     URBAN    SCHOOL
                        ------   ------    ------
           VMT Mix:    0.0002    0.0009    0.0018
-----------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
```

```
     Composite VOC :     5.866     0.336     0.702
     Composite CO  :    45.37      3.078     2.624
     Composite NOX :     7.533    12.368    11.380
---------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # # #
* Indiana Emissions - CY20xx

* File 1, Run 1, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # # #
  M616 Comment:
              User has supplied post-1999 sulfur levels.

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
  M 48 Warning:
             there are no sales for vehicle class HDGV8b
  M111 Warning:
              The input dIesel sulfur level of  43.0 ppm exceeds
              the 2007 HDD Rule diesel sulfur limit of 15 ppm.

                   Calendar Year:  2009
                           Month:  July
                        Altitude:  Low
             Minimum Temperature:  47.0 (F)
             Maximum Temperature:  64.0 (F)
               Absolute Humidity:   75. grains/lb
                Nominal Fuel RVP:   9.0 psi
                   Weathered RVP:   9.0 psi
             Fuel Sulfur Content:   30. ppm

             Exhaust I/M Program:  No
                Evap I/M Program:  No
                     ATP Program:  No
                Reformulated Gas:  No

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
               GVWR:               <6000     >6000     (All)
                        ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
   VMT Distribution:    0.3597    0.3800    0.1306              0.0360    0.0003    0.0019    0.0860    0.0055    1.0000
  ---------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :     0.803     0.899     1.515     1.056     1.135     0.250     0.526     0.477      2.18     0.923
     Composite CO  :    11.66     13.95     18.81     15.19     12.80      1.112     0.917     2.414     17.73    12.721
     Composite NOX :     0.619     0.828     1.232     0.931     2.619     0.597     0.925     8.840      1.42     1.562
  ---------------------------------------------------------------------------------------------------------------------
          Veh. Type:    GasBUS     URBAN    SCHOOL
                        ------    ------    ------
            VMT Mix:    0.0002    0.0009    0.0018
---------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :     4.466     0.336     0.702
     Composite CO  :    45.64      3.078     2.624
     Composite NOX :     7.716    12.368    11.380
---------------------------------------------------------------------------------------------------------------------
```

2009 MOBILE6.2 PM Output Report (IN.PM)

```
***************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                              *
* Input file: IN.SCN (file 1, run 1).                                     *
***************************************************************************

* # # # # # # # # # # # # # # # # # # # # # # # # # #
* Indiana Emissions - CY20xx

* File 1, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # # #

                             Calendar Year:  2009
                                     Month:  July
              Gasoline Fuel Sulfur Content:   30. ppm
                Diesel Fuel Sulfur Content:   43. ppm
                      Particle Size Cutoff:  2.50 Microns
                          Reformulated Gas:  No

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
               GVWR:               <6000     >6000     (All)
                        ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
   VMT Distribution:    0.3597    0.3800    0.1306              0.0360    0.0003    0.0019    0.0860    0.0055    1.0000
 ----------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
               Lead:    0.0000    0.0000    0.0000    0.0000    0.0000    ------    ------    ------    0.0000    0.0000
              GASPM:    0.0037    0.0038    0.0042    0.0039    0.0374    ------    ------    ------    0.0142    0.0047
```

```
           ECARBON:    ------    ------    ------    ------    ------    0.0463    0.0257    0.1140    ------    0.0099
           OCARBON:    ------    ------    ------    ------    ------    0.0131    0.0370    0.0577    ------    0.0050
               SO4:    0.0003    0.0005    0.0005    0.0005    0.0014    0.0004    0.0008    0.0027    0.0001    0.0007
  Total Exhaust PM:    0.0041    0.0043    0.0047    0.0044    0.0388    0.0598    0.0635    0.1744    0.0143    0.0203
             Brake:    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053
              Tire:    0.0020    0.0020    0.0020    0.0020    0.0022    0.0020    0.0020    0.0065    0.0010    0.0024
          Total PM:    0.0114    0.0116    0.0120    0.0117    0.0463    0.0671    0.0708    0.1862    0.0206    0.0280
               SO2:    0.0068    0.0088    0.0114    0.0095    0.0167    0.0085    0.0160    0.0379    0.0033    0.0112
               NH3:    0.1017    0.1012    0.1001    0.1009    0.0451    0.0068    0.0068    0.0270    0.0113    0.0921
-------------------------------------------------------------------------------------------------------------------------
         Veh. Type:    GasBUS     URBAN    SCHOOL
                       ------    ------    ------
           VMT Mix:    0.0002    0.0009    0.0018
-------------------------------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
              Lead:    0.0000    ------    ------
             GASPM:    0.0928    ------    ------
           ECARBON:    ------    0.1201    0.2929
           OCARBON:    ------    0.0944    0.2301
               SO4:    0.0005    0.0044    0.0031
  Total Exhaust PM:    0.0933    0.2189    0.5261
             Brake:    0.0053    0.0053    0.0053
              Tire:    0.0030    0.0030    0.0030
          Total PM:    0.1016    0.2272    0.5344
               SO2:    0.0262    0.0627    0.0439
               NH3:    0.0451    0.0270    0.0270
-------------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # # # # # #
* Indiana Emissions - CY20xx

* File 1, Run 1, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # # # # # #

                             Calendar Year:  2009
                                     Month:  July
               Gasoline Fuel Sulfur Content:   30. ppm
                 Diesel Fuel Sulfur Content:   43. ppm
                       Particle Size Cutoff:  2.50 Microns
                           Reformulated Gas:  No

      Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
              GVWR:               <6000     >6000     (All)
                       ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
  VMT Distribution:    0.3597    0.3800    0.1306              0.0360    0.0003    0.0019    0.0860    0.0055    1.0000
-------------------------------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
              Lead:    0.0000    0.0000    0.0000    0.0000    0.0000    ------    ------    ------    0.0000    0.0000
             GASPM:    0.0037    0.0038    0.0042    0.0039    0.0374    ------    ------    ------    0.0142    0.0047
           ECARBON:    ------    ------    ------    ------    ------    0.0463    0.0257    0.1140    ------    0.0099
           OCARBON:    ------    ------    ------    ------    ------    0.0131    0.0370    0.0577    ------    0.0050
               SO4:    0.0003    0.0005    0.0005    0.0005    0.0014    0.0004    0.0008    0.0027    0.0001    0.0007
  Total Exhaust PM:    0.0041    0.0043    0.0047    0.0044    0.0388    0.0598    0.0635    0.1744    0.0143    0.0203
             Brake:    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053
              Tire:    0.0020    0.0020    0.0020    0.0020    0.0022    0.0020    0.0020    0.0065    0.0010    0.0024
          Total PM:    0.0114    0.0116    0.0120    0.0117    0.0463    0.0671    0.0708    0.1862    0.0206    0.0280
               SO2:    0.0068    0.0088    0.0114    0.0095    0.0167    0.0085    0.0160    0.0379    0.0033    0.0112
               NH3:    0.1017    0.1012    0.1001    0.1009    0.0451    0.0068    0.0068    0.0270    0.0113    0.0921
-------------------------------------------------------------------------------------------------------------------------
         Veh. Type:    GasBUS     URBAN    SCHOOL
                       ------    ------    ------
           VMT Mix:    0.0002    0.0009    0.0018
-------------------------------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
              Lead:    0.0000    ------    ------
             GASPM:    0.0928    ------    ------
           ECARBON:    ------    0.1201    0.2929
           OCARBON:    ------    0.0944    0.2301
               SO4:    0.0005    0.0044    0.0031
  Total Exhaust PM:    0.0933    0.2189    0.5261
             Brake:    0.0053    0.0053    0.0053
              Tire:    0.0030    0.0030    0.0030
          Total PM:    0.1016    0.2272    0.5344
               SO2:    0.0262    0.0627    0.0439
               NH3:    0.0451    0.0270    0.0270
-------------------------------------------------------------------------------------------------------------------------
```

2009 MOBILE6.2 Input/Output Files for Kentucky Portion of Nonattainment Area

2009 VMT by Speed Bin (KYSVMT.D)

```
SPEED VMT
1  1 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0009 0.0164 0.0254 0.0429 0.0395 0.0602 0.1798 0.6350
1  2 0.0000 0.0000 0.0011 0.0035 0.0000 0.0008 0.0046 0.0111 0.0176 0.0444 0.0344 0.0942 0.1585 0.6299
1  3 0.0000 0.0009 0.0034 0.0007 0.0004 0.0011 0.0067 0.0097 0.0387 0.0961 0.0584 0.0993 0.0771 0.6075
1  4 0.0000 0.0000 0.0000 0.0005 0.0000 0.0026 0.0075 0.0138 0.0189 0.0525 0.0276 0.1042 0.1540 0.6183
1  5 0.0000 0.0000 0.0000 0.0000 0.0006 0.0003 0.0076 0.0116 0.0231 0.0463 0.0413 0.0630 0.1807 0.6255
1  6 0.0000 0.0000 0.0000 0.0000 0.0006 0.0000 0.0081 0.0120 0.0239 0.0452 0.0439 0.0637 0.1802 0.6224
1  7 0.0000 0.0000 0.0000 0.0000 0.0006 0.0015 0.0076 0.0145 0.0222 0.0539 0.0380 0.0650 0.1797 0.6169
1  8 0.0000 0.0000 0.0000 0.0006 0.0000 0.0015 0.0081 0.0145 0.0214 0.0538 0.0369 0.0652 0.1810 0.6168
1  9 0.0000 0.0000 0.0000 0.0000 0.0006 0.0003 0.0076 0.0122 0.0230 0.0452 0.0428 0.0642 0.1823 0.6219
1 10 0.0000 0.0000 0.0000 0.0000 0.0006 0.0003 0.0074 0.0119 0.0223 0.0445 0.0416 0.0638 0.1837 0.6240
1 11 0.0000 0.0000 0.0000 0.0000 0.0006 0.0013 0.0070 0.0124 0.0195 0.0503 0.0336 0.0690 0.1894 0.6168
1 12 0.0000 0.0000 0.0000 0.0005 0.0000 0.0013 0.0066 0.0117 0.0184 0.0518 0.0317 0.0898 0.1669 0.6213
1 13 0.0000 0.0000 0.0000 0.0000 0.0000 0.0005 0.0033 0.0138 0.0197 0.0408 0.0407 0.0670 0.1793 0.6348
```

```
1 14 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0005 0.0169 0.0206 0.0386 0.0436 0.0622 0.1859 0.6317
1 15 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0183 0.0217 0.0371 0.0456 0.0635 0.1870 0.6269
1 16 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0175 0.0208 0.0367 0.0436 0.0629 0.1884 0.6300
1 17 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0159 0.0188 0.0352 0.0398 0.0618 0.1925 0.6360
1 18 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0140 0.0166 0.0335 0.0350 0.0607 0.1971 0.6431
1 19 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0144 0.0170 0.0363 0.0364 0.0600 0.1927 0.6433
1 20 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0152 0.0179 0.0381 0.0387 0.0600 0.1891 0.6409
1 21 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0158 0.0187 0.0386 0.0402 0.0605 0.1876 0.6385
1 22 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0180 0.0213 0.0401 0.0455 0.0620 0.1830 0.6302
1 23 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0189 0.0223 0.0400 0.0476 0.0629 0.1820 0.6262
1 24 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0196 0.0232 0.0407 0.0495 0.0633 0.1802 0.6236
2  1 0.0000 0.0000 0.0000 0.1993 0.0996 0.0746 0.2239 0.1706 0.1970 0.0350 0.0000 0.0000 0.0000 0.0000
2  2 0.0000 0.0000 0.0000 0.2093 0.1130 0.0979 0.1980 0.1604 0.1876 0.0338 0.0000 0.0000 0.0000 0.0000
2  3 0.0000 0.0002 0.0033 0.2121 0.1120 0.1113 0.1947 0.1500 0.1823 0.0342 0.0000 0.0000 0.0000 0.0000
2  4 0.0000 0.0001 0.0004 0.2176 0.1102 0.0964 0.1935 0.1624 0.1852 0.0341 0.0000 0.0000 0.0000 0.0000
2  5 0.0000 0.0000 0.0001 0.2061 0.1094 0.0830 0.2024 0.1723 0.1924 0.0344 0.0000 0.0000 0.0000 0.0000
2  6 0.0000 0.0000 0.0000 0.1963 0.1025 0.0780 0.2072 0.1814 0.1988 0.0357 0.0000 0.0000 0.0000 0.0000
2  7 0.0000 0.0000 0.0002 0.2023 0.1082 0.0850 0.1990 0.1788 0.1913 0.0352 0.0000 0.0000 0.0000 0.0000
2  8 0.0000 0.0000 0.0002 0.2036 0.1073 0.0848 0.1997 0.1783 0.1912 0.0350 0.0000 0.0000 0.0000 0.0000
2  9 0.0000 0.0000 0.0001 0.2013 0.1044 0.0798 0.2036 0.1798 0.1960 0.0349 0.0000 0.0000 0.0000 0.0000
2 10 0.0000 0.0000 0.0001 0.2099 0.1101 0.0813 0.1983 0.1757 0.1906 0.0339 0.0000 0.0000 0.0000 0.0000
2 11 0.0000 0.0000 0.0002 0.2040 0.1091 0.0870 0.1990 0.1768 0.1895 0.0344 0.0000 0.0000 0.0000 0.0000
2 12 0.0000 0.0000 0.0002 0.1931 0.1016 0.0839 0.2064 0.1832 0.1962 0.0353 0.0000 0.0000 0.0000 0.0000
2 13 0.0000 0.0000 0.0000 0.1957 0.0975 0.0796 0.2097 0.1822 0.2012 0.0340 0.0000 0.0000 0.0000 0.0000
2 14 0.0000 0.0000 0.0000 0.1964 0.0973 0.0677 0.2233 0.1823 0.1994 0.0335 0.0000 0.0000 0.0000 0.0000
2 15 0.0000 0.0000 0.0000 0.2014 0.0991 0.0617 0.2239 0.1833 0.1973 0.0333 0.0000 0.0000 0.0000 0.0000
2 16 0.0000 0.0000 0.0000 0.1996 0.0981 0.0606 0.2232 0.1858 0.1990 0.0337 0.0000 0.0000 0.0000 0.0000
2 17 0.0000 0.0000 0.0000 0.2021 0.0994 0.0614 0.2229 0.1828 0.1974 0.0340 0.0000 0.0000 0.0000 0.0000
2 18 0.0000 0.0000 0.0000 0.2150 0.1050 0.0601 0.2205 0.1773 0.1894 0.0327 0.0000 0.0000 0.0000 0.0000
2 19 0.0000 0.0000 0.0000 0.1978 0.0968 0.0575 0.2195 0.1888 0.2029 0.0368 0.0000 0.0000 0.0000 0.0000
2 20 0.0000 0.0000 0.0000 0.2011 0.0987 0.0600 0.2206 0.1831 0.2000 0.0365 0.0000 0.0000 0.0000 0.0000
2 21 0.0000 0.0000 0.0000 0.2312 0.1130 0.0644 0.2212 0.1610 0.1779 0.0313 0.0000 0.0000 0.0000 0.0000
2 22 0.0000 0.0000 0.0000 0.2073 0.1024 0.0657 0.2251 0.1734 0.1927 0.0333 0.0000 0.0000 0.0000 0.0000
2 23 0.0000 0.0000 0.0000 0.2060 0.1020 0.0665 0.2262 0.1733 0.1930 0.0330 0.0000 0.0000 0.0000 0.0000
2 24 0.0000 0.0000 0.0000 0.1992 0.0988 0.0654 0.2259 0.1784 0.1981 0.0343 0.0000 0.0000 0.0000 0.0000
```

2009 VMT by Facility (KYFVMT.D)

```
VMT BY FACILITY
    1 0.455 0.331 0.181 0.032
      0.476 0.312 0.182 0.030
      0.485 0.313 0.172 0.031
      0.460 0.326 0.181 0.033
      0.444 0.339 0.182 0.035
      0.443 0.347 0.175 0.036
      0.428 0.354 0.181 0.037
      0.430 0.353 0.181 0.037
      0.444 0.344 0.177 0.036
      0.446 0.337 0.183 0.035
      0.460 0.332 0.173 0.034
      0.485 0.325 0.157 0.034
      0.485 0.320 0.162 0.033
      0.469 0.328 0.170 0.033
      0.457 0.333 0.176 0.034
      0.473 0.325 0.169 0.033
      0.496 0.309 0.164 0.031
      0.523 0.285 0.163 0.029
      0.534 0.290 0.146 0.030
      0.511 0.301 0.157 0.031
      0.465 0.306 0.199 0.029
      0.448 0.332 0.187 0.033
      0.434 0.341 0.191 0.033
      0.432 0.348 0.185 0.035
...
Identical distribution for all veh. types with the exception of diesel
transit buses
   26 0.191 0.766 0.023 0.020
      0.191 0.766 0.023 0.020
      0.191 0.766 0.023 0.020
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
```

