INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We Protect Hoosiers and Our Environment.
100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • www.idem.IN.gov

Michael R. Pence
Governor

Carol S. Comer
Commissioner

February 1, 2016

EPA Docket Center
EPA West (Air Docket)
Attention: Docket ID No. EPA-HQ-OAR-2015-0500
U.S. Environmental Protection Agency
Mailcode: 2821T
1200 Pennsylvania Avenue, NW
Washington, DC 20460

To Whom It May Concern:

The State of Indiana appreciates the opportunity to comment on the United States Environmental Protection Agency's (U.S. EPA's) Cross-State Air Pollution Rule (CSAPR) Update for the 2008 Ozone NAAQS; Proposed Rule [December 3, 2015, 80 FR 75706]. Indiana recognizes its obligation under the Good Neighbor Provision of the Clean Air Act section 110(a)(2)(D)(i)(I) to reduce interstate transport of air pollution and has enclosed technical comments on this important matter to assist U.S EPA in formulating an equitable approach for all states to address their responsibility to attain the 2008 ozone standard.

Indiana has reviewed the proposed rule and feels that Indiana's ozone contribution to downwind states is minimal. The previous final transport rule for the 1997 ozone standard, published in August of 2011, achieved maintenance for most of the ozone nonattainment monitors at a cost of $500/ton of oxides of nitrogen. Under the more protective 2008 standard and proposed rule, only a few of the maintenance monitors and none of the nonattainment monitors are projected to achieve attainment status of the 2008 ozone standard, even at a higher cost threshold of $1300/ton. Any future CSAPR analysis for the ozone standard promulgated on October 1, 2015 will require emission reductions from source categories other than electric generating units (EGUs), which are regulated exclusively at the federal level. U.S. EPA should take these considerations into account in the final rule for the 2008 ozone standard and in any future rules related to the 2015 ozone standard.

The expected deadline of May 1, 2017 for newly installed controls is too aggressive for full implementation. The timeline for implementation should be extended, including the moderate attainment date of July 1, 2018. In addition, Indiana has concerns about the data input to U.S. EPA's Integrated Planning Model (IPM). The IPM assumes shutdowns of several units, yet some of these facilities have no intention of shutting down, and some have even made recent investments on emission control

equipment. In addition, Indiana feels that the Clean Power Plan (CPP) should not be incorporated into CSAPR or integrated within IPM, given that the CPP may be altered or vacated by litigation.

Indiana conducted technical analysis to address and quantify the scope of its transport obligations. Attached to this letter are an Ozone Source Apportionment Technology (OSAT) and back trajectory analyses conducted by IDEM. The OSAT analysis shows that while Indiana's EGU emissions may contribute to downwind ozone values, other emission source categories also contribute to ozone values. Indiana believes, in order to fully address ozone transport in a cost-effective and equitable manner, other emission source categories such as non-electric generating units (non-EGUs), onroad and nonroad sources may need to achieve significant emission reductions.

The back trajectory analysis shows that exceedances at downwind ozone monitors in the northeast states frequently occur under a subtropical high pressure system known as the Bermuda High. The Bermuda High is known to create meteorological conditions that are conducive to ozone formation across the eastern coast of the United States. Under these hot and stagnant conditions, long range transport is less of a factor and local emissions and emissions from adjacent states tend to impact the Northeast states more than distant upwind states.

Please accept the attached comments and technical analysis detailing the above mentioned concerns. IDEM requests U.S. EPA take these considerations into account when finalizing the CSAPR rule. If you have any questions or need additional information, please contact Keith Baugues, Assistant Commissioner of the Office of Air Quality at (317)-232-8222 or kbaugues@idem.in.gov.

Sincerely,

Keith Baugues

Keith Baugues
Assistant Commissioner
Office of Air Quality

Attachments:
Attachment A – Technical Comments
Attachment B – OSAT Analysis
Attachment C – Trajectory Analysis

Attachment A: Technical Comments

- **Indiana feels that CSAPR is ineffective in reducing downwind air quality problems by just focusing on electric generating unit emissions.**
    - The proposed rule does not provide any relief for downwind non-attainment monitors, and only a handful of maintenance monitors. At an estimated implementation cost of $93 million dollars, the U.S. EPA is proposing a rule that will decrease ozone values at 33 non-attainment or maintenance monitors by a cumulative total of 16 parts per billion. This relates to an average of 0.485 parts per billion per monitor. The rule is ineffective at reducing the effects of upwind states' emissions on downwind nonattainment monitors in order to attain the ozone standard, the issue that the rule is designed to correct. Indiana believes that to fulfill its good neighbor obligations, NOx emission cuts must be made to other emission source categories, especially emissions from mobile sources, in addition to cuts already mandated for electric generating units (EGU). Emission reductions at other emission source categories would require rulemaking and implementations at the federal level.
    - Indiana has analyzed Ozone Source Apportionment Technology (OSAT) results provided by the Lake Michigan Air Directors Consortium (LADCO) for the 2018 emission platform. While Indiana agrees with U.S. EPA's position that Indiana's EGU NOx emissions play a role in ozone formation at downwind monitors, we believe Indiana's role is overstated. The 2018 OSAT results show other local emission source categories have a greater importance on downwind nonattainment areas. Indiana is currently awaiting 2017 OSAT results from LADCO to perform a similar analysis, but we do not anticipate those results to vary much from the 2018 OSAT results. Indiana's 2018 OSAT analysis is included with these comments as a technical addendum (Attachment B). Indiana looks forward to working with U.S. EPA to determine emission reductions in source categories that will provide nonattainment areas downwind an opportunity to demonstrate attainment. The 2017 OSAT analysis will be evaluated when it is made available to Indiana.

- **Indiana does not agree with U.S. EPA's method of linking a state with a downwind receptor.**
    - Indiana would prefer that after a state addresses its own nonattainment and maintenance issues, adjacent states should then address the nonattainment and maintenance issues in the original state. States are more likely to work with neighboring states on air quality issues. In addition, addressing more local or nearby ozone impacts will have a residual effect for nonattainment and maintenance areas further downwind. If after these first two tiers the nonattainment issue is not adequately addressed, then the next tier would be to analyze the emission impacts from states further downwind from a nonattainment or maintenance monitor, but only after all local emission source categories and emissions reduction strategies have been evaluated.

- **Indiana disagrees with the aggressive implementation schedule in the proposed rule.**
    - The schedule does not allow for ample time for facilities to install controls by the May 1, 2017 deadline. Indiana believes that more time should be given to facilities to determine the best approach to reducing emissions and go through the proper procedural steps to procure and install necessary control equipment.

- **U.S. EPA needs to clarify methodologies used to calculate proposed NOx budgets.**
    - The proposed rule states that "the EPA proposes to quantify state emission budgets using the minimum of calculated EGU emission budgets using the state-level EGU NOx emission rates that correspond to the upwind state reductions identified above using a uniform cost threshold of $1,300 per ton or 2014 monitored historic emissions " (80 FR 75739). This implies that the proposed state ozone season NOx emission budgets are obtained from the minimum value for a state listed between Table VI.D-1 (80 FR 75734) and Table VI.E-1 (80 FR 75739). The budgets obtained from Table VI.D-1 come from the difference between the 2017 emissions base case column and the $1,300 per ton reduction potential column. The proposed emission budgets given at 80 FR 75770 all come from Table VI.E-1. Following the budget calculation method that the U.S. EPA proposed, the budgets given in 80 FR 75770 are not correct. For example, the ozone season NOx emission budget given for Alabama for 2017 and beyond is 9,979 tons, which is given in Table VI.E-1. From Table V.D-1, the difference between the 2017 emissions base case and the $1,300 per ton reduction potential is 13,289 – 3,582 = 9,707 tons. Following the U.S. EPA's proposed methodology, Alabama's ozone season NOx emission budget should be 9,707 tons, not 9,979. The U.S. EPA should either correct this error or better clarify the methodology used to determine the proposed emission budgets.

- **U.S. EPA should provide calculations on how the cost threshold is used to determine the proposed state ozone season unit level NOx allocations.**
    - It is not immediately clear how this is achieved. Also, in U.S. EPA's "Unit Level Allocation and Underlying Data for the CSAPR for the 2008 Ozone NAAQS" spreadsheet, the final transport rule 2017 unit level NOx ozone season allocation seems to be "bumped up" from the initial heat input based 2017 ozone season NOx allocation. U.S. EPA should better explain this "bumped up" value that is provided in the proposed rule.

- **Indiana does not feel that U.S. EPA should incorporate Clean Power Plan (CPP) policies into the proposed CSAPR rule.**
    - The U.S. EPA states that the Clean Power Plan was used in determining the Cross State Air Pollution Rule (CSAPR) state emission allocations. Indiana disagrees with including the Clean Power Plan in these determinations. There are two reasons for this. First, under the Clean Power Plan, states are given flexibility in determining how to comply

with its 2030 goals. By considering the Clean Power Plan in the allocation determinations, the U.S. EPA is essentially forcing a particular compliance plan on the states with regards to the Clean Power Plan. Second, there is uncertainty in the future of this controversial rule. Lawsuits could delay the implementation deadlines of the rule, or the rule could be vacated by the litigation. For these two reasons, Indiana respectfully requests that the U.S. EPA not consider the Clean Power Plan in the CSAPR state allocation determinations.

- **U.S. EPA should consider basing current design values from 2013-2015 in the final rule.**
    - Indiana recommends that, upon final adoption of the rule, the U.S. EPA use the 2013-2015 ozone season data when determining the current design value of monitors and how to apply these values to modeled results for the non-attainment and maintenance monitors. The proposed rule utilizes the 2012-2014 ozone design values. When compared to other three-year average design values, 2012-2014 ozone design values could be inflated due to the high ozone values seen in 2012. The monitors that modeled nonattainment or maintenance in 2017 (with the 2012-2014 design values) may be better represented when using more recent 2013-2015 design values.

- **Indiana is concerned with assumptions made in the Integrated Planning Model**
    - IPM is consistently making decisions regarding shutting down EGU units that the utility owners have made significant investments and plan to continue to run in the future. These decisions in IPM have significant effects on budget allocations. One example is the Columbia River facility in Wisconsin; this facility invested $600 million in upgrades to comply with the Clean Power Plan, but is assumed shutdown by IPM for the purpose of CSAPR. In addition to these presumed shutdowns, IPM shuts down units but still gives the state its allocations for those units. An example of this is East Lake, Ohio facility. Reliance on the results of IPM without the ability to override these decisions in the model itself is an ongoing problem for both states and the utilities that should be addressed in a collaborative effort by EGUs, states and U.S. EPA.

- **Indiana is concerned with the unit level allocation method implemented for CSAPR**
    - U.S. EPA describes a unit level allocation method that is based on a method assigning allocations down to the unit level. This method essentially over controls some units such as Cliffy Creek unit 6 from an historic base line of 1215 tons down to 267 tons of ozone season NOx. Indiana suggests a state-wide allocation or regional allocation only.

- **U.S. EPA should consider an open and collaborative process with the states to review and comment on the IPM model and its assumptions.**
    - This collaborative process would involve stakeholders from the utilities as well as regional planning organizations and interested states. We expect that many states as

well as affected utilities will make comments on the U.S. EPA's choice in models to use for evaluating emissions for CSAPR allocations as well as future rulemakings.

Attachment B: OSAT Analysis

Background

The U.S. EPA conducted air quality modeling to study the transport of ozone pollution as a supplement to the Cross State Air Pollution Rule (CSAPR). The purpose of this modeling was to determine upwind state's ozone anthropogenic precursor emissions impacts on downwind ozone monitoring sites. The Indiana Department of Environmental Management (IDEM) Office of Air Quality (OAQ) has evaluated the results of this modeling to determine Indiana's anthropogenic impacts on selected regional and downwind ozone monitors. This report summarizes the results of that evaluation.

