

# Cincinnati, Ohio-Kentucky-Indiana Area Designations for the 2008 Ozone National Ambient Air Quality Standards

The table below identifies the areas in Ohio, Kentucky, and Indiana that EPA is designating as "nonattainment" for the 2008 8-hour ozone National Ambient Air Quality Standard (NAAQS)<sup>1</sup> as part of the Cincinnati, Ohio-Kentucky-Indiana (OH-KY-IN) multi-state nonattainment area. In accordance with section 107(d) of the Clean Air Act (CAA), EPA must designate an area (county or part of a county) 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 state nonattainment areas are provided below.

Table 1.	Areas in Ohio, Kentucky, and	Indiana Included	l in the Cincinnati,	<b>OH-KY-IN</b>
	Ozone Nonattainment Area			

State	State Recommended	EPA's Nonattainment	
	Nonattainment Counties	Counties	
Ohio	Butler	Butler	
	Clermont	Clermont	
	Clinton	Clinton	
	Hamilton	Hamilton	
	Warren	Warren	
Kentucky	None	Boone (partial)	
		Campbell (partial)	
		Kenton (partial)	
Indiana	None	Dearborn (partial)	

EPA is designating as "unclassifiable/attainment" for the 2008 8-hour ozone NAAQS: (1) the remaining counties in Ohio that are not included in the table above or in the Cleveland-Akron-Lorain, OH or Columbus, OH nonattainment areas (see the separate Technical Support Document for Ohio that covers the Cleveland-Akron-Lorain, OH and Columbus, OH ozone nonattainment areas); (2) the remaining counties and partial counties in Kentucky that are not included in the table above; and, (2) the remaining counties and partial counties in Indiana that are not included in the table above or that EPA is considering for inclusion as part of the Chicago-Naperville, Illinois-Indiana-Wisconsin (IL-IN-WI) ozone nonattainment area: EPA will issue a separate action no later than May 31, 2012 addressing all areas it is considering for inclusion as part of the Chicago-Naperville, IL-IN-WI ozone nonattainment area).

The analysis below provides the basis for the Cincinnati, OH-KY-IN nonattainment area boundary. It relies on our analysis of whether and which monitors are recording violations of the 2008 ozone NAAQS, based on certified air quality monitoring data from 2008-2010 and on an evaluation of whether nearby areas are contributing to such violations. EPA has evaluated

<sup>&</sup>lt;sup>1</sup> The primary 8-hour ozone standard, set to protect human health, was revised on March 27, 2008 (73 FR 16436) from 0.08 parts per million (ppm) to 0075 ppm. The secondary ozone standard, set to protect human welfare and the environment, was revised to be consistent with the primary ozone standard.

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 designation recommendations to EPA.<sup>2</sup>

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

Ground-level ozone is generally not emitted directly into the air, but is created by chemical reactions involving Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOC) in the presence of sunlight.<sup>3</sup> Because NOx 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>4</sup> All data and information used by EPA in this evaluation are the latest available to.

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. Congress required a similar approach in 1990 for areas classified as serious and above for the 1-hour ozone standard and EPA used the same approach in the designation process for the 1997 ozone NAAQS. Where a violating monitor is not located in a CSA or CBSA, EPA's September 4, 2008 guidance recommends using the boundary of the county containing the violating monitor as the starting point for considering the nonattainment area's boundary.

<sup>&</sup>lt;sup>2</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-Related Data," which results in 5 categories of factors.

<sup>&</sup>lt;sup>3</sup> Peak ozone concentrations generally occur downwind of source areas on relatively sunny days with high temperatures and relatively low wind speeds.

<sup>&</sup>lt;sup>4</sup> Lists of CBSAs and CSAs and their geographic components are provided at

<sup>&</sup>lt;u>www.census.gov/population/www/metroareas/metrodef.html</u>. 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 Cincinnati, OH-KY-IN**

Figure 1 is a map of the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA, which includes the Cincinnati, OH-KY-IN ozone nonattainment area (indicated in blue colors in the map). The map provides other relevant information, including the locations and ozone design values<sup>5</sup> of ozone air quality monitors, county and other jurisdictional boundaries, existing maintenance area boundary for the 1997 8-hour ozone NAAQS, and major transportation arteries.