```
0.041 0.922 0.029 0.008
0.041 0.922 0.029 0.008
0.041 0.922 0.029 0.008
0.041 0.922 0.029 0.008
0.191 0.766 0.023 0.020
0.191 0.766 0.023 0.020
0.191 0.766 0.023 0.020
0.041 0.922 0.029 0.008
0.041 0.922 0.029 0.008
0.041 0.922 0.029 0.008
0.041 0.922 0.029 0.008
0.041 0.922 0.029 0.008
0.041 0.922 0.029 0.008
0.041 0.922 0.029 0.008
0.041 0.922 0.029 0.008
0.041 0.922 0.029 0.008
0.041 0.922 0.029 0.008
0.041 0.922 0.029 0.008
0.041 0.922 0.029 0.008
```

2009 MOBILE6.2 Input File (KY.SCN)

```
* Mobile6 file for Boone, Campbell and Kenton counties
* post 2005 analysis years, includes annual scenario
* created 4/9/07,AJR, post 2005
*********************** Header Section *****************
MOBILE6 INPUT FILE :
POLLUTANTS         : HC NOx CO
PARTICULATES       :
* PARTICULATES REPORTED IN *.PM FILE
REPORT FILE        : KY.RPT
DATABASE OUTPUT    :
WITH FIELDNAMES    :
DATABASE EMISSIONS : 2211 1111 22
DAILY OUTPUT       :
EMISSIONS TABLE    : kyemiss.tb1
RUN DATA
*********************** Run Section *******************
VMT BY HOUR        : KYHVMT.D
SPEED VMT          : KYSVMT.D
VMT BY FACILITY    : KYFVMT.D
STAGE II REFUELING :
99 2 86. 86.
EXPAND BUS EFS     :
REBUILD EFFECTS    : 0.30
******************** Summer Scenario Section ****************
SCENARIO RECORD    : KY EMISSIONS - CY20xx
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
FUEL RVP           : 7.8
FUEL PROGRAM       : 2 N
PARTICLE SIZE      : 2.5
MIN/MAX TEMP       : 61.0 95.0
PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR      : 43
******************** Annual Scenario Section *****************
SCENARIO RECORD    : KY EMISSIONS - CY20xx
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
FUEL RVP           : 9.0
FUEL PROGRAM       : 2 N
PARTICLE SIZE      : 2.5
MIN/MAX TEMP       : 47.0 64.0
PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR      : 43
********************************** END OF RUN *****************
END OF RUN
```

2009 MOBILE6.2 Output Report (KY.RPT)

```
***************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                              *
* Input file: KY.SCN (file 2, run 1).                                     *
***************************************************************************

* Reading Hourly VMT distribution from the following external
* data file: KYHVMT.D

* Reading Hourly, Roadway, and Speed VMT dist. from the following external
```

```
* data file: KYSVMT.D

* Reading Hourly Roadway VMT distribution from the following external
* data file: KYFVMT.D

  Reading User Supplied ROADWAY VMT Factors
  M601 Comment:
               User has enabled STAGE II REFUELING.


* # # # # # # # # # # # # # # # # # # # # # # # # # #
* KY EMISSIONS - CY20xx

* File 2, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # # #
  M616 Comment:
               User has supplied post-1999 sulfur levels.

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
  M 48 Warning:
              there are no sales for vehicle class HDGV8b
 HDDV DEFEAT DEVICE EFFECTS ARE PRESENT. THE REBUILD FRACTION IS 0.30.
  M111 Warning:
               The input dIesel sulfur level of  43.0 ppm exceeds
               the 2007 HDD Rule diesel sulfur limit of 15 ppm.

                    Calendar Year:  2009
                            Month:  July
                         Altitude:  Low
              Minimum Temperature:  61.0 (F)
              Maximum Temperature:  95.0 (F)
                Absolute Humidity:   75. grains/lb
              Fuel Sulfur Content:   30. ppm

              Exhaust I/M Program:  No
                 Evap I/M Program:  No
                      ATP Program:  No
                Reformulated Gas:  Yes

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
               GVWR:               <6000     >6000     (All)
                        ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
   VMT Distribution:    0.3597    0.3800    0.1306              0.0360    0.0003    0.0019    0.0860    0.0055    1.0000
  ---------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :      0.707     0.745     1.238     0.871     0.909     0.235     0.494     0.435      2.30     0.783
     Composite CO  :      8.67      9.90     13.35     10.78      9.63     1.056     0.871     2.226     17.58     9.260
     Composite NOX :      0.639     0.802     1.186     0.900     2.659     0.622     0.963     9.426      1.28     1.605
  ---------------------------------------------------------------------------------------------------------------------
          Veh. Type:    GasBUS     URBAN    SCHOOL
                        ------    ------    ------
            VMT Mix:    0.0002    0.0009    0.0018
----------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :     3.715     0.344     0.640
     Composite CO  :    33.72      3.193     2.415
     Composite NOX :     7.832    13.064    11.880
----------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # # #
* KY EMISSIONS - CY20xx

* File 2, Run 1, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # # #
  M616 Comment:
               User has supplied post-1999 sulfur levels.

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
```

```
 M 48 Warning:
             there are no sales for vehicle class HDGV8b
 M111 Warning:
              The input dIesel sulfur level of  43.0 ppm exceeds
              the 2007 HDD Rule diesel sulfur limit of 15 ppm.

                   Calendar Year:  2009
                           Month:  July
                        Altitude:  Low
             Minimum Temperature:  47.0 (F)
             Maximum Temperature:  64.0 (F)
               Absolute Humidity:   75. grains/lb
             Fuel Sulfur Content:   30. ppm

             Exhaust I/M Program:  No
                Evap I/M Program:  No
                     ATP Program:  No
               Reformulated Gas:  Yes

      Vehicle Type:     LDGV    LDGT12    LDGT34     LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
              GVWR:              <6000     >6000     (All)
                       ------   ------    ------    ------    ------    ------    ------    ------    ------    ------
  VMT Distribution:    0.3597   0.3800    0.1306              0.0360    0.0003    0.0019    0.0860    0.0055    1.0000
 --------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :     0.679    0.750     1.249     0.878     0.813     0.235     0.494     0.435      2.09     0.772
     Composite CO  :    11.38    13.40     17.72     14.51     10.53      1.056     0.871     2.226    14.96     12.153
     Composite NOX :     0.630    0.839     1.246     0.943     2.707     0.622     0.963     9.426      1.50     1.626
 --------------------------------------------------------------------------------------------------------------------
         Veh. Type:    GasBUS    URBAN    SCHOOL
                       ------   ------    ------
           VMT Mix:    0.0002   0.0009    0.0018
--------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :     3.385    0.344     0.640
     Composite CO  :    36.87     3.193     2.415
     Composite NOX :     7.975   13.064    11.880
--------------------------------------------------------------------------------------------------------------------
```

2009 MOBILE6.2 PM Output Report (KY.PM)

```
*************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                            *
* Input file: KY.SCN (file 2, run 1).                                   *
*************************************************************************

* # # # # # # # # # # # # # # # # # # # # # # # # # #
* KY EMISSIONS - CY20xx

* File 2, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # # #

                             Calendar Year:  2009
                                     Month:  July
              Gasoline Fuel Sulfur Content:   30. ppm
                Diesel Fuel Sulfur Content:   43. ppm
                      Particle Size Cutoff:  2.50 Microns
                          Reformulated Gas:  Yes

      Vehicle Type:     LDGV    LDGT12    LDGT34     LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
              GVWR:              <6000     >6000     (All)
                       ------   ------    ------    ------    ------    ------    ------    ------    ------    ------
  VMT Distribution:    0.3597   0.3800    0.1306              0.0360    0.0003    0.0019    0.0860    0.0055    1.0000
 --------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
              Lead:    0.0000   0.0000    0.0000    0.0000    0.0000    ------    ------    ------    0.0000    0.0000
             GASPM:    0.0037   0.0038    0.0042    0.0039    0.0374    ------    ------    ------    0.0142    0.0047
           ECARBON:    ------   ------    ------    ------    ------    0.0463    0.0257    0.1141    ------    0.0099
           OCARBON:    ------   ------    ------    ------    ------    0.0131    0.0370    0.0578    ------    0.0050
               SO4:    0.0003   0.0005    0.0005    0.0005    0.0015    0.0004    0.0008    0.0027    0.0001    0.0007
  Total Exhaust PM:    0.0040   0.0043    0.0047    0.0044    0.0389    0.0598    0.0635    0.1745    0.0143    0.0203
             Brake:    0.0053   0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053
              Tire:    0.0020   0.0020    0.0020    0.0020    0.0022    0.0020    0.0020    0.0065    0.0010    0.0024
          Total PM:    0.0114   0.0116    0.0120    0.0117    0.0464    0.0671    0.0708    0.1863    0.0206    0.0280
               SO2:    0.0068   0.0088    0.0114    0.0095    0.0167    0.0085    0.0160    0.0379    0.0033    0.0112
               NH3:    0.1017   0.1012    0.1002    0.1010    0.0451    0.0068    0.0068    0.0270    0.0113    0.0922
 --------------------------------------------------------------------------------------------------------------------
         Veh. Type:    GasBUS    URBAN    SCHOOL
                       ------   ------    ------
           VMT Mix:    0.0002   0.0009    0.0018
 --------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
              Lead:    0.0000   ------    ------
             GASPM:    0.0928   ------    ------
           ECARBON:    ------   0.1201    0.2930
           OCARBON:    ------   0.0944    0.2302
               SO4:    0.0005   0.0044    0.0031
  Total Exhaust PM:    0.0933   0.2189    0.5262
             Brake:    0.0053   0.0053    0.0053
              Tire:    0.0030   0.0030    0.0030
          Total PM:    0.1016   0.2272    0.5346
               SO2:    0.0262   0.0627    0.0439
               NH3:    0.0451   0.0270    0.0270
 --------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # # #
* KY EMISSIONS - CY20xx
```

```
* File 2, Run 1, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # # #

                             Calendar Year:  2009
                                     Month:  July
              Gasoline Fuel Sulfur Content:   30. ppm
                Diesel Fuel Sulfur Content:   43. ppm
                      Particle Size Cutoff:  2.50 Microns
                          Reformulated Gas:  Yes

       Vehicle Type:     LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
               GVWR:              <6000     >6000     (All)
                       ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
   VMT Distribution:   0.3597    0.3800    0.1306              0.0360    0.0003    0.0019    0.0860    0.0055    1.0000
 ---------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
               Lead:   0.0000    0.0000    0.0000    0.0000    0.0000    ------    ------    ------    0.0000    0.0000
              GASPM:   0.0037    0.0038    0.0042    0.0039    0.0374    ------    ------    ------    0.0142    0.0047
            ECARBON:   ------    ------    ------    ------    ------    0.0463    0.0257    0.1141    ------    0.0099
            OCARBON:   ------    ------    ------    ------    ------    0.0131    0.0370    0.0578    ------    0.0050
                SO4:   0.0003    0.0005    0.0005    0.0005    0.0015    0.0004    0.0008    0.0027    0.0001    0.0007
   Total Exhaust PM:   0.0040    0.0043    0.0047    0.0044    0.0389    0.0598    0.0635    0.1745    0.0143    0.0203
              Brake:   0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053
               Tire:   0.0020    0.0020    0.0020    0.0020    0.0022    0.0020    0.0020    0.0065    0.0010    0.0024
           Total PM:   0.0114    0.0116    0.0120    0.0117    0.0464    0.0671    0.0708    0.1863    0.0206    0.0280
                SO2:   0.0068    0.0088    0.0114    0.0095    0.0167    0.0085    0.0160    0.0379    0.0033    0.0112
                NH3:   0.1017    0.1012    0.1002    0.1010    0.0451    0.0068    0.0068    0.0270    0.0113    0.0922
 ---------------------------------------------------------------------------------------------------------------------
          Veh. Type:   GasBUS     URBAN    SCHOOL
                       ------    ------    ------
            VMT Mix:   0.0002    0.0009    0.0018
 ---------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
               Lead:   0.0000    ------    ------
              GASPM:   0.0928    ------    ------
            ECARBON:   ------    0.1201    0.2930
            OCARBON:   ------    0.0944    0.2302
                SO4:   0.0005    0.0044    0.0031
   Total Exhaust PM:   0.0933    0.2189    0.5262
              Brake:   0.0053    0.0053    0.0053
               Tire:   0.0030    0.0030    0.0030
           Total PM:   0.1016    0.2272    0.5346
                SO2:   0.0262    0.0627    0.0439
                NH3:   0.0451    0.0270    0.0270
 ---------------------------------------------------------------------------------------------------------------------
```

2009 MOBILE6.2 Input/Output Files for the OKI's Ohio Portion of Nonattainment Area

2009 VMT by Speed Bin (OHSVMT.D)

```
SPEED VMT
1  1 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0008 0.0171 0.0174 0.0442 0.0329 0.1009 0.0221 0.7647
1  2 0.0000 0.0000 0.0000 0.0000 0.0000 0.0015 0.0065 0.0100 0.0166 0.0438 0.0246 0.1021 0.0221 0.7728
1  3 0.0000 0.0000 0.0003 0.0026 0.0021 0.0028 0.0074 0.0116 0.0155 0.0403 0.0354 0.1151 0.0500 0.7168
1  4 0.0000 0.0000 0.0000 0.0014 0.0015 0.0032 0.0080 0.0108 0.0171 0.0430 0.0254 0.1051 0.0216 0.7628
1  5 0.0000 0.0000 0.0000 0.0000 0.0006 0.0021 0.0083 0.0135 0.0185 0.0475 0.0264 0.1022 0.0213 0.7596
1  6 0.0000 0.0000 0.0000 0.0000 0.0001 0.0021 0.0082 0.0130 0.0210 0.0485 0.0276 0.1017 0.0216 0.7561
1  7 0.0000 0.0000 0.0000 0.0003 0.0019 0.0027 0.0097 0.0134 0.0200 0.0498 0.0274 0.1018 0.0215 0.7514
1  8 0.0000 0.0000 0.0000 0.0003 0.0023 0.0029 0.0098 0.0136 0.0203 0.0475 0.0272 0.1023 0.0211 0.7527
1  9 0.0000 0.0000 0.0000 0.0000 0.0003 0.0022 0.0082 0.0138 0.0197 0.0470 0.0269 0.1023 0.0213 0.7584
1 10 0.0000 0.0000 0.0000 0.0000 0.0003 0.0021 0.0082 0.0131 0.0191 0.0456 0.0263 0.1023 0.0214 0.7616
1 11 0.0000 0.0000 0.0000 0.0003 0.0017 0.0024 0.0086 0.0117 0.0175 0.0440 0.0250 0.1026 0.0220 0.7643
1 12 0.0000 0.0000 0.0000 0.0003 0.0016 0.0023 0.0082 0.0112 0.0172 0.0414 0.0241 0.1027 0.0221 0.7690
1 13 0.0000 0.0000 0.0000 0.0000 0.0000 0.0004 0.0063 0.0118 0.0180 0.0417 0.0249 0.1021 0.0217 0.7731
1 14 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0005 0.0174 0.0175 0.0379 0.0326 0.1014 0.0224 0.7703
1 15 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0184 0.0186 0.0378 0.0343 0.1014 0.0223 0.7671
1 16 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0176 0.0178 0.0364 0.0332 0.1014 0.0224 0.7711
1 17 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0158 0.0159 0.0343 0.0310 0.1011 0.0227 0.7791
1 18 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0139 0.0140 0.0304 0.0283 0.1010 0.0231 0.7894
1 19 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0143 0.0144 0.0329 0.0293 0.1009 0.0229 0.7852
1 20 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0152 0.0153 0.0356 0.0308 0.1009 0.0226 0.7794
1 21 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0159 0.0160 0.0364 0.0316 0.1011 0.0225 0.7764
1 22 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0182 0.0183 0.0403 0.0348 0.1012 0.0221 0.7650
1 23 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0191 0.0193 0.0416 0.0360 0.1013 0.0220 0.7608
1 24 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0199 0.0200 0.0433 0.0371 0.1013 0.0219 0.7565
2  1 0.0000 0.0000 0.0000 0.1510 0.0601 0.0727 0.2718 0.2020 0.2243 0.0183 0.0000 0.0000 0.0000 0.0000
2  2 0.0000 0.0001 0.0009 0.1606 0.0726 0.1081 0.2488 0.1789 0.2121 0.0177 0.0000 0.0000 0.0000 0.0000
2  3 0.0000 0.0020 0.0046 0.1636 0.0841 0.1308 0.2333 0.1614 0.2030 0.0169 0.0000 0.0000 0.0000 0.0000
2  4 0.0000 0.0007 0.0023 0.1652 0.0778 0.1155 0.2500 0.1700 0.2002 0.0181 0.0000 0.0000 0.0000 0.0000
2  5 0.0000 0.0000 0.0006 0.1588 0.0689 0.0982 0.2676 0.1866 0.2005 0.0187 0.0000 0.0000 0.0000 0.0000
2  6 0.0000 0.0000 0.0001 0.1508 0.0636 0.0880 0.2773 0.1952 0.2059 0.0193 0.0000 0.0000 0.0000 0.0000
2  7 0.0000 0.0001 0.0014 0.1564 0.0681 0.1009 0.2706 0.1861 0.1975 0.0190 0.0000 0.0000 0.0000 0.0000
2  8 0.0000 0.0001 0.0014 0.1574 0.0695 0.1014 0.2718 0.1837 0.1958 0.0190 0.0000 0.0000 0.0000 0.0000
2  9 0.0000 0.0000 0.0004 0.1551 0.0655 0.0909 0.2773 0.1930 0.1986 0.0191 0.0000 0.0000 0.0000 0.0000
2 10 0.0000 0.0001 0.0004 0.1622 0.0695 0.0967 0.2711 0.1882 0.1932 0.0188 0.0000 0.0000 0.0000 0.0000
2 11 0.0000 0.0001 0.0014 0.1581 0.0697 0.1027 0.2697 0.1842 0.1954 0.0187 0.0000 0.0000 0.0000 0.0000
2 12 0.0000 0.0001 0.0014 0.1491 0.0643 0.0973 0.2774 0.1902 0.2011 0.0191 0.0000 0.0000 0.0000 0.0000
2 13 0.0000 0.0000 0.0000 0.1502 0.0611 0.0821 0.2816 0.2029 0.2030 0.0191 0.0000 0.0000 0.0000 0.0000
2 14 0.0000 0.0000 0.0000 0.1502 0.0594 0.0695 0.2815 0.2130 0.2077 0.0187 0.0000 0.0000 0.0000 0.0000
2 15 0.0000 0.0000 0.0000 0.1543 0.0608 0.0675 0.2842 0.2134 0.2011 0.0187 0.0000 0.0000 0.0000 0.0000
```