EPA Initial Air Quality Modeling for Future Year 2018

The U.S. EPA released initial modeling for the 2008 Ozone NAAQS in January 2015. This modeling will help states in developing Good Neighbor SIPs. The modeling had a base year of 2011 and a future year of 2018, which is the attainment year for moderate ozone non-attainment areas. The U.S. EPA provided a Technical Support Document (TSD) for this modeling on January 22, 2015 (US EPA, 2015a). This TSD provided the future year design values for all monitors in the U.S. and each state's contribution to those design values. IDEM OAQ staff has examined this TSD to determine Indiana's contribution to those design values, and determine which source categories' emissions could be cut to reduce the impact on downwind monitors for which Indiana has a significant contribution.

OAQ staff examined the state's impact on other Lake Michigan Air Director Consortium (LADCO) and other neighboring states whose current actual 8-hour ozone design values exceed the NAAQS, as well as those downwind states that are projected to be in violation of the 8-hour ozone NAAQS in 2018. This analysis looks at the Ozone Source Apportionment Technology (OSAT) results obtained from LADCO modeling. OSAT groups the NOx and VOC ozone contributions into an emission source category. The different source categories for OSAT are: area, biogenic, boundary, electric generating unit (EGU), non-electric generating unit (nonEGU), onroad, and non-road and marine (off_mar).

The OAQ analysis looked only at the anthropogenic emissions categories from the state (EGU, nonEGU, area, onroad, and off_mar). A ratio of the ozone contribution from each of these categories to the total Indiana anthropogenic contribution is calculated to give the percentage that each category contributes. The results of this analysis are provided as a pie chart for each monitor analyzed.

LADCO Region

OAQ staff pulled 2012-2014 design values from the AQS data base for ozone monitors located in the LADCO states of Illinois, Michigan, Ohio, and Wisconsin. Table 1 shows the 11 monitoring sites that have 2012–2014 design values that exceed the 2008 Ozone NAAQS, and are predicted to have a significant ozone contribution from Indiana in 2018. Table 1 gives the current design value in units of ppb, along with the future year 2018 average design value obtained from the US EPA modeling, and Indiana's anthropogenic contributions to those sites. Two of these sites are considered maintenance sites, meaning that the 2018 maximum design value exceeds the 2008 Ozone NAAQS (Monitor ID's 26-005-

0003 and 55-117-0006). It should be noted that OAQ excluded those monitors that did not have a full three ozone seasons worth of data for this analysis. Following Table 1, Figures 1 through 11 shows the OSAT pie charts with the percent of anthropogenic contribution from each source category from Indiana.

Table 1: LADCO States Current Non-Attainment Monitors Design Values, 2018 Modeled Average Value, and 2018 Indiana Contribution

Monitor ID	State	2012 - 2014 Design Value (ppb)	2018 Modeled Average Design Value (ppb)	2018 Indiana Contribution (ppb)
17-031-0032	IL	76	64.5	1.79
17-031-7002	IL	78	60.3	5.34
17-097-1007	IL	79	64.1	5.33
26-005-0003	MI	83	74.5	8.17
26-021-0014	MI	79	72.8	7.79
26-121-0039	MI	79	70.8	6.63
39-085-0003	OH	78	64.9	2.16
55-059-0019	WI	81	65.4	3.74
55-079-0085	WI	77	70.9	6.72
55-089-0008	WI	77	70.2	6.91
55-117-0006	WI	81	75.4	7.91