#### Figure 1. Cincinnati, OH-KY-IN Ozone Nonattainment Area within the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA



# Cincinnati-Middletown-Wilmington, OH-KY-IN

For purposes of the 1997 ozone NAAQS, as noted in Figure 1, portions of this CSA were designated nonattainment and subsequently redesignated to attainment (maintenance). The boundary for the nonattainment area for the 1997 ozone NAAQS included the entire counties of Butler, Clermont, Clinton, Hamilton, and Warren in Ohio and Boone, Campbell, and Kenton in Kentucky and part of Dearborn County (Lawrenceburg Township) in Indiana.

<sup>&</sup>lt;sup>5</sup> The average of the annual fourth-highest daily maximum 8-hour ozone concentrations for a three-year period, in this case 2008-2010.

In March 2009, Ohio recommended that Butler, Clermont, Clinton, Hamilton, and Warren Counties be designated as "nonattainment" for the 2008 8-hour ozone NAAQS based on ozone air quality data from 2006-2008. In March 2009, Kentucky recommended that Kenton County by designated as "nonattainment" for the 2008 8-hour ozone based on ozone air quality data from 2006-2008. However, in October 2011, Kentucky submitted an update to its 2009 recommendation and revised its recommendation to "attainment" designations for all counties in the Commonwealth of Kentucky. Finally, in March 2009, Indiana recommended that all counties in Indiana, including those in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA, be designated as "attainment" for the 2008 8-hour ozone NAAQS based on 2006-2008 ozone air quality data. Letter from Chris Korlecki, Director, Ohio Environmental Protection Agency, to Lynn Buhl, Regional Administrator, U.S. Environmental Protection Agency, Region 5 (March 9, 2009). Letter from Leonard K. Peters, Secretary, Kentucky Energy and Environmental Cabinet, to A. Stanley Meiburg, Acting Regional Administrator, U.S. Environmental Protection Agency, Region 4 (March 12, 2009). Letter from Leonard K. Peters, Secretary, Kentucky Energy and Environmental Cabinet to Gwendolyn Keyes Fleming, Regional Administrator, U.S. Environmental Protection Agency, Region 4 (October 13, 2011). Letter from Thomas W. Easterly, Commissioner, Indiana Department of Environmental Management, to Bharat Mathur, Acting Regional Administrator, U.S. Environmental Protection Agency, Region 5 (March 11, 2009). All ozone data discussed in these State submittals and reviewed in this Technical Support Document are from FEM monitors sited and operated in accordance with 40 CFR part 58.

On December 9, 2011, EPA initiated the 120 day consultation process by notifying the Commonwealth of Kentucky, and the States of Indiana and Ohio, that, based on EPA's technical analysis of the 16-county Cincinnati-Middletown-Wilmington, OH-KY-IN CSA, EPA intended to designate one partial county in Indiana, three whole counties in Kentucky, and five whole counties in Ohio (identified in Table 2 below) as "nonattainment" for the 2008 8-hour ozone NAAQS as part of the Cincinnati, OH-KY-IN nonattainment area. In the December 2011 letters to the Commonwealth of Kentucky and the States of Indiana and Ohio, EPA also requested that, if the Commonwealth of Kentucky and the States of Indiana and Ohio wished to provide comments on EPA's intended designation or to use early certified data for designation, they should provide comments or early certify by February 29, 2012..

# Table 2. State's Recommended and EPA's Intended Nonattainment Counties for the Cincinnati, OH-KY-IN Area in the December 9, 2011 Letters

State	State Recommended	EPA Intended
	Nonattainment Counties	<b>Nonattainment Counties</b>
Indiana	None	Dearborn (partial)
Kentucky	None	Boone *
		Campbell
		Kenton
Ohio	Butler	Butler
	Clermont	Clermont
	Clinton	Clinton
	Hamilton	Hamilton
	Warren	Warren

\* *Bold italics* county names represent counties that were modified in the final nonattainment area boundary determination for the Cincinnati, OH-KY-IN nonattainment area.