```
2 16 0.0000 0.0000 0.0000 0.1528 0.0602 0.0666 0.2848 0.2155 0.2011 0.0190 0.0000 0.0000 0.0000 0.0000
2 17 0.0000 0.0000 0.0000 0.1544 0.0608 0.0671 0.2825 0.2122 0.2042 0.0189 0.0000 0.0000 0.0000 0.0000
2 18 0.0000 0.0000 0.0000 0.1647 0.0646 0.0680 0.2826 0.2062 0.1956 0.0183 0.0000 0.0000 0.0000 0.0000
2 19 0.0000 0.0000 0.0000 0.1499 0.0589 0.0639 0.2812 0.2163 0.2100 0.0198 0.0000 0.0000 0.0000 0.0000
2 20 0.0000 0.0000 0.0000 0.1523 0.0599 0.0656 0.2785 0.2111 0.2131 0.0194 0.0000 0.0000 0.0000 0.0000
2 21 0.0000 0.0000 0.0000 0.1770 0.0695 0.0721 0.2767 0.1910 0.1966 0.0172 0.0000 0.0000 0.0000 0.0000
2 22 0.0000 0.0000 0.0000 0.1582 0.0625 0.0700 0.2785 0.2040 0.2088 0.0182 0.0000 0.0000 0.0000 0.0000
2 23 0.0000 0.0000 0.0000 0.1574 0.0622 0.0704 0.2789 0.2043 0.2087 0.0181 0.0000 0.0000 0.0000 0.0000
2 24 0.0000 0.0000 0.0000 0.1518 0.0600 0.0689 0.2793 0.2090 0.2124 0.0186 0.0000 0.0000 0.0000 0.0000
```

2009 VMT by Facility (OHFVMT.D)

```
VMT BY FACILITY
    1 0.353 0.452 0.175 0.020
      0.372 0.432 0.177 0.019
      0.385 0.428 0.167 0.020
      0.363 0.441 0.176 0.021
      0.348 0.454 0.176 0.022
      0.347 0.462 0.168 0.023
      0.334 0.468 0.174 0.024
      0.337 0.465 0.174 0.024
      0.350 0.456 0.171 0.023
      0.353 0.448 0.177 0.022
      0.367 0.443 0.168 0.022
      0.387 0.436 0.154 0.022
      0.388 0.431 0.159 0.021
      0.374 0.439 0.166 0.021
      0.366 0.442 0.170 0.022
      0.380 0.434 0.164 0.022
      0.404 0.416 0.160 0.020
      0.432 0.388 0.161 0.019
      0.438 0.398 0.145 0.020
      0.412 0.413 0.155 0.020
      0.369 0.419 0.193 0.019
      0.352 0.447 0.180 0.021
      0.339 0.456 0.183 0.021
      0.336 0.465 0.177 0.022
...
Identical distribution for all veh. types with the exception of diesel
transit buses
   26 0.191 0.766 0.023 0.020
      0.191 0.766 0.023 0.020
      0.191 0.766 0.023 0.020
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.191 0.766 0.023 0.020
      0.191 0.766 0.023 0.020
      0.191 0.766 0.023 0.020
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
      0.041 0.922 0.029 0.008
```

2009 MOBILE6.2 Input File (OH.SCN)

```
* Mobile6 input file for Butler, Clermont, Hamilton and Warren counties,
* low RVP beginning summer 2008
* created 4/9/07 by ajr, includes annual scenario,low RVP,post 2007
*******************  Header Section  ************************
MOBILE6 INPUT FILE :
POLLUTANTS         : HC NOx CO
PARTICULATES       :
* PARTICULATES REPORTED IN *.PM FILE
REPORT FILE        : oh.rpt
DATABASE OUTPUT    :
WITH FIELDNAMES    :
DATABASE EMISSIONS : 2211 1111 22
DAILY OUTPUT       :
EMISSIONS TABLE    : ohemiss.tb1

RUN DATA
*******************  Run Section  ***************************
VMT BY HOUR        : OHHVMT.D
SPEED VMT          : OHSVMT.D
VMT BY FACILITY    : OHFVMT.D
REG DIST           : OHREG.D
ANTI-TAMP PROG     : 96 78 50 22222 21111111 1 12 098. 12111112
FUEL PROGRAM       : 1
OXYGENATED FUELS   : .000 .420 .000 .036 2
STAGE II REFUELING :
93 3 86. 86.
EXPAND BUS EFS     :
REBUILD EFFECTS    : 0.30
*******************  Summer Scenario Section  ***************
SCENARIO RECORD    : Ohio Emissions - CY20xx
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
FUEL RVP           : 7.8
SEASON             : 1
MIN/MAX TEMP       : 61.0 95.0
PARTICLE SIZE      : 2.5
PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR      : 43
*******************  Annual Scenario Section  ***************
SCENARIO RECORD    : Ohio Emissions - CY20xx
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
FUEL RVP           : 9.0
MIN/MAX TEMP       : 47.0 64.0
PARTICLE SIZE      : 2.5
PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR      : 43
*******************  End of Run  ****************************
END OF RUN
```

2009 MOBILE6.2 Output Report (OH.RPT)

```
***************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                              *
* Input file: OH.SCN (file 3, run 1).                                     *
***************************************************************************

* Reading Hourly VMT distribution from the following external
* data file: OHHVMT.D

* Reading Hourly, Roadway, and Speed VMT dist. from the following external
* data file: OHSVMT.D

* Reading Hourly Roadway VMT distribution from the following external
* data file: OHFVMT.D

  Reading User Supplied ROADWAY VMT Factors

* Reading Registration Distributions from the following external
* data file: OHREG.D
  M616 Comment:
             User has supplied post-1999 sulfur levels.
  M601 Comment:
             User has enabled STAGE II REFUELING.


* # # # # # # # # # # # # # # # # # # # # # # # # # # #
* Ohio Emissions - CY20xx

* File 3, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # # # #

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
```

```
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
  M 48 Warning:
            there are no sales for vehicle class HDGV8b
 HDDV DEFEAT DEVICE EFFECTS ARE PRESENT. THE REBUILD FRACTION IS 0.30.
  M111 Warning:
             The input dIesel sulfur level of  43.0 ppm exceeds
             the 2007 HDD Rule diesel sulfur limit of 15 ppm.

                  Calendar Year:  2009
                          Month:  July
                       Altitude:  Low
            Minimum Temperature:  61.0 (F)
            Maximum Temperature:  95.0 (F)
              Absolute Humidity:   75. grains/lb
               Nominal Fuel RVP:   7.8 psi
                  Weathered RVP:   7.9 psi
            Fuel Sulfur Content:   30. ppm

            Exhaust I/M Program:  No
               Evap I/M Program:  No
                    ATP Program:  Yes
               Reformulated Gas:  No

   Ether Blend Market Share: 0.000       Alcohol Blend Market Share: 0.420
   Ether Blend Oxygen Content: 0.000     Alcohol Blend Oxygen Content: 0.036
                                          Alcohol Blend RVP Waiver: Yes

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
               GVWR:               <6000     >6000     (All)
                        ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
   VMT Distribution:    0.3493    0.3797    0.1419              0.0358    0.0003    0.0021    0.0854    0.0054    1.0000
  ---------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :      0.836     0.712     0.901     0.763     1.092     0.262     0.447     0.445      2.94     0.784
     Composite CO  :      9.16      9.92     11.43     10.33     10.28     1.146     0.759     2.234     17.96     9.245
     Composite NOX :      0.681     0.863     1.228     0.962     2.638     0.653     0.931     9.012      1.24     1.612
  ---------------------------------------------------------------------------------------------------------------------
          Veh. Type:    GasBUS     URBAN    SCHOOL
                        ------    ------    ------
            VMT Mix:    0.0002    0.0009    0.0018
-----------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :     4.502     0.331     0.655
     Composite CO  :    36.23      3.047     2.425
     Composite NOX :     7.773    12.942    11.419
-----------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # # #
* Ohio Emissions - CY20xx

* File 3, Run 1, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # # #

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
  M 48 Warning:
            there are no sales for vehicle class HDGV8b
  M111 Warning:
             The input dIesel sulfur level of  43.0 ppm exceeds
             the 2007 HDD Rule diesel sulfur limit of 15 ppm.

                  Calendar Year:  2009
                          Month:  July
                       Altitude:  Low
            Minimum Temperature:  47.0 (F)
            Maximum Temperature:  64.0 (F)
              Absolute Humidity:   75. grains/lb
               Nominal Fuel RVP:   9.0 psi
                  Weathered RVP:   9.5 psi
            Fuel Sulfur Content:   30. ppm

            Exhaust I/M Program:  No
               Evap I/M Program:  No
                    ATP Program:  Yes
               Reformulated Gas:  No
```

```
   Ether Blend Market Share: 0.000       Alcohol Blend Market Share: 0.420
   Ether Blend Oxygen Content: 0.000     Alcohol Blend Oxygen Content: 0.036
                                          Alcohol Blend RVP Waiver: Yes

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
               GVWR:               <6000     >6000     (All)
                        ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
   VMT Distribution:    0.3493    0.3797    0.1419              0.0358    0.0003    0.0021    0.0854    0.0054    1.0000
  -------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :     0.775     0.713     0.920     0.769     0.925     0.262     0.447     0.445      2.13     0.756
     Composite CO  :     12.32     13.72     15.35     14.16     11.10     1.146     0.759     2.234     15.30    12.367
     Composite NOX :     0.673     0.907     1.291     1.011     2.649     0.653     0.931     9.012      1.46     1.637
  -------------------------------------------------------------------------------------------------------------------
          Veh. Type:    GasBUS     URBAN    SCHOOL
                        ------    ------    ------
            VMT Mix:    0.0002    0.0009    0.0018
-------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :     3.862     0.331     0.655
     Composite CO  :    39.13      3.047     2.425
     Composite NOX :     7.802    12.942    11.419
-------------------------------------------------------------------------------------------------------------------
```

2009 MOBILE6.2 PM Output File (OH.PM)

```
***************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                              *
* Input file: OH.SCN (file 3, run 1).                                     *
***************************************************************************

* # # # # # # # # # # # # # # # # # # # # # # # # #
* Ohio Emissions - CY20xx

* File 3, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                              Calendar Year:  2009
                                      Month:  July
               Gasoline Fuel Sulfur Content:   30. ppm
                 Diesel Fuel Sulfur Content:   43. ppm
                       Particle Size Cutoff:  2.50 Microns
                           Reformulated Gas:  No

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
               GVWR:               <6000     >6000     (All)
                        ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
   VMT Distribution:    0.3493    0.3797    0.1419              0.0358    0.0003    0.0021    0.0854    0.0054    1.0000
  -------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
               Lead:    0.0000    0.0000    0.0000    0.0000    0.0000    ------    ------    ------    0.0000    0.0000
              GASPM:    0.0037    0.0037    0.0038    0.0037    0.0374    ------    ------    ------    0.0142    0.0047
            ECARBON:    ------    ------    ------    ------    ------    0.0543    0.0230    0.1140    ------    0.0098
            OCARBON:    ------    ------    ------    ------    ------    0.0153    0.0331    0.0577    ------    0.0050
                SO4:    0.0003    0.0005    0.0005    0.0005    0.0015    0.0004    0.0008    0.0027    0.0001    0.0006
  Total Exhaust PM:     0.0041    0.0042    0.0043    0.0042    0.0389    0.0701    0.0569    0.1744    0.0143    0.0201
              Brake:    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053    0.0053
               Tire:    0.0020    0.0020    0.0020    0.0020    0.0022    0.0020    0.0020    0.0065    0.0010    0.0024
          Total PM:     0.0114    0.0115    0.0116    0.0115    0.0464    0.0774    0.0643    0.1862    0.0206    0.0278
                SO2:    0.0068    0.0088    0.0115    0.0095    0.0167    0.0085    0.0161    0.0379    0.0033    0.0112
                NH3:    0.1017    0.1016    0.1013    0.1015    0.0451    0.0068    0.0068    0.0270    0.0113    0.0925
  -------------------------------------------------------------------------------------------------------------------
          Veh. Type:    GasBUS     URBAN    SCHOOL
                        ------    ------    ------
            VMT Mix:    0.0002    0.0009    0.0018
  -------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
               Lead:    0.0000    ------    ------
              GASPM:    0.0928    ------    ------
            ECARBON:    ------    0.1201    0.2929
            OCARBON:    ------    0.0944    0.2301
                SO4:    0.0005    0.0044    0.0031
  Total Exhaust PM:     0.0933    0.2189    0.5261
              Brake:    0.0053    0.0053    0.0053
               Tire:    0.0030    0.0030    0.0030
          Total PM:     0.1016    0.2272    0.5344
                SO2:    0.0262    0.0627    0.0439
                NH3:    0.0451    0.0270    0.0270
  -------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* Ohio Emissions - CY20xx

* File 3, Run 1, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                              Calendar Year:  2009
                                      Month:  July
               Gasoline Fuel Sulfur Content:   30. ppm
                 Diesel Fuel Sulfur Content:   43. ppm
                       Particle Size Cutoff:  2.50 Microns
                           Reformulated Gas:  No