Figure1 - Chicago SWFP, IL

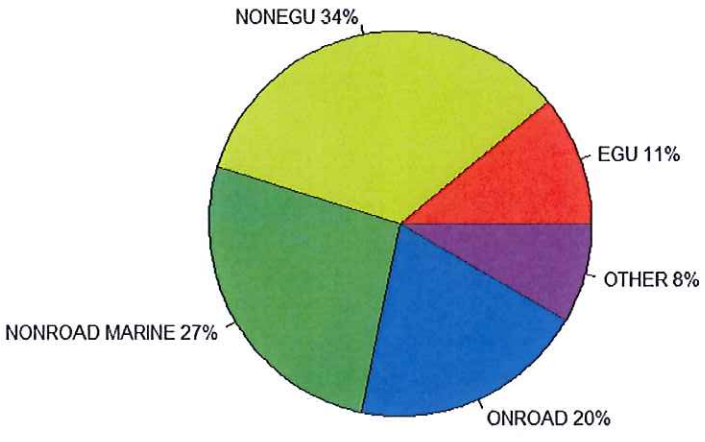


Figure 2 – Evanston, IL

Monitor ID 170317002 Indiana Contributions

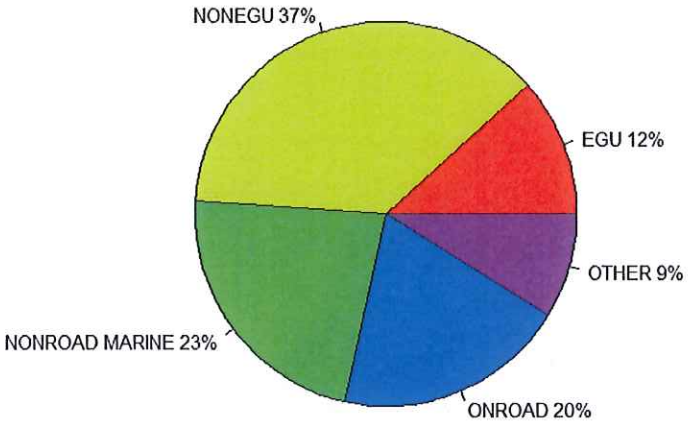


Figure 3 – Zion, IL

Monitor ID 170971007 Indiana Contributions

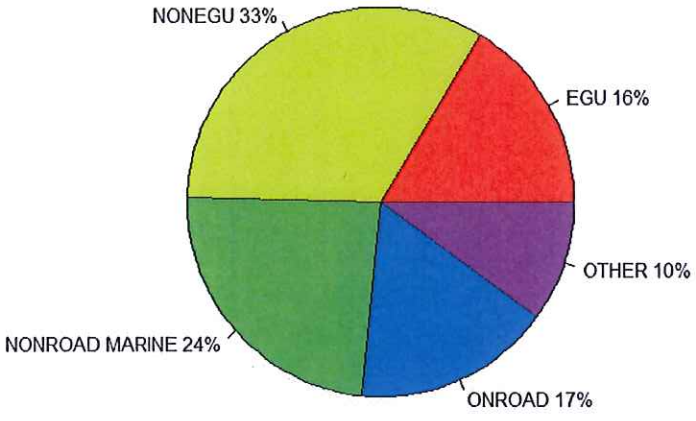


Figure 4 – Holland, MI

Monitor ID 260050003 Indiana Contributions

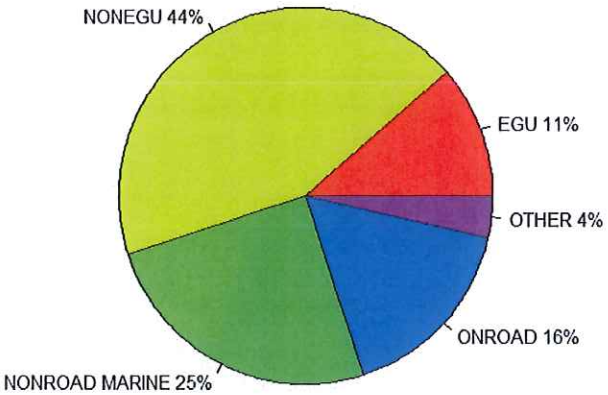


Figure 5 – Coloma, MI

Monitor ID 260210014 Indiana Contributions

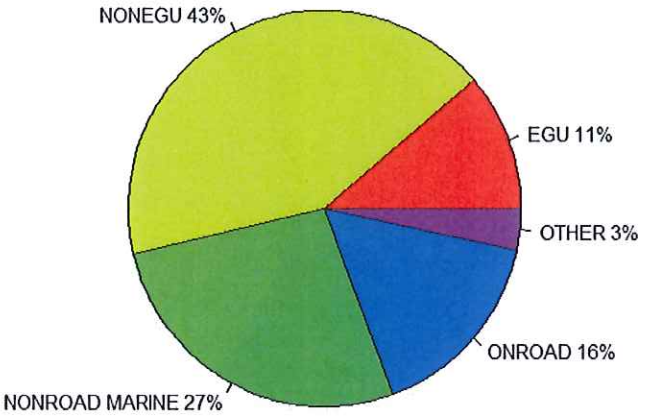


Figure 6 – Muskegon, MI

Monitor ID 261210039 Indiana Contributions

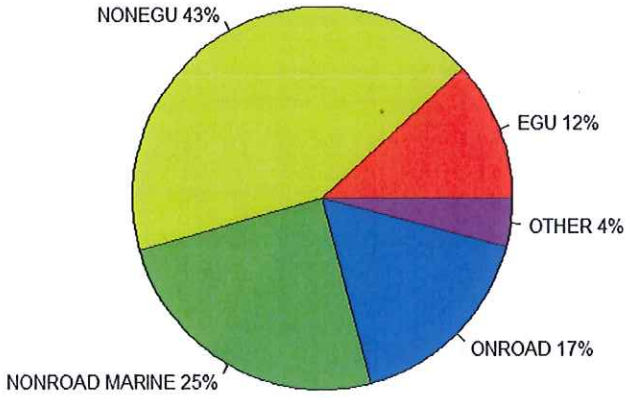


Figure 7 – Eastlake, OH

Monitor ID 390850003 Indiana Contributions

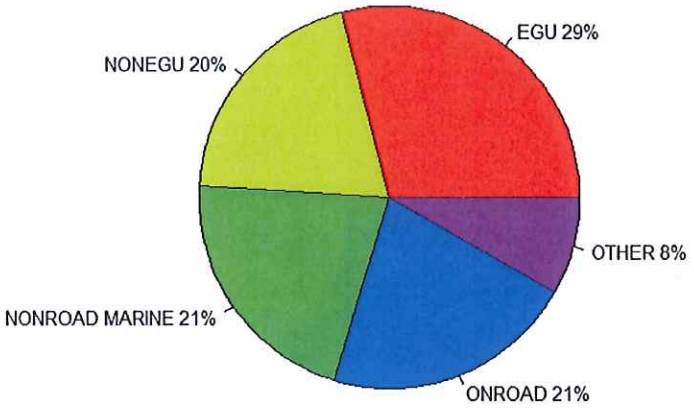


Figure 8 – Chiwaukee, WI

Monitor ID 550590019 Indiana Contributions

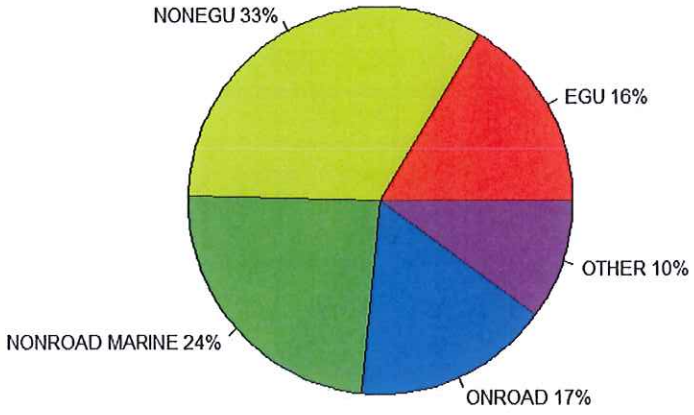


Figure 9 – Bayside, WI

Monitor ID 550790085 Indiana Contributions

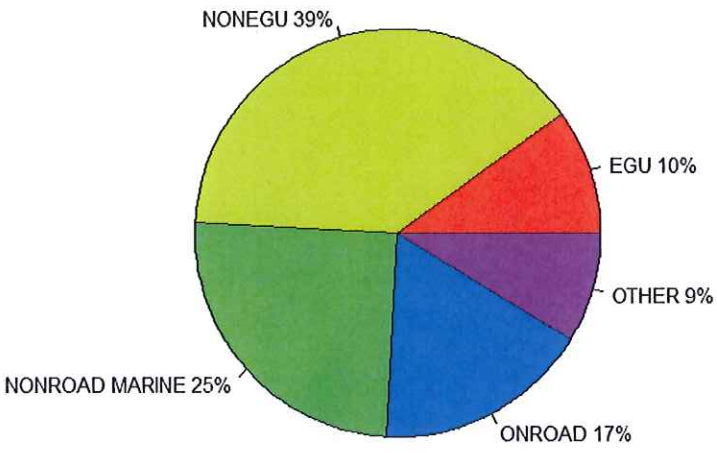


Figure 10 – Grafton, WI

Monitor ID 550890008 Indiana Contributions

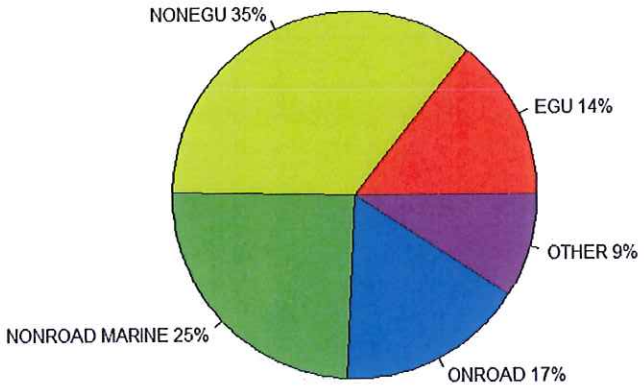
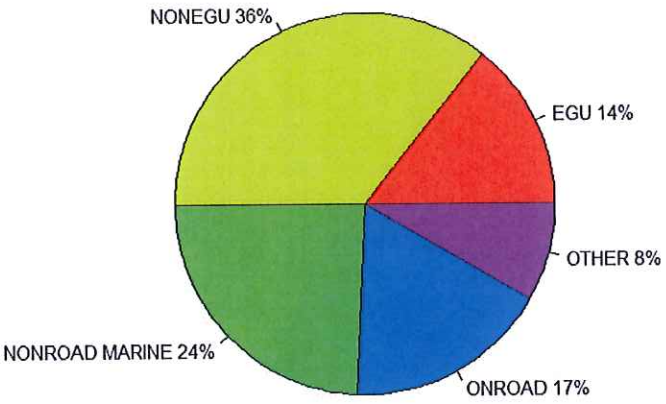


Figure 11 – Sheboygan, WI

Monitor ID 551170006 Indiana Contributions

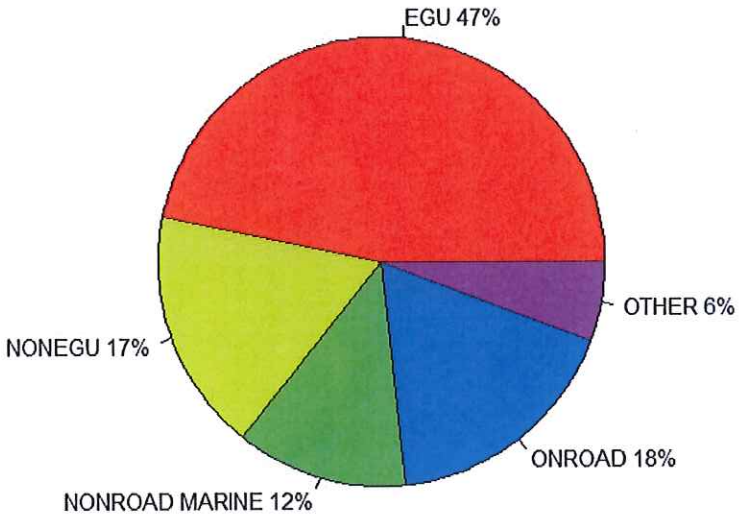


Louisville, Kentucky area

There was one monitor in Jefferson County, Kentucky that was predicted to be maintenance for the 2008 ozone NAAQS in 2018 (monitor ID 21-111-0067). However, because the U.S. EPA invalidated monitoring data that was controlled by the Louisville Air Pollution Control District, OAQ decided not to analyze this monitor, and instead use another representative monitor for the Louisville area. OAQ selected the Buckner, KY monitor (monitor ID 21-185-0004) as a representative monitor for the Louisville area. This monitor has a 2012-2014 design value of 74 ppb, and is modeled to have an average 2018 design value of 71 ppb. Indiana is predicted to have a 2018 contribution to this monitor of 14.39 ppb. Figure 12 shows the OSAT pie charts with the percent of anthropogenic contribution from each source category from Indiana.

Figure 12 – Buckner, KY

Monitor ID 211850004 Indiana Contributions



Cincinnati, Ohio area

The Cincinnati, Ohio area currently does not have any non-attainment monitors. However, there are ten monitors that have a 2009-2013 5-year weighted design value of 76 ppb or greater. OAQ analyzed the monitor with the highest 5-year weighted design value (monitor ID 39-061-0006) and the monitor with the highest Indiana contribution (monitor ID 21-015-0003). Table 2 shows the 2009-2013 5-year weighted averaged design values, 2018 modeled average design value, and Indiana's 2018 contribution. Figures 13 and 14 show the OSAT pie charts with the percent of anthropogenic contribution from each source category from Indiana.

Table 2: Cincinnati Area Design Values and 2018 Indiana Contributions

Monitor ID	State	2009-2013 Design Value (ppb)	2018 Modeled Average Design Value (ppb)	2018 Indiana Contribution (ppb)
39-061-0006	OH	82	73.2	6.61
21-015-0003	KY	68	59.8	12.78

Figure 13 – Sycamore, OH

Monitor ID 390610006 Indiana Contributions

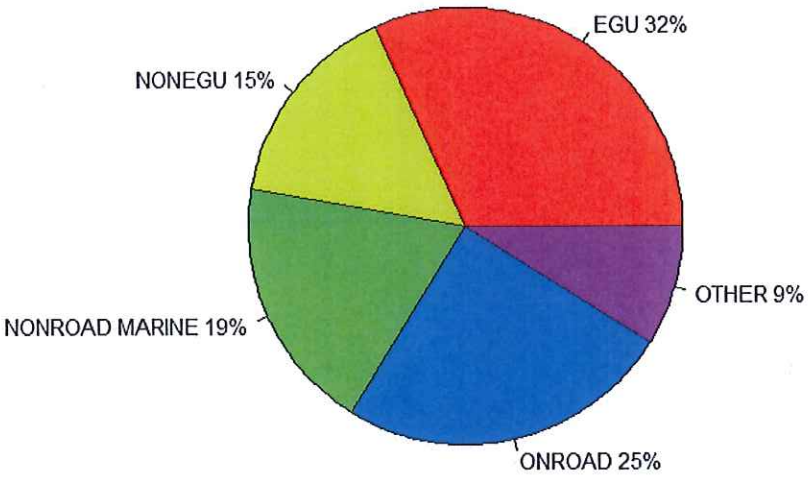
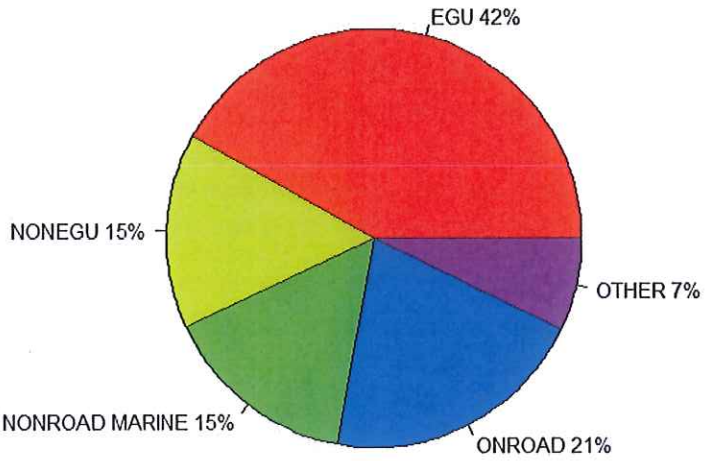


Figure 14 – East Bend, KY

Monitor ID 210150003 Indiana Contributions



Northeast States

OAQ applied the same type of OSAT analysis described above for the LADCO states ozone monitors in the northeast United States predicted to be nonattainment or maintenance in 2018 for the 2008 ozone NAAQS, and for which Indiana had a significant ozone contribution. Table 3 shows those monitors, their current 5-year weighted design values, the predicted 2018 average design value, and Indiana's anthropogenic contribution to those sites. Only the first two sites listed are considered nonattainment, the remaining six sites are considered maintenance sites. Figures 15 through 22 show the OSAT pie charts with the percent of anthropogenic contribution from each source category from Indiana.

Table 3: Northeast States Design Values and 2018 Indiana Contributions

Monitor ID	State	2009-2013 Design Value (ppb)	2018 Modeled Average Design Value (ppb)	2018 Indiana Contribution (ppb)
24-025-1001	MD	90	79.4	1.93
36-103-0002	NY	83.3	78.2	1.01
9-001-0017	CT	80.3	76.7	1.03
9-009-9002	CT	85.7	77.5	0.8
34-007-1001	NJ	82.7	72.3	1.65
34-015-0002	NJ	84.3	74	1
36-085-0067	NY	81.3	74.6	0.9
42-101-0024	PA	83.3	74.7	2.01

