IDEM

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

We Protect Hoosiers and Our Environment.

Mitchell E. Daniels, Jr.
Governor

Thomas W. Easterly
Commissioner

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December 5, 2012

Ms. Susan Hedman
Regional Administrator
U.S. Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604-3950

Re: Request for Redesignation Petition and Maintenance Plan Under the Annual National Ambient Air Quality Standard for 2008 8-Hour Ozone Nonattainment Area (Lake and Porter Counties, Indiana)

Dear Ms. Hedman:

The Indiana Department of Environmental Management (IDEM) submits a Redesignation Petition and Maintenance Plan for Lake and Porter counties, Indiana. These counties were designated as nonattainment of the 2008 8-hour ozone standard on January 31, 2012.

The attached document consists of the following:

Redesignation Petition and Maintenance Plan

- A formal request that Lake and Porter counties, Indiana be redesignated to attainment and reclassified as maintenance.
- The attached document contains and meets the requirements set forth in Section 107 of the Clean Air Act and in the United States Environmental Protection Agency (U.S. EPA) Redesignation Guidance.
- A maintenance year of 2030 is established and 2020 is analyzed as an interim year.
- The appendices of the document contain historical air quality trend data, current and projected emission inventory data and thorough documentation of the mobile emissions estimation process.

Motor Vehicle Emissions Budgets

- A conservative margin of safety was applied to the 2020 and 2030 projected emissions estimates.
- The travel demand model was updated with the best available assumptions.

- 2009 Vehicle Identification Numbers provided by the Indiana Bureau of Motor Vehicles for Lake and Porter counties were decoded and split into the car, passenger truck, and light commercial truck MOVES source types. These age distributions are not expected to change much over time, so they remain the same for the different analysis years.

IDEM requests that U.S. EPA proceed with review and approval of this submittal. If you have any questions or need additional information, please contact Keith Baugues at (317) 232-8222 or by email at kbaugues@idem.in.gov.

Sincerely,

Thomas W. Easterly
Commissioner

cc: George Czerniak, U.S. EPA Region 5 (no enclosures)
John Mooney, U.S. EPA Region 5 (no enclosures)
Doug Aburano, U.S. EPA Region 5 (w/ enclosures)
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REQUEST FOR REDESIGNATION AND MAINTENANCE PLAN FOR ATTAINMENT IN THE 2008 8-HOUR OZONE NONATTAINMENT AREA

Lake and Porter Counties, Indiana

Developed By:
The Indiana Department of Environmental Management

December 2012

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ACRONYMS/ABBREVIATION LIST

AQS	Air Quality System
BMV	Bureau of Motor Vehicles
BPR	Bureau of Public Roads
CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CAM_x	Comprehensive Air Quality Model
CFR	Code of Federal Regulations
CMSA	Consolidated Metropolitan Statistical Area
CTG	Control Technology Guidelines
CO	carbon monoxide
CSAPR	Cross-State Air Pollution Rule
D.C.	District of Columbia
EGUs	electric generating units
FR	Federal Register
IAC	Indiana Administrative Code
IDEM	Indiana Department of Environmental Management
IL	Illinois
IEPA	Illinois Environmental Protection Agency
IC	Indiana Code
IN	Indiana
km	kilometer
INDOT	Indiana Department of Transportation
LADCO	Lake Michigan Air Director's Consortium
MM5	Mesoscale Model
MSA	Metropolitan Statistical Area
MWe	megawatt electrical
NAAQS	National Ambient Air Quality Standard
NIRPC	Northwestern Indiana Regional Planning Commission
NO_x	nitrogen oxides
NSR	New Source Review
MOU	Memorandum of Understanding
MOVES	Motor Vehicle Emission Simulator
MPO	Metropolitan Planning Organization
OAQ	Office of Air Quality
$PM_{2.5}$	particulate matter less than or equal to 2.5 $\mu g/m^3$ or fine particles
ppb	parts per billion
ppm	parts per million
PSD	Prevention of Significant Deterioration
RACT	Reasonably Available Control Technology
ROP	Rate of Progress
RRF	Relative Response Factor

SIP	State Implementation Plan
SO_2	sulfur dioxide
SUVs	sport utility vehicles
TAZ	Travel Analysis Zones
tpy	tons per year
U.S. EPA	United States Environmental Protection Agency
$\mu g/m^3$	micrograms per cubic meter
VIN	Vehicle Identification Number
VMT	vehicle miles traveled
VOC	volatile organic compound
WI	Wisconsin
WDNR	Wisconsin Department of Natural Resources

REQUEST FOR REDESIGNATION AND MAINTENANCE PLAN FOR ATTAINMENT IN THE 2008 8-HOUR OZONE NONATTAINMENT AREA

LAKE AND PORTER COUNTIES, INDIANA

1.0 INTRODUCTION

This document supports Indiana's request that Lake and Porter counties in Northwest Indiana be redesignated from nonattainment to attainment of the 2008 8-hour ozone standard. These counties have demonstrated attainment of the 8-hour ozone standard by recording three (3) years of complete, quality-assured ambient air quality monitoring data for the years 2009 through 2011.

Indiana's request is based on Section 107(d)(3)(D) of the Clean Air Act (CAA), which states:

> (D) The Governor of any State may, on the Governor's own motion, submit to the Administrator a revised designation of any area or portion thereof within the State. Within 18 months of receipt of a complete State redesignation submittal, the Administrator shall approve or deny such redesignation. The submission of a redesignation by a Governor shall not affect the effectiveness or enforceability of the applicable implementation plan for the State.

Section 107(d)(3)(E) of the CAA establishes specific requirements to be met in order for an area to be considered for redesignation, including:

(a) A determination that the area (or a portion thereof) has attained the national ambient air quality standard (NAAQS).
(b) A State Implementation Plan (SIP) for the area under Section 110(k) is fully approved.
(c) A determination that the improvement in air quality is due to permanent and enforceable reductions in emissions resulting from implementation of the SIP or other federal requirements.
(d) A maintenance plan under Section 175A is fully approved.
(e) A determination that all Section 110 and Part D requirements have been met.

A maintenance plan provides for the continued attainment of the air quality standard by an area for a period of ten years after the United States Environmental Protection Agency (U.S. EPA) has formally redesignated the area to attainment. The plan also provides assurances that even if there is a subsequent exceedance of the air quality standard, then measures in the maintenance plan will prevent any future occurrences through contingency measures that would be triggered.

This document addresses each of these requirements, and provides additional information to support continued compliance with the 8-hour ozone standard.

1.1 Background

The CAA requires areas designated nonattainment for the National Ambient Air Quality Standard for ozone to develop state implementation plans (SIPs) to expeditiously attain and maintain the standard. In 1997, the United States Environmental Protection Agency (U.S. EPA) revised the air quality standards for ozone replacing the 1979 1-hour standard with an 8-hour ozone standard set at 0.08 parts per million (ppm). The standard was challenged legally and upheld by the U.S. Supreme Court in February of 2001. U.S. EPA designated areas under the 1997 8-hour ozone standard on April 15, 2004, as attainment, nonattainment, or unclassifiable.

The Indiana Department of Environmental Management (IDEM) submitted the final Request for Redesignation and Maintenance Plan for Ozone Attainment in the 1997 8-Hour Ozone Nonattainment Area, Lake and Porter counties, Indiana, on June 5, 2009. U.S. EPA subsequently approved the Redesignation Request on May 11, 2010. Therefore, this document only pertains to the 2008 8-hour ozone standard.

On March 12, 2008, U.S. EPA significantly strengthened the 8-hour ozone standard to a level of 0.075 ppm, as shown in Table 1.1.

Table 1.1 National Ambient Air Quality Standards for Ozone

	Primary Standards		Secondary Standards	
	Level	**Averaging Time**	**Level**	**Averaging Time**
1997 Ozone Standards	0.08 ppm*	Three Year average of the fourth highest 8-hour ozone value recorded each year.	Same as primary	
2008 Ozone Standards	0.075 ppm	Three Year average of the fourth highest 8-hour ozone value recorded each year.	Same as primary	

*Based on U.S. EPA's published data handling guidelines, values above 0.084 ppm were deemed to be in violation of the 2008 8-hour ozone standard.

On May 31, 2012, U.S. EPA designated Lake and Porter counties, Indiana, nonattainment as a portion of the Chicago-Naperville, Illinois (IL)-Indiana (IN)-Wisconsin(WI) nonattainment area in 40 Code of Federal Regulations (CFR) 81.315, and classified the area "marginal" under Subpart 2 of Part D of the CAA. If a nonattainment area is classified as "serious", "severe", or "extreme", the CAA mandates that the presumptive nonattainment boundary include the entire Consolidated Metropolitan Statistical Area (CMSA), or Metropolitan Statistical Area (MSA) and all of its Metropolitan Divisions. This designation subjected the nonattainment area to the new 8-hour ozone requirements, including development of a plan to reduce nitrogen oxide (NO_x) and volatile organic compound (VOC) emissions, and a demonstration that the area will meet the federal 2008 8-hour air quality standard for ozone by July 20, 2017.

The Chicago-Naperville, IL-IN-WI 2008 8-hour ozone nonattainment area, as defined in Section 1.2, has not previously been subject to nonattainment area rulemakings. However, Lake and

Porter counties, Indiana and Illinois' portion of the 8-hour ozone nonattainment area had been subject to nonattainment area rulemakings under the 1-hour ozone, 1997 8-hour ozone, and the 1997 annual standard for fine particles. The 1-hour ozone standard was revoked on June 15, 2005. Lake and Porter counties, Indiana, were redesignated to attainment and classified as maintenance under the 1997 8-hour ozone and annual fine particle standards on May 11, 2010, and February 6, 2012, respectively. Illinois' portions of the 1997 8-hour ozone and annual fine particle nonattainment areas remain designated as nonattainment under the standards.

1.2 Geographical Description

The specific counties and partial counties that compromise the Chicago-Naperville, IL-IN-WI nonattainment area (Chicago nonattainment area) as defined in 40 CFR 81.314 and 40 CFR 81.315, include: Cook, DuPage, Grundy (partial), Kane, Kendall (partial), Lake, McHenry, and Will counties, Illinois; Kenosha County (partial), Wisconsin; and Lake and Porter counties, Indiana. The Lake County-Kenosha County, Illinois-Wisconsin Metropolitan Division of the Chicago MSA was not included as part of the Chicago nonattainment area, however, Somers Township and Pleasant Prairie Township of Kenosha County, WI were included as part of the Chicago Nonattainment area due to the location of the ozone monitor, the number of sources in the townships, and the population of the townships. The nonattainment area contains such cities as Gary, Hammond, East Chicago, Portage, and Valparaiso in Indiana, Chicago, Elgin, Aurora, and Joliet in Illinois, and the City of Kenosha and Village of Pleasant Prairie in Wisconsin. This area is depicted in Figure 3.1.

IDEM, the Illinois Environmental Protection Agency (IEPA), and the Wisconsin Department of Natural Resources (WDNR) are responsible for assuring the nonattainment area for the 8-hour ozone standard complies with the CAA requirements. IDEM is responsible for Lake and Porter counties, Indiana, IEPA is responsible for Cook, DuPage, Grundy (partial), Kane, Kendall (partial), Lake, McHenry, and Will counties, Illinois, and the WDNR is responsible for Kenosha County (partial), Wisconsin.

The State of Illinois and the State of Wisconsin are required to make separate submittals for their portions of the planning components to U.S. EPA. As such, this submittal only covers Lake and Porter counties, Indiana.

1.3 Status of Air Quality

Ozone monitoring data for the most recent three (3) years, 2009 through 2011, demonstrates that the air quality of Lake and Porter counties, Indiana meets the 8-hour ozone standard. This fact, accompanied by the permanent and enforceable decreases in emission levels discussed in Section 4.0, justifies a redesignation to attainment for Indiana's portion of the nonattainment area based on Section 107(d)(3)(E) of the CAA.

2.0 REQUIREMENTS FOR REDESIGNATION

2.1 General

Section 110 and Part D of the CAA list a number of requirements that must be met by nonattainment areas prior to consideration for redesignation to attainment. In addition, U.S. EPA has published detailed guidance in a document entitled "Procedures for Processing Requests to Redesignate Areas to Attainment", issued September 4, 1992, to Regional Air Directors. This document is hereafter referred to as "Redesignation Guidance". This Request for Redesignation and Maintenance Plan is based on the Redesignation Guidance, supplemented with additional guidance received from staff of the Attainment Planning & Maintenance Section of U.S. EPA Region V. The specific requirements for redesignation are listed below.

2.2 Ozone Monitoring

1) A demonstration that the NAAQS for ozone, as published in 40 CFR 50.15, has been attained. Ozone monitoring data must show that violations of the ambient standard are no longer occurring.

2) Ambient monitoring data quality assured in accordance with 40 CFR 58.15, have been recorded in the U.S. EPA Air Quality System (AQS) database, and made available for public view.

3) A showing that the three-year average of the fourth highest values, based on data from all monitoring sites in the area or its affected downwind environs, are below 75 parts per billion (ppb). This showing must rely on three (3) complete, consecutive calendar years of quality assured data.

4) A commitment that, once redesignated, the state will continue to operate an appropriate monitoring network to verify the maintenance of the attainment status.

2.3 Emission Inventory

1) A comprehensive emissions inventory of the precursors of ozone completed for the base year.

2) A projection of the emissions inventory to a year at least ten years following redesignation.

3) A demonstration that the projected level of emissions is sufficient to maintain the ozone standard.

4) A demonstration that improvement in air quality between the year violations occurred and attainment was achieved is based on permanent and enforceable emission reductions and not on temporary adverse economic conditions or unusually favorable meteorology.

5) Provisions for future annual updates of the inventory to enable tracking of the emission levels, including an annual emission statement from major sources.

2.4 Modeling Demonstration

While no modeling is required for redesignating ozone nonattainment areas, IDEM has incorporated photochemical modeling information as part of this document to further support its request for Lake and Porter counties, Indiana, to be redesignated to attainment.

2.5 Controls and Regulations

1) A U.S. EPA-approved SIP control strategy that includes Reasonably Available Control Technology (RACT) requirements for existing stationary sources covered by Control Technology Guidelines (CTG) and non-CTG RACT for all major sources.

2) Evidence that control measures required in past ozone SIP revisions have been fully implemented.

3) Acceptable provisions to provide for New Source Review (NSR).

4) Assurances that existing controls will remain in effect after redesignation, unless the state demonstrates through photochemical modeling that the standard can be maintained without one or more controls.

5) If appropriate, a commitment to adopt a requirement that all transportation plans conform with and are consistent with the SIP.

2.6 Corrective Actions for Potential Future Violations of the Standard

1) A commitment to submit a revised plan eight (8) years after redesignation.

2) A commitment to expeditiously enact and implement additional contingency control measures in response to exceeding specified predetermined levels (triggers) or in the event that future violations of the ambient standards occur.

3) A list of potential contingency measures that would be implemented in such an event.

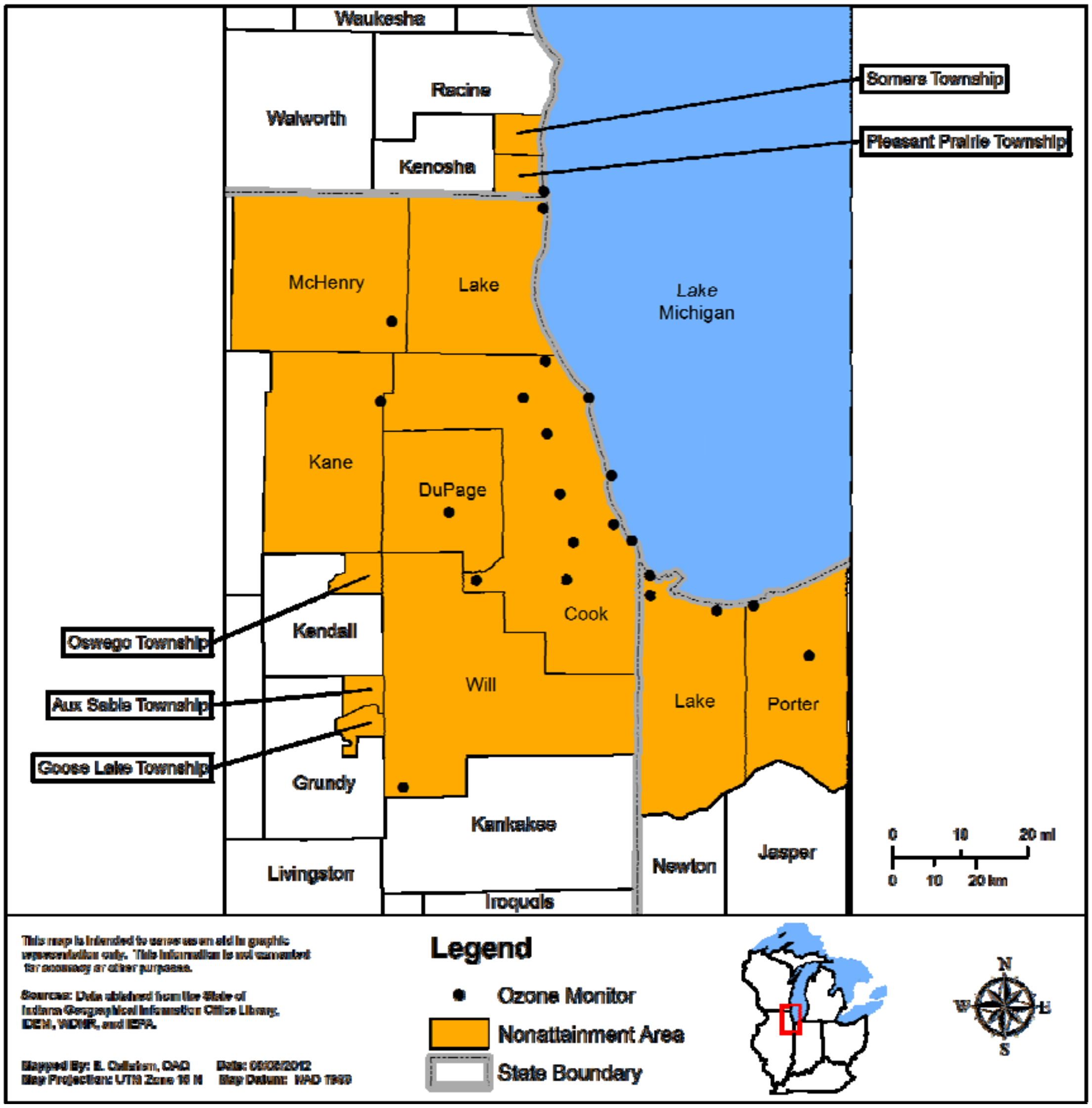
4) A list of NO_x and VOC sources potentially subject to future controls.

3.0 OZONE MONITORING

3.1 Ozone Monitoring Network

There are currently five monitors measuring ozone concentrations in Indiana's portion of the nonattainment area (three in Lake County and two in Porter County). IDEM's Office of Air Quality (OAQ) currently operates all of the monitors. A listing of the sites along with their annual fourth highest readings from 2006 through 2011 is shown in Table 3.1 and was retrieved from U.S. EPA's AQS database. The locations of the monitoring sites for this nonattainment area are shown on Figure 3.1. The States of Illinois and Wisconsin operate sixteen and one ozone-monitoring sites, respectively, within their portions of the nonattainment area.