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
               GVWR:               <6000     >6000     (All)
                        ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
   VMT Distribution:    0.3493    0.3797    0.1419              0.0358    0.0003    0.0021    0.0854    0.0054    1.0000
  -------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
```

Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	------	------	------	0.0000	0.0000
GASPM:	0.0037	0.0037	0.0038	0.0037	0.0374	------	------	------	0.0142	0.0047
ECARBON:	------	------	------	------	------	0.0543	0.0230	0.1140	------	0.0098
OCARBON:	------	------	------	------	------	0.0153	0.0331	0.0577	------	0.0050
SO4:	0.0003	0.0005	0.0005	0.0005	0.0015	0.0004	0.0008	0.0027	0.0001	0.0006
Total Exhaust PM:	0.0041	0.0042	0.0043	0.0042	0.0389	0.0701	0.0569	0.1744	0.0143	0.0201
Brake:	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053
Tire:	0.0020	0.0020	0.0020	0.0020	0.0022	0.0020	0.0020	0.0065	0.0010	0.0024
Total PM:	0.0114	0.0115	0.0116	0.0115	0.0464	0.0774	0.0643	0.1862	0.0206	0.0278
SO2:	0.0068	0.0088	0.0115	0.0095	0.0167	0.0085	0.0161	0.0379	0.0033	0.0112
NH3:	0.1017	0.1016	0.1013	0.1015	0.0451	0.0068	0.0068	0.0270	0.0113	0.0925

Veh. Type:	GasBUS	URBAN	SCHOOL
VMT Mix:	0.0002	0.0009	0.0018
Composite Emission Factors (g/mi):			
Lead:	0.0000	------	------
GASPM:	0.0928	------	------
ECARBON:	------	0.1201	0.2929
OCARBON:	------	0.0944	0.2301
SO4:	0.0005	0.0044	0.0031
Total Exhaust PM:	0.0933	0.2189	0.5261
Brake:	0.0053	0.0053	0.0053
Tire:	0.0030	0.0030	0.0030
Total PM:	0.1016	0.2272	0.5344
SO2:	0.0262	0.0627	0.0439
NH3:	0.0451	0.0270	0.0270

2009 Air Quality Impact Summary for the OKI Portion of the Nonattainment Area and Emissions by State/County

2009 Output Report (R7803)

DAILY AIR QUALITY IMPACT FOR OKI REGION SUMMARY 11-DEC-07

County or Township	Network Road Miles	Network Lane Miles	Vehicle Miles	VOC (Tons/Day)	CO (Tons/Day)	NOX (Tons/Day)	PM (Tons/Day)	Summer VMT
Boone County	227.96	638.17	4207739	3.873	42.950	7.940	0.130	4487764
Butler County	572.20	1471.29	7786350	7.054	79.350	14.503	0.239	8162040
Campbell County	195.81	514.50	2359923	2.175	24.089	4.458	0.073	2519983
Clermont County	422.90	980.02	5232413	4.795	53.323	9.859	0.160	5548290
Dearborn County	144.53	342.91	1343408	1.694	15.179	2.445	0.041	1433852
Hamilton County	1028.77	3100.25	22160814	20.339	225.838	41.820	0.679	23534910
Kenton County	228.41	588.02	3990665	3.673	40.734	7.528	0.123	4255204
Warren County	384.61	994.91	6090925	5.602	62.072	11.518	0.187	6481888
Montgomery Cnty	0.00	0.00	0	0.000	0.000	0.000	0.000	0
Greene County	0.00	0.00	0	0.000	0.000	0.000	0.000	0
Miami County	0.00	0.00	0	0.000	0.000	0.000	0.000	0
Clark County	0.00	0.00	0	0.000	0.000	0.000	0.000	0
Preble County	0.00	0.00	0	0.000	0.000	0.000	0.000	0
Clinton County	0.00	0.00	0	0.000	0.000	0.000	0.000	0
Lawrenceburg Twp	24.19	68.70	594131	0.729	6.713	1.052	0.018	617159
State								
IN Not AQ Region	144.53	342.91	1343408	1.694	15.179	2.445	0.041	1433852
KY - OKI Only	652.18	1740.69	10558327	9.721	107.773	19.926	0.326	11262952
OH - OKI Only	2408.48	6546.47	41270500	37.790	420.582	77.700	1.265	43727128
OH - MVRPC Only	0.00	0.00	0	0.000	0.000	0.000	0.000	0
OH - Other	0.00	0.00	0	0.000	0.000	0.000	0.000	0
IN NonAttainment	24.19	68.70	594131	0.729	6.713	1.052	0.018	617159
Region	3229.38	8698.77	53766372	49.934	550.246	101.124	1.650	57041092
AQ Region	2432.67	6615.17	41864632	38.519	427.295	78.752	1.283	44344288
Intra-Zonal VMT								
Boone County			26121	0.023	0.267	0.046	0.001	
Butler County			30888	0.027	0.315	0.055	0.001	
Campbell County			10026	0.009	0.102	0.018	0.000	
Clermont County			32800	0.028	0.334	0.058	0.001	
Dearborn County			17649	0.021	0.199	0.030	0.001	
Hamilton County			46314	0.040	0.472	0.082	0.001	
Kenton County			11242	0.010	0.115	0.020	0.000	
Warren County			31874	0.028	0.325	0.057	0.001	
Montgomery Cnty			0	0.000	0.000	0.000	0.000	
Greene County			0	0.000	0.000	0.000	0.000	
Miami County			0	0.000	0.000	0.000	0.000	
Clark County			0	0.000	0.000	0.000	0.000	
Preble County			0	0.000	0.000	0.000	0.000	
Clinton County			0	0.000	0.000	0.000	0.000	
Lawrenceburg Twp			3453	0.003	0.035	0.006	0.000	
Total Intra-Zonal			210367	0.187	2.164	0.372	0.006	
AQ Region Total Intra-Zonal			145329	0.126	1.481	0.258	0.004	

* Note: VMT reflects yearly average daily VMT. Emissions for CO are based on yearly average daily VMT. Emissions for VOC and NOX include a factor to represent summer travel.

Transit VMT

IN Not AQ Region	0	0.000	0.000	0.000	0.000
KY - OKI Only	8404	0.003	0.030	0.121	0.002
OH - OKI Only	29669	0.005	0.100	0.423	0.007
OH - MVRPC Only	0	0.000	0.000	0.000	0.000
OH - Other	0	0.000	0.000	0.000	0.000
IN NonAttainment	0	0.000	0.000	0.000	0.000
Total Transit	38073	0.008	0.129	0.544	0.010
AQ Region Total Transit	29669	0.005	0.100	0.423	0.007

* Note: VMT reflects yearly average daily VMT. Emissions for CO are based on yearly average daily VMT.
Emissions for VOC and NOX include a factor to represent summer travel.

Appendix I

Public Participation Documents

IDEM

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

We Protect Hoosiers and Our Environment.

Mitchell E. Daniels Jr.
Governor

Thomas W. Easterly
Commissioner

100 North Senate Avenue
Indianapolis, Indiana 46204
(317) 232-8603
Toll Free (800) 451-6027
www.idem.IN.gov

Date: April 3, 2008

To: Interested Parties

From: Scott Deloney, Chief
Air Programs Branch, Office of Air Quality

Subject: Fine Particle Attainment Demonstration and Technical Support Document for the Indiana Portion of the Cincinnati-Hamilton, OH-KY-IN Area

On April 5, 2005, the United States Environmental Protection Agency (U.S. EPA) designated Lawrenceburg Township, Dearborn County, IN a nonattainment area, as part of the Cincinnati-Hamilton OH-KY-IN Fine Particles Nonattainment Area.

The Clean Air Act Amendments of 1990 (CAAA) required areas designated nonattainment for the fine particles air quality standard to develop State Implementation Plans (SIPs) to expeditiously attain and maintain the standard. Section 172 (c) of the Clean Air Act (CAA) stipulates the requirements that nonattainment areas must meet, including the development of a plan to demonstrate that the area will meet the ambient air quality standard by its assigned deadline (April 5, 2008).

Therefore, in accordance with the CAA, the Indiana Department of Environmental Management (IDEM) has prepared a draft attainment demonstration plan for submittal to the U.S. EPA. IDEM is making available this draft document for public review and comment beginning April 3, 2008.

Notice is hereby given under 40 CFR 51.102 that IDEM will hold a public hearing on Thursday, May 8, 2008. The purpose of this hearing is to receive public comment on the Draft Attainment Demonstration Plan in association with the fine particles standard, for the Indiana portion of the Cincinnati-Hamilton, OH-KY-IN fine particles nonattainment area, (Lawrenceburg,Township, Dearborn County) Area. The meeting will convene at 5:30 p.m. (local time) in the Lawrenceburg Public Library, Depot Meeting Room, 150 Mary Street, Lawrenceburg, Indiana. All interested persons are invited and will be given opportunity to express their views concerning the draft document.

Upon request, copies of the draft documents will be available on or before April 3, 2008. The draft document is also available for review and download on IDEM's web site located at http://www.in.gov/idem/programs/air/attainmentdemos/index.html, or may be reviewed and copied at the following locations:

- Indiana Department of Environmental Management, Office of Air Quality, Indiana Government Center North, 100 North Senate Ave, Room N1003, Indianapolis, Indiana.

- Lawrenceburg Public Library, 150 Mary Street, Lawrenceburg, Indiana.

- Lawrenceburg City Building, 230 Walnut Street, Lawrenceburg, Indiana.

IDEM will accept written comments concerning this matter through May 9, 2008. Mailed comments should be addressed to:

> Lawrenceburg Township, Dearborn County Fine Particle Attainment Demonstration
> Scott Deloney, Chief
> Air Programs Branch, Office of Air Quality – Mail Code 61-50
> 100 North Senate Avenue
> Indiana Department of Environmental Management
> Indianapolis, IN 46204-2251

A transcript of the hearing and all written submissions provided at the public hearing shall be open to public inspection at IDEM and copies may be made available to any person upon payment of reproduction costs. Any person heard or represented at the hearing or requesting notice shall be given written notice of actions resulting from the hearing.

If you have any questions, you may contact me at (317) 233-5694 or sdeloney@idem.IN.gov or Ms. Amy Bukarica at (317) 233-1179 or abukarica@idem.IN.gov.

Steven L. Beshear
Governor

Robert D. Vance
Secretary

Commonwealth of Kentucky
Environmental and Public Protection Cabinet
Department for Environmental Protection
Division for Air Quality
803 Schenkel Lane
Frankfort, Kentucky 40601-1403
www.air.ky.gov

May 9, 2008

Ms. Amy Bukarica
Indiana Department of Environmental Management
Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room N1001
Indianapolis, Indiana 46204

Dear Ms. Bukarica:

The Division for Air Quality has reviewed the Indiana Department of Environmental Management (IDEM) document titled, "Fine Particle Attainment Demonstration and Technical Support Document for the Indiana Portion of the Cincinnati-Hamilton, OH-KY-IN Fine Particle Nonattainment Area," for the Lawrenceburg Township in Dearborn County, Indiana. Kentucky offers to make the following comments.

1) In Table 1.2 on page 3, the annual average data for Campbell and Kenton Counties do not match the Kentucky data submitted to the U.S. Environmental Protection Agency's Air Quality System database. As a result, this affects the 2001-2003 Averages for these counties in the next column. For Campbell County, the average listed is 14.42 micrograms per cubic meter ($\mu g/m^3$), compared to Kentucky's value of 13.9 $\mu g/m^3$. For Kenton County, the 2001-2003 Average of 14.90 $\mu g/m^3$ agrees with Kentucky's data, even though the annual average data are different. See the summary table provided below.

Comparison Between Indiana's and Kentucky's 2001-2003 Annual Averages

Monitor Site	IDEM Design Value ($\mu g/m^3$)	KDAQ Design Value ($\mu g/m^3$)
Campbell: 2001	15.28	13.4
Campbell: 2002	14.66	14.8
Campbell: 2003	13.34	13.4
Kenton: 2001	15.54	15.3
Kenton: 2002	14.98	15.1
Kenton: 2003	14.18	14.3

Ms. Amy Bukarica
Page 2
May 9, 2008

2) In Table 3.6 on page 28, data provided for Campbell and Kenton Counties do not match the Kentucky data submitted to the U.S. Environmental Protection Agency's Air Quality System database. Data for the years 2000 and 2004 appear to be correct. See the summary tables for each county provided below.

Comparison Between Indiana's and Kentucky's 2000-2006 Annual Design Values
Campbell County

State Agency Data	2001	2002	2003	2005	2006
IDEM Design Value (μg/m³)	15.3	14.7	13.3	14.9	No data
KDAQ Design Value (μg/m³)	13.4	14.8	13.4	14.8	11.5

Comparison Between Indiana's and Kentucky's 2000-2006 Annual Design Values
Kenton County

State Agency Data	2001	2002	2003	2005	2006
IDEM Design Value (μg/m³)	15.5	15.0	14.2	15.8	13.2
KDAQ Design Value (μg/m³)	15.3	15.1	14.3	15.9	13.3

The Division appreciates the opportunity to review this submittal and looks forward to the continued cooperation with your staff in matters relating to transportation/air quality planning. If you have any questions regarding this matter, please contact Joe Forgacs of my staff at (502) 573-3382.

Sincerely,

John S. Lyons
Director

JSL/jmf

cc: Dianna Smith, U.S. EPA – Region 4
Robert W. Koehler, OKI
Lynn Soporowski, KYTC

Bukarica, Amy

From: Forgacs, Joe (EPPC DEP DAQ) [Joe.Forgacs@ky.gov]
Sent: Wednesday, May 21, 2008 8:24 AM
To: Bukarica, Amy
Subject: RE: Dearborn Co., IN SIP

Good morning Amy,

Below is the information (in micrograms/cubic meter) that you need relating to Item # 1 from the May 9th letter. Going out to two decimal places, here are the numbers for **Campbell** County.

2001: 13.44
2002: 14.81
2003: 13.42

Also going out to two decimal places, here are the numbers for **Kenton** County.

2001: 15.25
2002: 15.06
2003: 14.30

I hope this meets your data needs relating to KYDAQ's review. Let me know if you need anything else.

Thanks!