Figure 15 – Edgewood, MD

Monitor ID 240251001 Indiana Contributions

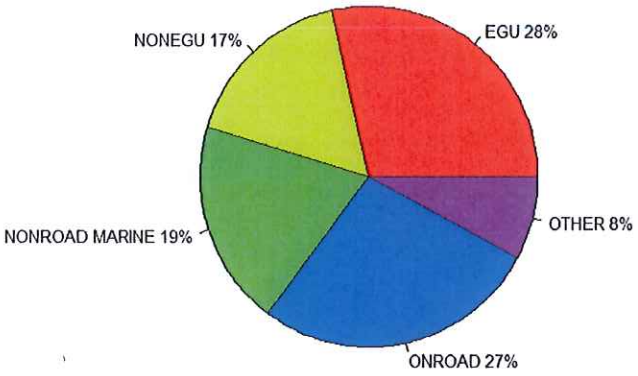


Figure 16 - Babylon

Monitor ID 361030002 Indiana Contributions

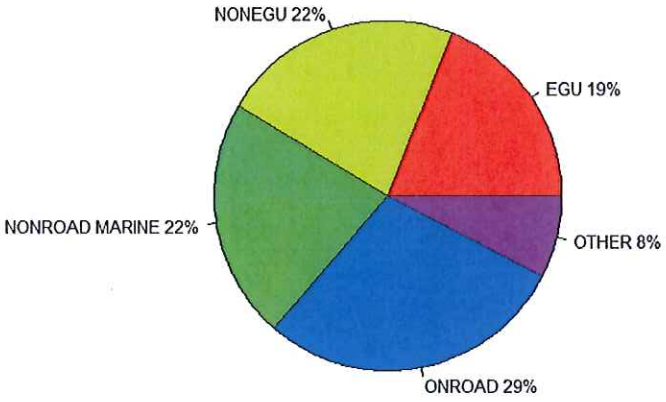


Figure 17 – Greenwich, CT

Monitor ID 90010017 Indiana Contributions

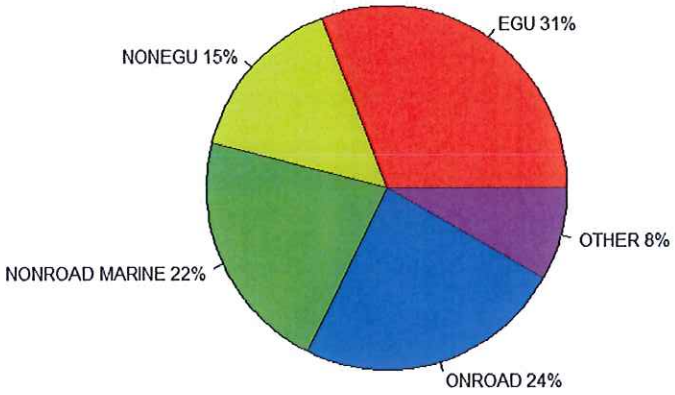


Figure 18 – Madison, CT

Monitor ID 90099002 Indiana Contributions

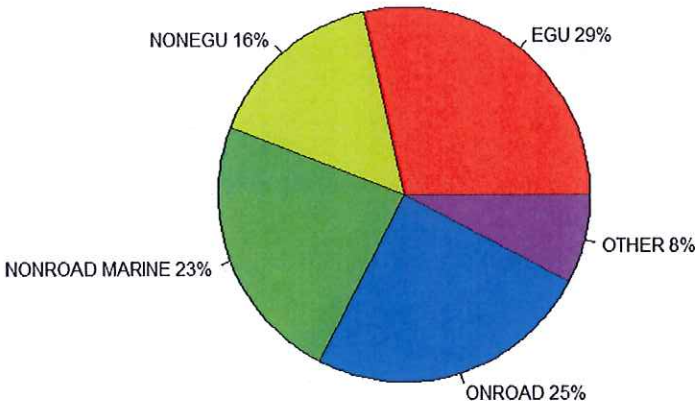


Figure 19 – Hammonton, NJ

Monitor ID 340071001 Indiana Contributions

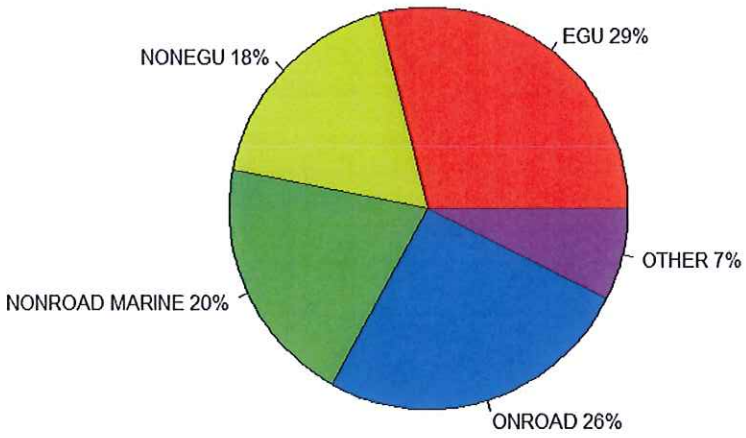


Figure 20 – Clarksboro, NJ

Monitor ID 340150002 Indiana Contributions

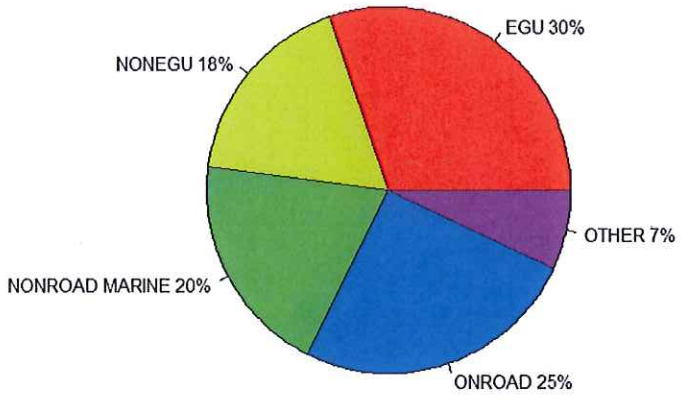


Figure 21 – Staten Island, NY

Monitor ID 360850067 Indiana Contributions

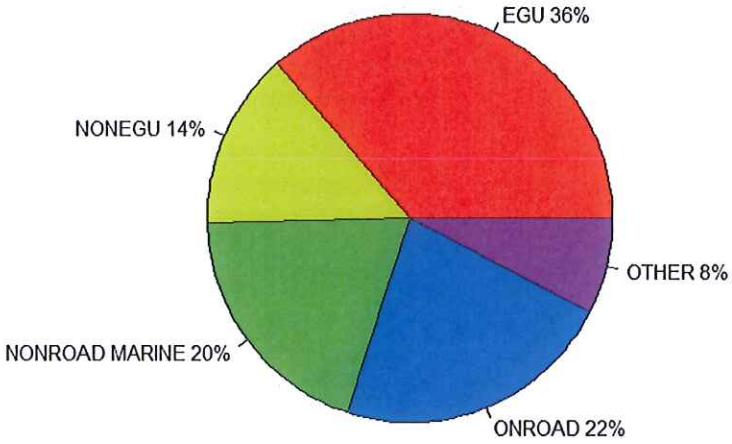
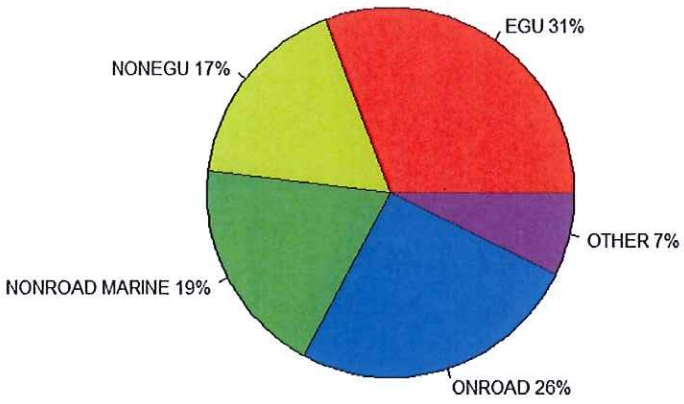


Figure 22 – Philadelphia, PA

Monitor ID 421010024 Indiana Contributions



US EPA Updated Air Quality Modeling for Future Year 2017

The U.S. EPA released updated modeling for the 2008 Ozone NAAQS in August 2015. This updated modeling adjusted the future year modeling to 2017, while continuing to use a 2011 base year. This adjustment was needed because the original attainment date for moderate ozone non-attainment areas fell in July 2018, which is in the middle of an ozone season. A requirement to have three full ozone seasons worth of data would not be met with an attainment date of July 2018, so the future year modeling was adjusted up to account for this situation. This adjustment means that the attainment designations will be based on the ozone seasons for 2015, 2016, and 2017.

The U.S. EPA provided a TSD for the air quality modeling on August 20th, 2015 (US EPA, 2015b). This TSD provided the future year design values for all monitors in the U.S. and each state's contribution to those design values. IDEM OAQ staff have examined the air quality results that US EPA has provided to determine Indiana's contribution to those design values, and determine which source categories could see emission cuts.

Currently, OAQ does not have the 2017 emission files that were used for this modeling, and no OSAT results are available for the 2017 modeling. However, OAQ staff has examined the results and identified those monitoring sites that are either considered nonattainment or maintenance sites for 2017 that have a significant contribution from Indiana. Table 4 shows those monitors that are predicted to be nonattainment in 2017 with their current 2009-2013 5-year weighted design values, 2017 average design value, and 2017 Indiana contributions. Table 5 shows the same information for the maintenance monitors. It should be noted that when compared to the 2018 modeling results, there are 5 more nonattainment monitors and 9 more maintenance sites predicted in 2017 that have a significant impact from Indiana. Of the five additional nonattainment sites, one site was considered a maintenance site in 2018 (Monitor ID 55-117-0006). Of the 11 total maintenance sites in 2017, only one of those sites was considered a maintenance site in 2018 (Monitor ID 26-005-0003).

Table 4: 2017 Non-Attainment Monitor's Design Values and Indiana Contributions

Monitor ID	State	2009-2013 Average Design Value (ppb)	2017 Average Design Value (ppb)	2017 Indiana Contribution (ppb)
39-061-0006	OH	82.0	76.3	7.15
55-117-0006	WI	84.3	77.0	6.24
24-025-1001	MD	90.0	81.3	1.88
36-103-0002	NY	83.3	79.2	1.03
36-085-0067	NY	81.3	76.3	1.02
9-001-9003	CT	83.7	78.0	0.89
9-001-3007	CT	84.3	77.1	0.76

Table 5: 2017 Maintenance Monitor's Design Values and Indiana Contributions

Monitor ID	State	2009-2013 Average Design Value (ppb)	2017 Average Design Value (ppb)	2017 Indiana Contribution (ppb)
21-185-0004	KY	82.00	75.80	14.95
24-005-3001	MD	80.70	73.20	1.53
26-005-0003	MI	82.70	75.50	8.02
26-163-0019	MI	78.70	74.00	2.64
34-007-1001	NJ	82.70	74.20	1.71
34-029-0006	NJ	82.00	73.90	1.06
34-015-0002	NJ	84.30	75.10	1.02
34-023-0011	NJ	81.30	73.00	0.85
36-081-0124	NY	78.00	75.70	0.80
42-003-1005	PA	80.70	75.30	1.86
42-101-0024	PA	83.30	75.10	1.71

While the 2017 OSAT results for these monitors are not currently available, OAQ staff has analyzed the 2018 OSAT results for these monitors to determine what emission categories could be reduced. Figures 23 through 30 below show those pie charts that were not be listed above.

