

Tennessee Unclassifiable Area Designations for the 2012 Primary Annual PM_{2.5} National Ambient Air Quality Standards Technical Support Document

1.0 Summary

In accordance with section 107(d) of the Clean Air Act (CAA), the EPA must promulgate designations for all areas of the country. In particular, the EPA must identify those areas that are violating a National Ambient Air Quality Standard (NAAQS) or contributing to a violation of the NAAQS in a nearby area. Additionally, through the designation process, the EPA identifies areas that are meeting the NAAQS and those areas without sufficient data for the Agency to make a determination. The EPA uses a designation category of "unclassifiable/attainment" for areas where air quality monitoring data indicate attainment of the NAAQS and for areas that do not have monitors but for which the EPA has reason to believe are likely to be in attainment and are not contributing to nearby violations. The EPA reserves the category of "unclassifiable" for areas where the EPA cannot determine based on available information whether the area is meeting or not meeting the NAAQS or where the EPA has not determined that the area contributes to a nearby violation. The EPA must complete the initial area designation process within 2 years of promulgating a new or revised NAAQS, or may do so within 3 years under certain circumstances.¹ This Technical Support Document (TSD) describes the EPA's intent to designate certain areas in Tennessee as unclassifiable for the 2012 primary annual fine particle NAAQS (2012 annual PM_{2.5} NAAQS).²

Under section 107(d), states are required to submit area designation recommendations to the EPA for the 2012 annual PM_{2.5} NAAQS no later than 1 year following promulgation of the NAAQS, or by December 13, 2013. In December 2013, Tennessee recommended that Knox County be designated "unclassifiable" and all other counties in the State be designated as "unclassifiable/attainment" for the 2012 annual PM_{2.5} NAAQS. However, a recent EPA-conducted technical systems audit of Tennessee's monitoring program revealed data completeness issues for several areas across the State.³ Given these data completeness issues, the

¹ Section 107(d) of the CAA requires the EPA to complete the initial designation process within 2 years of promulgation of a new or revised NAAQS, unless the Administrator has insufficient information to make initial designation decisions in the 2-year time frame. In such circumstances, the EPA may take up to 1 additional year to make initial area designation decisions (i.e., no later than 3 years after promulgation of the standard).

² On December 14, 2012, the EPA promulgated a revised primary annual PM_{2.5} NAAQS (78 FR 3086, January 15, 2013). In that action, the EPA revised the primary annual PM_{2.5} standard, strengthening it from 15.0 micrograms per cubic meter (µg/m³) to 12.0 µg/m³.

³ Memorandum from Liz Naess, Group Leader, Air Quality Analysis Group, US EPA Office of Air Quality Planning and Standards, to EPA Docket EPA-HQ-OAR-2012-0918, Air Quality Designations for the 2012 PM_{2.5}

EPA cannot determine whether the counties with the incomplete monitoring data are meeting or not meeting the NAAQS. Because the EPA cannot make a final regulatory determination about whether a violation exists in those counties with incomplete data, in some cases the EPA is also not able to determine whether counties nearby to those counties with incomplete monitoring data contribute to a nearby violation. Where data completeness issues remain unresolved prior to the EPA Administrator's final determination on designations for the 2012 PM_{2.5} NAAQS, the EPA intends to designate the affected areas as "unclassifiable."

After considering Tennessee's recommendations and based on the EPA's assessment of available information as described in this TSD, the EPA intends to designate the areas identified in Table 1 as unclassifiable for the 2012 annual PM_{2.5} NAAQS. Detailed analyses follow for each of the identified areas.

Table 1. EPA's Intended Unclassifiable Areas for the 2012 annual PM_{2.5} NAAQS

Area	Tennessee's Recommendations	EPA's Intended Unclassifiable Counties
Clarksville	Unclassifiable/Attainment	Montgomery and Stewart Counties
Kingsport	Unclassifiable/Attainment	Hawkins and Sullivan Counties
Knox County	Unclassifiable	Unclassifiable
Memphis	Unclassifiable/Attainment	Shelby, Fayette and Tipton Counties
Rest of State of Tennessee	Unclassifiable/Attainment	Remaining counties in the State of Tennessee with the exception of Hamilton, Marion and Sequatchie Counties in the Chattanooga Area

However, if future valid air quality data obtained by Tennessee or other relevant states provides adequate basis for determining the air quality status of these areas, in particular if reliable quality assured monitoring data become available that indicate that any of these areas are violating the standard, at that time the EPA will may initiate action to redesignate such areas, including conducting a complete 5-factor analysis, including consideration of the location and magnitude of the identified violations. As a result of any such future analyses, the boundaries of the

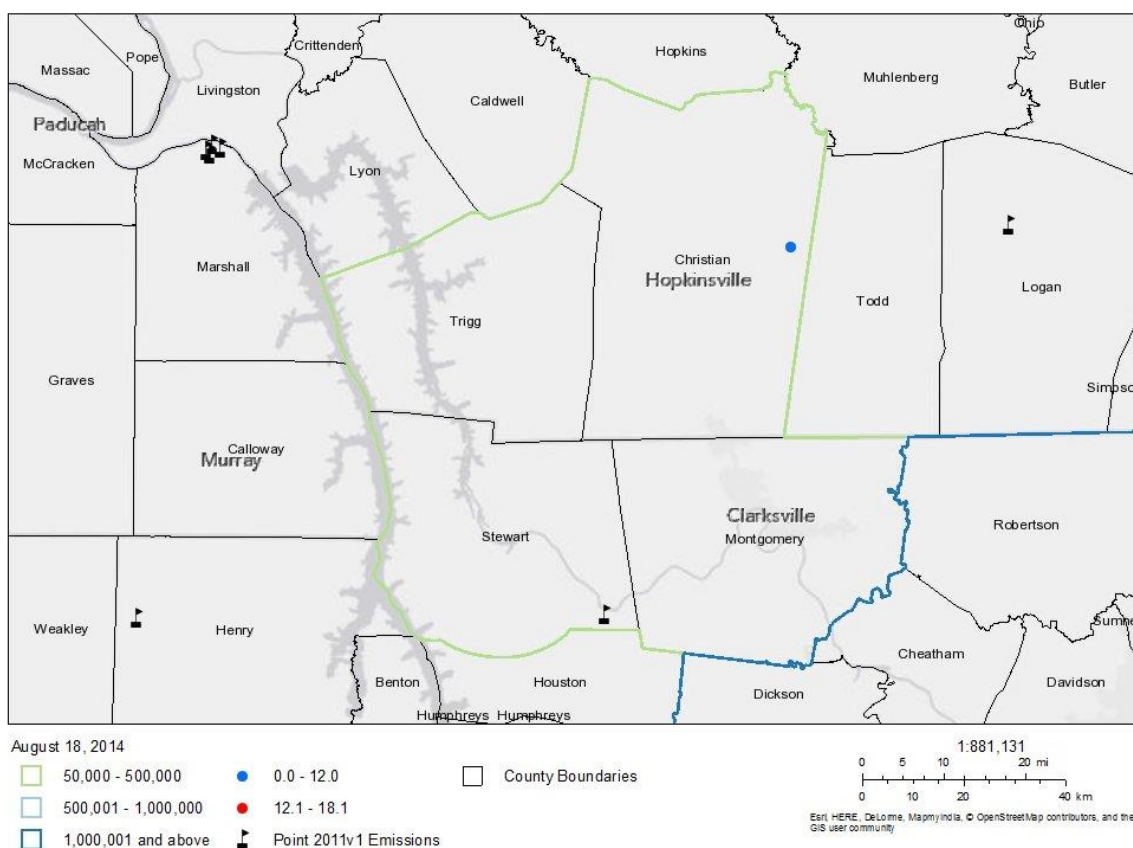
Standards, titled, "Initial Area Designations for the 2012 Revised Primary Annual Final Particle National Ambient Air Quality Standard: Tennessee Data Issues."

