ATTAINMENT PLAN

FOR THE

WISCONSIN PORTION OF THE CHICAGO-NAPERVILLE (IL-IN-WI) 2008 8-HOUR OZONE NONATTAINMENT AREA

Kenosha County (Partial), Wisconsin

DRAFT FOR PUBLIC REVIEW

Developed by:
The Wisconsin Department of Natural Resources

October 2020

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Table of Contents

List of Tables

List of Figures

List of Technical Appendices

List of Acronyms

CAA	Clean Air Act
CAMx	Comprehensive Air Quality Model with Extensions
CART	Classification and Regression Tree Analysis
CBL	Convective Boundary Layer
CSA	Combined Statistical Area
CSAPR	Cross-State Air Pollution Rule
CTG	Control Technology Guideline
EGU	Electric Generating Unit
EMP	Enhanced Monitoring Plan
ERC	Emission Reduction Credit
EPA	U.S. Environmental Protection Agency
ERTAC	Eastern Regional Technical Advisory Committee
GVWR	Gross Vehicle Weight Rating
HC	Hydrocarbon
I/M	Inspection and Maintenance
IDEM	Indiana Department of Environmental Management
IEPA	Illinois Environmental Protection Agency
LADCO	Lake Michigan Air Directors Consortium
MAR	Commercial Marine, Aircraft and Rail Locomotive
MDA8	Maximum Daily 8-hour Average ozone concentration
MOVES	Motor Vehicle Emission Simulator
MVEB	Motor Vehicle Emissions Budget
NAAQS	National Ambient Air Quality Standards
NEI	National Emissions Inventory
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxides (NO and NO_2)
NSR	New Source Review
OBDII	Vehicle On-Board Diagnostic System
PAMS	Photochemical Assessment Monitoring Stations
ppb	Parts Per Billion
RACM	Reasonably Available Control Measures
RACT	Reasonably Available Control Technology
RFP	Reasonable Further Progress
ROP	Rate of Progress
SIP	State Implementation Plan
SMAT-CE	Software for Modeled Attainment Test Community Edition
tposd	Tons Per Ozone Season Day
TPY	Tons Per Year
VOC	Volatile Organic Compound
WDNR	Wisconsin Department of Natural Resources
WRF	Weather Research and Forecasting

1. INTRODUCTION

The Wisconsin Department of Natural Resources (WDNR) has prepared this attainment plan to fulfill the state's Clean Air Act (CAA) state implementation plan (SIP) requirements for the partial Kenosha County serious nonattainment area for the 2008 ozone National Ambient Air Quality Standard (NAAQS). This document was developed in accordance with the U.S. Environmental Protection Agency (EPA)'s modeling guidance[1] and implementation rule for the 2008 ozone NAAQS (80 FR 12264). It includes all required elements for serious area attainment plans.

The CAA requires that serious area attainment plans include a modeling analysis projecting that the area will attain the NAAQS by the attainment date. This plan includes such modeling, which projects attainment for the area by the attainment date of July 20, 2021. However, preliminary monitoring data for the Chicago area shows that Illinois's Northbrook monitor has a design value of 77 ppb for the years 2018-2020, the design value year that will be used to determine attainment by the attainment date. WDNR is submitting this attainment plan to fulfill the CAA requirements for the partial Kenosha County 2008 ozone nonattainment area while acknowledging that the area may not attain the NAAQS by the attainment date based on this preliminary monitoring data.

1.1. Purpose and Regulatory Requirements

The CAA requires an area not meeting a NAAQS for a specified criteria pollutant to develop or revise its SIP to expeditiously attain and maintain the NAAQS in that nonattainment area. For serious nonattainment areas, these SIP requirements include:

1) An attainment demonstration (required under CAA section 182(c)(2)(A)).
2) Reasonably Available Control Technology (RACT) for volatile organic compounds (VOCs) and nitrogen oxides (NOx; CAA section 182(b)(2)).
3) Reasonably Available Control Measures (RACM; CAA section 172(c)(1).
4) Reasonable Further Progress (RFP) reductions in VOC and/or NOx emissions in the area (CAA sections 172(c)(2) and 182(c)(2)(B)).
5) Contingency measures to be implemented in the event of failure to attain the standard (CAA sections 172(c)(9) and 182(c)(9)).
6) An enhanced vehicle inspection and maintenance (I/M) program, as applicable (CAA section 181(c)(3)).
7) Enhanced monitoring of ozone and ozone precursors (CAA section 182(c)(1)).
8) Clean-fuel vehicle programs (CAA section 182(c)(4)).
9) A transportation control demonstration and, if applicable, a transportation control measures program (CAA section 182(c)(5)).

[1] EPA, 2018. Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze. Research Triangle Park, NC, https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf

10) Changes to permitting programs, including to the NOx and VOC emission offsets for major source permits (CAA section 182(c)(10)), the major source threshold (CAA section 182(c)) and several other areas (CAA sections 182(c)(6), (7) and (8)).

