Chicago-Naperville, Illinois-Indiana-Wisconsin Area Designation for the 2008 Ozone National Ambient Air Quality Standards

The table below identifies the areas in Illinois, Indiana, and Wisconsin that EPA is designating as "nonattainment" for the 2008 8-hour ozone National Ambient Air Quality Standard (NAAQS)[1] as part of the Chicago-Naperville, Illinois-Indiana-Wisconsin (IL-IN-WI) multi-state nonattainment area. All of the areas in Table 1,below, are part of the Chicago-Naperville-Michigan City, IL-IN-WI Combined Statistical Area (CSA) (the Chicago CSA). 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 analysis supporting the boundaries for the individual state nonattainment areas is provided below.

Table 1. Chicago-Naperville, IL-IN-WI Nonattainment Area for the 2008 Ozone NAAQS

State	Counties in Chicago-Naperville-Michigan City IL-IN-WI CSA	State Recommended Nonattainment Counties	EPA's Nonattainment Counties
Illinois	Cook DeKalb DuPage Grundy Kane Kankakee Kendall Lake McHenry Will	Cook DuPage Kane Lake McHenry Will Kendall – Partial Oswego Township Grundy – Partial Aux Sable Township Goose Lake Township	Cook DuPage Kane Lake McHenry Will Kendall – Partial Oswego Township Grundy – Partial Aux Sable Township Goose Lake Township
Indiana	Jasper Lake LaPorte Porter Newton	Lake	Lake Porter
Wisconsin	Kenosha	None	Kenosha – Partial Pleasant Prairie Township Somers Township

EPA is designating as "unclassifiable/attainment" for the 2008 ozone NAAQS: the remainder of Grundy and Kendall Counties in Illinois; Jasper, County in Indiana; and, the remainder of Kenosha County in Wisconsin.[2]

[1] 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 0.075 ppm. The secondary ozone standard, set to protect human welfare and the environment, was revised to equal the primary ozone standard.

[2] On April 30, 2012, EPA designated the following Chicago CSA counties as "unclassifiable/ attainment": DeKalb and Kankakee Counties in Illinois and LaPorte and Newton Counties in Indiana.

The analysis below provides the basis for the Chicago-Naperville, IL-IN-WI area boundary. It relies on our analysis of whether and which monitors are recording violations of the 2008 ozone NAAQS, based on quality-assured ozone data for 2008-2010 for Indiana and Wisconsin and 2009-2011 for Illinois. EPA previously notified States that in order for the Agency to consider air quality data from 2011, the data must be certified and submitted to EPA prior to February 29, 2012. Our boundary decision also relies on an evaluation of whether nearby areas are contributing to monitored violations of the 2008 ozone NAAQS within the Chicago CSA. 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 designation recommendations to EPA.[3]

1. Air quality data, including the ozone design value[4] calculated for each Federal Reference Method (FRM) or Federal Equivalent Method (FEM) monitor in the area;

2. Emissions and emissions-related data, including locations of sources, population, amounts of emissions and emission controls, and growth patterns;

3. Meteorology (weather/pollutant transport patterns);

4. Geography and topography (mountain ranges and other air 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 Organizations (MPOs) and their covered areas.

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.[5] 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 CSA or Core Based Statistical Area (CBSA) associated with the violating monitor(s).[6] All data and information used

[3] 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 main categories of factors used to evaluate potential nonattainment area boundaries.

[4] Average of the annual fourth-highest daily maximum 8-hour ozone concentrations during a three-year period with complete data that the state has quality assured and certified. In evaluating the attainment status of an area, EPA generally considers complete ozone data for the most recent three-year period.

[5] Peak ozone concentrations generally occur downwind of source areas on relatively sunny days with high temperatures and relatively low wind speeds.

[6] Lists of CBSAs and CSAs and their geographic components are provided at www.census.gov/population/www/metroareas/metrodef.html. The lists are periodically updated by the Office of

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. 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.

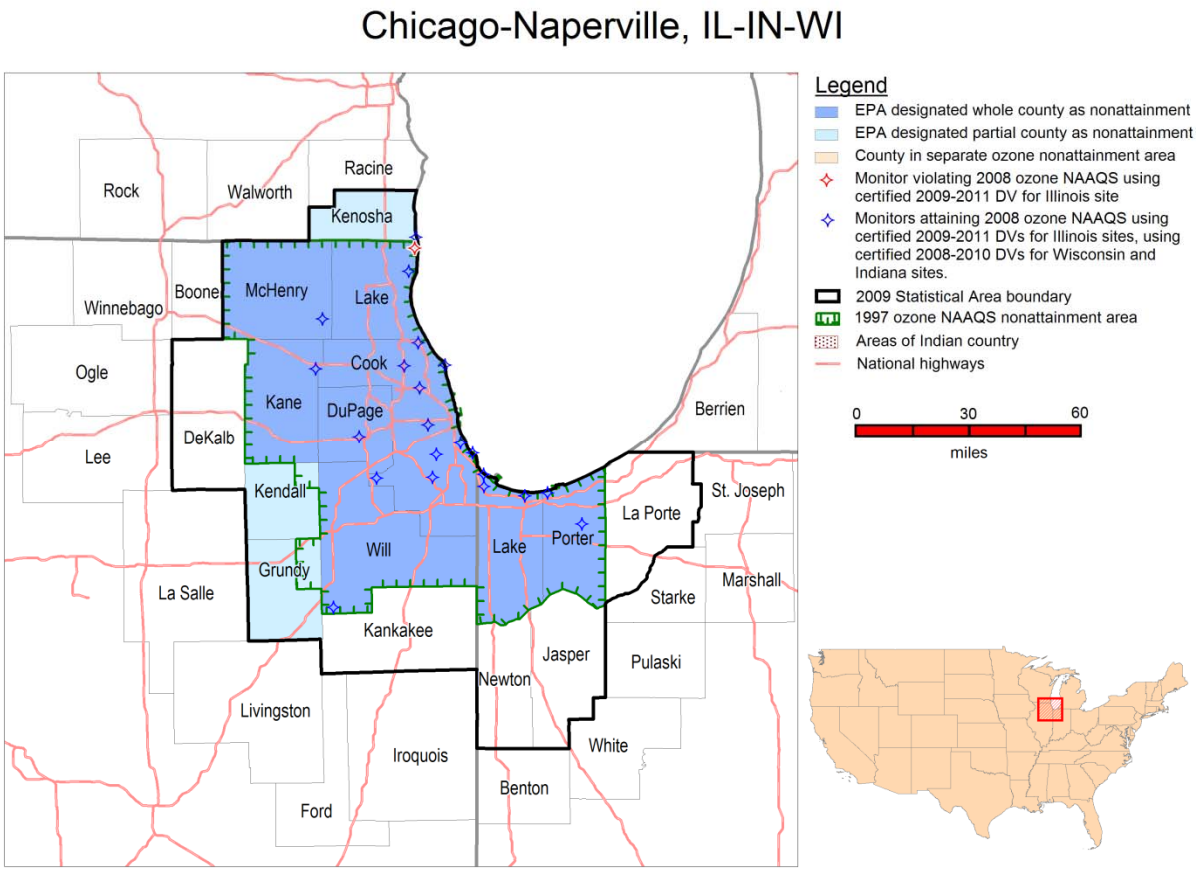
Technical Analysis for Chicago-Naperville, IL-IN-WI