On February 21, 2012, Kentucky submitted additional information in support of the Commonwealth's recommendation to designate Boone, Campbell, and Kenton Counties as attainment for the 2008 8-hour ozone NAAQS. In summary, Kentucky, using the same emissions information that EPA used for the December 9, 2011, technical support document, noted the difference in emissions and sources between the Kentucky portion of the intended ozone nonattainment area and the Ohio portion of the intended ozone nonattainment area. Kentucky noted that the emissions from Boone, Campbell, and Kenton Counties only contributed a minimal amount to violations of the 2008 8-hour ozone NAAQS at the violating monitors. The States of Indiana and Ohio did not submit additional technical information for EPA to consider in response to EPA's December 9, 2011, letters.

EPA originally started with the CSA or CBSA areas for evaluating what areas violate and contribute to violations of the 2008 8-hour ozone NAAQS, and, for final determinations refined its evaluations based on additional technical information provided by the states and tribes. After considering the recommendations from Indiana, Kentucky, and Ohio, the additional technical information provided by Kentucky, and based on EPA's reevaluation of the five factors as described below, EPA is designating a portion of Dearborn County in Indiana, portions of Boone, Campbell, an Kenton Counties in Kentucky, and the whole of Butler, Clermont, Clinton, Hamilton, and Warren Counties in Ohio as "nonattainment" for the 2008 8-hour ozone NAAQS as the Cincinnati, OH-KY-IN nonattainment area.

#### **Factor Assessment**

#### Factor 1: Air Quality Data

For this factor, EPA considered 8-hour ozone design values, in parts per million (ppm), for air quality monitors in counties in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA based on data for the 2008-2010 period (i.e., 2010 ozone design values), which are the most recent years with quality assured, state-certified air quality data. A monitor's design value is the metric or statistic that indicates whether that monitor attains a specified air quality standard. The 2008 ozone NAAQS are met at a monitor when the annual fourth-highest daily maximum 8-hour average concentration, averaged over the most recent three years is 0.075 ppm or less. A design value is valid only 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 design value for the county or area is determined by the monitor with the highest individual design value.

Note: Monitors that are eligible for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) that are sited in accordance with 40 CFR Part 58, Appendix D (Section 4.1) and operating with a Federal Reference Method (FRM) or Federal Equivalent Method (FEM) monitor that meets the requirements of 40 CFR part 58, appendix A. All data from a special purpose monitor (SPM) using an FRM or FEM which has operated for more than 24 months is eligible for comparison to the NAAQS unless the monitoring agency demonstrates that the data came from a particular period during which the requirements of appendix A (quality assurance requirements) or appendix E (probe and monitoring path citing criteria) were not met.

The 2008-2010 ozone design values for monitors and counties in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA are shown in Table 3.

State/County	Site Number	2008-2010 8-hour Ozone Design Values (ppm)		
Ohio:				
Butler	390170018	0.078†		
Butler	390170004	0.073		
Clermont	390250022	0.071		
Clinton	390271002	0.074		
Hamilton	390610040	0.076†		
Hamilton	390610010	0.073		
Hamilton	390610006	<b>0.079</b> †		
Warren	391650007	0.078†		
Kentucky:				
Boone	210150003	0.065		
Campbell	210373002	0.072		

Table 3.	<b>Ozone Air Quality Data for the Cincinnati-Middletown-Wilmington, OH-KY-IN</b>
	CSA

† Monitored violation of the 2008 ozone NAAQS.

Butler, Hamilton, and Warren Counties in Ohio show violations of the 2008 ozone NAAQS. Therefore, these counties are included in the Cincinnati, OH-KY-IN 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.

Please note that the State of Ohio, in its March 9, 2009 area designation recommendations and accompanying technical support documentation, based its recommendations on 2006-2008 ozone data. Since these data no longer cover the most recent 3-year period with quality-assured, state-certified data and have been supplanted by the more current 2008-2010 ozone data, EPA is not reviewing the older ozone data relied on by the State of Ohio for its 2009 recommendation.

### Factor 2: Emissions and Emissions-Related Data

EPA evaluated emissions for ozone precursors (VOC and NOx) and other emissions-related data that provide information on area contributions to ozone standard violations.