Figure 3.1 Chicago Nonattainment Area



3.2 <u>Ambient Ozone Monitoring Data</u>

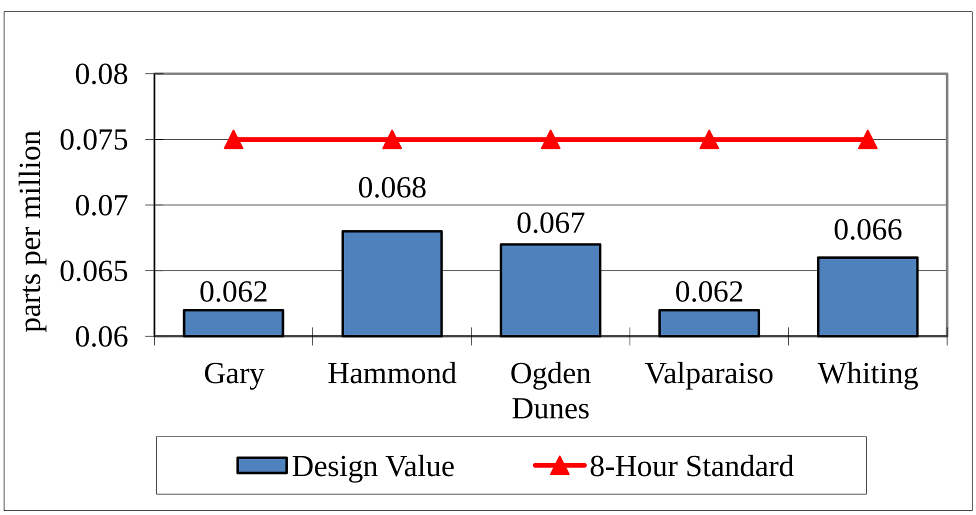
The following information is taken from U.S. EPA's "Guideline on Data Handling Conventions for the 8-Hour Ozone National Ambient Air Quality Standard (NAAQS)," EPA-454/R-98-017, December 1998. Three complete years of ozone monitoring data are required to demonstrate attainment at a monitoring site. The 8-hour primary and secondary ozone ambient air quality standards are met at an ambient air quality monitoring site when the three-year average of the annual fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to 0.076 ppm. When this occurs, the site is deemed to be in attainment. Three (3) significant digits must be carried in the computations. Values equal to or below 0.075 ppm meet the standard, values equal to or greater than 0.076 ppm exceed the standard. These data handling procedures are applied on an individual basis at each monitor in the area. An area complies with the 8-hour ozone standard if, and only if, every monitoring site in the area meets the NAAQS. An individual site's three-year average of the annual fourth highest daily maximum 8-hour average ozone concentration is also called the site's design value. The air quality design value for the area is the highest design value among all sites in the area.

Table 3.1 Monitoring Data for Lake and Porter Counties, Indiana (Annual 4th High and Design Values in ppm)

	Annual 4th High						Design Values			
Site/AQS#	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**06-08 avg**	**07-09 avg**	**08-10 avg**	**09-11 avg**
Gary 18-089-0022	0.073	0.085	0.062	0.058	0.064	0.066	0.073	0.068	0.061	0.062
Hammond 18-089-2008	0.075	0.077	0.068	0.065	0.069	0.072	0.073	0.070	0.067	0.068
Ogden Dunes 18-127-0024	0.070	0.084	0.069	0.067	0.067	0.068	0.074	0.073	0.067	0.067
Valparaiso 18-127-0026	0.071	0.080	0.061	0.064	0.061	0.063	0.070	0.068	0.062	0.062
Whiting 18-089-0028	0.081	0.088	0.062	0.062	0.069	0.069	0.077	0.070	0.064	0.066

Table 3.1 outlines the annual fourth high values and three-year design values for 2006 through 2011 for the five active monitoring sites in Indiana. The highest design value within Indiana's portion of the nonattainment area is 0.068 ppm for 2009 through 2011.

Graph 3.1 Design Values for Lake and Porter Counties, Indiana, 2009-2011



Graph 3.1 visually demonstrates the design values for Indiana's portion of the nonattainment area.

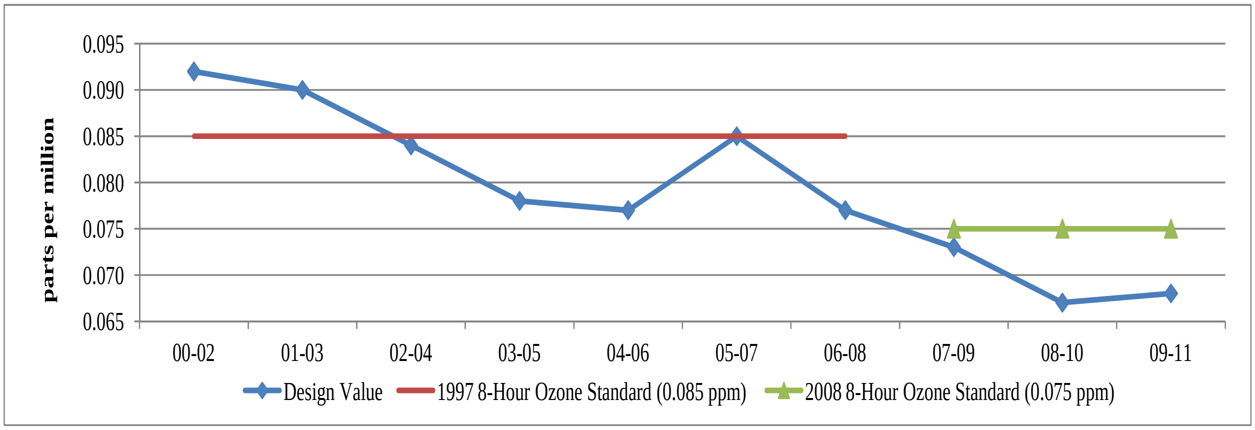
Table 3.2 Monitoring Data for Illinois Sites and Wisconsin Site (Annual 4th High and Design Values in ppm)

			Annual 4th High						Design Value			
AQS #	**County**	**Site**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**06-08 avg**	**07-09 avg**	**08-10 avg**	**09-11 avg**
17-031-0001	Cook	Alsip	0.078	0.085	0.066	0.069	0.073	0.071	0.076	0.073	0.069	0.071
17-031-0032	Cook	Chicago-Cheltenham	0.075	0.082	0.067	0.065	0.074	0.079	0.074	0.071	0.068	0.072
17-031-0064	Cook	Chicago-Ellis Ave	0.070	0.079	0.063	0.060	0.071	0.074	0.071	0.067	0.064	0.068
17-031-0072	Cook	Chicago-Ohio St	0.065	0.075	0.063	0.062	0.071	0.074	0.067	0.066	0.065	0.069
17-031-0076	Cook	Chicago-Lawndale	0.075	0.080	0.066	0.067	0.068	0.073	0.073	0.071	0.067	0.069
17-031-1003	Cook	Chicago-Hurlbut St	0.077	0.079	0.064	0.064	0.070	0.067	0.073	0.069	0.066	0.067
17-031-1601	Cook	Lemont	0.070	0.085	0.071	0.067	0.073	0.069	0.075	0.074	0.070	0.069
17-031-4002	Cook	Cicero	0.060	0.068	0.060	0.067	0.068	0.072	0.063	0.065	0.065	0.069
17-031-4007	Cook	Des Plaines	0.065	0.078	0.057	0.057	0.064	0.065	0.066	0.064	0.059	0.062
17-031-4201	Cook	Northbrook	0.068	0.076	0.065	0.069	0.072	0.076	0.069	0.070	0.068	0.072
17-031-7002	Cook	Evanston	0.072	0.080	0.058	0.064	0.067	0.078	0.070	0.067	0.063	0.069
17-043-6001	DuPage	Lisle	0.062	0.072	0.057	0.059	0.064	0.068	0.063	0.062	0.060	0.063
17-089-0005	Kane	Elgin	0.062	0.075	0.061	0.068	0.069	0.070	0.066	0.068	0.066	0.069
17-097-1007	Lake	Zion	0.068	0.080	0.069	0.075	0.078	0.076	0.072	0.075	0.074	0.076
17-111-0001	McHenry	Cary	0.057	0.074	0.065	0.066	0.065	0.071	0.065	0.068	0.065	0.067
17-197-1011	Will	Essex Rd	0.068	0.071	0.060	0.063	0.065	0.061	0.066	0.064	0.063	0.063
55-059-0019	Kenosha, WI	Chiwaukee	0.079	0.085	0.072	0.071	0.081	0.081	0.078	0.076	0.074	0.077

Table 3.2 outlines the annual fourth high values and three-year design values for 2006 through 2011 for the 16 Illinois and 1 Wisconsin active monitoring sites within their respective portions of the nonattainment area. The Zion, Lake County, Illinois monitor and the Chiwaukee, Kenosha County, Wisconsin monitor have design values that marginally exceeded the 2008 8-hour ozone standard (.075 ppm) for the 2009-2011 three year average. All of the Lake and Porter county, Indiana monitors have 2009 through 2011 design values well below the standard with the highest monitor (Hammond) at 0.068 ppm.

The design values for Lake and Porter counties, demonstrate that the NAAQS for ozone has been attained in Indiana's portion of the nonattainment area. Not only do all 2009 through 2011 design values in Lake and Porter counties, Indiana demonstrate attainment, but they all measure less than or equal to 0.068 ppm.

Graph 3.2 Design Values for Lake and Porter Counties, Indiana, 2000-2011 Compared to 1997 and 2008 8-hour Ozone Standard



Graph 3.2 shows the trend in design values for Lake and Porter counties, Indiana, over the past 12 years. A comprehensive list of the 4th highest daily maximum 8-hour average ozone concentrations over this period is included in Appendix A. The area's design values have recently trended downward as emissions have declined due to such programs as the Acid Rain program and cleaner automobiles and fuels both regionally and locally. U.S. EPA's rule to control nitrogen oxides from specific source categories (40 CFR Parts 51, 72, 75, and 96, published on October 17, 1998 and referred to as the "NO_x SIP Call") has significantly reduced emissions from large electric generating units (EGUs), industrial boilers, and cement kilns. Indiana's NO_x SIP Call Rule was approved on June 6, 2001 (326 Indiana Administrative Code (IAC) 10-3 and 326 IAC 10-4). The SIP submittals for NO_x reductions of other Midwest states were approved in this timeframe as well.

This document was developed prior to the close of the 2012 Indiana ozone season; however, the monitoring data collected for 2012 ozone season further supports this submittal. The 2010 through 2012 design values for all Lake and Porter county sites are below the 2008 8-hour ozone standard.

3.3 Quality Assurance

IDEM has quality-assured all data shown in Appendix A in accordance with 40 CFR 58.15 and the Indiana Quality Assurance Manual. IDEM has recorded the data in the AQS database making the data available to the public.

3.4 Continued Monitoring

Indiana commits to continue monitoring ozone levels at the sites indicated in Table 3.1 and Appendix A. IDEM will consult with U.S. EPA Region V staff prior to making changes to the existing monitoring network, should changes become necessary in the future. IDEM will continue to quality assure the monitoring data to meet the requirements of 40 CFR 58. Updates to the IDEM website[1] will provide real time availability of the data and knowledge of any exceedances. IDEM will enter all data into AQS in a timely manner in accordance with federal guidelines.

4.0 EMISSION INVENTORY

U.S. EPA's Redesignation Guidance requires the submittal of a comprehensive inventory of ozone precursor emissions (NO_x and VOC) representative of the year when the area achieves attainment of the ozone air quality standard. IDEM is using 2010 as the base year. Indiana must also demonstrate that the improvement in air quality between the year that violations occurred and the year that attainment was achieved is based on permanent and enforceable emission reductions. Other related requirements include a projection of the emission inventory to a year at least ten (10) years following redesignation, a demonstration that the projected level of emissions is sufficient to maintain the ozone standard, and a commitment to provide future updates of the inventory to enable tracking of emission levels during the ten (10) year maintenance period. The following subsections address each of these requirements.

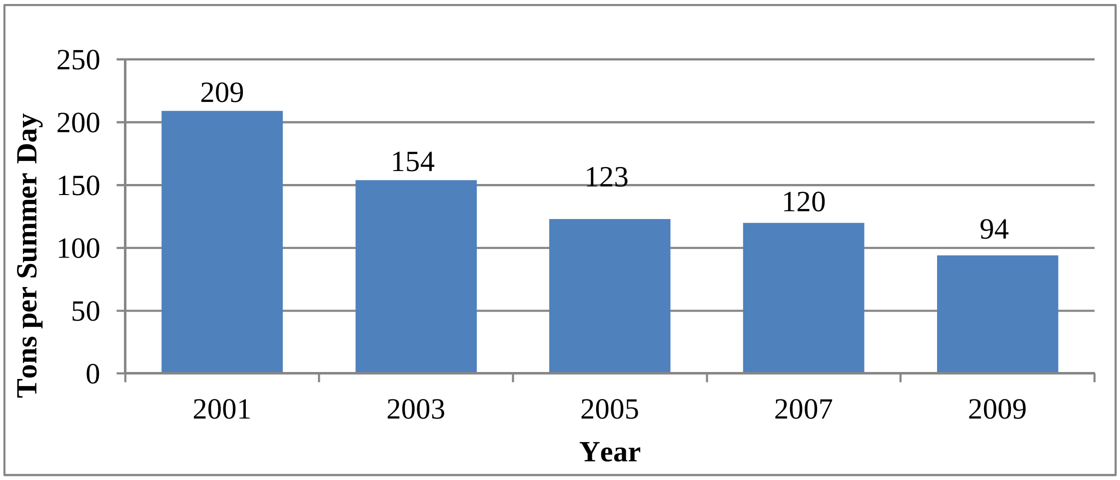
4.1 Emission Trends

4.1.1 Point Sources

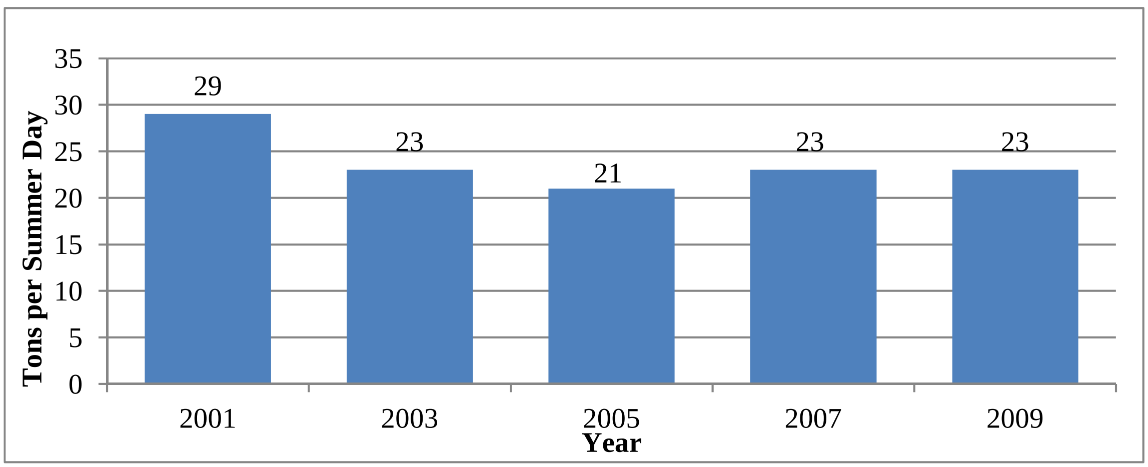
Graphs 4.1 and 4.2 show a downward trend in Lake and Porter Counties, Indiana point source emissions of NO_x and VOC, respectively, that generally correspond to the years of monitored values referenced in this report. The point source data are taken from Indiana's annual emissions reporting program.

[1] http://www.in.gov/idem/4670.htm

Graph 4.1 Lake and Porter Counties, Indiana NO_x Point Source Emissions, 2001-2009



Graph 4.2 Lake and Porter Counties, Indiana VOC Point Source Emissions, 2001-2009



4.1.2 Electric Generating Unit (EGU) Sources

Graph 4.3 shows the trend in regional NO_x emissions from EGUs in Northwest Indiana, including Jasper, Lake, LaPorte, and Porter counties. Graph 4.4 depicts the trends in statewide NO_x emissions from EGUs. While ozone and its precursors are also transported into this region from outside areas, this information does provide some indication of the impact that Indiana sources may have on the nonattainment area. The emissions are decreasing substantially in response to national programs affecting all EGUs, such as the Acid Rain program and the NO_x SIP Call. Other sectors of the inventory also impact ozone formation, but large regional sources, such as EGUs, have a substantial impact on the formation of ozone.

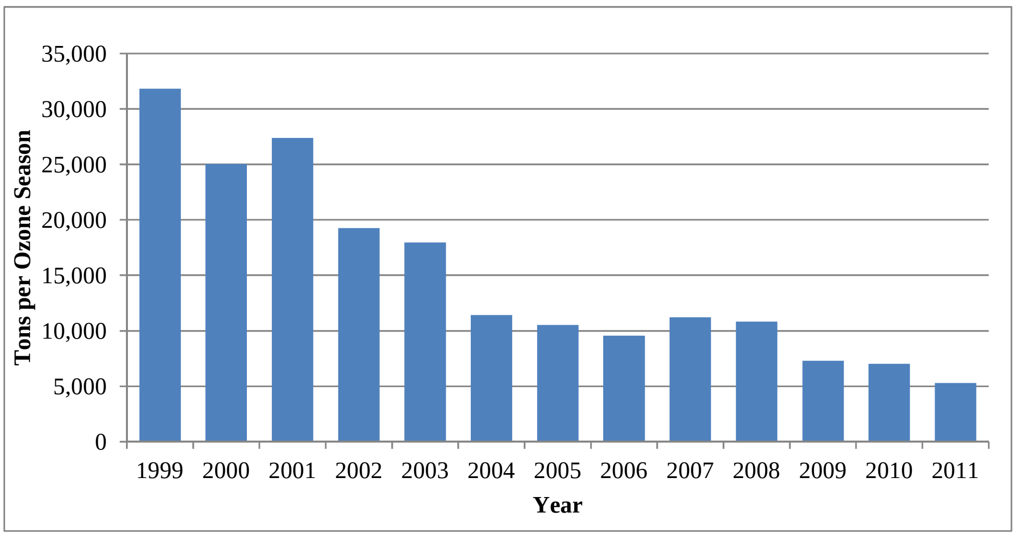
These data were taken from U.S. EPA's Clean Air Markets database[2]. Data are available sooner

[2] http://www.epa.gov/airmarkets/

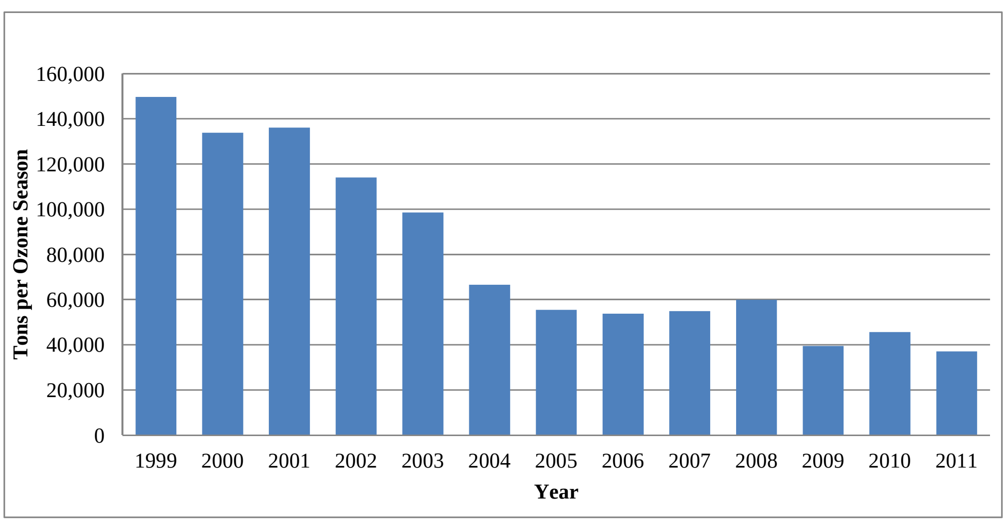
for these units than other point sources in the inventory because of the NO_x SIP Call budget and trading requirements. Information from 2003 is significant because some EGUs started operation of their NO_x SIP Call controls in order to generate Early Reduction Credits for their future year NO_x budgets. The first season of the NO_x SIP Call budget period began May 31, 2004.