Figure 1 is a map of the Chicago-Naperville-Michigan City, IL-IN-WI CSA, which includes the area we are designating as the Chicago-Naperville, IL-IN-WI ozone nonattainment area (indicated in blue/shaded colors in the map) for the 2008 ozone NAAQS. The map provides other relevant information, including the location and ozone design values[7] of ozone air quality monitors (violating monitoring sites only), county and other jurisdictional boundaries, existing nonattainment area boundary for the 1997 8-hour ozone NAAQS, and major transportation arteries.

Management and Budget. EPA used the most recent update, based on 2008 population estimates, issued on December 1, 2009 (OMB Bulletin No. 10-02).

[7] The average of the annual fourth-highest daily maximum 8-hour ozone concentrations for a three-year period, in this case 2009-2011 or 2008-2010.

Figure 1. Chicago-Naperville, IL-IN-WI Ozone Nonattainment Area within the Chicago-Naperville-Michigan City, IL-IN-WI CSA



For purposes of the 1997 ozone NAAQS, as noted in Figure 1, portions of the Chicago CSA were designated nonattainment. Lake and Porter Counties were subsequently redesignated to attainment (maintenance) of the 1997 ozone NAAQS. Illinois has requested redesignation of its portion of the Chicago-Gary-Lake County, IL-IN ozone nonattainment area to attainment of the 1997 ozone NAAQS. The Illinois portion of the nonattainment area for the 1997 ozone NAAQS includes the entire counties of Cook, DuPage, Kane, Lake, McHenry, and Will and portions of Grundy (Aux Sable and Goose Lake Townships) and Kendall (Oswego Township). Kenosha County, Wisconsin is currently designated nonattainment for the 1997 ozone NAAQS as part of the Milwaukee-Racine, WI ozone nonattainment area. The State of Wisconsin has requested the redesignation of the Milwaukee-Racine, WI area to attainment of the 1997 ozone NAAQS. Even though Kenosha County, Wisconsin was included as part of the Milwaukee-Racine, WI ozone nonattainment area for the 1997 ozone NAAQS, it is part of the Chicago CSA, and was part of Chicago-Gary-Lake County, IL-IN-WI Consolidated Metropolitan Statistical Area (CMSA) at the time it was designated as nonattainment as part of the Milwaukee-Racine, WI nonattainment area for the 1997 ozone NAAQS.

In March 2009, the Illinois Environmental Protection Agency (IEPA), representing the State of Illinois, recommended that Cook, DuPage, Kane, Lake, McHenry, Kendall (Oswego Township

only), Grundy (Aux Sable and Goose Lake Townships only), and Will Counties be designated as nonattainment for the 2008 ozone NAAQS based on ozone air quality data for 2006-2008. Illinois recommended that all other Illinois counties (and the remaining portions of Kendall and Grundy Counties) in the Chicago CSA be designated as attainment for the 2008 ozone NAAQS. On December 7, 2011, the IEPA submitted a certification of the State's ozone air quality data for 2011. The State did not provide a revised ozone nonattainment area recommendation in conjunction with the certification of the 2011 ozone data.

In March 2009, the State of Indiana recommended that Lake County be designated as nonattainment for the 2008 ozone NAAQS based on a monitored violation of this NAAQS in Lake County during 2006-2008, and that all other counties in the State be designated as attainment for the 2008 ozone NAAQS based on a lack of monitored violations of the 2008 ozone NAAQS in these counties during 2006-2008.

In March 2009, the State of Wisconsin recommended that Kenosha County be designated as attainment for the 2008 ozone NAAQS. At that time, a violation of the 2008 ozone NAAQS had been monitored in this county during 2006-2008.[8]

On December 9, 2011, EPA initiated the 120-day consultation process for area ozone designations by notifying the States of Illinois, Indiana, and Wisconsin that, based on air quality monitoring data from 2008-2010, EPA intended to designate all parts of this CSA as unclassifiable/attainment for the 2008 ozone NAAQS. EPA requested that, if the States wished to provide comments on EPA's intended designations for the Chicago CSA, they should do so by February 29, 2012. EPA also noted in the letter to each State that it had received Illinois' December 7, 2011, certification notice for Illinois' 2011 ozone data but that it had insufficient time to review and act on Illinois' 2011 ozone data prior to sending the December 9, 2011, letters. EPA committed to review and respond to Illinois' 2011 ozone data for the Chicago CSA as soon as possible and to notify the States of Illinois, Indiana, and Wisconsin as soon as possible if the 2011 data had implications for the designation of any areas in these States.

EPA reviewed Illinois' 2011 ozone data and determined that the 2008 ozone NAAQS had been violated at the Zion, Illinois monitoring site based on the 2009-2011 ozone design value for this monitoring site. EPA prepared a new Technical Support Document (TSD) for the Chicago area addressing the five factor analysis to determine the boundaries for the area EPA intended to designate as nonattainment in light of this violation and sent new/revised 120-day letters to the States of Illinois, Indiana, and Wisconsin on January 31, 2012, informing the States that EPA intended to designate the Chicago-Naperville, IL-IN-WI area as nonattainment for the 2008 ozone NAAQS. EPA provided that the States should submit any additional data or comments

[8] Letter from Douglas P. Scott, Director, Illinois Environmental Protection Agency, to Bharat Mathur, Acting Regional Administrator, U.S. Environmental Protection Agency, Region 5, regarding Illinois' recommended ozone nonattainment boundaries (March 9, 2009); Letter from Thomas W. Easterly, Commissioner, Indiana Department of Environmental Management, to Bharat Mathur, Acting Regional Administrator, U.S. Environmental Protection Agency, Region 5, regarding: Recommendations Concerning Air Quality Designations for the 2008 Revised 8-Hour Ozone National Ambient Air Quality Standard (March 11, 2009); and, Letter from Governor Jim Doyle, State of Wisconsin, to Lisa Jackson, Administrator, U.S. Environmental Protection Agency, regarding: Designation of 8-Hour Ozone Nonattainment Areas in Wisconsin (March 12, 2009).

regarding the intended designation no later than April 20, 2012. The letters and supporting TSD informed the States that EPA intended to include the following areas as part of the Chicago-Naperville, IL-IN-WI nonattainment area: Cook, DuPage, Kane, Lake, McHenry, Kendall (Oswego Township only), Grundy (Aux Sable and Goose Lake Townships only), and Will Counties in Illinois (which is consistent with the counties and partial counties recommended as nonattainment by Illinois in its 2009 recommendation); Lake, Porter, and Jasper Counties in Indiana; and, Kenosha County in Wisconsin. Table 2 shows the state-recommended and EPA-intended nonattainment area for the 2008 ozone NAAQS.

