UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

August 19, 2008

The Honorable Steve Beshear
Governor of Kentucky
State Capitol, Suite 100
700 Capital Avenue
Frankfort, Kentucky 40601

Dear Governor Beshear:

As you are aware, reducing fine particle pollution ($PM_{2.5}$) represents one of the most significant challenges to improving air quality in our nation today. Health studies link these tiny particles – about $1/30^{th}$ the diameter of a human hair – to serious human health problems, including aggravated asthma, increased respiratory symptoms like coughing and difficult or painful breathing, chronic bronchitis, decreased lung function, and even premature death in people with heart and lung disease. Fine particle pollution can remain suspended in the air for long periods of time and create public health problems far away from emission sources. Reducing levels of $PM_{2.5}$ is an important part of our nation's commitment to clean, healthy air.

We have reviewed the December 7, 2007, letter from former Governor Ernie Fletcher, and the June 25, 2008, letter from John S. Lyons, Director of the Kentucky Department for Environmental Protection's (KDEP) Division of Air Quality, submitting the Commonwealth's recommendations on air quality designations for the 2006 24-Hour $PM_{2.5}$ standards. We have also reviewed the technical information submitted to support Kentucky's recommendations. In accordance with the Clean Air Act, I write to inform you that the U.S. Environmental Protection Agency (EPA) intends to modify Kentucky's recommended designations and boundaries. Enclosed please find a detailed description of areas where EPA intends to modify the Commonwealth's recommendations and the basis for such modification. In addition, we have enclosed the results of our review of Kentucky's requests for consideration of data under the Exceptional Events rule for the Louisville and Paducah areas. We understand that Kentucky made recommendations based on the 2004-2006 period, and because the data were not yet quality assured as of its June 25, 2008, submission, KDEP did not include data from any monitor in the Paducah area which were above the standard for 2005-2007. If you have additional information that should be considered by EPA in this process, please provide it to us by October 20, 2008. In the near future, EPA will publish a notice in the Federal Register to solicit public comments on our intended designation decisions. We intend to make final designation decisions for the 2006 24-Hour PM2.5 standards by December 18, 2008.

EPA has taken steps to reduce fine particle pollution across the country, such as implementing the Clean Diesel Program to dramatically reduce emissions from highway, nonroad and stationary diesel engines. In addition to on-going initiatives, state programs to attain the 1997 $PM_{2.5}$ standards will also help to reduce unhealthy levels of fine particle pollution.

I appreciate the leadership and attention provided by you, Dr. Peters, and the management and staff of KDEP in protecting air quality. If you have any questions, please do not hesitate to contact me at (404) 562-8357. We look forward to continuing to work with you and KDEP officials in implementing the $PM_{2.5}$ standards.

Sincerely,

J. I. Palmer, Jr.
Regional Administrator

Enclosures

cc: Len Peters, Ph.D., Secretary
Energy and Environment Cabinet
Bruce Scott, Commissioner, KDEP

Enclosure 1

Kentucky
Area Designations For the
24-Hour Fine Particle National Ambient Air Quality Standard

The table below identifies the counties in Kentucky that EPA intends to designate as not attaining the 2006 24-hour fine particle (PM2.5) standard.[1] A county will be designated as nonattainment if it has an air quality monitor that is violating the standard or if the county is determined to be contributing to the violation of the standard.

Area	Kentucky Recommended Nonattainment Counties	EPA's Intended Nonattainment Counties
Cincinnati-Middleton, OH-KY-IN (formerly Cincinnati-Hamilton, OH-KY-IN)	None	Boone Campbell Kenton
Clarksville, TN-KY	None	Muhlenberg
Huntington-Ashland	None	Boyd Lawrence (Partial)
Louisville	None	Bullitt Jefferson
Paducah-Mayfield	None	McCracken

EPA intends to designate the counties in the state as "attainment/ unclassifiable."

EPA Technical Analysis for Cincinnati-Middleton

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for the Cincinnati-Middleton area identifies the counties with monitors that violate the 24-hour PM2.5 standard and evaluates the counties that potentially contribute to fine particle concentrations in the area. EPA has evaluated these counties

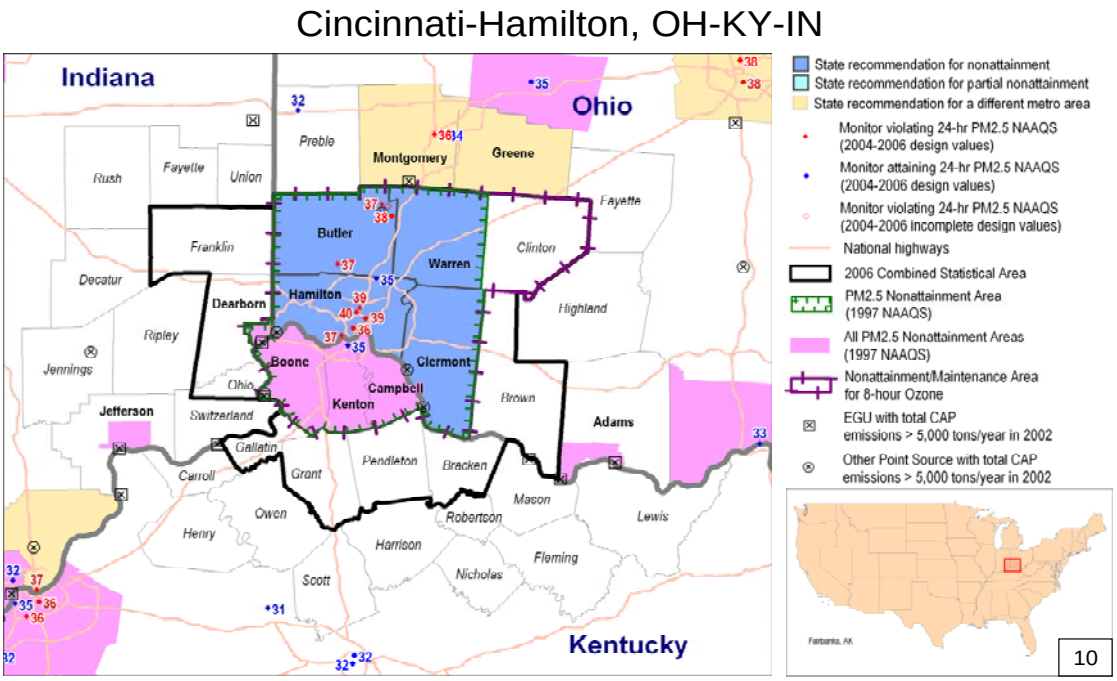
[1] EPA designated nonattainment areas for the 1997 fine particle standards in 2005. In 2006, the 24-hour PM2.5 standard was revised from 65 micrograms per cubic meter (average of 98th percentile values for 3 consecutive years) to 35 micrograms per cubic meter; the level of the annual standard for PM2.5 remained unchanged at 15 micrograms per cubic meter (average of annual averages for 3 consecutive years).

based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

Figure 1 is a map of the counties in the area and other relevant information such as the locations and design values of air quality monitors, the metropolitan area boundary, and counties recommended as nonattainment by the State.

Figure 1. Cincinnati-Middleton, OH-KY-IN MSA



Counties labeled in bold reflect NAAs under 1997 NAAQS

For this area, EPA previously established PM2.5 nonattainment boundaries for the 1997 $PM_{2.5}$ NAAQS that included 8 full and partial counties, with 3 being located in Kentucky.

In December 2007, Kentucky recommended that no areas be designated as "nonattainment" for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from

2004-2006. These data are from Federal Reference Method (FRM) and Federal Equivalent Method (FEM) monitors located in the state. This letter dated December 7, 2007 from Kentucky Governor Ernie Fletcher to EPA Region 4 Regional Administrator James I. Palmer, Jr., was received by our office on December 13, 2007.

Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network. Analysis of these data indicates that the days with the highest fine particle concentrations occur predominantly in the summer, and the average chemical composition of the highest days is 82 percent sulfate, 17 percent carbonaceous $PM_{2.5}$ and 1 percent other components.

Based on EPA's 9-factor analysis described below, EPA believes that Boone, Campbell and Kenton Counties in Kentucky should be designated nonattainment for the 24-hour $PM_{2.5}$ air-quality standard as part of the Cincinnati-Middleton nonattainment area, based upon currently available information. These counties are listed in the table below.

Cincinnati-Middleton	State-Recommended Nonattainment Counties	EPA-Recommended Nonattainment Counties
Kentucky	None	Boone Campbell Kenton

The following is a summary of the 9-factor analysis for the EPA Region 4 portion of the Cincinnati-Middleton, OH-KY-IN area.

The Cincinnati-Middleton, OH-KY-IN metropolitan statistical area (MSA) contains the Kentucky counties of Boone, Bracken, Campbell, Gallatin, Grant, Kenton, Pendleton, the Indiana counties of Dearborn, Franklin, and Ohio, and the Ohio counties of Brown, Butler, Clermont, Hamilton, and Warren. Of these counties, Boone, Kenton, Campbell counties were previously designated in 2005 as counties contributing to violations of the annual $PM_{2.5}$ standard in the Cincinnati area. Kenton County currently has a monitor violating the 24-hour standard with 2005-2007 data. Boone has a moderate level of $PM_{2.5}$ and SO_2 emissions and population growth for 2000-2005 was 22%. All three have moderate levels of population and commuting within the area.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not

shown in Table 1 as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive way for consideration of data for these factors. A summary of the CES is included in Enclosure 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Cincinnati-Middleton area. Counties that are part of the Cincinnati-Middleton nonattainment area for the 1997 $PM_{2.5}$ NAAQS are shown in boldface. Counties are listed in descending order by CES.

Table 1. $PM_{2.5}$ Related Emissions and Contributing Emissions Score

County	State	State Recom-mended Non-attain ment	CES	$PM_{2.5}$ emissions total (tpy)	$PM_{2.5}$ emissions carbon (tpy)	$PM_{2.5}$ emissions other (tpy)	SO_2 (tpy)	NOx (tpy)	VOCs (tpy)	N (
Hamilton	**OH**	**Yes**	**100**	**6,489**	**1,244**	**5,245**	**88,139**	**50,060**	**38,552**	
Clermont	**OH**	**Yes**	**36**	**5,399**	**733**	**4,665**	**90,341**	**35,748**	**6,982**	
Butler	**OH**	**Yes**	**24**	**2,269**	**563**	**1,706**	**10,636**	**16,661**	**12,734**	
Dearborn	**IN**	**No**	**22**	**2,780**	**288**	**2,492**	**47,908**	**12,881**	**3,268**	
Boone	**KY**	**No**	**6**	**1,629**	**615**	**1,014**	**5,383**	**10,852**	**5,883**	
Warren	**OH**	**Yes**	**5**	**1,304**	**535**	**768**	**568**	**7,244**	**7,278**	
Kenton	**KY**	**No**	**3**	**537**	**269**	**268**	**1,300**	**6,316**	**5,606**	
Campbell	**KY**	**No**	**2**	**412**	**179**	**233**	**731**	**4,231**	**2,923**	
Jefferson	IN	No	7	1,265	168	1,097	75,319	25,214	2,272	
Adams	OH	No	6	5,970	494	5,476	126,316	33,822	1,918	
Carroll	KY	No	6	2,652	253	2,399	50,856	17,443	4,181	
Montgomery	OH	other	6	1,555	637	919	9,468	21,109	21,905	
Mason	KY	No	3	2,019	200	1,818	41,088	11,199	1,099	
Clinton	OH	No	1	671	220	451	198	2,739	2,496	
Franklin	IN	No	1	448	118	331	163	1,224	1,687	
Greene	OH	other	1	984	265	719	1,798	8,499	5,712	

Jennings	IN	No	1	1,818	575	1,242	7,764	6,352	2,154	
Preble	OH	No	1	733	224	509	169	2,737	2,723	
Bracken	KY	No	0	137	49	88	53	492	462	
Fleming	KY	No	0	198	77	122	101	492	747	
Gallatin	KY	No	0	295	83	211	372	2,221	872	
Grant	KY	No	0	329	161	169	267	2,733	1,389	

Note that the table may not include all counties considered in the 9-factor analysis, and that those counties not shown had no factors that indicated that they should be candidates for a nonattainment status.

Based on emission levels, Boone, Campbell, and Kenton show contributing emissions to the Cincinnati-Middleton, OH-KY-IN Area. Hamilton and Clermont Counties produce majority of the total $PM_{2.5}$ emissions for the MSA at 31 and 26 percent respectively. Boone, Campbell, and Kenton Counties contribute 8, 2, and 3 percent of the $PM_{2.5}$ emissions for the MSA, respectively. The main precursor pollutants in Boone, Campbell, and Kenton Counties is NOx emissions, with Boone County contributing 10,852 tpy compared to Campbell and Kenton Counties contributing 4,231 and 6,316 tpy, respectively.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values (in $\mu g/m^3$) for air quality monitors in counties in the Cincinnati-Middleton area based on data for the 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98^{th} percentile values are 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour $PM_{2.5}$ design values for counties in the Cincinnati-Middleton area are shown in Table 2.

Table 2. Air Quality Data

County	**State**	**State Recommended Nonattainment**	**Design Values 2004-06 ($\mu g/m^3$)**	**Design Values 2005-07 ($\mu g/m^3$)**
Hamilton	OH	Yes	40	41
Clermont	OH	Yes	0	34
Butler	OH	Yes	38	38
Dearborn	IN	No	0	0
Boone	KY	No	0	0
Warren	OH	Yes	0	0
Kenton	KY	No	35	36
Campbell	KY	No	0	0

In Region 4, Kenton County, Kentucky shows a violation of the 24-hour $PM_{2.5}$ standard with 2005-2007 data. Therefore, this county is included in the Cincinnati-Middleton, OH-

KY-IN nonattainment area. However, the absence of a violating monitor alone is not a sufficient reason to eliminate counties as candidates for nonattainment status. No monitoring data was available for Boone County. Each county has been evaluated based on the weight of evidence of the nine factors and other relevant information.

Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with a FRM or FEM monitor. All data from Special Purpose Monitors (SPM) using an FRM, FEM, or Alternative Reference Method (ARM) which has operated for more than 24 months is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr PM2.5 NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Table 3 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data gives an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards.

The 2005 populations in Boone, Campbell and Kenton Counties are significantly lower when compared to other MSA counties such as Hamilton and Butler. Of the MSA population, 43 percent reside in Hamilton County compared to 17 percent living in Boone, Campbell and Kenton Counties combined. However, the population density of Hamilton County (2007) is only roughly twice that of Kenton County (930), meaning that Kenton County is very densely populated. Of the three Region 4 counties in the MSA, Kenton County has the highest population and is the most densely populated almost twice that of Campbell County. Boone and Campbell Counties have moderate size populations and densities.

Based on these factors, Kenton County requires further evaluation and is a candidate based on factors 1 and 2.

Table 3. Population

County	State	State Recommended Nonattainment	2005 Population	2005 Population Density (pop/sq mi)
Hamilton	OH	Yes	828,487	2007
Clermont	OH	Yes	190,329	417
Butler	OH	Yes	349,966	745
Dearborn	IN	No	48,930	160

Boone	KY	No	106,278	414
Warren	OH	Yes	196,793	484
Kenton	KY	No	153,314	930
Campbell	KY	No	87,048	547

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the Cincinnati-Middleton, OH-KY-IN Area, the percent of total commuters in each county who commute to other counties within the Cincinnati-Middleton, OH-KY-IN area, as well as the total Vehicle Miles Traveled (VMT) for each county in thousands of miles (see Table 4). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area.

Table 4. Traffic and Commuting Patterns

County	State	State Recommended Nonattainment	2005 VMT (1000s mi)	Number Commuting to any violating counties	Percent Commuting to any violating counties	Number Commuting into statistical area	Percent Commuting into statistical area
Hamilton	OH	Yes	8,132	364,380	92	391,410	98
Butler	OH	Yes	3,059	143,800	90	153,070	96
Kenton	KY	No	1,647	51,980	68	74,830	99
Clermont	OH	Yes	1,799	45,070	51	86,620	98
Warren	OH	Yes	1,692	41,510	54	62,590	82
Campbell	KY	No	1,000	21,460	50	42,160	99
Boone	KY	No	1,074	17,300	39	43,420	98
Dearborn	IN	No	708	8,920	40	20,700	92

The listing of counties on Table 4 reflects a ranking based on the number of people commuting to other counties. The counties that are in the nonattainment area for the 1997 $PM_{2.5}$ NAAQS are shown in boldface.

Hamilton and Butler Counties had the highest number of commuters traveling to both violating counties and statistical areas. Kenton County had a somewhat high percentage (68 percent) commuting to violating counties and 99 percent commuting to a statistical area. Campbell and Boone Counties each have more than 40,000 commuters, with roughly 40-50% commuting to violating counties.

Based on these factors, Boone, Campbell, and Kenton Counties should be considered for the nonattainment area. Note that Kenton County is also high ranking based on factors 1, 2 and 3.

Note: The 2005 VMT data used for table 4 and 5 of the 9-factor analysis has been derived using methodology similar to that described in "Documentation for the final 2002 Mobile National Emissions Inventory, Version 3, September 2007, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at:

ftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/2002_mobile_nei_version_3_report_092807.pdf
The 2005 VMT data were taken from documentation which is still draft, but which should be released in 2008.

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled (VMT) for 1996-2005 for counties in the Cincinnati-Middleton area, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and likely to be contributing to fine particle concentrations in the area.

Table 5 below shows population, population growth, VMT and VMT growth for counties that are included in the Cincinnati-Middleton area. Counties are listed in descending order based on VMT growth between 1996 and 2005.

Table 5. Population and VMT Values and Percent Change.

County	State	Population (2005)	Population Density (2005)	Population % change (2000 - 2005)	2005 VMT (1000s mi)	VMT % change (1996 to 2005)
Hamilton	OH	828,487	2007	-2	8,132	3
Clermont	OH	190,329	417	7	1,799	16
Butler	OH	349,966	745	5	3,059	28
Dearborn	IN	48,930	160	6	708	30
Boone	KY	106,278	414	22	1,074	48
Warren	OH	196,793	484	22	1,692	34
Kenton	KY	153,314	930	1	1,647	3
Campbell	KY	87,048	547	-2	1,000	4

Boone and Warren Counties had high population growth between 2000 and 2005 as well as a sizable increase in VMT from 1996 to 2005, an increase greater than Kenton, Campbell and Hamilton Counties in the Cincinnati-Middleton area.

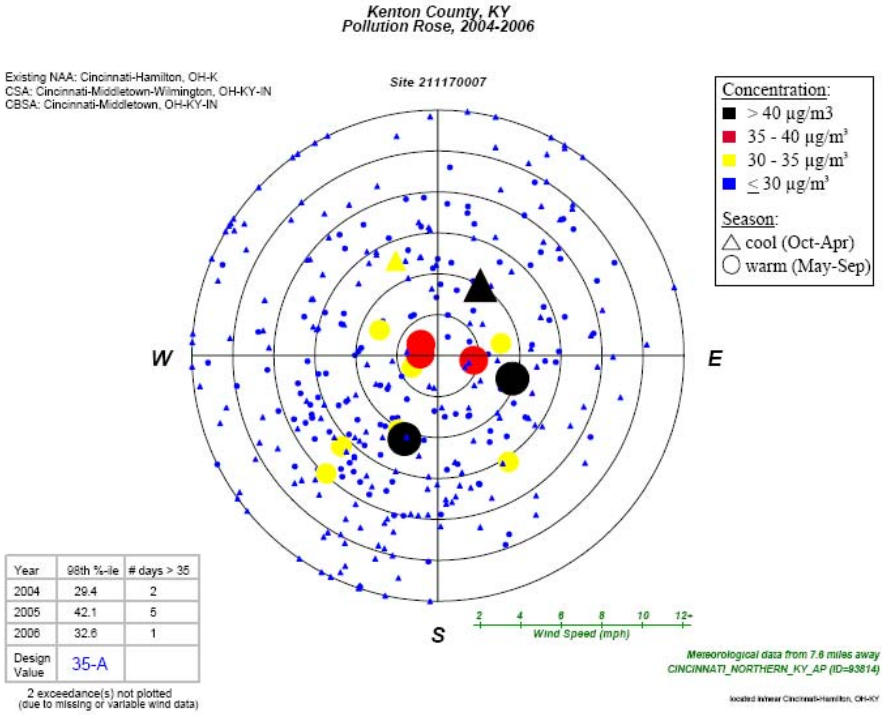
Based on these factors, Boone County should be considered for the nonattainment area. Note that Boone County is also high ranking based on factor 1.

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM or FEM air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour PM2.5 values by color; days exceeding 35 ug/m3 are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

Figure 2. Pollution roses for Kenton and Campbell Counties



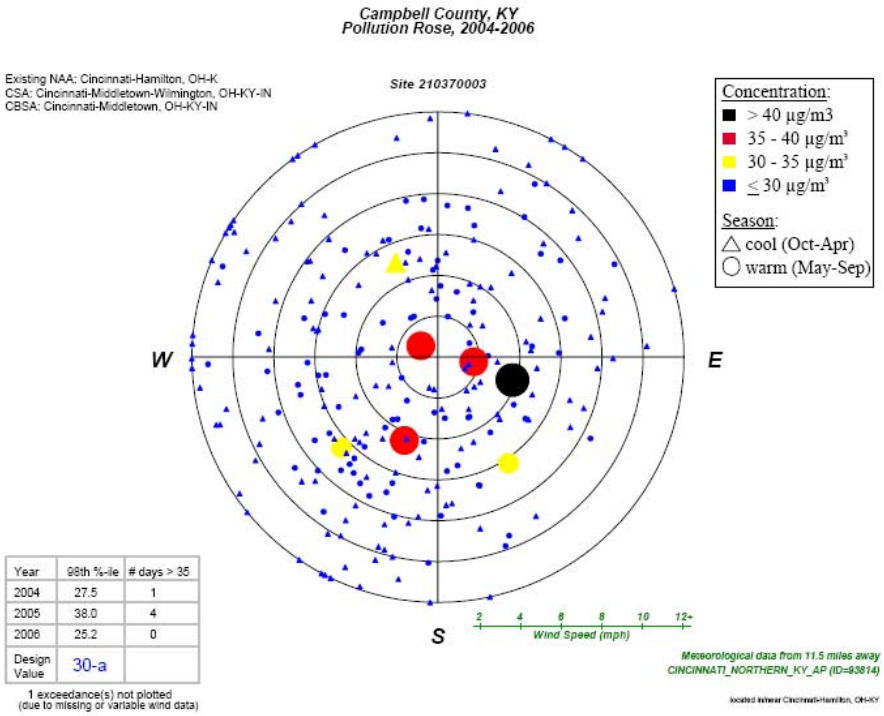


Figure 2 shows the average prevailing surface wind direction for high $PM_{2.5}$ days in Kenton and Campbell Counties. The pollution rose shows that elevated PM2.5 levels at the violating monitor may originate from multiple directions, and thus, cannot be attributed to one prevailing wind direction. The pollution roses show that 24-hour $PM_{2.5}$ concentrations are influenced by emissions from any direction at various times, but these data also suggest that emissions from some directions relative to the violation are more likely to contribute to the violation than emissions from other directions.

Based on these factors, Boone, Campbell and Kenton Counties should be considered for the nonattainment area. Note that all Counties are also high ranking based on factor 1.

Additionally, the state's submittal for Boone, Campbell, and Kenton Counties states that wind speed and wind direction are primarily from the west southwest traveling at 6-9 miles per hour towards the Kenton monitor with temperatures averaging 67° for the low and 85° for the average high. The violating monitor in this area is in Hamilton County, Ohio which is directly north of the Kentucky counties of Boone, Campbell, and Kenton.

Note: the meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)
The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of $PM_{2.5}$ over the Cincinnati-Middleton, OH-KY-IN area.

The Cincinnati-Middleton, OH-KY-IN area does not have any geographical or topographical barriers significantly limiting air-pollution transport within its air shed. Therefore, the absence of topographical and geographical barriers in this area supports our conclusion that emissions from Boone, Campbell, and Kenton Counties can be contributing to violations in the area.

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)
In evaluating the jurisdictional boundary factor, consideration should be given to existing boundaries and organizations that may facilitate air quality planning and the implementation of control measures to attain the standard. Areas designated as nonattainment (e.g. for PM2.5 or 8-hour ozone standard) represent important boundaries for state air quality planning.

For Cincinnati-Middleton, OH-KY-IN area, the MSA Counties in the nonattainment area for the 1997 $PM_{2.5}$ NAAQS include Boone, Kenton, and Campbell Counties in Kentucky, Dearborn County in Indiana, and Butler, Clermont, Hamilton, and Warren Counties in Ohio.

For Cincinnati-Middleton, OH-KY-IN area, the MSA Counties in the nonattainment area for the 1997 8-hour ozone standard were Boone, Campbell and Kenton Counties in Kentucky, Dearborn County in Indiana, and Butler, Clermont, Hamilton, Warren and Clinton Counties in Ohio.

The Cincinnati-Middleton, OH-KY-IN metropolitan area (originally the Cincinnati-Hamilton MSA) is composed of several counties including Boone, Bracken, Campbell, Gallatin, Grant, Kenton and Pendleton in Kentucky, Dearborn, Franklin and Ohio Counties in Indiana and in Ohio there is Brown, Butler, Clermont, Hamilton and Warren Counties.

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented for major sources in the Cincinnati-Middleton area.

The emission estimates on Table 1 (under Factor 1) include any control strategies implemented by the states in the Cincinnati-Middleton area before 2005 that may influence emissions of any component of $PM_{2.5}$ emissions (i.e., total carbon, SO_2, NOx, and crustal $PM_{2.5}$). Those control strategies implemented statewide are listed below which may influence emissions of any component of PM2.5 emissions:

Highway Mobile Source Reductions

Federal Motor Vehicle Control Programs (FMVCP)
Tier 2 Vehicle Emissions and Fuel Standards
Heavy Duty Engine, Vehicle and Fuel Standards

Point Source Emissions Reductions

Reasonably Available Control Measures (RACM)
Maximum Available Control Technology (MACT)

Area Source Reductions

Open burning regulations for former 1-hour ozone area

Additional Reductions

NO_X SIP Call Reductions

Point sources in Kentucky are subject to Prevention of Significant Deterioration requirements with New Source Review, CTG RACT and non-CTG RACT requirements, the Clean Air Interstate Rule, and the NO_X SIP Call.

A source of emissions in Boone County which affects the monitor in Kenton County is from the Duke Power Plant – East Bend Station near Rabbit Hash, KY. Installed equipment at this site includes wet lime slurry, which controls SO_2 emissions, and a modified furnace design (LNB/SCR) to reduce NO_X emissions.

Based on these factors, Boone County should be considered for the nonattainment area. Note that Boone County is also high ranking based on factor 1, 5 and 6.

In considering county-level emissions, EPA considered 2005 emissions data from the National Emissions Inventory. EPA recognizes that certain power plants or large sources of emissions in this potential nonattainment area may have installed emission controls or otherwise significantly reduced emissions since 2005 and that this information may not be reflected in this analysis. EPA will consider additional information on emission controls in making final designation decisions. In cases where specific plants already have installed emission controls or plan to install such controls in the near future, EPA requests additional information on:

- the plant name, city, county, and township/tax district
- identification of emission units at the plant, fuel use, and megawatt capacity
- identification of emission units on which controls will be installed, and units on which controls will not be installed
- identification of the type of emission control that has been or will be installed on each unit, the date on which the control device became / will become operational, and the emission reduction efficiency of the control device
- the estimated pollutant emissions for each unit before and after implementation of emission controls
- whether the requirement to operate the emission control device will be federally enforceable by December 2008, and the instrument by which federal enforceability will

be ensured (e.g. through source-specific SIP revision, operating permit requirement, consent decree).

EPA Technical Analysis for Clarksville, TN-KY

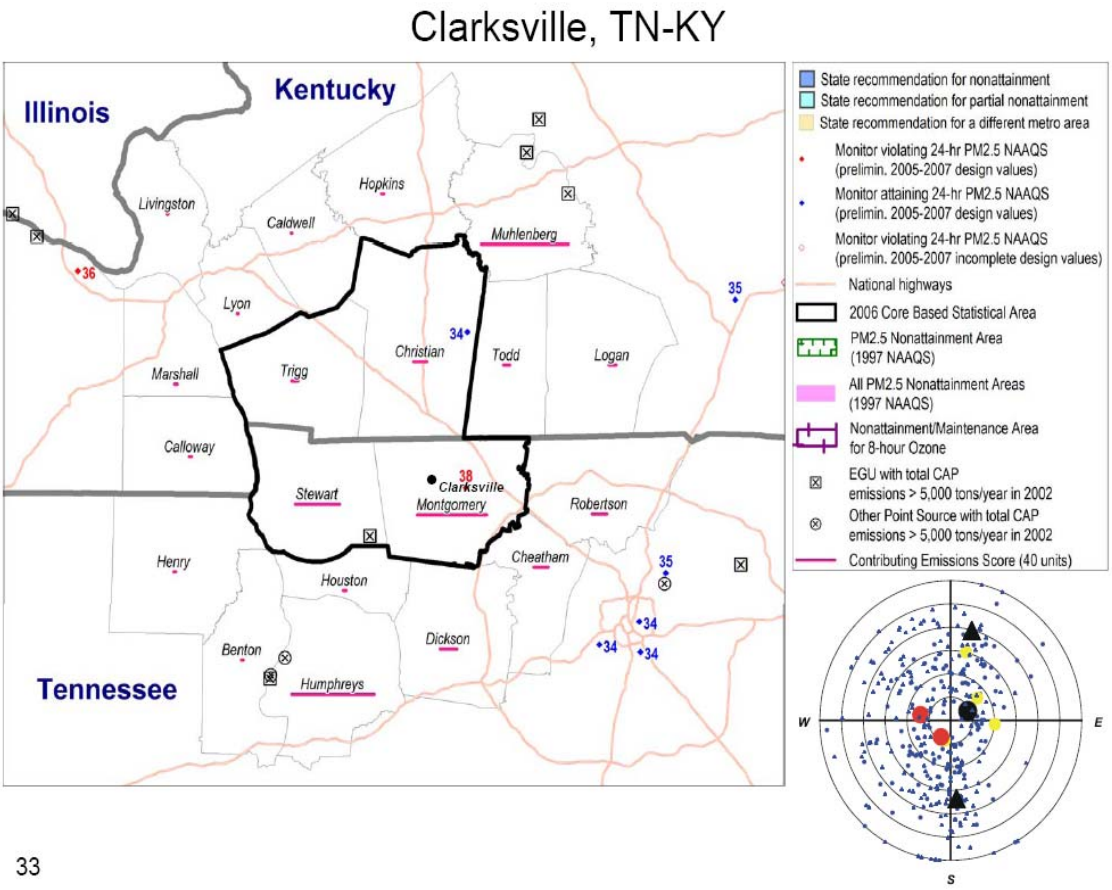
Discussion

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for the Clarksville, TN-KY area identifies the counties with monitors that violate the 24-hour PM2.5 standard and evaluates the counties that potentially contribute to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

Figure 1 is a map of the counties in the area and other relevant information such as the locations and design values of air quality monitors, the metropolitan area boundary, and counties recommended as nonattainment by the State.

Figure 1. Clarksville, TN-KY MSA



33

In December 2007, Kentucky recommended that the designation for the Clarksville area be attainment for all Kentucky counties for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2005-2007. These data are from Federal Reference Method (FRM) and Federal Equivalent Method (FEM) monitors located in the state. [December 7, 2007, letter from Ernie Fletcher, Governor to James I. Palmer. Jr., EPA Region 4, received December 13, 2007.]

