

## MISSOURI Area Designations for the 2008 Ozone National Ambient Air Quality Standards

The table below identifies the areas and associated counties or parts of counties in Missouri that EPA intends to designate as nonattainment for the 2008 ozone national ambient air quality standards (2008 NAAQS). In accordance with section 107(d) of the Clean Air Act, EPA must designate an area (county or part of a county) in Missouri as “nonattainment” if it is violating the 2008 ozone NAAQS or if it is contributing to a violation of the 2008 ozone NAAQS in a nearby area. The technical analyses supporting the boundaries for the individual nonattainment areas are provided below.

Table 1: Intended Nonattainment Areas in Missouri

Area	Missouri Recommended Nonattainment Counties/Areas	EPA’s Intended Nonattainment Counties/Areas
St. Louis-St Charles-Farmington, MO-IL	Franklin Jefferson St. Louis City St. Louis County St. Charles	Franklin Jefferson St. Louis City St. Louis County St. Charles

St. Louis-St. Charles-Farmington, MO-IL is a multi-state nonattainment area. Table 1 identifies the counties in Missouri that EPA intends to designate as part of the nonattainment area. EPA intends to designate the remaining counties in Missouri that are not listed in Table 1 as “unclassifiable/attainment” for the 2008 ozone NAAQS.

Note that counties in the Illinois portion of the St. Louis-St. Charles-Farmington, MO-IL Combined Statistical Area (CSA) are discussed in the ozone designation technical support document for Illinois.

The analysis below provides the basis for the intended nonattainment area boundaries. It relies on EPA’s analysis of which monitors are violating the 2008 ozone NAAQS, based on certified air quality monitoring data from 2008-2010 and an evaluation of whether nearby areas are contributing to such violations. EPA has evaluated contributions from nearby areas based on a weight of evidence analysis considering the factors identified below. EPA issued guidance on December 4, 2008 that identified these factors as ones EPA would consider in determining nonattainment area boundaries and recommended that states consider these factors in making their designations recommendations to EPA.<sup>1</sup>

1. Air quality data (including the design value calculated for each Federal Reference Method (FRM) or Federal Equivalent Method (FEM) monitor in the area);
2. Emissions and emissions-related data (including location of sources and population, amount of emissions and emissions controls, and urban growth patterns);
3. Meteorology (weather/transport patterns);
4. Geography and topography (mountain ranges or other basin boundaries);
5. Jurisdictional boundaries (e.g., counties, air districts, existing nonattainment areas, Indian country, metropolitan planning organizations (MPOs))

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<sup>1</sup> The December 4, 2008 guidance memorandum “Area Designations for the 2008 Revised Ozone National Ambient Air Quality Standards” refers to 9 factors. In this technical support document we have grouped the emissions-related factors together under the heading of “Emissions and Emissions-Related Data,” which results in 5 categories of factors.

Ground-level ozone is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOC) in the presence of sunlight. Because NO<sub>x</sub> and VOC emissions from a broad range of sources over a wide area typically contribute to violations of the ozone standards, EPA believes it is important to consider whether there are contributing emissions from a broad geographic area. Accordingly, EPA chose to examine the 5 factors with respect to the larger of the Combined Statistical Area (CSA) or Core Based Statistical Area (CBSA) associated with the violating monitor(s).<sup>2</sup> All data and information used by EPA in this evaluation are the latest available to EPA and/or provided to EPA by states or tribes.

In EPA's designations guidance for the 2008 ozone NAAQS EPA recommended examining CSA/CBSAs because certain factors used to establish CSAs and CBSAs are similar to the factors EPA is using in this technical analysis to determine if a nearby area is contributing to a violation of the 2008 ozone NAAQS. EPA used the same basic approach in the designation process for the 1997 ozone NAAQS. Where a violating monitor is not located in a CSA or CBSA, EPA's guidance recommended using the boundary of the county containing the violating monitor as the starting point for considering the nonattainment area's boundary.