Table 2. State's Recommended and EPA's Intended Nonattainment Counties for the Chicago-Naperville, IL-IN-WI Area in the January 31, 2012 Letters

State	State Recommended Nonattainment Counties	EPA's Intended Nonattainment Counties†
Illinois	Cook DuPage Kane Lake McHenry Will Kendall – Partial Oswego Township Grundy – Partial Aux Sable Township Goose Lake Township	Cook DuPage Kane Lake McHenry Will Kendall – Partial Oswego Township Grundy – Partial Aux Sable Township Goose Lake Township
Indiana	Lake	Lake Porter Jasper
Wisconsin	None	Kenosha

† Nonattainment for both primary and secondary 2008 8-hour ozone standards.

EPA used the Chicago CSA area as the starting point for its evaluation of which areas violate and/or contribute to the violation of the 2008 ozone NAAQS at the Zion monitor. For purposes of this final technical support document, we refined our evaluation based on additional technical information provided by the states in response to the January 2012 letters. We considered the recommendations from Illinois, Indiana, and Wisconsin; the information relied on in developing our intended designations in January 2012; and, additional technical information provided by Indiana and Wisconsin in the last several months, to evaluate the five factors as described below. Based on this evaluation, EPA is designating the area defined in Table 1 as "nonattainment" for the 2008 ozone NAAQS as the Chicago-Naperville, IL-IN-WI nonattainment area.

Factor Assessment

Factor 1: Air Quality Data

For this factor, we considered 8-hour ozone design values (in ppm) for air quality monitors in counties in the Chicago CSA. We used the most recent three-years of state-certified air quality

data available as of February 29, 2012; thus, we considered ozone data for the 2008-2010 period or Indiana and Wisconsin and for the 2009-2011 period for Illinois.

A monitor's ozone design value is the metric or statistic that indicates whether that monitor attained the ozone air quality standard. The 2008 ozone NAAQS are met at a monitor when the annual fourth-highest daily maximum 8-hour ozone concentrations, averaged over three years is 0.075 ppm or less. A design value is valid only if minimum data completeness requirements 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 4.10) and operating with a FRM or 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 monitor 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 40 CFR part 58 Appendix A (quality assurance requirements) or Appendix E (probe and monitoring path siting criteria) were not met.

The 2008-2010 (for Indiana and Wisconsin) and 2009-2011 (for Illinois) ozone design values for monitors and counties in the Chicago-Naperville-Michigan City, IL-IN-WI CSA are given in Table 3.

Table 3. Ozone Air Quality Data for the Chicago-Naperville-Michigan City, IL-IN-WI CSA

State/County	Site Number	2008-2010 8-Hour Ozone Design Value (ppm)	2009-2011 8-Hour Ozone Design Value (ppm)
Illinois:			
Cook	170317002	0.063	0.069
Cook	170310032	0.068	0.072
Cook	170310064	0.064	0.068
Cook	170310076	0.067	0.069
Cook	170314002	0.065	0.069
Cook	170311601	0.070	0.069
Cook	170314007	0.059	0.062
Cook	170314201	0.068	0.072
Cook	170310001	0.069	0.071
Cook	170311003	0.066	0.067
DuPage	170436001	0.060	0.063
Kane	170890005	0.066	0.069
Lake	170971007	0.074	0.076†
McHenry	171110001	0.065	0.067
Will	171971011	0.062	0.063
Indiana:			
Lake	180892008	0.067	NA
Lake	180890030	0.064	NA

Lake	180890022	0.061	NA
Porter	181270026	0.062	NA
Porter	181270024	0.067	NA
La Porte	180910010	0.065	NA
La Porte	180910005	0.065	NA
Wisconsin:			
Kenosha	550590019	0.074	NA

† Monitored violation of the 2008 8-hour ozone NAAQS.

Lake County (the Zion monitor) in Illinois shows a violation of the 2008 8-hour ozone NAAQS. This supports the inclusion of Lake County, Illinois in the intended ozone 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 may have contributed to the nearby violation.

On May 1, 2012, the State of Wisconsin has submitted certified 2011 ozone data. These data, show a violation of the 2008 ozone NAAQS at the Chiwaukee Prairie monitoring site, with a 2009-2011 ozone design value of 0.077 ppm. Because Wisconsin did not certify the 2011 ozone data by February 29, 2012, EPA did not have sufficient time to consider this information for purposes of designating Kenosha County nonattainment (and considering an appropriate boundary) as a violating area. However, we have taken note of this information in considering whether to include all or a portion of Kenosha County, Wisconsin in the Chicago-Naperville, IL-IN-WI ozone nonattainment area for the 2008 ozone NAAQS.

Factor 2: Emissions and Emissions-Related Data

Emissions Data

EPA evaluated county-level emissions data for NOx and VOC derived from the 2008 National Emissions Inventory (NEI), version 1.5. This is the most recently available NEI emissions data. See http://www.epa.gov/ttn/chief/net/2008inventory.html. Significant VOC and/NOx emission levels in a nearby area (in a county within the CSA) indicate the potential for the area to contribute to observed ozone standard violations.

Table 4 shows the 2008 emissions of VOC and NOx (tons per year (tpy)) and emissions percentages for all counties in the Chicago CSA. This table also indicates which of the counties were recommended by the states to be nonattainment for the 2008 ozone NAAQS.