nonattainment area will not necessarily be those that EPA uses to define the unclassifiable areas that EPA intends to promulgate now based on incomplete data.

Clarksville TN-KY Area

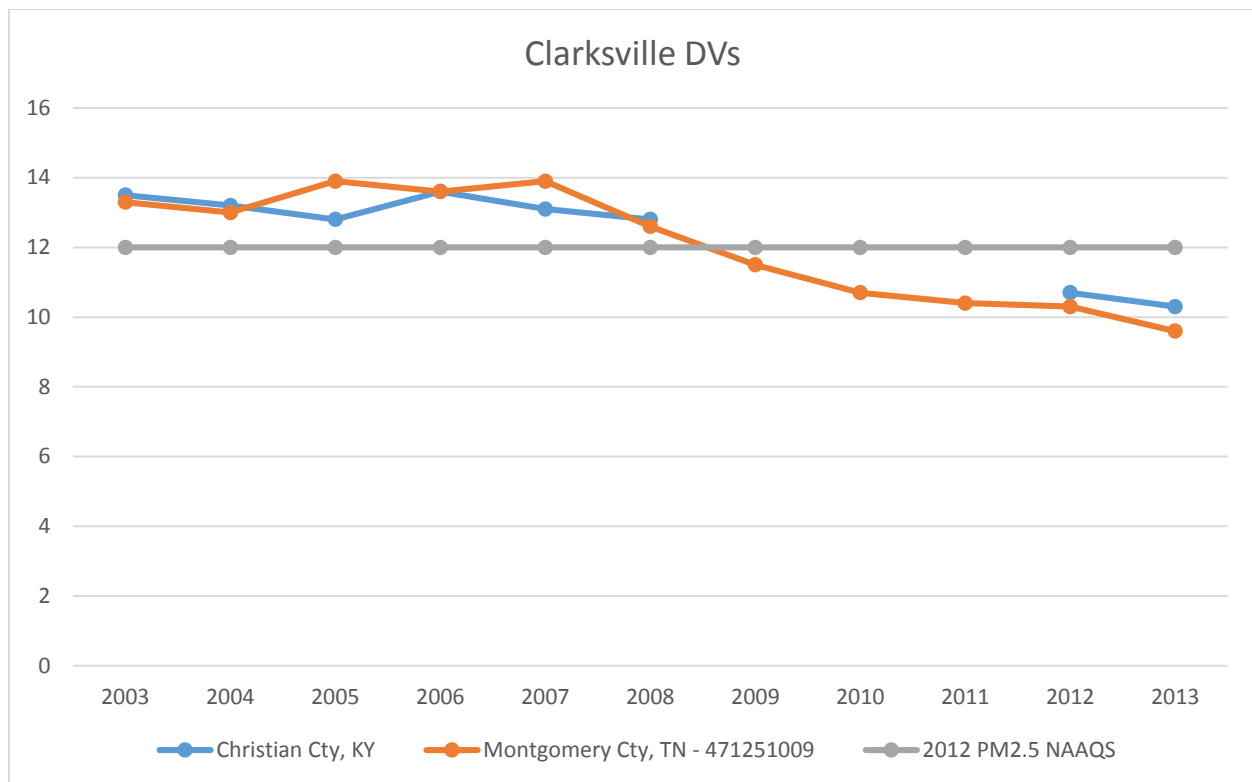
Clarksville is located in a bi-state CBSA that includes four counties: two counties in Tennessee and two counties in Kentucky. Most of the urbanized portion of Clarksville is contained within Montgomery County, Tennessee. None of the counties in the CBSA have ever been designated nonattainment for any for the 1997 or 2006 fine particulate matter (PM_{2.5}) national ambient air quality standard (NAAQS). The Clarksville CBSA and surrounding counties are shown in Figure 1, along with the location of point sources and air quality monitors.

Figure 1. Clarksville CBSA with Point Sources and Air Quality Monitor Locations



There is an attaining monitor in Christian County, Kentucky with a valid design value of 10.3 ug/m³ for the 2011-2013 timeframe. Also, the PM_{2.5} air quality in the area has been steadily improving since the early 2000's as evidenced by the downward trend of PM_{2.5} values measured at the monitors in the Clarksville area. This downward trend is shown in Figure 2. The Montgomery County, Tennessee monitor has an incomplete design value of 9.6 ug/m³ for the 2011-2013 timeframe.

Figure 2. Clarksville Area Air Monitor Design Value (DV) Trends



The EPA evaluated PM_{2.5} and PM_{2.5}-precursor emissions and related data from the counties in the Clarksville area. Table 2 provides a summary of this data. Montgomery and Stewart Counties have the majority of PM_{2.5} and precursor emissions, population and vehicle miles traveled (VMT). Montgomery County has a monitor with invalid data and an urbanized core around the City of Clarksville. Stewart County has a large point source (TVA Cumberland Fossil Plant) with over 2,500 tpy of PM_{2.5} emissions and over 7,600 tpy of SO₂ emissions in the upwind direction of the Montgomery County monitor.