Based on speciation data from the area, Clarksville experiences elevated sulfate levels during the warm season, with a carbon-based urban increment during both cold and warm seasons. This pattern is typical of many areas throughout the southeastern United States.

Based on EPA's 9-factor analysis described below, EPA believes that Montgomery, Stewart, and Humphreys Counties, Tennessee and Muhlenberg County, Kentucky should be designated nonattainment for the 24-hour $PM_{2.5}$ air-quality standard as part of the Clarksville, TN-KY nonattainment area, based upon currently available information. These counties are listed in the table below.

	State-Recommended Nonattainment Counties	EPA-Recommended Nonattainment Counties
Clarksville, TN-KY	None	Muhlenberg

The following is a summary of the 9-factor analysis for the Kentucky portion of the Clarksville, TN-KY area.

In general, the Clarksville, TN-KY area is a small metropolitan statistical area (MSA) with one county, Montgomery, containing a monitor that is violating the PM2.5 standard. Three other nearby counties are intended for inclusion in the nonattainment area on the basis of contributing emissions. Stewart county, also in the MSA, contains a power plant that has NO_X and SO_2 controls, yet still emits 35,000 tons of NO_X and 20,000 tons of SO_2 annually (based on 2006 emissions.) In addition, two non-MSA counties, Humphreys, TN, and Muhlenberg, KY, also have power plants. Humphreys' 2006 power plant emissions were approximately 20,000 tons of NO_X and 97,000 tons of SO_2, while Muhlenberg's 2006 power plant emissions were approximately 44,000 tons of NO_X and 98,000 tons of SO_2. (Note that these 2006 emissions levels vary to some degree from the 2005 emissions data presented in table 1.)

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown in Table 1 as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html.

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive way for consideration of data for these

factors. A summary of the CES is included in Enclosure 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.]

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Clarksville area. Counties are listed in descending order by CES.

Table 1. $PM_{2.5}$ Related Emissions and Contributing Emissions Score

County	State Recommended Nonattainment	CES	$PM_{2.5}$ emissions total (tpy)	$PM_{2.5}$ emissions carbon (tpy)	$PM_{2.5}$ emissions other (tpy)	SO_2 (tpy)	NOx (tpy)	VOCs (tpy)	NH_3 (tpy)
Muhlenberg Co	No	100	3,769	226	110	100,828	39,096	1,741	787
Humphreys Co	No	92	6,359	368	249	77,765	23,238	5,458	730
Montgomery Co	No	76	1,424	331	152	2,156	5,555	6,438	485
Stewart Co	No	47	2,614	159	93	17,755	28,776	1,689	154
Dickson Co	No	19	909	219	83	432	3,212	4,375	268
Robertson Co	No	17	703	186	102	560	3,870	3,363	806
Cheatham Co	No	16	484	159	75	325	2,172	3,201	100
Christian Co	No	14	728	140	102	854	3,947	3,833	1,639
Trigg Co	No	7	537	184	67	222	1,332	1,815	451

Based on emission levels and CES values, Montgomery, Stewart, and Humphreys Counties, Tennessee and Muhlenberg County, Kentucky are candidates for a 24-hour $PM_{2.5}$ nonattainment designation.

In the designation process for the 1997 $PM_{2.5}$ standards, in some cases EPA identified a nearby county as contributing to a violating monitor, and it was determined that a very high percentage of the county's emissions came from a large power plant. In certain cases, EPA concluded that only the portion of the county including the source with the contributing emissions needed to be designated as nonattainment. If Kentucky believes that a similar situation exists for Muhlenberg County, the Commonwealth should provide EPA the necessary information to demonstrate that the source dominates the overall county emissions and to identify a reasonable partial county boundary.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values (in $\mu g/m^3$) for air quality monitors in counties in the Clarksville area based on data for the 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98^{th} percentile values are 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour $PM_{2.5}$ design values for counties in the Clarksville area are shown in Table 2.

Table 2. Air Quality Data

County	State Recommended Nonattainment	24-hr PM2.5 Design Values, 2004-2006 ($\mu g/m^3$)	24-hr PM2.5 Design Values, 2005-2007 ($\mu g/m^3$)
Montgomery	No	34	37
Christian	No	30	33

Montgomery County shows a violation of the 24-hour $PM_{2.5}$ standard. Therefore, this county is included in the Clarksville nonattainment area. However, the absence of a violating monitor alone is not a sufficient reason to eliminate counties as candidates for nonattainment status. Each county has been evaluated based on the weight of evidence of the nine factors and other relevant information.

[Note: Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with a FRM or FEM monitor. All data from Special Purpose Monitors (SPM) using an FRM, FEM, or Alternative Reference Method (ARM) which has operated for more than 24 months is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr PM2.5 NAAQS for designation purposes.]

Factor 3: Population density and degree of urbanization (including commercial development)

Table 4 shows the 2005 population for each county in the Clarksville area, as well as the population density for each county in that area. Population data gives an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards.

Based on this factor, Montgomery County, TN dominates the Clarksville area in terms of population and population density. Christian County, KY has the next highest population and density; however, Christian County has a monitor which shows attainment with the 24-hour $PM_{2.5}$ standards. Nearly 90 percent of the Clarksville MSA resides in Montgomery County, Tennessee and Christian County, Kentucky.

Table 4. Population

County	State Recommended Nonattainment	2005 Population	2005 Population Density (pop/sq mi)

Montgomery	No	146,845	270
Christian	No	69,735	96
Muhlenberg	No	31,562	66
Humphreys	No	18,208	33
Trigg	No	13,329	28
Stewart	No	12,975	26

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the Clarksville area, the percent of total commuters in each county who commute to other counties within the Clarksville area, as well as the total Vehicle Miles Traveled (VMT) for each county in thousands of miles (see Table 5). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area.

Table 5. Traffic and Commuting Patterns

County	State Recommended Non-attainment	2005 VMT (1000s mi)	Number Commuting to any violating counties	Percent Commuting to any violating counties	Number Commuting into statistical area	Percent Commuting into statistical area
Montgomery	No	1,343	40,570	62	56,550	87
Christian	No	1,002	2,080	6	31,190	95
Stewart	No	122	1,480	30	4,180	84
Trigg	No	262	140	3	5,010	93
Humphreys	No	341	50	1	120	2
Muhlenberg	No	311	20	0	230	2

The listing of counties on Table 5 reflects a ranking based on the number of people commuting to other counties. Montgomery County is a NAA candidate based on other Factors (1, 2, and 3) and the CES.

Note: The 2005 VMT data used for table 5 and 6 of the 9-factor analysis has been derived using methodology similar to that described in "Documentation for the final 2002 Mobile National Emissions Inventory, Version 3, September 2007, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: atftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/2002_mobile_nei_version_3_report_092807.pdf
The 2005 VMT data were taken from documentation which is still draft, but which should be released in 2008.

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled for 1996-2005 for counties in the Clarksville area, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and likely to be contributing to fine particle concentrations in the area.

Table 6 below shows population, population growth, VMT and VMT growth for counties that are included in the Clarksville area. Counties are listed in descending order based on VMT growth between 1996 and 2005.

Table 6. Population and VMT Values and Percent Change.

Location	Population (2005)	Population Density (2005)	Population % change (2000 - 2005)	2005 VMT (1000s mi)	VMT % change (1996 to 2005)
Montgomery	146,845	270	9	1,343	20
Christian	69,735	96	(4)	1,002	18
Muhlenberg	31,562	66	(1)	311	29
Humphreys	18,208	33	2	341	43
Trigg	13,329	28	5	262	11
Stewart	12,975	26	4	122	21

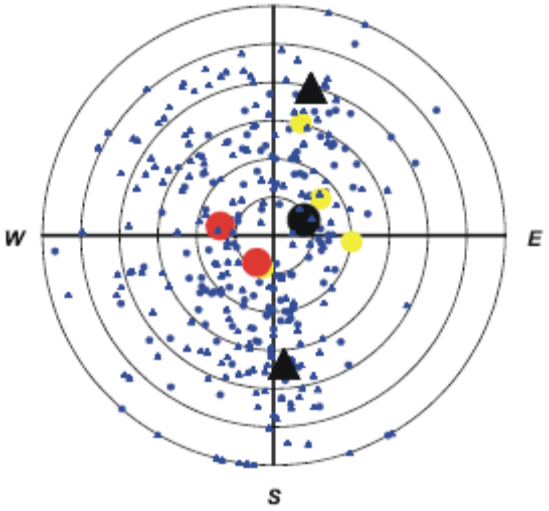
Montgomery County had relatively high population growth between 2000 and 2005, and is a NAA candidate based on other Factors (1, 2, 3, and 4) and the CES.

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM or FEM air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour PM2.5 values by color; days exceeding 35 ug/m3 are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

Figure 2. Pollution rose for the Clarksville area.



As shown in the pollution rose in Figure 2, the average prevailing surface wind direction for high $PM_{2.5}$ days in Montgomery County are from the north and south. The pollution roses show that 24-hour $PM_{2.5}$ concentrations are influenced by emissions from any direction at various times, but these data also suggest that emissions from some directions relative to the violation are more likely to contribute to the violation than emissions from other directions.

Note: the meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of $PM_{2.5}$ over the Clarksville area.

The Clarksville area does not have any geographical or topographical barriers significantly limiting air-pollution transport within its air shed. Therefore, this factor did not play a significant role in the decision-making process.

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

In evaluating the jurisdictional boundary factor, consideration should be given to existing boundaries and organizations that may facilitate air quality planning and the

implementation of control measures to attain the standard. Areas designated as nonattainment (e.g. for PM2.5 or 8-hour ozone standard) represent important boundaries for state air quality planning. The major jurisdictional boundary in the Clarksville area is the Clarksville MSA, which consists of Christian and Trigg Counties, KY, and Montgomery and Stewart Counties, TN. The Clarksville area was designated as an 8-hour ozone nonattainment area, which included Christian and Montgomery Counties.

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented for major sources in the Clarksville area.

The emission estimates on Table 1 (under Factor 1) include any control strategies implemented by the states in the Clarksville area before 2005 that may influence emissions of any component of $PM_{2.5}$ emissions (i.e., total carbon, SO_2, NOx, and crustal $PM_{2.5}$).

In considering county-level emissions, EPA considered 2005 emissions data from the National Emissions Inventory. EPA recognizes that certain power plants or large sources of emissions in this potential nonattainment area may have installed emission controls or otherwise significantly reduced emissions since 2005 and that this information may not be reflected in this analysis. EPA will consider additional information on emission controls in making final designation decisions. In cases where specific plants already have installed emission controls or plan to install such controls in the near future, EPA requests additional information on:

- the plant name, city, county, and township/tax district
- identification of emission units at the plant, fuel use, and megawatt capacity
- identification of emission units on which controls will be installed, and units on which controls will not be installed
- identification of the type of emission control that has been or will be installed on each unit, the date on which the control device became / will become operational, and the emission reduction efficiency of the control device
- the estimated pollutant emissions for each unit before and after implementation of emission controls
- whether the requirement to operate the emission control device will be federally enforceable by December 2008, and the instrument by which federal enforceability will be ensured (e.g. through source-specific SIP revision, operating permit requirement, consent decree)

It should be noted that there are several electric generating units (EGU) within the area. Specifically, they reside in Muhlenberg, Humphreys, and Stewart Counties. The control levels on these power plants can be seen in the table below, and represent moderate to heavy control on emissions from these plants.

Pre-2008 Control Measures

County	Plant	Unit ID	NOX Controls	SO2 Controls	PM 10 Controls
Muhlenberg	Green River	4	LNB	---	ESP 1973
Muhlenberg	Green River	5	LNB	---	ESP 1975
Muhlenberg	Paradise	1	OFA/SCR 2001	FGD – Venturi Scrubber 1982	Venturi Scrubber 1982
Muhlenberg	Paradise	2	OFA/SCR 2001	FGD – Venturi Scrubber 1982	Venturi Scrubber 1982
Muhlenberg	Paradise	3	OFA/SCR 2003	FGD – Venturi Scrubber 2006	Venturi Scrubber 1970's
Stewart	Cumberland	1	LNB	Limestone Scrubber	Lime Injection
Stewart	Cumberland	2	LNB	Limestone Scrubber	Lime Injection
Humphreys	Johnsonville	7, 8, 9, 10	LNB	Low Sulfur Coal	---
Humphreys	Johnsonville	1, 2, 3, 4, 5	CO	Low Sulfur Coal	---

Legend	
LNB	Low NOx Burner
OFA	Over Fired Air
SCR	Selective Catalytic Reduction
FGD	Flue gas desulfurization

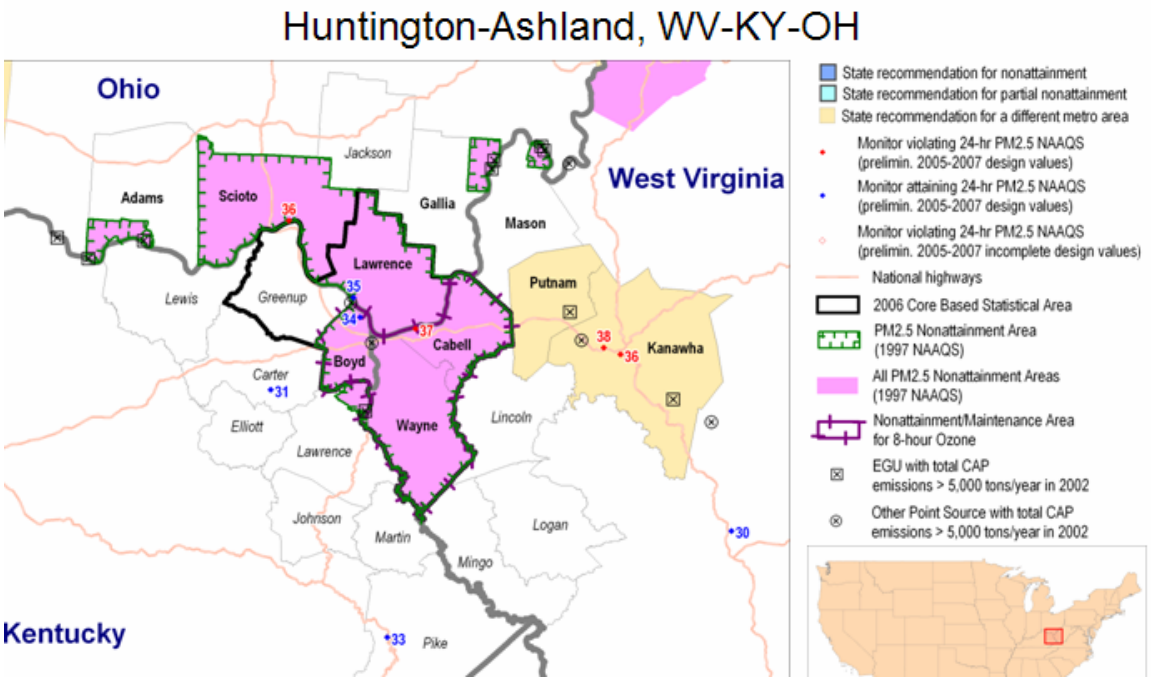
EPA Technical Analysis for the Huntington-Ashland Area

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for the Huntington-Ashland area identifies the counties with monitors that violate the 24-hour PM2.5 standard and evaluates the counties that potentially contribute to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

Figure 1 is a map of the counties in the area and other relevant information such as the locations and design values of air quality monitors, the metropolitan area boundary, and counties recommended as nonattainment by the State.

Figure 1. Huntington-Ashland, WV-KY-OH CBSA



For this area, EPA previously established PM2.5 nonattainment boundaries for the 1997 $PM_{2.5}$ NAAQS that included 9 full and partial counties, with 2 being located in Kentucky – Boyd county and part of Lawrence county.

In December 2007, Kentucky recommended that no areas be designated as "nonattainment" for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2004-2006. These data are from Federal Reference Method (FRM) and Federal Equivalent Method (FEM) monitors located in the state. This letter dated December 7, 2007 was sent to James Palmer, EPA Region 4 from Kentucky's Governor Ernie Fletcher and was received in our office on December 13, 2007. At this time, the Huntington-Ashland area did not have any violating monitors and was not under consideration for nonattainment status for the 24-hour PM2.5 standard. Since that time, it was determined that monitors in Scioto county, Ohio and Cabell county, West Virginia violated the 24-hour PM2.5 standard for the 2005-2007 period. Kentucky submitted a second letter on June 25, 2008 to revise its recommendation yet still maintained that no Kentucky counties should be designated nonattainment for the standard.

Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network. Analysis of these data indicates that the days with the highest fine particle concentrations occur predominantly in the warm seasons, and the average chemical composition of the highest days is 70% sulfate and 27% carbonaceous PM2.5. Key contributing sources to these components include power plants, industrial facilities, mobile sources, and burning of wood and biomass.

Based on EPA's 9-factor analysis described below, EPA believes that the following counties in Kentucky should be designated nonattainment for the 24-hour $PM_{2.5}$ air-quality standard as part of the Huntington-Ashland nonattainment area, based upon currently available information. These counties are listed in the table below.

Huntington-Ashland	State-Recommended Nonattainment Counties	EPA-Recommended Nonattainment Counties
Kentucky	None	Boyd Lawrence (Partial)

The following is a summary of the 9-factor analysis for the EPA Region 4 portion of the Huntington-Ashland area.

The Huntington-Ashland core-based statistical area (CBSA) contains the Kentucky counties of Boyd and Greenup, the Ohio county of Lawrence and the West Virginia counties of Cabell and Wayne. Lawrence County, Kentucky is adjacent to the CBSA. Based on a review of all 9 factors, EPA finds that Boyd county should be included in the nonattainment area on the basis of moderate emissions of SO2, NOx, and PM2.5, its central location, and a relatively high population density. Huntington-Ashland derives its

name from the cities of Huntington, WV, located in Cabell county, and Ashland, KY, located in Boyd county. Consistent with 2005 designations for violations of the annual PM2.5 standard, EPA also intends to designate a portion of Lawrence county, Kentucky, the area that contains the Big Sandy power plant, on the basis of significant contributing emissions.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown in Table 1 as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive way for consideration of data for these factors. A summary of the CES is included in Enclosure 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Huntington-Ashland area. Counties that are part of the Huntington-Ashland nonattainment area for the 1997 $PM_{2.5}$ NAAQS are shown in boldface. Counties are listed in descending order by CES.

Table 1. $PM_{2.5}$ Related Emissions and Contributing Emissions Score

County	State	State Recommended Nonattainment	CES	$PM_{2.5}$ Emissions total (tpy)	$PM_{2.5}$ Emissions carbon (tpy)	$PM_{2.5}$ emissions other (tpy)	SO_2 (tpy)	NO_x (tpy)	VOCs (tpy)	NH_3 (tpy)
Cabell	WV	No	100	1,082	434	649	4,355	10,644	5,878	181
Gallia	OH	No	100	7,087	499	6,588	100,704	59,035	1,939	327
Lawrence	OH	No	78	1,078	672	406	573	3,769	4,847	316
Scioto	OH	No	58	775	416	359	555	4,981	4,111	1,349
Adams	OH	No	46	5,970	494	5,476	126,316	33,822	1,918	837
Boyd	KY	No	44	1,729	412	1,317	10,501	10,123	5,762	477
Wayne	WV	No	33	657	446	210	1,041	7,619	2,577	70
Lawrence	KY	No	27	2,567	199	2,368	50,239	13,761	932	90
Greenup	KY	No	24	319	151	169	2,183	4,102	1,694	155

Note that the table may not include all counties considered in the 9-factor analysis, and that those counties not shown had no factors that indicated that they should be candidates for a nonattainment status.

Based on emission levels and CES values, Boyd, Lawrence, and Greenup Counties in Kentucky are possible candidates for a 24-hour $PM_{2.5}$ nonattainment designation. Lawrence county has the highest emissions, primarily due to the Big Sandy power plant. Boyd has moderate emissions of SO2, NOx, and direct PM2.5.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values (in $\mu g/m^3$) for air quality monitors in counties in the Huntington-Ashland area based on data for the 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98^{th} percentile values are 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour $PM_{2.5}$ design values for counties in the Huntington-Ashland area are shown in Table 2.

Table 2. Air Quality Data

County	State	State Recommended Nonattainment	24-hr PM2.5 Design Values, 2005-2007 ($\mu g/m^3$)
Cabell	**WV**	No	**37**
Lawrence	**OH**	No	**35**
Scioto	**OH**	No	**36**
Boyd	**KY**	No	**34**

In Region 4, no counties show a violation of the 24-hour $PM_{2.5}$ standard. However, the absence of a violating monitor alone is not a sufficient reason to eliminate counties as

candidates for nonattainment status. Each county has been evaluated based on the weight of evidence of the nine factors and other relevant information and require further evaluation.

Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with a FRM or FEM monitor. All data from Special Purpose Monitors (SPM) using an FRM, FEM, or Alternative Reference Method (ARM) which has operated for more than 24 months is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr PM2.5 NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Table 3 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data gives an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards.

Boyd, Lawrence, and Greenup Counties of Kentucky have moderately sized populations. Boyd County has the highest population of the Kentucky counties in the area and it is one of the most densely populated counties in the area. The counties in Kentucky do not give an indication of population based emissions contributing to the violation of the 24-hour $PM_{2.5}$ standards

Table 3. Population

County	State	State Recommended Nonattainment	2005 Population	2005 Population Density (pop/sq mi)
Cabell	WV	No	93,988	327
Gallia	OH	No	31,241	68
Lawrence	OH	No	62,946	134
Scioto	OH	No	76,506	124
Adams	OH	No	28,454	49
Boyd	KY	No	49,359	305
Wayne	WV	No	41,959	82
Lawrence	KY	No	16,162	39
Greenup	KY	No	37,206	105

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the Huntington-Ashland area, the percent of total commuters in each county who commute to other counties within the Huntington-Ashland area, as well as the total Vehicle Miles Traveled (VMT) for each county in thousands of miles (see Table 4). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area.

Table 4. Traffic and Commuting Patterns

County	State	State Recommended Nonattainment	2005 VMT (1000s mi)	Number Commuting to any violating county	Percent Commuting to any violating county	Number Commuting into statistical area	Percent Commuting into statistical area
Cabell	**WV**	No	1230	**34,670**	**86**	**35,460**	**88**
Scioto	**OH**	No	591	**22,040**	**78**	**1,330**	**5**
Lawrence	**OH**	No	650	**7,970**	**35**	**21,160**	**92**
Wayne	**WV**	No	438	**7,170**	**46**	**14,040**	**90**
Greenup	KY	No	371	1,770	13	11,130	83
Boyd	**KY**	No	574	**1,380**	**7**	**17,580**	**93**
Gallia	**OH**	No	247	**300**	**3**	**330**	**3**
Lawrence	**KY**	No	159	**250**	**5**	**920**	**19**
Adams	**OH**	No	283	**130**	**1**	**20**	**0**

The listing of counties on Table 4 reflects a ranking based on the number of people commuting to other counties. The counties that are in the nonattainment area for the 1997 $PM_{2.5}$ NAAQS are shown in boldface.

In Region 4, Boyd, Lawrence and Greenup have relatively low VMT and percent commuting into violating counties. In Boyd County, 73 percent of commuters remain in Boyd County which currently has monitor maintaining the standard; in Greenup 43 percent of the commuters remain in the county and 30 percent commute to Boyd County which has a monitor that is maintaining the standard.

Note: The 2005 VMT data used for table 4 and 5 of the 9-factor analysis has been derived using methodology similar to that described in "Documentation for the final 2002 Mobile National Emissions Inventory, Version 3, September 2007, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/2002_mobile_nei_version_3_report_092807.pdf
The 2005 VMT data were taken from documentation which is still draft, but which should be released in 2008.

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled for 1996-2005 for counties in the Huntington-Ashland area, as well as patterns of

population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and likely to be contributing to fine particle concentrations in the area.

Table 5 below shows population, population growth, VMT and VMT growth for counties that are included in the Huntington-Ashland area. Counties are listed in descending order based on VMT growth between 1996 and 2005.

Table 5. Population and VMT Values and Percent Change.

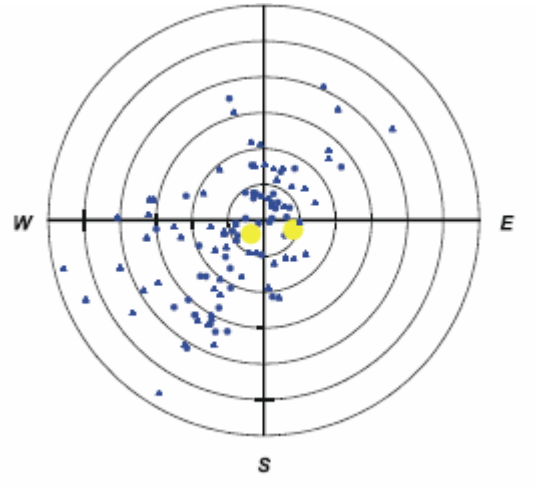
County	State	Population (2005)	Population Density (2005)	Population % change (2000 - 2005)	2005 VMT (1000s mi)	VMT % change (1996 to 2005)
Wayne	**WV**	**41,959**	82	**-2**	438	**47**
Cabell	**WV**	**93,988**	327	**-3**	1230	**41**
Greenup	KY	37,206	105	**1**	371	23
Boyd	**KY**	**49,359**	305	**-1**	574	**16**
Lawrence	**KY**	**16,162**	39	**4**	159	**11**
Lawrence	**OH**	**62,946**	134	**1**	650	**9**
Adams	**OH**	**28,454**	49	**4**	283	**7**
Gallia	**OH**	**31,241**	68	**1**	247	**0**
Scioto	**OH**	**76,506**	124	**-3**	591	**-3**

In general, there was little change in population from 2000-2005 in the Huntington-Ashland area. Boyd County had a 1 percent decrease; Greenup had a 1 percent increase, and Lawrence, KY, with a 4 percent increase. Vehicle miles traveled increased between 11-23% for the three Kentucky counties during the 1996-2005 period. Overall, growth-related information was not a major consideration in EPA's intended designation.

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM or FEM air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values.
For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour PM2.5 values by color; days exceeding 35 ug/m3 are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

Figure 2. Pollution rose the Huntington-Ashland Area.



As shown in the pollution rose in Figure 2, the average prevailing surface wind direction for high $PM_{2.5}$ days in the Huntington-Ashland area came from south /southwest. The West Virginia Weather Station reports that the average high temperature for the July area in 2005-2007 was 87 F and the average low was 67F.

The pollution roses show that 24-hour $PM_{2.5}$ concentrations are influenced by emissions from any direction at various times, but these data also suggest that emissions from some directions relative to the violation are more likely to contribute to the violation than emissions from other directions.

Based on analysis of this factor, EPA concludes that further evaluation is needed to make conclusion.

Note: the meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of $PM_{2.5}$ over the Huntington-Ashland area.

Boyd County sits at the northeastern corner of Kentucky and is situated along the Ohio River and the Big Sandy River.

Greenup County sits on the Ohio River in the Appalachian foothills.

Lawrence County lies on the Kentucky-West Virginia border and the eastern border is formed by the Big Sandy River.

The Kentucky portion of the Huntington-Ashland area does not have any geographical or topographical barriers significantly limiting air-pollution transport within its air shed. Therefore, the absence of topographical and geographical barriers in this area supports our conclusion that emissions from Boyd, Greenup. And Lawrence can be contributing to violations in the area.

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

In evaluating the jurisdictional boundary factor, consideration should be given to existing boundaries and organizations that may facilitate air quality planning and the implementation of control measures to attain the standard. Areas designated as nonattainment (e.g for PM2.5 or 8-hour ozone standard) represent important boundaries for state air quality planning.

The current PM2.5 boundary consist of the Kentucky County of Boyd and Lawrence (P), the Ohio counties of Adams (P), Gallia (P), Lawrence, Scioto, and the West Virginia Counties of Cabell and Wayne.

The ozone 8 hour boundary for the Huntington Ashland area includes the Kentucky County of Boyd and the West Virginia County of Cabell and Wayne.

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented for major sources in the Huntington-Ashland area.

The emission estimates on Table 1 (under Factor 1) include any control strategies implemented by the states in the Huntington-Ashland area before 2005 that may influence emissions of any component of $PM_{2.5}$ emissions (i.e., total carbon, SO_2, NOx, and crustal $PM_{2.5}$).

Emission Controls include:
Federal Motor Vehicle Control Programs (FMVCP)
Tier 2 Vehicle Emissions and Fuel Standards
Heavy Duty Engine, Vehicle and Fuel Standards
Reasonably Available Control Measures (RACM)
Maximum Available Control Technology (MACT)
Open burning regulations for former 1-hour ozone area
Knox SIP Call Reductions

In considering county-level emissions, EPA considered 2005 emissions data from the National Emissions Inventory. EPA recognizes that certain power plants or large sources of emissions in this potential nonattainment area may have installed emission controls or otherwise significantly reduced emissions since 2005 and that this information may not be reflected in this analysis. EPA will consider additional information on emission controls in making final designation decisions. In cases where specific plants already have installed emission controls or plan to install such controls in the near future, EPA requests additional information on:

- the plant name, city, county, and township/tax district
- identification of emission units at the plant, fuel use, and megawatt capacity
- identification of emission units on which controls will be installed, and units on which controls will not be installed
- identification of the type of emission control that has been or will be installed on each unit, the date on which the control device became / will become operational, and the emission reduction efficiency of the control device
- the estimated pollutant emissions for each unit before and after implementation of emission controls
- whether the requirement to operate the emission control device will be federally enforceable by December 2008, and the instrument by which federal enforceability will be ensured (e.g. through source-specific SIP revision, operating permit requirement, consent decree)

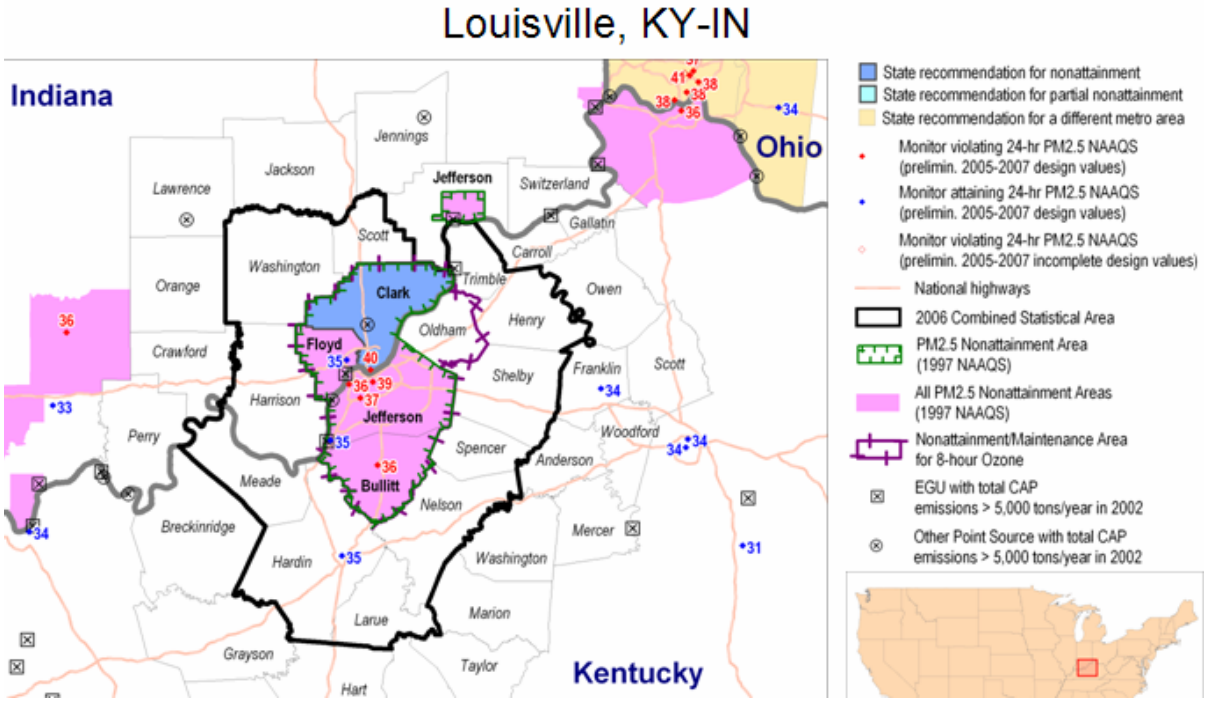
EPA Technical Analysis for Louisville

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for the Louisville area identifies the counties with monitors that violate the 24-hour PM2.5 standard and evaluates the counties that potentially contribute to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

Figure 1 is a map of the counties in the area and other relevant information such as the locations and design values of air quality monitors, the metropolitan area boundary, and counties recommended as nonattainment by the State.