### **Emissions Data**

EPA evaluated county-level emission data for NOx and VOC derived from the 2008 National Emissions Inventory (NEI), version 1.5. This is the most recently available NEI. (See <a href="http://www.epa.gov/ttn/chief/net/2008inventory.html">http://www.epa.gov/ttn/chief/net/2008inventory.html</a>). Significant emissions levels in a nearby area indicate the potential for the area to contribute to observed violations. EPA also considered any additional information received on changes to emissions levels that are not reflected in recent inventories.

Table 4 shows the 2008 emissions of VOC and NOx (tons per year (tpy)) for all counties in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA.

# Table 4. Total 2008 VOC and NOx Emissions (tons/year) in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA

State/County	State Recommended Nonattainment?	VOC Emissions	NOx Emissions		
		(tpy)	(tpy)		
Indiana:					
Dearborn	No	3,572	11,637		
Franklin	No	1,097	862		
Ohio	No	210	259		
Kentucky:					
Boone	No	4,332	8,848		
Bracken	No	361	760		
Campbell	No	2,260	2,697		
Gallatin	No	671	1,634		

Grant	No	1,148	1,623
Kenton	No	3,901	4,095
Pendleton	No	608	1,394
Ohio:			
Brown	No	1,720	1,430
Butler	Yes	10,813	12,600
Clermont	Yes	5,809	28,461
Clinton	Yes	2,618	2,941
Hamilton	Yes	26,816	38,664
Warren	Yes	5,618	6,027
CSA Total		71,554	123,933

# *Emissions Observations for each State* Indiana:

From the emissions in Table 3, it can be seen that, for Indiana, relatively high 2008 VOC and NOx emissions in the vicinity of the violating counties originate in Dearborn County. Emissions from this county in 2008 account for 5.0 percent of the VOC emissions and 9.4 percent of the NOx emissions for the entire Cincinnati-Middletown-Wilmington, OH-KY-IN CSA. The majority of these emissions come from the American Electric Power (AEP) - Tanners Creek Generating Station located in Lawrenceburg Township, adjacent to the Ohio portion of the final nonattainment area.

The VOC and NOx emissions from Franklin and Ohio Counties in Indiana are considerably smaller than those originating in the higher emitting counties elsewhere in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA. This supports the exclusion of these counties from the ozone nonattainment area for the 2008 8-hour ozone NAAQS.

# Kentucky:

Based on the 2008 NEI, 62 percent of Boone County's NOx emissions are from point sources, and 21 percent from mobile sources. Less than 5 percent of Campbell County's NOx emissions are from mobile sources and 57 percent of Campbell County's NOx emissions are from mobile sources. Kenton County also has less than 5 percent of its NOx emission from point sources, but 63 percent of Kenton County's NOx emissions are from mobile sources. Boone County has 29 percent of its VOC emission coming from area sources and 23 percent of its VOC emissions from mobile sources. Campbell County has 35 percent of its VOC emissions coming from area sources and 43 percent of VOC emissions from mobile sources. Kenton County has 38 percent of its VOC emission coming from area sources and 41 percent of its VOC emissions from mobile sources. The total VOC and NOx emissions in each of Boone, Campbell, and Kenton Counties are considered to be significant contributors to the high ozone concentrations in the Cincinnati, OH-KY-IN nonattainment area for the 2008 8-hour ozone NAAQS.

The VOC and NOx emissions from Bracken, Gallatin, Grant, and Pendleton Counties, Kentucky are considerably less than those originating in the higher emitting counties elsewhere in the

Cincinnati-Middletown-Wilmington, OH-KY-IN CSA. This supports the exclusion of these counties from the ozone nonattainment area for the 2008 8-hour ozone NAAQS.

# Ohio:

From the Ohio emissions data in Table 3, it can be seen that comparatively high 2008 VOC and NOx emissions in the vicinity of the violating counties originate in the following counties: Butler, Clermont, Hamilton, and Warren. Emissions from these counties in 2008 account for 68.6 percent of the VOC emissions and 69.2 percent of the NOx emissions in the entire Cincinnati-Middletown-Wilmington, OH-KY-IN CSA.