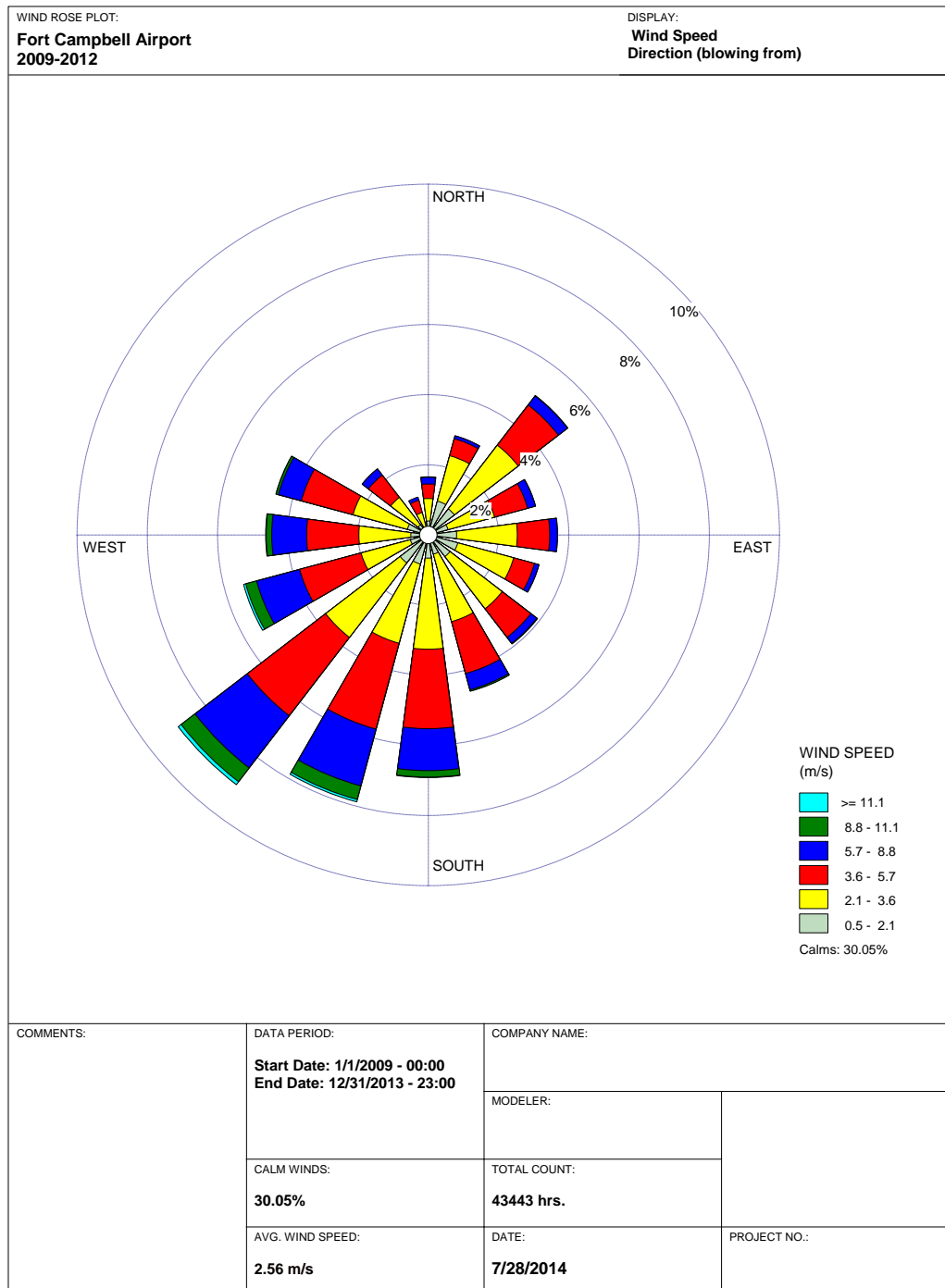
In Kentucky, Christian County and Trigg County are outlying areas that are located primarily downwind from the Montgomery County PM_{2.5} monitoring site. Christian County has an attaining PM_{2.5} monitor, and while the county population is nearly half that of Montgomery County, current growth is only about 3 percent. Trigg County has very low emissions of all pollutants (e.g., 28 tpy of SO₂ and 389 tpy of PM_{2.5}), and the County's population is relatively small at about 5 percent for the area.

Table 2. Summary statistics for the Clarksville, TN-KY CBSA

	Montgomery	Stewart	Christian	Trigg
State	Tennessee	Tennessee	Kentucky	Kentucky
Core urbanized county or outlying?	Core	Outlying	Outlying	Outlying
SO2 Emissions (tpy)	1,529	7,740	77	28
PM_{2.5} emissions (tpy)	1,018	2,452	947	389
Population	173,375	13,340	74,138	14,355
Population (% of CBSA)	63%	5%	27%	5%
Population growth (2000 – 2010)	29%	8%	3%	14%
VMT (Millions)	1,467	166	912	218
VMT (% of CBSA)	53%	6%	33%	8%

The EPA also evaluated the meteorology in the area by evaluating wind data collected at the Fort Campbell Airport. Figure 3 provides a wind rose created five years of data from 2009-2013. The predominant winds blow from the southwest and south directions. These predominant wind directions do not support contribution of emissions from the Kentucky counties to the PM_{2.5} air quality in the Tennessee areas.