Figure 1. Louisville, KY-IN MSA



For this area, EPA previously established PM2.5 nonattainment boundaries for the 1997 $PM_{2.5}$ NAAQS that included 4 full and partial counties, with 2 being located in Kentucky.

In December 2007 Kentucky recommended that no areas be designated as "nonattainment" for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2004-2006. These data are from Federal Reference Method (FRM) and Federal Equivalent Method (FEM) monitors located in the state. This letter dated December 7, 2007 was sent to James Palmer, EPA Region 4 from Kentucky's Governor Ernie Fletcher and was received in our office on December 13, 2007.

Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network. Analysis of these data indicates that the days with the highest fine particle concentrations occur in both cool and warm seasons, and the average chemical composition of the highest days is over 70% of sulfates and carbon in the warm seasons due to the power plants and cars in the urban areas and for the cold seasons the average chemical compositions are over 20 percent nitrates and over 60 percent carbons due to wood fire burning.

Based on EPA's 9-factor analysis described below, EPA believes that Bullitt and Jefferson should be designated nonattainment for the 24-hour $PM_{2.5}$ air-quality standard as part of the Louisville nonattainment area, based upon currently available information. These counties are listed in the table below.

Louisville	State-Recommended Nonattainment Counties	EPA-Recommended Nonattainment Counties
Kentucky	None	Bullitt Jefferson

The following is a summary of the 9-factor analysis for the EPA Region 4 portion of the Louisville area.

The Louisville metropolitan statistical area (MSA) contains the Kentucky counties of Bullitt, Hardin, Henry, Jefferson, Meade, Nelson, Oldham, Shelby, Spencer, and Trimble and the Indiana counties of Clark, Floyd, Harrison and Washington.

Jefferson County has 4 violating monitors for the 2004-2006 standards and has a design value of 36 $\mu g/m^3$ for the 04-06.

Bullitt County has a design value of 34 $\mu g/m^3$- very close to the standard and is adjacent to Jefferson County who is currently violating the standard. Also the significant on-road mobile source emissions to and from Jefferson County, and the population growth suggest nonattainment status.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown in Table 1 as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive way for consideration of data for these factors. A summary of the CES is included in Enclosure 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Louisville area. Counties that are part of the Louisville nonattainment area for the 1997 $PM_{2.5}$ NAAQS are shown in boldface. Counties are listed in descending order by CES.

Table 1. $PM_{2.5}$ Related Emissions and Contributing Emissions Score

County	State Recommended Nonattainment	CES	$PM_{2.5}$ emissions total (tpy)	$PM_{2.5}$ emissions carbon (tpy)	$PM_{2.5}$ emissions other (tpy)	SO_2 (tpy)	NOx (tpy)	VOCs (tpy)	NH_3 (tpy)
Jefferson KY	No	**100**	**5,941**	**2,726**	**3,215**	**53,066**	**58,643**	**38,095**	**1,628**
Floyd IN	No	**33**	**3,206**	**285**	**2,920**	**57,498**	**8,169**	**3,462**	**258**
Clark IN	Yes	**16**	**1,398**	**338**	**1,060**	**4,043**	**5,749**	**6,049**	**800**
Bullitt KY	No	**6**	**659**	**283**	**376**	**857**	**3,140**	**5,816**	**182**
Oldham KY	No	6	579	220	359	504	3,306	1,821	254
Harrison IN	No	5	746	238	507	672	3,423	2,379	1,208
Hardin KY	No	3	896	358	538	1,207	4,714	4,384	1,163

Shelby KY	No	3	574	227	347	610	2,657	2,550	734
Meade KY	No	2	439	188	253	665	3,516	2,322	442
Nelson KY	No	2	623	240	383	791	1,724	7,310	1,080
Washington IN	No	2	589	162	427	361	1,374	2,287	1,192
Henry KY	No	1	319	106	213	144	1,312	1,161	463
Scott IN	No	1	406	111	295	317	1,365	1,887	275
Spencer KY	No	1	228	84	144	37	416	590	206
Trimble KY	No	1	593	112	481	5,570	5,206	511	212
Larue KY	No	0	246	92	155	195	805	606	498

Use natural break points to limit the number of counties shown. It is not necessary to show every county no matter how low an emission score. Note that the table may not include all counties considered in the 9-factor analysis, and that those counties not shown had no factors that indicated that they should be candidates for a nonattainment status.

Based on emissions levels and CES values, Jefferson county in Kentucky is a candidate for a 24-hour $PM_{2.5}$ nonattainment designation and Bullitt has a violating monitor for the 2005-2007 period and therefore, require further analysis.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values (in $\mu g/m^3$) for air quality monitors in counties in the Louisville area based on data for the 2004-2006 and 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98^{th} percentile values are 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour $PM_{2.5}$ design values for counties in the Louisville area are shown in Table 2.

Table 2. Air Quality Data

County	State Recommended Nonattainment	24-hr PM2.5 Design Values, 2004-2006 ($\mu g/m^3$)	24-hr PM2.5 Design Values, 2005-2007 ($\mu g/m^3$)
Jefferson, KY	No	36	39
Floyd, IN	No	32	35
Clark, IN	Yes	37	40
Bullitt, KY	No	34	36
Hardin, KY	No	32	35

Jefferson and Bullitt Counties show a violation of the 24-hour $PM_{2.5}$ standard. Therefore, these Counties are included in the Louisville nonattainment area. However, the absence of a violating monitor alone is not a sufficient reason to eliminate counties as candidates for nonattainment status. Each county has been evaluated based on the weight of evidence of the nine factors and other relevant information.

Jefferson and Bullitt Counties in Kentucky based on this factor are also counties that are nonattainment candidates based on CESs and Factor 1. Jefferson County, Kentucky has the highest CES score (100) and Bullitt County, Kentucky has a CES score of 6.

Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with a FRM or FEM monitor. All data from Special Purpose Monitors (SPM) using an FRM, FEM, or Alternative Reference Method (ARM) which has operated for more than 24 months is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr PM2.5 NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Table 3 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data gives an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards.

Jefferson County has the highest population, population density and also highest CES score of all the counties listed above. Bullitt, Oldham, and Hardin Counties of Kentucky have moderately sized populations and population densities are relatively low compared to Jefferson County. All of the Kentucky counties mentioned above, based on this factor require further evaluation and are candidates in Factors 1 and 2 above.

Table 3. Population

County	State Recommended Nonattainment	2005 Population	2005 Population Density (pop/sq mi)
Jefferson KY	No	699,051	1755
Floyd IN	No	72,025	485
Clark IN	Yes	101,625	270
Bullitt KY	No	71,440	238
Oldham KY	No	53,459	273
Hardin KY	No	96,825	154

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the Louisville area, the percent of total commuters in each county who commute to other counties within the Louisville area, as well as the total Vehicle Miles Traveled (VMT) for each county in thousands of miles (see Table 4). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area.

Table 4. Traffic and Commuting Patterns

County	State Recommended Non-attainment	2005 VMT (1000s mi)	Number Commuting to any violating counties	Percent Commuting to any violating counties	Number Commuting into statistical area	Percent Commuting into statistical area
Jefferson KY	**No**	**8,080**	**312,660**	**95**	**322,950**	**98**
Floyd IN	**No**	**9030**	**18,380**	**52**	**34,590**	**99**
Clark IN	**Yes**	**768**	**41,100**	**85**	**47,410**	**98**
Bullitt KY	**No**	**1218**	**28,570**	**94**	**30,160**	**99**
Oldham KY	No	852	13,050	61	21,020	98
Hardin KY	No	585	6,060	14	43,440	98

The listing of counties on Table 4 reflects a ranking based on the number of people commuting to other counties. The counties that are in the nonattainment area for the 1997 $PM_{2.5}$ NAAQS are shown in boldface.

In Region 4, Jefferson and Bullitt Counties in Kentucky show a violation of the 24-hour $PM_{2.5}$ standard and also have the highest vehicle miles traveled as well as the highest percentage of people commuting into the violating counties and MSA. The high ranking counties based on this factor are also counties that are nonattainment factors based on the other factors above.

Note: The 2005 VMT data used for table 4 and 5 of the 9-factor analysis has been derived using methodology similar to that described in "Documentation for the final 2002 Mobile National Emissions Inventory, Version 3, September 2007, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/2002_mobile_nei_version_3_report_092807.pdf
The 2005 VMT data were taken from documentation which is still draft, but which should be released in 2008.

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled for 1996-2005 for counties in Louisville, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and likely to be contributing to fine particle concentrations in the area.

Table 5 below shows population, population growth, VMT and VMT growth for counties that are included in the Louisville area. Counties are listed in descending order based on VMT growth between 1996 and 2005.

Table 5. Population and VMT Values and Percent Change.

Location	Population (2005)	Population Density (2005)	Population % change (2000 - 2005)	2005 VMT (1000s mi)	VMT % change (1996 to 2005)
Oldham , KY	53,459	273	16	526	19
Jefferson , KY	699,051	1755	1	9030	18
Bullitt, KY	71,440	238	17	852	13
Clark , IN	101,625	270	0	1218	10
Floyd, IN	72,025	485	0	768	3
Hardin, KY	96,825	154	0	688	-39

Bullitt and Oldham Counties had high population growth between 2000 and 2005 compared to the other counties in the Louisville area. However, Oldham, Jefferson and Bullitt Counties had a sizable increase in VMT from 1996 and 2005, an increase greater than Clark, Floyd and Hardin Counties in the Louisville area. The Kentucky counties of Jefferson, Bullitt and Oldham based on this factor are also counties that are nonattainment candidates based on Factors 1, 2, 3, and 4.

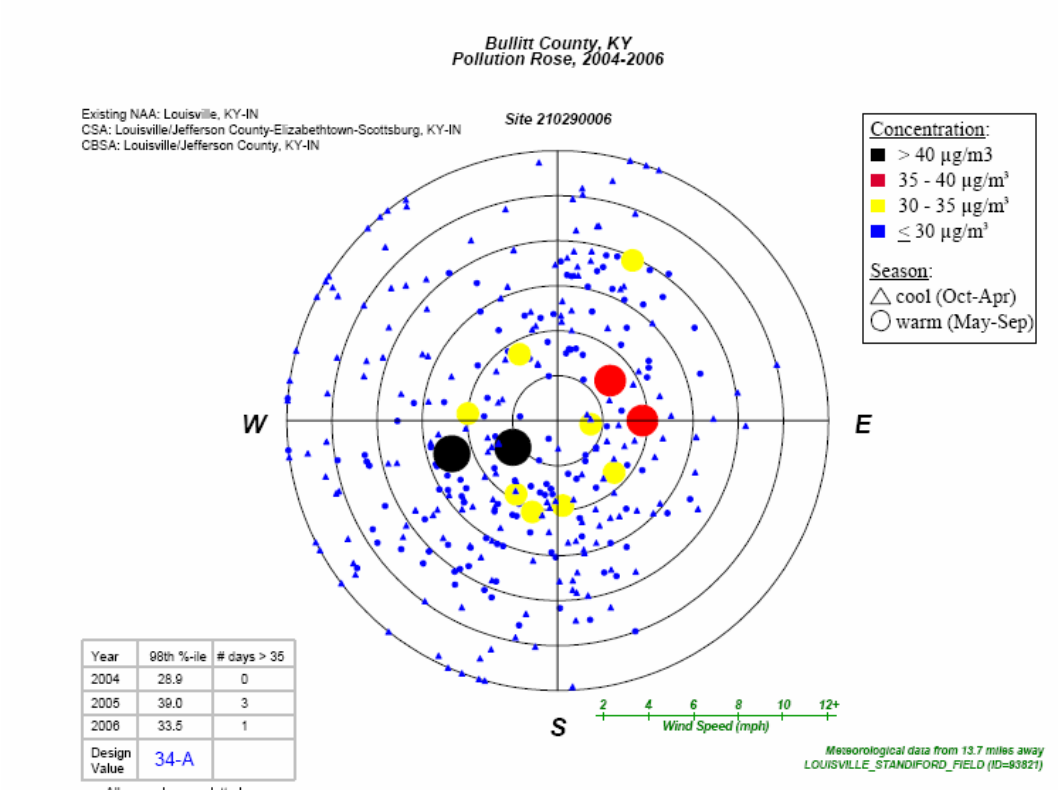
Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM or FEM air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour PM2.5 values by color; days exceeding 35 ug/m3 are denoted with a red or black icon. A dot indicates the day occurred in the warm

season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

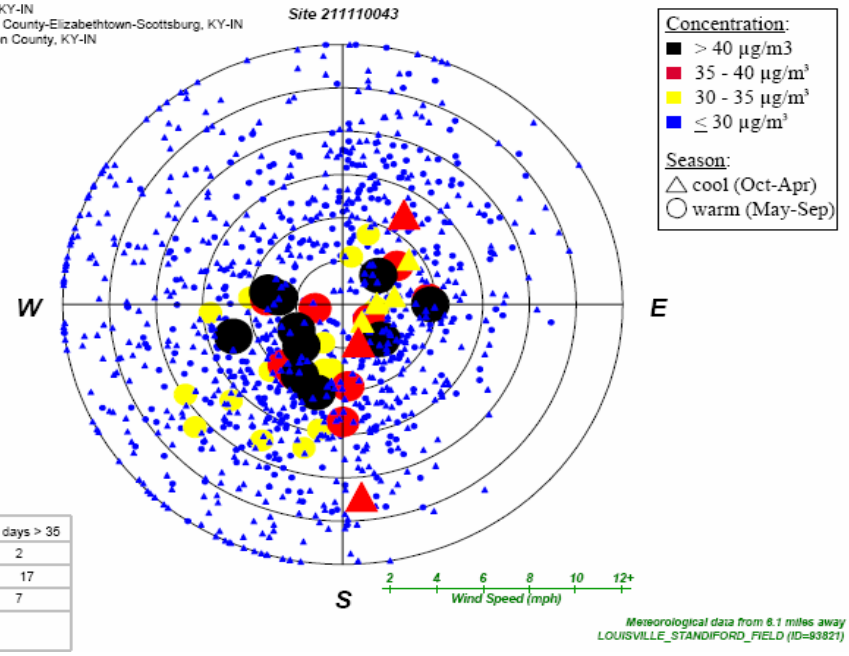
Figure 2. Pollution roses for Bullitt and Jefferson Counties, KY



Jefferson County, KY
Pollution Rose, 2004-2006

Existing NAA: Louisville, KY-IN
CSA: Louisville/Jefferson County-Elizabethtown-Scottsburg, KY-IN
CBSA: Louisville/Jefferson County, KY-IN

Site 211110043



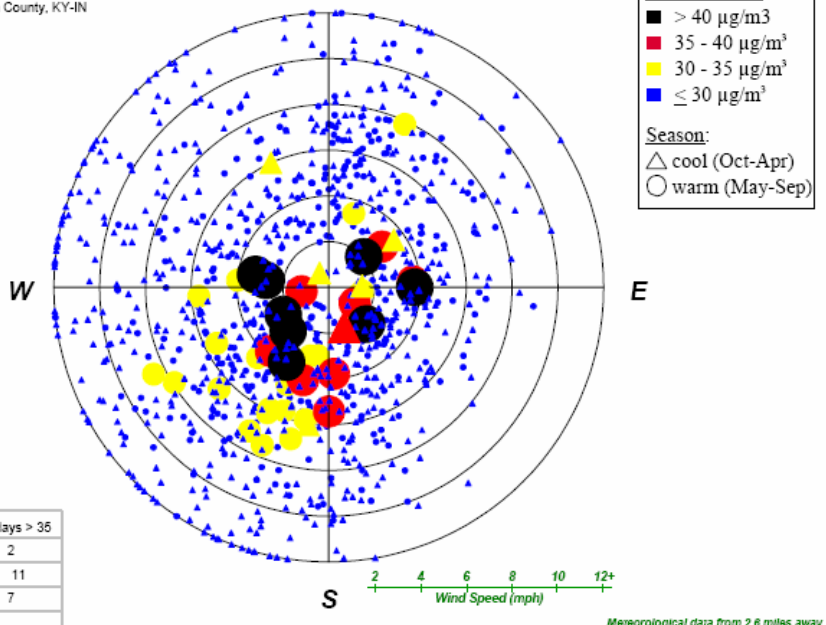
Year	98th %-ile	# days > 35
2004	30.6	2
2005	40.9	17
2006	32.3	7
Design Value	35-A	

Meteorological data from 6.1 miles away
LOUISVILLE_STANDIFORD_FIELD (ID=93821)

Jefferson County, KY
Pollution Rose, 2004-2006

Existing NAA: Louisville, KY-IN
CSA: Louisville/Jefferson County-Elizabethtown-Scottsburg, KY-IN
CBSA: Louisville/Jefferson County, KY-IN

Site 211110044



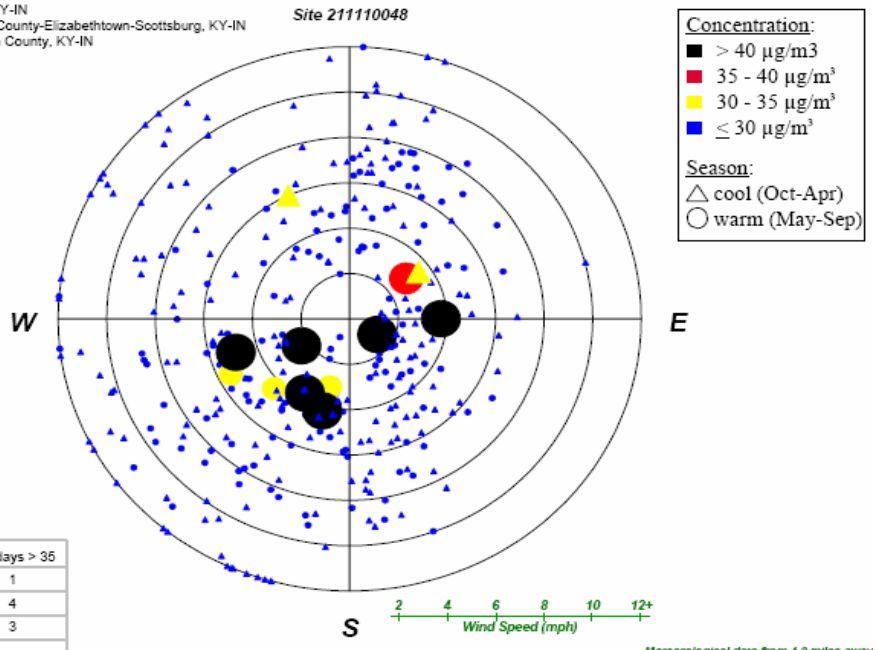
Year	98th %-ile	# days > 35
2004	30.6	2
2005	40.1	11
2006	36.3	7
Design Value	36-NA	

Meteorological data from 2.6 miles away
LOUISVILLE_STANDIFORD_FIELD (ID=93821)

Jefferson County, KY
Pollution Rose, 2004-2006

Existing NAA: Louisville, KY-IN
CSA: Louisville/Jefferson County-Elizabethtown-Scottsburg, KY-IN
CBSA: Louisville/Jefferson County, KY-IN

Site 211110048



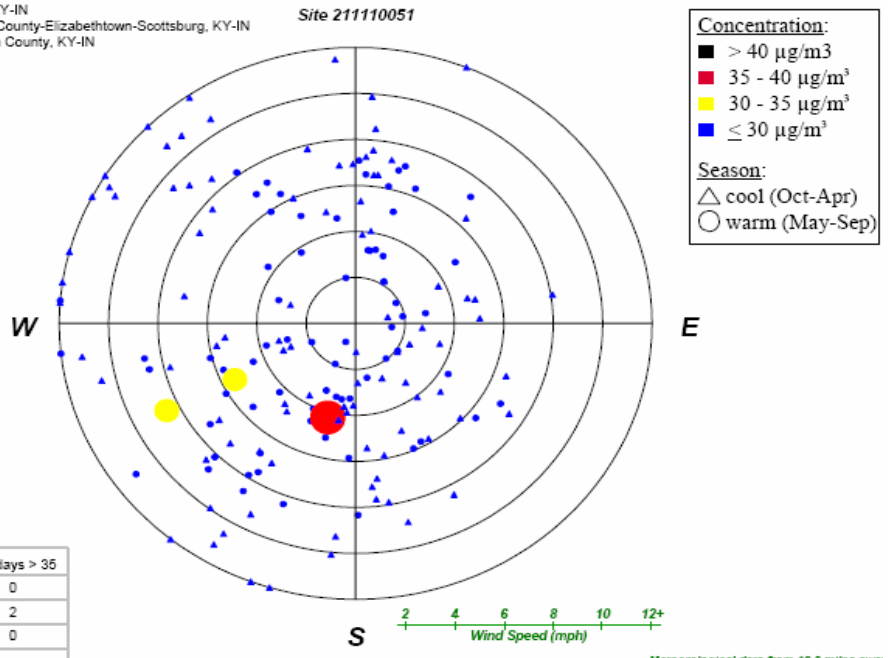
Year	98th %-ile	# days > 35
2004	28.8	1
2005	43.2	4
2006	36.7	3
Design Value	36-NA	

Meteorological data from 4.0 miles away
LOUISVILLE_STANDIFORD_FIELD (ID=93821)

Jefferson County, KY
Pollution Rose, 2004-2006

Existing NAA: Louisville, KY-IN
CSA: Louisville/Jefferson County-Elizabethtown-Scottsburg, KY-IN
CBSA: Louisville/Jefferson County, KY-IN

Site 211110051



Year	98th %-ile	# days > 35
2004	25.8	0
2005	36.5	2
2006	32.5	0
Design Value	32-A	

Meteorological data from 12.2 miles away
LOUISVILLE_STANDIFORD_FIELD (ID=93821)

As shown in the pollution rose in Figure 2, the average prevailing surface wind direction for high $PM_{2.5}$ days in Bullitt, Jefferson and Oldham Counties is from the southwest and, west typically at 6-12 miles per hour. The pollution roses show that 24-hour $PM_{2.5}$ concentrations are influenced by emissions from any direction at various times, but these data also suggest that emissions from some directions relative to the violation are more likely to contribute to the violation than emissions from other directions.

Based on analysis of this factor, EPA concludes that Jefferson and Bullitt Counties are further geographically and meteorologically candidates for a 24-hour $PM_{2.5}$ nonattainment designation.

The Kentucky counties of the Louisville area based on this factor are also counties that are nonattainment candidates based all factors above.

Note: the meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of $PM_{2.5}$ over the Louisville area.

The Louisville area does not have any geographical or topographical barriers significantly limiting air-pollution transport within its air shed. Therefore, this factor did not play a significant role in the decision-making process.

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

In evaluating the jurisdictional boundary factor, consideration should be given to existing boundaries and organizations that may facilitate air quality planning and the implementation of control measures to attain the standard. Areas designated as nonattainment (e.g for PM2.5 or 8-hour ozone standard) represent important boundaries for state air quality planning.

The existing PM2.5 nonattainment boundary consists of Jefferson and Bullitt Kentucky and Clark and Floyd Counties in Indiana.

The Louisville metropolitan area is comprised of Jefferson, Bullitt, and Oldham, Kentucky and Clark and Floyd Counties in Indiana were included in the ozone nonattainment.

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented for major sources in the Louisville area.

The emission estimates on Table 1 (under Factor 1) include any control strategies implemented by the states in the Louisville area before 2005 that may influence emissions of any component of $PM_{2.5}$ emissions (i.e., total carbon, SO_2, NOx, and crustal $PM_{2.5}$).

Highway Mobile Source Reductions
Federal Motor Vehicle Control Programs (FMVCP)
Tier 2 Vehicle Emissions and Fuel Standards
Heavy Duty Engine, Vehicle and Fuel Standards
Point Source Emissions Reductions
Reasonably Available Control Measures (RACM)
Maximum Available Control Technology (MACT)
Area Source Reductions
Open burning regulations for former 1-hour ozone area
Additional Reductions
NOx SIP Call Reductions

Jefferson County has two major power plants (Cane Run and Mill Creek) that contribute to the nonattainment area and will still require further analysis.

In considering county-level emissions, EPA considered 2005 emissions data from the National Emissions Inventory. EPA recognizes that certain power plants or large sources of emissions in this potential nonattainment area may have installed emission controls or otherwise significantly reduced emissions since 2005 and that this information may not be reflected in this analysis. EPA will consider additional information on emission controls in making final designation decisions. In cases where specific plants already have installed emission controls or plan to install such controls in the near future, EPA requests additional information on:

- the plant name, city, county, and township/tax district
- identification of emission units at the plant, fuel use, and megawatt capacity
- identification of emission units on which controls will be installed, and units on which controls will not be installed
- identification of the type of emission control that has been or will be installed on each unit, the date on which the control device became / will become operational, and the emission reduction efficiency of the control device
- the estimated pollutant emissions for each unit before and after implementation of emission controls

- whether the requirement to operate the emission control device will be federally enforceable by December 2008, and the instrument by which federal enforceability will be ensured (e.g. through source-specific SIP revision, operating permit requirement, consent decree)

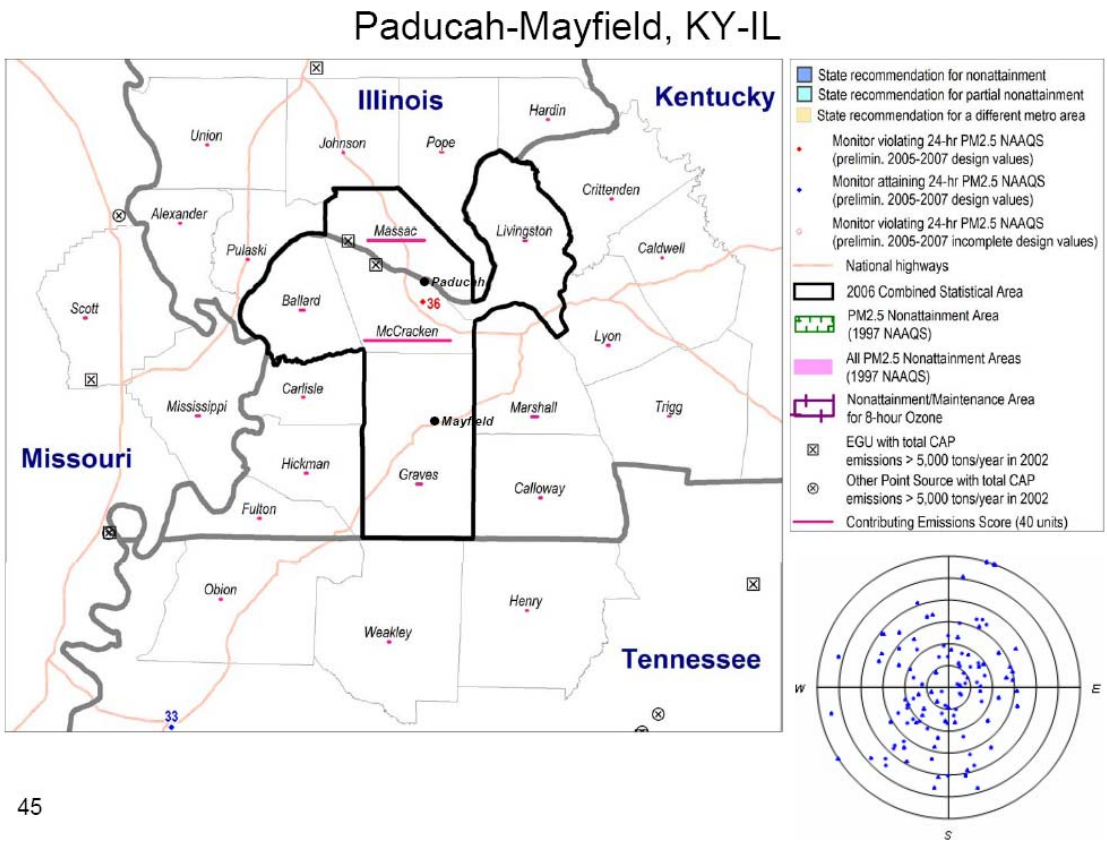
EPA Technical Analysis for Paducah-Mayfield

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for the Paducah-Mayfield area identifies the counties with monitors that violate the 24-hour PM2.5 standard and evaluates the counties that potentially contribute to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

Figure 1 is a map of the counties in the area and other relevant information such as the locations and design values of air quality monitors, the metropolitan area boundary, and counties recommended as nonattainment by the State.

Figure 1. Paducah-Mayfield, KY-IL MSA



In December 2007, Kentucky recommended that no areas be designated as "nonattainment" for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2004-2006. These data are from Federal Reference Method (FRM) and Federal Equivalent Method (FEM) monitors located in the state. A State letter from the Kentucky Division for Air Quality was sent to EPA, on December 7, 2007.

Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network. Analysis of these data indicates that the days with the highest fine particle concentrations occur predominantly in the summer.

Based on EPA's 9-factor analysis described below, EPA believes that McCracken County should be designated nonattainment for the 24-hour $PM_{2.5}$ air-quality standard as part of the Paducah-Mayfield nonattainment area, based upon currently available information. These counties are listed in the table below.

Paducah-Mayfield	State-Recommended Nonattainment Counties	EPA-Recommended Nonattainment Counties
Kentucky	None	McCracken

The following is a summary of the 9-factor analysis for the EPA Region 4 portion of the Paducah-Mayfield area.

The Paducah, KY-IL metropolitan statistical area (MSA) includes the counties of Massac, IL, Ballard, KY, Livingston, KY, and McCracken, KY. The Mayfield, KY MSA includes Graves County, KY. The Paducah-Mayfield, KY-IL combined statistical area (CSA) is comprised of the Paducah, KY-IL MSA, and the Mayfield, KY MSA.

McCracken County is within the CSA, and contains a violating monitor. The County contains an electric generating unit (EGU), and has high emissions levels of PM, SO_2, NOx and VOC.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown in Table 1 as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive way for consideration of data for these factors. A summary of the CES is included in Enclosure 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Paducah-Mayfield area. Counties are listed in descending order by CES.

Table 1. $PM_{2.5}$ Related Emissions and Contributing Emissions Score

County	State Recommended Nonattainment	CES	$PM_{2.5}$ emissions total (tpy)	$PM_{2.5}$ emissions carbon (tpy)	$PM_{2.5}$ emissions other (tpy)	SOx (tpy)	NOx (tpy)	VOCs (tpy)	NH_3 (tpy)
McCracken, KY	No	100	1,046	293	1,046	38,956	24,803	6,661	366
Massac, IL	No	66	1,799	159	1,799	26,884	12,369	2,612	417
Graves, KY	No	6	520	278	520	413	1,735	1,867	2,538
Ballard, KY	No	5	456	140	456	927	2,785	1,661	855
Livingston, KY	No	3	197	121	197	337	2,155	1,200	239

Note that the table may not include all counties considered in the 9-factor analysis, and that those counties not shown had no factors that indicated that they should be candidates for a nonattainment status.