Table 4. Total 2008 VOC and NOx Emissions (tons/year) in the Chicago-Naperville-Michigan City, IL-IN-WI CSA

State/County	State Recommended Nonattainment?	VOC Emissions - tpy (percent of CSA total)	NOx Emissions - tpy (percent of CSA total)
Illinois:			
Cook	Yes	129,466 (45.6)	143,372 (36.4)
DeKalb	No	4,395 (1.5)	4,637 (1.2)
DuPage	Yes	30,508 (10.7)	30,412 (7.7)

Grundy	Yes (partial)	3,291 (1.2)	4,577 (1.2)
Kane	Yes	13,893 (4.9)	15,161 (3.9)
Kankakee	No	5,179 (1.8)	6,941 (1.8)
Kendall	Yes (partial)	3,970 (1.4)	4,642 (1.2)
Lake	Yes	19,978 (7.0)	24,549 (6.2)
McHenry	Yes	9,012 (3.2)	9,138 (2.3)
Will	Yes	19,255 (6.8)	39,878 (10.1)
Illinois Totals		**235,347 (82.9)**	**283,307 (72.0)**
Indiana:			
Jasper	No	2,845 (1.0)	19,788[9] (5.0)
Lake	Yes	21,266 (7.5)	46,808 (11.9)
La Porte	No	5,555 (2.0)	8,875 (2.3)
Newton	No	1,913 (0.6)	841 (0.2)
Porter	No	8,100 (2.9)	27,055 (6.9)
Indiana Totals		**39,679 (14.0)**	**103,367 (26.3)**
Wisconsin:			
Kenosha	No	5,370 (1.9)	6,788 (1.7)
Total CSA Emissions		**283,996**	**393,462**

Emissions Observations by State

Illinois:

From the Illinois emissions in Table 4, it can be seen that comparatively high VOC and NOx emissions originate in the following counties: Cook, DuPage, Kane, Lake, McHenry, and Will. Emissions from these counties, in 2008, account for 94.4 percent of the total Illinois VOC emissions and 92.7 percent of the total Illinois NOx emissions in the Illinois portion of the Chicago CSA. These same counties account for 78.3 percent of the total VOC emissions and 66.7 percent of the total NOx emissions for the entire Chicago CSA.

The VOC and NOx emissions for DeKalb, Grundy, Kankakee, and Kendall Counties are small compared to those from the higher emitting counties in the Chicago CSA.

Indiana:

From the Indiana emissions data in Table 4, it can be seen that comparatively high VOC and NOx emissions originate in Lake and Porter Counties. These counties account for 74.0 percent of the total VOC emissions and 71.5 percent of the total NOx emissions for the Indiana portion of the Chicago CSA. These same counties account for 10.3 percent of the total VOC emissions and 18.8 percent of the total NOx emissions for the entire Chicago CSA.

VOC and NOx emissions in Newton County represent only 0.6 and 0.2 percent of emissions totals for the Chicago CSA, respectively. VOC and NOx emissions in LaPorte County represent

[9] In Indiana's April 13, 2012 response from Commissioner Easterly, updated emissions data were provided for Jasper County showing 2011 NOx emissions levels of 9,791 tons.

2.0 and 2.3 percent of emissions totals for the Chicago CSA, respectively.

Jasper County appears to be a small source area for VOC emissions. The data in Table 4 show emission for all counties in the CSA in 2008 including the 2008 NOx emission levels for Jasper County. However, in Indiana's April 13, 2012 response from Commissioner Easterly, updated emissions data were provided for Jasper County showing 2011 NOx emissions levels of 9,791 tons. The NOx emissions in Jasper County are dominated by emissions from the Northern Indiana Public Service Company-R.M. Schahfer Generating Station (NIPSCO-Schahfer) located in the northern end of Jasper County, near the border of Jasper County and Porter County. Indiana presented information that NIPSCO-Schahfer has substantially controlled its NOx emissions through the implementation of Selective Catalytic Reduction (SCR) on its largest power unit and implementation of low-NOx burner with over-fired air on the remaining combustion units. The installation of these NOx emission controls resulted in a reduction of NIPSCO-Schahfer NOx emissions from 17,324 tons in 2008 to 7,327 tons in 2011.

Wisconsin:

From the Wisconsin emissions in Table 4, it can be seen that comparatively low VOC and NOx emissions originate in Kenosha County. Kenosha County accounts for 1.9 percent of the total VOC emissions and 1.7 percent of the total NOx emissions for the entire Chicago CSA. Pleasant Prairie and Somers Townships contain 91 percent of the County's NOx emissions and 86 percent of the County's VOC emissions.

Population, Population Density, and Degree of Urbanization

EPA evaluated the county-specific populations, population trends, and vehicle use characteristics for the Chicago CSA 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 NOx and VOC emissions that may contribute to violating ozone monitors. Rapid population growth in a county on the urban perimeter signifies increasing integration with the urban core area, and indicates that it may be appropriate to include this county in the ozone nonattainment area, particularly if this county already has moderate or higher VOC and/or NOx emissions. Table 5 shows the 2010 population, population density, and population growth information for each county in the Chicago CSA.

Table 5. Population and Population Growth in the Chicago-Naperville-Michigan City, IL-IN-WI CSA

State/County	State Recommended Nonattainment?	2010 Population	2010 Population Density (1,000 per square mile)	Change in Population (2000-2010)	Population Percent Change (2000-2010)
Illinois:					
Cook	Yes	5,194,675	5.43	-182,417	-3
DeKalb	No	105,160	0.17	15,839	18
DuPage	Yes	916,924	2.73	10,269	1
Grundy	Yes (partial)	50,063	0.12	12,388	33
Kane	Yes	515,269	0.98	107,749	26
Kankakee	No	113,449	0.17	9,573	9
Kendall	Yes (partial)	114,736	0.36	59,529	108
Lake	Yes	703,462	1.50	55,288	9
McHenry	Yes	308,760	0.51	46,890	18
Will	Yes	677,560	0.80	169,531	33
Indiana:					
Jasper	No	33,478	0.06	3,296	11
Lake	Yes	496,005	0.99	11,516	2
La Porte	No	111,467	0.18	1,309	1
Newton	No	14,244	0.04	-298	-2
Porter	No	164,343	0.39	17,188	12
Wisconsin:					
Kenosha	No	166,426	0.60	16,352	11

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) and U.S. Census Bureau GIS files for the county boundaries.

Population Observations By State

Illinois:

For Illinois, the population data show that Cook, DuPage, Kane, Lake, McHenry, and Will Counties have comparatively large populations and population densities and, therefore, are more urbanized than the other Illinois counties in this CSA. This indicates that the population-related VOC and NOx emissions in these counties are relatively high. In addition, the population change levels for 2000-2010 in Kane, Kendall, Lake, McHenry, and Will Counties significantly exceed those of other counties in the CSA, suggesting that these "fast growing" counties are becoming increasingly urbanized and integrated with the urban core of the Chicago CSA. This further indicates that the population-related emission contributions from these counties are increasing compared to those from other counties in the Chicago CSA.

The population densities of DeKalb, Grundy, Kendall, and Kankakee Counties are relatively small compared to those of other counties in the Chicago CSA. The portions of Grundy and

Kendall Counties we are including in the ozone nonattainment area are the greater populated portions of these counties.