Figure 3. Wind Rose Data for the Clarksville TN-KY Area



WRPLOT View - Lakes Environmental Software

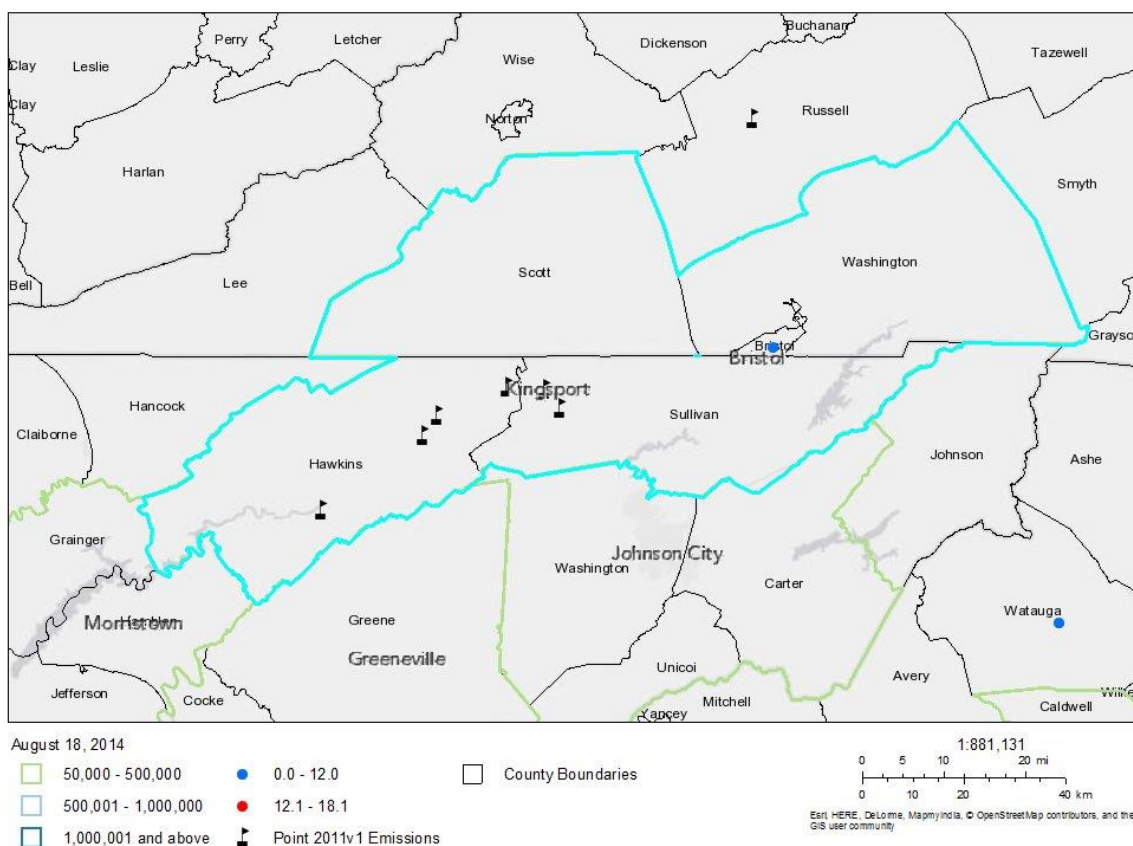
Clarksville Area Conclusion:

As a result of our technical analysis of the Clarksville CBSA, the EPA is preliminarily determining that the Tennessee counties of Montgomery and Stewart be designated unclassifiable along with most of the State of Tennessee due to the ambient monitoring data quality issues, including an invalid 2013 design value at the Montgomery County monitor. The EPA is agreeing with the recommendation from Kentucky and are preliminarily recommending that Christian and Trigg Counties be designated attainment/unclassifiable. As discussed above, any potential violation at the Montgomery County monitor would be strongly influenced by the point sources in Stewart County, Tennessee.

Kingsport-Bristol, TN-VA Area

Kingsport-Bristol is located in a bi-state CBSA that includes four counties and a city: two counties in Tennessee and two counties in Virginia, along with Bristol City which straddles the Tennessee and Virginia state line. Most of the urbanized portion of Kingsport-Bristol is contained within Sullivan and Hawkins Counties in Tennessee. None of the counties in the CBSA have ever been designated nonattainment for any for the 1997 or 2006 fine particulate matter (PM_{2.5}) national ambient air quality standards (NAAQS). The Kingsport-Bristol CBSA and surrounding counties are shown in Figure 4, along with the location of point sources and air quality monitors.

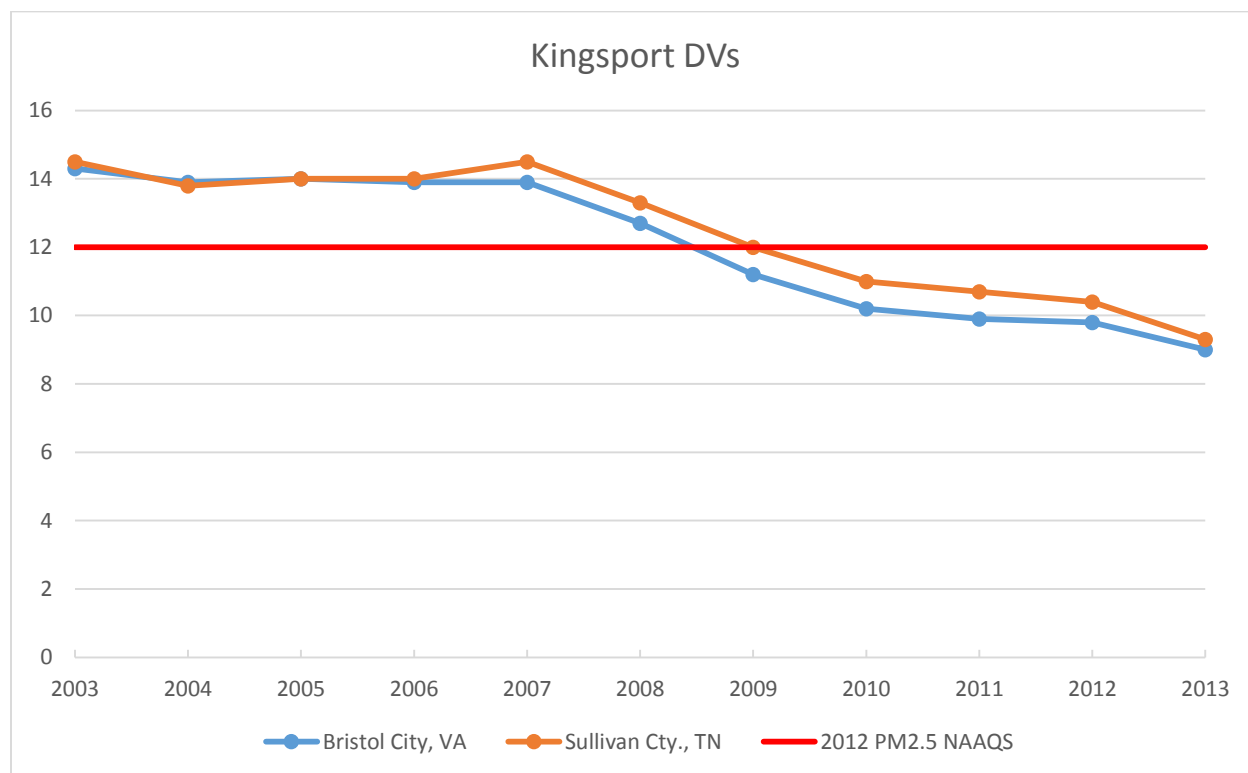
Figure 4. Kingsport-Bristol CBSA with Point Sources and Air Quality Monitor Locations



There is an attaining monitor in Bristol City on the Virginia side of the state line with a valid design value of 9.0 ug/m³ for the 2011-2013 timeframe. Also, the PM_{2.5} air quality in the area has been steadily improving since the early 2000's as evidenced by the downward trend of PM_{2.5}

values measured at the monitors in the Kingsport-Bristol area. This downward trend is shown in Figure 5. The Sullivan County, Tennessee monitor has an incomplete design value of 9.3 ug/m³ for the 2011-2013 timeframe.