Figure 23 – Westport, CT

Monitor ID 90019003 Indiana Contributions

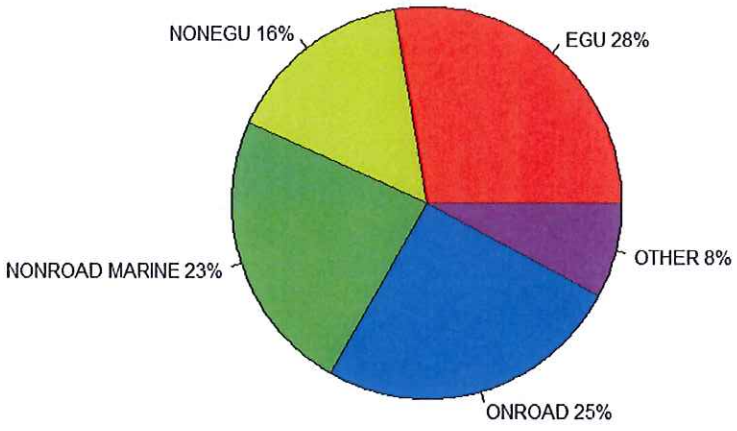


Figure 24 – Stratford, CT

Monitor ID 90013007 Indiana Contributions

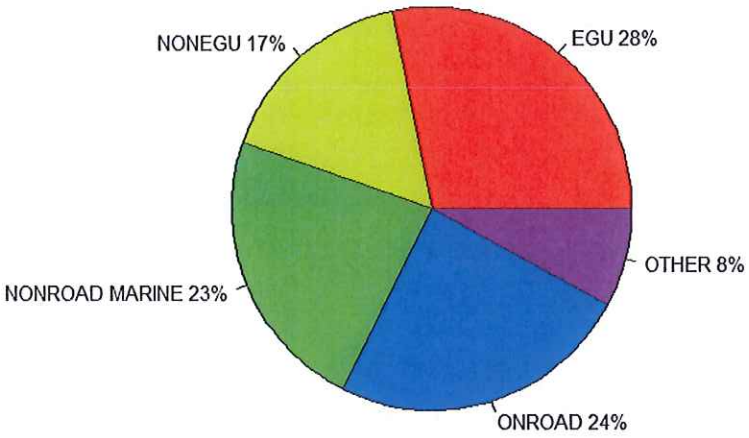


Figure 25 – Essex, MD

Monitor ID 240053001 Indiana Contributions

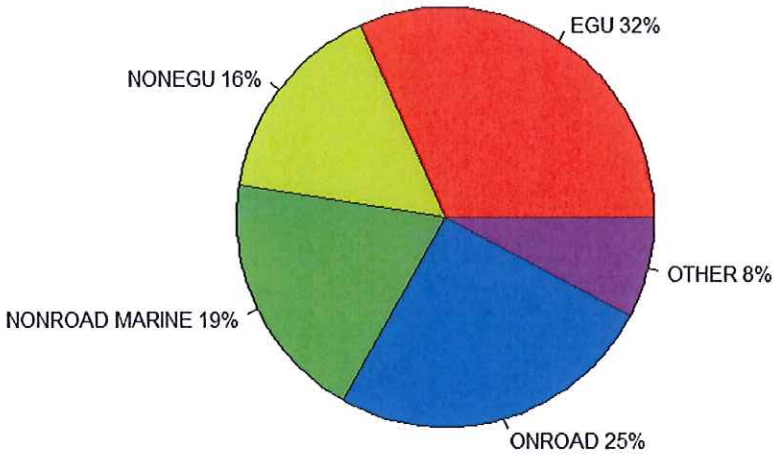


Figure 26 – Detroit, MI

Monitor ID 261630019 Indiana Contributions

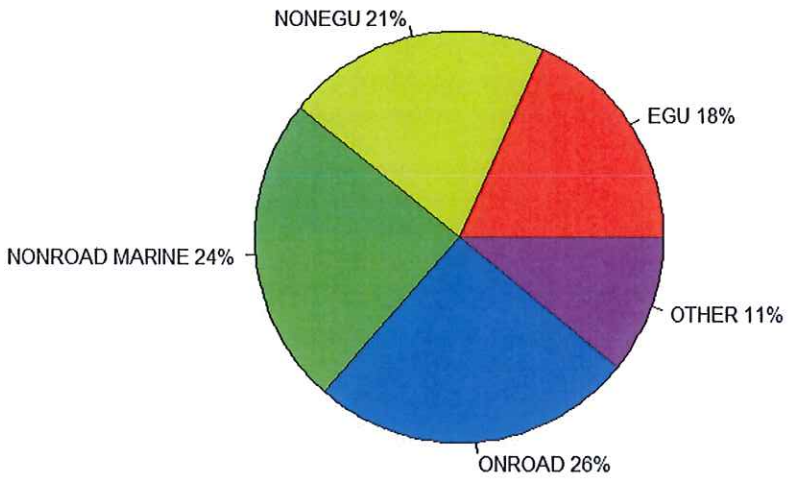


Figure 27 – Colliers Mill, NJ

Monitor ID 340290006 Indiana Contributions

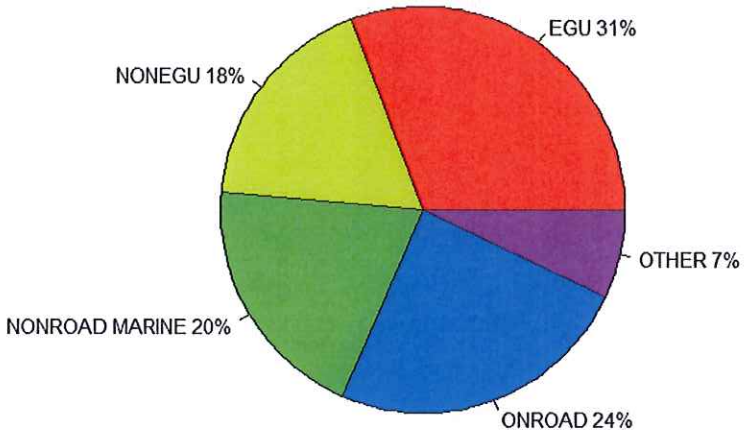


Figure 28 – New Brunswick, NJ

Monitor ID 340230011 Indiana Contributions

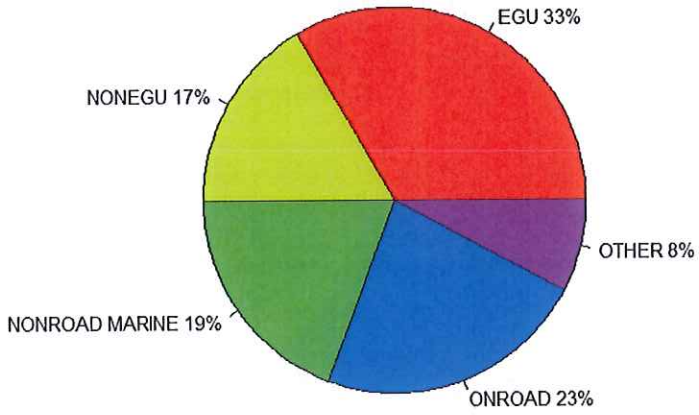


Figure 29 – Queens, NY

Monitor ID 360810124 Indiana Contributions

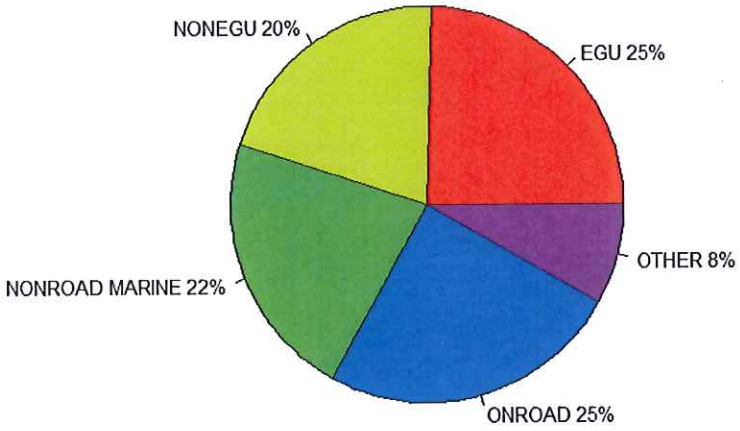
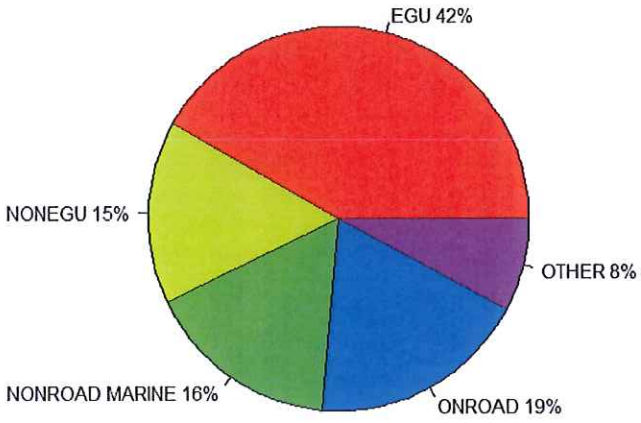


Figure 30 – Pittsburg, PA

Monitor ID 420031005 Indiana Contributions



December 2015 Rule Update

U.S. EPA updated the proposed CSAPR rule in December of 2015. While the air quality modeling results did not change from the August 2015 update, US EPA considered the current 2012-2014 design values to determine whether a monitor would be designated as nonattainment or maintenance. A modeled 2017 nonattainment monitor that had a 2012-2014 design value that did not exceed the NAAQS is now considered to be a maintenance monitor. After this update, Indiana has a significant contribution to 3 nonattainment monitors and 16 maintenance monitors. Table 6 shows these 18 monitors, their 2012-2014 design value, the modeled 2017 average design value, and whether the monitor is considered an nonattainment or maintenance monitor. This analysis excludes the monitor in Jefferson County, KY, as explained above.

Conclusion

While there is contribution to ozone impacts from EGUs, there is significant contribution from other emission source categories as well. Emissions from Indiana on-road and non-road/marine emission sources contribute at least 30 percent of the ozone impacts from the state at every monitor discussed in this analysis. Indiana believes that no further significant emission reductions can be achieved from the EGU sources to adequately address attainment issues in other states. Full attainment of the 2008 ozone NAAQS will require further reductions from emission sources other than EGUs, especially mobile sources. In order for states to meet their obligation to address long range transport issues, the burden

of creating rulemaking and implementing these emission reductions should fall on the federal government, not on the states.

Table 6: December 2015 Update to CSAPR Air Quality Modeling

Monitor ID	2012-2014 Design Values	2017 Average Design Values	Non-attainment or Maintenance
9-001-3007	84.0	77.1	Non-attainment
9-001-9003	85.0	78.0	Non-attainment
55-117-0006	81.0	77.0	Non-attainment
21-185-0004	74.0	73.7	Maintenance
24-005-3001	72.0	73.2	Maintenance
24-025-1001	75.0	81.3	Maintenance
26-005-0003	83.0	75.5	Maintenance
26-163-0019	74.0	74.0	Maintenance
34-007-1001	76.0	74.2	Maintenance
34-015-0002	76.0	75.1	Maintenance
34-023-0011	74.0	73.0	Maintenance
34-029-0006	75.0	73.9	Maintenance
36-081-0124	72.0	75.7	Maintenance
36-085-0067	73.0	76.3	Maintenance
36-103-0002	73.0	79.2	Maintenance
39-061-0006	75.0	76.3	Maintenance
42-003-1005	77.0	75.3	Maintenance
42-101-0024	75.1	75.0	Maintenance

References

U.S. Environmental Protection Agency, 2015a. Air Quality Modeling Technical Support Document for the 2008 Ozone NAAQS Transport Assessment. (http://www.epa.gov/airtransport/ozonetransportNAAQS.html)

U.S. Environmental Protection Agency, 2015b. Updated Air Quality Modeling Technical Support Document for the 2008 Ozone NAAQS Transport Assessment. (http://www.epa.gov/airtransport/ozonetransportNAAQS.html)

Attachment C: Trajectory Analysis

Indiana performed a trajectory analysis over a three-year period from 2012 through 2014 for 230 monitors in the northeast states. Using the National Oceanic and Atmospheric Administration's (NOAA) HYSPLIT model, Indiana calculated approximately 1 million 72-hour back trajectories and paired them with air quality data from monitors across the northeast states using U.S. EPA's Air Quality System (AQS) database. Pairing the trajectories with the air quality data allowed Indiana to conduct an analysis of air pollution transport. Two trajectories were calculated for every day of the ozone season in the years 2012 through 2014 for each ozone monitor in the northeast and for each height above ground level. The first of these two trajectories corresponded to the beginning of the 8-hour ozone averaging period while the second of the daily trajectories corresponded to the end of the of the 8-hour ozone averaging period. This approach brackets the period used in determining ozone design values and is an appropriate method to evaluate long-range transport of air pollution.

Indiana also performed a cluster analysis of these trajectories to show general patterns of air flow and to determine which air flow patterns where most likely to result in exceedances of the NAAQS standards. The results of this analysis are shown below for the 1000 meter level in the atmosphere at monitors where Indiana was found to have a linkage to downwind air quality monitors. The two locations shown were chosen based on previous U.S. EPA photochemical modeling linking these monitor locations; however, these two monitors represent the general pattern of trajectories throughout the Northeast states.