Joe

From: Bukarica, Amy [mailto:abukarica@idem.IN.gov]
Sent: Tuesday, May 20, 2008 3:34 PM
To: Forgacs, Joe (EPPC DEP DAQ)
Subject: Dearborn Co., IN SIP

Joe,

Thank you for submitting your comments regarding the Cincinnati-Hamilton OH-KY-IN PM state implementation plan. We are going to use the data you submitted to us. However, we need the data to go out two decimal places and the data you submitted only goes out one. Would you mind sending me the info one more time, but with two decimal places? I've attached a copy of the comments we received from you for your reference. Please call me if you have any questions.

Thanks,

Amy Bukarica
Environmental Scientist
Office of Air Quality
Indiana Department of Environmental Management
(317) 233-1179

Annual Fine Particle Attainment Demonstration and Technical Support Document for the Indiana portion of the Cincinnati-Hamilton OH-KY-IN Fine Particle Nonattainment Area, Dearborn County (Lawrenceburg Township), Indiana

Summary/Response to Comments Received at Public Hearing

On May 8, 2008, the Indiana Department of Environmental Management (IDEM) conducted a public hearing concerning the draft attainment demonstration and technical support document of the annual fine particulate matter ($PM_{2.5}$) standard for the Indiana portion of the Cincinnati OH-KY-IN Fine Particle Nonattainment Area, Dearborn County (Lawrenceburg Township), Indiana. There were no comments received during the public hearing.

Summary/Response to Comments Received During Comment Period

IDEM requested public comment on the draft attainment demonstration and technical support document for Indiana's portion of the Cincinnati OH-KY-IN Fine Particle Nonattainment Area, from April 4, 2008 through May 9, 2008. IDEM received comments from the following parties:

John S. Lyons, Director, Kentucky DEQ, Division of Air Quality (JL)

<u>Following is a summary of comments received and IDEM's responses thereto:</u>

Comment: In Table 1.2 on Page 3, the annual average data for Campbell and Kenton counties do not match the Kentucky data submitted to the United States Environmental Protection Agency's (U.S. EPA) Air Quality System database. As a result, this affects the 2001-2003 averages for these counties in the next column. The units are in micrograms per cubic meters ($\mu g/m^3$). Below is a summary of the data discrepancies. (JL)

Comparison between Indiana's and Kentucky's 2001-2003 Annual Averages (μg/m³)

Monitor Site	**IDEM Design Value (μg/m³)**	**Kentucky Department of Air Quality Design Value (μg/m³)**
Campbell: 2001	15.28	13.4
Campbell: 2002	14.66	14.8
Campbell: 2003	13.34	13.4
Kenton: 2001	15.54	15.3
Kenton: 2002	14.98	15.1
Kenton: 2003	14.18	14.3

IDEM has revised Table 1.2 to incorporate Kentucky's 2001-2003 monitoring data for the Campbell and Kenton counties' monitoring sites as requested.

Comment: In Table 3.6 on Page 28, data provided for Campbell and Kenton counties do not match the Kentucky data submitted to the U.S. EPA's Air Quality System database. Data for the years 2000 and 2004 appear to be correct. The units are in micrograms per cubic meters (μg/m³). Below is a summary of the data discrepancies. (JL)

Comparison between Indiana's and Kentucky's 2000-2006 Annual Design Values for Campbell County

State Agency Data	2001	2002	2003	2005	2006
IDEM Design Value (μg/m³)	15.3	14.7	13.3	14.9	No data
KDAQ Design Value (μg/m³)	13.4	14.8	13.4	14.8	11.5

Comparison between Indiana's and Kentucky's 2000-2006 Annual Design Values for Kenton County

State Agency Data	2001	2002	2003	2005	2006
IDEM Design Value (μg/m³)	15.5	15	14.2	15.8	13.2
KDAQ Design Value (μg/m³)	15.3	15.1	14.3	15.9	13.3

IDEM has revised Table 3.6 to incorporate Kentucky's 2000-2006 Annual Design Values for the Campbell and Kenton counties' monitoring sites as requested.

LEGAL NOTICE OF PUBLIC HEARING

STATE IMPLEMENTATON PLAN SUBMITTAL
Fine Particle Attainment Demonstration Plan
Lawrenceburg Township, Dearborn County, Indiana

Notice is hereby given under 40 CFR 51.102 that the Indiana Department of Environmental Management (IDEM) will hold a public hearing on May 8, 2008. The purpose of this hearing is to receive public comment on the amendment to the State Implementation Plan (SIP) developed for the purpose of complying with the attainment demonstration requirement of Section 172 (c) of the Clean Air Act (CAA), as it applies to Lawrenceburg Township, Dearborn County, Indiana. Public comments will also be received on the 2002 emissions inventory included in the attainment demonstration. The meeting will convene at 5:30 p.m. (local time) in the Lawrenceburg Public Library, Depot Meeting Room, 150 Mary Street, Lawrenceburg, Indiana. All interested persons are invited and will be given opportunity to express their views concerning the draft documents.

Lawrenceburg Township, located in Dearborn County, Indiana is part of the Cincinnati-Hamilton OH-KY-IN Fine Particle Nonattainment Area. This area was designated as a nonattainment area and is subject to the requirements of Section 172 of the CAA. One of the compliance requirements mandated by Section 172 (c) of the CAA is the development of a plan demonstrating that the area will meet the annual fine particle air quality standard by the required attainment date. This Fine Particle Attainment Demonstration Plan is being drafted and submitted consistent with United States Environmental Protection Agency (U.S. EPA) guidance.

The attainment demonstration includes an air quality modeling analysis, an emissions inventory, an air quality and emissions trend analysis, a summary of current and anticipated emission control measures and mobile source emission budgets for purposes of transportation conformity. Public comments will be received on all components of the attainment demonstration SIP submittal.

Copies of the draft documents will be available on or before April 4, 2008 to any person upon request and at the following locations:

- Indiana Department of Environmental Management, Office of Air Quality, Indiana Government Center North, 100 North Senate Ave., Room N1003, Indianapolis, Indiana.
- Lawrenceburg Public Library, 150 Mary Street, Lawrenceburg, Indiana.
- Lawrenceburg City Building, 230 Walnut Street, Lawrenceburg, Indiana.

Oral statements will be heard, but for the accuracy of the record, statements should be submitted in writing. Written statements may be submitted to the attendant designated to receive written comments at the public hearing.

IDEM will also accept written comments through May 9, 2008. Mailed comments should be addressed to:

Lawrenceburg Township, Dearborn County Fine Particle Attainment Demonstration
Scott Deloney, Chief
Air Programs Branch, Office of Air Quality – Mail Code 61-50
100 North Senate Avenue
Indiana Department of Environmental Management
Indianapolis, IN 46204-2251

A transcript of the hearing and all written submissions provided at the public hearing shall be open to public inspection at IDEM and copies may be made available to any person upon payment of reproduction costs. Any person heard or represented at the hearing or requesting notice shall be given written notice of actions resulting from the hearing.

For additional information, contact Ms. Amy Bukarica at the Indiana Department of Environmental Management, Office of Air Quality, Room N1001, Indiana Government Center North, 100 North Senate Avenue, Indianapolis, IN 46204 or call (317) 233-1179 or (800) 451-6027 ext. 3-1179 (in Indiana).

****

Individuals requiring reasonable accommodations for participation in this hearing should contact the IDEM Americans with Disabilities Act (ADA) coordinator at:

Attn: ADA Coordinator
Indiana Department of Environmental Management – Mail Code 50-10
100 North Senate Avenue
Indianapolis, IN 46204-2251

Or call (317) 233-1785 (voice) or (317) 232-6565 (TDD). Please provide a minimum of 72 hours notification.

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY

COPY

DATE: May 8, 2008

TIME: 5:30 P.M.

PLACE: Lawrenceburg Public Library
150 Mary Street
The Depot Room
Lawrenceburg, IN 47025

PRESENT: Ms. Sarah Raymond, Hearing Officer
Ms. Amy Bukarica, Officer

Audience Members

Sharon Shields, Reporter

Sharon Shields
S.A.S. Reporting Service
3650 N. Old SR 62, Madison, IN 47250
Business: (812) 265-2994
Fax (812) 273-5220

A public hearing regarding the draft Fine Particle Attainment Demonstration and Technical Support Document was held at the Lawrenceburg Public Library, 150 Mary Street, Depot Meeting Room, Lawrenceburg, Indiana at 5:30 P.M. on May 8, 2008.

OPENING STATEMENTS BY MS. SARAH RAYMOND:

This is a public hearing to solely provide interested persons an opportunity to provide comments to the State regarding the draft Fine Particle Attainment Demonstration and Technical Support Document for the Indiana Portion of the Cincinnati-Hamilton, OH-KY-IN Fine Particle Nonattainment Area; Lawrenceburgh Township, Dearborn County, Indiana. Comments are also being accepted on the 2005 emissions inventory that is included as part of the attainment demonstration. This hearing is being held to conform to the provisions in 40 CFR Part 51 regarding public hearings for State Implementation Plan (SIP) submittals. There's a spelling error on here. Lawrenceburg has no "H" on it.

The area was designated as a nonattainment area for the annual fine particle standard and subject to the requirements of Section 172 of the Clean Air Act (CAA). One (1) of the compliance requirements mandated by Section 172c of the Clean Air Act is the development of a plan demonstrating that the area will meet the annual fine particle national ambient air quality standard (NAAQS) by the required attainment date, April 5, 2010. The Indiana Department of Environmental Management (IDEM) will accept comments concerning this revision to the SIP for the purpose of complying with the attainment demonstration requirement, as it applies to Lawrenceburg Township, Dearborn County, Indiana. This fine particle attainment demonstration and technical support document is being drafted and submitted consistent with United States Environmental Protection Agency (U.S.EPA) guidance.

My name is Sarah Raymond. I am an Environmental Manager in the Planning Section of the Indiana Department of Environmental Management's Office of Air Quality. I have been appointed to act as hearing officer for this public hearing. Also, here with me is Amy Bukarica, an Environmental Scientist, in the Planning Section of the Indiana Department of Environmental Management's Office of Air Quality.

Notice of the time and place of the hearing was given as provided by law by publication in the following newspapers:

(1) The Indianapolis Star, Indianapolis, Indiana
(2) Dearborn County Register, Lawrenceburg, Indiana
(3) Ohio County News, Rising Sun, Indiana
(4) The Versailles Republican, Versailles, Indiana

Appearance blanks have been distributed in the hearing room for all those desiring to be shown appearing on record in this cause. If you have not already filled out the form, please do so and indicate if you are appearing for yourself or on behalf of a group or organization and identify such group or organization. Also, note the capacity in which you appear, such as, attorney, officer or authorized spokesperson.

Any person who is heard or represented at this hearing or who requests notice may be given written notice of the final action taken on this State Implementation Plan submittal. Please indicate on the appearance card if you wish to receive this notification. When appearance cards have been completed, they should be handed to me and I will include them with the official record of this proceeding.

Oral statements will be heard, but written statements may be handed to me or mailed to the Office of Air Quality on or before close of business on Friday, May 9th,

2008. A written transcript of this hearing is being made. The transcript will be open for public inspection and a copy of the transcript will be made available to any person upon payment of the copying cost.

After the conclusion of this public hearing, I will prepare a written report summarizing the comments received at this hearing and recommending changes which may need to be made to this document.

I would like to introduce the following documents into the record:

(1) The notice of public hearing.