Figure 5. Kingsport-Bristol Area Air Monitor Design Value (DV) Trends



The EPA evaluated PM_{2.5} and PM_{2.5}-precursor emissions and related data from the counties in the Kingsport-Bristol area. Table 3 provides a summary of this data. Sullivan and Hawkins Counties have the majority of PM_{2.5} and precursor emissions, population and VMT. Hawkins County also has four large point sources in the upwind direction of the Sullivan County monitor, two of which, TVA John Sevier Fossil Plant and Holston Army Ammunition Plant, have significant SO₂ emissions of over 15,000 tpy and over 1,500 tpy, respectively.

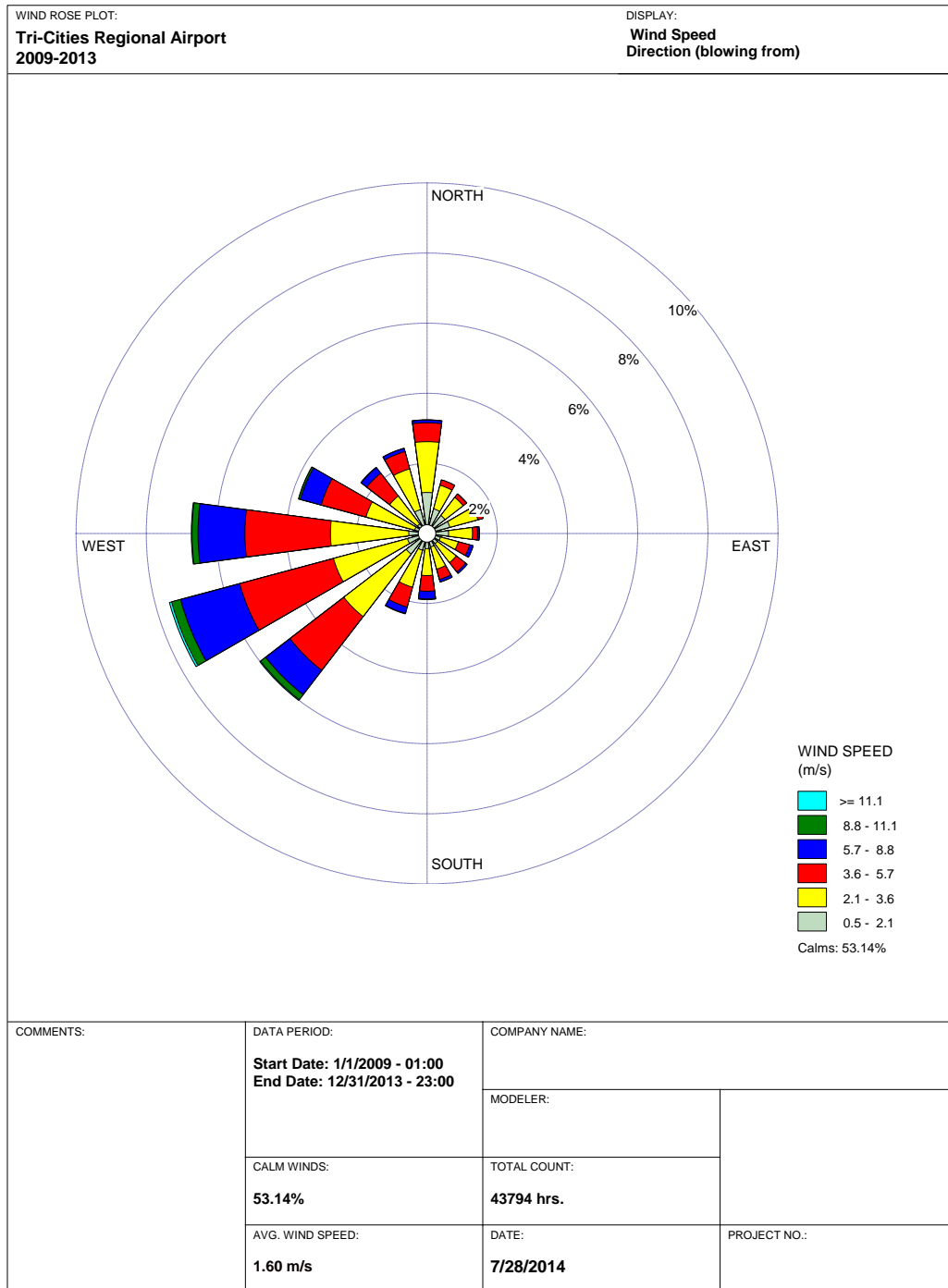
In Virginia, Scott and Washington Counties and Bristol City have low emissions, population and VMT relative to Sullivan and Hawkins Counties. These are outlying areas that are located in the primarily downwind direction from the Sullivan County PM_{2.5} monitoring site. Bristol City has an attaining PM_{2.5} monitor and low population and population growth of about 3 percent. Scott County has very low SO₂ emissions of about 40 tpy and relatively low PM_{2.5} emissions of 306 tpy. Although Scott County has 18 percent of the area's population, the recent growth trend is negative. Washington County has very low emissions of all pollutants (e.g., 88 tpy of SO₂ and 104 tpy of PM_{2.5}), and the County's population is relatively small at about 6 percent for the area.

Table 3. Summary statistics for the Kingsport-Bristol, TN-VA CBSA

	Hawkins	Sullivan	Bristol City	Scott	Washington
State	Tennessee	Tennessee	Virginia	Virginia	Virginia
Core urbanized county or outlying?	Outlying	Core	Outlying	Outlying	Outlying
SO2 Emissions (tpy)	17,819	24,937	26	40	88
PM_{2.5} emissions (tpy)	892	3,036	946	306	104
Population	56,842	156,866	17,849	23,111	54,879
Population (% of CBSA)	18%	51%	6%	18%	6%
Population growth (2000 – 2010)	6%	3%	3%	-1%	7%
VMT (Millions)	537	1,748	225	275	741
VMT (% of CBSA)	15%	50%	6%	21%	8%

The EPA also evaluated the meteorology in the area by evaluating wind data collected at the Tri-Cities Regional Airport. Figure 6 is a wind rose created from five years of data from 2009-2013. The predominant winds blow from the west and southwest directions. These predominant wind directions do not support contribution of emissions from the Virginia areas to the PM_{2.5} air quality in the Tennessee areas.