Indiana:

In the Indiana portion of the Chicago CSA, the population and population density of Lake and County is comparable to Kane County in Illinois. The population density of Porter County in Indiana is similar to that of Kendall County in Illinois, but the population of Porter County is approximately 43 percent greater. The population in La Porte County is comparable to DeKalb and Kankakee Counties in Illinois.

The population and population densities in Jasper and Newton Counties are the lowest of any counties within the CSA.

Wisconsin:

Kenosha County has population levels very similar to those in Porter County, which is lower that than the most highly populated counties in the Chicago CSA. However, the population density of Kenosha County is relatively high, showing that this county is significantly urbanized indicating increased integration with the core of the CSA. Pleasant Prairie and Somers Townships are the most densely populated portion of Kenosha County with 77 percent of the County's population.

Traffic and Commuting Patterns

EPA evaluated the total VMT for each county in the Chicago CSA. In combination with the population/population density data and the location of main transportation arteries (see the 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 the urban area and indicates the presence of relatively high motor vehicle (on-road mobile source) emissions that may significantly contribute to ozone formation and transport in the urban area. This implies 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 area (in the CSA/CBSA).

Table 6 shows the traffic levels, total 2008 VMT, in each county in the Chicago CSA.

Table 6. Traffic Levels in the Chicago-Naperville-Michigan City, IL-IN-WI CSA

State/County	State Recommended Nonattainment?	2008 VMT (million miles)*
Illinois:		
Cook	Yes	32,755
DeKalb	No	883
DuPage	Yes	8,443
Grundy	Yes (partial)	678
Kane	Yes	3,628

Kankakee	No	945
Kendall	Yes (partial)	769
Lake	Yes	5,638
McHenry	Yes	2,169
Will	Yes	5,713
Indiana:		
Jasper	No	732
Lake	Yes	4,915
La Porte	No	936
Newton	No	219
Porter	No	1,640
Wisconsin:		
Kenosha	No	1,354

***** Mobile source VMT are those input into the NEI version 1.6 used to compute the mobile source portion of the NEI emissions summarized above in Table 4.

VMT Observations By State

Illinois:

For Illinois, the VMT data show that VMT levels in Cook County are significantly higher than those for other counties in the Chicago CSA. The VMT levels for DuPage, Kane, Lake, McHenry, and Will Counties are comparatively higher than those of the other counties in the Chicago CSA and, cumulatively, are a significant portion of the total VMT for the Chicago CSA.

Indiana:

For Indiana, the VMT data show that VMT levels in Lake and Porter Counties are comparatively higher than those of the other counties in the Chicago CSA (with the exception of Cook County), and, cumulatively, are a significant portion of the total VMT for the Chicago CSA.

Wisconsin:

The VMT level in Kenosha County is similar to the VMT level in Porter County, Indiana. This indicates that the ozone impact of mobile source emissions in Kenosha County should be similar to that of Porter County.

Factor 3: Meteorology (Weather/Transport Patterns)

EPA evaluated available meteorological data to help determine how meteorological conditions, particularly transport conditions, affect the fate and transport of ozone and ozone precursors contributing to ozone formation in the Chicago CSA. The data available for part of this evaluation were presented by the States of Illinois and Wisconsin, as part of their March 2009 ozone designation recommendation submittals and by Indiana in its April 13, 2012 response to EPA's 120 day letter.

In Illinois' March 9, 2009 ozone designation recommendation submittal, the IEPA notes that the predominant wind direction across the State is from south/southwest, with an average wind speed

of approximately 11 miles per hour. The State notes that ozone monitors in the Chicago area that exceed the 2008 ozone NAAQS, based on 2006-2008 data, show strong evidence of regional (i.e., longer-range) contributions to high ozone levels. The State also presents a pollution wind rose (direction percent frequency) for days in 2006-2008 with peak 8-hour ozone concentrations exceeding 75 ppb, with wind data collected at the Alsip monitoring site (Cook County). These data show that, on high ozone days, the wind blew from the south through southwest. Some high ozone day winds were also recorded with winds from east-northeast through south-southeast and west-southwest through west. Virtually no high ozone day wind directions were recorded for wind directions for west-northwest through northeast.

In Wisconsin's March 12, 2009 ozone designation recommendation submittal technical support document, the Wisconsin Department of Natural Resources (WDNR) summarized the wind directions for days (2006-2008) when 1-hour ozone concentrations at the Chiwaukee Prairie monitoring site in Kenosha County exceeded 75 ppb. This analysis indicated that, on 57.9 percent of these high ozone days, winds were from the southeast through south. On 15.8 percent of the high ozone days, winds were from the southwest. Collectively, these wind directions point to the Northeast Illinois and Northwest Indiana areas as likely source areas for VOC and NOx emissions that have contributed to the high ozone concentrations at the Chiwaukee Prairie monitoring site.

Wisconsin's analysis focused on the Chiwaukee Prairie monitoring site, which is not violating the standard based on 2008-2010 data but was violating the standard at the time that the State made its initial recommendation in March 2009. However, we believe this analysis is informative for purposes of evaluating the violation at the Zion monitor for the reasons presented below.

Figure 2 considers the relationship between daily peak 1-hour ozone concentrations for the Chiwaukee Prairie and Zion monitoring sites for the 2000-2011 period.

Figure 2. Correlation Between Daily Peak 1-Hour Ozone Concentrations at Chiwaukee Prairie (Wisconsin) and Zion (Illinois) Monitoring Sites (2000-2011)