As part of the NO_x SIP Call, the states were required to adopt into their rules a budget for all large EGUs. Indiana's budget is found in 326 IAC 10-4. The budget represents a statewide cap on NO_x emissions. Although each unit is allocated emissions based upon historic heat input, utilities can meet this budget by over-controlling certain units or purchasing credits from the market to account for overages at other units. To summarize, NO_x emissions have dramatically decreased over the years as represented on these graphs. These emissions, capped by the state rule, should remain at least this low through the maintenance period covered by this request.

Graph 4.3 NO_x Emissions - Northwest Indiana Electric Generating Units, 1999-2011



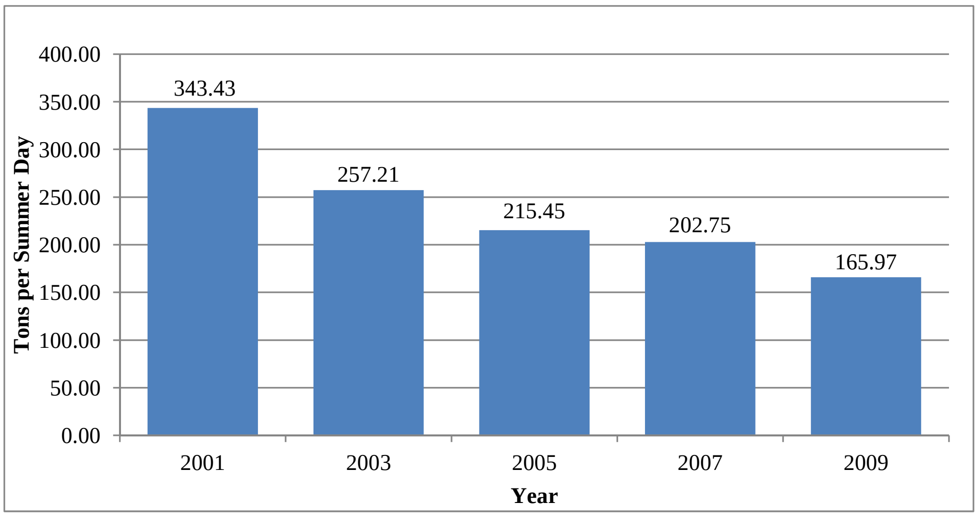
Graph 4.4 Statewide NO_x Emissions from Electric Generating Units, 1999-2011



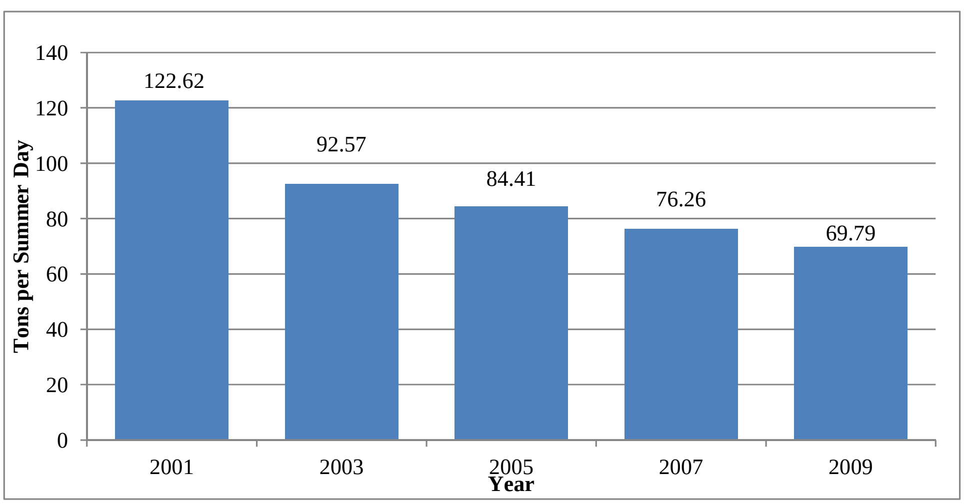
4.1.3 All Anthropogenic Sources

Periodic inventories, which include emissions from all sectors (mobile, area[3], non-road, and point sources) were prepared for 2001, 2003, 2005, 2007, and 2009. Graphs 4.5, 4.6, 4.7, and 4.8 show the trends for the total emissions for all anthropogenic source categories (within Lake and Porter counties), which also roughly follow the years of monitored air quality trends discussed in Section 3.0. Graphs and data tables of emissions from each source category are available in Appendix B.

Graph 4.5 NO_x Emissions Trends - Lake and Porter Counties, Indiana, All Sources, 2001-2009

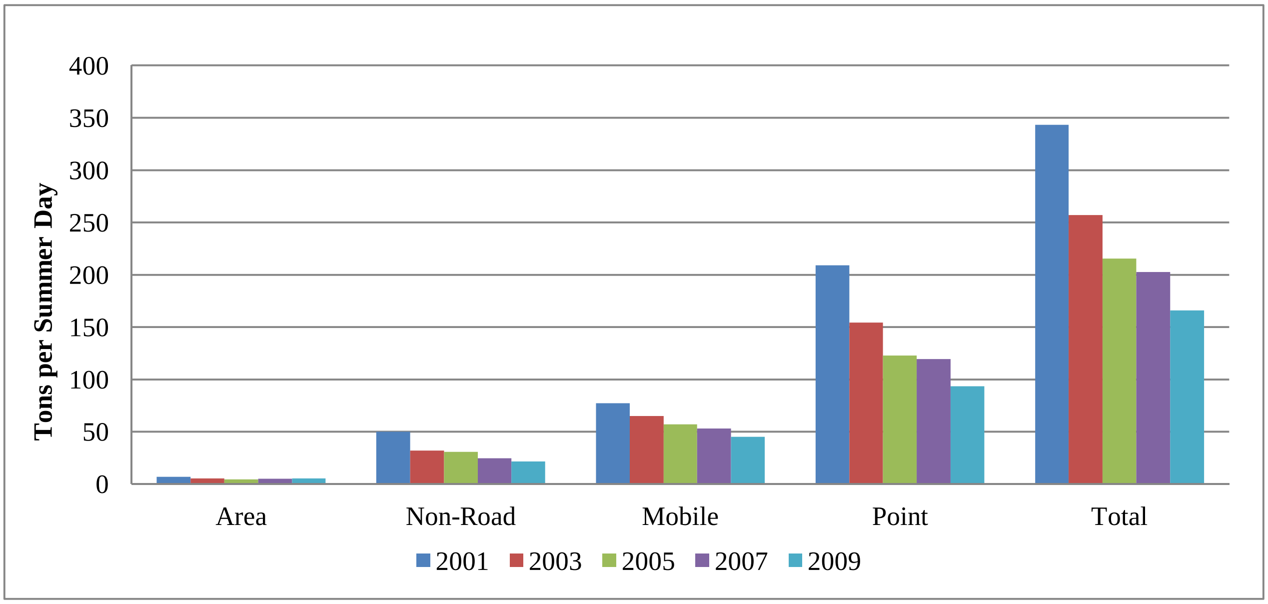


Graph 4.6 VOC Emissions Trends - Lake and Porter Counties, Indiana, All Sources, 2001-2009

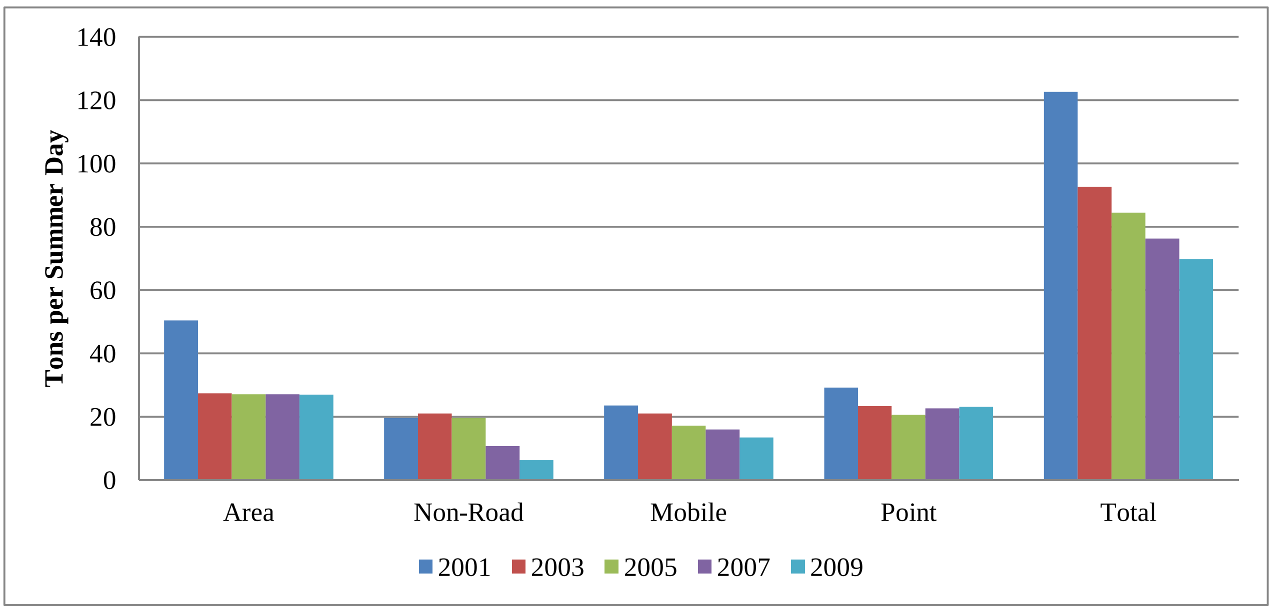


[3] Area Source estimates for 2006 use the 2005 inventory.

Graph 4.7 NOx Emission Trends by Category and Year, Lake and Porter Counties, Indiana, 2001-2009



Graph 4.8 VOC Emission Trends by Category and Year, Lake and Porter Counties, Indiana, 2001-2009



4.2 <u>Base year Inventory</u>

IDEM prepared a comprehensive inventory for Lake and Porter counties, including area, mobile, non-road, and point sources for precursors of ozone (NO_x and VOCs) for the base year 2010. Factors considered for development of the base year inventory include:

1. Area sources were grown from the Indiana 2005 periodic inventory submitted to U.S. EPA.
2. Mobile source emissions were calculated from emission factors produced by the Motor Vehicle Emission Simulator (MOVES) and data extracted from the region's travel-demand model. Several adjustments were made to the travel demand model and calculation methodology since 1996. As a result, since the 1996, 1999, and 2002 emission inventories were prepared with a slightly different methodology, they do not provide for a true comparison with the 2004 through 2020 estimates. The fluctuations referenced in the data, particularly 1996 through 2002 NO_x emissions, are due to changes in the calculation methodology, not necessarily actual mobile source emissions.
3. Point source information was compiled from IDEM's 2006 annual emissions statement database and the 2007 U.S. EPA Air Markets acid rain database[4].
4. Biogenic emissions are not included in these summaries.
5. Non-road emissions for 2010 were grown from the 2005 National Emissions Inventory (NEI).

To address concerns about the accuracy of some of the categories in U.S. EPA's non-road emissions model, the Lake Michigan Air Directors' Consortium (LADCO), contracted with two companies to review the base data and make recommendations. One of the contractors also estimated emissions for two categories not included in U.S. EPA's non-road model and reviewed model inputs for another. Emissions were estimated for commercial marine vessels and railroads. Recreational motorboat population and spatial surrogates (used to assign emissions to each county) were significantly updated. The populations for the construction equipment category were reviewed and updated based upon surveys completed in the Midwest and the temporal allocation for agricultural sources was also updated by the other contractor. A new non-road estimation model was provided by U.S. EPA for the 2002 analysis. The 1996 and 1999 non-road emission estimates were generated by a previous U.S. EPA model, and cannot provide for a true comparison. The fluctuations referenced in the data could be due to changes in the model and methodology, and not necessarily reflect changes in emissions. Appendix B contains data tables and graphs of all these emissions.

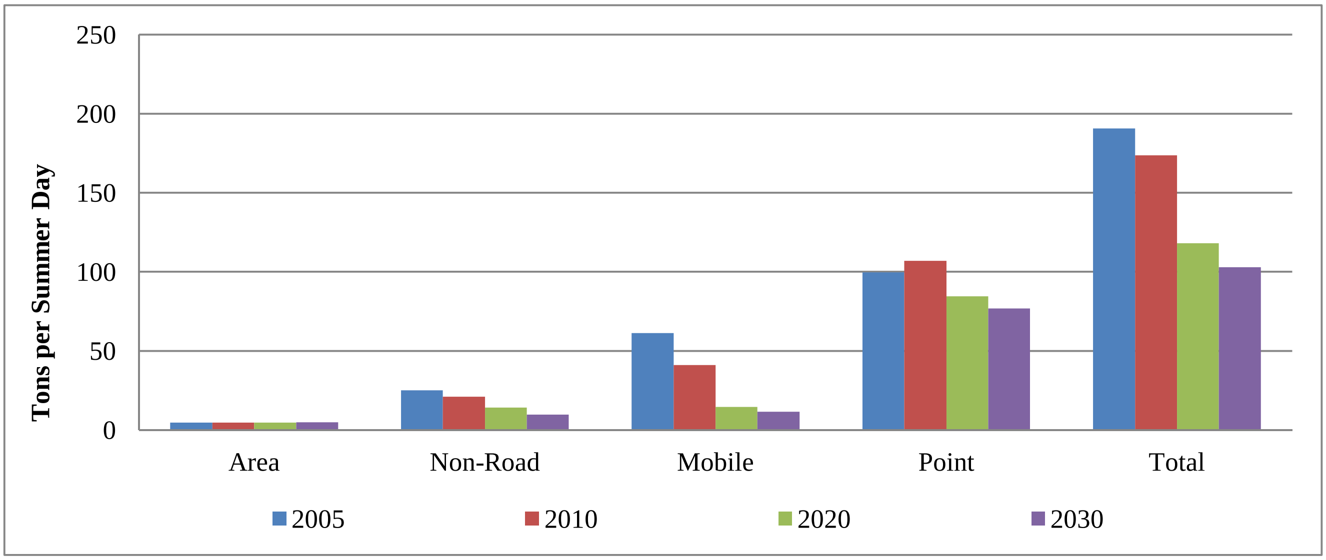
4.3 Emission Projections

In consultation with the U.S. EPA and other stakeholders, IDEM selected the year 2030 as the maintenance year for this redesignation request. This document contains projected emissions inventories for 2020 and 2030[5]. Emission projections were prepared for Lake and Porter counties. IDEM, with assistance from LADCO, prepared emission projections for 2020 and 2030 for the Indiana portion of the nonattainment area. The detailed inventory information for Lake and Porter counties for 2020 and 2030 is in Appendix B. Emission trends are an important gauge for continued compliance with the ozone standard. Therefore, IDEM performed an initial comparison of the inventories for the base year (2010), interim year (2020), and maintenance year (2030) for Lake and Porter counties. Graphs 4.9 and 4.10 visually compare the 2010 (base year) estimated NO_x and VOC emissions with the 2020 and 2030 projected NO_x and VOC emissions for Lake and Porter counties. Mobile source emission inventories are described in

[4] http://camddataandmaps.epa.gov/gdm/
[5] Estimates for 2030 base year are grown from the emission inventories stipulated in Section 4.2.

Section 5.0. In addition to LADCO's estimates, point source emissions were projected based on the statewide EGU NO_x budgets from the Indiana NO_x rule.

Graph 4.9 Comparisons of 2005 and 2010 (Estimated) and 2020 and 2030 (Projected) NO_x Emissions for Lake and Porter Counties, Indiana



Graph 4.10 Comparison of 2005 and 2010 (Estimated) and 2020 and 2030 (Projected) VOC Emissions for Lake and Porter Counties, Indiana

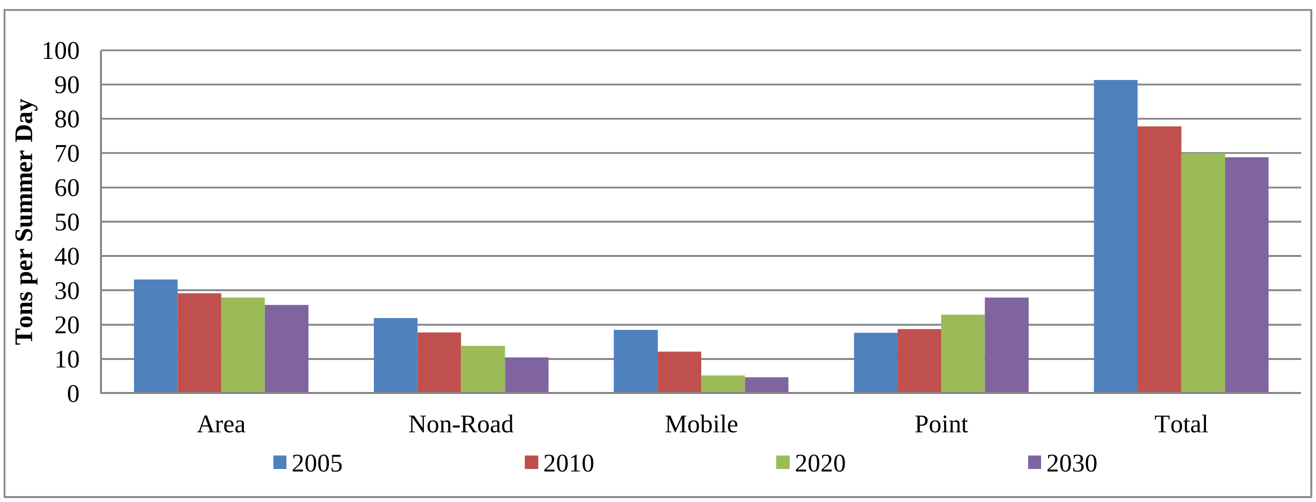


Table 4.1 Comparison of 2010 Estimated and 2030 Projected Emission Estimates in Lake and Porter Counties, Indiana (tons per summer day)

Emission	2010	2030	Change	% change
NO_x	173.68	102.95	-70.73	-40.70
VOC	77.78	68.81	-8.97	-11.53

Table 4.1 shows the downward trend of NO_x and VOC emissions from 2010 to 2030. NO_x emissions within Lake and Porter counties are projected to decline by over 40% between 2010 and 2030. VOC emissions within Lake and Porter counties are projected to decline by more than 11% between 2010 and 2030. Emission reduction benefits from U.S. EPA rules covering the NO_x SIP Call, Clean Air Interstate Rule (CAIR), Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements[6], Highway Heavy-Duty Engine Rule[7], and Non-Road Diesel Engine Rule[8] are factored into the changes. Further, due to implementation of the NO_x SIP Call across the eastern United States, NO_x and ozone levels entering this area will decrease.