Figure 6. Wind Rose Data for the Kingsport-Bristol TN-VA Area



WRPLOT View - Lakes Environmental Software

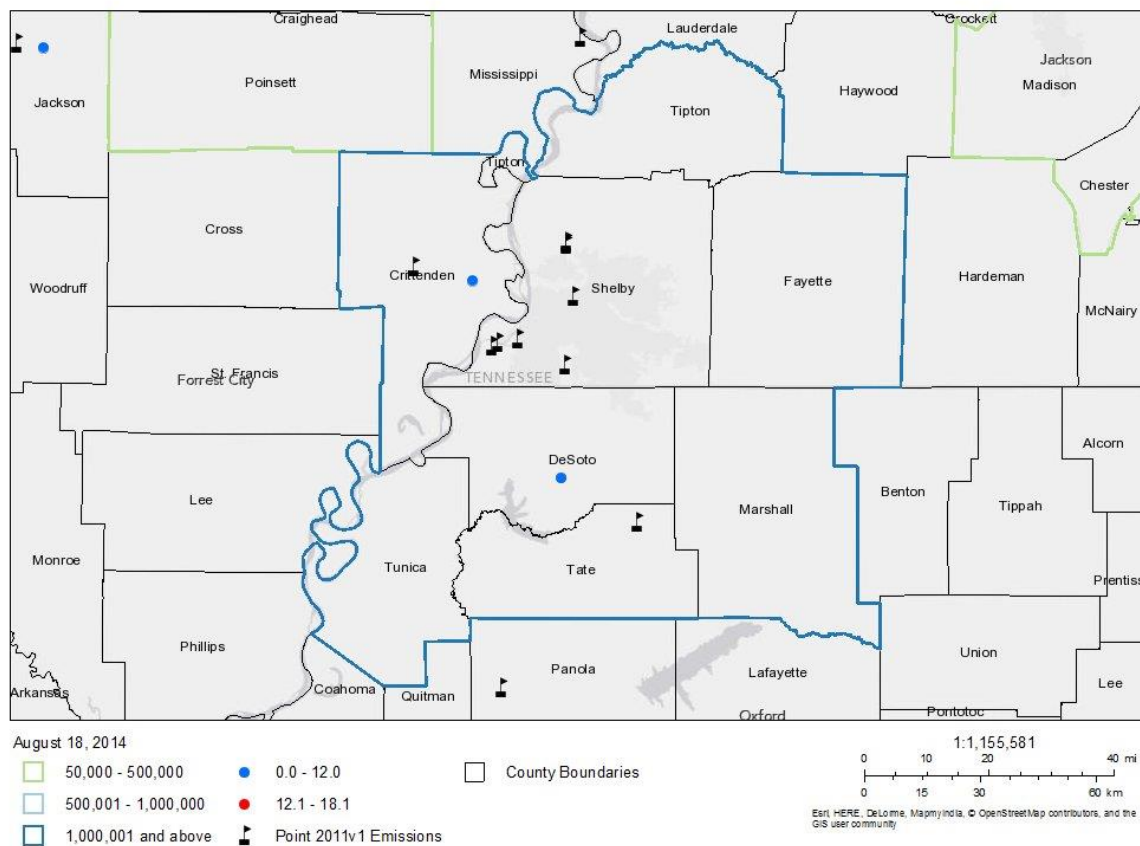
Kingsport-Bristol Area Conclusion:

As a result of our technical analysis of the Kingsport-Bristol CBSA, the EPA is preliminarily determining that the Tennessee counties of Sullivan and Hawkins be designated unclassifiable along with most of the State of Tennessee due to the ambient monitoring data quality issues, including an invalid 2013 design value at the Sullivan County monitor. The EPA is agreeing with the recommendation from Virginia and is preliminarily determining that Scott and Washington Counties and Bristol City in Virginia be designated attainment/unclassifiable. As discussed above, any potential violation at the Sullivan County monitor would be strongly influenced by the point sources in Sullivan and Hawkins County, Tennessee.

Memphis TN-MS-AR Area

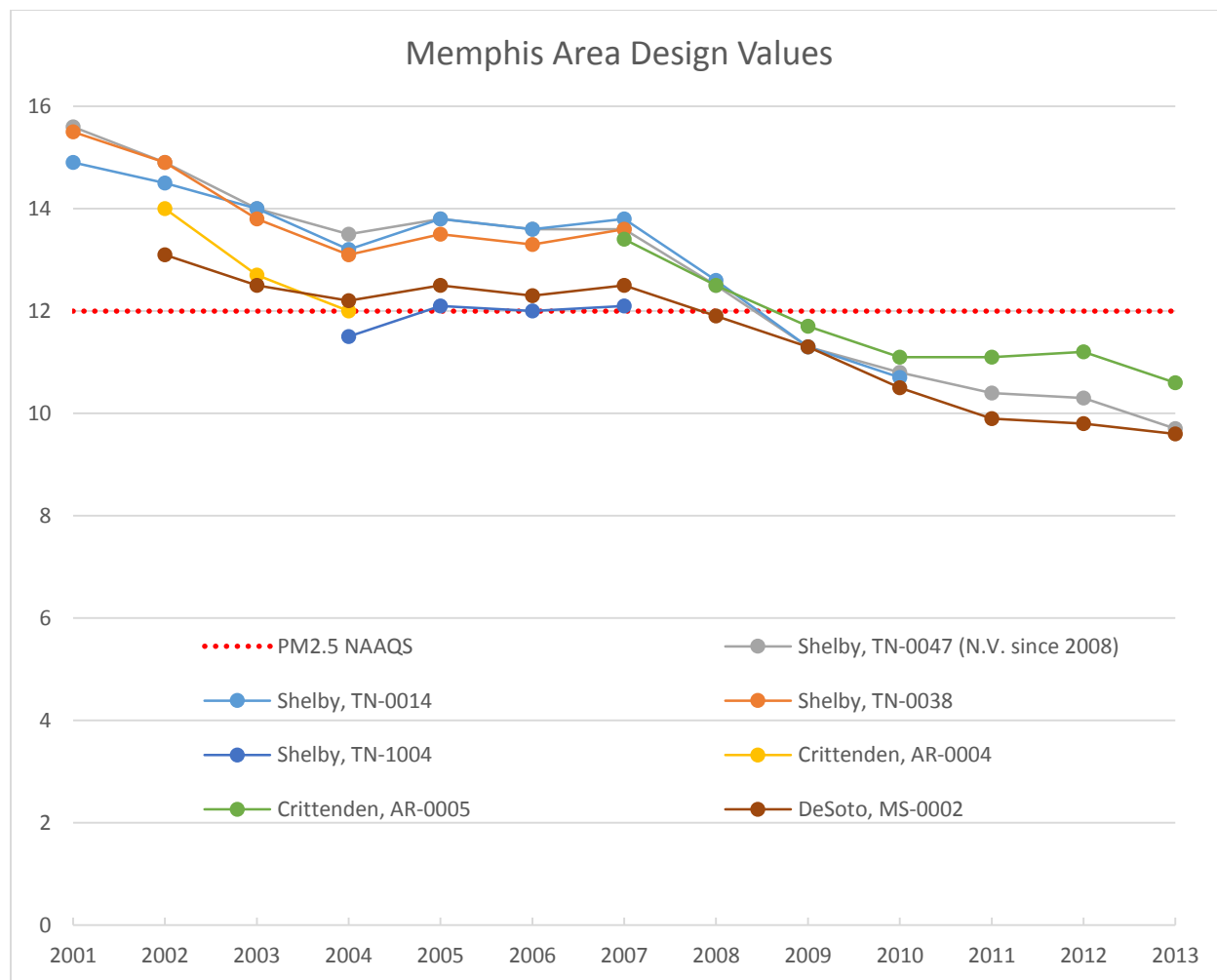
Memphis is located in a tri-state CBSA that includes nine counties: three counties in Tennessee, five counties in Mississippi, and one county in Arkansas. Most of the urbanized portion of Memphis is contained within Shelby County, Tennessee, although there are pockets of urbanization that stretch into DeSoto County, Mississippi, and Crittenden County, Arkansas. None of the counties in the CBSA have ever been designated nonattainment for either the 1997 or 2006 PM_{2.5} NAAQS. The Memphis CBSA and surrounding counties are shown in Figure 7, along with the location of point sources and air quality monitors.