The results of this analysis indicated that any impact from Indiana was most likely to occur at higher levels above the monitor at approximately (1000 meters) and that any contribution from Indiana would likely occur under certain meteorological conditions. Trajectories passing over Indiana, associated with high ozone values at monitors downwind, were frequently found to occur under clockwise flow around a high pressure system known as the Bermuda High centered along the east coast of the United States. Thus, any transport from Indiana would also occur under regional meteorological conditions in the northeast conducive to ozone formation. The results of these two locations in the northeast are representative of similar analysis across all monitors in the northeast, which generally show exceedance trajectories as part of clockwise circulation of the Bermuda high pressure system across the east coast of the U.S.

Figure 1 – Harford, MD (24-025-1001) Trajectories associated with an exceedance of the 2008 ozone NAAQS at 10 meters above ground level.

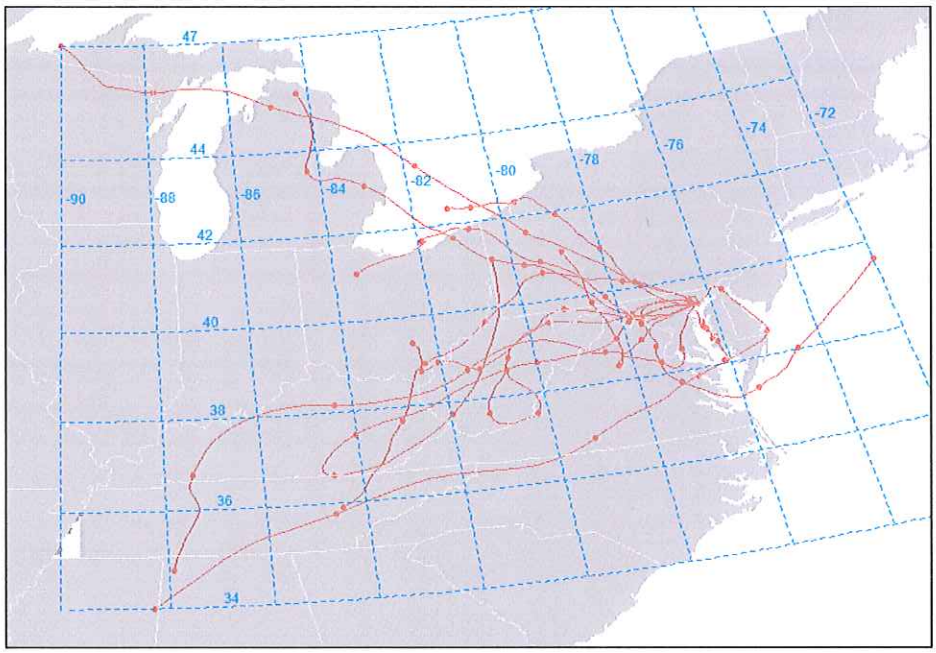


Figure 2 – Harford, MD (24-025-1001) Trajectories associated with an exceedance of the 2008 ozone NAAQS at 100 meters above ground level.

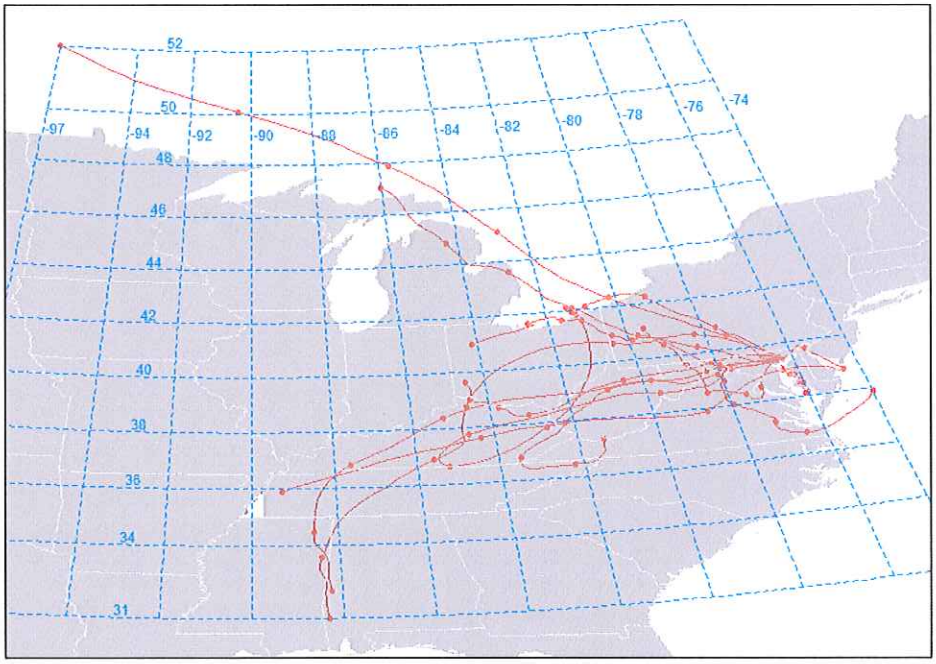


Figure 3 - Harford, MD (24-025-1001) Trajectories associated with an exceedance of the 2008 ozone NAAQS at 1000 meters above ground level.

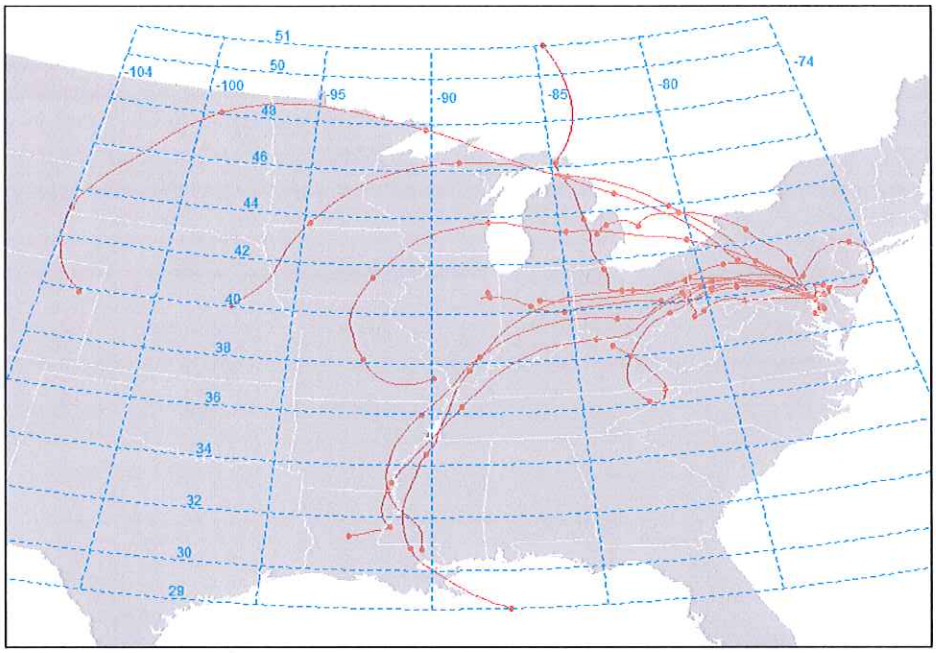


Figure 4 - The graphic below shows ozone concentration (ppm) by cluster for the Harford, MD monitor (24-025-1001). Cluster 5 is the cluster belonging to the Bermuda High Pressure System and the highest June and July concentrations occur with cluster 5.

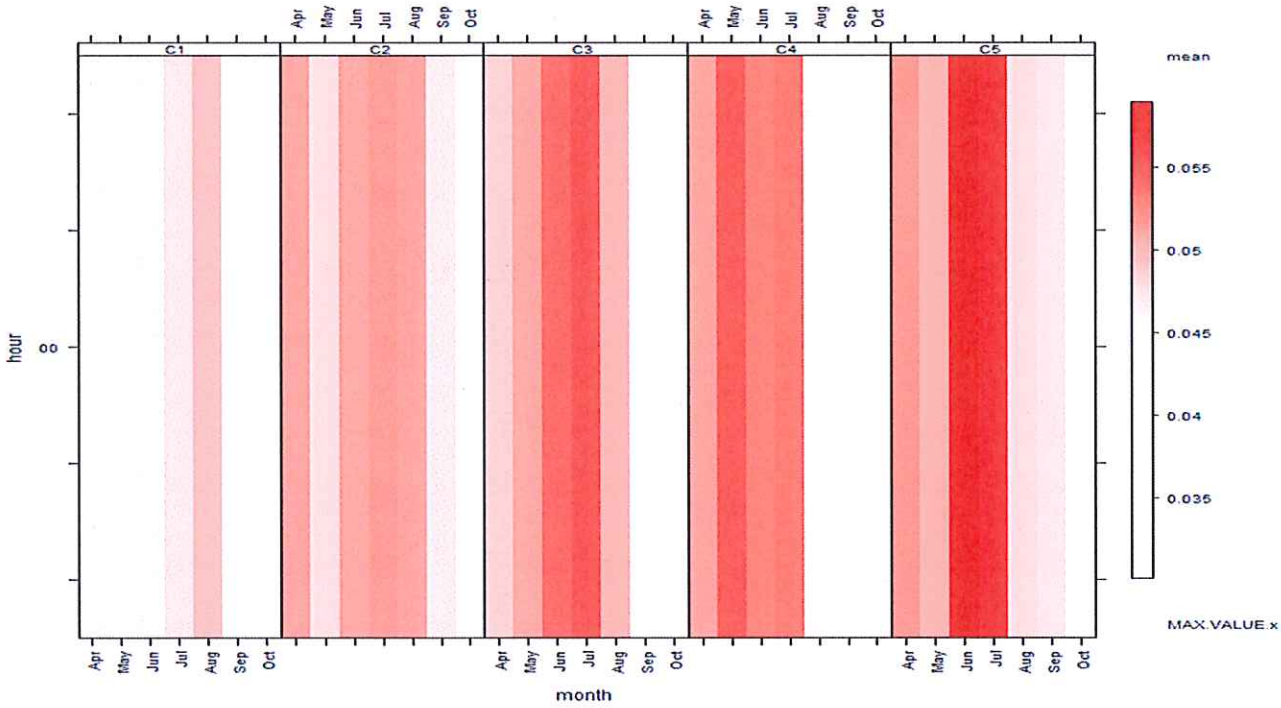
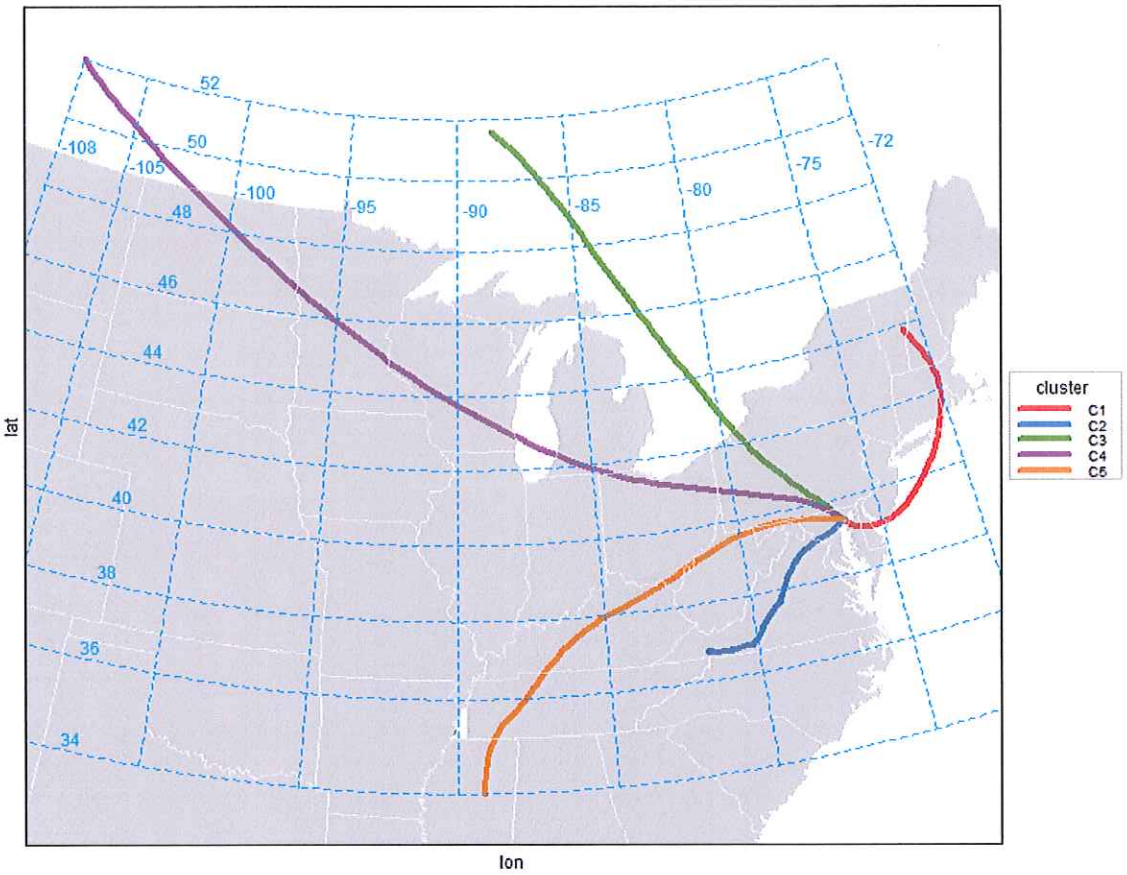