4.4 Demonstration of Maintenance

Ambient air quality data from all monitoring sites indicate that air quality in Lake and Porter counties met the NAAQS for ozone in 2010. U.S. EPA's Redesignation Guidance (pg. 9) states, "A state may generally demonstrate maintenance of the NAAQS by either showing that future emissions of a pollutant or its precursors will not exceed the level of the attainment inventory, or by modeling to show that the future mix of sources and emissions rates will not cause a violation of the NAAQS." Emission projections outlined in Section 4.0 of this document clearly illustrate that NO_x and VOC emissions in Lake and Porter counties will continue to decline between 2010 (base year) and 2030. Section 7.0 further discusses the implications of these emission trends and provides an analysis to support these conclusions. Therefore, air quality should meet the NAAQS ozone standard through the projected years of 2020 and 2030.

In Indiana, major point sources in all counties are required to submit air emissions information once every three (3) years or annually if the NO_x potential to emit is greater than 2,500 tons per year or the VOC potential to emit is greater than 250 tons per year, in accordance with the Emission Statement Rule, 326 IAC 2-6. IDEM prepares a new periodic inventory for all ozone precursor emission sectors every three (3) years. These ozone precursor inventories will be prepared for 2008, 2011, and 2014, as necessary, to comply with the inventory reporting requirements established in the CAA. Emissions information will be compared to the 2010 base year and the 2030 projected maintenance year inventories to assess emission trends, as necessary, to assure continued compliance with the ozone standard.

4.5 Permanent and Enforceable Emission Reductions

Permanent and enforceable reductions of NO_x and VOCs have resulted in attainment of the 8-hour ozone standard. Some of these reductions were due to the application of RACT rules and some were due to the application of tighter federal standards on new vehicles. Also, Title IV of the CAA and the NO_x SIP Call required the reduction of NO_x from utility sources. Section 6.0 identifies the emission control measures specific to Lake and Porter counties, as well as the implementation status of each measure.

[6] http://www.epa.gov/fedrgstr/EPA-AIR/2000/February/Day-10/a19a.htm
[7] http://www.epa.gov/fedrgstr/EPA-AIR/1997/October/Day-21/a27494.htm
[8] http://www.epa.gov/fedrgstr/EPA-AIR/1998/October/Day-23/a24836.htm

4.6 Provisions for Future Updates

As required by Section 175A(b) of the CAA, Indiana commits to submit to the Administrator, eight (8) years after redesignation, an additional revision of the SIP. The revision will contain Indiana's plan for maintaining the national primary ozone air quality standard for ten (10) years beyond the first ten (10) year period after redesignation, which will be 2040 in this case.

5.0 TRANSPORTATION CONFORMITY BUDGETS

U.S. EPA requirements outlined in 40 CFR 93.118(e)(4) stipulate that mobile source emissions budgets for NO_x and VOC be established as part of a SIP. The mobile source emissions budgets are necessary to demonstrate conformance of transportation plans and improvement programs with the SIP. A general summary of the Motor Vehicle Emission Simulator (MOVES) methodology used in this area can be found in Appendix C. In addition, MOVES input and output files are being provided electronically with this submittal.

5.1 On-Road Emission Estimations

The Northwestern Indiana Regional Planning Commission (NIRPC) is the Metropolitan Planning Organization (MPO) for the area that includes Lake, Porter, and LaPorte counties. This organization maintains a travel demand forecast model that is used to simulate the traffic in the area and is used to predict what that traffic will be like in future years given growth expectations. The model is used mostly to identify where travel capacity will be needed and to determine the infrastructure requirements necessary to meet that need. It is also used to support the calculation of mobile source emissions. The travel demand forecast model is used to predict the total daily Vehicle Miles Traveled (VMT) and a U.S. EPA software program called MOVES is used to calculate the emissions per mile. The product of these two outputs, once combined, is the total amount of pollution emitted by on-road vehicles for the particular analyzed area.

5.2 Overview

Broadly described, MOVES is used to determine “emission factors,” which are the average emissions per mile (grams/mile) for the ozone precursors: NO_x and VOC. There are numerous variables that can affect the emission factors. The vehicle fleet (vehicles on the road) age and the vehicle types have a major effect on the emission factors. The facility type the vehicles are traveling on (MOVES facility types are Freeway and Arterial and distinguish between urban and rural areas) and the vehicle speeds also affect the emission factor values. Meteorological factors, such as hourly air temperature and humidity, and the area’s Vehicle Inspection/Maintenance program affect the emission factors as well. Once emission factors are determined, the emission factor(s) is multiplied by the VMT to ultimately determine the quantity of vehicle emissions. VMT data is generated by the region’s travel demand model.

5.3 Best Available Data

Depending on the details of the travel demand model, much of MOVES input data for emission factor computation can be found in the model, but some must come from other sources. The

Indiana Department of Transportation (INDOT) has produced a tool for processing the output of the travel demand model for use in MOVES. The tool uses a composite vehicle profile and daily traffic values, applies Highway Performance Monitoring System adjustment factors, and produces the required hourly VMT and speed profiles.

5.3.1 Vehicle Age Distribution

MOVES has 13 different vehicle-type categories (known as source types) differentiated by size and use. The first 4 are generally light vehicles: motorcycles, cars, passenger trucks (pick-up trucks, sports utility vehicles, vans), and light commercial vehicles. The others are different sized trucks and buses. The MOVES vehicle age distribution describes what fraction of each of the 13 source types is one year old, two years old, etc., up to the 30 and older category. MOVES has a default age profile of each source type taken from national surveys.

Due to its geographic proximity to Chicago, Northwestern Indiana is a through-traffic area for an enormous amount of freight transportation. National default age profiles make sense to use for freight vehicles, but for cars, passenger trucks, and light commercial trucks, local data exists and was used for the age distribution for these three MOVES source types.

Vehicle Identification Numbers (VIN) provided by the Indiana Bureau of Motor Vehicles (BMV) for the year 2009 for Lake and Porter counties were decoded and split into the car, passenger truck, and light commercial truck MOVES source types. These age distributions are not expected to change much over time, so they do not change for the different analysis years.

5.3.2 Speeds

Speeds are calculated by the post processor developed by INDOT for the purposes of applying the MOVES emission rates to the NIRPC travel model data. The post processor determines hourly volumes for each link by applying diurnal distribution factors to the model volumes produced by the NIRPC travel demand model. It then calculates a congested travel time for each hour of the day using the Bureau of Public Roads (BPR) equation shown below:

$$T_1 = T_0 \left(1 + \alpha \left(\frac{v}{c}\right)^{\beta}\right)$$

T_0 = free flow travel time in minutes
v = hourly link volume
c = hourly link capacity
α = coefficient; typical value is 0.15, but can vary depending on the travel demand model
β = exponent; typical value is 4, but can vary depending on the travel demand model
T_1 = congested travel time in minutes

Once the congested travel time has been calculated, a travel speed for each hour of the day is determined by following equation:

$$Spd = \frac{Len}{T_1} \cdot 60$$

Len = link length in miles
Spd = congested speed in miles per hour

The congested speeds are then referenced against the 16 MOVES speed bins. The speed bins are groupings of speeds centered on an average speed. The first bin is 0 – 2.5 miles per hour. The final bin is > 72.5 miles per hour. The other 14 bins range between these two in five miles per hour intervals. Rather than using the emission rate associated with the average speed of the speed bin, the post processor interpolates the emission rates between the two nearest speed bins as recommended in the MOVES 2010 User Guide. This is intended to provide more stability to emission estimates calculated using emission rates developed by MOVES.

5.3.3 Socioeconomic data

Travel demand models contain hundreds of Travel Analysis Zones (TAZs) that have zone specific information regarding population, employment, destinations, and expected growth, among other things. These data are commonly referred to as the "socioeconomic data". These data are updated most accurately when new census data comes out. This model was updated in 2003 based on 2000 census data. The traffic analyses of future years are then based on growth projections. These growth projections are then put into the TAZs where the growth (or decline) is expected to occur.

5.4 <u>Analysis Years</u>

The travel demand model also contains the road network, thus the information is time specific. NIRPC has modeled the years 2010, 2020, and 2030. Each future analysis year model contains the road network NIRPC staff expects to exist at the beginning of that year with the concomitant expected socioeconomic growth projections.

5.5 <u>Emission Estimations</u>

Table 5.1 outlines the on-road emission estimations for the Lake and Porter ozone nonattainment area for the years 2010, 2020, and 2030. The 2010, 2020, and 2030 emission estimates are based on the actual travel demand model network runs generating estimated emissions to exist for the years 2010, 2020, and 2030 under the Connections 2040 Comprehensive Regional Plan.

Table 5.1 Emission Estimations for On-Road Mobile Sources
Lake and Porter Ozone Nonattainment Area

Lake and Porter	2010	2020	2030
NO_x (tons/day)	41.09	14.52	11.56
VOC (tons/day)	12.16	5.21	4.66

5.6 <u>Motor Vehicle Emission Budget</u>

Table 5.2 contains the motor vehicle emissions budget for the Lake and Porter ozone nonattainment area for the years 2020 and 2030.

Table 5.2 Motor Vehicle Emission Budgets
Lake and Porter Ozone Nonattainment Area

Lake and Porter	2020	2030
NO_x (tons/day)	16.69	13.29
VOC (tons/day)	5.99	5.36

This budget includes the projected emission estimates for 2020 and 2030 with a 15% margin of safety. Since assumptions change over time, IDEM determined a 15% margin of safety to be reasonable to account for such changes within the conformity process. The emission estimates derive from the NIRPC travel demand model and MOVES as described above under the NIRPC 2040 Comprehensive Regional Plan. The emissions calculation methodology, latest planning assumptions and margin of safety were determined through the interagency consultation process described in the Transportation Conformity Memorandum of Understanding (MOU) for NIRPC.

6.0 CONTROL MEASURES AND REGULATIONS

This section provides specific information on the control measures implemented in Lake and Porter counties, Indiana, including CAA requirements and additional state or local measures implemented beyond CAA requirements.

6.1 Reasonably Available Control Technology (RACT) and other State Volatile Organic Compound (VOC) Rules

As required by Section 172 of the CAA, Indiana has promulgated several rules requiring RACT for emissions of VOCs since the mid 1990's. In addition, other statewide rules for controlling VOCs have also been promulgated. The Indiana VOC rules are found in 326 IAC 8. The following is a listing of statewide rules that assist with the reduction of VOCs in the state:

326 IAC 8-1-6	Best Available Control Technology for Non-Specific Sources
326 IAC 8-2	Surface Coating Emission Limitations
326 IAC 8-3	Organic Solvent Degreasing Operations
326 IAC 8-4	Petroleum Sources
326 IAC 8-5	Miscellaneous Operation
326 IAC 8-6	Organic Solvent Emission Limitations
326 IAC 8-10	Automobile Refinishing
326 IAC 8-14	Architectural and Industrial Maintenance Coatings
326 IAC 8-15	Standards for Consumer and Commercial Products

Additional rules specifically applicable to Lake and Porter counties, Indiana, are summarized in Section 6.2.

6.2 Implementation of Past State Implementation Plans (SIP) Revisions

Lake and Porter counties, Indiana, were previously nonattainment under the 1-hour ozone standard. The area met all of its 1-hour SIP obligations, including an U.S. EPA-approved attainment demonstration. All of the control measures outlined within the Post-1999 (2002, 2005, and 2007) Rate of Progress (ROP) plans have been fully implemented. The area was also designated nonattainment for ozone under the 1997 8-hour standard in 2004. Since that time, the area has attained the 1997 8-hour ozone standard and was redesignated to attainment on May 11, 2010. Therefore, no further SIP revisions are required under the 1997 8-hour ozone standard.

Listed below are measures, implemented in association with previous SIP submittals, which have resulted in permanent and enforceable emission reductions in Lake and Porter counties, Indiana.

6.2.1 Fifteen Percent (15%) Rate of Progress (ROP) Plan

Indiana's final 15% ROP plan was approved by U.S. EPA on July 18, 1997. The measures include a mix of point, area, and mobile source control measures:

1. Enhanced Vehicle Inspection and Maintenance Program

   Regulatory Basis: 326 IAC 13-1.1
   Implementation Status: Control remains in place.

2. Stage II Vapor Recovery

   Regulatory Basis: 326 IAC 8-4-6
   Implementation Status: Control remains in place.

3. Reformulated Gasoline Program

   Regulatory Basis: CAA-Federal Control Program
   Implementation Status: Control remains in place.

4. National Volatile Organic Compound Emission Standards for Architectural Coatings Rule

   Regulatory Basis: 326 IAC 8-14
   Implementation Status: Control remains in place.

5. Residential Opening Burning Ban

   Regulatory Basis: 326 IAC 4-1
   Implementation Status: Control remains in place for all incorporated areas.

6. Non-CTG RACT

   Regulatory Basis: 326 IAC 8-7
   Implementation Status: Control remains in place.

6.2.2 1999 Nine Percent (9%) ROP

Indiana's final 1999 9% ROP plan was approved by U.S. EPA on January 26, 2000. The reductions included a variety of state and federal measures that affected various industrial and area sources, such as steel mills, small engines (e.g. lawnmowers), gasoline reformulation, and personal solvent usage. The measures included the following:

1. Emission Limits for Benzene from Coke Oven By-Product Recovery Plants

   Regulatory Basis: 326 IAC 14-9
   Implementation Status: Control remains in place.

2. National Emission Standards for Hazardous Air Pollutants for Coke Oven Batteries

   Regulatory Basis: 326 IAC 20-3-1
   Implementation Status: Control remains in place.

3. Federal Phase I Reformulated Gasoline on Small Non-Road Engines

   Regulatory Basis: Clean Air Act Amendments of 1990; Section 211 of the Clean Air Act
   Implementation Status: Control remains in place.

4. Federal Controls on Small Spark-Ignited Engines (July 3, 1995, 60 FR 34581)

   Regulatory Basis: Court-ordered standards for small spark-ignited engines; 40 CFR Part 90
   Implementation Status: Control remains in place.

5. Commercial/Consumer Solvent Reformulation Rule

   Regulatory Basis: 326 IAC 8-15
   Implementation Status: Control remains in place.

6. Volatile Organic Liquid Storage RACT

   Regulatory Basis: 326 IAC 8-9
   Implementation Status: Control remains in place.

6.2.3 2002 Nine Percent (9%) ROP

Indiana's 2002 9% ROP plan consists of several federal regulations and some measures specific to Indiana, including state rules and negotiated agreements. The reductions included measures that control VOC emissions from steel mill sinter plants, non-road mobile sources, and municipal solid waste landfills. The measures included the following:

1. Additional Reductions from Federal Controls on Small Spark-Ignited Engines (64 FR 15207, March 30, 1999)

   Regulatory Basis: Court-ordered standards for small spark-ignited engines; 40 CFR Part 90
   Implementation Status: Control remains in place.

2. Sinter Plant Rule

   Regulatory Basis: 326 IAC 8-13
   Implementation Status: Control remains in place.

3. Municipal Solid Waste Landfill

   Regulatory Basis: 326 IAC 8-8
   Implementation Status: Control remains in place.

6.2.4 2005 Nine Percent (9%) ROP

Since there were surplus emission reductions from previous plans, no emission reductions were necessary to meet the additional 9% reduction in VOC emissions for the 2005 ROP. However, the plan includes a federal regulation that further reduces the amount of VOCs emitted by non-road small engine sources. The measure includes the following:

1. Further Reductions from Federal Controls on Small Spark-Ignited Engines (65 FR 24268, April 25, 2000)

   Regulatory Basis: Federal Standards for small spark-ignited engines; 40 CFR Part 90
   Implementation Status: Control remains in place.

6.2.5 2007 Six Percent (6%) ROP

Indiana's 2007 6% ROP plan consists of several federal regulations and some measures specific to Indiana, including state rules and negotiated agreements. The reductions included measures that control VOC emissions from petroleum refineries, non-road mobile sources, volatile organic liquid storage operations, cold cleaning degreasing operations, and the reformulation of commercial and consumer products. The measures included the following:

1. Further Reductions from Federal Controls on Small Spark-Ignited Engines (69 FR 1823, January 12, 2004)

   Regulatory Basis: Court-ordered standards for small spark-ignited engines; 40 CFR Part 90
   Implementation Status: Control remains in place.

2. Commercial/Consumer Solvent Reformulation Rule

Regulatory Basis: 326 IAC 8-15
Implementation Status: Control remains in place.

3. Petroleum Refineries National Emission Standards for Hazardous Air Pollutants (NESHAP)

   Regulatory Basis: 326 IAC 20-16
   Implementation Status: Control remains in place.

4. United States Steel-Gary Works Agreed Order with IDEM (March 22, 1996)

   Control Method: Halts the use of untreated water for quenching (326 IAC 6.8-9-3(7))
   Implementation Status: Control remains in place.

5. Volatile Organic Liquid Storage RACT

   Regulatory Basis: 326 IAC 8-9
   Implementation Status: Control remains in place.

6. Cold Cleaner Degreasers

   Regulatory Basis: 326 IAC 8-3-8
   Implementation Status: Control remains in place.

6.3 Nitrogen Oxides (NO_x) Rule

On October 27, 1998, U.S. EPA established the NO_x SIP Call, which required twenty-two states to adopt rules that would result in significant emission reductions from large EGUs, industrial boilers, and cement kilns in the eastern United States. The Indiana rule was adopted in 2001 at 326 IAC 10-1. Beginning in 2004, this rule accounted for a reduction of approximately 31% of all NO_x emissions statewide compared to previous uncontrolled years.

Twenty-one other states also adopted these rules. The result is that significant reductions have occurred within Indiana and regionally due to the number of affected units within the region. The historical trend charts show that air quality has improved due to the decreased emissions resulting from this program and are found in Appendix B.