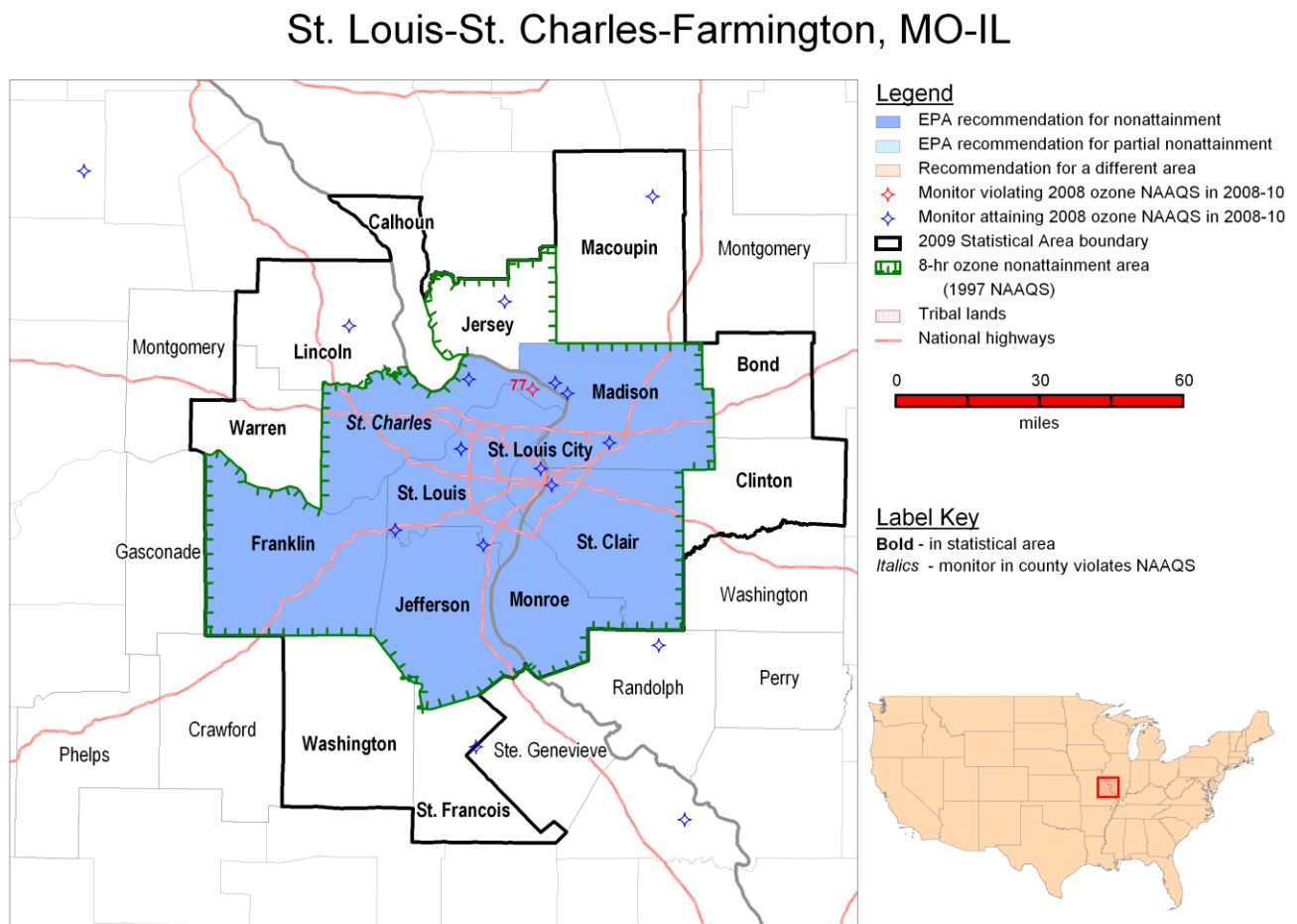
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<sup>2</sup> Lists of CBSAs and CSAs and their geographic components are provided at [www.census.gov/population/www/metroareas/metrodef.html](http://www.census.gov/population/www/metroareas/metrodef.html). The lists are periodically updated by the Office of Management and Budget. EPA used the most recent update, based on 2008 population estimates, issued on December 1, 2009 (OMB Bulletin No. 10-02).