Figure 5 - Harford, MD (24-025-1001) Cluster Analysis of All 2012-2014 Ozone Season (May 1 – Sept 30) Trajectories with statistical monitor data for each cluster (Table). The image of the trajectory clusters shows the mean trajectory for each cluster. The statistical table shows clusters 2 and 5 as having the highest average and median concentrations. These clusters are both associated with the clockwise flow around the Bermuda High pressure.



Cluster	Number of Trajectories	Mean (ppm)	Median (ppm)	Max (ppm)
C1	129	0.0444	0.0440	0.076
C2	138	0.0487	0.0490	0.086
C3	131	0.0478	0.0470	0.083
C4	66	0.0441	0.0445	0.095
C5	122	0.0511	0.0510	0.106

Figure 6 - Suffolk, NY (36-103-0002) Trajectories associated with an exceedance of the 2008 ozone NAAQS at 1000 meters above ground level.

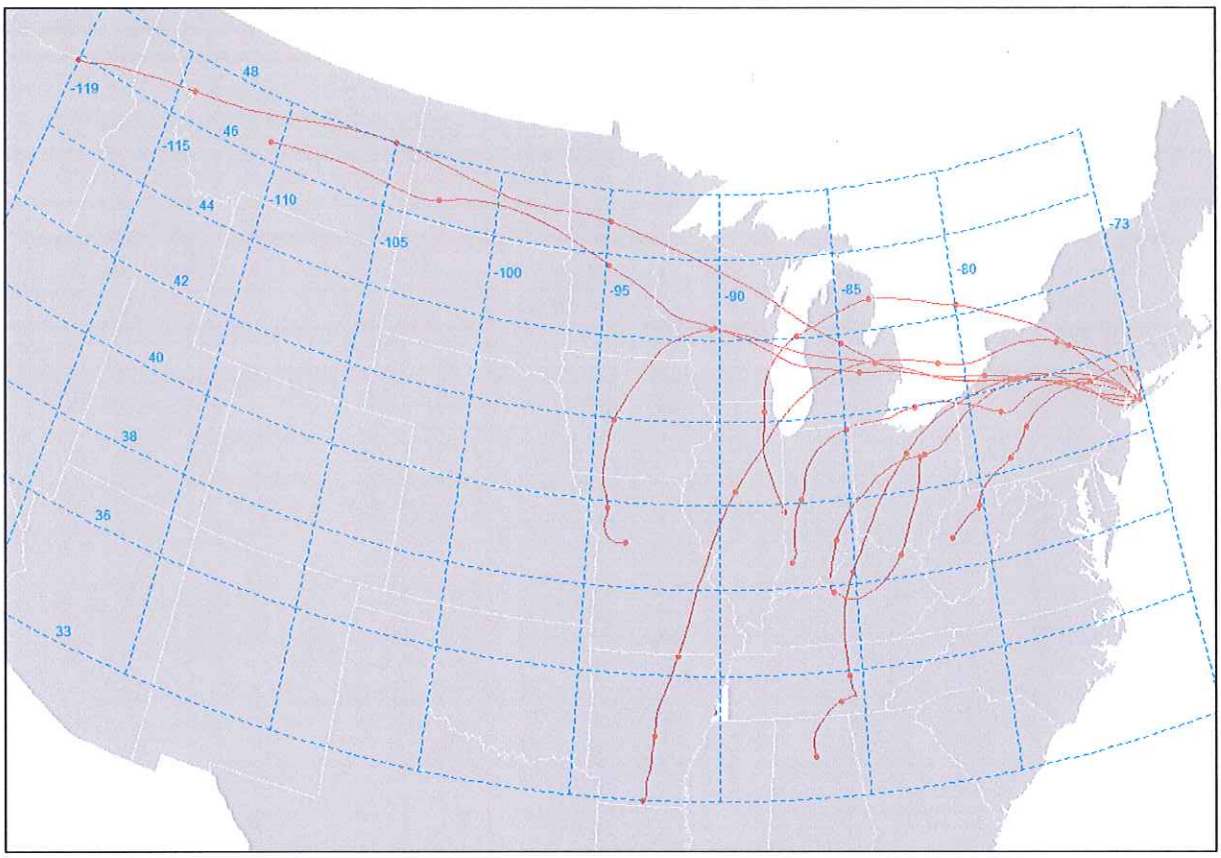
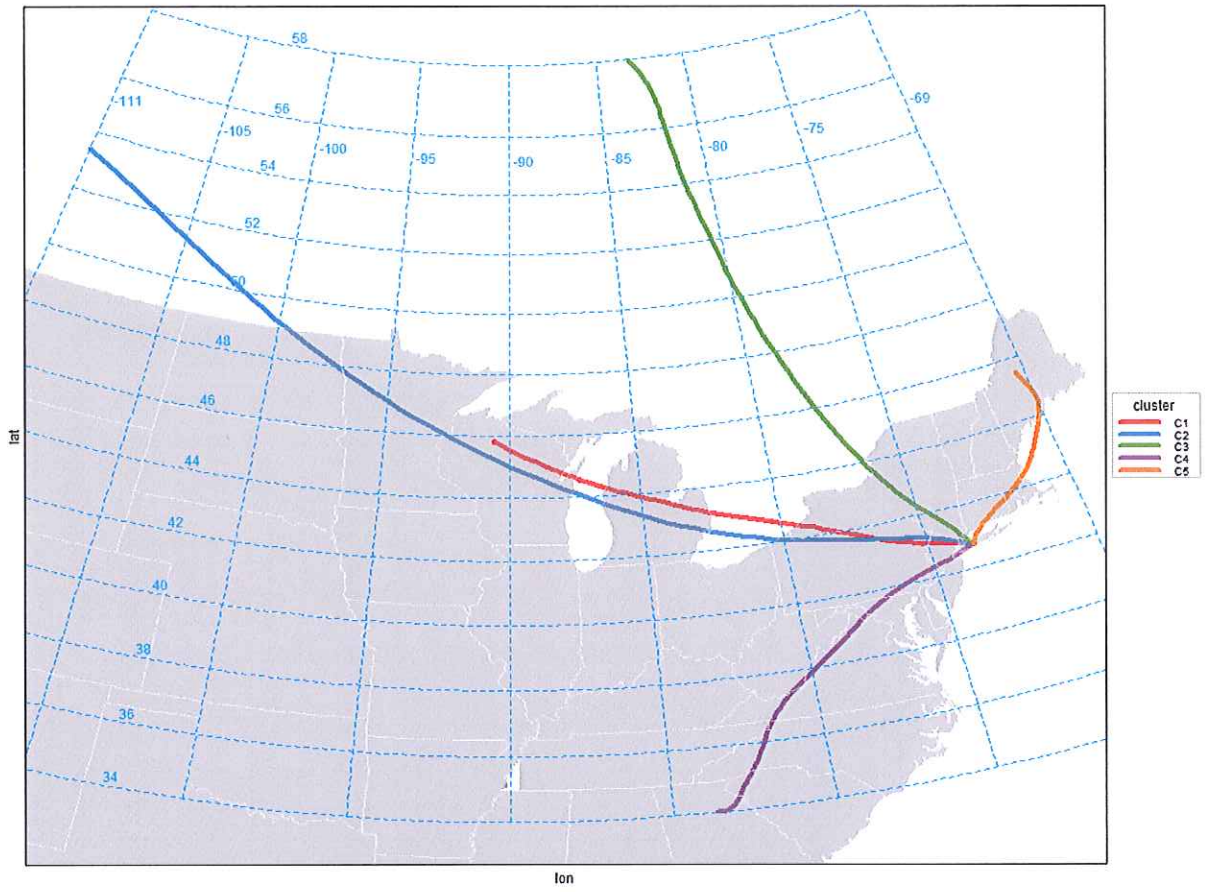
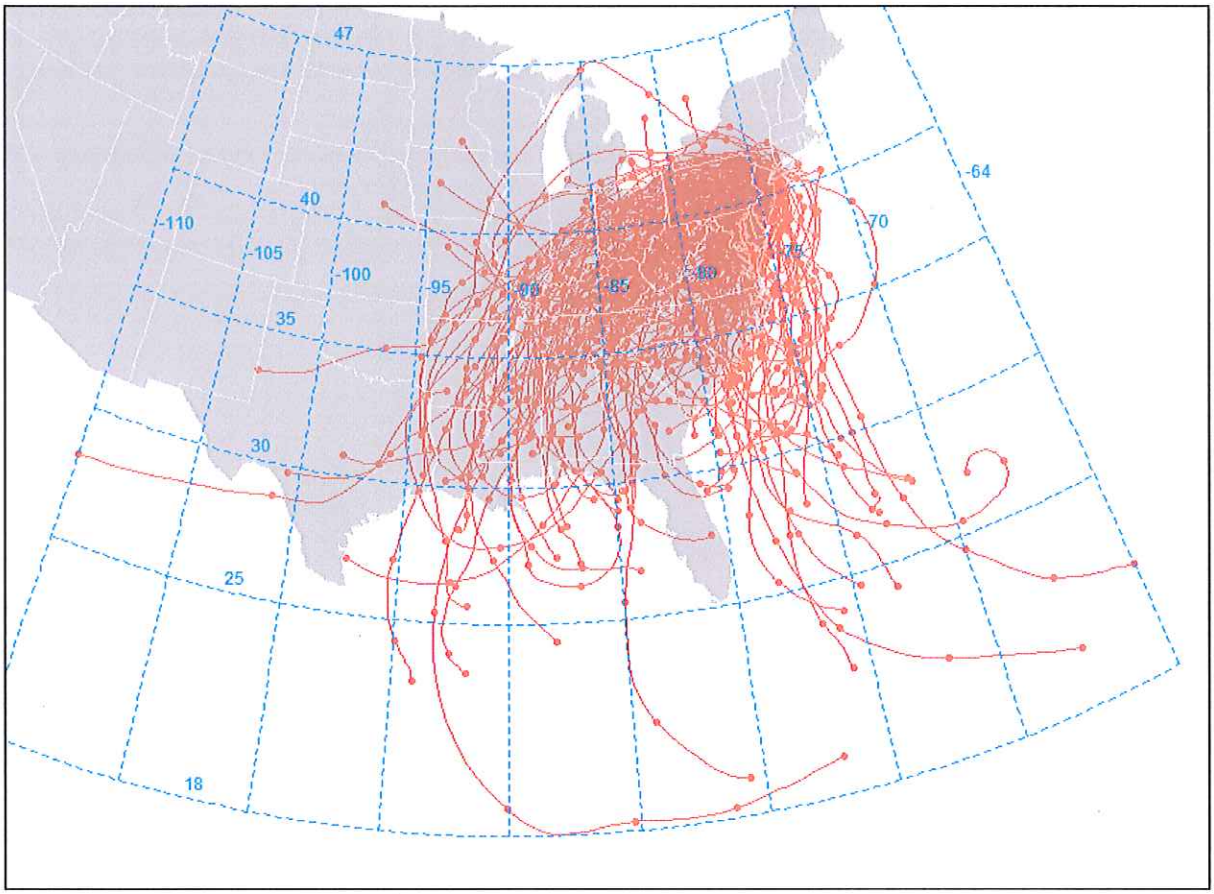


Figure 7 - Suffolk, NY (36-103-0002) Cluster Analysis of All 2012-2014 Ozone Season (May 1 – Sept 30) Trajectories with statistical monitor data for each cluster (Table). The image of the trajectory clusters shows the mean trajectory for each cluster. Cluster 4 would be associated with the Bermuda high and has the largest Maximum 8-hour ozone concentration.