The VOC and NOx emissions in Clinton County are similar to those in Campbell County, Kentucky, which EPA has decided to include in the ozone nonattainment area. Therefore, this favors also including Clinton County, Ohio in the ozone nonattainment area.

The VOC and NOx emissions in Brown County, Ohio are significantly lower than those of other counties EPA is including in the ozone nonattainment area. Therefore, this supports the exclusion of Brown County from the ozone nonattainment area. As noted elsewhere in this Technical Support Document, this is also supported by the State of Ohio's recommendation that this county be excluded from the ozone nonattainment area.

# Population, 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 ozonecreating 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 NOx and VOC emissions that may contribute to violating ozone monitors. Figure 2 shows the population density for the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA.

#### Figure 2. Population Density in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA



# Cincinnati Ozone Nonattainment Area Boundary

Figure created using GIS data layers available on-line from ESRI. http://goto.arcgisonline.com/maps/Demographics/USA\_Population\_Density

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 it is be appropriate to include the Area associated with the area source and mobile source emissions as part of the nonattainment area. Table 5 shows the population, population density, and population growth information for each county in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA.

# Table 5. Population and Population Growth in the Cincinnati-Middletown-Wilmington,OH-KY-IN CSA

State/County	State	2010	2010	Change in	Population
	Recommended	Population	Population	Population	Percent
	Nonattainment		Density	(2000-2010)	Change

			(1,000 per		(2000-2010)
			square mile)		
Indiana:					
Dearborn	No	50,047	0.16	3,702	8
Franklin	No	23,087	0.06	866	4
Ohio	No	6,128	0.07	492	9
Kentucky:		·		-	
Boone	No	118,811	0.46	31,811	37
Bracken	No	8,488	0.04	211	3
Campbell	No	90,336	0.57	1,680	2
Gallatin	No	8,589	0.08	705	9
Grant	No	24,662	0.09	2,115	9
Kenton	No	159,720	0.97	8,032	5
Pendleton	No	14,877	0.05	389	3
Ohio:					
Brown	No	44,846	0.09	2,263	5
Butler	Yes	368,130	0.78	34,447	10
Clermont	Yes	197,363	0.43	18,733	10
Clinton	Yes	42,040	0.10	1,378	3
Hamilton	Yes	802,374	1.94	-41,916	-5
Warren	Yes	212,693	0.52	52,006	32
Area-wide		2,172,191	0.45	116,914	6

\*Counties that EPA is designating as nonattainment are shown in bold. Sources: U.S. Census Bureau population estimates for 2010 as of August 4, 2011 (<u>http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC\_10\_PL</u> GCTPL2.STO5&prodType=table)

#### Population Observations for each State

#### Indiana:

The populations of the Indiana counties in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA are smaller than those of the Ohio counties and larger Kentucky counties in this CSA, but Dearborn County has a moderate population implying moderate population-related VOC and NOx emissions. In addition, the population change percentage change from 2000 to 2010 in Dearborn County is greater than the population change percentage for the entire Cincinnati-Middletown-Wilmington, OH-KY-IN CSA, implying that the population-related emission contribution from this county may be increasing relative to those from other counties in the Cincinnati-Middletown-Wilmington, OH-KY-IN area. Ohio County, Indiana also has a greater population change percentage as well, but the lower population in this county (which is the lowest for any county in the CSA) indicates this change is less significant.

#### Kentucky:

For Kentucky, Boone, Campbell, and Kenton Counties have relatively high populations and population densities when compared to the rest of the CSA. Additionally, Boone, Campbell and Kenton Counties are highly developed in the northern portions of the counties near the Ohio border. Bracken, Gallatin, Grant and Pendleton are smaller when compared to the counties included in the nonattainment area. Boone County at 37 percent and Warren County at 32 percent had the highest percentage of population growth for any of the counties included in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA. Other counties in this CSA did not have as large of a population percentage change with the growth rates ranging from a 2 to 10 percent increase.