On April 21, 2004, U.S. EPA published Phase II of the NO_x SIP Call that established a budget for large (emissions of greater than one ton per day) stationary internal combustion engines. In Indiana, the rule decreased NO_x emissions statewide from natural gas compressor stations by 4,263 tons during May through September. The Indiana Phase II NO_x SIP Call rule became effective in 2006, and implementation began in 2007 (326 IAC 10-4).

6.4 Measures Beyond Clean Air Act (CAA) Requirements

Reductions in ozone precursor emissions have occurred, or are anticipated to occur, as a result of state and federal control programs. These additional control measures include:

6.4.1 Tier II Emission Standards for Vehicles and Gasoline Sulfur Standards[9]

In February 2000, U.S. EPA finalized a federal rule to significantly reduce emissions from cars and light duty trucks, including SUVs. This rule required automakers to produce cleaner cars, and refineries to make cleaner, lower sulfur gasoline. This rule was phased in between 2004 and 2009 and resulted in a 77% decrease in NO_x emissions from passenger cars, an 86% decrease from smaller SUVs, light duty trucks, and minivans, and a 65% decrease from larger SUVs, vans, and heavier duty trucks. This rule also resulted in a 12% decrease in VOC emissions from passenger cars, an 18% decrease from smaller SUVs, light duty trucks, and minivans, and a 15% decrease from larger SUVs, vans, and heavier duty trucks.

6.4.2 Heavy-Duty Diesel Engines[10]

In July 2000, U.S. EPA issued a final rule for Highway Heavy-Duty Engines, a program that includes low-sulfur diesel fuel standards. This rule applies to heavy-duty gasoline and diesel trucks and buses. This rule was phased in from 2004 through 2007 and resulted in a 40% decrease in NO_x emissions from diesel trucks and buses.

6.4.3 Clean Air Non-road Diesel Rule[11]

In May 2004, U.S. EPA issued the Clean Air Non-road Diesel Rule. This rule applies to diesel engines used in industries such as construction, agriculture, and mining. It also contains a cleaner fuel standard similar to the highway diesel program. The engine standards for non-road engines took effect in 2008 and resulted in a 90% decrease in SO_2 emissions from non-road diesel engines. Sulfur levels were also reduced in non-road diesel fuel by 99.5% from approximately 3,000 ppm to 15 ppm.

6.4.4 Non-road Spark-Ignition Engines and Recreational Engine Standards

This standard, effective in July 2003, regulates NO_x, VOCs, and carbon monoxide (CO) for groups of previously unregulated non-road engines. This standard applies to all new engines sold in the United States and imported after the standards went into effect. The standard applies to large spark-ignition engines (forklifts and airport ground service equipment), recreational vehicles (off-highway motorcycles and all terrain vehicles), and recreational marine diesel engines. When all of the non-road spark-ignition engines and recreational engine standards are fully implemented, an overall 80% reduction in NO_x, 72% reduction in VOC, and 56% reduction in CO emissions are expected by 2020.

6.4.5 Reciprocating Internal Combustion Engine Standards[12]

This new standard, effective in May 2010, regulates emissions of air toxics from existing diesel-powered stationary reciprocating internal combustion engines that meet specific site rating, age,

[9] http://www.epa.gov/fedrgstr/EPA-AIR/2000/February/Day-10/a19a.htm
[10] http://www.epa.gov/fedrgstr/EPA-AIR/1997/October/Day-21/a27494.htm
[11] http://www.epa.gov/fedrgstr/EPA-AIR/1998/October/Day-23/a24836.htm
[12] http://www.epa.gov/ttn/atw/rice/fr03mr10.pdf

and size criteria. These engines are typically used at industrial facilities (e.g. power, chemical, and manufacturing plants) to generate electricity for compressors and pumps and to produce electricity to pump water for flood and fire control during emergencies.

The standard applies to stationary diesel engines: (1) used at area sources of air toxics and constructed or reconstructed before June 12, 2006; (2) used at major sources of air toxics, having a site rating of less than or equal to 500 horsepower, and constructed or reconstructed before June 12, 2006; and, (3) used at major sources of air toxics for non-emergency purposes, having a site rating of greater than 500 horsepower, and constructed or reconstructed before December 19, 2002.

Operators of existing engines will be required to: (1) install emissions control equipment that would limit air toxics up to 70% for stationary non-emergency engines with a site rating greater than 300 horsepower; (2) perform emission tests to demonstrate engine performance and compliance with rule requirements; and, (3) burn ultra-low sulfur fuel in stationary non-emergency engines with a site rating greater than 300 horsepower.

When all of the reciprocating internal combustion engine standards are fully implemented in 2013, U.S. EPA estimates that emissions from these engines will reduce air toxics by approximately 1,000 tons per year (tpy), fine particles ($PM_{2.5}$) by 2,800 tpy, CO by 14,000 tpy, and VOCs by 27,000 tpy.

6.4.6 Category 3 Marine Diesel Engine Standards[13]

This new standard, effective in June 2010, promulgates more stringent exhaust emission standards for new large marine diesel engines with per-cylinder displacement at or above 30 liters (commonly referred to as Category 3 compression-ignition marine engines) as part of a coordinated strategy to address emissions from all ships that affect U.S. air quality. These emission standards are equivalent to those adopted in the amendments to Annex VI to the International Convention for the Prevention of Pollution from Ships (MARPOL Annex VI). The emission standards apply in two stages: near-term standards, for newly built engines, will apply beginning in 2011 and long-term standards requiring an 80% reduction in NO_x emissions will begin in 2016.

U.S. EPA is adopting changes to the diesel fuel program to allow for the production and sale of diesel fuel with up to 1,000 ppm sulfur for use in Category 3 marine vessels. The regulations generally forbid production and sale of fuels with more than 1,000 ppm sulfur for use in most U.S. waters, unless operators achieve equivalent emission reductions in other ways.

U.S. EPA is also adopting provisions to apply some emission and fuel standards to foreign-flagged and in-use vessels that are covered by MARPOL Annex VI.

When this strategy is fully implemented in 2030, U.S. EPA estimates that NO_x and $PM_{2.5}$ emissions in the U.S. will be reduced by approximately 1.2 million tons per year (tpy) and 143,000 tpy, respectively.

[13] http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2007-0121-0633;oldLink=false

6.4.7 Clean Air Interstate Rule (CAIR)

On May 12, 2005, U.S. EPA published the following regulation: "Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (CAIR); Revisions to Acid Rain Program; Revisions to the NO_x SIP Call; Final Rule". This rule established the requirement for states to adopt rules limiting the emissions of NO_x and SO_2 and provided a model rule for the states to use in developing their rules in order to meet federal requirements. The purpose of CAIR was to reduce interstate transport of $PM_{2.5}$, SO_2, and ozone precursors (NO_x).

CAIR applied to any stationary, fossil fuel-fired boiler or stationary, fossil fuel-fired combustion turbine, or a generator with a nameplate capacity of more than 25 megawatt electrical (MWe) producing electricity for sale. This rule provided annual state caps for NO_x and SO_2 in two phases, with Phase I caps for NO_x and SO_2 starting in 2009 and 2010, respectively. Phase II caps were to become effective in 2015. U.S. EPA allowed limits to be met through a cap and trade program if a state chose to participate in the program. SO_2 emissions from power plants in the 28 eastern states and the District of Columbia (D.C.) covered by CAIR were to be cut by 4.3 million tons from 2003 levels by 2010 and 5.4 million tons from 2003 levels by 2015. NO_x emissions were to be cut by 1.7 million tons by 2009 and reduced by an additional 1.3 million tons by 2015. In response to U.S. EPA's rulemaking, Indiana adopted a state rule in 2006 based on the model federal rule (326 IAC 24-1). Indiana's rule included annual and seasonal NO_x trading programs, and an annual SO_2 trading program. This rule required compliance effective January 1, 2009.

In July 2008, the D.C. Circuit court vacated CAIR and issued a subsequent remand without vacatur of CAIR in December 2008. The court then directed U.S. EPA to revise or replace CAIR in order to address the deficiencies identified by the court. On July 6, 2011, U.S. EPA finalized the Cross-State Air Pollution Rule (CSAPR) as a replacement for CAIR. On August 21, 2012, the U.S. Court of Appeals for the D.C. Circuit vacated CSAPR and directed U.S. EPA to continue administering CAIR "pending the promulgation of a valid replacement."

6.4.8 Oil and Natural Gas Industry Standards

This new standard, issued on April 17, 2012, regulates VOC and air toxic emissions from hydraulically fractured natural gas wells, along with requirements for several other sources of pollution in the oil and natural gas industry that were previously unregulated in the United States. U.S. EPA estimates that these standards will apply to approximately 11,400 new natural gas wells hydraulically fractured each year and an additional 1,400 existing natural gas wells refractured annually. When these standards are fully implemented in 2015, U.S. EPA estimates that VOC and air toxic emissions in the U.S. will be reduced by approximately 190,000 to 290,000 tpy and 12,000 to 20,000 tpy, respectively.

6.4.9 Mercury and Air Toxic Standards[14]

This new standard, effective in April 2012, regulates emissions of mercury, acid gases, and non-

[14] http://www.gpo.gov/fdsys/pkg/FR-2012-02-16/pdf/2012-806.pdf, (page 9424)

mercury metallic toxic pollutants from new and existing coal and oil-fired EGUs. U.S. EPA estimates that this rule will apply to approximately 1,100 coal-fired and 300 oil-fired EGUs at 600 power plants in the United States. According to U.S. EPA, most facilities will comply with these standards through a range of strategies, including the use of existing emission controls, upgrades to existing emission controls, installation of new pollution controls, and fuel switching.

When these standards are fully implemented in 2016, U.S. EPA estimates that mercury, acid gas, and sulfur dioxide emissions in the U.S. will be reduced by approximately 75%, 88%, and 41%, respectively.

6.4.10 Controls Specific to Lake and Porter Counties, Indiana

Local control measures, including some RACT rules specific to Lake and Porter counties, have helped reduce VOC emissions and other types of emissions in Northwest Indiana. These measures include:

326 IAC 8-7	Specific VOC Reduction Requirements
326 IAC 8-8	Municipal Solid Waste Landfills
326 IAC 8-9	Volatile Organic Liquid Storage Vessels
326 IAC 8-11	Wood Furniture Coatings
326 IAC 8-12	Shipbuilding or Ship Repair Operations
326 IAC 8-13	Sinter Plants
326 IAC 8-16	Offset Lithographic Printing and Letterpress Printing
326 IAC 8-17	Industrial Solvent Cleaning Operations
326 IAC 8-18	Synthetic Organic Chemical Manufacturing Industry Air Oxidation, Distillation, and Reactor Processes
326 IAC 8-19	Control of Volatile Organic Compound Emissions from Process Vents in Batch Operations
326 IAC 8-20	Industrial Wastewater
326 IAC 8-21	Aerospace Manufacturing and Rework Operations
326 IAC 8-22	Miscellaneous Industrial Adhesives
326 IAC 13	Motor Vehicle Emission and Fuel Standards (including a motor vehicle inspection and maintenance program for Lake and Porter counties)
326 IAC 4-1-4.1(c)	Ban on residential burning in Lake and Porter counties
40 CFR 80.70(f)(3)	Federal requirement for the use of federal reformulated gasoline (RFG) in Lake and Porter counties

6.5 <u>Controls to Remain in Effect</u>

Indiana commits to maintain the control measures listed above after redesignation, or submit to U.S. EPA as a SIP revision any changes to its rules or emission limits applicable to NO_x or VOC sources, as required for maintenance of the 8-hour ozone standard in Lake and Porter counties, Indiana.

Indiana, through IDEM's Office of Air Quality and its Compliance and Enforcement Branch, has the legal authority and necessary resources to actively enforce any violations of its rules or permit provisions. After redesignation, IDEM intends to continue enforcing all rules that relate to the emission of ozone precursors in Lake and Porter counties, Indiana.

6.6 New Source Review (NSR) Provisions

Indiana has a long standing and fully implemented New Source Review (NSR) program that is outlined in 326 IAC 2. The rule includes provisions for the Prevention of Significant Deterioration (PSD) permitting program in 326 IAC 2-2 and the Emission Offset Permitting Program in 326 IAC 2-3. Indiana's PSD program was conditionally approved on March 3, 2003 (68 FR 9892) and received final approval on May 20, 2004 (69 FR 29071) by U.S. EPA as part of the SIP.

Any facility that is not listed in the 2005 emission inventory, or for which emission reduction credit through closing was taken in demonstrating attainment, will not be allowed to construct, reopen, modify, or reconstruct without meeting all applicable permit rule requirements. The review process will be identical to that used for new sources. Once the area is redesignated, OAQ will implement NSR for major sources through the PSD program, which requires an air quality analysis to evaluate whether the new source will threaten the NAAQS.

Together, these rules will substantially reduce local and regional sources of ozone precursors. The modeling analyses discussed in Section 7.0 include these rules and show the ozone concentrations expected to result from their implementation.

7.0 MODELING AND METEOROLOGY

7.1 Summary of Modeling Results for National Emission Control Strategies in Final Rulemakings

On March 10, 2005, the U.S. EPA finalized CAIR. NO_x emissions from power plants were projected to be cut by 1.7 million tons by 2009 and reduce power plant emissions by 2 million tons in 2015 in 28 eastern states and the District of Columbia. To support this rulemaking, U.S. EPA first conducted a basecase future year modeling run to show future year concentrations resulting from existing emission controls, and then conducted future year modeling with emission reductions attributed to CAIR. Table 7.1 shows basecase and CAIR modeled results, as compared to the 8-hour ozone NAAQS of 0.08 ppm, established in 1997. The modeling was based on 1999 through 2003 (1999 through 2001, 2000 through 2002, and 2001 through 2003) design values. Emissions were based on 2001 emission inventories and three separate ozone episodes (June 12-14, 1995, July 5-15, 1995 and August 7-21, 1995) were modeled. Future year modeling was conducted, including for Lake and Porter counties, and the future year design values for 2010 and 2015 were evaluated for attainment of the 1997 8-hour ozone NAAQS.

At the time of the U.S. EPA modeling demonstration, the 1997 ozone NAAQS was set at 0.08 ppm. Results of the basecase future year modeling without CAIR show that Lake and Porter counties attained the 1997 8-hour ozone NAAQS in 2010 and modeled concentrations would further decrease by 2015. The CAIR modeled results even approached within 0.005 ppm of the current 2008 8-hour ozone NAAQS of 0.075 ppm.

Table 7.1 Modeling Results from U.S. EPA for the Clean Air Interstate Rule

County	MSA/CMSA	1999-2003 Design Value	2010 Base Future Design Value	2010 CAIR Future Design Value	2015 Base Future Design Value	2015 CAIR Future Design Value
		(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
Lake	Hammond	0.091	0.0832	0.0828	0.0816	0.0807
Porter	Ogden Dunes	0.089	0.0814	0.0811	0.0793	0.0786

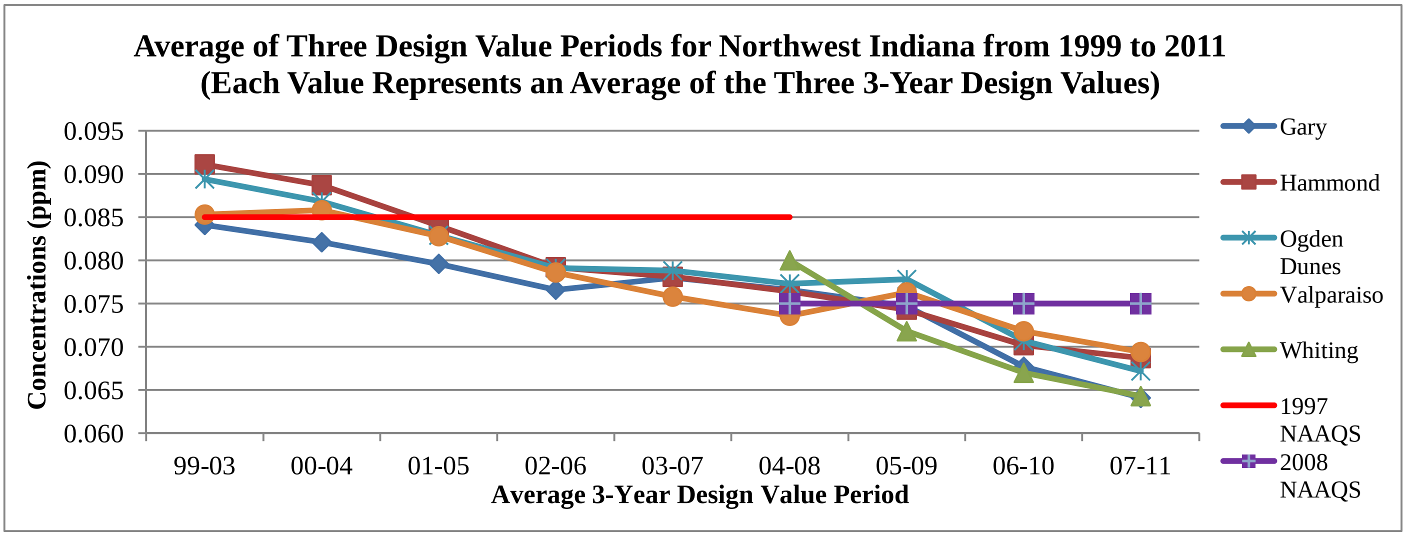
The 1999 through 2003 design values used for modeling are much higher than the more current design values from 2007 through 2011. Each value represents an average of three design values (i.e., 1999 through 2003 value derived from the average of the design values from 1999 through 2001, 2000 through 2002, and 2001 through 2003). Since the U.S. EPA CAIR modeling results were based on the 1999 through 2003 design values and compared against the 1997 8-hour ozone NAAQS, the modeled future year concentrations will be much higher than what would be expected if the modeling were based on more current future design values. The more current design values would be more representative of all national, regional and local emissions control strategies in place and are compared to the current 8-hour ozone NAAQS of 0.075 ppm. Table 7.2 shows the difference between the 1999 through 2003 base design value and the most current base design value from 2007 through 2011. As can be seen, the comparison shows the 2007 through 2011 design values are 0.016 to 0.022 ppm lower. Graph 7.1 shows the trend of the three base year average design values over the past thirteen years. The general trend for the design values at all northwest Indiana monitors has dropped over this time period and remains well below the current 2008 8-hour ozone NAAQS of 0.075 ppm.

Table 7.2 Design Value Comparison from 1999-2003 to 2007-2011 (in ppm)

Site/AQS #	99-03	00-04	01-05	02-06	03-07	04-08	05-09	06-10	07-11	Difference 99-03 to 07-11
Gary 18-089-0022	0.084	0.082	0.080	0.077	0.078	0.077	0.075	0.068	0.064	0.020
Hammond 18-089-2008	0.091	0.089	0.084	0.079	0.078	0.076	0.074	0.070	0.069	0.022
Ogden Dunes 18-127-0024	0.089	0.087	0.083	0.079	0.079	0.077	0.078	0.071	0.067	0.022
Valparaiso 18-127-0026	0.085	0.086	0.083	0.079	0.076	0.074	0.076	0.072	0.069	0.016
Whiting 18-089-0028	N/O	N/O	N/O	N/O	N/O	0.080	0.072	0.067	0.064	0.016*

N/O Not operational
*This represents the difference in the ozone design values from 04-08 to 07-11.