McCracken County, KY has a CES score of 100, as well as high emissions levels. McCracken County contains one large electric generating unit (EGU) facility, and two chemical manufacturing facilities that contribute to the elevated emissions levels. Massac County, IL also has a relatively high CES score and emissions levels. Massac County has two EGU facilities, and one natural gas facility, one cement facility, and one chemical manufacturing facility. Based on the emissions levels and CES values, McCracken County, KY is a candidate for a 24-hour $PM_{2.5}$ nonattainment designation and, therefore, requires further analysis.

Based on the analysis for this factor, the Counties of Graves, Ballard and Livingston should be dropped from consideration. Additionally, these counties were not recommended for a nonattainment designation by the State.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values (in $\mu g/m^3$) for air quality monitors in counties in the Paducah-Mayfield area based on data for the 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98^{th} percentile values are 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour $PM_{2.5}$ design values for counties in the Paducah-Mayfield area are shown in Table 2.

Table 2. Air Quality Data

County	State Recommended Nonattainment	24-hr PM2.5 Design Values, 2004-2006 ($\mu g/m^3$)	24-hr PM2.5 Design Values, 2005-2007 ($\mu g/m^3$)
McCracken County, KY	No	33	36

McCracken County, Kentucky shows a violation of the 2006 24-hour $PM_{2.5}$ standard. Therefore, this county is included in the Paducah-Mayfield nonattainment area. However, the absence of a violating monitor alone is not a sufficient reason to eliminate counties as candidates for nonattainment status. Each county has been evaluated based on the weight of evidence of the nine factors and other relevant information.

Additionally, McCracken County is also a nonattainment area candidate based on the CES score and Factor 1.

Note: Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with a FRM or FEM monitor. All data from Special Purpose Monitors (SPM) using an FRM, FEM, or Alternative Reference Method (ARM) which has operated for more than 24 months is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr PM2.5 NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Table 3 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data gives an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards.

Table 3. Population

County	2005 Population	2005 Population Density (pop/sq mi)
McCracken, KY	64,690	241
Massac, IL	15,225	63
Graves, KY	37,650	68
Ballard, KY	8,262	30
Livingston, KY	9,783	29

McCracken County, Kentucky, has the highest population and population density of the counties listed above. Graves, Ballard, and Livingston, counties have moderately low populations and population densities compared to McCracken County, and based on this factor do not require further evaluation.

Note that McCracken County, which ranks high for this factor, is also high-ranking based on other factors and the CES score.

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the Paducah-Mayfield area, the percent of total commuters in each county who commute to other counties within the Paducah-Mayfield area, as well as the total Vehicle Miles Traveled (VMT) for each county in thousands of miles (see Table 4). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area.

Table 4. Traffic and Commuting Patterns

County	State Recommended Non-attainment	2005 VMT (1000s mi)	Number Commuting to any violating county	Percent Commuting to any violating county	Number Commuting into statistical area	Percent Commuting into statistical area
McCracken, KY	No	832	24,204	84	26,830	93
Graves, KY	No	435	2,350	15	12,880	83
Massac, IL	No	225	1,950	30	5,860	90
Livingston, KY	No	174	1,770	41	3,580	82
Ballard, KY	No	102	1,290	35	3,380	92

The listing of counties in Table 4 reflects a ranking based on the number of people commuting to other counties.

McCracken County shows the highest numbers for vehicle miles traveled, as well as those commuting into the CSA and any violating county.

McCracken County is also a consideration for a nonattainment designation based on other factors and the CES score.

Note: The 2005 VMT data used for Tables 4 and 5 of the 9-factor analysis has been derived using methodology similar to that described in "Documentation for the final 2002 Mobile National Emissions Inventory, Version 3, September 2007, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/2002_mobile_nei_version_3_report_092807.pdf
The 2005 VMT data were taken from documentation which is still draft, but which should be released in 2008.

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled for 1996-2005 for counties in the Paducah-Mayfield area, as well as patterns of

population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and likely to be contributing to fine particle concentrations in the area.

Table 5 below shows population, population growth, VMT and VMT growth for counties that are included in the Paducah-Mayfield area. Counties are listed in descending order based on VMT growth between 1996 and 2005.

Table 5. Population and VMT Values and Percent Change.

Location	Population (2005)	Population Density	Population Growth (2000-2005)	Population % change (2000 - 2005)	2005 VMT (1000s mi)	VMT % change (1996 to 2005)
Livingston, KY	9,783	29	622	1.68%	174	56
McCracken, KY	64,690	241	-21	-0.21%	832	26
Massac, IL	15,225	63	-24	-0.29%	225	25
Graves, KY	37,650	68	64	0.42%	435	21
Ballard, KY	8,262	30	-824	-1.26%	102	12

All of the counties in the Paducah-Mayfield CSA showed negligible population growth between 2000 and 2005. However, Livingston, KY more than doubled in VMT from 1996 to 2005, at 56 percent. Additionally, McCracken, KY, and Massac, IL had sizeable increases in VMT from 1996 to 2005, at 25 and 26 percent, respectively.

McCracken, KY is also a nonattainment county candidate based on other factors and the CES score.

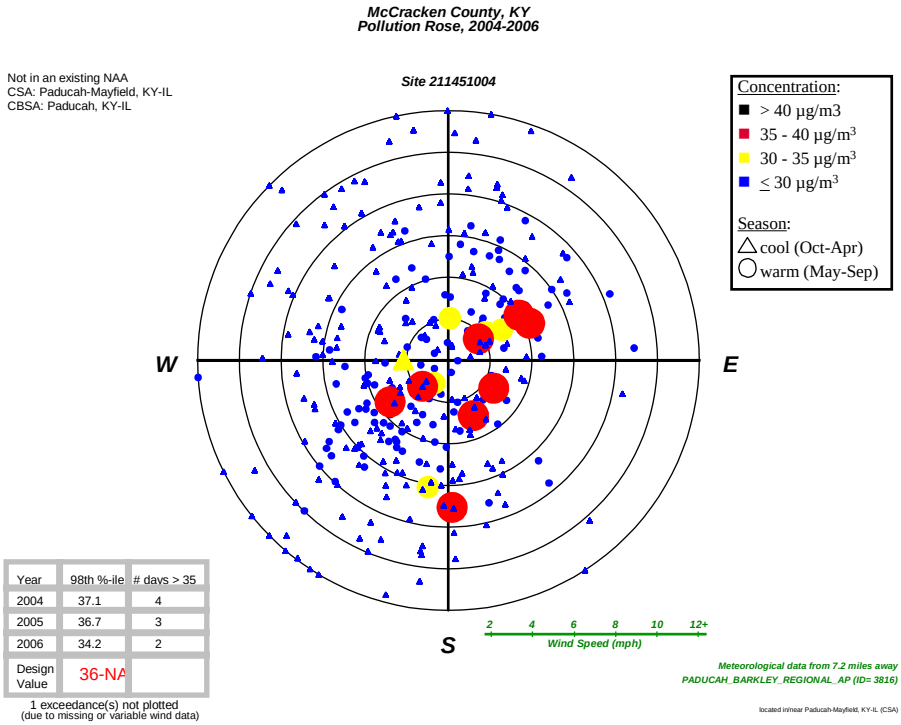
Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM or FEM air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour PM2.5 values by color; days exceeding 35 ug/m3 are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that

day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

Figure 2. McCracken County, KY Pollution Rose



A pollutions rose for the violating monitor in McCracken County is shown above. The pollution rose shows that elevated PM2.5 levels at the violating monitor may originate from multiple directions, and thus, cannot be attributed to one prevailing wind direction. However, data does suggest that potential emissions contributions originating from a northwesterly direction should be eliminated.

McCracken County is also a nonattainment area candidate based on CES score and other factors.

Note: the meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of $PM_{2.5}$ over the Paducah-Mayfield area.

The Paducah-Mayfield area does not have any geographical or topographical barriers significantly limiting air-pollution transport within its air shed. The Ohio River separates McCracken County, KY from Massac County, IL; however, we do not expect this factor to have any impact on air pollution transport within the area's air shed. Therefore, this factor did not play a significant role in the decision-making process.

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

In evaluating the jurisdictional boundary factor, consideration should be given to existing boundaries and organizations that may facilitate air quality planning and the implementation of control measures to attain the standard. Areas designated as nonattainment (e.g for PM2.5 or 8-hour ozone standard) represent important boundaries for state air quality planning.

From an EPA Region 4 perspective, there are no existing nonattainment boundaries for the Paducah-Mayfield area. Therefore, this factor did not play a significant role in the decision-making process.

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented for major sources in the Paducah-Mayfield area.

The emission estimates on Table 1 (under Factor 1) include any control strategies implemented by the states in the Paducah-Mayfield area before 2005 that may influence emissions of any component of $PM_{2.5}$ emissions (i.e., total carbon, SO_2, NOx, and crustal $PM_{2.5}$).

In the Paducah-Mayfield area, the majority of the emissions are from SO_2 and NOx in McCracken and Massac Counties. McCracken County currently has low-NOx boilers (LNB) installed on all ten units at the Tennessee Valley Authority's (TVA) Shawnee Fossil Plant. The facility also has baghouse PM_{10} controls installed on all units. Additionally, unit 10 has a bubbling limestone bed to control SO_2. Thus, this factor analysis generally considered the emissions controls currently in place for McCracken County.

In considering county-level emissions, EPA considered 2005 emissions data from the National Emissions Inventory. EPA recognizes that certain power plants or large sources

of emissions in this potential nonattainment area may have installed emission controls or otherwise significantly reduced emissions since 2005 and that this information may not be reflected in this analysis. EPA will consider additional information on emission controls in making final designation decisions. In cases where specific plants already have installed emission controls or plan to install such controls in the near future, EPA requests additional information on:

- the plant name, city, county, and township/tax district
- identification of emission units at the plant, fuel use, and megawatt capacity
- identification of emission units on which controls will be installed, and units on which controls will not be installed
- identification of the type of emission control that has been or will be installed on each unit, the date on which the control device became / will become operational, and the emission reduction efficiency of the control device
- the estimated pollutant emissions for each unit before and after implementation of emission controls
- whether the requirement to operate the emission control device will be federally enforceable by December 2008, and the instrument by which federal enforceability will be ensured (e.g. through source-specific SIP revision, operating permit requirement, consent decree)

McCracken County is also a high-ranking county based on others factors and the CES score.

Enclosure 2

Description of the Contributing Emissions Score

The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Using this methodology, scores were developed for each county in and around the relevant metro area. The county with the highest contribution potential was assigned a score of 100, and other county scores were adjusted in relation to the highest county. The CES represents the relative maximum influence that emissions in that county have on a violating county. The CES, which reflects consideration of multiple factors, should be considered in evaluating the weight of evidence supporting designation decisions for each area.

The CES for each county was derived by incorporating the following significant information and variables that impact $PM_{2.5}$ transport:

- Major $PM_{2.5}$ components: total carbon (organic carbon (OC) and elemental carbon (EC)), SO_2, NO_x, and inorganic particles (crustal).
- $PM_{2.5}$ emissions for the highest (generally top 5%) $PM_{2.5}$ emission days (herein called "high days") for each of two seasons, cold (Oct-Apr) and warm (May-Sept)
- Meteorology on high days using the NOAA HYSPLIT model for determining trajectories of air masses for specified days
- The "urban increment" of a violating monitor, which is the urban $PM_{2.5}$ concentration that is in addition to a regional background $PM_{2.5}$ concentration, determined for each $PM_{2.5}$ component
- Distance from each potentially contributing county to a violating county or counties

A more detailed description of the CES can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.

Enclosure 3

$PM_{2.5}$ Exceptional Events Technical Support Document

U.S. Environmental Protection Agency Region 4

Louisville, KY-IN Metropolitan Statistical Area

2004 - 2007

Introduction

This document provides U.S Environmental Protection Agency (EPA) Region 4 rationale for concurrence or non-concurrence with an exceptional event flag on the 24-hr average $PM_{2.5}$ concentration recorded at various Air Quality System (AQS) sites within the Louisville Metro Air Pollution Control District (LMAPCD) Ambient Air Monitoring Network. The exceptional event flags that EPA Region 4 has concurred with will be excluded from use in determinations of exceedances and National Ambient Air Quality Standards (NAAQS) violations.

According to 40 CFR 50.1(j):

> "Exceptional event means an event that affects air quality, is not reasonably controllable or preventable, is an event caused by human activity that is unlikely to recur at a particular location or a natural event, and is determined by the Administrator in accordance with 40 CFR 50.14 to be an exceptional event. It does not include stagnation of air masses or meteorological inversions, a meteorological event involving high temperatures or lack of precipitation, or air pollution relating to source noncompliance."

§50.14(b)(2) also states:

> "EPA shall exclude data from use in determinations of exceedances and NAAQS violations where a State demonstrates to EPA's satisfaction that emissions from fireworks displays caused a specific air pollution concentration in excess of one or more national ambient air quality standards at a particular air quality monitoring location and otherwise satisfies the requirements of this section. Such data will be treated in the same manner as exceptional events under this rule, provided a State demonstrates that such use of fireworks is significantly integral to traditional national, ethnic, or other cultural events including, but not limited to July Fourth celebrations which satisfy the requirements of this section."

Finally, §50.14(c)(3)(iii) states:

> "The demonstration to justify data exclusion shall provide evidence that:
> (A) The event satisfies the criteria set forth in 40 CFR 50.1(j);
> (B) There is a clear causal relationship between the measurement under consideration and the event that is claimed to have affected the air quality in the area;
> (C) The event is associated with a measured concentration in excess of normal historical fluctuations, including background; and
> (D) There would have been no exceedance or violation but for the event.

Each $PM_{2.5}$ 24-hr average concentration requested for exclusion was first evaluated against these criteria using a two-step analysis. This analysis was designed to compare the requested value to historical values observed at the site and determine whether any exceedances could have been caused by the suspected event.

Step 1: Monthly Average Comparison

Using 24-hr $PM_{2.5}$ data from AQS for 2004-2007, a comparison three-year monthly average was calculated. The three-year monthly average concentration was calculated excluding data from

the year in which the data in question was collected. For example, a requested value in May 2006 was compared to the average of all the samples collected at the site during May 2004, May 2005, and May 2007. If the three-year average was greater than the annual $PM_{2.5}$ NAAQS (15.0 $\mu g/m^3$) and the requested value was less than the 24-hr $PM_{2.5}$ NAAQS (35 $\mu g/m^3$), then EPA concurrence was not given to the requested value. This is because in EPA's judgment there is insufficient evidence that "there would have been no exceedance or violation but for the event" as required by §50.14(c)(3)(iii)(D) because the normally expected concentration at the site (the three-year monthly mean concentration) is in excess of the NAAQS.

Step 2: Monthly 84th Percentile Comparison

Using 24-hr $PM_{2.5}$ data from AQS for 2004-2007, a comparison three-year upper 84th percentile was calculated for the month in which the requested value was collected. The three-year monthly 84th percentile was calculated excluding data from the year in which the data in question was collected. For example, a requested value in May 2006 was compared to the upper 84th percentile calculated from of all the samples collected at the site during May 2004, May 2005, and May 2007. The calculated three-year monthly upper 84th percentile was considered to represent the range of normally expected high values at that site due to normal local and background sources If the requested value was below the calculated three-year monthly upper 84th percentile, EPA concurrence was not given to the requested value. This is because in EPA's judgment there is insufficient evidence to demonstrate that the NAAQS exceedance was caused by the suspected event as required by §50.14(c)(3)(iii)(D) and not by normal local and background sources at the site.

If a requested value did not meet the requirements described in one or more of the above steps and the State did not submit compelling evidence to demonstrate that the event satisfied the exceptional event criteria, then EPA concurrence was not given to the exceptional event flag on the requested value. The values that did meet all of the conditions described above were then evaluated against the requirements of §50.14(c)(3)(iii).

Summary of maps and graphs used

A variety of maps and graphs were used in this document. Unless otherwise noted, these products were obtained from the DATAFED Data Views Catalog, which can be accessed at http://datafedwiki.wustl.edu/index.php/Data_Views_Catalog. This includes maps using data from AQS, the National Aeronautics and Space Administration (NASA), and the Navy Aerosol Analysis and Prediction System (NAAPS.) Also, unless otherwise noted, all ambient air monitoring data used in this analysis was obtained from the EPA AQS database.

The following discussion will demonstrate that the 24-hr average $PM_{2.5}$ concentrations observed at various Louisville Metro Air Pollution Control District (LMAPCD) network monitoring sites on the following dates meet or fail to meet the criteria laid out in the Exceptional Events Rule, §50.14.

EXCEEDANCE EVENT: Independence Day Fire Work

Exceedance Date:	July 4, 2004
MSA:	Louisville - Jefferson Co. - Scottsburg
Event Description:	Smoke impact from permitted Local firework displays

Table 1: site-specific information used in analysis (μg/m^3)

AQS ID	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-111-0043-1	33.1	20.5	29.5	33.8	No[1]
21-111-0043-2	25.4	20.5	29.8	34.1	No[1,2]
21-111-0044	26.4	21.3	30.9	33.4	No[1,2]

Note [1]Three-year monthly average above 15μg/m^3 and observed concentration is below 35μg/m^3
[2]Observed concentration is below 84 percentile

A. EVENT DESCRIPTION:

Documentation submitted by the Louisville Metro Air Pollution Control District claims that smoke from permitted local firework displays caused NAAQS exceedances at the sites listed above. None of the requested values, however, passed the two-step analysis. Also, documentation submitted by LMAPCD did not clearly demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance "but for" the event. Due to these reasons, no further analyses of these events are necessary[1]. EPA concurrence was not given to these exceptional event flags.

[1] Sonomatech analysis Appendix 1

EXCEEDANCE EVENT: Independence Day Fire Work

Exceedance Date:	July 3 - 4, 2005
MSA:	Louisville -Jefferson Co. - Scottsburg
Event Description:	Smoke impact from permitted Local firework displays

.

Table 2 Site-specific information used in analysis (μg/m^3)

AQS ID	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-111-0043-1	7/3/2005	24.1	18.8	28.0	33.2	No[1,2]
21-111-0043-2	7/3/2005	23.7	18.8	27.8	33.0	No[1.2]
21-111-0044	7/3/2005	27.5	18.9	27.7	32.0	No[1,2]
21-111-0043-1	7/4/2005	29.5	18.8	28.0	33.2	No[1]
21-111-0043-2	7/4/2005	29.7	18.8	27.8	33.0	No[1]
21-111-0044	7/4/2005	31.7	18.9	27.7	32.0	No[1]
21-111-0051	7/4/2005	28.9	19.0	27.9	29.2	No[1]

Note [1]Three-year monthly average above 15μg/m^3 and observed concentration is below 35μg/m^3
[2]Observed concentration is below 84 percentile

A. EVENT DESCRIPTION

Documentation submitted by the Louisville Metro Air Pollution Control District claims that smoke from permitted local firework displays caused NAAQS exceedances at the site listed above. None of the requested values, however, passed the two-step analysis. Also, documentation submitted by LMAPCD did not clearly demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. Due to these reasons, no further analyses of these events are necessary[2]. EPA concurrence was not given to these exceptional event flags.

[2] Sonomatech analysis Appendix 1

EXCEEDANCE EVENT: Independence Day Fire Work

Exceedance Date:	July 3 - 4, 2006
MSA:	Louisville - Jefferson Co. - Scottsburg
Event Description:	Smoke impact from permitted Local firework displays

Table 3 Site-specific information used in analysis (μg/m^3)

AQS ID	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-111-0043-1	7/3/2006	31.7	18.8	28.0	33.2	No[1]
21-111-0043-2	7/3/2006	32.6	18.8	27.8	33.0	No[1]
21-111-0044	7/3/2006	32.1	18.9	27.7	32.0	No[1]
21-111-0043-1	7/4/2006	29.6	18.8	28.0	33.2	No[1]
21-111-0043-2	7/4/2006	31.5	18.8	27.8	33.0	No[1]
21-111-0044	7/4/2006	31.7	18.9	27.7	32.0	No[1]
21-111-0048	7/4/2006	35.3	17.4	25.0	29.5	Yes
21-111-0051	7/4/2006	32.8	19.0	27.9	29.2	No[1]

Note [1]Three-year monthly average above 15μg/m^3 and observed concentration is below 35μg/m^3
[2]Observed concentration is below 84 percentile

A. EVENT DESCRIPTION

Documentation submitted by the Louisville Metro Air Pollution Control District claims that smoke from permitted local firework displays caused NAAQS exceedances at the site listed above. All but one of the requested values failed the two-step analysis. Due to these reasons, no further analyses of these events are necessary[3]. EPA concurrence was not given to these exceptional event flags.

The following analysis will be centered on the Barret site (21-111-0048) event which took place on July 4, 2006. The LMACPD Technical Demonstration provides graphical presentation of hourly data of the $PM_{2.5}$ continuous TEOM monitor, wind speed and wind direction as well as concentration levels three days prior and after the event. Permits for organized Independence Day Fire work displays were also provided.

Fine particulate matter speciation data are available for July 4, 2006, where measured concentrations of both Potassium and Strontium significantly above background levels for the same time period in 2004, 2005, 2006 and 2007. The increased concentration of potassium is indicative that the measured $PM_{2.5}$ mass was impacted by the fire work displays. This along with the other evidence submitted satisfy the requirements of §50.14(c)(3)(iii)(A-D). Therefore, U.S. Environmental Agency Region 4 concurs with LMAPCD request to flag the July 4, 2006, at the Barret site as indicated in $PM_{2.5}$ in Table 3 above.

[3] Sonomatech analysis Appendix 1

B. CAUSAL CONNECTION BETWEEN THE EVENT AND AIR QUALITY

A causal connection between the fireworks displays and the observed exceedance of the $PM_{2.5}$ NAAQS was graphical demonstrated with the hourly data from the $PM_{2.5}$ continuous TEOM monitors which show concentrations of $PM_{2.5}$ beginning to rise at 1900 hours (Figure 1). Large spikes in concentration were seen on 7/4/06 at hours 22-24. Smaller spikes were seen the previous night. The impact from the fireworks was limited to a few hours due to light/moderate winds throughout the night, a weak upper-level trough, and the lack of a surface inversion, all of which enhanced mixing. If the three highest hours (22-24) are replaced with the median or excluded, the 24-hour average decreases by about 38%[4].

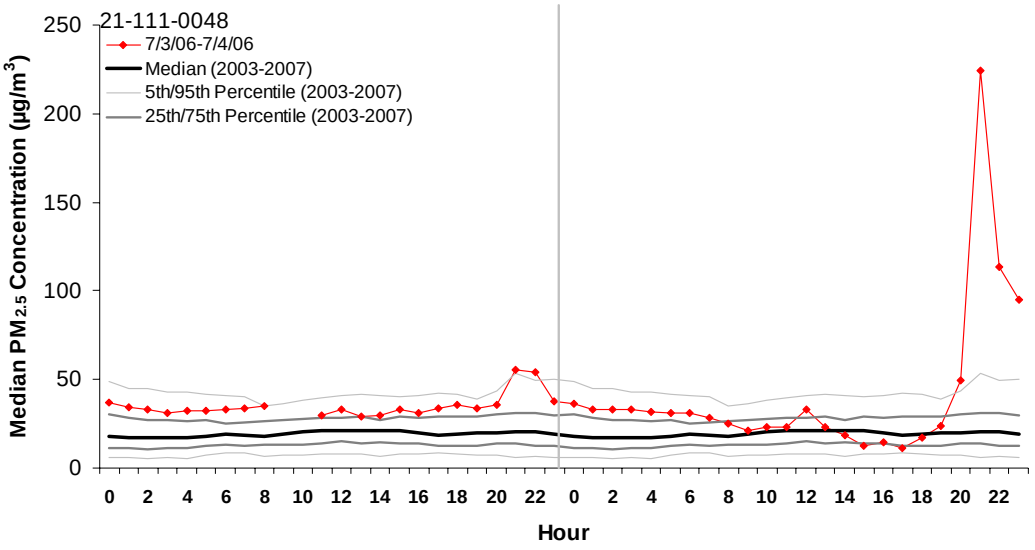


Figure 1: Barret TEOM hourly data SONOMATECH

According to Perry (1999) and Vecchi et al. (2008), strontium is widely used in fireworks to create red coloring, and is normally present in the atmosphere at very low levels. According to Vecchi et al. (2008), "Sr was recognized as the best fireworks tracer because its concentration was very high during the [fireworks] event and lower than, or comparable with, minimum detection limits during other time intervals, suggesting that it was mainly due to pyrotechnic displays." Potassium nitrate is used as an oxidizer and is a prominent component in fireworks.

[4] SONOMATECH

C. COMPARISON TO BACKGROUND LEVELS

Concentrations of both Potassium and Strontium are significantly above background levels for the same time period in 2004, 2005, 2006 and 2007 at the nearby Southwick site. The concentrations are 6 to 10 times higher than background levels for Strontium and 20 to 70 times higher for Potassium. The magnitudes of these concentrations are indicative that the measured $PM_{2.5}$ mass was impacted by the fire work displays (Figure 2 – 3).

Figure 2: Southwick 7/4/06 - Strontium

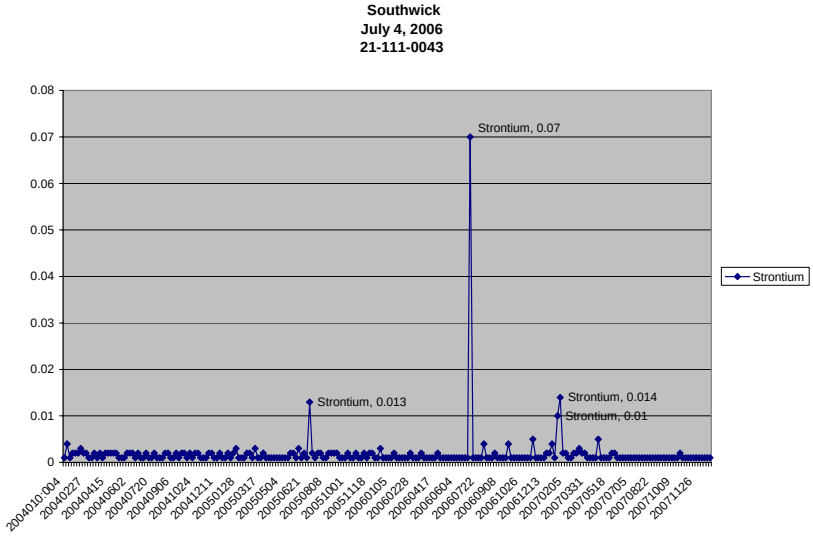
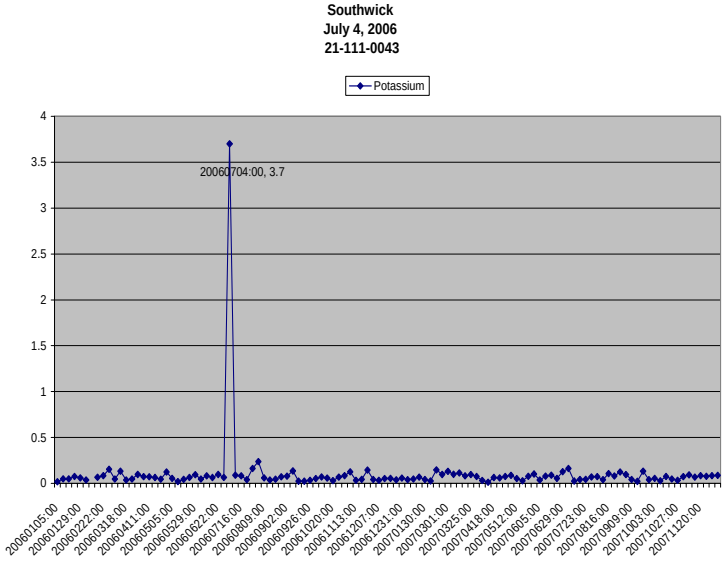


Figure 3: Southwick 7/4/06 - Potassium



D. DEMONSTRATION OF NO EXCEEDANCE "BUT FOR" THE EVENT

In order to demonstrate that there would have been no exceedance of the 24-hr $PM_{2.5}$ standard at the Barret site but for the fireworks displays, a $PM_{2.5}$ source apportionment analysis was conducted using $PM_{2.5}$ speciation data collected on July 4, 2006, at the Barret site, and as discussion using fireworks source apportionment data collected by Perry (1999).

First, $PM_{2.5}$ Speciation data for the Barret site was collected for June 22 – July 19, 2006 from EPA's Air Explorer website, which uses data from the EPA Air Quality System (AQS) database. Next, data collected by Perry (1999) on the percent variance in $PM_{2.5}$ mass explained by each of three source categories (fireworks, wind-blown soil, and other sources) for each of 18 $PM_{2.5}$ speciated parameters (Al, Ba, Br, Ca, Cu, Fe, K, Mg, Mn, Na, Pb, S, Si, Sr, Ti, V, Zn, and Soot) were identified. This data was based on $PM_{2.5}$ speciation data collected from July 1 – 7, 1990 across Western portion of Washington State.

Next, for each day that $PM_{2.5}$ speciation data was collected during June 22 – July 16, 2006, a $PM_{2.5}$ strontium ratio was calculated by dividing the measured $PM_{2.5}$ strontium mass on a given day by the measured $PM_{2.5}$ strontium mass at that site on July 4th. The purpose of this calculation was to quantify the relative impact of $PM_{2.5}$ from fireworks on different days. Next, a $PM_{2.5}$ mass apportionment was conducted for each measured speciation component for each day that speciation data was available. This was accomplished using the following equation:

$$M_{source} = \%V_{source} \times M_{measured} \quad (Eq.\ 1)$$

Where M_{source} is the mass of a specific $PM_{2.5}$ speciated component attributed to a source (i.e. fireworks, wind-blown soil, or other), $\%V_{source}$ is the percent variance that is explained by the source, obtained from Perry (1999), and Mmeasured is the measured $PM_{2.5}$ mass of the speciated component. This analysis was conducted for each of the 18 speciated components discussed in Perry (1999). Because no data was available for the $\%V_{source}$ values for sulfate mass, the $\%V_{source}$ values for elemental sulfur were used, assuming that sulfur mass and sulfate mass are directly proportional. Also, the $\%V_{source}$ values calculated by Perry (1999) for soot were used for both elemental and organic carbon. For all other speciated parameters for which no $\%V_{source}$ values were available, the mass was assumed to be entirely from "other sources."

One limitation of this analysis method is that the $\%V_{source}$ values for each of the three source categories do not add up to 100%. As a result, the entire $PM_{2.5}$ mass observed could not be directly accounted for (mean unaccounted mass fraction = 31.5%). To compensate for this problem, the percentage of the accounted mass was calculated for each of the three sources. The unaccounted mass (observed $PM_{2.5}$ mass – accounted mass) was then apportioned according to these percentages.

The final step in the source apportionment calculations was to account for day to day variability of source categories. Due to the fact that fireworks were only a documented source on July 4th, the $M_{fireworks}$ calculated for each day was multiplied by the $PM_{2.5}$ strontium ratio described above, in order to quantify the relative significance of fireworks as an emissions source on different days. This was considered the final $PM_{2.5}$ mass attributed to fireworks. A leftover mass was

then calculated by subtracting the final mass attributed to fireworks from the fireworks. This leftover mass was then added to the "other sources" category. The resulting source apportionment analysis is shown in Figure 4. This figure demonstrates that this event satisfies the requirement of §50.14(c)(3)(iii)(D) that "there would have been no exceedance or violation but for the event.