#### **Ohio:**

For Ohio, the population data show that Butler, Clermont, Hamilton, and Warren Counties have comparatively large populations and population densities. This implies that the population-related VOC and NOx emissions in these counties are relatively high. In addition, the population change percentages in Butler, Clermont, and Warren Counties between 2000 and 2010 exceed the population change percentage for the entire Cincinnati-Middletown-Wilmington, OH-KY-IN area, implying that the population-related emission contributions from these counties are increasing compared to those from other counties in the Cincinnati-Middletown-Wilmington, OH-KY-IN area. Hamilton County, Ohio population decreased by 5 percent between 2000 and 2010, but the population in this county remains relatively high compared to the populations of other counties in the CSA.

#### **Traffic and Commuting Patterns**

EPA evaluated the total VMT for each county in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA. In combination with the population/population density data and the location of main transportation arteries (see above area map), this information helps identify the probable location of non-point source emissions. A county with high VMT is generally an integral part of an urban area and indicates the presence of relatively high motor vehicle emissions that may significantly contribute to ozone formation and transport that contributes to nonattainment in the urban area. Rapid population or VMT growth in a county on the urban perimeter signifies increasing integration with the core urban area, and suggests that this county should be included in the ozone nonattainment area, particularly if the VOC and/or NOx emissions in this county are a significant portion of the total emissions in the nonattainment area.

Table 6 shows the traffic levels, total 2008 VMT, in each county in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA.

State/County	State	2008 VMT*	
	Recommended Nonattainment	(million miles)	
Indiana:		· · · · · · · · · · · · · · · · · · ·	
Dearborn	No	904	
Franklin	No	316	
Ohio	No	63	
Kentucky:			
Boone	No	1,095	
Bracken	No	89	
Campbell	No	1,005	
Gallatin	No	278	
Grant	No	432	
Kenton	No	1,669	
Pendleton	No	182	
Ohio:			
Brown	No	413	
Butler	Yes	2,469	
Clermont	Yes	1,464	
Clinton	Yes	655	
Hamilton	Yes	7,391	
Warren	Yes	1,640	
Anos wido		20.063	

#### Table 6. Traffic Levels in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA

#### Area-wid

\* MOBILE model VMT are those input into the NEI version 1.5 use to compute the mobile source portion of the NEI emissions summarized above in Table 4.

#### VMT Observations by State

#### Ohio:

For Ohio, the VMT data show that VMT levels in Hamilton, Butler, Warren, and Clermont Counties rank first, second, fourth, and fifth, respectively, for the total VMT for the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA.

#### Indiana:

For Indiana, the data show that the VMT level in Dearborn County ranks eighth for the total VMT for the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA.

### Kentucky:

The VMT data show that VMT levels in Kenton, Boone, and Campbell Counties rank third, sixth, and seventh, respectively, for the total VMT for the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA.

The VMT for the remaining counties in the CSA are lower in ranking.

### Additional Emissions-Related Data Discussed in Ohio's March 9, 2009 Designation Recommendation Submittal

The State of Ohio, through the Ohio Environmental Protection Agency (OEPA), has provided a detailed discussion of the county-specific VOC and NOx emissions, populations, and traffic and commuting patterns for the Ohio counties in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA. These data support our conclusions discussed above, but also allow us to further refine EPA's analysis for Factor 2 for the Ohio portion of the CSA. This is particularly true for growth in county populations and traffic levels and the inter-county impact of commuter traffic.

With regard to emissions, Ohio shows that both VOC and NOx daily emissions in Brown County are considerably lower than many other counties in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA. This confirms our conclusion that Brown County emissions are relatively low and would not support inclusion of this county in the ozone nonattainment area.

Ohio has projected county-populations through 2030. These population projections show that populations in Clinton and Brown Counties will remain comparatively low through 2030. Whereas, the populations of Butler, Clermont, Hamilton, and Warren Counties are projected to significantly increase and remain relatively high through 2030.

Estimated daily VMT in Brown County are shown to be largely unchanged beginning in 2001 through 2007, and daily VMT in Hamilton County are estimated to be similarly unchanged between 1990 and 2007. In contrast, daily VMT levels have shown significant growth trends in Butler, Clinton, Clermont, and Warren Counties between 1990 and 2007.