Figure 7. Memphis TN-MS-AR CBSA with Point Sources and Air Quality Monitor Locations



There are attaining monitors in both DeSoto County and Crittenden County with valid design values for the 2011-2013 timeframe of 9.6 $\mu\text{g}/\text{m}^3$ and 10.6 $\mu\text{g}/\text{m}^3$, respectively. Also, the $\text{PM}_{2.5}$ air quality in the area has been steadily improving since the early 2000's as evidenced by the downward trend of $\text{PM}_{2.5}$ values measured at all of the monitors in the Memphis area, including the monitors in Shelby County prior to the time when data quality issues caused that data to be unreliable for final regulatory determinations (approximately 2008). This downward trend is shown in Figure 8. The Shelby County, Tennessee monitor has an incomplete design value of 9.7 $\mu\text{g}/\text{m}^3$ for the 2011-2013 timeframe.

Figure 8. Memphis Area Air Monitor Design Value (DV) Trends



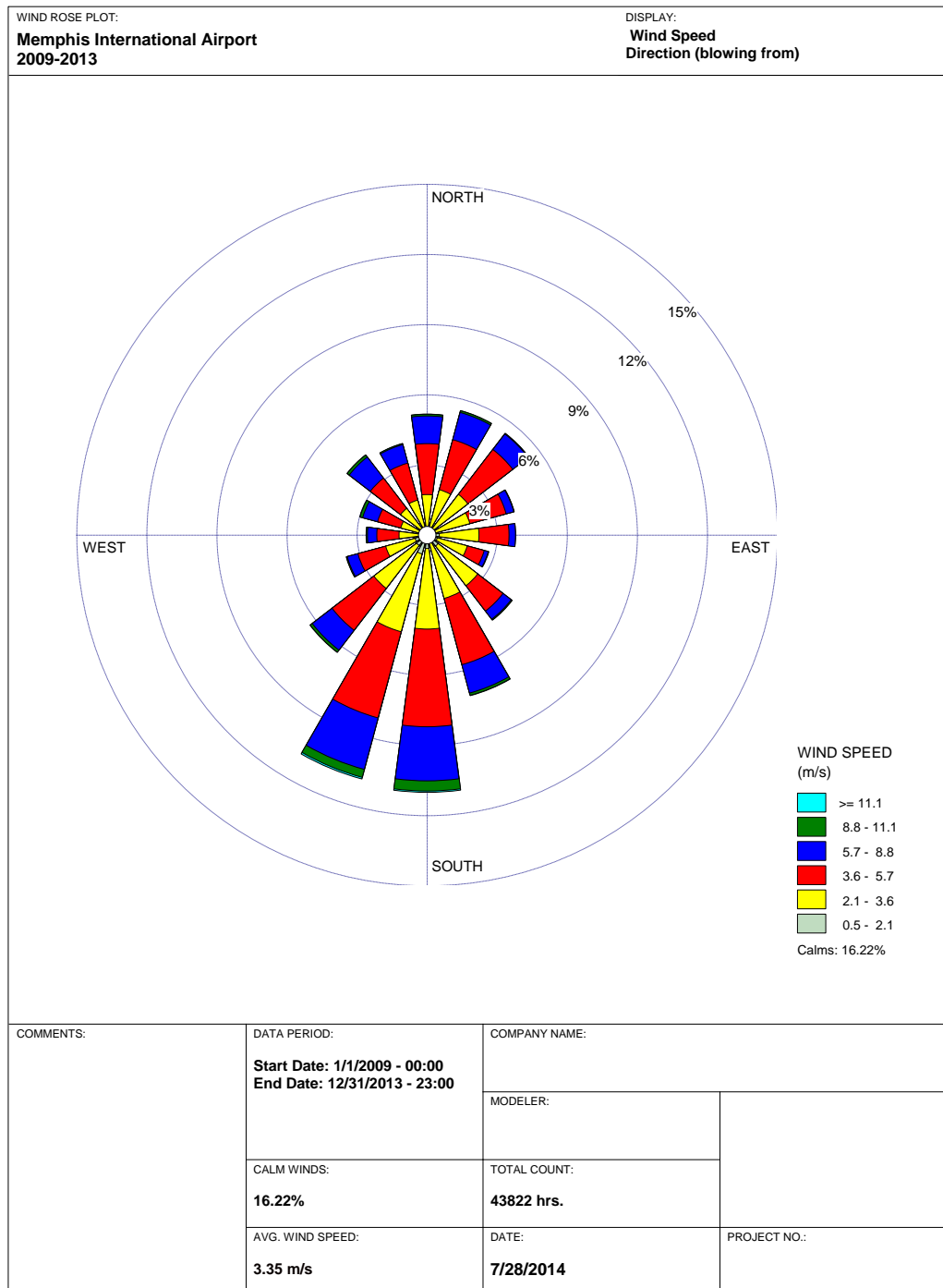
The EPA evaluated $\text{PM}_{2.5}$ and $\text{PM}_{2.5}$ -precursor emissions and related data from the counties in the Memphis area. Table 4 provides a summary of this data. Shelby County has the majority of $\text{PM}_{2.5}$ and precursor emissions, population and VMT. Shelby County also has four large sources just 8-12 miles upwind of the Shelby County monitor, including Cargill Corn Milling (330 tpy $\text{PM}_{2.5}$ and 3,000 tpy SO_2) and Allen Fossil Plant (415 tpy $\text{PM}_{2.5}$ and 11,000 tpy SO_2) as can be seen in the map of the Memphis area provided in Figure 7.