## Technical Analysis for St. Louis-St. Charles-Farmington, MO-IL

Figure 1 is a map of the St. Louis-St. Charles-Farmington, MO-IL intended nonattainment area. The map provides other relevant information including the locations and design values of air quality monitors, county and other jurisdictional boundaries, St. Louis-St. Charles-Farmington, MO-IL CSA boundary, existing nonattainment boundary for 1997 ozone NAAQS, and major transportation arteries.

Figure 1:



For purposes of the 1997 8-hour ozone NAAQS, this area was designated nonattainment. The boundary for the nonattainment area for the 1997 ozone NAAQS included the entire counties of Franklin, Jefferson, St. Charles, St. Louis, and the City of St. Louis City in Missouri, and Monroe, Jersey, St. Clair, and Madison counties in Illinois.

In March 2009, Missouri recommended that the above mentioned counties, plus Lincoln County, in the St. Louis area; Cass, Clay, Clinton, Jackson, and Platte counties in the Kansas City area; as well as Perry and St. Genevieve counties be designated as “nonattainment.” The state also recommended St. Francois and Cape Girardeau counties as “unclassifiable” for the 2008 ozone NAAQS based on air

quality data from 2006-2008.<sup>3</sup> In December 2011, Missouri submitted a revised recommendation to include the entire counties of Franklin, Jefferson, St. Charles, and St. Louis and the City of St. Louis as “nonattainment” for the 2008 ozone NAAQS based on air quality data from 2008-2010. The State recommended designating the remaining areas of the State as attainment/unclassifiable. In March 2009, Illinois recommended that Madison, Monroe and St. Clair Counties be designated as “nonattainment” for the 2008 ozone NAAQS based on air quality data from 2006-2008.<sup>4</sup> These recommendations from both Missouri and Illinois rely on data from FRM monitors or FEM monitors sited and operated in accordance with 40 CFR Part 58.

After considering these recommendations and based on EPA's technical analysis described below, EPA intends to designate the entire counties of Franklin, Jefferson, St. Charles, and St. Louis, and the City of St. Louis in Missouri, and the entire counties of Monroe, Madison, and St. Clair in Illinois as “nonattainment” (as indicated in Table 2 below) for the 2008 ozone NAAQS as the St. Louis-St. Charles-Farmington, MO-IL multi-state nonattainment area.

Table 2. State's Recommended and EPA's Intended Designated Nonattainment Counties for St. Louis-St. Charles-Farmington, MO-IL Area.

St. Louis-St. Charles-Farmington, MO-IL	State-Recommended Nonattainment Counties	EPA Intended Nonattainment Counties
Missouri	Franklin Jefferson St. Charles St. Louis City St. Louis County	Franklin Jefferson St. Charles St. Louis City St. Louis County
Illinois	Madison Monroe St. Clair	Madison Monroe St. Clair

## **Factor Assessment**

### ***Factor 1: Air Quality Data***

<sup>3</sup>Missouri submitted its designation recommendations in a March 11, 2009 letter from Mark N. Templeton, Director of the Missouri Department of Natural Resources, which included enclosures containing an analysis of data supporting the State's recommendations. Missouri revised its recommendations and MDNR requested EPA to act on the revisions in a letter dated December 5, 2011.

<sup>4</sup> Illinois submitted its designation recommendations in a March 9, 2009 letter from Douglas P. Scott, Director of the Illinois Environmental Protection Agency. The state also provided a Technical Support Document dated March 9, 2009, which included a nine factor analysis to support the State's recommendations.