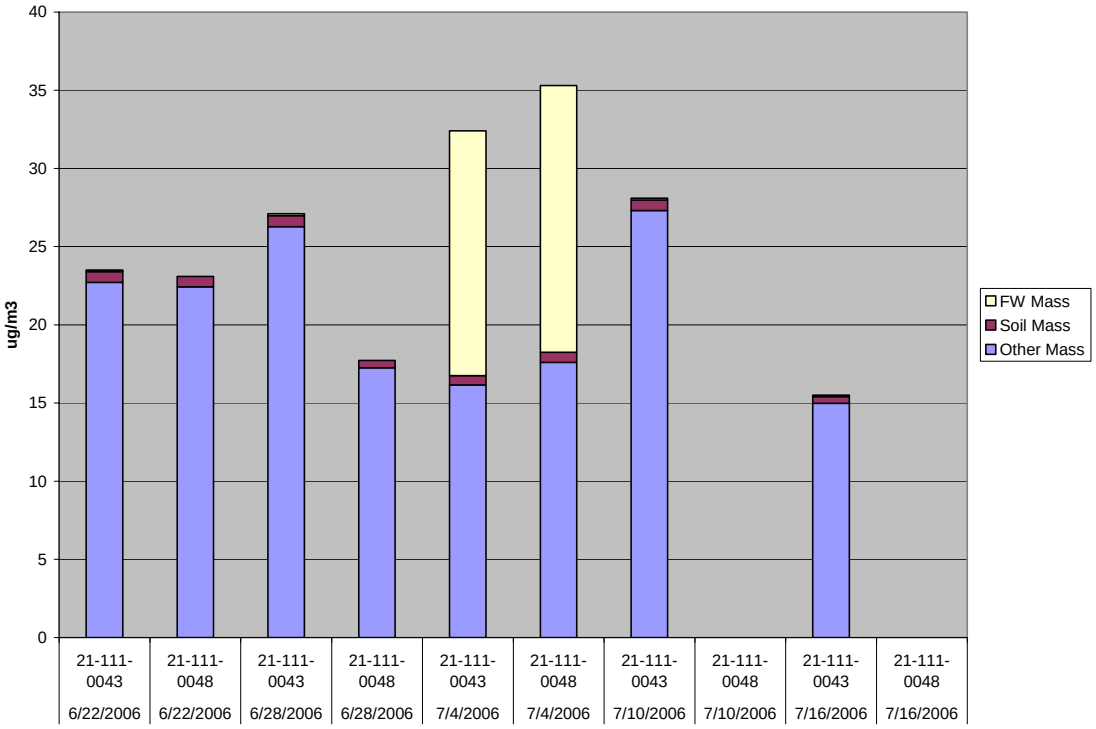


Figure 4 Southwick 7/4/06 "But For"

EXCEEDANCE EVENT: Fort Knox Range Fire

Exceedance Date:	November 11 – 12, 2005
MSA:	Louisville - Jefferson Co. - Scottsburg
Event Description:	Tracer rounds started brush fire in unexplored munitions area

Table 4: Site-specific information used in analysis ($\mu g/m^3$)

AQS ID	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-111-0043-1	11/11/2005	21.3	12.9	18.3	21.7	Yes
21-111-0043-2	11/11/2005	21.2	12.4	17.8	21.0	Yes
21-111-0044	11/11/2005	21.2	13.0	18.5	22.1	Yes
21-111-0048	11/11/2005	28.8	12.0	17.2	18.9	Yes
21-111-0043-1	11/12/2005	36.4	12.9	18.3	21.7	Yes
21-111-0043-2	11/12/2005	35.6	12.4	17.8	21.0	Yes
21-111-0044	11/12/2005	29.6	13.0	18.5	22.1	Yes

Note [1]Three-year monthly average above $15\mu g/m^3$ and observed concentration is below $35\mu g/m^3$
[2]Observed concentration is below 84 percentile

A. EVENT DESCRIPTION

Documentation submitted by the Louisville Metro Air Pollution Control District claims that smoke from the Fort Knox range fire caused NAAQS exceedances at the sites listed above. All of the requested values passed the two-step analysis. Also documentation submitted by Louisville Metro Air Pollution Control District was sufficient to make a determination of a clear causal relationship between the measured concentrations and the event, and that there would have been no exceedance or violation but for the event as required by of§50.14(c)(3)(iii). Therefore, U.S. Environmental Agency Region 4 concurs with LMAPCD request to flag on the dates in Table 4 above.

B. CAUSAL CONNECTION BETWEEN THE EVENT AND AIR QUALITY

The causal connection between the Fort Knox Military Reservation range fire and the exceedance or violation of the NAAQS values has been established by the documentation LMAPCD provided in their Technical Documentation. The demonstration provided the following: 95^{th} percentile for the last four years at each of the sites, pollution roses, wind rose graphs, National Oceanic and Atmospheric Administration (NOAA) satellite fire detection and smoke maps, notification of Air Quality Index (AQI) alerts issued, TEOM continuous $PM_{2.5}$ strip chart and statistical analysis of daily $PM_{2.5}$ and speciation data.

The Ft. Knox Military Reservation is approximately 20 miles southwest of the Louisville. The Courier-Journal Newspaper article reported calls made to the fire stations in Elizabethtown and Louisville prompted by the haze visible in the area. Dispatcher Pat Riordan of the Louisville Fire & Rescue reported that “strong winds of 9 – 15 mph out of the south and low humidity

carried smoke into the Louisville area[5]." The NOAA satellite fire detection map[6] demonstrates smoke plume passing over a portion of the Louisville area submitted provided enough evidence to pinpoint direct causation when taken into consideration together. Speciation data collected at the Barret and Southwick sites on November 12, 2005, show organic matter comprising a greater portion of the particulate mass measured on that day. The increased level of organic carbon is indicative that the measured particulate matter levels were impacted by smoke.

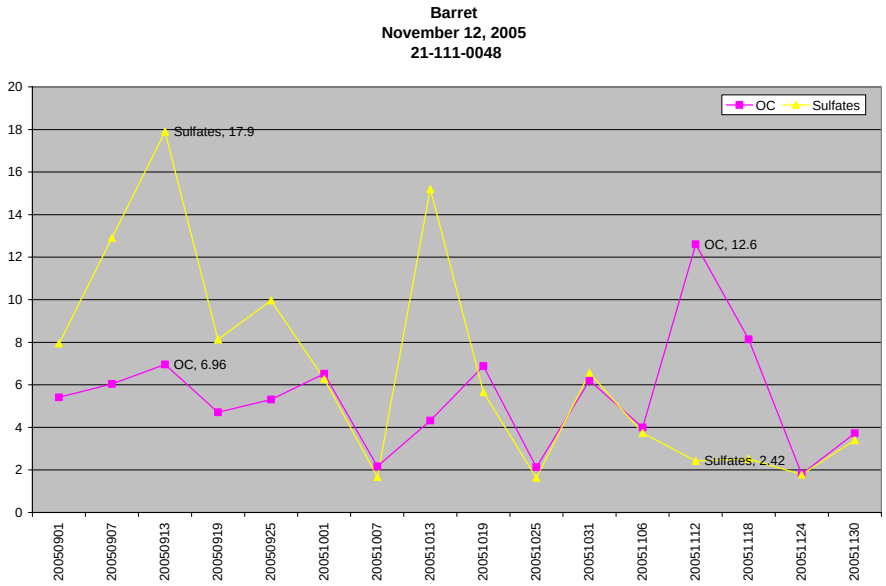


Figure 6: Barret Speciation 11/12/06

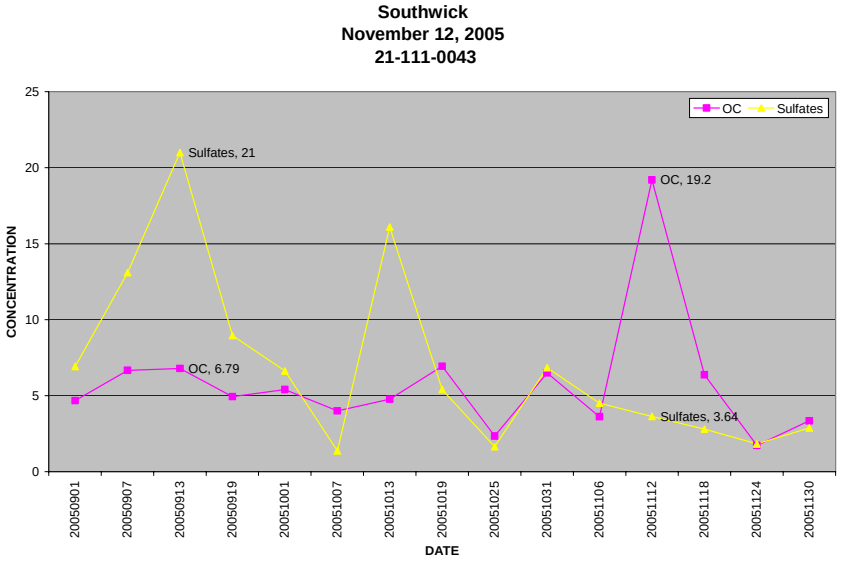


Figure 7: Southwick Speciation 11/12/06

[5] LMAPCD Technical Demonstration Exclusion of $PM_{2.5}$ AQ Monitoring Data Influenced By Wildland Fires for November 11-12, 2005, (NOV 11-12, 2005) pg 7 of 11

[6] Nov 11-12, 2005, page 11 of 11

Hourly concentrations on November 11, 2005 well above the 95th percentile concentrations were assumed to be due to smoke influence. Contribution of smoke[7] to total $PM_{2.5}$, was calculated by replacing concentrations above the 95th percentile with the median concentration measured during the three highest hours (22-24) that hour. The 24-hour average of the hourly measurements decreases by 30% (11/11) and 62% (11/12) at Southwick site and 54% (11/11) and 56% (11/12) at the Barret site. If the 24-hour filter measurements are decreased by the same percentages, the 11/12/05 concentration at 21-111-0043 is well below the 24-hour standard ($17.5\mu g/m^3$).

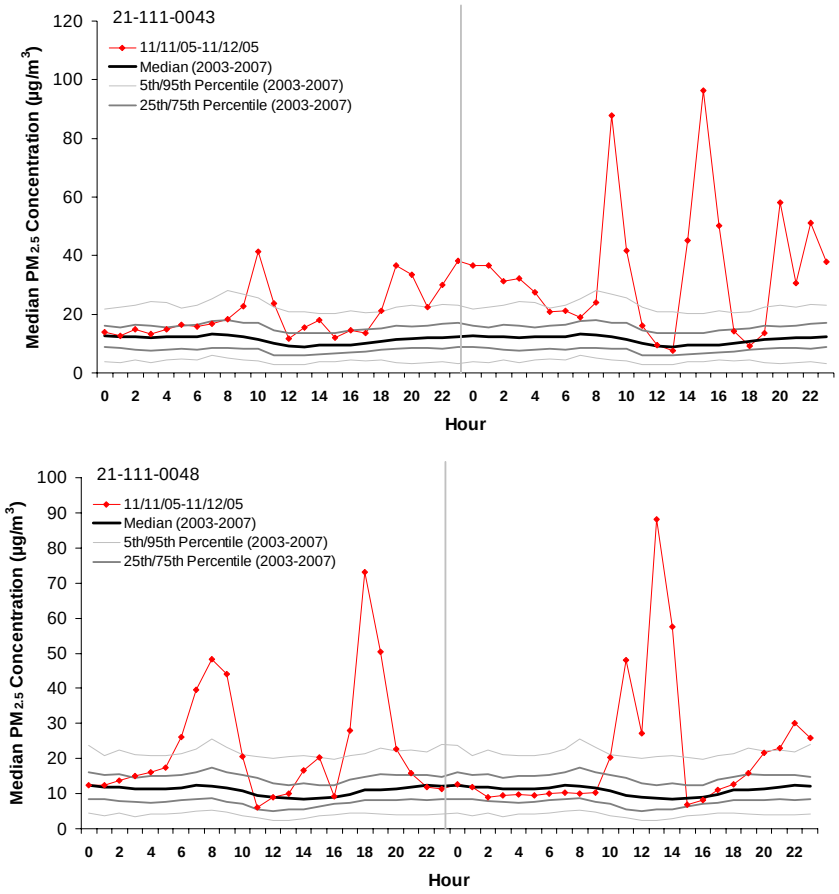


Figure 5: Hourly $PM_{2.5}$ Continuous Data 7/4/06

[7] Smoke contribution values and percentage decrease calculated by SONOMATECH

C. COMPARISON TO BACKGROUND LEVELS

The 24-hr average $PM_{2.5}$ concentrations measured at the sites are above the monthly mean and calculated 95^{th} percentile. The organic carbon measured at Southwick site is approximately 4 times higher than the three year monthly average for that site and 3 times higher for the Barret site. Thereby indicating that exceedance was more likely caused by the increased level of organic carbon measured that day as opposed to the sulfate mass measured.

D. DEMONSTRATION OF NO EXCEEDANCE "BUT FOR" THE EVENT

In order to quantify the impacts of the fire on observed PM2.5 concentrations, speciation data collected at the Southwick site on November 12, 2005 was used to approximate the organic mass increment of the observed PM2.5 mass that was caused by the fire. To demonstrate that there would have been an exceedance or violation of the 24-hour NAAQ Standard the following graphs represents the estimated particulate matter "but for" speciated organic carbon and sulfate mass (Figure 8-9.) The portion of organic matter mass attributable to the fire is defined by the following equation: OMinc = 2(OCd – OC avg)[8], where OMinc is the organic mass increment; OCd and OCavg are the daily and typical (average) measured organic carbon.

The calculated OMinc for the data collected on Nov 12, 2005 at the Barret site (21-111-0048) was 12.0µg/m^3 and at the Southwick site (21-111-0043) was 19.2µg/m^3. Averaging the portion of organic matter mass attributable to the fire yields an OM_{inc} average of 23.3µg/m^3. This figure demonstrates that this event satisfies the requirement of §50.14(c)(3)(iii)(D) that there would have been no exceedance "but for" the event.

[8] "Species Contributions to PM2.5 Mass Concentrations (Turpin and Lim 2001)"

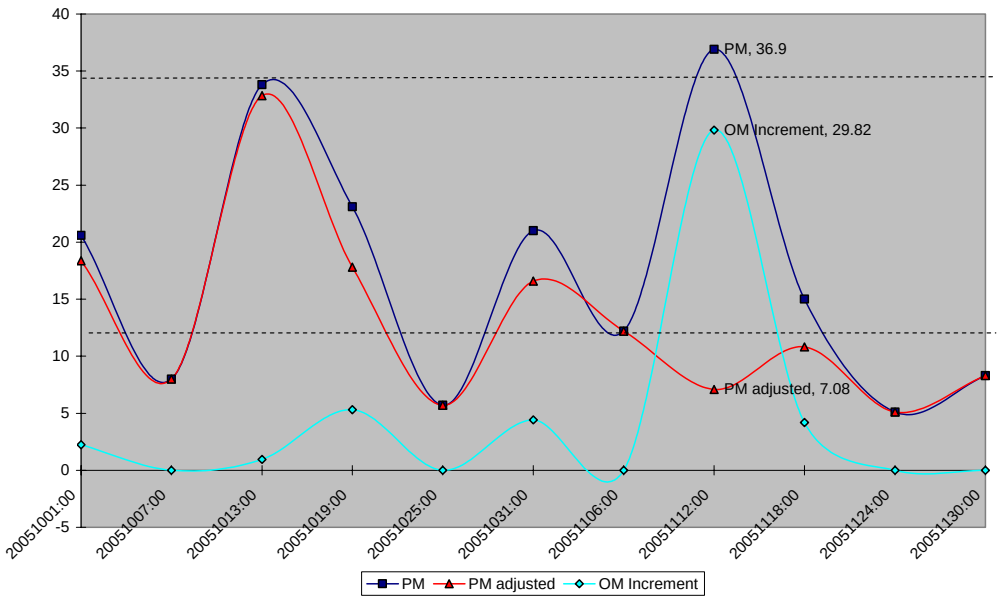


Figure 8 Barret "But For" November 12, 2005

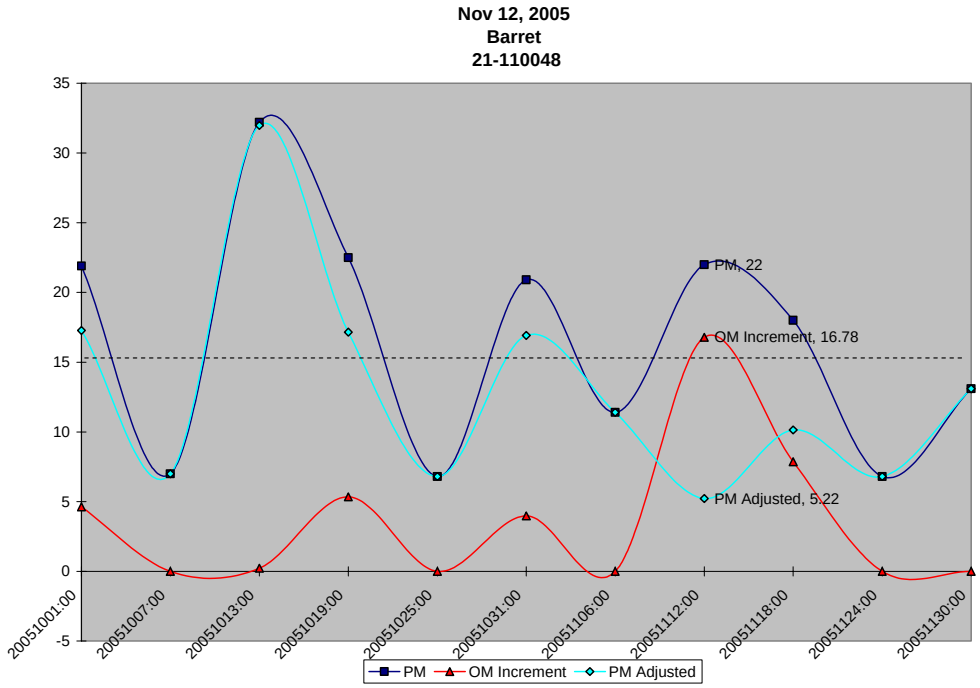


Figure 9 "But For" Southwick November 12, 2005

EXCEEDANCE EVENT: Kansas and Southeastern Wildfires

Exceedance Date:	July 21, 2004
MSA:	Louisville - Jefferson Co. - Scottsburg
Event Description:	Smoke impact from Kansas and Southeastern Wildfires

Table 5 site-specific information used in analysis ($\mu g/m^3$)

AQS ID	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-111-0043-1	7/21/2004	42.8	22.1	28.8	40.0	No
21-111-0043-2	7/21/2004	43	21.7	29.4	37.7	No
21-111-0044	7/21/2004	41	21.9	30.9	39.5	No

Note [1]Three-year monthly average above $15\mu g/m^3$ and observed concentration is below $35\mu g/m^3$
[2]Observed concentration is below 84 percentile

A. EVENT DESCRIPTION

Documentation submitted by the Louisville Metro Air Pollution Control District claims that smoke from the Kansas and Southeastern wildfires caused NAAQS exceedances at the site listed above. All of the requested values passed the two-step analysis. However, documentation submitted by LMAPCD did not clearly demonstrate a clear causal relationship between the measured concentration and the smoke impact from the event, and did not demonstrate that there would have been no exceedance "but for" the event. EPA concurrence was not given to these exceptional event flags.

B. CAUSAL CONNECTION BETWEEN THE EVENT AND AIR QUALITY

A causal connection between the Kansas and Southeastern wildfires and the observed exceedances of the $PM_{2.5}$ NAAQS can not be demonstrated. The demonstration provided the following: TEOM continuous $PM_{2.5}$ strip chart, daily $PM_{2.5}$ measured values four days prior to and two days after the event, statistical analysis of historical $PM_{2.5}$ data and $PM_{2.5}$ speciation data, pollution roses, HYSPLIT backward trajectories, notification of Air Quality Index (AQI) alerts issued, and National Oceanic and Atmospheric Administration (NOAA) smoke maps. The NOAA satellite smoke maps show no smoke plume coverage over the Louisville, KY-IN MSA from the 20th through the 23rd of July 2004[9].

The supporting documentation provided in this Technical Document does not provide enough evidence to prove direct causation. A causal connection between the Kansas and Southeastern wildfires and the observed exceedance of the $PM_{2.5}$ NAAQS can not be demonstrated as required in §50.14(c)(3)(iii)(C).

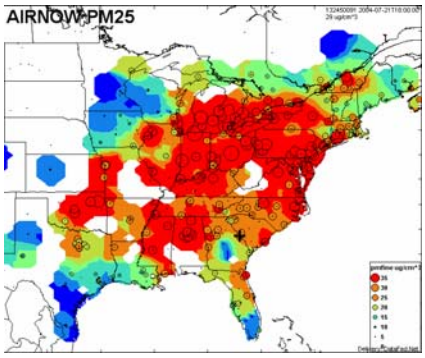
[9] LMAPCD Technical Demonstration Exclusion of $PM_{2.5}$ AQ Monitoring Data Influenced By Wildland Fires for July 21, 2004, (Jul 21, 2004) pg (9-10, 12-13)

C. COMPARISON TO BACKGROUND LEVELS

Figure 10 shows the elevated $PM_{2.5}$ concentration over entire Eastern U.S. was a regional event. The 24-hr average $PM_{2.5}$ concentrations measured at the sites are above the monthly mean and calculated 95th percentile. Also, the multi-year 98th percentile for 2004 including this event is considerably lower than the 98th percentile calculated for 2005. This evidence alone is insufficient to establish a causal relationship between the Kansas and Southeastern wildfires and the exceedance of the 24-hr NAAQS.

D. DEMONSTRATION OF NO EXCEEDANCE "BUT FOR" THE EVENT

The requirement to establish that there would have been no exceedance or violation "but for" this event, as found in Section §50.14(c)(3)(iii)(B), has not been met. The submittal does not adequately demonstrate that emissions from the wildfires impacted exceedances of the National Ambient Air Quality Standard in Louisville - Jefferson Co. – Scottsburg MSA due to transport of airborne particulate matter, as defined in Section 3 of the Final Rule. Region 4 does not concur with the request to flag data on July 21, 2004.



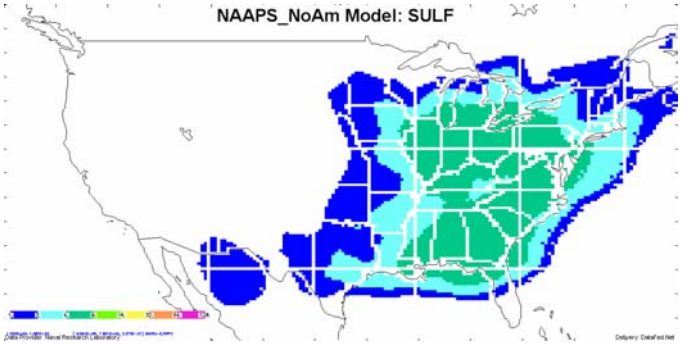


Figure 10: $PM_{2.5}$ concentrations Jul, 21, 2004 **Model SO_4 July 21, 2004**

Kansas and Northwestern Wildfires

Exceedance Date:	August 3 – 4, 2004
MSA:	Louisville - Jefferson Co. - Scottsburg
Event Description:	Smoke impact from Kansas/Northwestern Wildfires

Table 6: site-specific information used in analysis (μg/m^3)

AQS ID	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-111-0043-1	8/03/2004	42.8	22.1	28.8	40.0	No
21-111-0043-2	8/03/2004	43.0	21.7	29.4	37.7	No
21-111-0044	8/03/2004	41.0	21.9	30.9	39.5	No
21-111-0043-1	8/04/2004	43.7	22.1	28.8	40.0	No
21-111-0043-2	8/04/2004	45.8	21.7	29.4	37.7	No
21-111-0044	8/04/2004	43.5	21.9	30.9	39.5	No
21-111-0048	8/04/2004	42.7	21.7	29.2	39.2	No

Note [1]Three-year monthly average above 15μg/m^3 and observed concentration is below 35μg/m^3
[2]Observed concentration is below 84 percentile

A. EVENT DESCRIPTION

Documentation submitted by the Louisville Metro Air Pollution Control District claims that smoke from Kansas and Northwestern Wildfires caused the NAAQS exceedances at the site listed above. All of the requested values passed the two-step analysis. However, documentation submitted by LMAPCD did not clearly demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. EPA concurrence was not given to these exceptional event flags.

B. CAUSAL CONNECTION BETWEEN THE EVENT AND AIR QUALITY

A causal connection between the Kansas and Northwestern wildfires and the observed exceedances of the $PM_{2.5}$ NAAQS can not be demonstrated. No speciation data was provided in the Technical Demonstration for the site or surrounding sites. The demonstration provided the following: TEOM continuous $PM_{2.5}$ strip charts, daily $PM_{2.5}$ measured values four days prior to and two days after the event, statistical analysis of historical $PM_{2.5}$ data and $PM_{2.5}$ speciation data, pollution roses, wind rose graph, HYSPLIT backward trajectory, notification of Air Quality Index (AQI) Alerts issued, National Oceanic and Atmospheric Administration (NOAA) smoke maps, and MODIS TERRA and MODIS AQUA satellite images.

The HYSPLIT backward trajectory when referenced with the NOAA smoke plume maps[10] are insufficient to make an inference with air mass depicted, the subject wildfires and the potential impact to the air quality in the Louisville- KY-IN, MSA.

[10] LMAPCD Technical Demonstration Exclusion of $PM_{2.5}$ AQ Monitoring Data Influenced By Wildland Fires for august 3-4, 2004, (Aug 3-4, 2004) pg (7-13)

The supporting documentation provided in this Technical Document does not provide enough evidence to prove direct causation. A causal connection between the Kansas and Northwestern wildfires and the observed exceedance of the $PM_{2.5}$ NAAQS can not be demonstrated as required in §50.14(c)(3)(iii)(C).

C. COMPARISON TO BACKGROUND LEVELS

The 24-hr average $PM_{2.5}$ concentration is above the 30-day mean, and the calculated 95th percentile. The seasonal average at the Barret site for sulfate and carbon is 6.7µg/m^3 and 4.7µg/m^3 and at the Southwick site 6.5µg/m^3 and 4.8µg/m^3, respectively.

D. DEMONSTRATION OF NO EXCEEDANCE "BUT FOR" THE EVENT

Figure 11 shows the entire Eastern U.S. was experiencing a regionally elevated $PM_{2.5}$ event. However, a widespread sulfate event is evident across the entire Southeast U.S. on August 3, 2004 (Figure 12). Organic carbon is shown to be above average concentrations only in Alabama and parts of Georgia and Mississippi (Figure 12.) The levels of organic carbon measured are at or below the seasonal[11] averages which suggests that the elevated $PM_{2.5}$ levels observed on August 3rd were not caused by transport of airborne particulate matter due to a wildfire event. The requirement to establish that there would have been no exceedance or violation "but for" this event, as found in Section §50.14(c)(3)(iii)(B), has not been met.

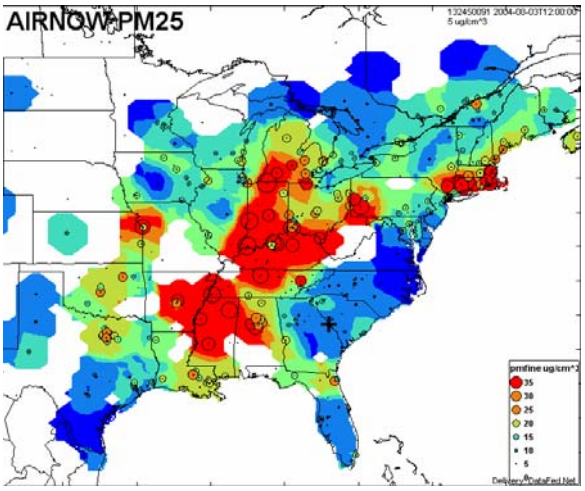
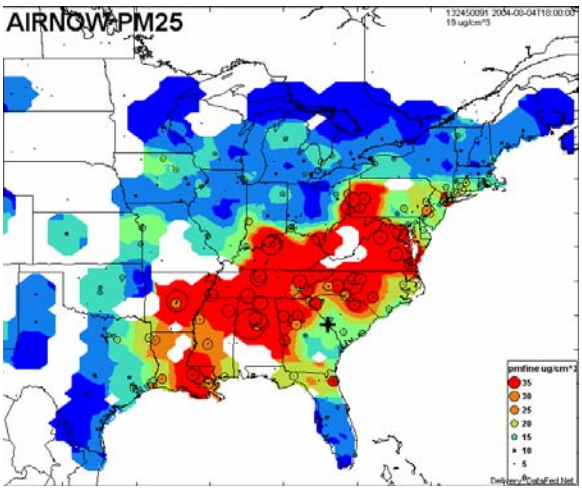


Figure 11 $PM_{2.5}$ concentrations Aug 3, 2004



$PM_{2.5}$ concentrations Aug 4, 2004

[11] Seasonal average (Jun –Aug 2004 -2005 Barret) (Jun –Aug 2006 -2007 Southwick)

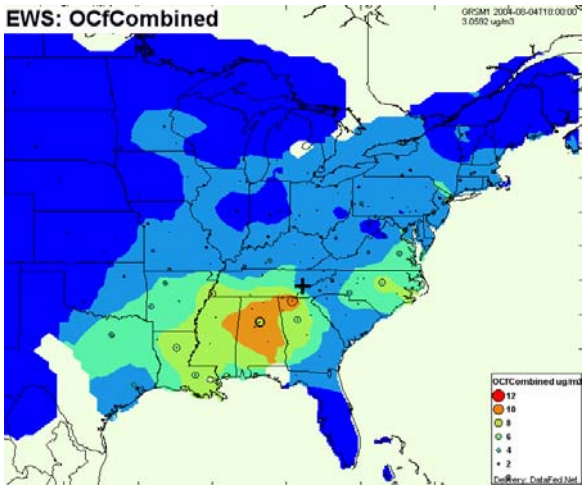
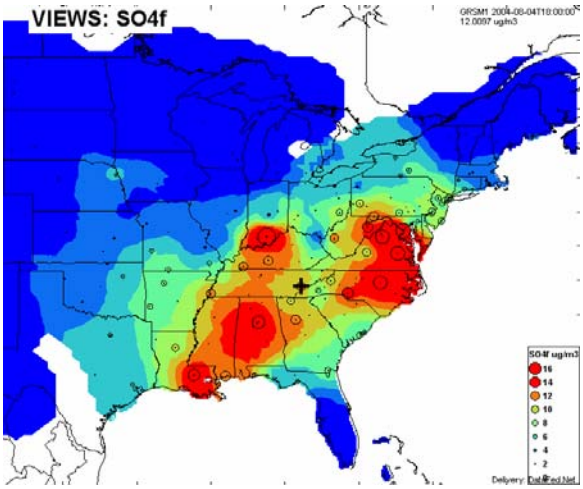


Figure 12 OC Concentrations Aug 3, 2004



SO4 Concentrations Aug 3, 2004

Arkansas, Mississippi and Texas Wildfires

Exceedance Date:	September 8 – 13, 2005
MSA:	Louisville - Jefferson Co. - Scottsburg
Event Description:	Smoke impact from Arkansas, Mississippi and Texas Wildfires

Table 7 : site-specific information used in analysis ($\mu g/m^3$)

AQS ID	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-111-0043-1	9/08/2005	43.5	17.0	27.4	31.1	No
21-111-0043-2	9/08/2005	42.3	16.0	26.7	30.4	No
21-111-0044	9/08/2005	41.1	16.4	26.9	30.6	No
21-111-0043-1	9/09/2005	48.8	17.0	27.4	31.1	No
21-111-0043-2	9/09/2005	47.4	16.0	26.7	30.4	No
21-111-0044	9/09/2005	44.5	16.4	26.9	30.6	No
21-111-0043-1	9/10/2005	45.9	17.0	27.4	31.1	No
21-111-0044	9/10/2005	43.2	16.4	26.9	30.6	No
21-111-0048	9/10/2005	46.4	16.3	25.5	31.2	No
21-111-0043-1	9/11/2005	47.8	17.0	27.4	31.1	No
21-111-0043-2	9/11/2005	47.1	16.0	26.7	30.4	No
21-111-0044	9/11/2005	48.9	16.4	26.9	30.6	No
21-111-0043-1	9/12/2005	40.1	17.0	27.4	31.1	No
21-111-0043-2	9/12/2005	38.2	16.0	26.7	30.4	No
21-111-0044	9/12/2005	37.4	16.4	26.9	30.6	No
21-111-0043-1	9/13/2005	42.9	17.0	27.4	31.1	No
21-111-0043-2	9/13/2005	42.7	16.0	26.7	30.4	No
21-111-0044	9/13/2005	40.1	16.4	26.9	30.6	No
21-111-0048	9/13/2005	41.6	16.3	25.5	31.2	No
21-111-0051	9/13/2005	39.1	14.8	23.6	26.5	No

Note [1]Three-year monthly average above $15\mu g/m^3$ and observed concentration is below $35\mu g/m^3$
[2]Observed concentration is below 84 percentile

A. EVENT DESCRIPTION

The documentation submitted by the Louisville Metro Air Pollution Control District claims that smoke from Arkansas, Mississippi and Texas Wildfires caused NAAQS exceedances at the site listed above. All of the requested values passed the two-step analysis. However, documentation submitted by LMAPCD did not clearly demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. EPA concurrence was not given to these exceptional event flags.