Graph 7.1 Comparison of Design Values from 1999 through 2011



On December 23, 2008, the D.C. Circuit Court of Appeals remanded, without vacatur, U.S. EPA's CAIR. While NO_x emission reductions associated with CAIR were projected to lower ozone concentrations in Northwest Indiana by 0.001 ppm or less, CAIR was created primarily as a control strategy for $PM_{2.5}$. Therefore, air quality benefits for reducing ozone concentrations as a result of CAIR are not as great and the remand of CAIR does not significantly impact future year 8-hour ozone design values for the Northwest Indiana area. This is because the budgets associated with the NO_x SIP Call are designed exclusively to address ozone transport and are fairly equivalent to those of CAIR.

7.2 Lake Michigan Air Director's Consortium (LADCO) Round 6 (CAIR) Modeling for 8-Hour Ozone Standard

LADCO performed Comprehensive Air Quality Model (CAM_x) modeling for ozone, referred to as "Round 6", which uses the most recent emission inventories and model updates. This modeling was performed to support redesignation and maintenance plans for the six-state LADCO region. The photochemical model used by LADCO and Indiana for the 2008 8-hour ozone standard analysis is CAM_x version 4.5beta_deposition, developed by Environ. This model has been accepted by U.S. EPA as an approved air quality model for regulatory analysis and attainment demonstrations. Requirements of 40 CFR 51.112, as well as the "Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS" (EPA-454/R-05-002, Oct. 2005) are satisfied with the use of CAM_x for attainment demonstrations. Meteorology from 2005, as well as 2005 baseyear emissions (legally enforceable controls required by consent decree, state rule, or permit) were used to conduct Round 6 modeling. The base-year design value for attainment purposes was calculated from the periods 2003 through 2005, 2004 through 2006, and 2005 through 2007. The future years modeled were 2009, 2012, and 2018.

Table 7.3 LADCO's Round 6 (CAIR) Modeling Results for Northwest Indiana

Monitor ID	Site	2003-2007 Base DV (ppm)	2009 Future DV (ppm)	2012 Future DV (ppm)	2018 Future DV (ppm)
18-089-0022	Gary	0.078	0.075	0.074	0.071
18-089-0030	Whiting	0.079 *	0.077	0.076	0.073
18-089-2008	Hammond	0.078	0.075	0.074	0.071
18-127-0024	Ogden Dunes	0.078	0.075	0.074	0.071
18-127-0026	Valparaiso	0.075	0.072	0.071	0.068

* Represents 4 year design value averaging period (2004 through 2007)

Modeling results in Table 7.3 show modeled ozone concentrations in Northwest Indiana for 2012 will be below the 8-hour ozone standard of 0.075 ppm except for Whiting, which had a modeled design value of 0.076 ppm. As shown earlier in Table 7.2, modeled design values have trended downward over the past ten years and the 2003 through 2007 design values are considerably higher than current design values. At most monitors, the 2007 through 2011 design values are 0.009 to 0.015 ppm lower, making future modeled results lower using more current design values.

7.3 U.S. EPA Modeling Analysis for Cross-State Air Pollution Rule (CSAPR)

U.S. EPA conducted modeling to support CSAPR. This analysis was performed in 2011 and included in the "Air Quality Modeling – Final Rule Technical Support Document" to assist states in attaining the 1997 8-hour ozone NAAQS. CSAPR required 28 states to reduce annual SO_2 and NO_x emissions and ozone season NO_x emissions from power plants. Emission reductions would have totaled 1.4 million tons per year of NO_x, representing a 54% reduction, including 340,000 tons per year of NO_x during the ozone season. On August 21, 2012, the D.C. Circuit Court of Appeals vacated CSAPR. While NO_x emission reductions associated with CSAPR were projected to lower ozone concentrations in Northwest Indiana, U.S. EPA's modeling was for projected basecase emission scenarios for 2012 and 2014; therefore, U.S. EPA basecase photochemical modeling would be considered valid by using more current emissions than previous U.S. EPA modeling.

The air quality model used for this rulemaking was the CAM_x version 5.3. The modeling domain consisted of 36 kilometer (km) x 36 km coarse grid covering the continental United States and portions of Canada and Mexico with a 12 km x 12 km fine grid covering the East Coast westward to Texas to North Dakota. Thirty-seven states and the District of Columbia were included in the grid configuration. Base year 2005 emissions were modeled. Meteorology from 2005 was created using the Mesoscale Model (MM5) and used for the basecase and future year modeling runs. More detailed information on the CAM_x input file and additional data used for the photochemical modeling can be found in U.S. EPA's "Air Quality Modeling Final Rule Technical Support Document," dated June 2011.

Table 7.4 shows the results of U.S. EPA's CSAPR modeling for ozone impacts at the Lake and Porter county ozone monitors in Northwest Indiana. The monitor identification number, name, and county are listed, as well as the 2003 through 2007 8-hour ozone design values that were used to calculate basecase and future year modeling results. Model results are used in a relative rather than absolute sense. Relative use of the model results calculates the percent change in concentrations based on two different emission scenarios. This percent change can be applied to each monitor's design value to determine ozone impacts. This approach differs from using the absolute or actual modeled result, which may show under or over-predictions with the actual monitored values. Based on the relative response factors (RRFs) that were modeled for each monitor site, the 2003 through 2007 design values were multiplied by the corresponding RRF to determine all future year basecase design values. The 2012 and 2014 basecase emissions were modeled to determine the future year design values.

Table 7.4 Modeling Results: U.S. EPA CSAPR Modeling Results

Monitor ID	Monitor Name	County	Average Design Value (ppm)	Basecase Average Value (ppm)	Future Average Design Value (ppm)
			2003-2007	**2012 Base**	**2014 Base**
18-089-0022	Gary	Lake	0.0777	0.0721	0.0712
18-089-2008	Hammond	Lake	0.0777	0.0727	0.0718
18-089-0030	Whiting	Lake	0.0810	0.0758	0.0749
18-127-0024	Ogden Dunes	Porter	0.0783	0.0719	0.0709
18-127-0026	Valparaiso	Porter	0.0753	0.0684	0.0671

Due to the differences in the modeled base design values and the most current actual design values for all Lake and Porter counties ozone monitors, a comparison of these two values, as well as the modeled 2012 base design value taken from CSAPR was made. The average values modeled by U.S. EPA for CSAPR were used for this comparison, shown in Table 7.5. U.S. EPA listed both the average and maximum design value modeling results. The average design values were calculated by averaging the three year design values from 2003 through 2005, 2004 through 2006, and 2005 through 2007, while the maximum values were the maximum three-year design value of the five year period. Comparison of the future year average modeled design values with the most current 5-year design value for all ozone monitors in Northwest Indiana show the most current design values are well below the modeled CSAPR average 8-hour ozone design values for 2012. The differences between the design values range from 0.0025 ppm to 0.008 ppm.

Table 7.5 Comparison of Northwest Indiana Monitored Design Values with CSAPR Modeling Results

Monitor ID	Monitor Name	County	CSAPR Average Modeled Base Design Value	CSAPR Average Modeled Future Year Design Value	Current Actual Design Value
			2003-2007	**2012 Base**	**2007-2011**
18-089-0022	Gary	Lake	0.0777	0.0721	0.0641
18-089-2008	Hammond	Lake	0.0777	0.0727	0.0687
18-089-0030	Whiting	Lake	0.0810	0.0758	0.0672
18-127-0024	Ogden Dunes	Porter	0.0783	0.0719	0.0694
18-127-0026	Valparaiso	Porter	0.0753	0.0684	0.0643

7.4 Summary of Existing Modeling Results

U.S. EPA and LADCO modeling shows that existing national emission control measures have brought Lake and Porter counties into attainment of the 2008 8-hour ozone NAAQS. Rulemakings to be implemented in the next several years will provide even greater assurance that air quality will continue to meet the standard into the future. Modeling support for the CAIR shows future year design values for Lake and Porter counties approaching the ozone standard with modeled future year design values near the 2008 8-hour ozone NAAQS of 0.075 ppm. Further investigation of the base design values used show that 1999 through 2003 design values are grossly conservative and over-estimate the air quality concentrations when compared to current design values. Indiana feels that this analysis would mirror the U.S. EPA CSAPR modeling results and show Lake and Porter counties as attainment. Modeling support for CSAPR show future year design values for Lake and Porter counties will attain the ozone standard with modeled future year design values below the 8-hour ozone NAAQS of 0.075 ppm. LADCO's results continue to show future year design values below the 8-hour ozone NAAQS. U.S. EPA modeled basecase future years with existing emission controls only and showed that Lake and Porter counties will attain the 2008 8-hour ozone NAAQS without proposed additional national emission control strategies. U.S. EPA and LADCO modeling demonstrates that the area will continue to attain the standard into the future. Future national and local emission control strategies will ensure that each county's attainment will be maintained with an increasing margin of safety over time.

7.5 Temperature Analysis for Lake and Porter Counties

Meteorological conditions are one of the most important factors that influence ozone development and transport. A temperature analysis was conducted to determine how the temperatures during the ozone conducive months of May, June, July, August, and September compare to normal temperatures for the Northwest Indiana area for the years 1981 through 2010. Temperature information was taken from the National Weather Service Station at O'Hare International Airport in Chicago, Illinois and meteorological stations at Lowell (Lake County, Indiana) and Valparaiso (Porter County, Indiana). Available normal maximum temperatures by summer months from 1981 through 2010 for the Northwest Indiana/Chicago, Illinois area are as follows:

May – 70.0^{o} F
June – 79.7^{o} F
July – 84.1^{o} F
August – 81.9^{o} F
September – 74.8^{o} F
May - September – 78.1^{o} F

Monthly maximum temperatures for the previous 10 years (2002 – 2011) during the summer months are compared to normal summer month temperatures in Table 7.6. Overall, the temperatures during the 2002, 2005, 2007, and 2010 summer months of May, June, July, August, and September were 1% to 3% above normal while temperatures during the 2003, 2004, 2006, 2008, 2009, and 2011 summer months were 1% to 3% lower than the normal temperatures. Table 7.6 shows the average maximum temperatures in Northwest Indiana for each of the past ten years and the percent difference from normal for each year.

Table 7.6 Analysis of Maximum Temperatures for Lake and Porter Counties, Indiana

(Percent Change from Maximum Temperature (^{o}F) Normals (1981 – 2010))

	Normal	2002		2003		2004		2005		2006	
	Max	**Max**	**%**	**Max**	**%**	**Max**	**%**	**Max**	**%**	**Max**	**%**
May	70.0	65.2	-7	65.4	-7	71.3	+2	67.6	-3	69.7	0
June	79.7	81.3	+2	74.5	-7	76.4	-4	82.6	+4	78.8	-1
July	84.1	85.9	+2	81.0	-4	79.6	-5	85.0	+1	85.7	+2
August	81.9	81.8	0	82.1	0	75.1	+8	82.5	+1	83.0	+1
September	74.8	79.1	+6	72.1	-4	77.1	+3	79.3	+6	71.1	-5
AVE. May-Sept.	**78.1**	**78.7**	**+1**	**75.0**	**-3**	**75.9**	**-3**	**79.4**	**+2**	**77.7**	**-1**

	Normal	2007		2008		2009		2010		2011	
	Max	**Max**	**%**	**Max**	**%**	**Max**	**%**	**Max**	**%**	**Max**	**%**
May	70.0	75.5	+8	66.2	-5	70.6	+1	71.2	+2	67.8	-3
June	79.7	81.6	+2	80.9	+2	77.0	-3	80.2	+1	79.4	0
July	84.1	83.5	-1	83.8	0	78.4	-7	87.1	+4	88.5	+5
August	81.9	83.2	+2	81.8	0	79.1	-3	85.7	+5	82.5	+1
September	74.8	79.2	+6	75.2	+1	74.3	-1	74.2	-1	69.9	-7
AVE. May-Sept.	**78.1**	**80.6**	**+2**	**77.6**	**-1**	**75.9**	**-3**	**79.7**	**+2**	**77.6**	**-1**

The number of days with temperatures of 90^{o} F and higher were collected from O'Hare National Weather Service Station and Lowell (Lake County, Indiana) and Valparaiso (Porter County, Indiana) meteorological stations and compared to the average number of days from 2002 through 2011, as well as the number of 8-hour ozone exceedance days. After 2007, the 8-hour ozone NAAQS was lowered from 0.08 to 0.075 ppm, so the number of days counted after 2007 was from the lower threshold. Table 7.7 shows the number of 90^{o} F temperature days and the number of 8-hour ozone exceedance days for all Northwest Indiana ozone monitors over the past 10 years. Graph 7.2 shows the comparison graphically.

Table 7.7 Comparison of Days at 90^{o} F and Higher and 8-Hour Ozone Exceedance Days 2002- 2011

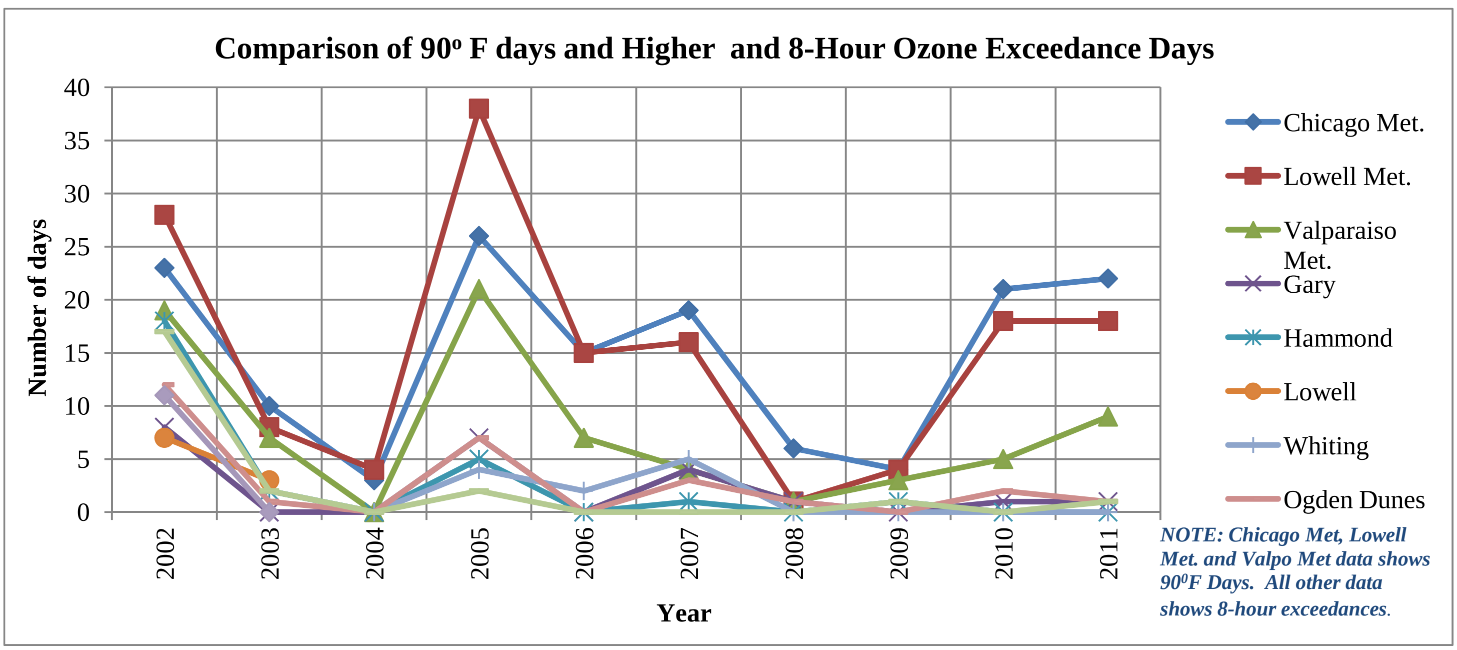
Number of Days with Temperatures of 90^{o} F and higher							
Site	**County**	**Ave. # of 90^{o} F Days**	**2002**	**2003**	**2004**	**2005**	**2006**
Chicago, IL	Cook	14.9	23	10	3	26	15
Lowell	Lake	15.0	28	8	4	38	15
Valparaiso	Porter	7.6	19	7	0	21	7
Number of 8-Hour Exceedance Days at Lake/Porter County area ozone monitors							
Monitor ID	**County**	**Monitor Site**	**2002**	**2003**	**2004**	**2005**	**2006**
18-089-0022	Lake	Gary	8	0	0	7	0
18-089-2006	Lake	Hammond	18	2	0	5	0
18-089-0024	Lake	Lowell	7	3	N/O	N/O	N/O
11-089-0030	Lake	Whiting	N/O	N/O	0	4	2
18-127-0024	Porter	Ogden Dunes	12	1	0	7	0
18-127-0026	Porter	Valparaiso	17	2	0	2	0
18-127-0020	Porter	National Lakeshore	11	0	N/O	N/O	N/O

Table 7.7 (continued)

Number of Days with Temperatures of 90° F and higher							
Site	**County**	**Ave. # of 90° F Days**	**2007**	**2008**	**2009**	**2010**	**2011**
Chicago, IL	Cook	14.9	19	6	4	21	22
Lowell	Lake	15.0	16	1	4	18	18
Valparaiso	Porter	7.6	4	1	3	5	9
Number of 8-Hour Exceedance Days at Lake/Porter County area ozone monitors							
Monitor ID	**County**	**Monitor Site**	**2007**	**2008**	**2009**	**2010**	**2011**
18-089-0022	Lake	Gary	4	1	0	1	1
18-089-2006	Lake	Hammond	1	0	1	0	0
18-089-0024	Lake	Lowell	N/O	N/O	N/O	N/O	N/O
11-089-0030	Lake	Whiting	5	0	0	0	0
18-127-0024	Porter	Ogden Dunes	3	1	0	2	1
18-127-0026	Porter	Valparaiso	0	0	1	0	1
18-127-0020	Porter	National Lakeshore	N/O	N/O	N/O	N/O	N/O

N/O – Not Operational

Graph 7.2: Comparison of Days at 90° F and Higher and 8-Hour Ozone Exceedance Days



As can be seen, prior to the implementation of the NO_x SIP call in 2004, the number of ozone exceedance days per year correlated quite well with the number of 90° F days per year. The effects of national control measures appear to have had an impact on the number of ozone exceedance days per year, resulting in a lower number of exceedance days per year despite the 8-hour ozone NAAQS being lowered from 0.08 to 0.075 ppm. This is evident because 2005 had a greater number of days with temperatures of 90° F or more than 2002, but the number of 8-hour exceedance days was significantly lower than 2002. The years 2007, 2010 and 2011, had higher numbers of 90^o F days than normal, yet the number of ozone exceedance days throughout the Northwest Indiana area has remained relatively low. While other meteorological factors may have influenced this result to some degree; emission reductions have helped to keep the number of 8-hour ozone exceedance days low during ozone conducive conditions.