For this factor, EPA considered 8-hour ozone design values (in ppm) for air quality monitors in counties in the St. Louis-St. Charles-Farmington, MO-IL area based on data for the 2008-2010 period (i.e., the 2010 design value, or DV), which are the most recent years with fully-certified air quality data. A monitor's DV is the metric or statistic that indicates whether that monitor attains a specified air quality standard. The 2008 ozone NAAQS are met when the annual fourth-highest daily maximum 8-hour average concentration, averaged over 3 years is 0.075 ppm or less. A DV is only valid if minimum data completeness criteria are met. See 40 CFR part 50 Appendix P. Where several monitors are located in a county (or a designated nonattainment area or maintenance area), the DV for the county or area is determined by the monitor with the highest level.

NOTE: Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with an FRM monitor. All data from Special Purpose Monitors (SPM) using an FRM are 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 2008 ozone NAAQS for designation purposes.

The 2010 DVs for the ozone NAAQS, where available, for counties in the St. Louis-St. Charles-Farmington, MO-IL CSA are shown in Table 3.

Table 3. Air Quality Data.

County	State Recommended Nonattainment?	2008-2010 Design Value (ppb)
Missouri:		
Franklin, MO	Yes	
Jefferson, MO	Yes	72
Lincoln, MO	No	72
St. Charles, MO	Yes	77
St. Francois, MO	No	
St. Louis, MO	Yes	71
St. Louis City, MO	Yes	69
Warren, MO	No	
Washington, MO	No	
Illinois:		
Bond, IL	No	
Calhoun, IL	No	
Clinton, IL	No	
Jersey, IL	No	69
Macoupin, IL	No	66
Madison, IL	Yes	72
Monroe, IL	Yes	
St. Clair, IL	Yes	68

St. Charles County in Missouri shows a violation of the 2008 ozone NAAQS, therefore this is included in the nonattainment area. A county (or partial county) must also be designated nonattainment if it contributes to a violation in a nearby area. Each county without a violating monitor that is located near a county with a violating monitor has been evaluated based on the weight of evidence of the five factors to determine whether it contributes to the nearby violation.

## Factor 2: Emissions and Emissions-Related Data

EPA evaluated emissions of ozone precursors (NO<sub>x</sub> and VOC) and other emissions-related data that provide information on areas contributing to violating monitors.

### Emissions Data

EPA evaluated county-level emission data for NO<sub>x</sub> and VOC derived from the 2008 National Emissions Inventory (NEI), version 1.5. This is the most recently available NEI. (See <http://www.epa.gov/ttn/chief/net/2008inventory.html>) Significant emissions levels in a nearby area indicate the potential for the area to contribute to observed violations. EPA will also consider any additional information we receive on changes to emissions levels that are not reflected in recent inventories. These changes include emissions reductions due to permanent and enforceable emissions controls that will be in place before final designations are issued and emissions increases due to new sources.

Table 4 shows emissions of NO<sub>x</sub> and VOC (given in tons per year) for violating and potentially contributing counties in the St. Louis-St. Charles-Farmington, MO-IL CSA.

Table 4. Total 2008 NO<sub>x</sub> and VOC Emissions.

County	State Recommended Nonattainment?	NO <sub>x</sub> (tpy)	VOC (tpy)
Missouri:			
Franklin, MO	Yes	14,094	4,939
Jefferson, MO	Yes	11,769	6,729
Lincoln, MO	No	1,855	2,081
St. Charles, MO	Yes	15,894	11,652
St. Francois, MO	No	2,030	2,349
St. Louis, MO	Yes	36,455	41,894
St. Louis City, MO	Yes	17,576	14,027
Warren, MO	No	1,749	2,064
Washington	No	678	862
Missouri Total:		102,099	86,596
Illinois			
Bond, IL	No	1,422	1,181
Calhoun, IL	No	607	1,057
Clinton, IL	No	4,409	2,515
Jersey, IL	No	1,125	1,166
Macoupin, IL	No	2,286	2,147
Madison, IL	Yes	23,109	12,351
Monroe, IL	Yes	2,410	1,551
St. Clair, IL	Yes	10,804	8,719
Illinois total:		46,173	30,687
Areawide:		148,272	117,284