B. CAUSAL CONNECTION BETWEEN THE EVENT AND AIR QUALITY

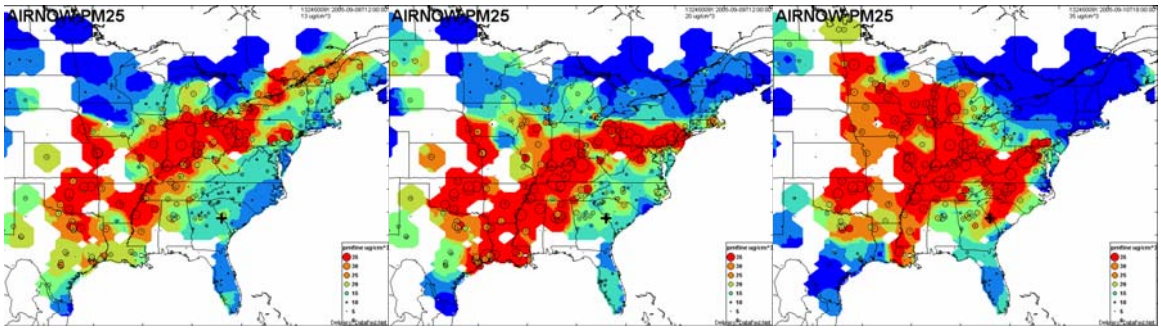
A causal connection between the Arkansas, Mississippi and Texas Wildfires and the observed exceedances of the $PM_{2.5}$ NAAQS can not be demonstrated. The demonstration provided the following: TEOM continuous $PM_{2.5}$ strip charts, daily $PM_{2.5}$ measured values four days prior to and three days after the event, statistical analysis of historical $PM_{2.5}$ data and $PM_{2.5}$ speciation data, pollution roses, wind rose graphs, HYSPLIT backward trajectories, notification of Air

Quality Index (AQI) alerts issued, National Oceanic and Atmospheric Administration (NOAA) smoke maps, and MODIS TERRA and MODIS AQUA satellite images.

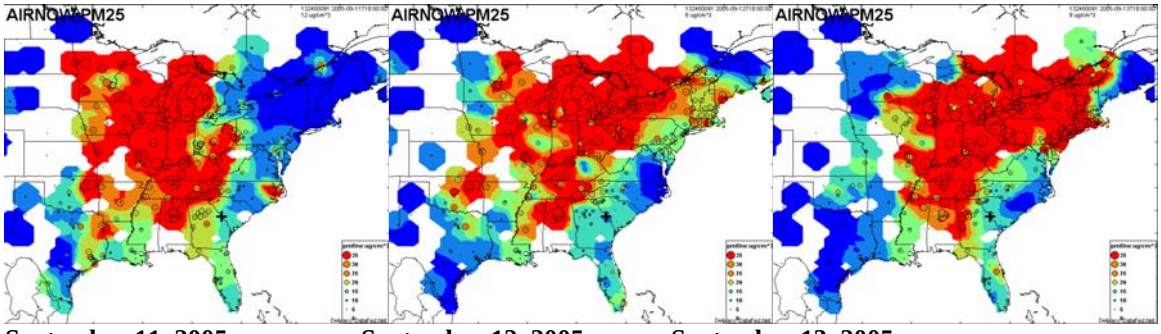
The HYSPLIT backward trajectory[12] from September 7th through September 10th does not indicate the air mass traveling from the Arkansas, Mississippi and Texas Wildfires. The NOAA smoke plume maps[13] provided for the dates listed above is a composite of the dates listed above and therefore insufficient for making a determination.

There is no indication as to causal relationship between the exceedances and the wildfires. The maps obtained from the www.datafed.net website show detectable organic carbon and sulfate levels for only September 10th and 13th. Figures 14 and 15 shows a high regional $PM_{2.5}$ and sulfate concentrations overlapping the Louisville monitoring sites.

The supporting documentation provided in this Technical Document does not provide enough evidence to prove direct causation. A causal connection between the Arkansas, Mississippi and Texas Wildfires and the observed exceedance of the $PM_{2.5}$ NAAQS can not be demonstrated as required in §50.14(c)(3)(iii)©.



September 8, 2005 **September 9, 2005** **September 10, 2005**

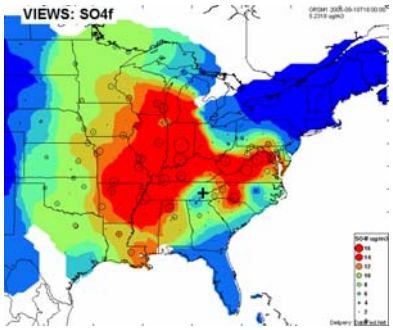


September 11, 2005. **September 12, 2005** **September 13, 2005**

Figure 13 : $PM_{2.5}$ **Concentrations**

[12] LMAPCD Technical Demonstration Exclusion of $PM_{2.5}$ AQ Monitoring Data Influenced By Wildland Fires for September 8-13, 2005, (EMD Sep 8- 13, 2005) pg 17

[13] EMD Sep 8-13, 2005, pg 12-13



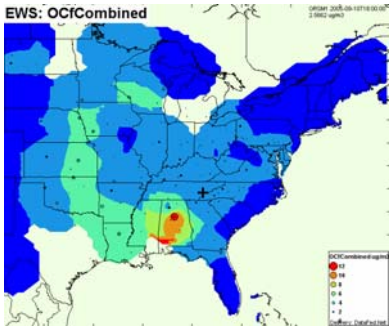
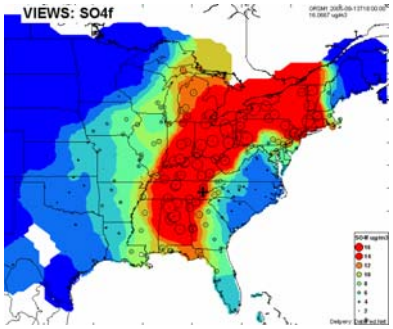


Figure 14: SO4 Concentrations Sep 10, 2005 **OC Concentrations Sep 10, 2005**



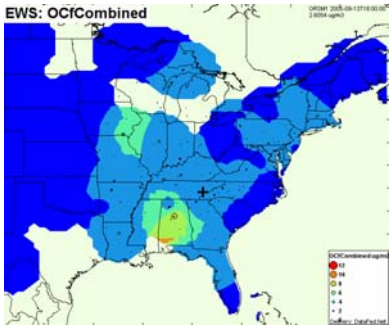
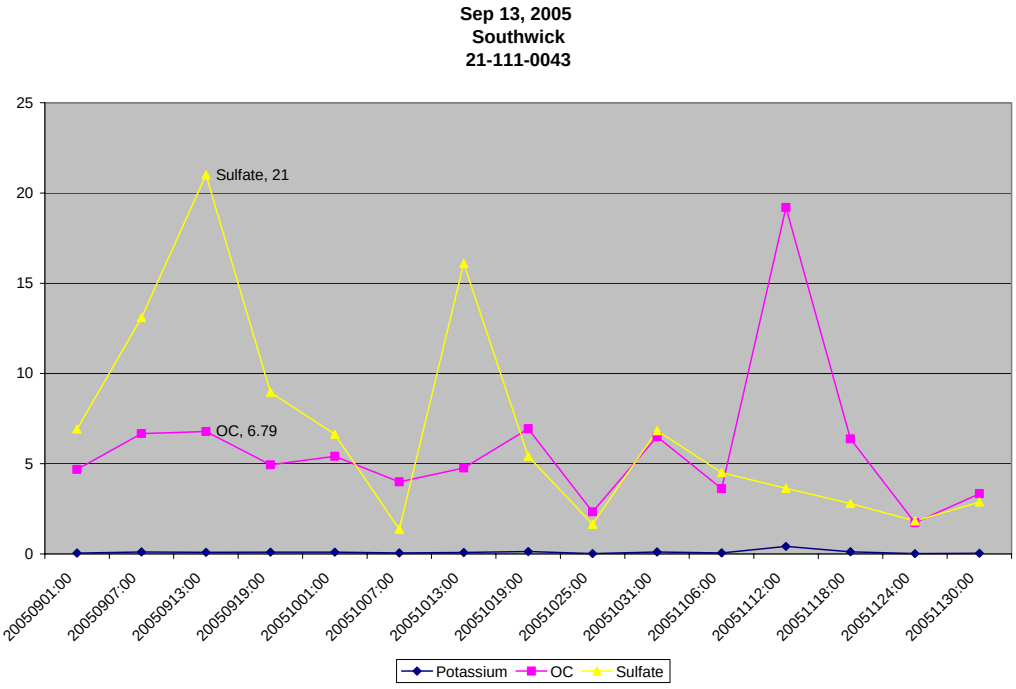


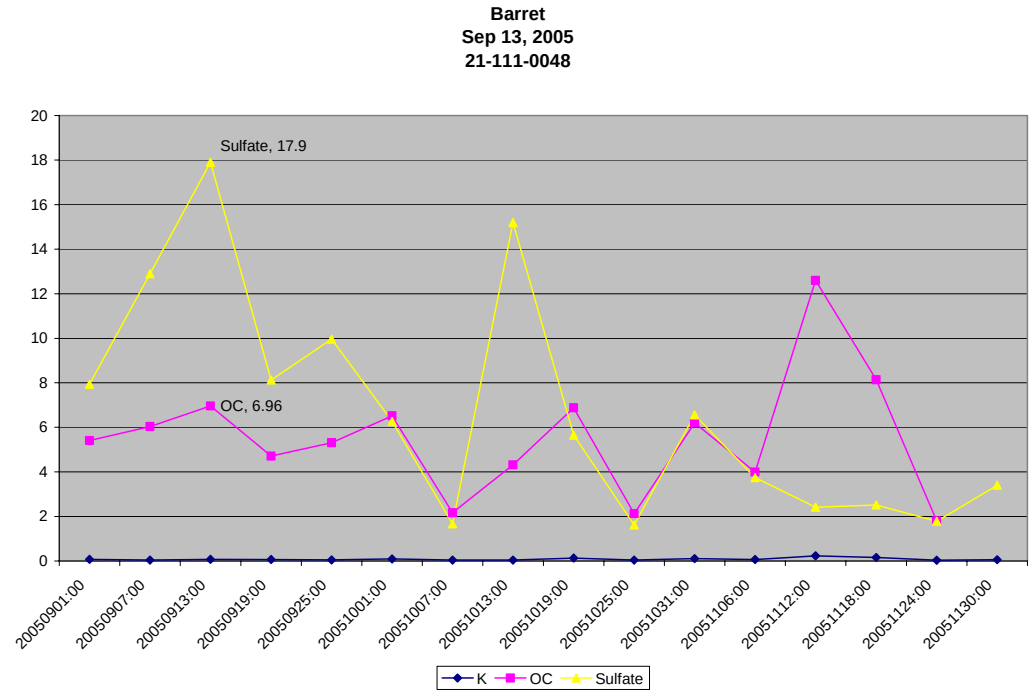
Figure: 15 SO4 Concentrations Sep 13, 2005 **OC Concentrations Sep 13, 2005**

C. COMPARISON TO BACKGROUND LEVELS

The 24-hr average $PM_{2.5}$ concentrations measured at the sites are above the monthly mean and calculated 95th percentile. On September 13, 2005 Speciated fine particulate organic carbon matter and sulfate levels measured 6.96µg/m^3 and 17.9µg/m^3 and 6.79µg/m^3 and 21.0µg/m^3 at the Barret and Southwick sites, respectively (Figure 16). The sulfates are approximately 4 times higher than the seasonal average at both sites. The PM mass is clearly impacted by the elevated sulfate mass and conversely the organic carbon mass attributes little to the particulate matter mass measured on September 8th – 13th.



Southwick SO_4/OC concentration



Barret SO_4/OC concentration

Figure: 16 September 13, 2005

D. DEMONSTRATION OF NO EXCEEDANCE "BUT FOR" THE EVENT

To demonstrate that there would have been an exceedance or violation of the 24hour NAAQS the following graph represents the "estimated particulate matter "but for" speciated organic carbon and sulfate mass (Figure 6)." The portion of organic matter mass attributable to the fire is defined by the following equation: OMinc = 2(OCd – OC avg)[14], where OMinc is the organic mass increment; OCd and OCavg are the daily and typical (average) measured organic carbon. The sulfate mass increment is calculated using the following: SMinc = 1.7(Sd – OC avg). Figure 17 shows that the contribution to the particulate matter mass attributable to the smoke is approximately 4.6µg/m^3.

Therefore the requirement to establish that there would have been no exceedance or violation "but for" this event, as found in Section §50.14(c)(3)(iii)(B), has not been met. The submittal for affected Louisville sites does not adequately demonstrate that emissions from the wildfires impacted exceedances of the National Ambient Air Quality Standard in Louisville - Jefferson Co. – Scottsburg MSA due to transport of airborne particulate matter, as defined in Section 3 of the Final Rule. Region 4 does not concur with the request to flag data on September 8-13, 2005.

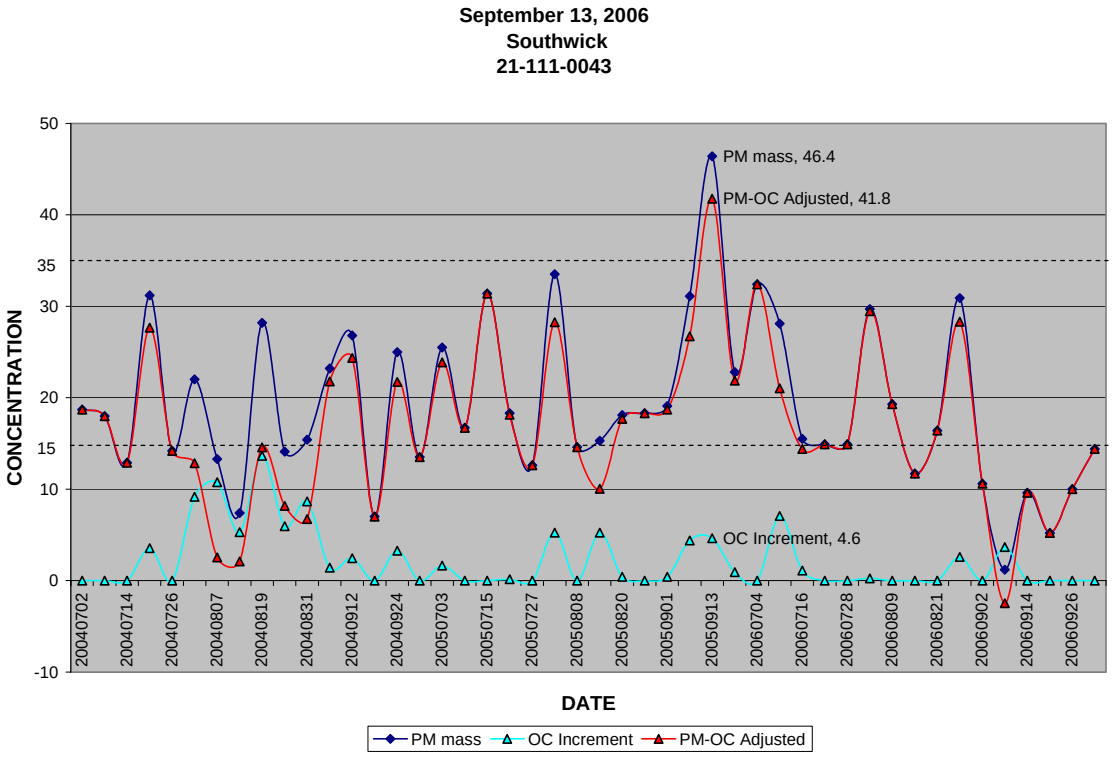


Figure 17: "But For" Southwick September 13, 2005

[14] "Species Contributions to PM2.5 Mass Concentrations (Turpin and Lim 2001)"

Kansas and Surrounding States Wildfires

Exceedance Date:	July 18-20, 2006
MSA:	Louisville - Jefferson Co. - Scottsburg
Event Description:	Smoke impact from Kansas Wildfires

Table 8: site-specific information used in analysis (μg/m^3)

AQS ID	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-111-0043-2	7/18/2006	39.6	18.8	27.8	33.0	No
21-111-0044-1	7/18/2006	37.9	18.9	27.7	32.0	No
21-111-0048-1	7/18/2006	40.9	17.4	25.0	29.5	No
21-111-0043-1	7/19/2006	39.3	18.8	28.0	33.2	No
21-111-0043-2	7/19/2006	38.6	18.8	27.8	33.0	No
21-111-0044-1	7/19/2006	38.3	18.9	27.7	32.0	No
21-111-0048-1	7/19/2006	37.6	17.4	25.0	29.5	No
21-111-0043-1	7/20/2006	48.2	18.8	28.0	33.2	No
21-111-0043-2	7/20/2006	47.9	18.8	27.8	33.0	No
21-111-0044-1	7/20/2006	48.9	18.9	27.7	32.0	No

Note [1]Three-year monthly average above 15μg/m^3 and observed concentration is below 35μg/m^3
[2]Observed concentration is below 84 percentile

A. EVENT DESCRIPTION

The documentation submitted by the Louisville Metro Air Pollution Control District claims that smoke from Kansas wildfires caused NAAQS exceedances at the site listed above. All of the requested values passed the two-step analysis. However, documentation submitted by LMAPCD did not clearly demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. EPA concurrence was not given to these exceptional event flags.

B. CAUSAL CONNECTION BETWEEN THE EVENT AND AIR QUALITY

A causal connection between the Kansas wildfires and the observed exceedances of the $PM_{2.5}$ NAAQS can not be demonstrated. The demonstration provided the following: TEOM continuous $PM_{2.5}$ strip chart, daily $PM_{2.5}$ measured values two days prior after the event, statistical analysis of historical $PM_{2.5}$ data and $PM_{2.5}$ speciation data, pollution roses, wind rose graph, HYSPLIT backward trajectory, notification of Air Quality Index (AQI) alerts issued, and National Oceanic and Atmospheric Administration (NOAA) smoke maps.

The HYSPLIT backward trajectory[15] for July 17 through July 21 does not indicate the air mass traveling from the Kansas wildfires. The wind rose graphs[16] indicate that the wind was from the WNW, NW,NNE, NE or 95% calm with the remaining 5% traveling at wind speeds less then 3 meters per second from of the WNW.

[15] LMAPCD Technical Demonstration Exclusion of $PM_{2.5}$ AQ Monitoring Data Influenced By Wildland Fires for July 18-20, 2006, (EMD Jul 18-20,2006) pg 17 of 18
[16] EMD Jul 18-20,2006, pg 8, 10, 12

There is no indication as to causal relationship between the exceedances and the wildfires. Figures 14 and 15 provide a view of high regional PM2.5 and sulfate concentrations overlapping the Louisville monitoring sites. A causal connection between the Kansas wildfires and the observed exceedance of the $PM_{2.5}$ NAAQS can not be demonstrated as required in §50.14(c)(3)(iii)(C).

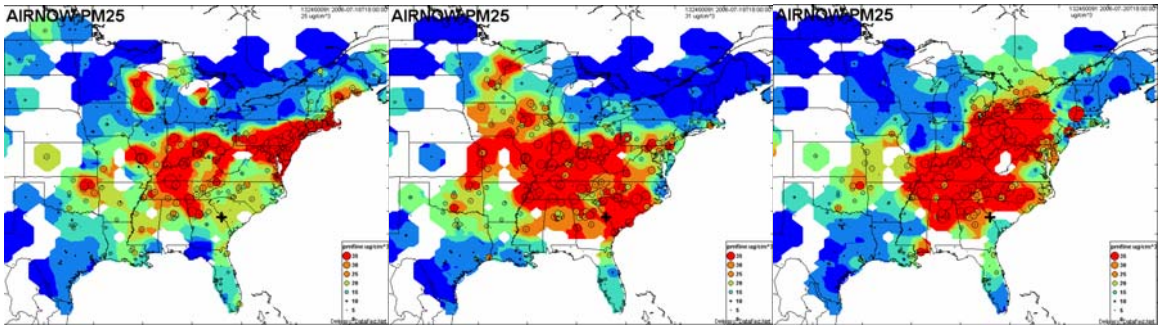
C. COMPARISON TO BACKGROUND LEVELS

The 24-hr average $PM_{2.5}$ concentration is above the 30-day mean, and the calculated 95th percentile. The seasonal[17] average at the Barret site for sulfate and carbon is 6.7µg/m^3 and 4.7µg/m^3 and at the Southwick site 6.5µg/m^3 and 4.8µg/m^3, respectively. The maps in figure 18 show elevated concentrations of sulfate throughout the region while in Louisville organic carbons are shown to be at seasonal averages. This indicates that the exceedances were not caused by the level of organic carbon mass measured that day.

D. DEMONSTRATION OF NO EXCEEDANCE "BUT FOR" THE EVENT

The increase in sulfate mass attributes to the particulate matter mass measured on July 18th – 20th while the organic carbon mass contribution was negligible. Maps in Figures 18 and 19 shows a high regional PM2.5 and sulfate concentrations overlapping the Louisville monitoring sites. The increased levels of sulfate negates the possibility that the there would have been no exccedance of the NAAQS "but for" this event.

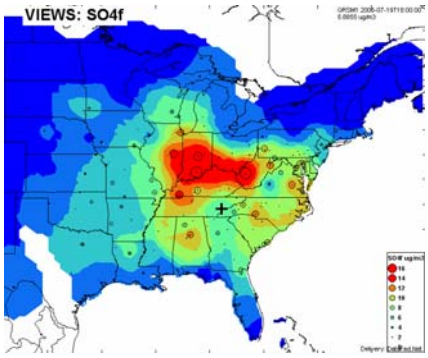
The requirement to establish that there would have been no exceedance or violation "but for" this event, as found in Section §50.14(c)(3)(iii)(B), has not been met. The submittal for affected Louisville sites does not adequately demonstrate that emissions from the wildfires impacted exceedances of the National Ambient Air Quality Standard in Louisville - Jefferson Co. – Scottsburg MSA due to transport of airborne particulate matter, as defined in Section 3 of the Final Rule. Region 4 does not concur with the request to flag data on July 18-20, 2006.



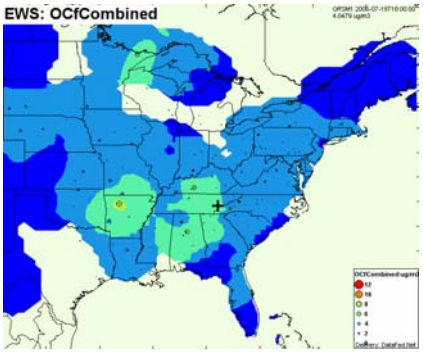
July 18, 2006 **July 19, 2006** **July 20, 2006**

Figure 18: PM2.5 Concentrations

[17] [17] Seasonal average (Jun –Aug 2004 -2005 Barret) (Jun –Aug 2006 -2007 Southwick)



SO4 Concentrations July 19, 2006



OC Concentrations July 19, 2006

Figure: 19

Kentucky and Surrounding States Wildfires

Exceedance Date:	August 25-26, 2006
MSA:	Louisville - Jefferson Co. - Scottsburg
Event Description:	Smoke impact from Kentucky and Surrounding States Wildfires

Table 9: site-specific information used in analysis ($\mu g/m^3$)

AQS ID	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-111-0043-1	8/25/2006	38	20.2	27.3	42.6	No
21-111-0043-2	8/25/2006	38	20.0	27.3	39.4	No
21-111-0044-1	8/25/2006	38.2	20.0	27.2	40.9	No
21-111-0043-1	8/26/2006	37.3	20.2	27.3	42.6	No
21-111-0043-2	8/26/2006	37.7	20.0	27.3	39.4	No
21-111-0044-1	8/26/2006	38.4	20.0	27.2	40.9	No

Note [1]Three-year monthly average above $15\mu g/m^3$ and observed concentration is below $35\mu g/m^3$
[2]Observed concentration is below 84 percentile

A. EVENT DESCRIPTION

Documentation submitted by the Louisville Metro Air Pollution Control District claims that smoke from Kentucky and surrounding states wildfires caused the NAAQS exceedances at the site listed above. All of the requested values passed the two-step analysis. However, documentation submitted by LMAPCD did not clearly demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. EPA concurrence was not given to these exceptional event flags.

B. CAUSAL CONNECTION BETWEEN THE EVENT AND AIR QUALITY

A causal connection between the Kentucky and surrounding states wildfires and the observed exceedances of the $PM_{2.5}$ NAAQS can not be demonstrated. No speciation data was provided in technical demonstration for the site or surrounding sites. The demonstration provided the following: TEOM continuous $PM_{2.5}$ strip chart, daily $PM_{2.5}$ measured values four days prior to and three days after the event, statistical analysis of historical $PM_{2.5}$ data, pollution roses, wind rose graph, HYSPLIT back trajectory, notification of Air Quality Index (AQI) alerts issued, National Oceanic and Atmospheric Administration (NOAA) smoke maps.

The NOAA smoke plume maps[18] show no smoke plume over the Louisville, KY-IN MSA on either August 25th or 26th. Wind rose graphs show winds calm for over 95% and 70% on the 25th and 26th, respectively. Wind speeds over 3 meters per second on either day are insufficient to make an inference with air mass depicted, the subject wildfires and the potential impact to the air quality in the Louisville- KY-IN, MSA.

[18] LMAPCD Technical Demonstration Exclusion of $PM_{2.5}$ AQ Monitoring Data Influenced By Wildland Fires for August 25-26, 2004, (Aug 25-26, 2004) pg (7-13)

The supporting documentation provided in this Technical Document does not provide enough evidence to prove direct causation. A causal connection between the Kentucky wildfires and the observed exceedance of the $PM_{2.5}$ NAAQS can not be demonstrated as required in §50.14(c)(3)(iii)(C).

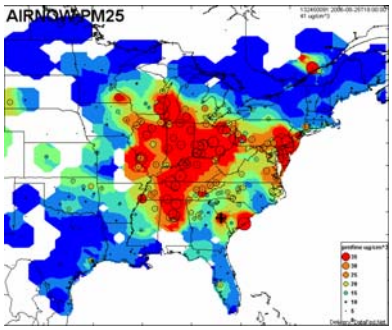
C. COMPARISON TO BACKGROUND LEVELS

The 24-hr average $PM_{2.5}$ concentration is above the 30-day mean, and the calculated 95th percentile. The seasonal[19] average at the Barret site for sulfate and carbon is 6.7µg/m^3 and 4.7µg/m^3 and at the Southwick site 6.5µg/m^3 and 4.8µg/m^3, respectively.

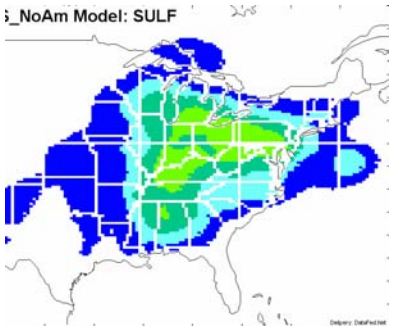
D. DEMONSTRATION OF NO EXCEEDANCE "BUT FOR" THE EVENT

The increase in sulfate mass attributes to the particulate matter mass measured on August 25th – 26th while the organic carbon mass contribution was negligible. Maps in Figure 20 show a regional event of elevated $PM_{2.5}$ and sulfate concentrations overlapping over the Louisville monitoring sites. The increased levels of sulfate negates LMAPCD claim that the there would have been no exccedance of the NAAQS "but for" this event.

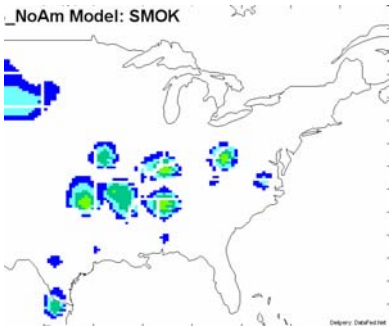
The requirement to establish that there would have been no exceedance or violation "but for" this event, as found in Section §50.14(c)(3)(iii)(B), has not been met. The submittal for affected Louisville sites does not adequately demonstrate that emissions from the wildfires impacted exceedances of the National Ambient Air Quality Standard in Louisville - Jefferson Co. – Scottsburg MSA due to transport of airborne particulate matter, as defined in Section 3 of the Final Rule. Region 4 does not concur with the request to flag data on August 25-26, 2006.