(2) Draft Fine Particle Attainment Demonstration and Technical Support Document for the Indiana Portion of the Cincinnati-Hamilton, OH-KY-IN Fine Particle Nonattainment Area; Lawrenceburg Township, Dearborn County, Indiana.

(3) Supplement to Appendix A, 2007 Monitoring Data Technical Support Documentation.

(4) 2005 Dearborn County, Indiana Emissions Inventory.

Finally, I would like to briefly go over the contents of the draft document.

In 1997, the United States Environmental Protection Agency set daily and annual ambient air quality standards for fine particles at 15.0 micrograms per cubic meter on an annual basis and at 65.0 micrograms per cubic meter on a 24-hour or daily basis.

Legal challenges to the new standards for fine particles resulted in delayed implementation of the standards until February 2001, when the Supreme Court upheld the standards and ruled that the U.S.EPA could proceed with implementation of the new standards. Indiana began monitoring for fine particles in 1999. The U.S.EPA originally designated counties under the fine particle standards based on 2001 through 2003 monitoring data in December 2004. The U.S.EPA designated areas throughout the country as attainment, nonattainment, or unclassifiable. Lawrenceburg Township in Dearborn County, Indiana was designated nonattainment as part of the Cincinnati-Hamilton OH-KY-IN Fine Particle Nonattainment Area. The U.S.EPA withdrew a number of counties identified as nonattainment based on updated monitoring data for 2002 through 2004 prior to the effective date of designations, which was April 5, 2005, based on the fact that those counties had met the standard at the close of 2004. However, this action did not affect the Cincinnati-Hamilton OH-KY-IN nonattainment area. The area's controlling design value (17.8 micrograms per cubic meter) was monitored at the Seymour & Vine Street monitor in Hamilton County, Ohio. Monitors for ambient fine particle levels are located in all counties in the Cincinnati-Hamilton OH-KY-IN nonattainment area except Warren County, Ohio, Boone County, Kentucky and Lawrenceburg Township in Dearborn County, Indiana.

The Cincinnati-Hamilton Oh-KY-IN Fine Particle nonattainment area consists of Lawrenceburg Township in Dearborn County, Indiana; Butler, Clermont, Hamilton, and Warren Counties, Ohio; and Boone, Campbell and Kenton Counties, Kentucky.

The agencies responsible for assuring the nonattainment area complies with the Clean Air Act requirements are:

* The Ohio Environmental Protection Agency (Ohio EPA), which is responsible for Butler, Clermont, Clinton, Hamilton and Warren Counties, Ohio;

* The Kentucky Department for Environmental Protection, (KDEP), which is responsible for Boone, Campbell and Kenton Counties, Kentucky; and,
* The Indiana Department of Environmental Management (IDEM), which is responsible for Lawrenceburg Township, Dearborn County, Indiana.

Indiana, Ohio and Kentucky have worked cooperatively with U.S.EPA Regions IV and V to address attainment planning issues.

Although Indiana, Ohio and Kentucky have worked together on a comprehensive plan for multi-state areas, each state is required to make a separate submittal for its portion of the planning components to U.S.EPA. Attainment demonstrations are considered SIP submittals and U.S.EPA action on them is taken separately. This submittal only covers the Indiana portion of the nonattainment area, Lawrenceburg Township, in Dearborn County, Indiana.

The Clean Air Act Amendments of 1990 (CAA) required areas designated nonattainment for the annual fine particle NAAQS to develop SIP revisions, to expeditiously attain and maintain the standard. Section 172 of the 1990 Clean Air Act stipulates the requirements nonattainment areas must meet, including the development of a plan to reduce direct $PM_{2.5}$, NO_x and SO_2 emissions and a demonstration that the area will meet the ambient air quality standard by April 5, 2010.

The Clean Air Act requires multi-state nonattainment areas to demonstrate attainment using photochemical computer grid modeling. A computer model is used to predict maximum fine particle concentrations in every grid cell (or point of analysis) within the nonattainment area. Computer modeling conducted by the Lake Michigan Air Director's Consortium (LADCO) shows all future year concentrations well below the annual fine particle NAAQS of 15.0 micrograms per cubic meter. According to the U.S.EPA guidance, areas with future year design values lower than 14.5 micrograms per cubic meter at each monitor site only need to provide a basic supplemental analysis that the area will attain the annual fine particle standard. Since the area's future year design value is predicted to be significantly below the fine particle standard, at 14.4 micrograms per cubic meter, a basic supplemental analysis is only required to support the modeling analysis. This analysis further demonstrates that the nonattainment area will comply with the annual fine particle standard by the prescribed attainment date of April 5, 2010.

This demonstration shows that NO_x and SO_2 emissions reductions since designation have had a positive effect on regional fine particle levels. It also shows that once the photochemical modeling results are considered along with additional national, regional and local control measures to be phased-in or implemented in 2008 and 2009, air quality in the area will achieve attainment of the annual NAAQS for fine particles by April 5, 2010, and provide for an ample margin of safety.

This plan satisfies Indiana's obligation under Section 172c of the Clean Air Act to demonstrate how the area will attain the annual standard for fine particles by the attainment date, and as a result, realize cleaner air. The development of this plan will bring this region into compliance with state and federal fine particle air quality standards, and provide real progress in the state's journey toward cleaner air.

In conclusion, monitors in Ohio's portion of the Cincinnati-Hamilton OH-KY-IN Fine Particle Nonattainment Area have measured values above the 2006 daily standard.

However, the U.S.EPA has not implemented the standard at this time. This document solely applies to demonstrating attainment of the annual fine particle standard.

This concludes my comments regarding the draft Fine Particle Attainment Demonstration and Technical Support Document for the Lawrenceburg Township in Dearborn County, Indiana, the Indiana portion of the Cincinnati-Hamilton OH-KY-IN Fine Particle Nonattainment Area. Before opening this hearing for public comments, may I once again remind you that this hearing pertains solely to this draft attainment demonstration and technical support document in association with the annual standard for fine particles for Indiana's portion of the Cincinnati-Hamilton OH-KY-IN Fine Particle Nonattainment Area, and only comments germane to this matter will be considered as part of the public record.

Amy and I will be available following this hearing to address any questions you may have that do not pertain to this specific matter.

This hearing is now open for public comment. Are there any public comments?

In the absence of any further comments, these proceedings are hereby concluded. This hearing is adjourned.

Thank you.

* * * * *

CONCLUSION OF HEARING

C E R T I F I C A T E

STATE OF INDIANA)
) SS:
COUNTY OF JEFFERSON)

I, Sharon Shields, do hereby certify that I am a Notary Public in and for the County of Jefferson, State of Indiana, duly authorized and qualified to administer oaths; That the foregoing public hearing was taken by me in shorthand and on a tape recorder on May 8, 2008 at the Lawrenceburg Public Library, 150 Mary Street, the Depot Room, Lawrenceburg, IN; That this public hearing was taken on behalf of the Indiana Department of Environmental Management pursuant to agreement for taking at this time and place; That the testimony of the witnesses was reduced to typewriting by me and contains a complete and accurate transcript of the said testimony.

I further certify that pursuant to stipulation by and between the respective parties, this testimony has been transcribed and submitted to the Indiana Department of Environmental Management.

WITNESS my hand and notarial seal this 13th day of May, 2008.

Sharon Shields, Notary Public
Jefferson County, State of Indiana

My Commission Expires:

July 2, 2015

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

PUBLIC HEARING ATTENDANCE RECORD

Title of Public Hearing: Lawrenceburg Township (Dearborn County) PM2.5 Attainment Demonstration **Location:** 150 W Mary St Lawrenceburg, IN Lawrenceburg Public Library **Date:** 5-8-08

Please print all the information:

NAME	ORGANIZATION/ COMPANY	PHONE NUMBER	ADDRESS
Andy Reser	OKI	513-621-6300	720 E. Pete Rose Way Ste 420 Cincinnati OH
Sharon McFarland	AEP-Tanners Creek Plant	812-532-3124	800 AEP Drive, Lawrenceburg IN 47025
Jim Butcher	I²M Power	317-822-6373	101 W. Ohio St. Indianapolis, IN
Randy Graves	Lawrenceburg Distillers	812-537-8525	7 Ridge Ave Lawrenceburg, IN 47025

4/1

IDEM
Public hearing
Ripley County

IDEM FISCAL/ACCOUNTING Versailles
2008 APR 11 P 2:36

PUBLISHER'S CLAIM

LINE COUNT

Display Matter (Must not exceed two actual lines, neither of which shall total more than four solid lines of the type in which the body of the

Head - number of lines	6
Body - number of lines	131
Tail - number of lines	
TOTAL number of lines in notice	137

COMPUTATION OF CHARGES

137 lines 1 column wide 137 equivalent 0.345

Cents per line	47.27
Additional charges notices containing rule or tabular work (50% of above amount)	
Charge for extra proofs of publication ($1.00 for each proof in excess of two)	
TOTAL AMOUNT OF CLAIM	47.27

DATA FOR COMPUTING COST

Width of single column 8 ems Size of type 6 point
Number of Insertions 1

Pursuant to the provisions and penalties of Chapter 155, Acts 1953,

I hereby certify that the foregoing account is just and correct, that the amount claimed is legally due, after allowing all just credits, and that no part of the same has been paid.

April 4 2008

Linda Chandler
Publisher

PUBLISHER'S AFFIDAVIT

State of Indiana}
Ripley County } ss:

Personally appeared before me, a notary public in and for said county and state, the undersigned Linda Chandler who, being duly sworn, says that she is publisher of the Versailles Republican a weekly newspaper of general circulation printed and published in the English language in the (city)(town) of Versailles in state and county aforesaid, and paper for 1 times, the date of publication being as follows: 4/3/2008

Wanda R. Burnett
Wanda R. Burnett
Notary Public
Resident of Ripley County

My commission expires July 30, 2014
Ripley Publishing Co., Inc., PO 158 Versailles, IN 470442

Legal Notice of Public Hearing

STATE IMPLEMENTATION PLAN SUBMITTAL
Fine Particle Attainment Demonstration Plan
Lawrenceburg Township,
Dearborn County, Indiana

Notice is hereby given under 40 CFR 51.102 that the Indiana Department of Environmental Management (IDEM) will hold a public hearing on May 8, 2008. The purpose of this hearing is to receive public comment on the amendment to the State Implementation Plan (SIP) developed for the purpose of complying with the attainment demonstration requirement of Section 172(c) of the Clean Air Act (CAA), as it applies to Lawrenceburg Township, Dearborn County, Indiana. Public comments will also be received on the 2002 emissions inventory included in the attainment demonstration. The meeting will convene at 5:30 p.m. (local time) in the Lawrenceburg Public Library, Depot Meeting Room, 150 Mary Street, Lawrenceburg, Indiana. All interested persons are invited and will be given opportunity to express their views concerning the draft documents.

Lawrenceburg Township, located in Dearborn County, Indiana is part of the Cincinnati-Hamilton OH-KY-IN Fine Particle Nonattainment Area. This area was designated as a nonattainment area and is subject to the requirements of Section 172 of the CAA. One of the compliance requirements mandated by Section 172 (c) of the CAA is the development of a plan demonstrating that the area will meet the annual fine particle air quality standard by the required attainment date. This Fine Particle Attainment Demonstration Plan is being drafted and submitted consistent with United States Environmental Protection Agency (U.S. EPA) guidance.