Cluster	Number of Trajectories	Mean (ppm)	Median (ppm)	Max (ppm)
C1	127	0.0507	0.0520	0.083
C2	83	0.0476	0.0480	0.083
C3	66	0.0486	0.0495	0.074
C4	136	0.0483	0.0470	0.095
C5	122	0.0456	0.0460	0.073

Figure 6 - Suffolk, NY (36-103-0002) Cluster 4 Trajectories – 1000 meters above ground level. Most cluster 4 trajectories belong to the subtropical Bermuda high pressure circulation. This high pressure cell creates meteorological conditions conducive to ozone formation (i.e. clear skies, subsidence, etc.)



August 2015, U.S. EPA Photochemical Modeling Update

In August of 2015, U.S. EPA updated its photochemical modeling used to develop and determine state budgets in CSAPR. For the most recent photochemical modeling, Indiana was linked to three nonattainment monitors. Two of these monitors are located in Fairfield County, CT. The updated modeling did not indicate a linkage between Indiana and previously linked monitors located in Harford, MD and Suffolk, NY. The above analysis for the Harford County, MD monitor and Suffolk, NY monitor, however, render similar results and trajectories as would be expected for the two Connecticut monitors for which Indiana is now linked according to the new photochemical modeling. While Indiana understands that we are required to address our transport obligations, the trajectories indicate that Indiana contributes most often when the northeast states are simultaneously influenced by the Bermuda High Pressure System. This high pressure system produces local meteorological conditions conducive to ozone formation.

The third nonattainment monitor for which Indiana is linked according to the newest modeling is in Sheboygan, WI. The plot below shows daily 72-hour back trajectories for the Sheboygan monitor using 2015 meteorology. Many of these trajectories have air parcels originating from Canada, outside of U.S. jurisdiction. In addition, states that are not linked to Sheboygan air quality problems have a greater number of trajectories passing through these states than states that are linked to Sheboygan air quality issues.

Figure 7 - Sheboygan, WI 2015 trajectories at 1000 meter above ground level. Sheboygan, WI is listed as a nonattainment monitor for the 2017 analysis year and has a linkage with Indiana in US EPA photochemical modeling. Many trajectories originated outside of the continental U.S. and, overall, only a small percentage of all trajectories passed over Indiana.

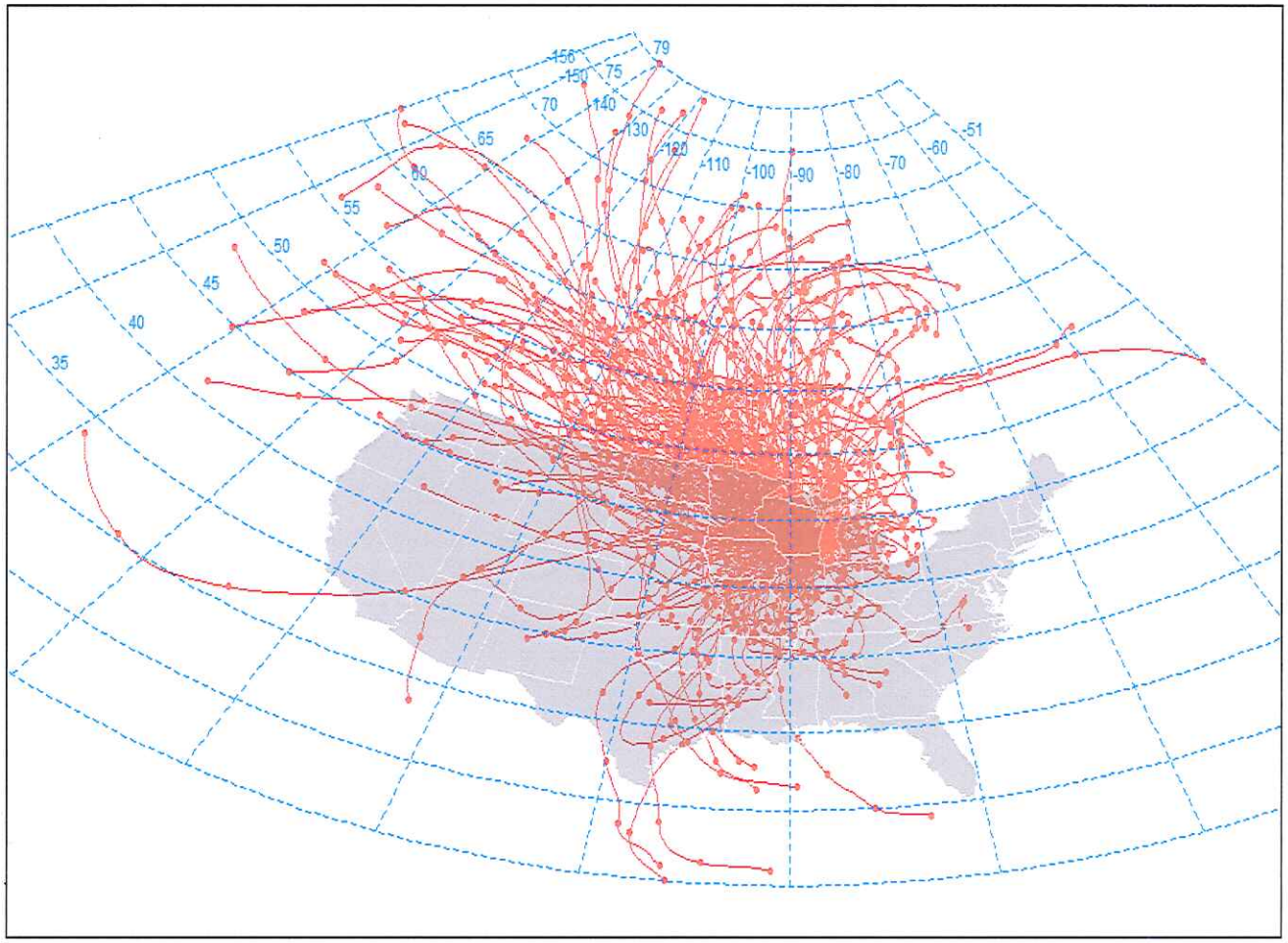
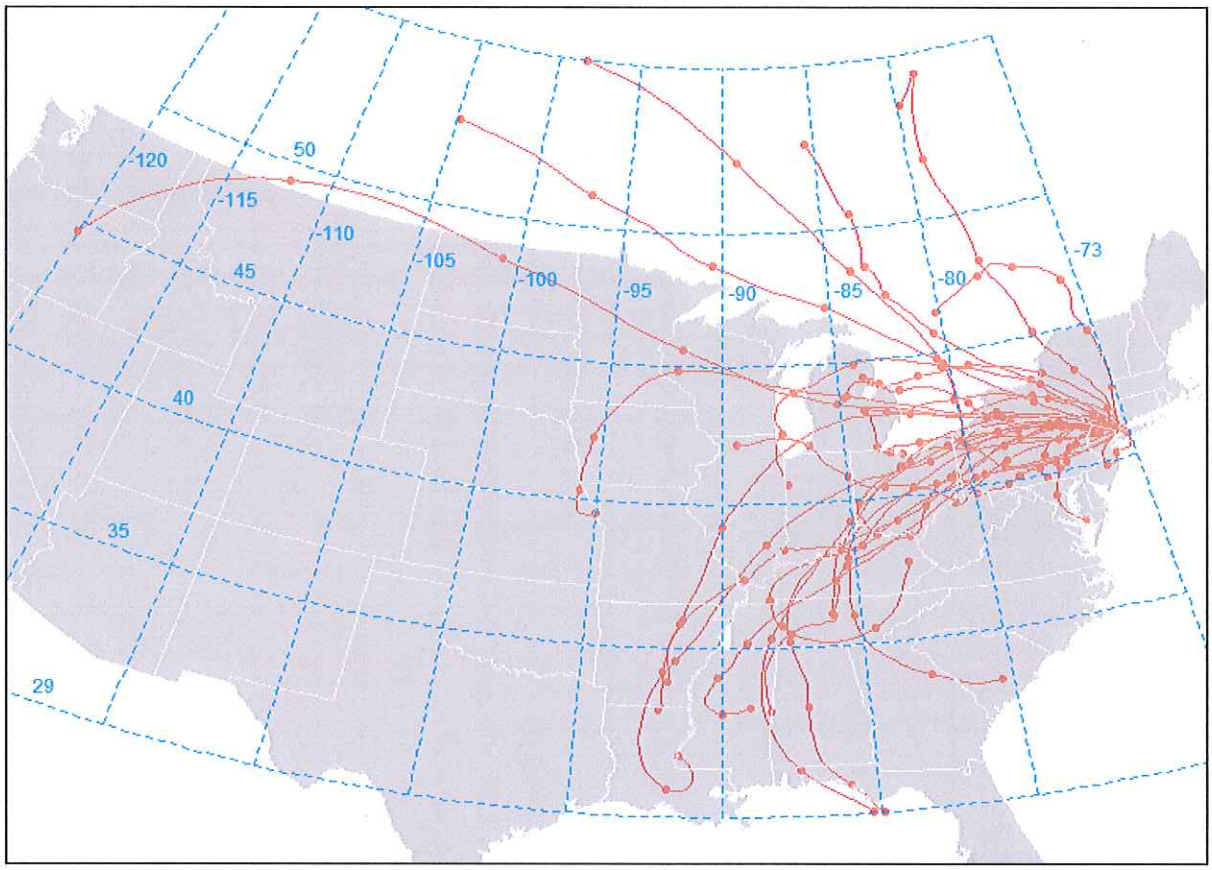


Figure 8 – Fairfield, CT trajectories associated with an exceedance of the 2008 ozone NAAQS at 1000 meters above ground level.



Summary

The back trajectory analysis indicated that impacts from Indiana on Northeast states during ozone conducive conditions was most likely to occur at higher levels and under certain meteorological conditions. Trajectories passing over Indiana were frequently found to occur under clockwise flow around a high pressure system known as the Bermuda High centered along the east coast of the United States. Under this type of weather system, emissions from local emission source sectors would be more significant under the hot and stagnant weather conditions. Thus, any transport of ozone and ozone precursor emissions from Indiana, occurring under regional meteorological conditions, would be dominated by the influence of local emissions on ozone formation in the Northeast.