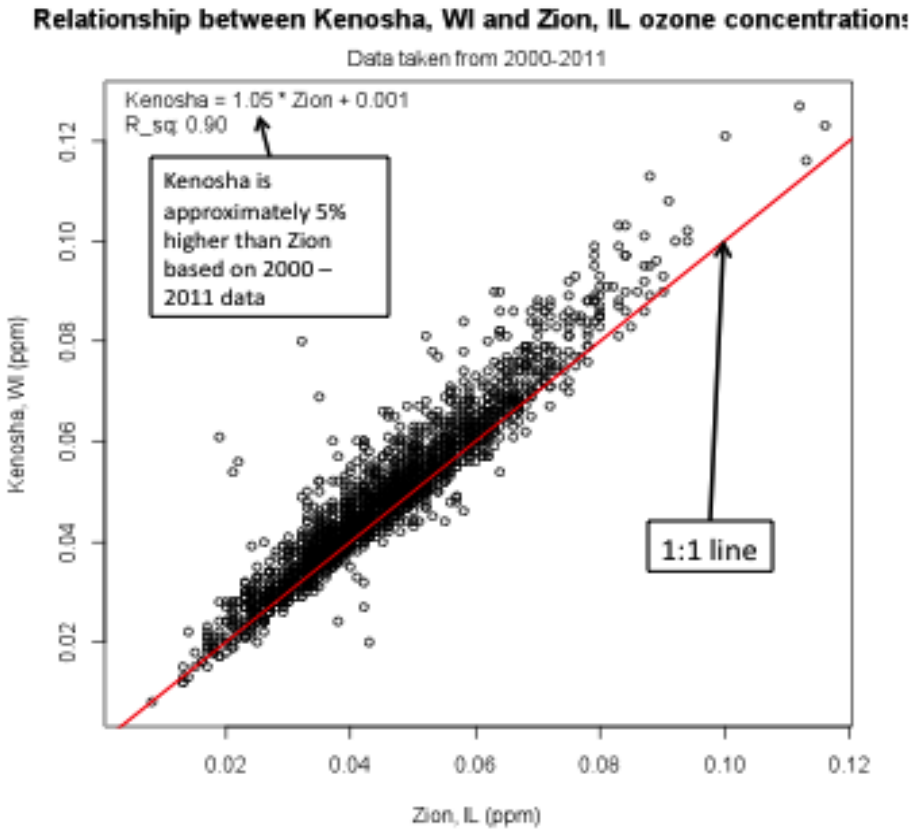


Figure 3 shows the comparison between 3-year ozone design values for the Chiwaukee Prairie and Zion monitoring sites for the 2000-2011 period.

Figure 3. Three-Year 8-Hour Ozone Design Values for Chiwaukee Prairie (Wisconsin) and Zion (Illinois) Monitoring Sites (2000-2011)

The Chiwaukee Prairie monitoring site is located approximately six miles north of the Zion, Illinois monitoring site. The data displayed in Figures 2 and 3 demonstrate the strong correlation between the peak ozone concentrations at the Chiwaukee Prairie and Zion monitoring sites.

Reacting to the January 31, 2011, 120-day letter to Governor Mitchell E. Daniels, Indiana Department of Environmental Management (IDEM) conducted several analyses that they suggest demonstrate that VOC and NOx emissions from Northwest Indiana do not contribute to the high ozone concentrations monitored at the Zion, Illinois monitoring site. These analyses provide information on air pollutant transport and source apportionment of ozone contributions on high ozone days. IDEM conducted wind direction analyses for 2009-2011 summer ozone seasons in Northwest Indiana and 2009-2011 high ozone days at Zion, Illinois and pollutant trajectory analyses using National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory-Hybrid Single Particle Lagrangian Integrated Trajectory Model (HYSPLIT) for air transport trajectories originating in Northwest Indiana and air transport trajectories ending at Zion, Illinois (documented in Appendix F of IDEM's April 13, 2012, response to EPA's January 31, 2012, 120-day letter).

Using wind direction data for a Gary, Indiana meteorological site and from a NIPSCO-Schahfer meteorological tower, IDEM determined that summertime winds during 2009-2011 were primarily from south through southwest and from northeast through east. IDEM also considered wind-rose data for the Zion, Illinois ozone monitoring site. The Zion, Illinois wind-rose data provided by Indiana show that high ozone concentrations at this monitoring site occur on days with winds from the southeast and the southwest.

To apply HYSPLIT, IDEM input forty kilometer gridded meteorological data into HYSPLIT to determine air pollutant trajectory directions and heights. Background trajectories were run from the Chicago area and show where the air came from two days prior to an 8-hour ozone exceedance day at the Zion, Illinois monitoring site. Forward trajectories were created from the nearest surface weather stations (Valparaiso ASOS and Gary ASOS) to Jasper County. These HYSPLIT trajectories show the way the air travels two days before arriving in the Chicago area and way the air travels after picking up emissions in the Northwest Indiana area. The HYSPLIT upwind results show a complex pollutant transport pattern, with pollutants arriving in the Chicago area from a wide range of upwind areas covering much of the Midwest and states east of Illinois and Indiana. The downwind results, in the view of IDEM, show emissions from Northwest Indiana transporting over Lake Michigan and northeast into Michigan. IDEM argues that these results show that emissions contributions from Lake, Porter, and Jasper Counties to high ozone levels at the Zion, Illinois monitoring site are small as compared to emissions contributions from the rest of the Lake Michigan airshed. IDEM also argues that these results, along with wind-roses generated for Northwest Indiana demonstrate that Northwest Indiana emissions transport north and northeast away from the Zion, Illinois monitoring site on high ozone days at this monitoring site.

EPA's review of Indiana's summarized wind-rose and HYSPLIT results shows that Indiana has not demonstrated that Northwest Indiana emissions did not contribute to the Zion, Illinois ozone standard exceedances in 2009-2011. The wind-roses for the Zion, Illinois monitoring site show a definite wind component from the southeast on high ozone days. This implies that Northwest Indiana emissions may have contributed to the high ozone levels at Zion, Illinois. Forward HYSPLIT trajectories for certain high-ozone days at Zion, Illinois show the potential for pollutant transport from Northwest Indiana to the Zion, Illinois area. Such transport was modeled on the following high-ozone days: June 23, 2009; June 24, 2009; May 30, 2010; July 3, 2010; September 1, 2011; and June 30, 2011. Clearly, these data show that Northwest Indiana emissions may have contributed to high ozone levels on a number of high ozone days. In addition, EPA notes that Indiana ran HYSPLIT trajectories for a limited set of starting (forward trajectory) and ending (backward trajectory) hours. This has produced a relatively small number of trajectories. EPA believes that Indiana's HYSPLIT analysis has produced an insufficient number of trajectories to definitively demonstrate that Indiana's emissions have not contributed to the high ozone concentrations at Zion, Illinois for all of the periods of high ozone, which covers many hours over 12 plus high ozone days.