7.6 Summary of Meteorological Conditions

The analysis of the departure from normal of the maximum temperatures during the summer months shows variation as illustrated in Table 7.7 and Graph 7.2. One of the reasons the 8-hour ozone standard is expressed as a 4th high ozone value averaged over 3 years is to account for expected variations in temperature. The analysis shows that 15 or more days with temperatures of 90^o F and higher occurred in 2002, 2005, 2006, 2007, 2010, and 2011. The number of 8-hour ozone exceedance days for 2002 shows a greater correlation to the number of higher temperature days than in 2005, 2010, and 2011 where the correlation is clearly reduced if not absent in 2010 and 2011. Overall, ozone values are lower and correspond to reduced local and regional ozone precursor emissions despite ozone conducive conditions being present. Ozone values in Lake and Porter counties have steadily decreased since 2002 to design value concentrations well below the current 8-hour ozone NAAQS of 0.075 ppm.

8.0 CORRECTIVE ACTIONS

8.1 Commitment to Revise Plan

As noted in Section 4.6, Indiana commits to review its Maintenance Plan eight years after redesignation, as required by Section 175(A) of the CAA and the maintenance horizons will be extended by ten years to the year 2040.

8.2 Commitment for Contingency Measures

Indiana commits to adopt and expeditiously implement necessary corrective actions in the following circumstances:

Warning Level Response

A Warning Level Response shall be prompted whenever an annual (1-year) 4th high monitored value of 0.079 ppm occurs in a single ozone season or a two-year average 4th high monitored value of 0.075 ppm or greater occurs within the maintenance area. A Warning Level Response will consist of a study to determine whether the ozone value indicates a trend toward higher ozone values or whether emissions appear to be increasing. The study will evaluate whether the trend, if any, is likely to continue and, if so, the control measures necessary to reverse the trend taking into consideration ease and timing for implementation, as well as economic and social considerations. Implementation of necessary controls in response to a Warning Level Response trigger will take place as expeditiously as possible, but in no event later than twelve months from the conclusion of the most recent ozone season (September 30).

Should it be determined through the Warning Level study that action is necessary to reverse the noted trend, the procedures for control selection and implementation outlined under “Action Level Response” shall be followed.

Action Level Response

An Action Level Response shall be prompted whenever a violation of the standard three-year average fourth high monitored value of 0.075 ppm or greater occurs within the maintenance area. In the event that the Action Level is triggered and is not found to be due to an exceptional event, malfunction, or noncompliance with a permit condition or rule requirement, IDEM will determine additional control measures needed to assure future attainment of NAAQS for ozone. In this case, measures that can be implemented in a short time will be selected and be in place within eighteen months from the close of the ozone season that prompted the Action Level.

Control Measure Selection and Implementation

Adoption of any additional control measures is subject to the necessary administrative and legal process. This process will include posting of notices, an opportunity for public hearing, and other measures required by Indiana law for rulemaking by state environmental board.

If a new measure or control is already promulgated and scheduled to be implemented at the federal or state level, and that measure or control is determined to be sufficient to address the upward trend in air quality, additional local measures may be unnecessary. Furthermore, Indiana will submit to U.S. EPA an analysis to demonstrate the proposed measures are adequate to return the area to attainment.

8.3 Contingency Measures

Contingency measures to be considered will be selected from a comprehensive list of measures deemed appropriate and effective at the time the selection is made. Listed below are example measures that may be considered. The selection of measures will be based upon cost-effectiveness, emission reduction potential, economic and social considerations, or other factors that IDEM deems appropriate. IDEM will solicit input from all interested and affected persons in the maintenance area prior to selecting appropriate contingency measures. All of the listed contingency measures are potentially effective or proven methods of obtaining significant reductions of ozone precursor emissions. Because it is not possible at this time to determine what control measure will be appropriate at an unspecified time in the future, the list of contingency measures outlined below is not comprehensive. Indiana anticipates that if contingency measures should ever be necessary, it is unlikely that a significant number (i.e., all those listed below) will be required.

1. Vehicle emissions testing program enhancements (increased weight limit, addition of diesel vehicles, etc.)
2. Asphalt paving (lower VOC formulation)
3. Diesel exhaust retrofits
4. Traffic flow improvements
5. Idle reduction programs
6. Portable fuel container regulation (statewide)
7. Park and ride facilities
8. Rideshare/carpool program

9. VOC cap/trade program for major stationary sources
10. NO_x Reasonably Available Control Technology

No contingency measure shall be implemented without providing the opportunity for full public participation during which the relative costs and benefits of individual measures, at the time they are under consideration, can be fully evaluated.

9.0 PUBLIC PARTICIPATION

In accordance with 40 CFR 51.102, public participation in this request was provided as follows:

Notice of availability of the complete document and a request for the opportunity for a public hearing was published in the Chesterton Tribune, Chesterton, Indiana and the Northwest Indiana Times, Munster, Indiana.

No public comments were received during the 30-day comment period. There was not a request for a public hearing during the comment period and the hearing was not required to be held.

A copy of the legal public notice and copies of the proof of publication can be found in Appendix E.

10.0 CONCLUSIONS

Lake and Porter counties, Indiana have attained the 2008 8-hour NAAQS for ozone. This petition demonstrates that Lake and Porter counties, Indiana, have complied with the applicable provisions of the CAA regarding redesignation of ozone nonattainment areas. IDEM has prepared a Redesignation Request and Maintenance Plan that meets the requirement of Section 110(a)(1) of the CAA.

Indiana has performed an analysis that shows the air quality improvements are due to permanent and enforceable measures and that significant regional NO_x reductions will ensure continued compliance (maintenance) with the standard. Additionally, Indiana has ensured that all CAA requirements necessary to support redesignation have been met.

Under the previous 1-hour standard, and under the 1997 8-hour standard for ozone, controls that are more stringent than in any other portion of Indiana have been implemented in Lake and Porter counties, Indiana. These controls are comparable, and in certain cases more stringent, than those implemented elsewhere within the nonattainment area and shall remain in effect following redesignation to ensure continued compliance with the standard.

In addition to the corrective actions (should they be necessary) outlined in this submittal, Indiana continues to participate in the regional air quality planning efforts sponsored by LADCO. The current goal of the planning process is to establish a regional control strategy that provides for attainment of the ozone and fine particle standards throughout the States of Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin. Along with the other LADCO states, Indiana is developing local and statewide emission control measures where photochemical modeling and culpability analyses demonstrate a clear need and cost effectiveness analyses justify the implementation of such measures.

LADCO's results continue to show future year design values below the 2008 8-hour ozone NAAQS. U.S. EPA modeled basecase future years with existing emission controls only and showed that Lake and Porter counties will attain the 2008 8-hour ozone NAAQS without proposed additional national emission control strategies. The U.S. EPA and LADCO modeling demonstrates that the area will continue to attain the standard into the future. Future national and local emission control strategies will ensure that each county's attainment will be maintained with an increasing margin of safety over time. Overall, ozone values are lower and correspond to reduced local and regional ozone precursor emissions despite ozone conducive conditions being present. Ozone values in Lake and Porter counties have steadily decreased since 2002 to design value concentrations well below the current 8-hour ozone NAAQS of 0.075 ppm.

Based on this presentation, Indiana's portion of the nonattainment area (Lake and Porter counties) meets the requirements for redesignation under the CAA (Section 107(d)(3)) and U.S. EPA guidance. Furthermore, because this area is subject to transport, additional regional NO_x and VOC reductions will ensure continued compliance (maintenance) with the standards and provide an increased margin of safety.

Consistent with the authority granted to U.S. EPA under Section 107(d)(3) of the CAA, Indiana requests that Lake and Porter counties, Indiana, be redesignated to attainment simultaneously with U.S. EPA approval of the Redesignation Request and Maintenance Plan provisions.

APPENDIX A

Air Quality System Data

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Air Quality System (AQS) Data Report

2006 Through September 2011 (current as of October 3, 2012)

Air Quality System (AQS) Data Report

EXCEPTIONAL DATA TYPES

EDT	DESCRIPTION
0	NO EVENTS
1	EVENTS EXCLUDED
2	EVENTS INCLUDED
3	EXCEPTIONAL EVENTS EXCLUDED
4	NATURAL EVENTS EXCLUDED
5	EVENTS WITH CONCURRENCE EXCLUDED
6	EXCEPTIONAL EVENTS WITH CONCURRENCE EXCLUDED
7	NATURAL EVENTS WITH CONCURRENCE EXCLUDED

Indiana

								Parts per Million			
State	County	Site ID	Parameter Code (Ozone)	POC	Year	ADDRESS	% of OBS	1st Max 8-HR	2nd Max 8-HR	3rd Max 8-HR	4th Max 8-HR
18	89	22	44201	1	2006	MISSISSIPPI ST., IITRI BUNKER	98	0.078	0.074	0.073	0.073
18	89	22	44201	1	2007	MISSISSIPPI ST., IITRI BUNKER	79	0.089	0.089	0.085	0.085
18	89	22	44201	1	2008	MISSISSIPPI ST., IITRI BUNKER	93	0.077	0.066	0.063	0.062
18	89	22	44201	1	2009	MISSISSIPPI ST., IITRI BUNKER	96	0.061	0.059	0.058	0.058
18	89	22	44201	1	2010	MISSISSIPPI ST., IITRI BUNKER	80	0.08	0.067	0.064	0.064
18	89	22	44201	1	2011	MISSISSIPPI ST., IITRI BUNKER	98	0.083	0.067	0.066	0.066
18	89	30	44201	1	2006	1 OLIVER ST/ WHITING HIGH SCHO	100	0.086	0.085	0.083	0.081

18	89	30	44201	1	2007	1 OLIVER ST/ WHITING HIGH SCHO	99	0.094	0.091	0.09	0.088
18	89	30	44201	1	2008	1 OLIVER ST/ WHITING HIGH SCHO	79	0.066	0.065	0.065	0.062
18	89	30	44201	1	2009	1 OLIVER ST/ WHITING HIGH SCHO	100	0.071	0.069	0.067	0.062
18	89	30	44201	1	2010	1 OLIVER ST/ WHITING HIGH SCHO	100	0.072	0.072	0.071	0.069
18	89	30	44201	1	2011	1 OLIVER ST/ WHITING HIGH SCHO	100	0.075	0.069	0.069	0.069
18	89	2008	44201	1	2006	0 141 ST STREET	100	0.082	0.077	0.076	0.075
18	89	2008	44201	1	2007	0 141 ST STREET	96	0.087	0.082	0.079	0.077
18	89	2008	44201	1	2008	0 141 ST STREET	97	0.072	0.072	0.07	0.068
18	89	2008	44201	1	2009	0 141 ST STREET	99	0.076	0.069	0.067	0.065
18	89	2008	44201	1	2010	0 141 ST STREET	92	0.073	0.071	0.071	0.069
18	89	2008	44201	1	2011	0 141 ST STREET	91	0.074	0.073	0.073	0.072
18	127	24	44201	1	2006	DIANA RD/ WATER TREATMENT PLAN	100	0.076	0.075	0.074	0.07
18	127	24	44201	1	2007	DIANA RD/ WATER TREATMENT PLAN	97	0.091	0.089	0.089	0.084
18	127	24	44201	1	2008	DIANA RD/ WATER TREATMENT PLAN	100	0.082	0.072	0.07	0.069
18	127	24	44201	1	2009	DIANA RD/ WATER TREATMENT PLAN	100	0.073	0.07	0.07	0.067
18	127	24	44201	1	2010	DIANA RD/ WATER TREATMENT PLAN	99	0.08	0.076	0.068	0.067
18	127	24	44201	1	2011	DIANA RD/ WATER TREATMENT PLAN	90	0.082	0.075	0.074	0.068
18	127	26	44201	1	2006	0 WESLEY/ VALPARAISO WATER DEP	99	0.078	0.074	0.072	0.071
18	127	26	44201	1	2007	0 WESLEY/ VALPARAISO WATER DEP	93	0.084	0.083	0.081	0.08
18	127	26	44201	1	2008	0 WESLEY/ VALPARAISO WATER DEP	96	0.066	0.062	0.062	0.061
18	127	26	44201	1	2009	0 WESLEY/ VALPARAISO WATER DEP	100	0.076	0.069	0.066	0.064
18	127	26	44201	1	2010	0 WESLEY/ VALPARAISO WATER DEP	100	0.063	0.062	0.062	0.061
18	127	26	44201	1	2011	0 WESLEY/ VALPARAISO WATER DEP	97	0.077	0.064	0.063	0.063

APPENDIX B

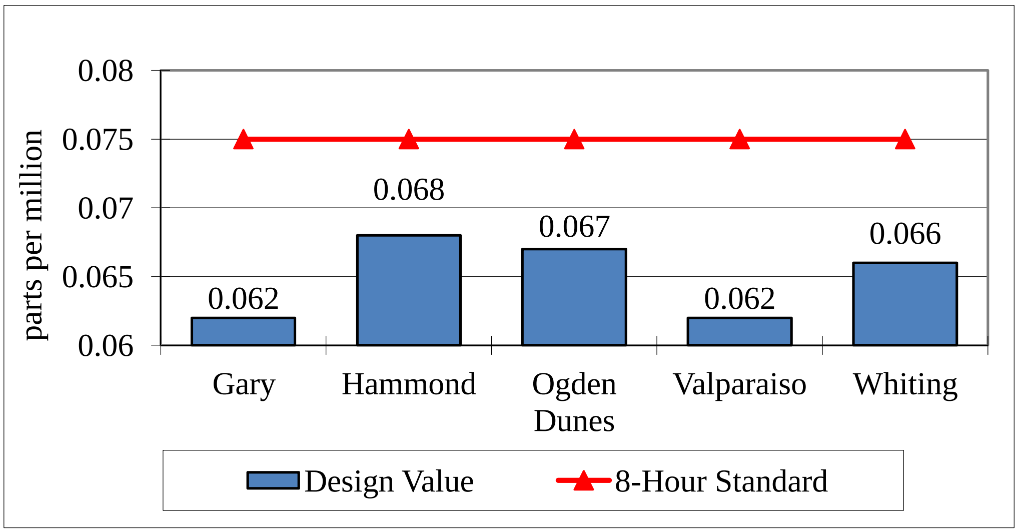
Historic and Projected Emission Inventories

Lake and Porter Counties, Indiana

Fourth Highest Daily Values

Site	2006	2007	2008	2009	2010	2011	06-08 avg	07-09 avg	08-10 avg	09-11 avg
Gary	0.073	0.085	0.062	0.058	0.064	0.066	0.073	0.068	0.061	0.062
Hammond	0.075	0.077	0.068	0.065	0.069	0.072	0.073	0.070	0.067	0.068
Ogden Dunes	0.070	0.084	0.069	0.067	0.067	0.068	0.074	0.073	0.067	0.067
Valparaiso	0.071	0.080	0.061	0.064	0.061	0.063	0.070	0.068	0.062	0.062
Whiting	0.081	0.088	0.062	0.062	0.069	0.069	0.077	0.070	0.064	0.066

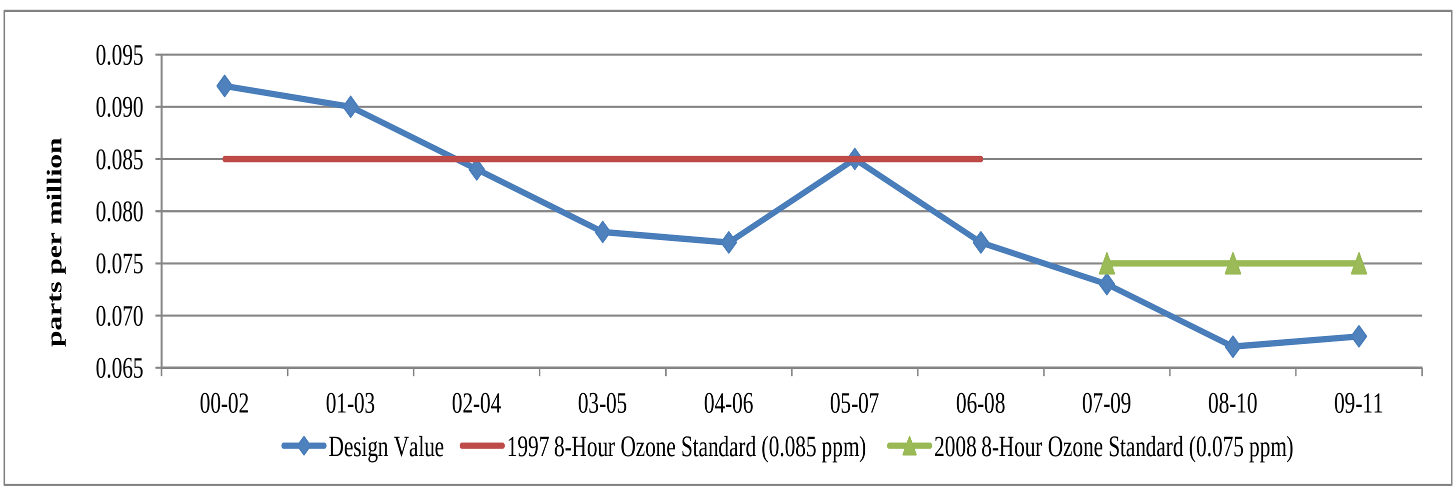
Graph 3.1 Design Values for Lake and Porter Counties, Indiana, 2009-2011



Historic Ozone Design Values

	Gary	Hammond	Ogden Dunes	Valparaiso	Whiting
98-00	0.084	0.088	0.091	0.086	n/a
99-01	0.084	0.090	0.09	0.083	n/a
00-02	0.084	0.092	0.09	0.086	n/a
01-03	0.084	0.090	0.087	0.086	n/a
02-04	0.078	0.083	0.082	0.084	n/a
03-05	0.076	0.078	0.078	0.077	n/a
04-06	0.075	0.076	0.076	0.073	0.077
05-07	0.082	0.079	0.081	0.076	0.085
06-08	0.073	0.073	0.074	0.070	0.077

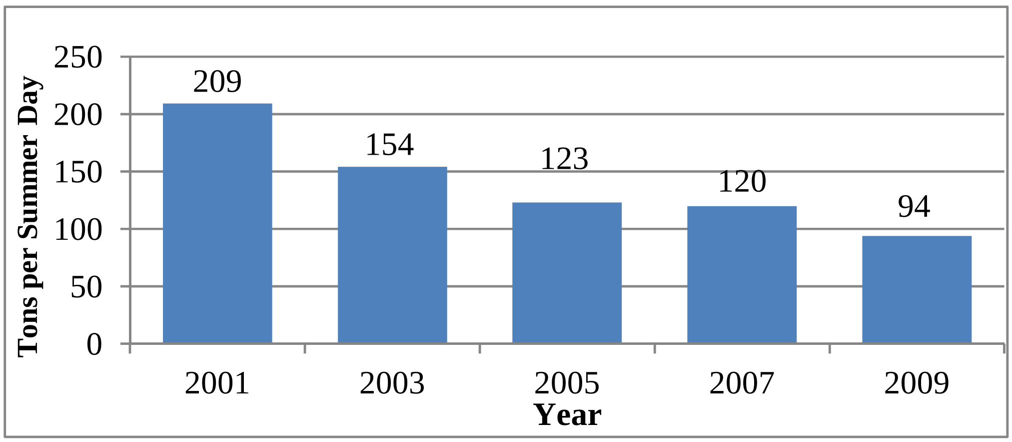
Graph 3.2 Design Values for Lake and Porter Counties, Indiana 2000-2011