The emission data in Table 4 indicate that for Missouri, the highest NO<sub>x</sub> and VOC emissions reside in St. Louis County and the City of St. Louis. In 2008 these two areas accounted for 53% and 65% of NO<sub>x</sub> and VOC emissions respectively for the Missouri portion of the area. In addition, Franklin and Jefferson Counties also have comparatively high NO<sub>x</sub> emissions (behind St. Louis and St. Charles Counties and the City of St. Louis) and form a contiguous area with the three top emitting areas. Together, the City of St. Louis, Franklin, Jefferson, and St. Louis Counties make up 78% of both NO<sub>x</sub> and VOC emissions in the Missouri portion of the area, and 54% of the NO<sub>x</sub> emissions and 58% of the VOC emissions for the entire St. Louis-St. Charles-Farmington, MO-IL CSA.

The NO<sub>x</sub> and VOC emissions are relatively low in Warren, Washington, and Lincoln counties. Together in 2008 these counties account for 4% of NO<sub>x</sub> and 6% of VOC in the Missouri portion of the area.

Note that the relative emissions levels in the Illinois portion of the St. Louis-St. Charles-Farmington, MO-IL CSA are discussed in the ozone designation technical support document for Illinois.

### **Population density and degree of urbanization**

EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. These include ozone-creating emissions from on-road and off-road vehicles and engines, consumer products, residential fuel combustion, and consumer services. Areas of dense population or commercial development are an indicator of area source and mobile source NO<sub>x</sub> and VOC emissions that may contribute to ozone formation. Rapid population or Vehicle Miles Traveled (VMT) growth (see below) in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that the associated area source and mobile source emissions may be appropriate to include in the nonattainment area. Table 5 shows the population, population density, and population growth information for each county in the area.

Table 5. Population and Growth.

County	State Recommended Nonattainment?	2010 Population	2010 Population Density (1000 pop/sq mi)	Absolute change in population (2000-2010)	Population % change (2000-2010)
Missouri:					
Franklin, MO	Yes	101,492	0.11	7,434	+8%
Jefferson, MO	Yes	218,733	0.33	19,995	+10%
Lincoln, MO	No	52,566	0.08	13,310	+34%
St. Charles, MO	Yes	360,485	0.61	74,322	+26%
St. Francois, MO	No	65,359	0.14	9,615	+17%
St. Louis, MO	Yes	998,954	1.91	17,376	-2%
St. Louis City, MO	Yes	319,294	4.83	27,570	-8%
Warren, MO	No	32,513	0.07	7,793	+32%
Washington	No	25,195	0.03	1,785	+8%

Missouri total:		2,174,591	0.43	89,308	+4%
Illinois:					
Bond, IL	No	17,768	0.05	118	+1%
Calhoun, IL	No	5,089	0.02	(1)	0%
Clinton, IL	No	37,762	0.08	2,233	+6%
Jersey, IL	No	22,985	0.06	1,330	+6%
Macoupin, IL	No	47,765	0.06	(1,224)	-2%
Madison, IL	Yes	269,282	0.36	10,165	+4%
Monroe, IL	Yes	32,957	0.08	5,193	+19%
St. Clair, IL	Yes	270,056	0.40	13,852	+5%
Illinois total:		703,664	0.17	31,666	+5%
Areawide:		2,878,255	0.31	120,974	+4%

Sources: U.S. Census Bureau population estimates for 2010 as of August 4, 2011 ([http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC\\_10\\_PL\\_GCTPL2.STO5&prodType=table](http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_PL_GCTPL2.STO5&prodType=table)) and U.S. Census Bureau GIS files for the county boundaries

In the Missouri portion of the St. Louis-St. Charles-Farmington, MO-IL CSA, St. Louis and St. Charles counties along with the City of St. Louis have comparatively high population and high population density. This also correlates to those three counties having the highest amount of NO<sub>x</sub> and VOC emissions in the area. Warren, Washington, and St. Francois Counties have relatively low population, population density, and lowest absolute change in population. Lincoln County has relatively low population for the area, as well as one of the lowest population densities (behind Warren and Washington Counties) among the Missouri Counties in the CSA.