Daily Concentrations Aug 25, 2006

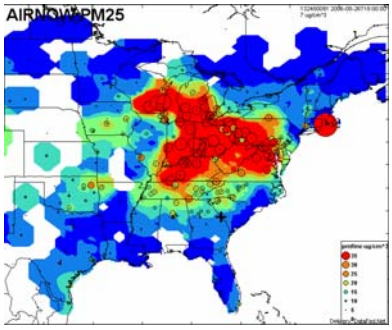


Modeled SO_4 Aug 25, 2006

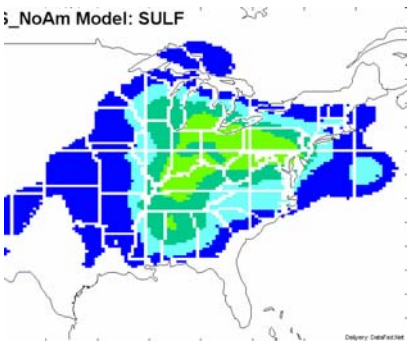


Modeled Smoke Aug 25, 2006

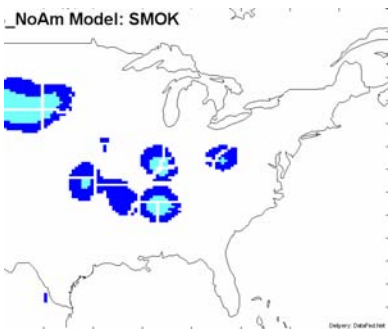
[19] [19] Seasonal average (Jun –Aug 2004 -2005 Barret) (Jun –Aug 2006 -2007 Southwick)



Daily Concentrations Aug 26, 2006



Modeled SO_4 Aug 26 2006



Modeled Smoke Aug -26 2006

Figure: 20

Georgia Wild Fires

Exceedance Date:	June 2, 2007
MSA:	Louisville - Jefferson Co. - Scottsburg
Event Description:	Smoke impact from Southeast Georgia and Northeast Florida wildfires

Table 10: site-specific information used in analysis ($\mu g/m^3$)

AQS ID	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-111-0043-1	6/2/2007	34.2	19.2	25.2	36.9	No
21-111-0043-2	6/2/2007	33.8	18.7	25.6	35.1	No
21-111-0044	6/2/2007	36.8	17.6	23.8	31.0	No
21-111-0048	6/2/2007	37.2	16.9	22.9	25.7	No
21-111-0051	6/2/2007	36.2	17.6	23.0	32.0	No

Note [1]Three-year monthly average above $15\mu g/m^3$ and observed concentration is below $35\mu g/m^3$
[2]Observed concentration is below 84 percentile

A. EVENT DESCRIPTION

Documentation submitted by the Louisville Metro Air Pollution Control District claims that smoke from Georgia wildfires caused the NAAQS exceedances at the site listed above. All but one of the requested values failed the two-step analysis. However, wind rose graphs at the Southwick site indicates that a stagnation[20] event existed May 30 through June 2[21]. Therefore, this event does not meet the definition of an exceptional event in accordance with 40 CFR 50.1(j). Therefore, U.S. Environmental Agency Region does not concur with the exceptional event flags for the events listed in Table 10 above.

B. CAUSAL CONNECTION BETWEEN THE EVENT AND AIR QUALITY

Figure 21, "Source Impact Tool" shows wind trajectories maps and measured concentrations. The blue lines indicate air mass movement. The red lines indicate the direction of travel at the point of exit. The map indicates that the air mass travels from the South Georgia and North Florida wildfires and passes over the Louisville area on June 2, 2007. Figure 22, AIRNOW $PM_{2.5}$ daily concentration map shows that an elevated level of $PM_{2.5}$ ground level concentration was measured on June 2, 2007, which reflected the path of the air mass passed through the South Georgia and North Florida wildfires.

The NOAA Satellite Fire Detection Map[22] shows an absence of a smoke plume over the entire State of Kentucky but appears over a portion of the States on the Gulf of Mexico. This conflicts

[20] Guidelines on Identification and use of Air Quality Data Affected by Exceptional Events, Appendix II (2) Stagnations/Inversions

[21] LMAPCD Technical Demonstration Exclusion of $PM_{2.5}$ AQ Monitoring Data Influenced By Wildland Fires for June 2, 2007, (EMD June 2, 2007) pg 13, 15,17,19

[22] EMD June 2, 2007 pg 20 of 26

with the image provided in Figure 21 showing the direction of wind trajectories coming from the Southeast passing over the majority of the State of Kentucky to include Louisville.

The supporting documentation provided in this Technical Document does not provide enough evidence to prove direct causation. A causal connection between the Kentucky wildfires and the observed exceedance of the $PM_{2.5}$ NAAQS can not be demonstrated as required in §50.14(c)(3)(iii)(C).

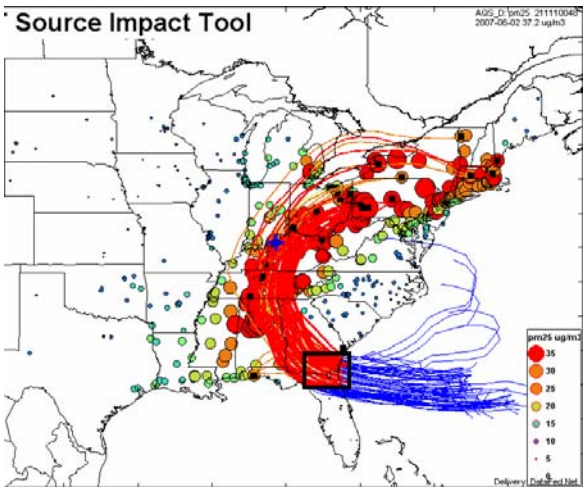


Figure 21: Air Mass Trajectory June 2, 2007

C. COMPARISON TO BACKGROUND LEVELS

The 24-hr average $PM_{2.5}$ concentrations are above the 30-day mean, and the calculated 95th percentile. The sulfate footprint in Figure 23 mirrors the path of the air mass trajectory and the area of elevated $PM_{2.5}$ ground level concentration. However, the isolated areas of moderate smoke concentrations seen in Figure 24 negates the conclusion that the high $PM_{2.5}$ concentrations measured in Louisville were due to the air mass shown in Figure 21. The modeled sulfate levels are below the seasonal average[23] of 6.6µg/m^3 and organic carbon is shown to be at or moderately above the average concentrations (Figure 24) 4.8µg/m^3

D. DEMONSTRATION OF NO EXCEEDANCE "BUT FOR" THE EVENT

The isolated areas of moderate smoke concentrations seen in Figure 24 negates the conclusion that the high $PM_{2.5}$ concentrations measured in Louisville were caused by the South Georgia and North Florida wildfires. Maps in Figures 22 and 23 shows a regional event of elevated $PM_{2.5}$ and sulfate concentrations overlapping over the Louisville monitoring sites. The increased levels of sulfate negates LMAPCD claim that the there would have been no exceedance of the NAAQS "but for" this event.

[23] [23] Seasonal average (May- Aug Southwick)+ (Jun-Aug Barret)/2

The requirement to establish that there would have been no exceedance or violation "but for" this event, as found in Section §50.14(c)(3)(iii)(B), has not been met. The submittal for affected Louisville sites does not adequately demonstrate that emissions from the wildfires impacted exceedances of the National Ambient Air Quality Standard in Louisville - Jefferson Co. – Scottsburg MSA due to transport of airborne particulate matter, as defined in Section 3 of the Final Rule. Region 4 does not concur with the request to flag data on June 2, 2007.

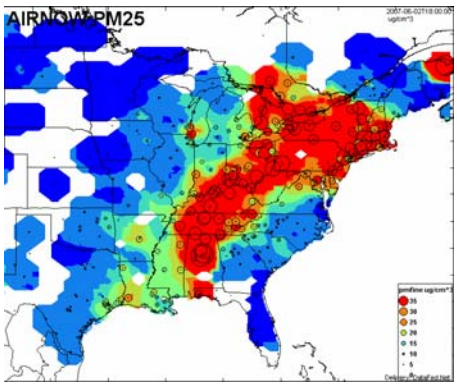


Figure 22: $PM_{2.5}$ Concentration

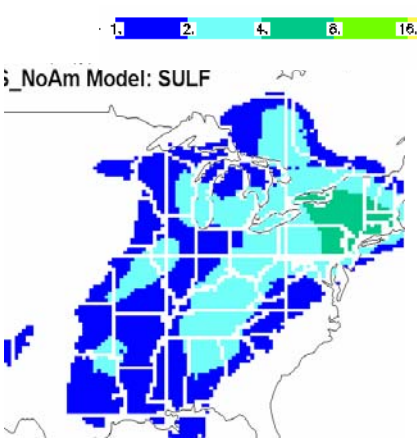


Figure 23: Modeled Sulfate June 2, 2007

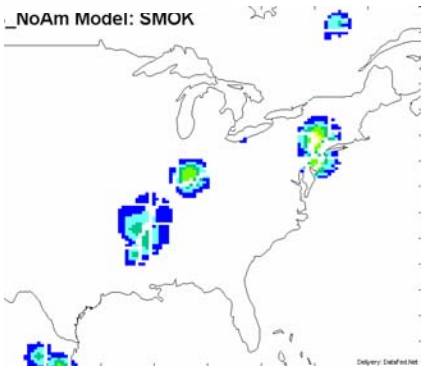


Figure 24: Modeled Smoke

Canada and Northwest Wildfires

Exceedance Date:	August 2-4, 2007
MSA:	Louisville - Jefferson Co. - Scottsburg
Event Description:	Smoke impact from Canadian and Northwestern Wildfires

Table 11: site-specific information used in analysis ($\mu g/m^3$)

AQS ID	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-111-0043-1	08/02/07	47.7	19.2	25.2	36.9	No
21-111-0043-2	08/02/07	47.2	18.7	25.6	35.1	No
21-111-0044	08/02/07	44.5	17.6	23.8	31.0	No
21-111-0043-1	08/03/07	40.4	19.2	25.2	36.9	No
21-111-0044	08/03/07	40.3	17.6	23.8	31.0	No
21-111-0043-1	08/04/07	43.0	18.7	25.6	35.1	No
21-111-0044	08/04/07	42.8	17.6	23.8	31.0	No
21-111-0048	08/04/07	42.9	16.9	22.9	25.7	No
21-111-0051	08/04/07	51.3	17.6	23.0	32.0	No

Note [1]Three-year monthly average above $15\mu g/m^3$ and observed concentration is below $35\mu g/m^3$
[2]Observed concentration is below 84 percentile

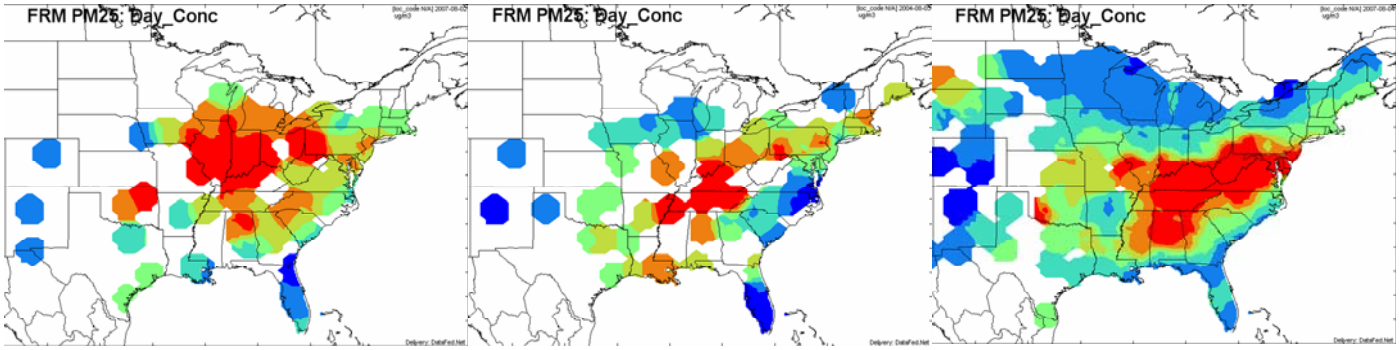
A. EVENT DESCRIPTION

Documentation submitted by the Louisville Metro Air Pollution Control District claims that smoke from Canada and Northwestern wildfires caused the NAAQS exceedances at the site listed above. All of the requested values passed the two-step analysis. However, documentation submitted by LMAPCD did not clearly demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. EPA concurrence was not given to these exceptional event flags.

B. CAUSAL CONNECTION BETWEEN THE EVENT AND AIR QUALITY

Figure 25, FRM $PM_{2.5}$ daily concentration map shows that an elevated level of $PM_{2.5}$ ground level concentration as measured on August 2nd , 3rd and 4th. However, the NOAA Satellite Fire Detection smoke maps[24] do not sufficiently establish a casual relationship. On August 2nd and 3rd winds are over 87% calm and wind speeds are 3 meters per second. On August 4th winds are out of the W/WSW and over 70% calm with less than 25% winds over 6 meters per second[25]. A causal connection between the Canada and Northwestern wildfires and the observed exceedance of the $PM_{2.5}$ NAAQS can not be demonstrated as required in §50.14(c)(3)(iii)(C).

[24] LMAPCD Technical Demonstration Exclusion of $PM_{2.5}$ AQ Monitoring Data Influenced By Wildland Fires for Aug 2-4, 2007, (EMD Aug 2-4, 2007) pg 18, 01, 22
[25] EMD Aug 2-4, 2007, pg 19, 21, 23



Aug 2, 2007 **Aug 3, 2007** **Aug 4, 2007**

Figure 25 $PM_{2.5}$ Concentration

C. COMPARISON TO BACKGROUND LEVELS

The sulfate measured at the Southwick site was approximately 4 times higher than the seasonal[26] average and the organic carbon was only slightly higher then the seasonal averages. In LMAPCD's Technical Document, sulfates account for 50% and 51% of the particulate matter mass measured on July 29th and August 4th [27], respectively. Thereby indicating that exceedance was more likely caused by the increased level of sulfate mass measured that day as opposed to the organic carbon mass measured.

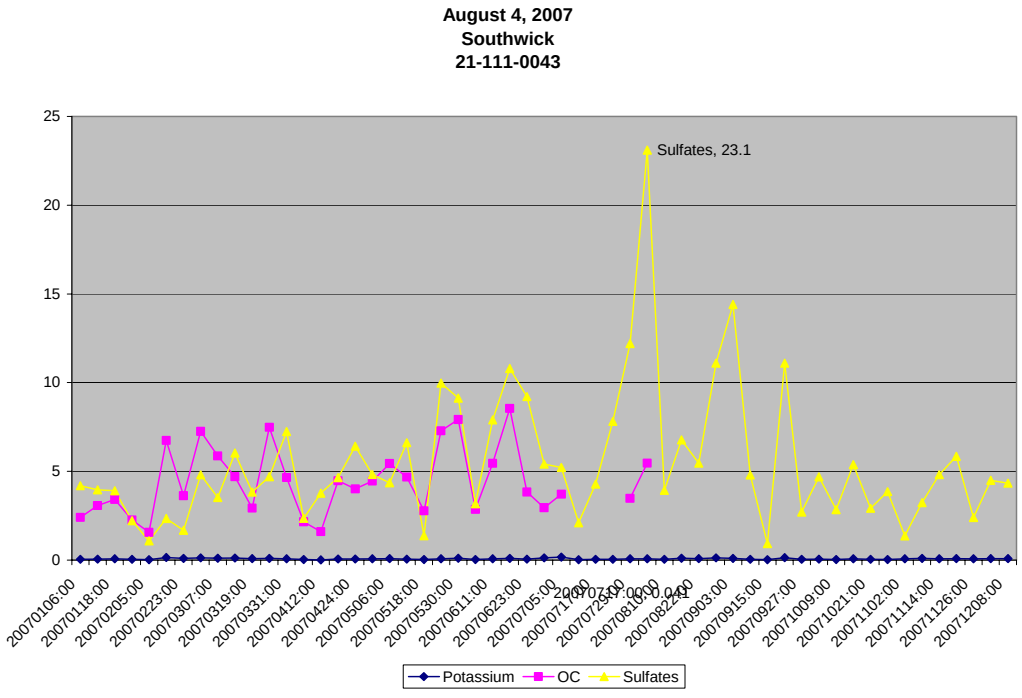


Figure 26 Southwick Speciation Aug 4, 2007

[26] Seasonal June – August 2005 -2006
[27] EMD Aug 2-4, 2007, pg 31 of 33.

D. DEMONSTRATION OF NO EXCEEDANCE "BUT FOR" THE EVENT

To demonstrate that there would have been an exceedance or violation of the 24-hour NAAQS the following graph represents the "estimated particulate matter "but for" speciated organic carbon and sulfate mass (Figure 27)." The portion of organic matter mass attributable to the fire is defined by the following equation: OMinc = 2(OCd – OC avg)[28], where OMinc is the organic mass increment; OCd and OCavg are the daily and typical (average) measured organic carbon. The sulfate mass increment is calculated using the following: SMinc = 1.7(Sd – OC avg). The particulate matter mass has clearly been impacted by the increase in sulfates and conversely the organic matter attributes very little to the PM mass measured on August 4th.

The requirement to establish that there would have been no exceedance or violation "but for" this event, as found in Section §50.14(c)(3)(iii)(B), has not been met. Speciated fine particulate matter data collected at the Southwick site on August 4, 2007 measured sulfate and organic carbon levels of 23.1 µg/m^3 and 5.46µg/m^3, respectively (Figure 27). The increased levels of sulfate negates the possibility that there would have been no exceedance of the NAAQ Standard "but for" this event.

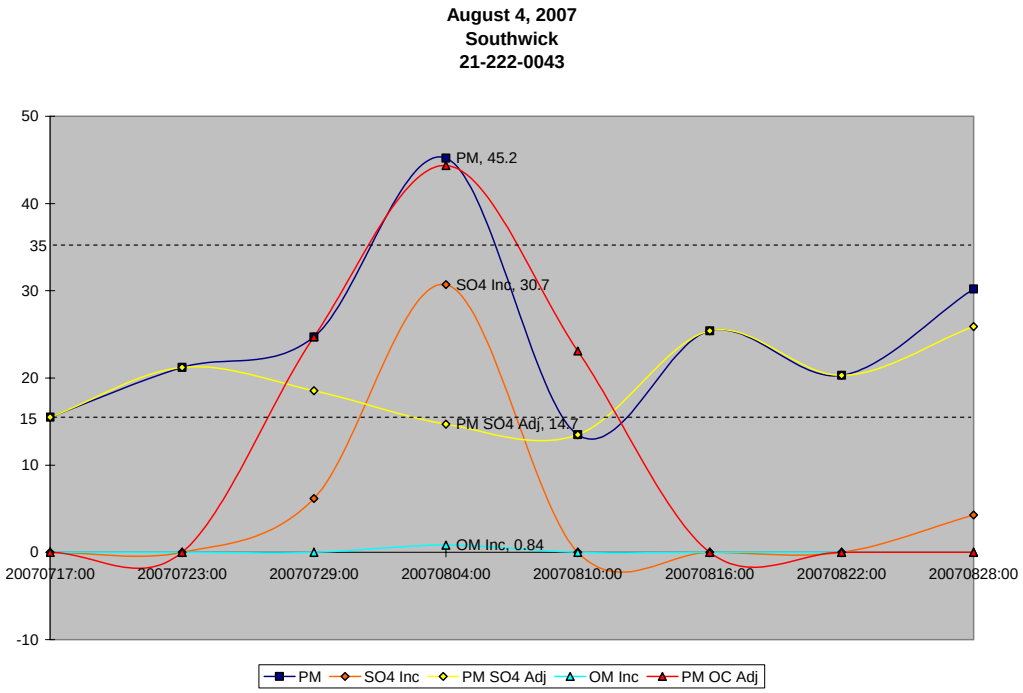


Figure 27 Southwick "But For" August 4, 2007

[28] "Species Contributions to PM2.5 Mass Concentrations (Turpin and Lim 2001)"

EXCEEDANCE EVENT: Idaho, Montana and Central U.S. Wildfires

Exceedance Date:	September 6, 2007
MSA:	Louisville - Jefferson Co. - Scottsburg
Event Description:	Smoke impact from Idaho, Montana and Central U.S. Wildfires

Table 12: site-specific information used in analysis ($\mu g/m^3$)

AQS ID	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-111-0043	09/06/07	41.4	19.0	27.8	43.0	No
21-111-0044	09/06/07	41.6	18.6	28.2	39.4	No
21-111-0048	09/06/07	40.4	18.3	29.5	36.0	No

Note [1]Three-year monthly average above $15\mu g/m^3$ and observed concentration is below $35\mu g/m^3$
[2]Observed concentration is below 84 percentile

A. EVENT DESCRIPTION

Documentation submitted by the Louisville Metro Air Pollution Control District claims that smoke from the Idaho, Montana and Central U.S. Wildfires caused the NAAQS exceedances at the sites listed above. All of the requested values passed the two-step analysis. However, supporting documentation provided in this Technical Document does not provide sufficient evidence to prove direct causation. EPA concurrence was not given to these exceptional event flags.

B. CAUSAL CONNECTION BETWEEN THE EVENT AND AIR QUALITY

The Technical Demonstration attempts to establish a strong causal relationship between the measured values in Table 12 above and the smoke plumes generated by numerous wildfires in Idaho, Montana, Kansas, Oklahoma and Missouri. LMAPCD submitted NOAA fire detection maps, pollution roses, wind rose graphs, NOAA HYSPLIT trajectory models, $PM_{2.5}$ data at impacted sites five days prior to the event and two days post event along with statistical analyses of historical data for the month of September (2005-2007) as supporting documentation in the Technical Demonstration.

The NOAA Satellite smoke map[29] shows that no smoke plume covered the Louisville MSA area. Winds were mostly variable. On September 6th, winds were calm more than 70% of the time. However, six percent of the winds were blowing at approximately six meters per second[30].

The supporting documentation provided in this Technical Document does not provide sufficient evidence to prove direct causation. A causal connection between the Idaho, Montana and Central U.S. wildfires and the observed exceedance of the $PM_{2.5}$ NAAQS can not be demonstrated as required in §50.14(c)(3)(iii)(C).

[29] LMAPCD Technical Demonstration Exclusion of $PM_{2.5}$ AQ Monitoring Data Influenced By Wildland Fires for September 6, 2007, (EMD Sep 6, 2007) pg 18 of 23

[30] EMD Sep 6, 200, pg 8 - 22

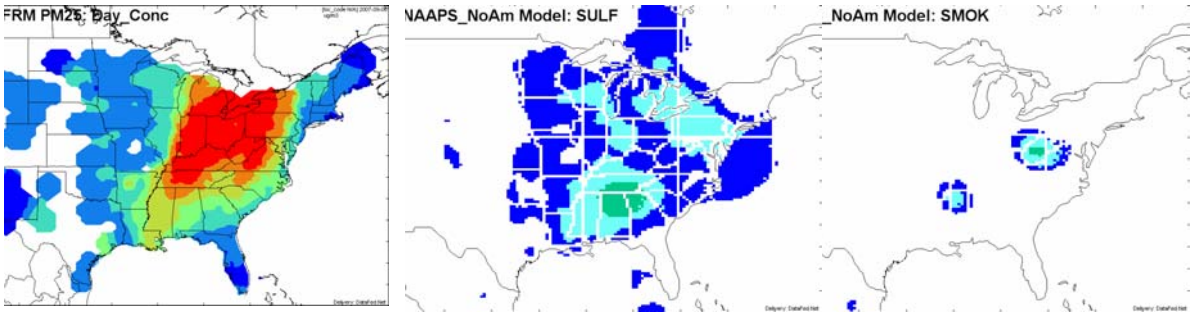
C. COMPARISON TO BACKGROUND LEVELS

In order to further assess the impacts of the Idaho, Montana, and Central U.S. wildfires on the Louisville area, the observed concentrations were compared to historical levels observed at each site. LMAPCD provided measured values five days prior and two days post event. Of these measured values nine are above the monthly average; five are above the 84 percentile value and one is above the 95 percentile value. On September 5th, where the NOAA smoke map[31] shows a dense plume covering most of the eastern seaboard, the two measured values are below the 95th percentile calculated for the given site. Values measured at both the Barret and Wyandotte site were greater that the 95th percentile. This evidence alone is insufficient to establish a causal relationship between the Idaho, Montana and Central U.S. Wildfires and the exceedance of the 24-hr NAAQS.

D. DEMONSTRATION OF NO EXCEEDANCE "BUT FOR" THE EVENT

In Figure 27, the $PM_{2.5}$ Daily Concentration Map indicates a regional area of elevated $PM_{2.5}$ levels; the NAAPS Model Sulfur Concentration Map shows levels of sulfur below the seasonal average[32] of 7.55µg/m^3; The NAAPS Model: Smoke concentration map indicates the absence of smoke over the Louisville area.

The supporting documentation provided in this Technical Document does not provide enough evidence to prove that there would have been no exceedance "but for" this event, as required in Section §50.14(c)(3)(iii)(B).



$PM_{2.5}$ Concentration **Modeled Sulfate Concentration** **Modeled Smoke Concentration**

Figure 27: September 6, 2007

[31] EMD Sep, 2007 pg 16
[32] July –September 2005 - 2007

References

Perry, K.D., 1999. Effects of outdoor pyrotechnic displays on the regional air quality of Western Washington State. *Journal of Air & Waste Management Association* Volume 49, Pages 146-155.

Turpin, B.J., Lim, H.J., 2001. Species Contributions to $PM_{2.5}$ Mass Concentrations: Revisiting common Assumptions for Estimating Organic Mass; *Aerosol Science and Technology*. Volume 35, Pages 602-610.

$PM_{2.5}$ Exceptional Events Technical Support Document

U.S. Environmental Protection Agency
Region 4

State of Kentucky: Paducah KY-IL Metropolitan Statistical Area

2005-2007

Introduction

This document provides U.S Environmental Protection Agency (EPA) Region 4 rationale for concurrence or non-concurrence with exceptional event flags on the 24-hr average $PM_{2.5}$ concentrations recorded at various Air Quality System (AQS) sites within the Kentucky Department of Air Quality (KYDAQ) Ambient Air Monitoring Network. The exceptional event flags that EPA Region 4 has concurred with will be excluded from use in determinations of exceedances and National Ambient Air Quality Standards (NAAQS) violations.

According to 40 CFR 50.1(j):

> "*Exceptional event* means an event that affects air quality, is not reasonably controllable or preventable, is an event caused by human activity that is unlikely to recur at a particular location or a natural event, and is determined by the Administrator in accordance with 40 CFR 50.14 to be an exceptional event. It does not include stagnation of air masses or meteorological inversions, a meteorological event involving high temperatures or lack of precipitation, or air pollution relating to source noncompliance."

§50.14(b)(2) also states:

> "EPA shall exclude data from use in determinations of exceedances and NAAQS violations where a State demonstrates to EPA's satisfaction that emissions from fireworks displays caused a specific air pollution concentration in excess of one or more national ambient air quality standards at a particular air quality monitoring location and otherwise satisfies the requirements of this section. Such data will be treated in the same manner as exceptional events under this rule, provided a State demonstrates that such use of fireworks is significantly integral to traditional national, ethnic, or other cultural events including, but not limited to July Fourth celebrations which satisfy the requirements of this section."

Finally, §50.14(c)(3)(iii) states:

> "The demonstration to justify data exclusion shall provide evidence that:
> (A) The event satisfies the criteria set forth in 40 CFR 50.1(j);
> (B) There is a clear causal relationship between the measurement under consideration and the event that is claimed to have affected the air quality in the area;
> (C) The event is associated with a measured concentration in excess of normal historical fluctuations, including background; and
> (D) There would have been no exceedance or violation but for the event.

Each $PM_{2.5}$ 24-hr average concentration requested for exclusion was first evaluated against these criteria using a two-step analysis. This analysis was designed to compare the requested value to historical values observed at the site and determine whether any exceedances could have been caused by the suspected event.

Step 1: Monthly Average Comparison

Using 24-hr $PM_{2.5}$ data from AQS for 2004-2007, a comparison three-year monthly average was calculated. The three-year monthly average concentration was calculated excluding data from the year in which the data in question was collected. For example, a requested value in May 2006 was compared to the average of all the samples collected at the site during May 2004, May 2005, and May 2007. If the three-year average was greater than the annual $PM_{2.5}$ NAAQS (15.0 $\mu g/m^3$) and the requested value was less than the 24-hr $PM_{2.5}$ NAAQS (35 $\mu g/m^3$), then EPA concurrence was not given to the requested value. This is because in EPA's judgment there is insufficient evidence that "there would have been no exceedance or violation but for the event" as required by §50.14(c)(3)(iii)(D) because the normally expected concentration at the site (the three-year monthly mean concentration) is in excess of the NAAQS.

Step 2: Monthly 84th Percentile Comparison

Using 24-hr $PM_{2.5}$ data from AQS for 2004-2007, a comparison three-year upper 84th percentile was calculated for the month in which the requested value was collected. The three-year monthly 84th percentile was calculated excluding data from the year in which the data in question was collected. For example, a requested value in May 2006 was compared to the upper 84th percentile calculated from of all the samples collected at the site during May 2004, May 2005, and May 2007. The calculated three-year monthly upper 84th percentile was considered to represent the range of normally expected high values at that site due to normal local and background sources If the requested value was below the calculated three-year monthly upper 84th percentile, EPA concurrence was not given to the requested value. This is because in EPA's judgment that there is insufficient evidence to demonstrate that the NAAQS exceedance was caused by the suspected event as required by §50.14(c)(3)(iii)(D) and not by normal local and background sources at the site.

If a requested value did not meet the requirements described in one or more of the above steps and the State did not submit compelling evidence to demonstrate that the event satisfied the exceptional event criteria, then EPA concurrence was not given to the exceptional event flag on the requested value. The values that did meet all of the conditions described above were then evaluated against the requirements of §50.14(c)(3)(iii).

Summary of maps and graphs used

A variety of maps and graphs were used in this document. Unless otherwise noted, these products were obtained from the DATAFED Data Views Catalog, which can be accessed at http://datafedwiki.wustl.edu/index.php/Data_Views_Catalog. This includes maps using data from AQS, the National Aeronautics and Space Administration (NASA), and the Navy Aerosol Analysis and Prediction System (NAAPS). Also, unless otherwise noted, all ambient air monitoring data used in this analysis was obtained from the EPA AQS database.

The following discussion will demonstrate that the 24-hr average $PM_{2.5}$ concentrations observed at various Kentucky Department of Air Quality network monitoring sites on the following dates meet or fail to meet the criteria laid out in the Exceptional Events Rule, §50.14.

Exceedance Date(s): June 21, 2005, June 24, 2005
MSA(s): Paducah, KY-IL
Event Description: Monitoring sites downwind of western Kentucky fires.

Table 1 - Site-specific information used in analysis (µg/m^3)

AQS	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-145 -1004	6/21/2005	36.9	16.3	22.8	27.0	NO
21-145 -1004	6/24/2005	37.1	16.3	22.8	27.0	NO

DETAILED DISCUSSION OF EVIDENCE

A. EVENT DISCRIPTION:

Documentation submitted by the Kentucky DAQ claims that smoke from wildfires in western Kentucky caused NAAQS exceedances at the site listed above. The requested values that passed both steps with concentrations of 36.9µg/m^3 and 37.1µg/m^3 were collected on June 21 and June 24, 2005, respectively. However, the documentation submitted by the Kentucky DAQ did not demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance "but for" the events on June 21 and June 24, 2005.

B. CAUSAL CONNECTION BETWEEN THE EVENT AND AIR QUALITY

KYDAQ submittal consisted of National Oceanic and Atmospheric Administration (NOAA) map of "hot spots", a wind rose and historical data for the month of June (2002 -2006). PM2.5 speciation data was collected in the Paducah area during this time period as seen in Figure 5. High aerosol particulate concentrations can be seen in the source region on June 21 and June 24, 2005, in Figures 1-4. The wind speed and wind direction suggests impact for the location of the local fires to the Paducah site. This evidence alone is insufficient to establish a causal relationship between the local wildfires and the exceedance of the 24-hr NAAQS.

C. COMPARISON TO BACKGROUND LEVELS

The sulfate measured at the Paducah site was approximately 4 times higher than the seasonal[1] average versus the organic carbon which was 1.3 higher. Sulfate and organic carbon concentrations on the 21st and 24th, respectively are illustrated in Figures 1 – 4. A widespread sulfate event is evident across the southeast U.S. on these days. Thereby indicating that exceedance was more likely caused by the increased level of sulfates mass measured that day as opposed to the organic carbon mass measured.