The attainment demonstration includes an air quality modeling analysis, an emissions inventory, an air quality and emissions trend analysis, a summary of current and anticipated emission control measures and mobile source emission budgets for purpose of transportation conformity. Public comments will be received on all components of the attainment demonstration SIP submittal.

Copies of the draft documents will be available on or before April 4, 2008 to any person upon request and at the following locations:

- Indiana Department of Environmental Management, Office of Air Quality, Indiana Government Center North, 100 North Senate Ave., Room N1003, Indianapolis, Indiana.
- Lawrenceburg Public Library, 150 Mary Street, Lawrenceburg, Indiana.
- Lawrenceburg City Building, 230 Walnut Street, Lawrenceburg, Indiana.

Oral statements will be heard, but for the accuracy of the record, statements should be submitted in writing. Written statements may be submitted to the attendant designated to receive written comments at the public hearing.

IDEM will also accept written comments through May 9, 2008. Mailed comments should be addressed to: Lawrenceburg Township, Dearborn County Fine Particle Attainment Demonstration; Scott Deloney, Chief, Air Programs Branch

TO: ACCOUNTING
IGCN - Room 1345

FROM: KAROL T. CHUMA
IGCN - 1001
RULES SECTION
OFFICE OF AIR QUALITY

DATE: 4-18-08

Note: Please send a copy of the paid publication to The Versailles Republican

The attached invoice for publication of public notice is approved for payment.

ACCOUNT # 3610/140900

IDEM

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

We Protect Hoosiers and Our Environment.

Mitchell E. Daniels Jr.
Governor

Thomas W. Easterly
Commissioner

100 North Senate Avenue
Indianapolis, Indiana 46204
(317) 232-8603
Toll Free (800) 451-6027
www.idem.IN.gov

April 1, 2008

The Versailles Republican
115 South Washington Street
PO Box 158
Versailles, Indiana 47042

Phone: 812-689-6364
Fax: 812-689-6508

ATTENTION: PUBLIC NOTICES - LEGAL ADVERTISING SECTION

Enclosed, please find an Indiana Department of Environmental Management Public Hearing Legal Notice(s) concerning the Annual Fine Particle Attainment Demonstration and Technical Support Plan for the Lawrenceburg, Indiana area.

Please print ONE TIME, on or before April 4, 2008, in order for us to satisfy our statutory requirements.

Please send a notarized form no. 99p and/or publisher's claim, together with the newspaper clipping, showing the date of publication and your Federal ID number to:

Attn: Sandra Robinson, Room N1003
Indiana Department of Environmental Management
Air Programs Branch, Office of Air Quality
Mail Code 61-50
Indianapolis, Indiana 46206-2251

If you have any questions, please call me at 317-233-0427. Thank you.

Sincerely,

Sandra Robinson
Air Programs Branch
Office of Air Quality

Enclosures

Form Prescribed by State Board of Accounts

81956-5174166

General Form No 99 P (Rev 1987)

IND DEPT OF ENVIRONMENTAL MGMT

MARION COUNTY, INDIANA

To: INDIANAPOLIS NEWSPAPERS
307 N PENNSYLVANIA ST - PO BOX 145
INDIANAPOLIS, IN 46206-0145

PUBLISHER'S CLAIM

LINE COUNT

Display Matter - (Must not exceed two actual lines, neither of which shall total more than four solid lines of the type in which the body of the advertisement is set) Number of equivalent lines

Head - Number of lines ______ $______

Body - Number of lines ______ $______ $______

Tail - Number of lines ______ $______

Total number of lines in notice ______

COMPUTATION OF CHARGES

171.0 lines 1.0 columns wide equals 171.0 equivalent lines at .393 cents per line $ 67.20

Additional charge for notices containing rule and figure work (50 per cent of above amount) $______

Charges for extra proofs of publication ($1.00 for each proof in excess of two) $ .00 $ .00

TOTAL AMOUNT OF CLAIM $______

DATA FOR COMPUTING COST $______

Width of single column 7.83 ems Size of type 5.7 point $______ $______

Number of insertions 1.0 $ 67.20

Pursuant to the provisions and penalties of Chapter 155, Acts of 1953,
I hereby certify that the foregoing account is just and correct, that the amount claimed is legally due, after allowing all just credits, and that no part of the same has been paid.

DATE: 04/02/2008

Clerk
Title

81956-5174166

PUBLISHER'S AFFIDAVIT

State of Indiana SS
MARION County

Personally appeared before me, a notary public in and for said county and state, the undersigned **Karen Mullins** who, being duly sworn, says that SHE is clerk of the INDIANAPOLIS NEWSPAPERS a DAILY STAR newspaper of general circulation printed and published in the English language in the city of INDIANAPOLIS in state and county aforesaid, and that the printed matter attached hereto is a true copy, which was duly published in said paper for 1 time(s), between the dates of **04/02/2008 and 04/02/2008**

Clerk
Title

Subscribed and sworn to before me on 04/02/2008

Notary Public

DENISE HAMBRITE
NOTARY PUBLIC
SEAL
STATE OF INDIANA
MY COMMISSION EXPIRES February 28, 2016

Form 65-REV 1-88

My commission expires:______

STATE PRESCRIBED FORMULA

7.83 PICA COLUMN - 94 POINT
94 POINTS / 5.7 PT. TYPE - 16.49
16.49 EMS / 250 - .06596 SQUARES
.06596 SQUARES x $5.14 - .339 CENTS PER LINE

RATE PER LINE

PUBLISHED 1 TIME = .339
PUBLISHED 2 TIMES= .509
PUBLISHED 3 TIMES= .679
PUBLISHED 4 TIMES= .848

DATE: 04/02/2008

Clerk
Title

81956-5174166

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MARION County

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04/02/2008 and **04/02/2008**

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Notary Public

DENISE HAMBRITE
NOTARY PUBLIC
SEAL
STATE OF INDIANA
MY COMMISSION EXPIRES February 28, 2016

My commission expires: __________

Form 65-REV 1-88

PUBLIC NOTICES

LEGAL NOTICE
OF PUBLIC HEARING
STATE IMPLEMENTATON
PLAN SUBMITTAL

Fine Particle Attainment Demonstration Plan
Lawrenceburg Township, Dearborn County, Indiana

Notice is hereby given under 40 CFR 51.102 that the Indiana Department of Environmental Management (IDEM) will hold a public hearing on May 8, 2008. The purpose of this hearing is to receive public comment on the amendment to the State Implementation Plan (SIP) developed for the purpose of complying with the attainment demonstration requirement of Section 172 (c) of the Clean Air Act (CAA), as it applies to Lawrenceburg Township, Dearborn County, Indiana. Public comments will also be received on the 2002 emissions inventory included in the attainment demonstration. The meeting will convene at 5:30 p.m. (local time) in the Lawrenceburg Public Library, Depot Meeting Room, 150 Mary Street, Lawrenceburg, Indiana. All interested persons are invited and will be given opportunity to express their views concerning the draft documents.

Lawrenceburg Township, located in Dearborn County, Indiana is part of the Cincinnati-Hamilton OH-KY-IN Fine Particle Nonattainment Area. This area was designated as a nonattainment area and is subject to the requirements of Section 172 of the CAA. One of the compliance requirements mandated by Section 172 (c) of the CAA is the development of a plan demonstrating that the area will meet the annual fine particle air quality standard by the required attainment date. This Fine Particle Attainment Demonstration Plan is being drafted and submitted consistent with United States Environmental Protection Agency (U.S. EPA) guidance.

The attainment demonstration includes an air quality modeling analysis, an emissions inventory, an air quality and emissions trend analysis, a summary of current and anticipated emission control measures and mobile source emission budgets for purposes of transportation conformity. Public comments will be received on all components of the attainment demonstration SIP submittal.

Copies of the draft documents will be available on or before April 4, 2008 to any person upon request and at the following locations:

•Indiana Department of Environmental Management, Office of Air Quality, Indiana Government Center North, 100 North Senate Ave., Room N1003, Indianapolis, Indiana.
•Lawrenceburg Public Library, 150 Mary Street,

STATE ORMULA

7.83 PI 4 POINT
94 POI PE - 16.49
16.49 E 5 SQUARES
.06596 4 - .339 CENTS PER LINE

RATE PER LINE

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IDEM
INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We Protect Hoosiers and Our Environment.

Mitchell E. Daniels Jr.
Governor

Thomas W. Easterly
Commissioner

100 North Senate Avenue
Indianapolis, Indiana 46204
(317) 232-8603
Toll Free (800) 451-6027
www.idem.IN.gov

April 1, 2008

Indianapolis Star/News
307 North Pennsylvania Street
PO Box 145
Indianapolis, Indiana 46206-0145

Phone: 317-444-4000
Fax: 317-444-8806

ATTENTION: PUBLIC NOTICES - LEGAL ADVERTISING SECTION

Enclosed, please find an Indiana Department of Environmental Management Public Hearing Legal Notice(s) concerning the Annual Fine Particle Attainment Demonstration and Technical Support Plan for the Lawrenceburg, Indiana area.

Please print ONE TIME, on or before April 4, 2008, in order for us to satisfy our statutory requirements.

Please send a notarized form no. 99p and/or publisher's claim, together with the newspaper clipping, showing the date of publication and your Federal ID number to:

Attn: Sandra Robinson, Room N1003
Indiana Department of Environmental Management
Air Programs Branch, Office of Air Quality
Mail Code 61-50
Indianapolis, Indiana 46206-2251

If you have any questions, please call me at 317-233-0427. Thank you.

Sincerely,

Sandra Robinson
Air Programs Branch
Office of Air Quality

Enclosures

TO: ACCOUNTING
IGCN - Room 1345

FROM: KAROL T. CHUMA
IGCN - 1001
RULES SECTION
OFFICE OF AIR QUALITY

DATE: 4/8/08

Note: Please send a copy of the paid publication to Indianapolis Star/News

The attached invoice for publication of public notice is approved for payment.

ACCOUNT # 3610/140900

Form prescribed by State Board of Accounts — General Form No. 99P (Rev. 2002)

IDEM
(Governmental Unit)

Ohio County, Indiana

To: Ohio County News Dr.
Rising Sun, Indiana 47040
#35-1869520

LINE COUNT

PUBLISHER'S CLAIM

Display Matter (Must not exceed two actual lines, neither of which shall total more than four solid lines of type in which the body of the advertisement is set) - number of equivalent lines .... ______

Head - number of lines .... ______

Body - number of lines .... ______

Tail - number of lines .... ______

Total number of lines in notice 51

COMPUTATION OF CHARGES

51 lines, 1 columns wide equals 51 equivalent lines at .800 cents per line .... $ 40.80

Additional charge for notices containing rule or tabular work (50 percent of above amount) .... $ ______

Charge for extra proofs of publication ($1.00 for each proof in excess of two) .... ______

TOTAL AMOUNT OF CLAIM .... $ 40.80

DATA FOR COMPUTING COST

Width of single column 17 ems

Number of insertions 1

Size of type 5.5 point

Pursuant to the provisions and penalties of Chapter 155, Acts 1953,

I hereby certify that the foregoing account is just and correct, that the amount claimed is legally due, after allowing all just credits, and that no part of the same has been paid.

Date: April 3, 2008 Title: Publisher

PROOF OF PUBLICATION/PUBLISHER'S AFFIDAVIT

State of Indiana)
) SS:
Ohio County)

Personally appeared before me, a notary public in and for said county and state, the undersigned Joseph M. Awad who, said duly sworn, says that he is Publisher of the Ohio County News newspaper of general circulation printed and published in the English language in the (city) (town) of Rising Sun in the state and county aforesaid, and that the printed matter attached hereto is a true copy, which was duly published in said paper for 1 time ______, the dates of publication being as follows:

ATTACH COPY OF ADVERTISEMENT HERE

April 3, 2008

Subscribed and sworn to before me this 3 day of April, 2008

Notary Public

My commission expires: 6/20/19

LEGAL NOTICE OF PUBLIC HEARING
STATE IMPLEMENTATION PLAN SUBMITTAL
Fine Particle Attainment Demonstration Plan
Lawrenceburg Township, Dearborn County, Indiana

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C-4-3-OCN-1t
C-4-3-R-1t

IDEM

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

We Protect Hoosiers and Our Environment.

Mitchell E. Daniels Jr.
Governor

Thomas W. Easterly
Commissioner

100 North Senate Avenue