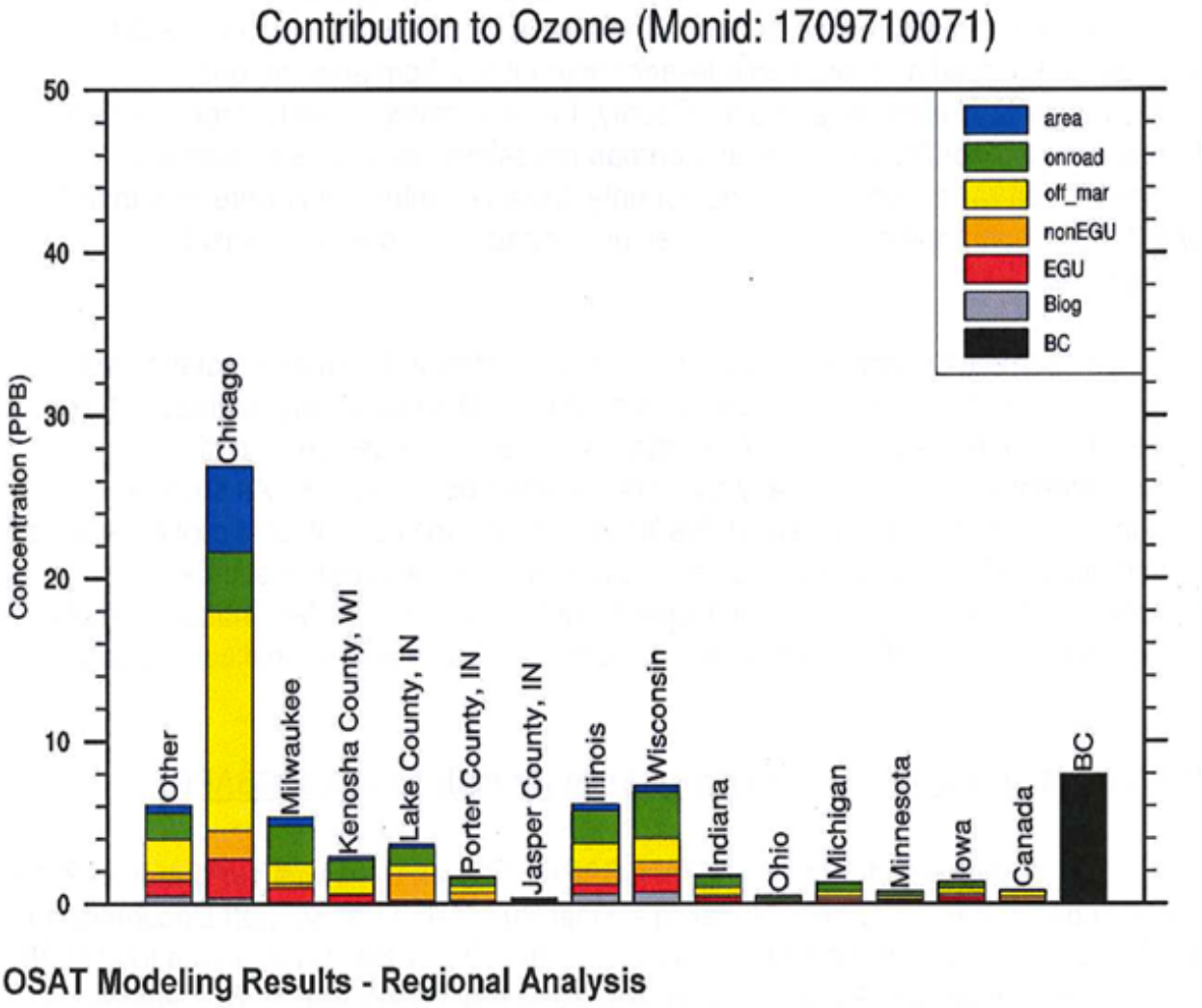
To demonstrate that Northwest Indiana emissions are small contributors to high ozone levels at Zion, Illinois, IDEM also considered ozone source apportionment modeling conducted by Lake Michigan Air Directors Consortium (LADCO) for 2007 high ozone periods at Zion, Illinois. LADCO modeled ozone concentrations for the Zion, Illinois monitoring site using meteorology

for 2007 and the CAMx ozone modeling system. Days modeled with peak 8-hour ozone concentrations exceeding 0.075 ppm were selected to conduct ozone source apportionment modeling using Ozone Source Apportionment Techniques (OSAT). The output of OSAT produced a graphed source distribution chart. This chart has been included in IDEM's April 13, 2012, response letter and is reproduced here. IDEM states in its comment letter that LADCO's OSAT modeling results show that Lake County VOC and NOx emissions only contributed 0.004 ppm (4 ppb) ozone levels to the Zion, Illinois ozone concentrations, that Porter County VOC and NOx emissions only contribute 0.002 ppm (2 ppb) to the Zion, Illinois ozone concentrations, and that Jasper County VOC and NOx emissions contributed less than 0.0005 ppm (0.5 ppb) ozone levels to the Zion, Illinois ozone concentrations. IDEM considers these contributed ozone levels to be small, proving that Northwest Indiana is an Indiana is an insignificant source area for high ozone concentrations at the Zion, Illinois monitoring site.

EPA disagrees with IDEM's conclusions. In keeping with EPA's ozone contribution levels used to select states that should be covered in regional emission control programs, 2 ppb to 4 ppb ozone concentration contributions are considered to be significant ozone contributions. We believe that the LADCO OSAT modeling results discussed by IDEM support that emissions in Lake and Porter Counties are significant contributors to the high ozone levels monitored at Zion, Illinois.

The LADCO OSAT modeling results also show that Kenosha County VOC and NOx emissions contributed approximately 0.003 ppm (3 ppb) ozone levels to the Zion, Illinois peak ozone concentrations, a contribution level that we believe is significant.

Figure 4: Ozone Contributions at the Zion, Illinois Ozone Monitor



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.

The Chicago CSA borders Lake Michigan. The "lake effect" (the inshore flow of polluted air over Lake Michigan in afternoon hours under the effect of a land-lake breeze due to temperature differences between the Lake surface and the onshore surface) can significantly complicate the analysis of ozone formation and transport in this area. This effect can significantly affect the distribution of high ozone concentrations in the area, making it difficult to determine the source of the monitored high ozone concentrations. LADCO, however, has modeled meteorology, emissions, and ozone formation and transport in the Lake Michigan area over multiple day high ozone events. These ozone modeling analyses have led to LADCO's ozone modeling analysis of ozone contribution levels for specific areas, specific monitoring sites, and specific source categories, as discussed above.

Factor 5: Jurisdictional Boundaries

Once we identified the general area that we anticipated we would recommend as nonattainment for the 2008 8-hour ozone NAAQS, we then considered existing jurisdictional boundaries for purposes of providing a clearly defined legal boundary and to help identify the area appropriate for carrying out the air quality planning and enforcement functions for an ozone nonattainment area. Examples of jurisdictional boundaries include existing or prior nonattainment boundaries, air district boundaries, township boundaries, areas covered by metropolitan planning organizations, state lines, and Reservation boundaries. Where existing jurisdictional boundaries are not adequate or appropriate to describe the nonattainment area, other clearly defined and permanent landmarks or geographic coordinates may be considered.