[1] Seasonal June – August 2004 -2005

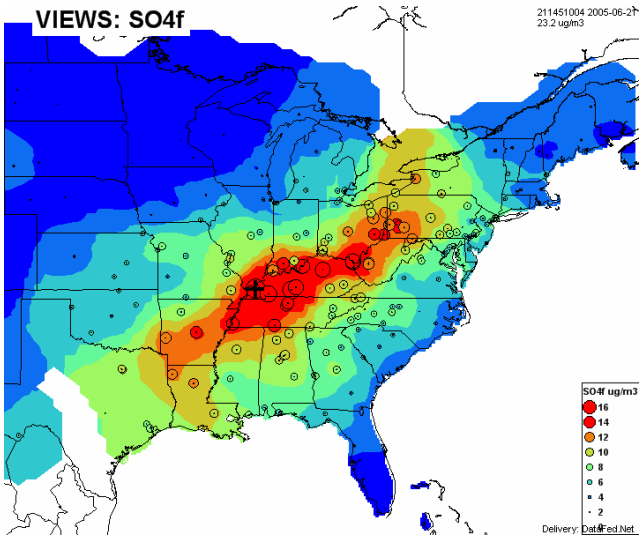


Figure 1: Paducah SO4 Concentrations, June 21, 2005

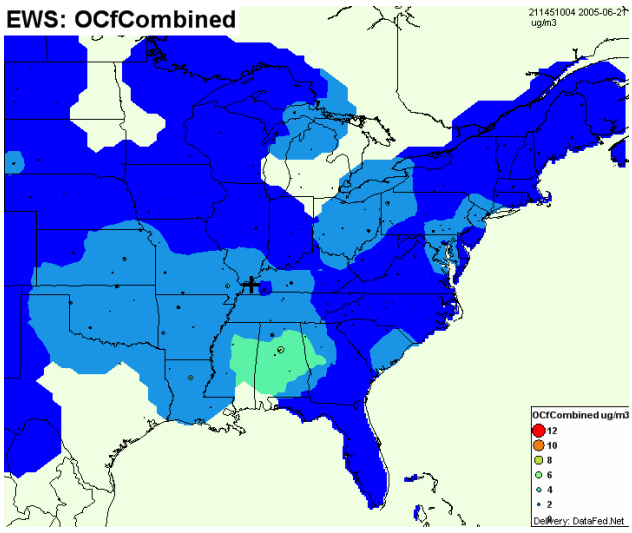


Figure 2: Paducah OC Concentrations, June 21, 2005

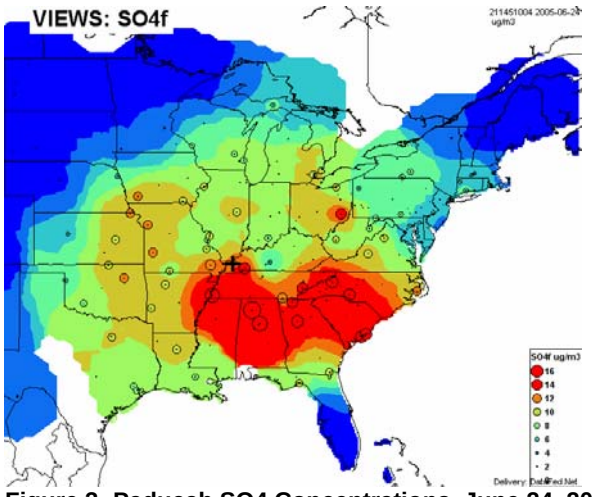


Figure 3: Paducah SO4 Concentrations, June 24, 2005

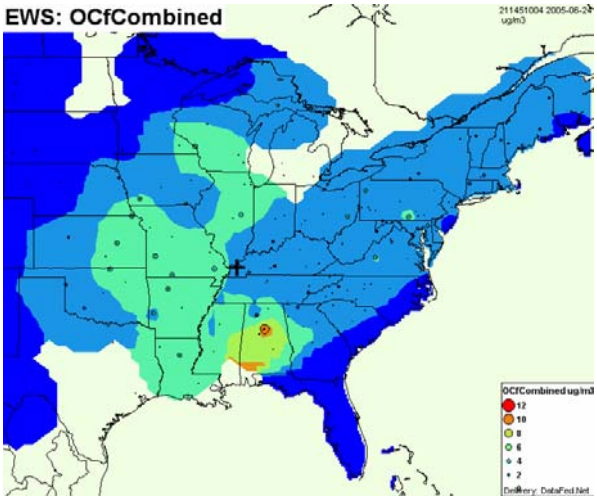


Figure 4: Paducah OC Concentrations, June 24, 2005

D. DEMONSTRATION OF NO EXCEEDANCE "BUT FOR" THE EVENT

The requirement to establish that there would have been no exceedance or violation "but for" this event, as found in Section §50.14(c)(3)(iii)(B), has not been met. Speciated fine particulate matter data collected at the Paducah site on June 21, 2005 measured sulfate and organic carbon levels of 23.2 µg/m^3 and 6.13µg/m^3, respectively (Figure 5). The increased levels of sulfate negates the possibility that there would have been no exceedance of the NAAQS "but for" this event.

To demonstrate that there would have been an exceedance or violation of the 24hour NAAQS, the following graphs represents the "estimated particulate matter "but for" speciated organic carbon and sulfate mass (Figure 6)." The portion of organic matter mass attributable to the fire is defined by the following equation[2]: OMinc = 2(OCd – OCavg), where OMinc is the organic mass increment; OCd and OCavg are the daily and typical (average) measured organic carbon. The Sulfate mass increment is calculated using the following: SO_4Minc = 1.7(SO_4d – SO_4 avg). The particulate matter mass has clearly been impacted by the increase in sulfates and conversely the organic matter attributes very little to the PM mass measured on June 21.

[2] "Species Contributions to PM2.5 Mass Concentrations (Turpin and Lim 2001)"

Figure 5: Paducah Speciation Data

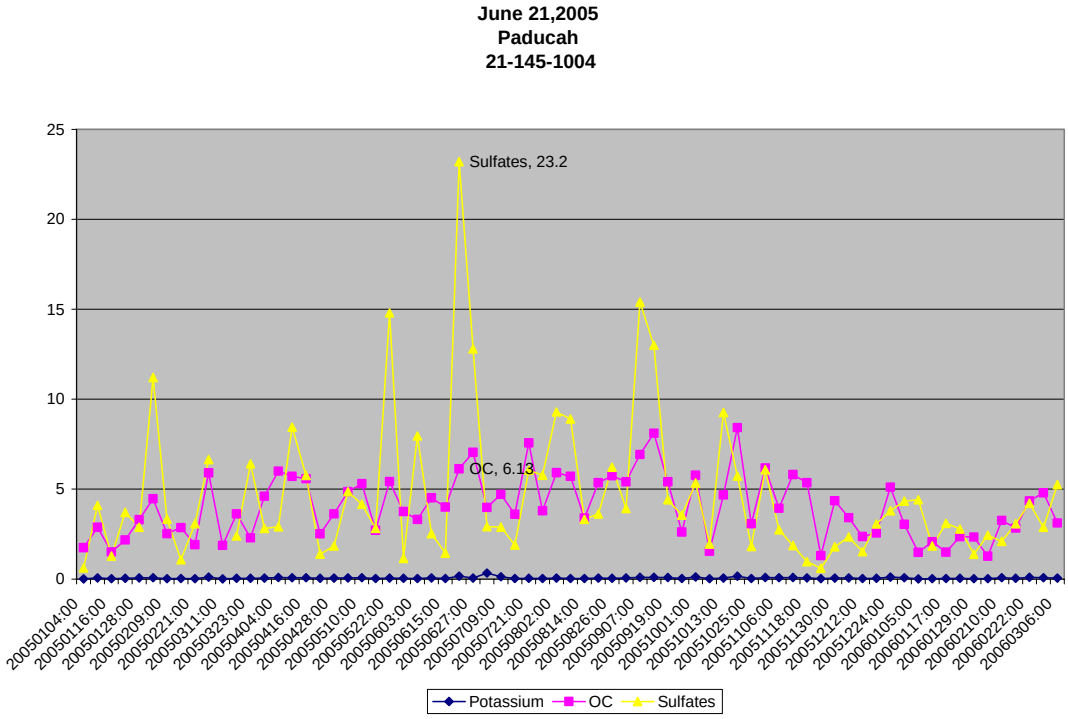
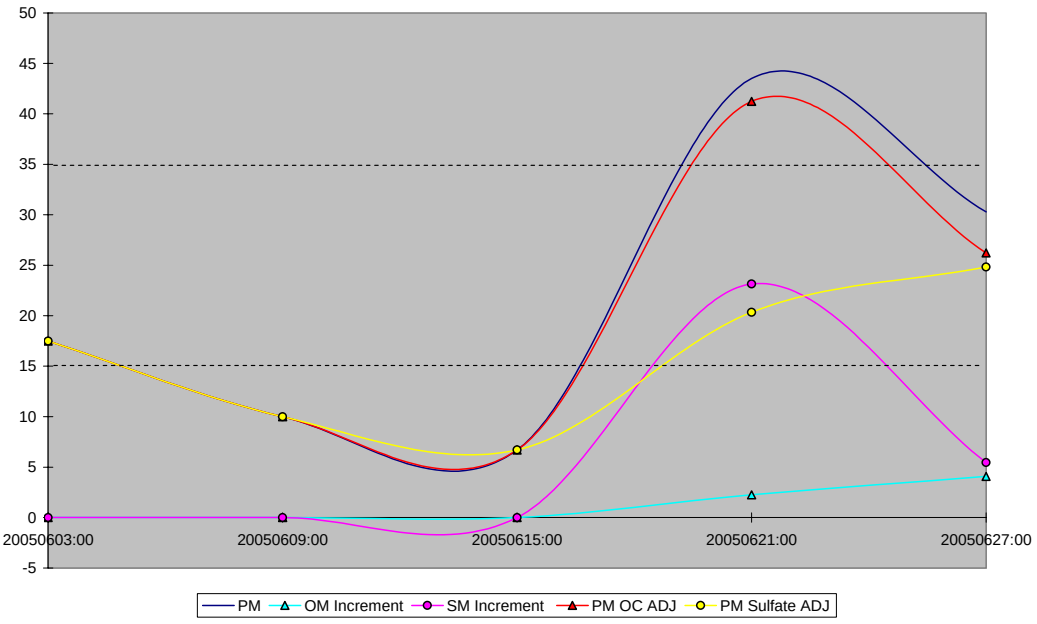


Figure 6: Paducah "But For" Demonstration



Exceedance Date(s): September 10, 2005
MSA(s): Paducah, KY-IL
Event Description: Monitoring sites surrounded by Arkansas/Mississippi wildfires.

Table 2 - Site-specific information used in analysis (µg/m^3)

AQS ID	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-145-1004	9/10/2005	39.6	15.2	22.4	35.3	No

DETAILED DISCUSSION OF EVIDENCE

A. EVENT DISCRIPTION:

Documentation submitted by the Kentucky DAQ claims that smoke from wildfires in Arkansas and Mississippi caused NAAQS exceedances at the site listed above. The only requested value that passed both steps with a concentration of 39.6µg/m^3 was collected on September 10, 2005. The documentation submitted by the Kentucky DAQ did not demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance "but for" the event on September 10, 2005.

B. CAUSAL CONNECTION BETWEEN THE EVENT AND AIR QUALITY

KYDAQ submittal consisted of National Oceanic and Atmospheric Administration (NOAA) map "Hot Spots", wind rose graphs of meteorological data and historical data for the month of September (2002 -2006). The causal relationship suggested is solely based on wind speed and wind direction. This evidence alone is insufficient to establish a causal relationship between the Arkansas and Mississippi wildfires and the exceedance of the 24-hr NAAQS.

C. COMPARISON TO BACKGROUND LEVELS

The 24-hr average $PM_{2.5}$ concentration is above the 30-day mean, and the calculated 95th percentile. A widespread sulfate event is evident across the Eastern U.S. on September 10, 2005 (Figure 7). The seasonal[3] average for sulfate is 4.8µgm/m^3 and for organic carbon is 4.7µg/m^3 at the Paducah site thereby indicating that the exceedance was more likely caused by the increased level of sulfates mass measured that day as opposed to the organic carbon mass measured.

[3] Seasonal average September – November 2004 - 2006

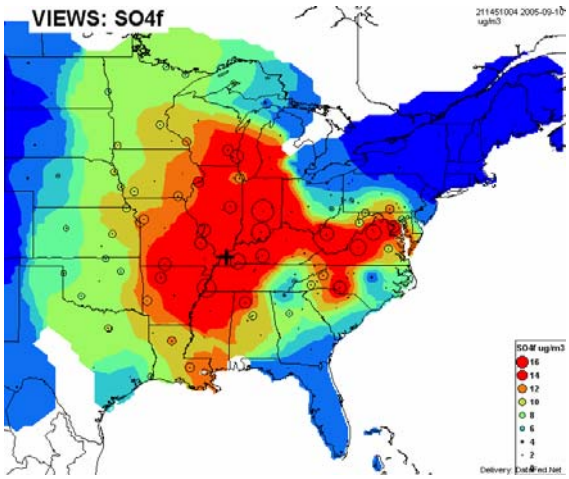


Figure 7: SO_4 Concentrations, Sept. 10, 2005

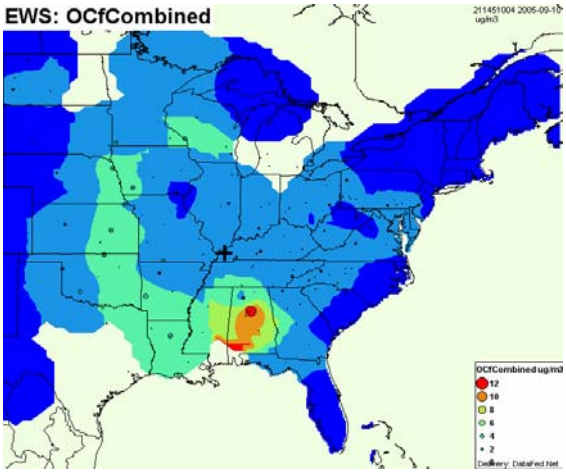


Figure 8: OC Concentrations, Sept. 10, 2005

D. DEMONSTRATION OF NO EXCEEDANCE "BUT FOR" THE EVENT

The requirement to establish that there would have been no exceedance "but for" this event, as found in Section §50.14(c)(3)(iii)(B), has not been met. This is supported by widespread elevated sulfate levels over the entire Eastern U.S. coupled with the organic carbon levels equal to the seasonal[4] average. This suggests that the elevated $PM_{2.5}$ levels observed at the Paducah site on September 10, 2005, were not caused by transport of airborne particulate matter attributed to the Arkansas/Mississippi wildfire event, but due to increased levels of sulfates.

[4] Seasonal (June - August)

Exceedance Date(s): July 19, 2006
MSA(s): Paducah, KY-IL
Event Description: Monitoring sites in western Kentucky blanketed with a smoke plume from the Arkansas/Mississippi wildfires.

Table 3 - Site-specific information used in analysis (µg/m^3)

AQS ID	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-145-1004	7/19/2006	36.7	17.4	23.9	34.1	No

DETAILED DISCUSSION OF EVIDENCE

A. EVENT DISCRIPTION:

Documentation submitted by the Kentucky DAQ claims that smoke from wildfires in Arkansas and Mississippi caused NAAQS exceedance at the site listed above. The only requested value that passed both steps with a concentration of 36.7µg/m^3 was collected on July 19, 2006. The documentation submitted by the Kentucky DAQ did not demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance "but for" the event on July 19, 2006.

B. CAUSAL CONNECTION BETWEEN THE EVENT AND AIR QUALITY

KYDAQ submittal consisted of National Oceanic and Atmospheric Administration (NOAA) analyzed smoke map wind rose graphs of meteorological data and historical data for the month of July (2002-2006.) The causal relationship suggested that Western Kentucky was blanketed with a smoke plume from the Arkansas and local wildfires; and that local meteorological conditions indicated calm winds from the southeast. This evidence alone is insufficient to establish a causal relationship between the Arkansas and Mississippi wildfires and the exceedance of the 24-hr NAAQS.

C. COMPARISON TO BACKGROUND LEVELS

The 24-hr average $PM_{2.5}$ concentration is above the 30-day mean, and the calculated 95th percentile. A widespread sulfate event is evident across the entire state of Kentucky on July 19, 2006. Organic carbon is shown to be above average concentrations only in Alabama and parts of Georgia and Mississippi (Figure 11). The seasonal[5] average for sulfate is 3.9µg/m^3 and for organic carbon is 4.7µg/m^3 at the Paducah site. The State of Kentucky including the Paducah site (Figures 10-11) has sulfate levels between 14 and 16µg/m^3 and organic carbon levels in the range of 4µg/m^3. Thereby indicating that exceedance was more likely caused by the increased level of sulfates mass measured that day as opposed to the organic carbon mass measured.

[5] Seasonal average (September - November 2004 and 2005)
AQS Database OC unadjusted 88305, Sulfates 88403

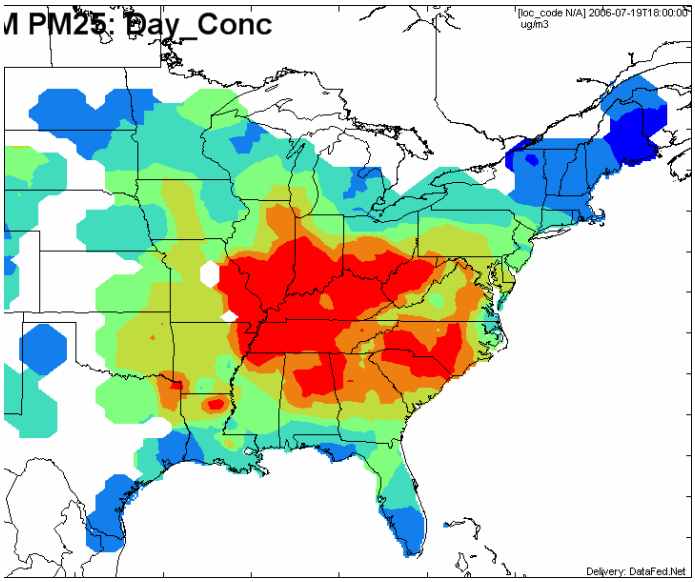


Figure 9: Paducah $PM_{2.5}$ Concentrations, July 19, 2006

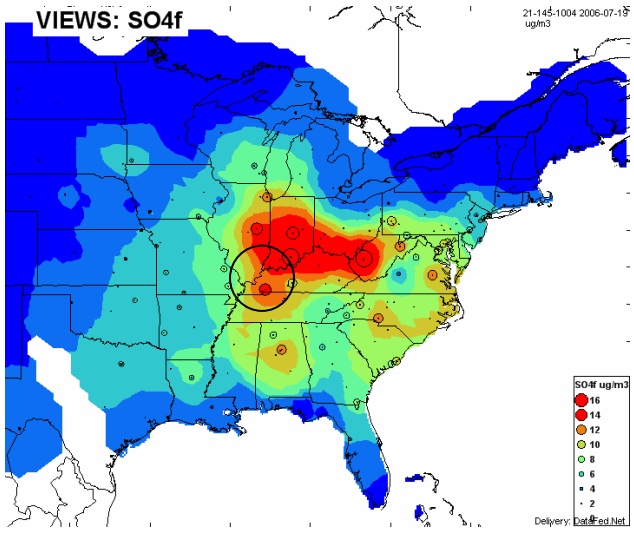


Figure 10: Paducah SO4 Concentrations, July 19, 2006

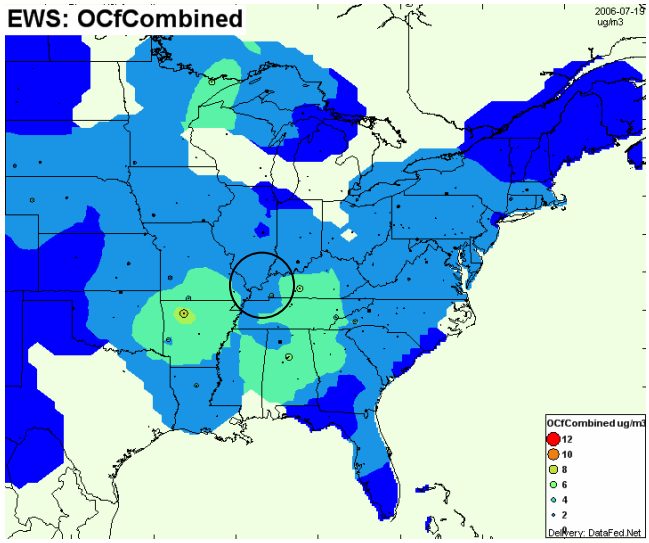


Figure 11: Paducah OC Concentrations, July 19, 2006

D. DEMONSTRATION OF NO EXCEEDANCE "BUT FOR" THE EVENT

The requirement to establish that there would have been no exceedance or violation "but for" this event, as found in Section §50.14(c)(3)(iii)(B), has not been met. The widespread sulfate over parts of Tennessee, Kentucky, Illinois, Indiana, Ohio and West Virginia, suggest a regional impact combined with stagnant wind conditions. The levels of organic carbon measured are at or below the seasonal[6] averages suggests that the elevated $PM_{2.5}$ levels observed at the Paducah site on July 19, 2006, were not caused by transport of airborne particulate matter attributed to a wildfire event, but due to high sulfate levels.

[6] Seasonal average (June – August 2004 and 2005) AQS Data base OC unadjusted 88305, Sulfates 88403

Exceedance Date(s): May 24 - June 2, 2007
MSA(s): Paducah, KY-IL
Event Description: Monitoring site impacted by smoke plumes from the Southeast Georgia/Florida wildfires.

Table 4 - Site-specific information used in analysis (µg/m^3)

AQS ID	Date	Observed Concentration	Monthly Mean	84th Percentile	95th Percentile	EPA Concurrence
21-145-1004	5/24/2007	39.4	12.1	16.8	19.1	Yes

A. EVENT DISCRIPTION:

Documentation submitted by the Kentucky DAQ claims that smoke from the Southeast Georgia/Florida wildfires (see Figures 12 and 13) caused an exceedance of the 24-hr PM2.5 NAAQS on May 24, 2007. The requested value of 39.4µg/m^3 passed both steps.

Due to the amount of acreage consumed from these wildfires, copious smoke impacted sites around Region 4 from May through the first week of June, in many cases causing very large increases in the 24 hour $PM_{2.5}$ mass. The documentation submitted by the Kentucky DAQ demonstrates a clear causal relationship between the measured concentration and the event, and that there would have been no exceedance "but for" the event on May 24, 2007.

B. CAUSAL CONNECTION BETWEEN THE EVENT AND AIR QUALITY

KYDAQ provided PM2.5 speciation and meteorological documentation (including National Oceanic and Atmospheric Administration (NOAA) smoke analysis maps, Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) models, and wind rose graphs along with statistical analysis of the data). The overall body of evidence was sufficient to establish a causal relationship between the Southeast Georgia/Florida wildfires and the exceedance.

The Bugaboo Scrub Fire wildfire (a.k.a. Big Turnaround fire) (Figure 12) raged from May to June in 2007 and was the largest fire in the history of both Georgia and Florida. The "Bugaboo" scrub fire, started in the Okefenokee Swamp, the majority of which is located in Georgia. It was previously known as the Sweat Farm Road Fire (Figure 13), which merged with the Big Turnaround fire.

Fig. 12: Big Turnaround fire 4/29/07 Blaine Eckberg, USFWS

Fig. 13: GA Forestry Commission - Sweat Farm Road Fire on 4/28/07

C. COMPARISON TO BACKGROUND LEVELS

Figure 14 shows wind trajectories maps and measured concentrations. The blue lines indicate air mass movement. The red lines indicate the direction of travel at the point of exit. The organic carbon map (Figure 16) indicates organic carbon levels are approximately 2 times higher than the seasonal average[7] of 4.4µg/m^3, where as the sulfate maps (Figure 15) show levels that are equal to the seasonal levels of 6.1µg/m^3. This is a strong indication that the exceedance was due to the smoke plume traveling from the Southeast Georgia/Florida wildfires.

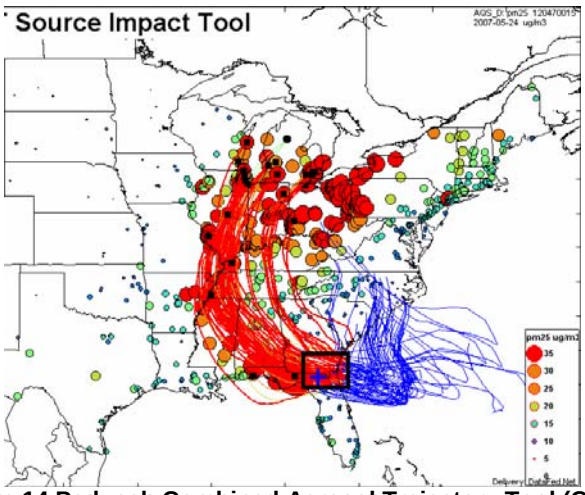


Figure 14 Paducah Combined Aerosol Trajectory Tool (CATT) Back Trajectory May 24, 2007

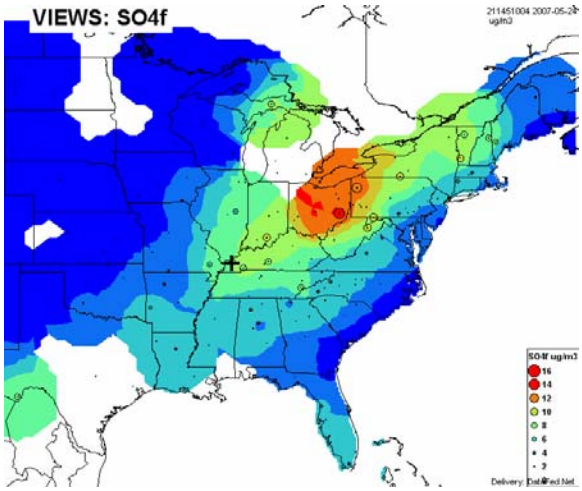


Figure 15: Paducah SO4f Concentration 5/24/07

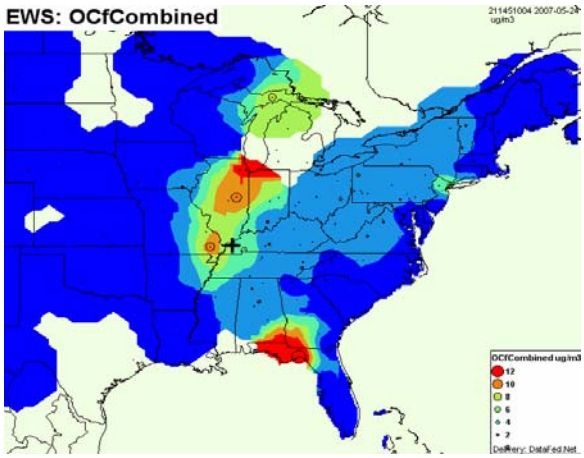


Figure 16: Paducah OC Concentration 5/24/07

D. DEMONSTRATION OF NO EXCEEDANCE "BUT FOR" THE EVENT

In order to quantify the impacts of the fire on observed PM2.5 concentrations, speciation data collected at the Clarksville, TN site (47-125-0009) and the Southwick, KY site in Louisville, KY (21-111-0043) on May 24, 2007, was used to approximate the organic mass increment of the observed PM2.5 mass that was caused by the wildfire. (These sites were chosen due to their proximity to the Paducah site.) The organic mass increment was calculated using the following equation[8],

[7] Seasonal average (May – July 2004 and 2005) AQS Data base OC unadjusted 88305, Sulfates 88403
[8] "Species Contributions to PM2.5 Mass Concentrations (Turpin and Lim 2001)"

$$OMI = (OC_{observed} - OC_{average}) \times 2.0 \qquad \textit{(Eq. 2)}$$

Where OMI is the organic mass increment due to smoke from the wildfire, $OC_{observed}$ is the observed organic carbon mass, and $OC_{average}$ is the average organic carbon mass observed at the nearby Southwick, KY (2005-2006) and Clarksville, TN (2007) sites during the month of May. A multiplier of 2.0 is used to approximate the total PM2.5 mass associated with smoke from wildfires.[9] In order to approximate the PM2.5 concentration that would have been observed but for the fire, the OMI was subtracted from the observed 24-hr average PM2.5 concentration. This procedure was then repeated for each day that PM2.5 speciation data was collected during May 2007 to compare impacts of smoke on different days. The results of this analysis are shown in Figure 17. This figure shows the calculated OMI and the adjusted PM2.5 mass (Observed PM2.5 – OMI). The graph demonstrates that without the PM2.5 mass emitted by the fire on May 24, 2007, the 24-hr average PM2.5 concentration would have been approximately 35.1µg/m^3, and thus that there would have been no exceedance but for the wildfire.

The overall body of evidence suggests that there would have been no NAAQS exceedance during this period but for the Southeast Georgia/Florida wildfires. EPA concurrence was given to the value requested.

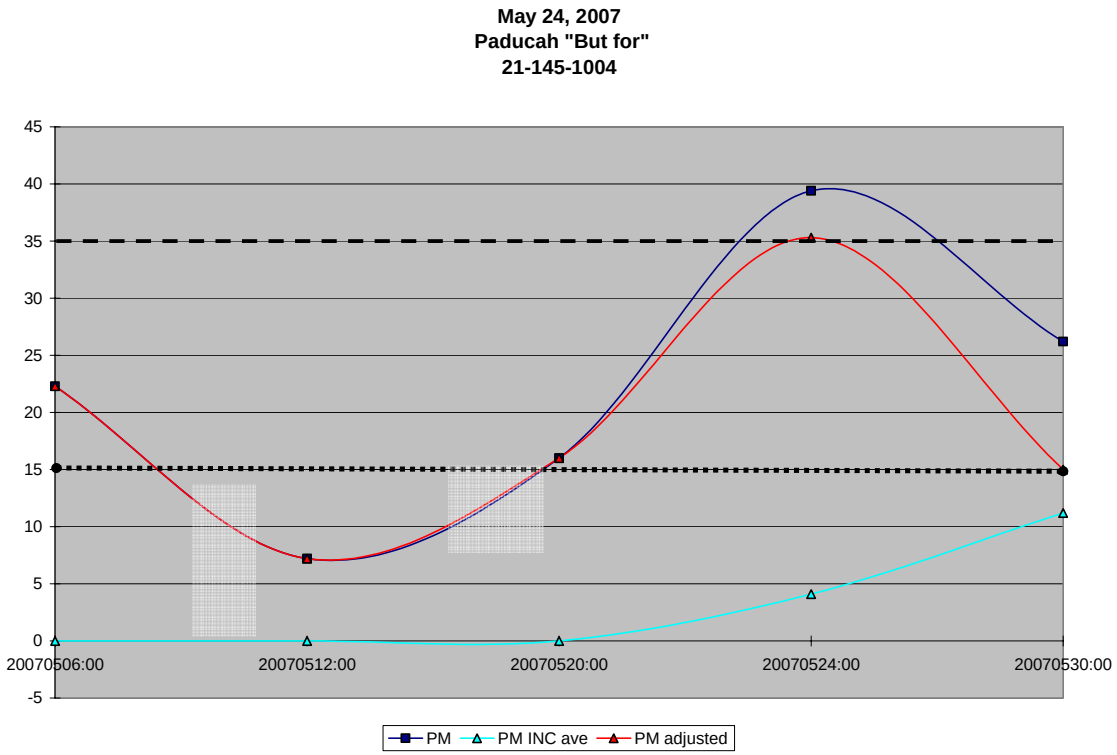


Figure 17: Paducah "But for" Demonstration

[9] "Species Contributions to PM2.5 Mass Concentrations (Turpin and Lim 2001)"