Note that the ozone designation technical support document for Illinois addresses the population-related emission contributions from the Illinois portion of the St. Louis-St. Charles-Farmington, MO-IL CSA.



## **Traffic and commuting patterns**

EPA evaluated the commuting patterns of residents in the area, as well as the total VMT for each county. In combination with the population/population density data and the location of main transportation arteries (see Figure 1 above), this information helps identify the probable location of non-point source emissions. A county with high VMT and/or a high number of commuters is generally an integral part of an urban area and indicates the presence of motor vehicle emissions that may contribute to ozone formation. Rapid population or VMT growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that the associated area source and mobile source emissions may be appropriate to include in the nonattainment area.

Table 6 shows traffic and commuting pattern data, including total 2008 VMT for each county, number of commuters in each county who drive to another county within the area, and the percent of total commuters in each county who commute to other counties within the area.

Table 6. Traffic and Commuting Patterns.

County	State Recommended Nonattainment?	2008 VMT* (million miles)	Number Commuting to or within any violating counties**	Percent Commuting to or within any violating counties**
<b>Missouri:</b>				
Franklin, MO	Yes	1,637	776	2%
Jefferson, MO	Yes	1,885	1,337	1%
Lincoln, MO	No	495	5,529	30%
St. Charles, MO	Yes	2,728	70,282	47%
St. Francois, MO	No	548	92	0%
St. Louis, MO	Yes	11,925	13,513	3%
St. Louis City, MO	Yes	3,450	1,502	1%
Warren, MO	No	525	2,967	25%
Washington	No	220	27	0%
Missouri total:		23,414	96,025	10%
<b>Illinois:</b>				
Bond County	No	284	20	0%
Calhoun County	No	40	109	5%
Clinton County	No	389	49	0%
Jersey County	No	192	125	1%
Macoupin County	No	415	36	0%
Madison County	Yes	2,839	1,126	1%
Monroe County	Yes	361	84	1%
St. Clair County	Yes	2,666	729	1%
Illinois total:		7,186	2,278	1%
Areawide:		30,599	98,303	8%

\* MOBILE model VMTs are those inputs into the NEI version 1.5.

\*\* U.S. Census Bureau estimates for 2000 County-to-County Worker Flow

<http://www.census.gov/hhes/commuting/data/commuting.html>.

For Missouri, the VMT data show that VMT levels in St. Louis City, St. Louis County, and St. Charles County are significantly higher than those in other Missouri counties in the St. Louis-St. Charles-

Farmington, MO-IL CSA. Cumulatively, the VMT in these counties are a significant portion of the total VMT for the St. Louis-St. Charles-Farmington, MO-IL CSA.

Note that the ozone designation technical support document for Illinois addresses the traffic and commuting patterns for the Illinois portion of the St. Louis-St. Charles-Farmington, MO-IL CSA.

***Factor 3: Meteorology (weather/transport patterns)***

EPA evaluated any available meteorological data to help determine how meteorological conditions, such as weather, transport patterns and stagnation conditions, would affect the fate and transport of precursor emissions contributing to ozone formation. EPA examined the frequency distribution of wind directions during the summer by averaging National Weather Service direction-sorted wind directions for each county for a 30 year period. To apply the results of this data analysis to the St. Louis-St. Charles-Farmington, MO-IL CSA, we have considered the wind direction frequencies during the summer months (June-August) for St. Charles County in Missouri, the only county with a recorded violation of the 2008 ozone NAAQS (see Table 2). The table below shows the summertime 30-year averaged percentages of wind directions for St. Charles County in Missouri.