Table 4. Summary statistics for the Memphis, TN-MS-AR CBSA

	Fayette	Shelby	Tipton	Benton	Desoto	Marshall	Tate	Tunica	Crittenden
State	TN	TN	TN	MS	MS	MS	MS	MS	AR
Core urbanized county or outlying?	Outlying	Core	Outlying	Outlying	Core	Outlying	Outlying	Outlying	Core
SO₂ Emissions (tpy)	429	20,010	308	36	52	63	58	107	125
Primary Sulfate Emissions (tpy)	10	140	8	10	29	6	6	8	11
PM_{2.5} emissions (tpy)	790	4,042	874	475	1,419	1,064	651	1,471	1,854
Population	38,413	928,792	61,160	8,712	161,732	37,098	28,970	10,741	50,952
Population (% of CBSA)	3%	70%	5%	1%	12%	3%	2%	1%	4%
Population growth (2000 – 2010)	33%	4%	19%	9%	51%	6%	14%	16%	0.2%
VMT (Millions)	540	8,562	417	190	1,798	683	365	237	866
VMT (% of CBSA)	4%	63%	3%	1%	13%	5%	3%	2%	6%

The EPA also evaluated the meteorology in the area by evaluating wind data collected at the Memphis International Airport. Figure 9 is a wind rose created from five years of data from 2009-2013. The predominant winds blow from the south and southwesterly directions, with a smaller component of winds blowing from the north to the south. These wind patterns suggest the Shelby County monitor would be strongly be impacted by emissions from these large point sources in Shelby County.

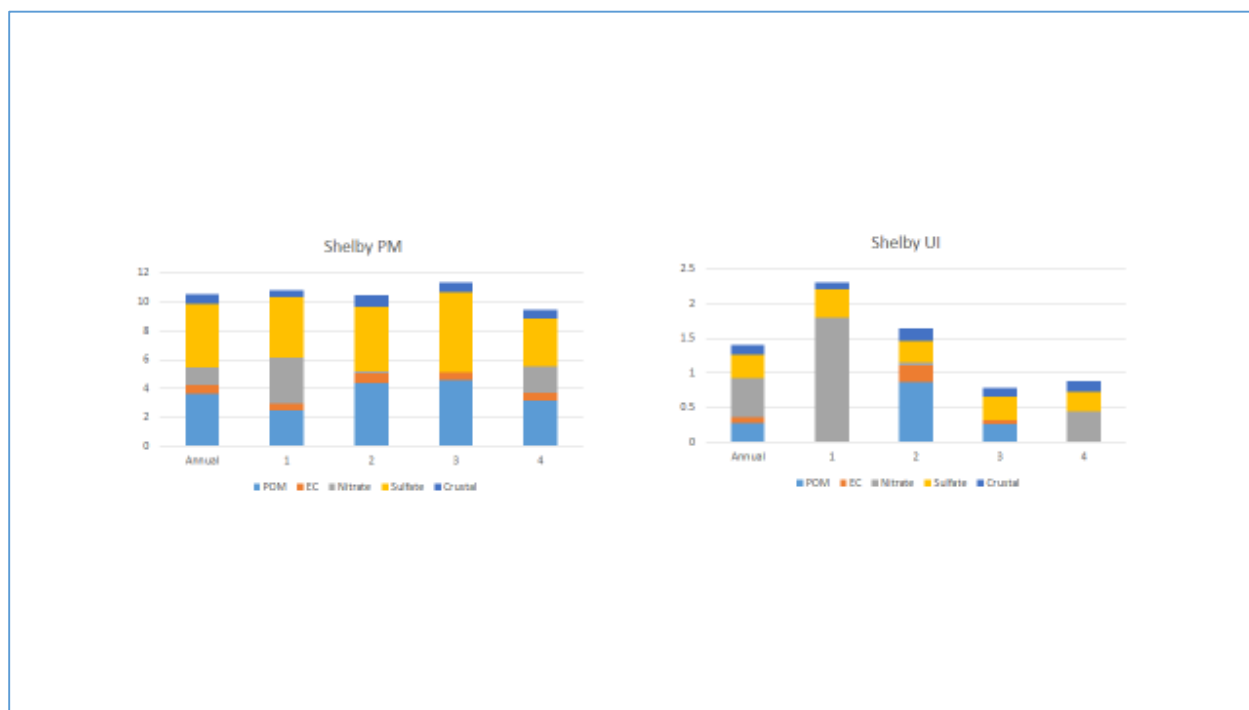
Figure 9. Wind Rose Data for the Memphis TN-MS-AR Area



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In addition, the EPA evaluated speciated $PM_{2.5}$ information collected at the Chemical Speciation Network monitor in the area (Figure 10). The $PM_{2.5}$ speciation data and the derived urban-increment analysis indicate the dominance of different contributing species in each quarter. The peak $PM_{2.5}$ concentrations occur during the 3rd quarter of the calendar year (July-September) when sulfate and primary organic matter are the major urban increment components of the $PM_{2.5}$ mass. Largely responsible for these peak concentrations are the emissions from Shelby County, which include 20,010 tpy of SO_2 and 140 tpy direct sulfate. By comparison, the Mississippi and Arkansas counties of the CBSA have low overall emissions, and in particular they have emissions of SO_2 and direct sulfate in the range of just 36 to 125 tpy and 6 to 29 tpy, respectively.

Figure 10. Quarterly Speciated Monitoring and Urban Increment Data for the Memphis Area



Memphis Area Conclusion:

As a result of our technical analysis of the Memphis CBSA, the EPA is preliminarily determining that the Tennessee counties of Shelby, Fayette and Tipton be designated unclassifiable along with most of the State of Tennessee due to the ambient monitoring data quality issues, including an invalid 2013 design value at the Shelby County monitor. The EPA is preliminarily determining that Crittenden County, Arkansas, and Benton, DeSoto, Marshall, Tate and Tunica Counties in Mississippi be designated unclassifiable/attainment, which agrees with the recommendations from Mississippi and represents a slight modification to the recommendation from Arkansas of attainment for Crittenden County. As discussed above, any

potential violation at the Shelby County monitor would be strongly influenced by the point sources within Shelby County, Tennessee, particularly the much higher level of SO₂ and direct sulfate emissions relative to the rest of the CBSA.