Indianapolis, Indiana 46204
(317) 232-8603
Toll Free (800) 451-6027
www.idem.IN.gov

April 1, 2008

Ohio County News
235 Main Street
PO Box 128
Rising Sun, Indiana 47040

Phone: 812-537-0063
Fax: 812-537-5576

ATTENTION: PUBLIC NOTICES - LEGAL ADVERTISING SECTION

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Indiana Department of Environmental Management
Air Programs Branch, Office of Air Quality
Mail Code 61-50
Indianapolis, Indiana 46206-2251

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Sincerely,

Sandra Robinson
Air Programs Branch
Office of Air Quality

Enclosures

Form prescribed by State Board of Accounts General Form No. 99P (Rev. 2002

IDEM
(Governmental Unit)

Ohio County, Indiana

To: Rising Sun Recorder Dr

Rising Sun, Indiana 47040
#35-1869520

LINE COUNT

PUBLISHER'S CLAIM

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Head - number of lines .... ____

Body - number of lines .... ____

Tail - number of lines .... ____

Total number of lines in notice 51

COMPUTATION OF CHARGES

51 lines, 1 columns wide equals 51 equivalent lines at .800 cents per line .... $ 40.80

Additional charge for notices containing rule or tabular work (50 percent of above amount) .... $ ____

Charge for extra proofs of publication ($1.00 for each proof in excess of two) .... ____

TOTAL AMOUNT OF CLAIM .... $ 40.80

DATA FOR COMPUTING COST

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Number of insertions 1

Size of type 5.5 point

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Joseph M. Awad

Date: April 3, 2008 Title: Publisher

PROOF OF PUBLICATION/PUBLISHER'S AFFIDAVIT

State of Indiana)
) ss:
Ohio County)

ATTACH COPY OF ADVERTISEMENT HERE

Personally appeared before me, a notary public in and for said count and state, the undersigned Joseph M. Awad who, said duly sworn, says that he is Publisher of the Rising Sun Recorder newspaper o general circulation printed and published in the English language in the (city) (town) of Rising Sun in the state and county afore said, and that the printed matter attached hereto is a true copy, which was duly published in said paper for 1 time ____, th dates of publication being as follows:

April 3, 2008

Joseph M. Awad

Subscribed and sworn to before me this 3 day of April, 20 ___

Tim Hellmann
Notary Public

My commission expires: 6/20/09

LEGAL NOTICE OF PUBLIC HEARING
STATE IMPLEMENTATION PLAN SUBMITTAL
Fine Particle Attainment Demonstration Plan
Lawrenceburg Township, Dearborn County, Indiana

Notice is hereby given under 40 CFR 51.102 that the Indiana Department of Environmental Management (IDEM) will hold a public hearing on May 8, 2008. The purpose of this hearing is to receive public comment on the amendment to the State Implementation Plan (SIP) developed for the purpose of complying with the attainment demonstration requirement of Section 172 (c) of the Clean Air Act (CAA), as it applies to Lawrenceburg Township, Dearborn County, Indiana. Public comments will also be received on the 2002 emissions inventory included in the attainment demonstration. The meeting will convene at 5:30 p.m. (local time) in the Lawrenceburg Public Library, Depot Meeting Room, 150 Mary Street, Lawrenceburg, Indiana. All interested persons are invited and will be given opportunity to express their views concerning the draft documents.

Lawrenceburg Township, located in Dearborn County, Indiana is part of the Cincinnati-Hamilton OH-KY-IN Fine Particle Nonattainment Area. This area was designated as a nonattainment area and is subject to the requirements of Section 172 of the CAA. One of the compliance requirements mandated by Section 172 (c) of the CAA is the development of a plan demonstrating that the area will meet the annual fine particle air quality standard by the required attainment date. This Fine Particle Attainment Demonstration Plan is being drafted and submitted consistent with United State Environmental Protection Agency (U.S. EPA) guidance.

The attainment demonstration includes an air quality modeling analysis, an emission inventory, an air quality and emissions trend analysis, a summary of current and anticipated emission control measures and mobile source emission budgets for purpose of transportation conformity. Public comments will be received on all components of the attainment demonstration SIP submittal.

Copies of the draft documents will be available on or before April 4, 2008 to any person upon request and at the following locations:

- Indiana Department of Environmental Management, Office of Air Quality, Indiana Government Center North, 100 North Senate Ave., Room N1003, Indianapolis, Indiana.
- Lawrenceburg Public Library, 150 Mary Street, Lawrenceburg, Indiana.
- Lawrenceburg City Building, 230 Walnut Street, Lawrenceburg, Indiana.

Oral statements will be heard, but for the accuracy of the record, statements should be submitted in writing. Written statements may be submitted to the attendant designated to receive written comments at the public hearing.

C-4-3-OCN-1t
C-4-3-R-1t

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We Protect Hoosiers and Our Environment.

Mitchell E. Daniels Jr.
Governor

Thomas W. Easterly
Commissioner

100 North Senate Avenue
Indianapolis, Indiana 46204
(317) 232-8603
Toll Free (800) 451-6027
www.idem.IN.gov

Rising Sun Recorder
PO Box 128
Rising Sun, Indiana 47040

April 1, 2008

Phone: 812-537-0063
Fax: 812-537-5576

ATTENTION: PUBLIC NOTICES - LEGAL ADVERTISING SECTION

Enclosed please find an Indiana Department of Environmental Management Public Hearing Legal Notice(s) concerning the Attainment Demonstration and Technical Support Plan for the Lawrenceburg, Indiana area.

Please print ONE TIME, on or before April 4, 2008, in order for us to satisfy our statutory requirements.

Please send a notarized form no. 99p and/or publisher's claim, together with the newspaper clipping, showing the date of publication and your Federal ID number to:

Attn: Sandra Robinson, Room N1001
Indiana Department of Environmental Management
Air Programs Branch, Office of Air Quality
Mail Code 61-50
Indianapolis, Indiana 46206-2251

If you have any questions, please call me at 317-233-0427. Thank you.

Sincerely,

Sandra Robinson
Air Programs Branch
Office of Air Quality

Enclosures

TO: ACCOUNTING
IGCN - Room 1345

FROM: KAROL T. CHUMA
IGCN - 1001
RULES SECTION
OFFICE OF AIR QUALITY

DATE: 5/3/08

Note: Please send a copy of the paid publication to Rising Sun Recorder

The attached invoice for publication of public notice is approved for payment.

ACCOUNT # 3610/140900

Form prescribed by State Board of Accounts | General Form No. 99P (Rev. 2002

Legal Notice Public Hearing (Governmental Unit) IREN? To: Dearborn County Register Dr

Dearborn County, Indiana | Lawrenceburg, Indiana 47025

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Additional charge for notices containing rule or tabular work (50 percent of above amount)	$
Charge for extra proofs of publication ($1.00 for each proof in excess of two)	
TOTAL AMOUNT OF CLAIM	$ 40.80

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Pursuant to the provisions and penalties of Chapter 155, Acts 1953,

I hereby certify that the foregoing account is just and correct, that the amount claimed is legally due, after allowing all just credits, and that no part of the same has been paid.

Joseph M. Awad

Date: April 13, 20 09 Title: Publisher

PROOF OF PUBLICATION/PUBLISHER'S AFFIDAVIT

State of Indiana)
) ss:
Dearborn County)

ATTACH COPY OF ADVERTISEMENT HERE

Personally appeared before me, a notary public in and for said count and state, the undersigned Joseph M. Awad who, said duly sworn, says that he is Publisher of the Dearborn County Register newspaper c general circulation printed and published in the English language in the (city) (town) of Lawrenceburg in the state and county afore said, and that the printed matter attached hereto is a true copy, which was duly published in said paper for 1 time ______, th dates of publication being as follows:

April 13

Joseph M. Awad

Subscribed and sworn to before me this 13 day of April, 2009

Yvonne D. Waters

Yvonne D. Waters, Notary Public

My commission expires: 5-30-13

LEGAL NOTICE OF PUBLIC HEARING
STATE IMPLEMENTATION PLAN SUBMITTAL
Fine Particle Attainment Demonstration Plan
Lawrenceburg Township, Dearborn County, Indiana

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IDEM

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April 1, 2008

Dearborn County Register
126 West High Street
PO Box 4128
Lawrenceburg, Indiana 47025

Phone: 812-537-0063
Fax: 812-537-5576

ATTENTION: PUBLIC NOTICES - LEGAL ADVERTISING SECTION

Enclosed, please find an Indiana Department of Environmental Management Public Hearing Legal Notice(s) concerning the Annual Fine Particle Attainment Demonstration and Technical Support Plan for the Lawrenceburg, Indiana area.

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Indiana Department of Environmental Management
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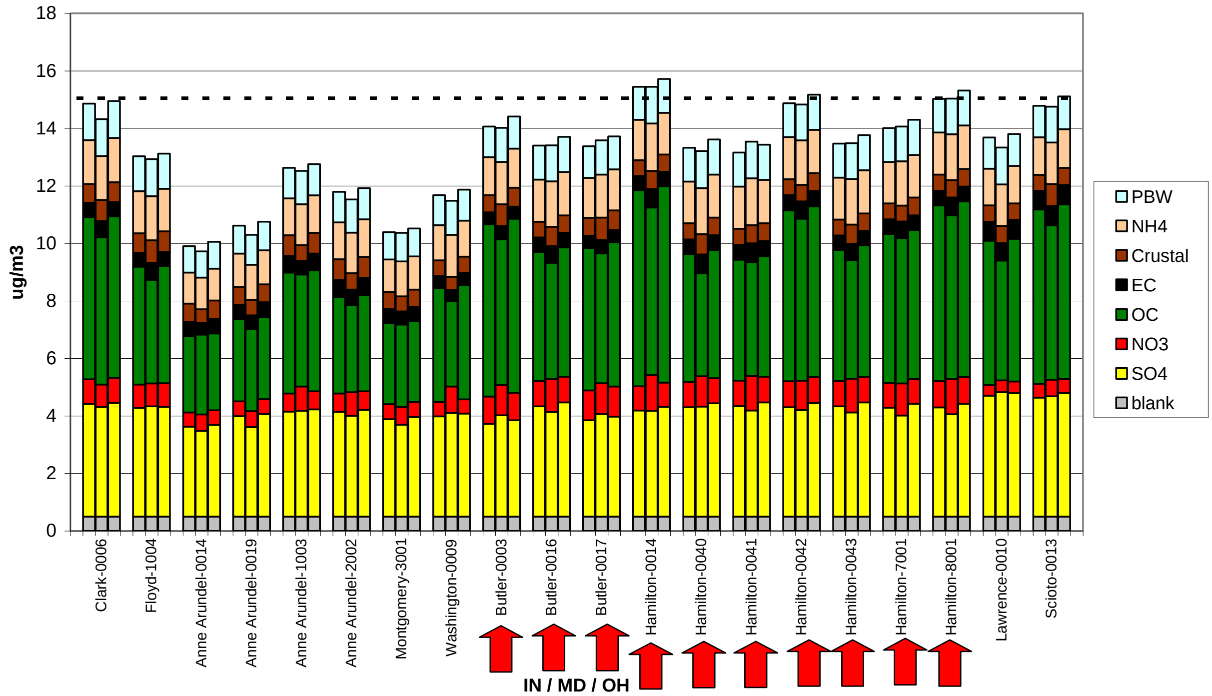
Appendix J

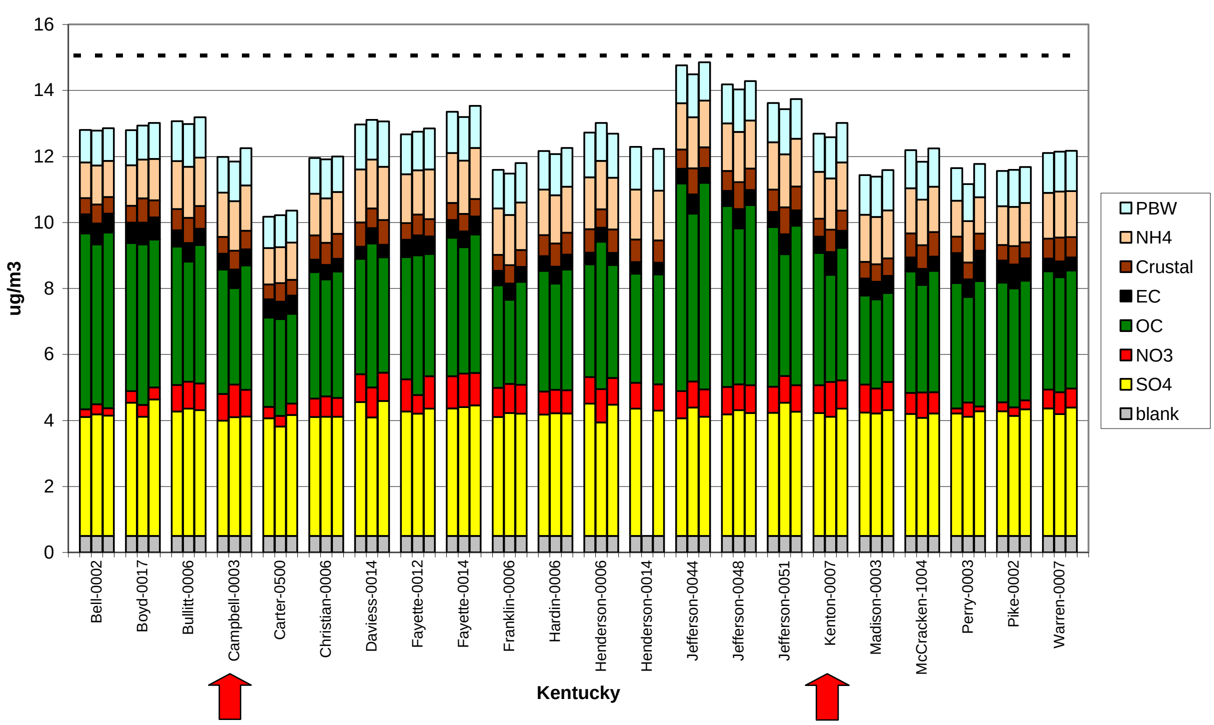
Charts of ASIP Base G2 Modeling Results for Southern Indiana/Northern Kentucky $PM_{2.5}$ Monitors

(red arrows designate the Cincinnati nonattainment area's $PM_{2.5}$ monitors)

IN / MD / OH 12km 2009 Projected DVF by G4a_EXCEL(Left) and G4a_MATS (Middle) andG2a_EXCEL (Right)



Kentucky 12km 2009 Projected DVF by G4a_EXCEL(Left) and G4a_MATS (Middle) andG2a_EXCEL (Right)



ASIP's BaseG4 Annual $PM_{2.5}$ Modeling Results

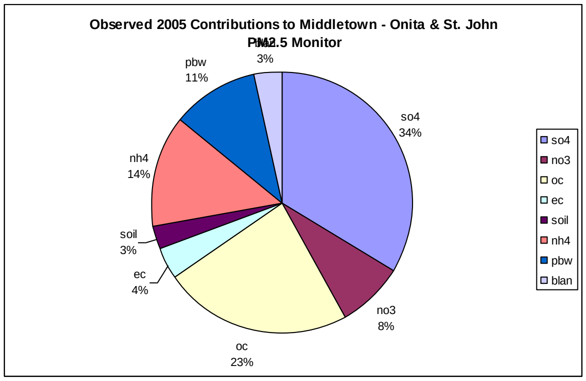
Monitor ID	Monitor Name	County	Design Value 2000-2004	Basecase 2009 12 km
			(µg/m3)	(µg/m3)
39-017-0003	Bonita & St John	Butler	16.05	14.06
39-017-0016	Nilles Rd.	Butler	15.68	13.40
39-017-0017	Wildwood	Butler	15.38	13.38
39-017-1004	Hook Field Airport	Butler	[a]	[a]
39-025-0022	Clermont Dr.	Clermont	[a]	[a]
39-061-0006	Grooms Rd	Hamilton	[a]	[a]
39-061-0014	Seymour & Vine St.	Hamilton	17.67	**15.44**
39-061-0040	Howard Taft	Hamilton	15.56	13.33
39-061-0041	Winneste Ave.	Hamilton	15.40	13.16
39-061-0042	W. 8th St.	Hamilton	17.10	14.87
39-061-0043	E. Kemper Rd.	Hamilton	15.76	13.47
39-061-7001	Sherman Ave.	Hamilton	16.26	14.01
39-061-8001	Murray Rd.	Hamilton	17.24	15.03
21-037-0003	Fort Thomas	Campbell	14.00	11.98
21-117-0007	Covington	Kenton	14.88	12.68

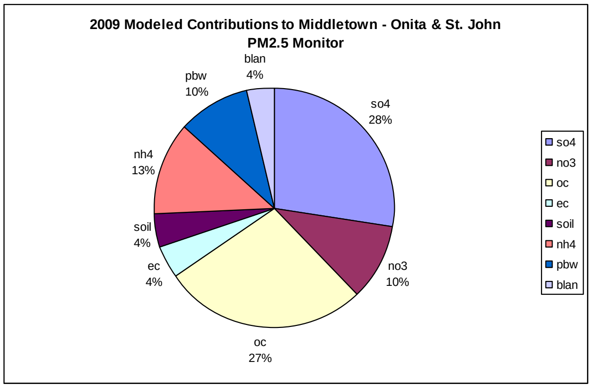
[a] No SMAT data available

Appendix K

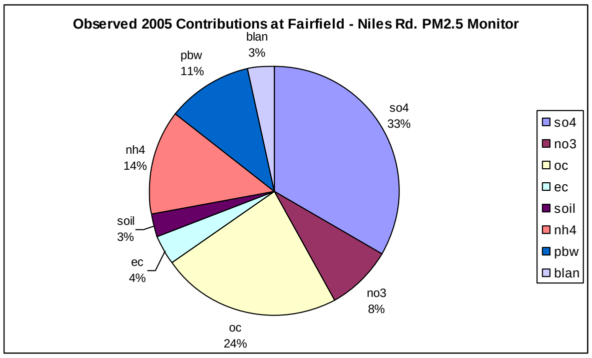
Modeled Species Contributions at
Northern Kentucky $PM_{2.5}$ Monitors

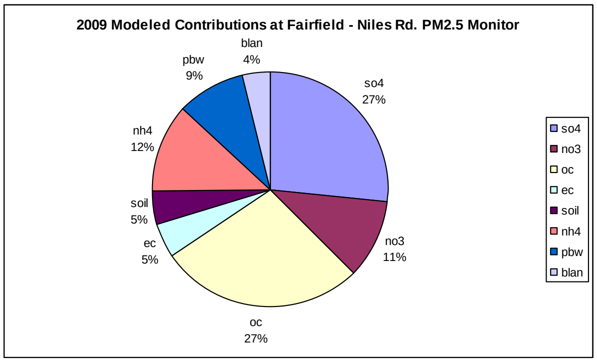
Modeled Species Contributions to Middleton, OH – Bonita & St. John $PM_{2.5}$ Monitor



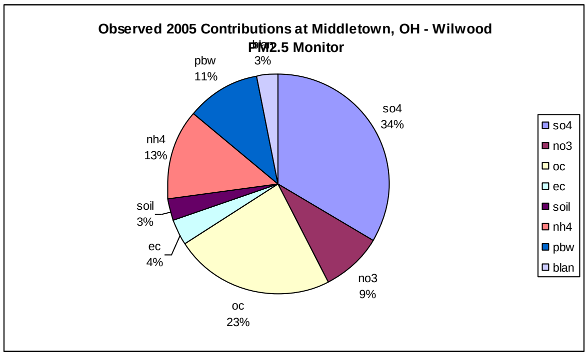


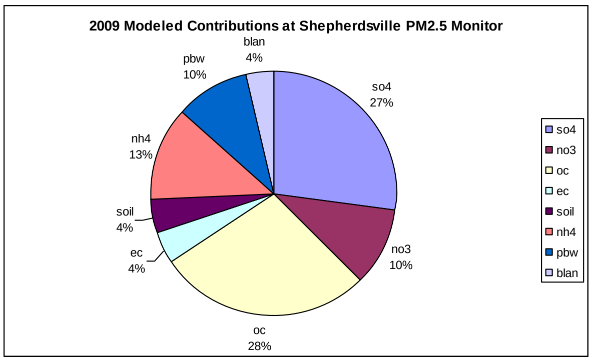
Modeled Species Contributions to Fairfield, OH - Nilles Rd.$PM_{2.5}$ Monitor



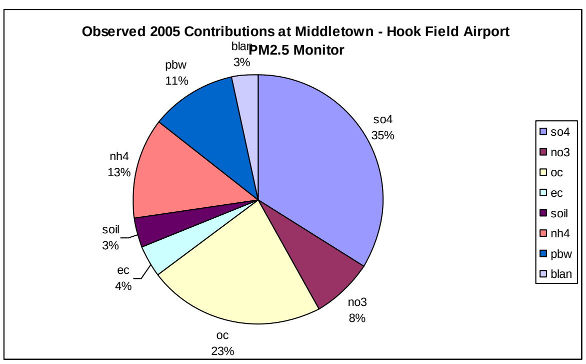


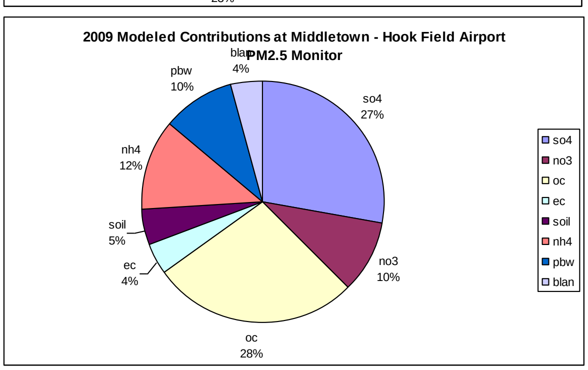
Modeled Species Contributions to Middletown, OH - Wilwood $PM_{2.5}$ Monitor



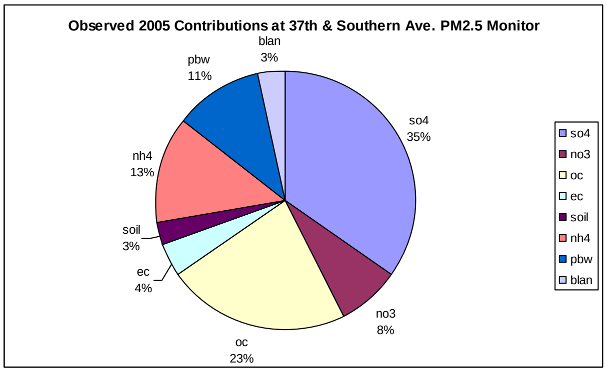


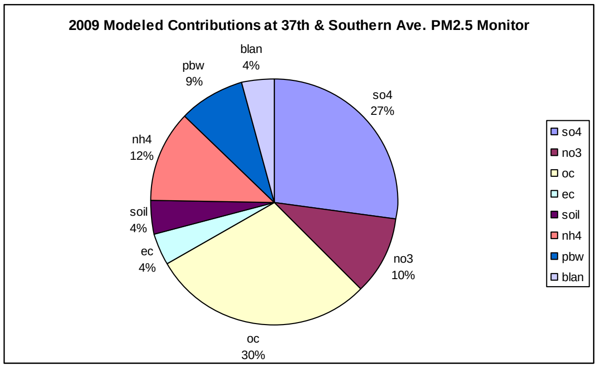
Modeled Species Contributions to Middletown, OH - Hook Field Airport $PM_{2.5}$ Monitor



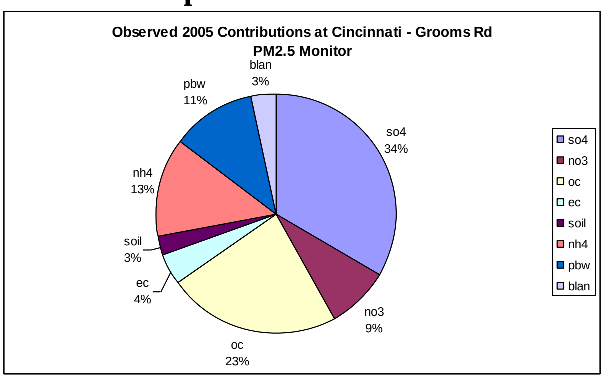


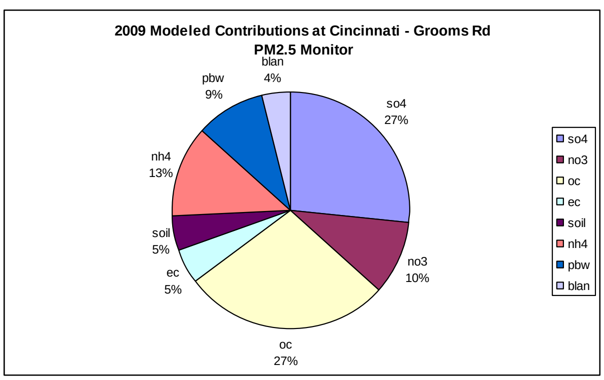
Modeled Species Contributions to Batavia, OH - Clermont Rd. $PM_{2.5}$ Monitor



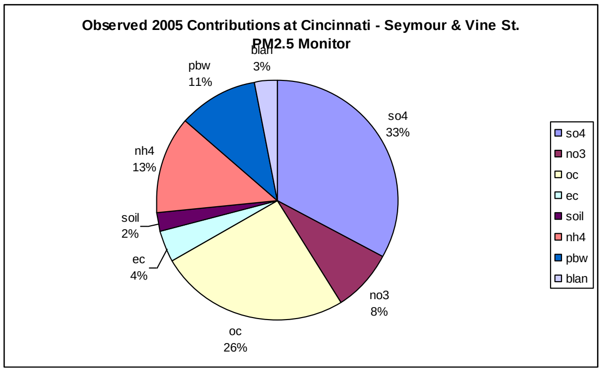


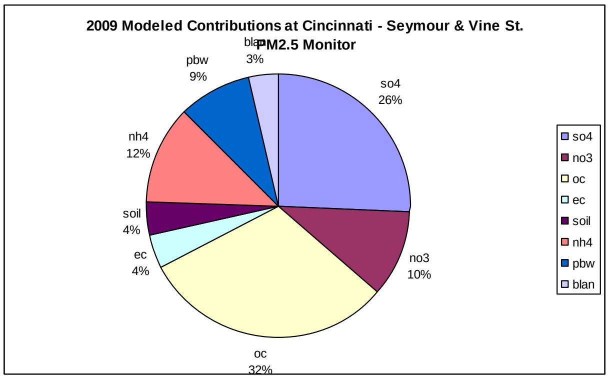
Modeled Species Contributions to Cincinnati, OH - Grooms Rd $PM_{2.5}$ Monitor



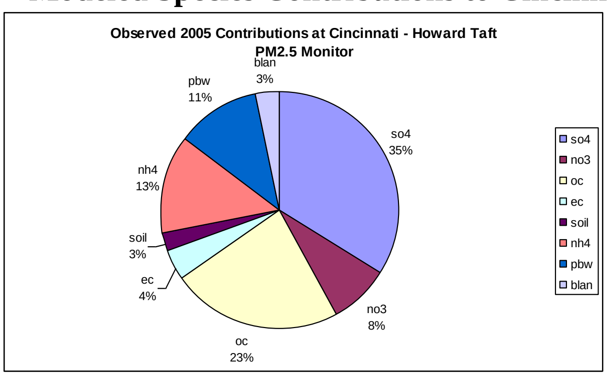


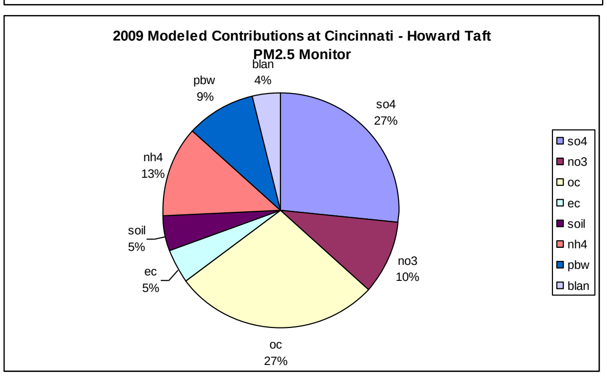
Modeled Species Contributions to Cincinnati, OH - Seymour & Vine St. $PM_{2.5}$ Monitor



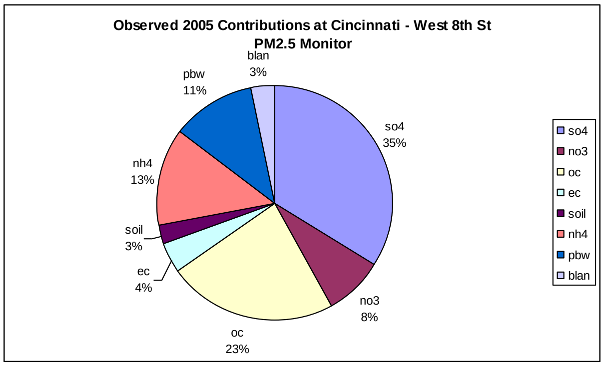


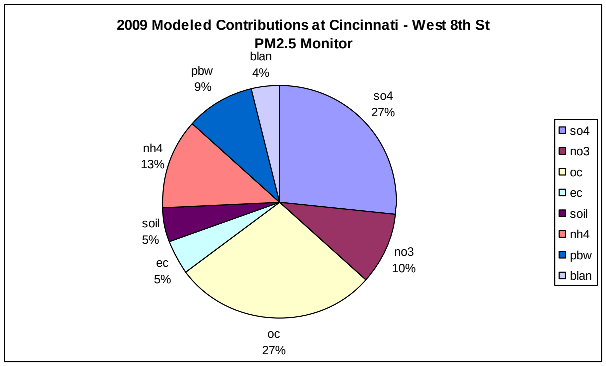
Modeled Species Contributions to Cincinnati, OH - Howard Taft $PM_{2.5}$ Monitor



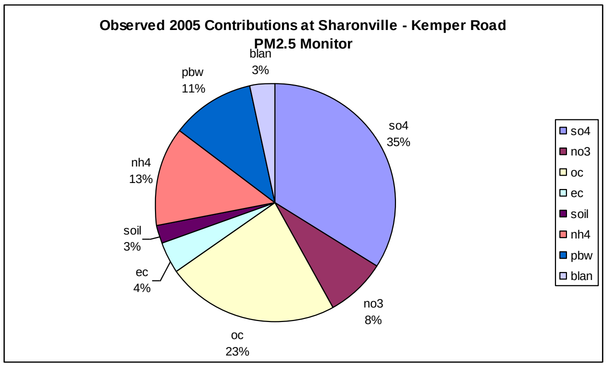


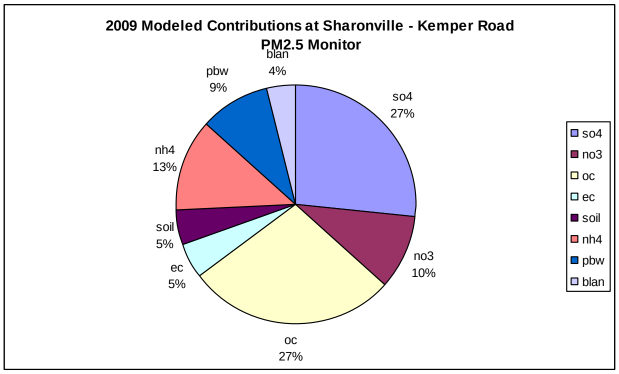
Modeled Species Contributions to Cincinnati, OH - West 8th St $PM_{2.5}$ Monitor



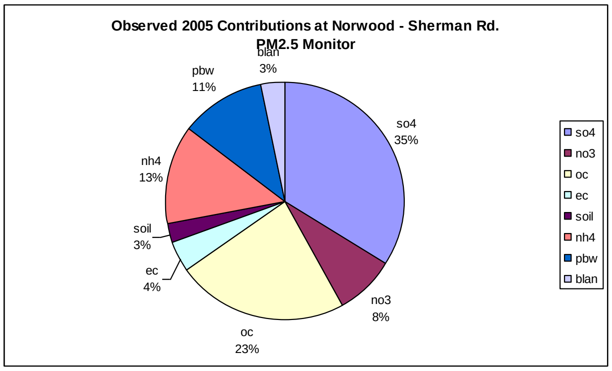


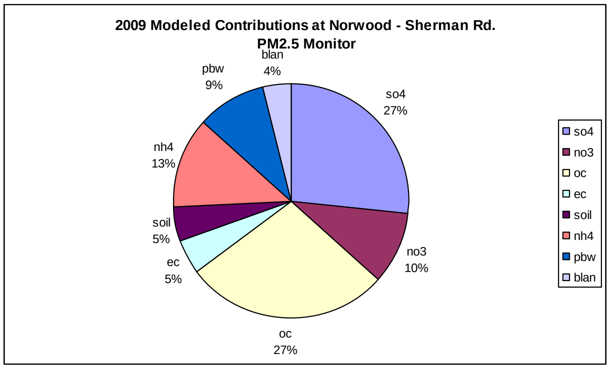
Modeled Species Contributions to Sharonville, OH - Kemper Road $PM_{2.5}$ Monitor





Modeled Species Contributions to Norwood - Sherman Rd. $PM_{2.5}$ Monitor





Modeled Species Contributions to Fort Thomas, KY - Alexandria Park $PM_{2.5}$ Monitor