The State of Ohio notes that the vast majority of workers traveling out of county from Butler, Warren, and Clermont Counties commute to Hamilton County. This conclusion is supported by tabulated inter-county commuter numbers and percentages in Ohio' March 9, 2009 submittal. It is also noted that approximately 15 percent of the Hamilton County workers commute outside of the county, with the majority traveling to Butler County, with significant numbers of commuters also traveling from Hamilton County to Warren and Clermont Counties. The commuter numbers for Brown County show a much smaller number commuters traveling to or from other counties in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA.

Considering all of the information provided by the State of Ohio supports the conclusion that there is strong urban integration of Butler, Clermont, Hamilton, and Warren Counties. In contrast, Clinton and Brown Counties are not significantly integrated with the Cincinnati urban area. This favors the exclusion of Brown County from the Cincinnati-Middletown-Wilmington, OH-KY-IN ozone nonattainment area for the 2008 ozone NAAQS. Clinton County, however, cannot be excluded from the ozone nonattainment area due to jurisdictional boundary considerations, as discussed for Factor 5 below.

# Factor 3: Meteorology (Weather/Transport Patterns)

For this factor, EPA analyzed 30-years of National Weather Service (NWS) wind speed and wind direction data collected at the Covington/Greater Cincinnati Airport (NWS Station 93814) to help determine transport patterns and source contributions. EPA assessed wind direction and speed for the 2008-2010 "ozone season" (March through October) in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA. These analyses were conducted to better understand the fate and transport of precursor emissions contributing to ozone formation. EPA's analysis of the NWS data indicate predominate south-southwest and west-southwest component for the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA. These wind directions are typical of wind directions on high ozone days in this area.

# 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 air shed and, therefore, the distribution of ozone over the area.

While the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA does not appear to have major geographical or topographical barriers significantly limiting air pollution transport within its air shed, EPA notes that geographically, the northern portions of Kenton and Campbell Counties in Kentucky area are in very close proximity (just across Ohio River) from the core of the downtown Cincinnati area.

# Factor 5: Jurisdictional Boundaries

Once EPA identified the general area to be included in the nonattainment area, EPA considered existing jurisdictional boundaries for the purposes of providing a clearly defined legal boundary and to help identify the areas appropriate for carrying out the air quality planning and enforcement functions for nonattainment areas. Examples of jurisdictional boundaries include existing/prior nonattainment area boundaries for ozone or other urban-scale pollutants, county lines, air district boundaries, township boundaries, areas covered by MPOs, state lines, Reservation boundaries, and urban growth boundaries. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, other clearly defined and permanent landmarks or geographic coordinates were considered.

The Cincinnati-Middletown-Wilmington, OH-KY-IN CSA has previously established nonattainment boundaries associated with the both the 1-hour ozone NAAQS and with the 1997 8-hour ozone NAAQS. The Cincinnati nonattainment boundary for the 1-hour ozone NAAQS included Boone, Campbell and Kenton Counties in their entireties in Kentucky; Butler, Clermont, Hamilton and Warren Counties in their entireties in Ohio. Whereas the Cincinnati nonattainment boundary for the 1997 8-hour ozone NAAQS included Boone, Campbell and Kenton Counties in their entireties in Kentucky, Butler, Clermont, Hamilton and Warren Counties in their entireties in Ohio, and a portion of Dearborn County (Lawrenceburg Township) in Indiana. Kentucky and Indiana have recommended a different boundary for the 2008 ozone NAAQS for their portion of this Area. Ohio recommended the same area as included in the nonattainment area for the 1997 8-hour ozone NAAQS.

In review of the emissions from the Kentucky Counties that were found to contribute to the violations at monitors in Ohio, EPA determined that these emissions were primarily populationbased emissions such as mobile sources. Thus, EPA determined it was most appropriate to capture the urbanized area for the Kentucky Counties in the Cincinnati, OH-KY-IN nonattainment area. An Urbanized Area (UZA), as defined by the Census Bureau, consists of a central core and adjacent densely settled territory that together contain at least 50,000 people, generally with an overall population density of at least 1,000 people per square mile. EPA evaluated the 2000 Census UZA data for the Kentucky portion of the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA in order to help define partial boundaries for Boone, Kenton, and Campbell Counties. EPA overlaid the UZA areas with census tracts to determine the high population census tracts in Boone, Campbell, and Kenton Counties. (See Figure 3). All of the census tracts in Boone, Campbell, and Kenton Counties are included in the nonattainment area for the 2008 8-hour ozone NAAQS, excluding census tracks 706.01 and 706.04 in Boone County, 637.01 and 637.02 in Kenton County, and 520.01 and 520.02 in Campbell County.