Averaged Summertime Wind Direction Percentages for St. Charles County, MO

Wind Direction	Percentage
North-Northeast	9.82%
East-Northeast	7.24%
East-Southeast	13.66%
South-Southeast	14.41%
South-Southwest	20.01%
West-Southwest	14.64%
West-Northwest	12.84%
North-Northwest	7.39%

The table indicates that winds from the south-southwest may be slightly more prevalent than winds from other directions during the summertime, and there is a southerly component 62.72% of the time. This means that the locations of Franklin, St. Louis and Jefferson counties, as well as St. Louis city, are upwind when the southerly component occurs.

***Factor 4: Geography/topography (mountain ranges or other air basin boundaries)***

The geography/topography analysis evaluates the physical features of the land that might affect the airshed and, therefore, the distribution of ozone over the area.

The St. Louis-St. Charles-Farmington, MO-IL 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 this evaluation.

### ***Factor 5: Jurisdictional boundaries***

Once the general areas to be included in the nonattainment area were determined, EPA considered existing jurisdictional boundaries for the purposes of providing a clearly defined legal boundary and carrying out the air quality planning and enforcement functions for nonattainment areas. Examples of jurisdictional boundaries include existing/prior nonattainment areas for ozone or other urban-scale pollutants, counties, air districts, townships, metropolitan planning organizations, state lines, Reservations, urban growth boundary, etc. Where existing jurisdictional boundaries are not adequate to describe the nonattainment area, other clearly defined and permanent landmarks or geographic coordinates were considered.

The St. Louis, MO-IL area has previously established nonattainment boundaries associated with the 1-hour and the 1997 8-hour ozone NAAQS. The Missouri portion of the St. Louis-St. Charles-Farmington, MO-IL CSA that EPA is intending to designate as nonattainment for the 2008 ozone NAAQS is the same area that EPA designated as nonattainment under the 1-hour NAAQS, as well as what was recommended by the state of Missouri and designated nonattainment for the 1997 8-hour ozone NAAQS. Under the 1997 8-hour ozone NAAQS for the Illinois portion of the St. Louis-St. Charles-Farmington, MO-IL CSA, Jersey County, IL was also included in the nonattainment area due to a monitored violation of the standard in that county. The state of Illinois has recommended designating Jersey County, IL as attainment for the 2008 ozone NAAQS. The monitor in Jersey County, IL is currently monitoring attainment and, as provided in the TSD for Illinois, we do not believe Jersey County is contributing to nonattainment at the violating monitors in the area. Thus, we do not intend to include Jersey County in the designated nonattainment area.

### **Conclusion**

Based on the assessment of factors described above, EPA has preliminarily concluded that the following Missouri areas meet the CAA criteria for inclusion in the St. Louis-St. Charles-Farmington, MO-IL nonattainment area because they are either violating the 2008 ozone NAAQS or contributing to a violation in a nearby area: Franklin County, Jefferson County, St. Charles County, St. Louis City, and St. Louis County. This is consistent with the recommendation submitted by Missouri. These are the same Missouri counties that were included in the St. Louis, MO-IL nonattainment area for the 1-hour ozone NAAQS as well as for the 1997 8-hour ozone NAAQS. One air quality monitor in the Missouri counties (St. Charles) indicated a violation of the 2008 ozone NAAQS based on 2010 design values, therefore this county is included in the nonattainment area. Franklin County, Jefferson County, St. Louis City, and St. Louis County are nearby counties that do not have violating monitors, but EPA has concluded that these areas contribute to the ozone concentrations in violation of the 2008 ozone NAAQS in St. Charles County. This conclusion is based in part on relatively high NO<sub>x</sub> and VOC emissions and relatively high VMT in those counties. Based on 2008 data, St. Louis County, St. Louis City, Franklin County, and Jefferson County have the first, second, fourth, and fifth highest NO<sub>x</sub> emissions respectively in the St. Louis-St. Charles-Farmington, MO-IL CSA. These counties also have among the highest VOC emissions in the St. Louis-St. Charles-Farmington, MO-IL CSA. St. Louis County and St. Louis City have the highest 2008 VMT, and Franklin and Jefferson has the fourth and fifth highest 2008 VMT in the St. Louis-St. Charles-Farmington, MO-IL CSA.