The Chicago CSA has previously established ozone nonattainment boundaries associated with both the 1-hour and 8-hour ozone NAAQS. The Chicago nonattainment boundary for the 1-hour ozone NAAQS included Cook, DuPage, Kane, Lake, McHenry, and Will Counties and Lake and Porter Counties in Indiana in their entireties and partial counties for Grundy (Aux Sable and Goose Lake Townships) and Kendall (Oswego Township) Counties in Illinois. Kenosha County, Wisconsin was part of the Milwaukee 1-hour ozone nonattainment area. Both of these areas were designated as nonattainment for the both the 1-hour and 1997 8-hour ozone NAAQS.

Although Kenosha County was previously included with the Milwaukee nonattainment area, it is part of the Chicago CSA and was also part of the Chicago-Gary-Lake County, IL-IN-WI Consolidated Metropolitan Statistical Area, a metropolitan area definition used by the Office of Management and Budget at the time of the 1-hour ozone designations. The Chiwaukee Prairie monitoring site historically has been the high downwind monitoring site for the Chicago region and its design value was used to establish the classification for both the Chicago-Gary-Lake County, IL-IN and the Milwaukee-Racine, WI ozone nonattainment areas under the 1997 8-hour ozone standard and the 1-hour ozone standard. In addition, monitoring data from this monitoring site were historically used by the States of Illinois, Indiana, and Wisconsin in conjunction with modeled ozone concentrations to demonstrate that emission reductions in the Chicago area were sufficient to attain the 1-hour ozone standard and the 1997 8-hour ozone standard.

Illinois has recommended that the same full and partial counties in Illinois be included as part of the Chicago nonattainment area for the 2008 8-hour ozone NAAQS. Indiana has recommended that only Lake County be designated as nonattainment for the 2008 ozone NAAQS. Finally, Wisconsin has recommended that Kenosha County be designated as attainment for the 2008 8-hour ozone NAAQS.

Conclusion

Illinois:

Based on the assessment of factors described above, EPA intends to include the following Illinois counties and partial counties in the Chicago-Naperville, IL-IN-WI ozone nonattainment area: Cook, DuPage, Kane, Lake, McHenry, and Will Counties in their entirety; and, Oswego Township in Kendall County, and Aux Sable and Goose Lake Townships in Grundy County.

Based on the levels of VOC and NOx emissions, and other emissions-related data, including population and VMT levels, it is concluded that Cook, DuPage, Kane, Lake, McHenry, and Will Counties are significant sources of emissions that contribute to the high ozone levels at the Zion monitor. Based on the State of Illinois' recommendation and on historical nonattainment boundary considerations, we also intend to include Oswego Township in Kendall County and Aux Sable and Goose Lake Townships in Grundy County as part of the Chicago-Naperville, IL-IN-WI ozone nonattainment area for the 2008 8-hour ozone standard.

Based on our analysis of the factors above, in particular the emissions- and population related factors, we are designating the remaining portions of Kendall and Grundy Counties, in the Chicago CSA as attainment for the 2008 8-hour ozone NAAQS. We notified the State of Illinois on April 30, 2012 that we were designating all other Illinois counties as unclassifiable/attainment for the 2008 ozone NAAQS.

Indiana:

Based on the assessment of factors described above, EPA intends to include Lake and Porter Counties in the Chicago-Naperville, IL-IN-WI nonattainment area for the 2008 8-hour ozone NAAQS. This is based on the significant emissions levels in these counties that contribute to high ozone concentrations at the Zion monitor. Meteorology on high ozone days in the Chicago area favors the transport of ozone and ozone precursor emissions from these counties to the Zion monitor.

LADCO OSAT modeling shows that while Jasper County has VOC and NOx emissions levels similar to some of the other counties we are including in the nonattainment area, these levels are not significant contributors to the high ozone concentrations monitored at the Zion, Illinois monitoring site. Specifically, the LADCO monitoring indicates that Jasper County contributes 0.5 ppb to the Zion monitor. VOC emissions are relatively small for Jasper County. The low population and VMT data of Jasper County also favors the exclusion of this county from the nonattainment area. It is concluded that emissions from Jasper County do not meaningfully contribute to the high ozone concentrations at the Zion monitor and that and Jasper County should be excluded from the Chicago-Naperville, IL-IN-WI ozone nonattainment area for the 2008 ozone NAAQS. We are designating Jasper County as unclassifiable attainment. We notified the State of Indiana on April 30, 2012 that we were designating all other Indiana counties as unclassifiable/attainment for the 2008 ozone NAAQS.

Wisconsin:

The VOC and NOx emissions in Kenosha County are most similar to counties we are not including in the designated nonattainment area. While the wind direction analyses provided by Illinois and Wisconsin with their March 2009 recommendations indicate that Kenosha County emissions are predominately downwind of the violating Zion, Illinois monitor on high ozone days, LADCO OSAT modeling results (submitted by IDEM in response to the January 31, 2012 120-day letter) show that VOC and NOx emissions do significantly contribute to high ozone levels at the Zion, Illinois monitoring site.

We also recognize the close link between Kenosha County and the Chiwaukee Prairie monitoring site and the historical Chicago nonattainment area. The Chiwaukee Prairie monitoring site is located approximately 6 miles north of the violating Zion monitoring site and both sites are located quite close to Lake Michigan and are similarly affected due to the "lake effect." On May 1, 2012, Wisconsin submitted certified air quality data for 2011 and that data indicates that there is a violation at the Chiwaukee Prairie monitoring site based on data from 2009-2011. As previously explained, we did not have sufficient time to evaluate this violation and perform a five factor analysis for purposes of designating the area as a violating area and including any nearby contributing areas. We do take note of this new information, however, in our consideration of whether to include all or part of Kenosha County as part of the designated Chicago nonattainment area.

We also considered that the State of Wisconsin urged that if we include Kenosha County in the designated nonattainment area, we include only a narrow band of the easternmost portion of the county. The State based this suggestion on the fact that historical ozone monitoring data and LADCO ozone modeling demonstrate that high ozone levels are generally restricted to the eastern portion of Kenosha County, near the Lake Michigan shoreline. As noted, however, we are not evaluating Kenosha County on the basis of the recent violation at the Chiwaukee Monitor.

Recognizing that Kenosha County emissions do contribute to high ozone levels at the Zion monitor, we evaluated VOC and NOx emissions and population distributions for this county. EPA has determined that 91 percent of the County's NOx emissions, 86 percent of the County's VOC emissions, and 77 percent of the County's population are covered by Somers and Pleasant Prairie Townships. The Chiwaukee monitor is located in Pleasant Prairie Township. Based on the above information, we are designating Somers and Pleasant Prairie Townships in Kenosha County, Wisconsin as part of the Chicago nonattainment area for the 2008 ozone NAAQS. We are designating the remaining portion of Kenosha County unclassifiable/attainment.