#### Figure 3. Cincinnati Urbanized Area and Census Tracts



# Cincinnati Ozone Nonattainment Area Boundary

# **Conclusion**

#### Indiana:

For Indiana, Franklin and Ohio Counties have low emissions, low VMTs, and low populations. These counties are mostly rural with no major point source emissions and minimal amounts of nonpoint source and mobile emissions. The areas were not included in the Cincinnati ozone nonattainment area for the 1997 ozone NAAQS. EPA believes that Franklin and Ohio Counties contribute minimally, at most, to the ozone standard violations at the three monitors that are violating in the Cincinnati, OH-KY-IN area. EPA is not including these counties in the ozone nonattainment area.

Lawrenceburg Township in Dearborn County contains the AEP- Tanner's Creek Generating Station that has high  $NO_x$  and VOC emissions. Dearborn County also has the potential to have moderate mobile source and population related VOC and  $NO_x$  emissions, with the highest population being located in Lawrenceburg Township. Lawrenceburg Township was included as part of the designated nonattainment area for the 1997 8-hour ozone NAAQS. Lawrence

Township contains the only major stationary source and accounts for the majority of the emissions for the area. The remainder of the county is fairly rural and is similar to Franklin and Ohio Counties in other emission aspects. Therefore, EPA is including Lawrenceburg Township in Dearborn County, Indiana as part of the Cincinnati, OH-KY-IN ozone nonattainment area for the 2008 8-hour ozone NAAQS and designating the remainder of the county as unclassifiable/attainment for this NAAQS.

#### Kentucky:

Based on the assessment of factors described above for Kentucky, EPA has concluded that portions of Boone, Campbell Counties must be included as part of the Cincinnati, OH-KY-IN nonattainment area because they are contributing to a violation in a nearby area. The total of mobile source and area source emissions comprise approximately 40 percent of the total mobile source and area source NOx emissions in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA. The total of mobile source and area source emissions comprise approximately 75 percent of the total mobile source and area source VOC emissions in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA. Point sources comprise approximately 50 percent of the total NOx emissions and 10 percent of the total VOC emissions in the Cincinnati-Middletown-Wilmington, OH-KY-IN CSA. As indicated in the factors above, Boone, Campbell, and Kenton Counties have sources of NOx and VOC emissions; rank among the highest VMT contributors for the Cincinnati, OH-KY-IN nonattainment area; have high population densities and high population growth in Boone County. The northern portions of these counties are in close proximity to and have easy access to the core of the Cincinnati, OH-KY-IN area. As such, EPA is designating portions of Boone, Campbell, and Kenton Counties as part of the Cincinnati, OH-KY-IN nonattainment area. The partial county boundary for Boone, Campbell, and Kenton Counties includes all of the census tracks in these counties except the census tracks 706.01 and 706.04 in Boone County, 637.01 and 637.02 in Kenton County, and 520.01 and 520.02 in Campbell County.

#### **Ohio:**

For Ohio, EPA is designating the five counties recommended by the State of Ohio for inclusion in the Cincinnati, OH-KY-IN nonattainment area for the 2008 ozone NAAQS. These five counties were also included in the ozone nonattainment area for the 1997 8-hour ozone NAAQS. Butler, Hamilton, and Warren Counties must be included in the Cincinnati, OH-KY-IN ozone nonattainment area based on violations of the 2008 ozone NAAQS in these counties. EPA also notes that these counties are among the highest in this nonattainment area in terms of emissions, VMTs, and populations. While Clermont and Clinton Counties have comparatively low emissions, populations, and VMTs, EPA notes that there are emission sources in these counties and our analysis of the meteorological information indicates that emissions from these counties can contribute to exceedances of the 2008 ozone NAAQS at the violating monitors on the days when the ozone standards are exceeded.