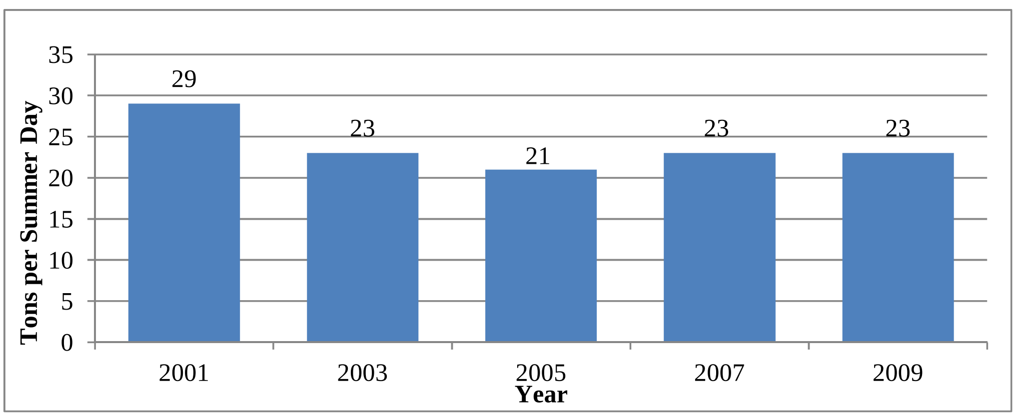
Emission Inventories for Lake and Porter Counties, Indiana

NO_x and VOC Point Source Trends Lake and Porter Counties, Indiana (Tons per Summer Day)		
Year	**NO_x**	**VOC**
2001	209	29
2003	154	23
2005	123	21
2007	120	23
2009	94	23

Graph 4.1 Lake and Porter Counties, Indiana NO_x Point Source Emissions 2001-2009



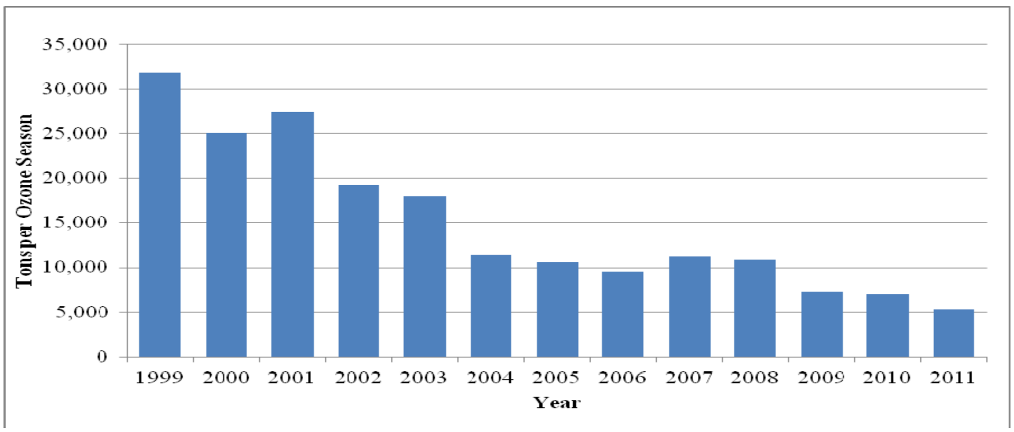
Graph 4.2 Lake and Porter Counties, Indiana VOC Point Source Emissions 2001-2009



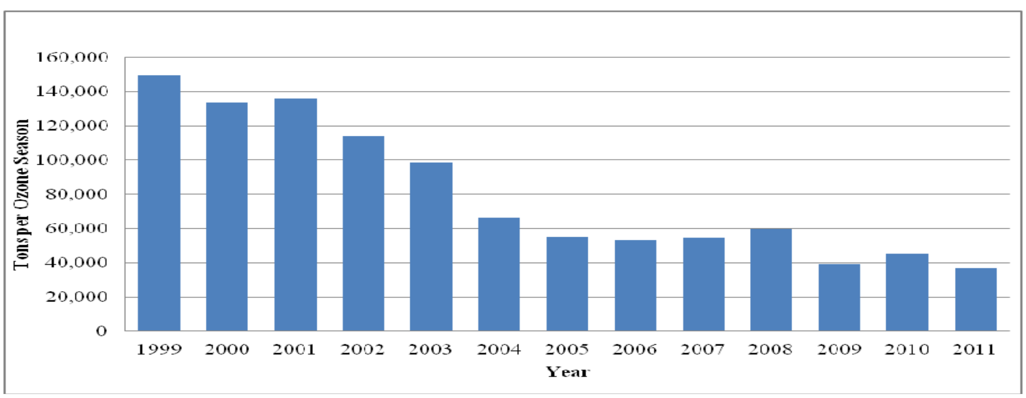
NO_x Emissions – NW Indiana Electric Generating Units 1999-2011 (Tons per Ozone Season)	
1999	31,815
2000	25,028
2001	27,394
2002	19,260
2003	17,966
2004	11,419
2005	10,537
2006	9,567
2007	11,230
2008	10,833
2009	7,305
2010	7,030
2011	5,300

NO_x Emissions – Indiana Electric Generating Units 1999-2011 (Tons per Ozone Season)	
1999	149,660
2000	133,880
2001	136,121
2002	114,083
2003	98,482
2004	66,568
2005	55,390
2006	53,768
2007	54,816
2008	59,967
2009	39,457
2010	45,687
2011	37,068

Graph 4.3 NO_x Emissions - Northwest Indiana Electric Generating Units. 1999-2011

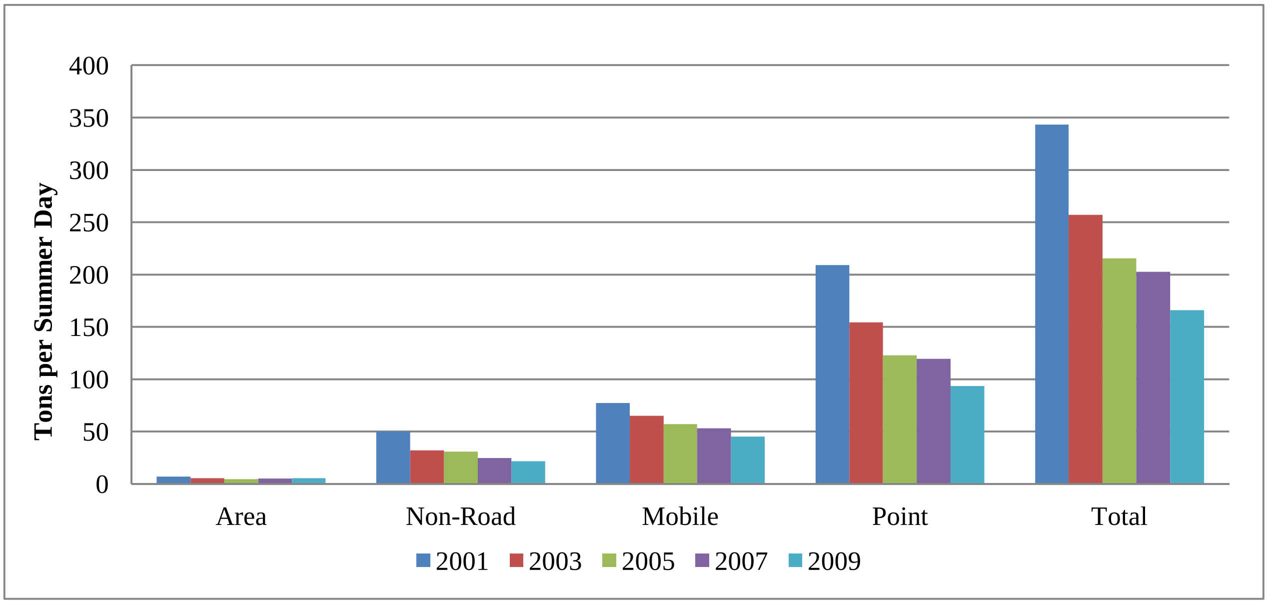


Graph 4.4 Statewide NO_x Emissions from Electric Generating Units, 1999-2011

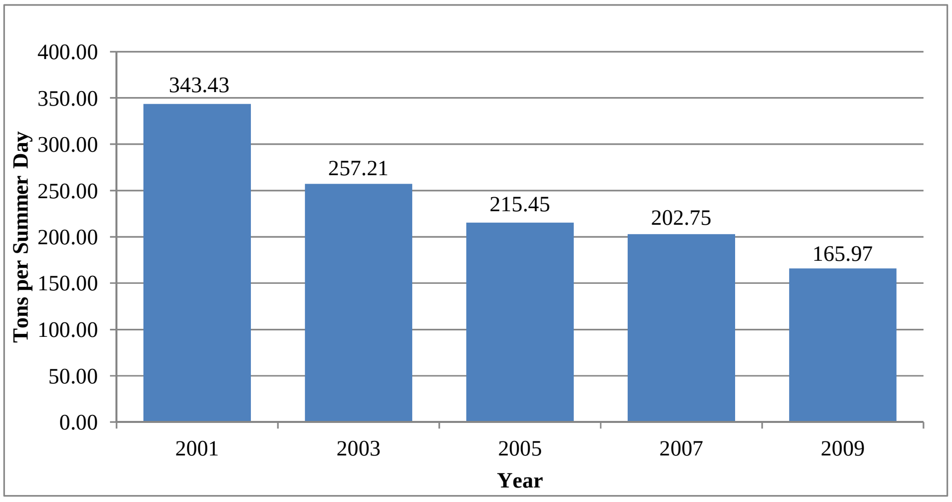


NO_x Emission Trends – Lake and Porter Counties, Indiana (Tons per Summer Day)					
Year	**Area**	**Non-Road**	**Mobile**	**Point**	**Total**
2001	6.99	50.21	77.28	208.95	343.43
2003	5.50	32.14	65.22	154.35	257.21
2005	4.62	30.93	57.17	122.73	215.45
2007	5.28	24.75	53.15	119.57	202.75
2009	5.6	21.66	45.11	93.6	165.97

Graph 4.7 NOx Emission Trends by Category and Year, Lake and Porter Counties, Indiana, All Sources, 2001-2009

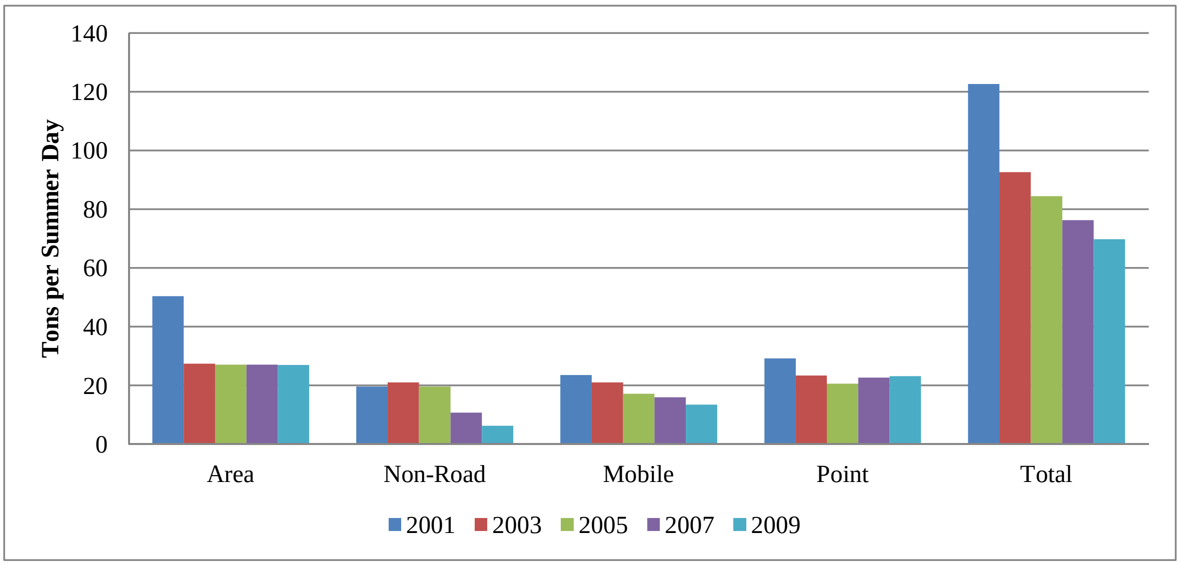


Graph 4.5 NO_x Emissions Trends - Lake and Porter Counties, Indiana All Sources, 2001-2009

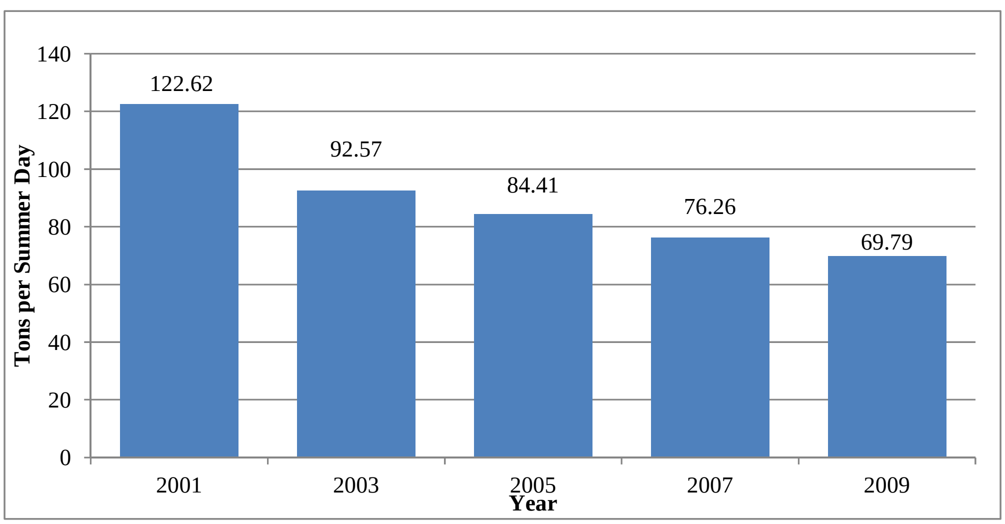


VOC Emission Trends – Lake and Porter Counties, Indiana (Tons per Summer Day)					
Year	**Area**	**Non-Road**	**Mobile**	**Point**	**Total**
2001	50.38	19.55	23.48	29.21	122.62
2003	27.31	21.02	20.96	23.28	92.57
2005	27.1	19.55	17.19	20.57	84.41
2007	27.02	10.69	15.93	22.62	76.26
2009	26.97	6.26	13.42	23.14	69.79

Graph 4.8 VOC Emission Trends by Category and Year, Lake and Porter Counties, Indiana, 2001-2009



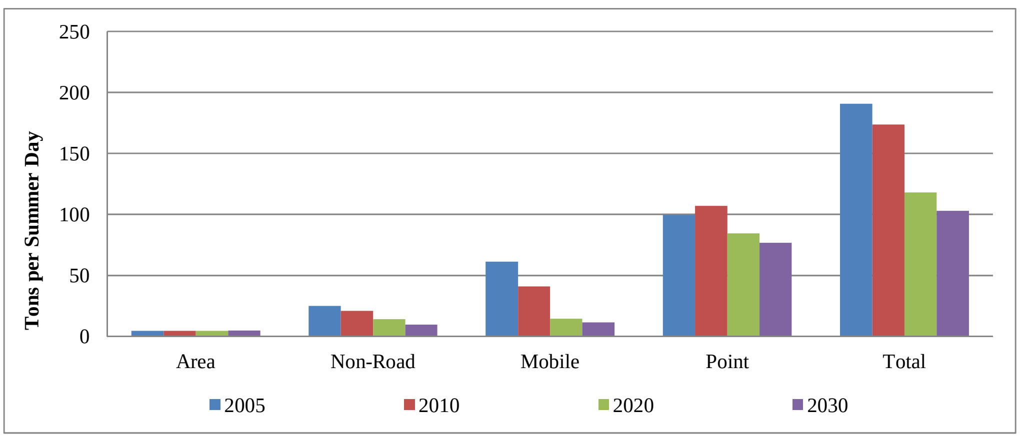
Graph 4.6 VOC Emissions Trends - Lake and Porter Counties, Indiana, 2001-2009



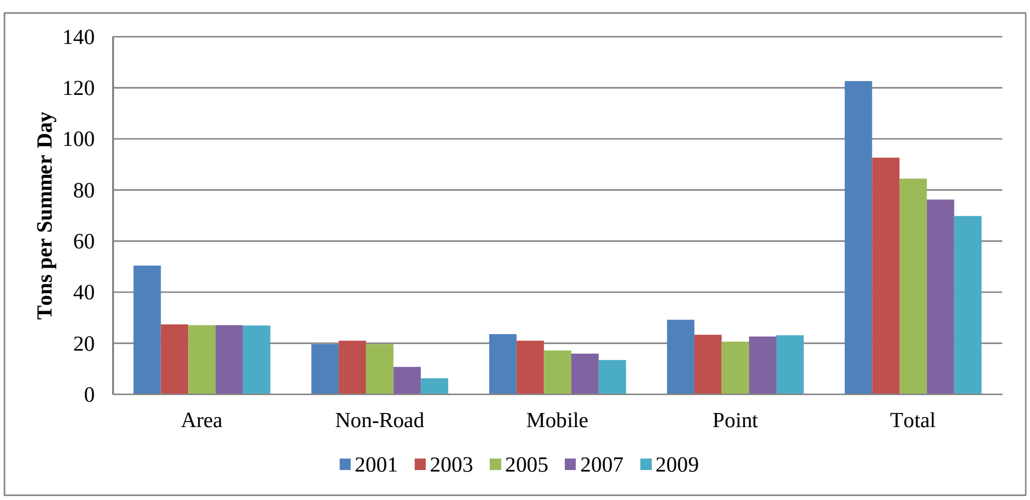
Projected Emissions Inventory

NO$_x$ Emission Inventory, Lake and Porter Counties, Indiana (Tons per Summer Day)					VOC Emission Inventory, Lake and Porter Counties, Indiana (Tons per Summer Day)			
Sector	**2005**	**2010**	**2020**	**2030**	**2005**	**2010**	**2020**	**2030**
Area	4.62	4.67	4.69	4.74	27.1	29.17	27.93	25.8
Non-Road	30.93	20.92	14.22	9.76	19.55	17.76	13.82	10.47
Mobile	57.17	41.09	14.52	11.56	17.19	12.16	5.21	4.66
Point	122.73	107.00	84.56	76.89	20.57	18.69	22.94	27.88
TOTAL	215.45	173.68	117.99	102.95	84.41	77.78	69.9	68.81

Graph 4.9 Comparisons of 2005 and 2010 (Estimated) and 2020 and 2030 (Projected) NO$_x$ Emissions for Lake and Porter Counties, Indiana



Graph 4.10 Comparisons of 2005 and 2010 (Estimated) and 2020 and 2030 (Projected) VOC Emissions for Lake and Porter Counties, Indiana



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