This document addresses these requirements for Wisconsin's partial Kenosha County ozone nonattainment area for the 2008 ozone NAAQS.

This attainment plan includes the required assessments of measured and modeled air quality data. In addition, this document describes how permanent and federally enforceable control measures in Wisconsin have resulted in substantial reductions of ozone precursors in the partial Kenosha County 2008 ozone nonattainment area. These controls are projected to yield emission reductions that meet RFP requirements. Supplemental analyses of monitoring data are presented as weight of evidence support. These analyses show that ambient levels of ozone and ozone precursors have been substantially reduced in eastern Wisconsin over the past 18 years. Finally, this document describes how the area has met the all other requirements for serious nonattainment areas for the 2008 ozone NAAQS.

1.2. The Chicago 2008 Ozone Nonattainment Area

Historically, exceedances of the federal ozone standards have been recorded along the lakeshore of Lake Michigan, including Kenosha County. Kenosha County was designated nonattainment for two previous ozone NAAQS, but has been either redesignated to attainment for, or found to be attaining, each of these standards[2], as shown in Table 1.1. Part of the county was designated and remains nonattainment for a subsequent standard.

Table 1.1. Kenosha County nonattainment history for ozone NAAQS.

Year Promulgated	1979	1997	2008	2015
Level	0.12 ppm	0.08 ppm	0.075 ppm	0.070 ppm
Averaging Time	1 hour	8 hours	8 hours	8 hours
WI Nonattainment Area	Milwaukee-Racine Area*	Milwaukee-Racine Area*	Kenosha (partial), part of the Chicago Area	Kenosha (partial), part of the Chicago Area
Classification	Severe-17	Moderate	Marginal (reclassified to Moderate then Serious)	Marginal
Finding of / Redesignation to Attainment[4]	4/24/2009 74 FR 18641	7/31/2012 77 FR 45252	TBD	TBD

*The Milwaukee-Racine Area encompassed Kenosha, Racine, Milwaukee, Ozaukee, Washington and Waukesha Counties for the 1979 and 1997 NAAQS.

In March 2008, EPA finalized a revision to the 8-hour ozone NAAQS (73 FR 16436). The 2008 ozone NAAQS (0.075 parts per million, or ppm) is more stringent than the previous 1997 ozone

[2] EPA issued an attainment determination for the Milwaukee-Racine nonattainment area after the 1979 1-hour NAAQS was revoked, so this area was never formally redesignated to attainment of this standard. The area was redesignated to attainment of the 1997 ozone NAAQS in July 2012.

NAAQS (0.08 ppm). In June 2012, EPA published a final rule that designated all or part of eleven counties in the Chicago-Naperville, IL-IN-WI Combined Statistical Area (CSA) as marginal nonattainment for the 2008 ozone NAAQS (77 FR 34221). This nonattainment area (the “Chicago nonattainment area”) is shown in Figure 1.1. The nonattainment area designation was based upon EPA’s review of ozone monitoring data collected during the years 2009-2011 for Illinois and 2008-2010 for Indiana and Wisconsin.[3] On May 4, 2016, EPA reclassified the Chicago nonattainment area from marginal to moderate nonattainment status, effective June 3, 2016 (81 FR 26697). This reclassification was based on 2012-2014 monitoring data. On August 23, 2019, EPA again reclassified the Chicago nonattainment area from moderate to serious nonattainment status, effective September 23, 2019 (84 FR 44238). This reclassification was based on 2015-2017 monitoring data.

Wisconsin’s part of the Chicago nonattainment area is the eastern portion of Kenosha County. Kenosha County is located in southeastern Wisconsin along the western shoreline of Lake Michigan, just north of the Illinois state line. The nonattainment designation for Kenosha County applies only to the eastern portion of the county, including the townships of Pleasant Prairie and Somers. Kenosha County has a largely service-based and industrial economy, with a 2010 population of 166,426. 77% of the county’s population (128,534) lives in the 2008 ozone NAAQS nonattainment area. Kenosha County is roughly halfway between the cities of Chicago and Milwaukee and is part of the Chicago-Naperville CSA. Most of the CSA is upwind of Kenosha County on high ozone days and contributes to high ozone concentrations in Kenosha County.

1.1.Overview of this Attainment Plan

This document is structured as follows:

Chapter 2 outlines a conceptual model for ozone formation in the Lake Michigan region, including Kenosha County. This chapter describes how synoptic-scale and mesoscale meteorology combine to create high ozone along the Wisconsin lakeshore under particular conditions.

Chapter 3 presents base and future year inventories for the partial Kenosha County 2008 ozone nonattainment area and discusses how these inventories show that the state has met its requirements for RFP and contingency measures. This chapter also outlines the permanent and enforceable emissions reduction measures that have reduced ozone precursor emissions.

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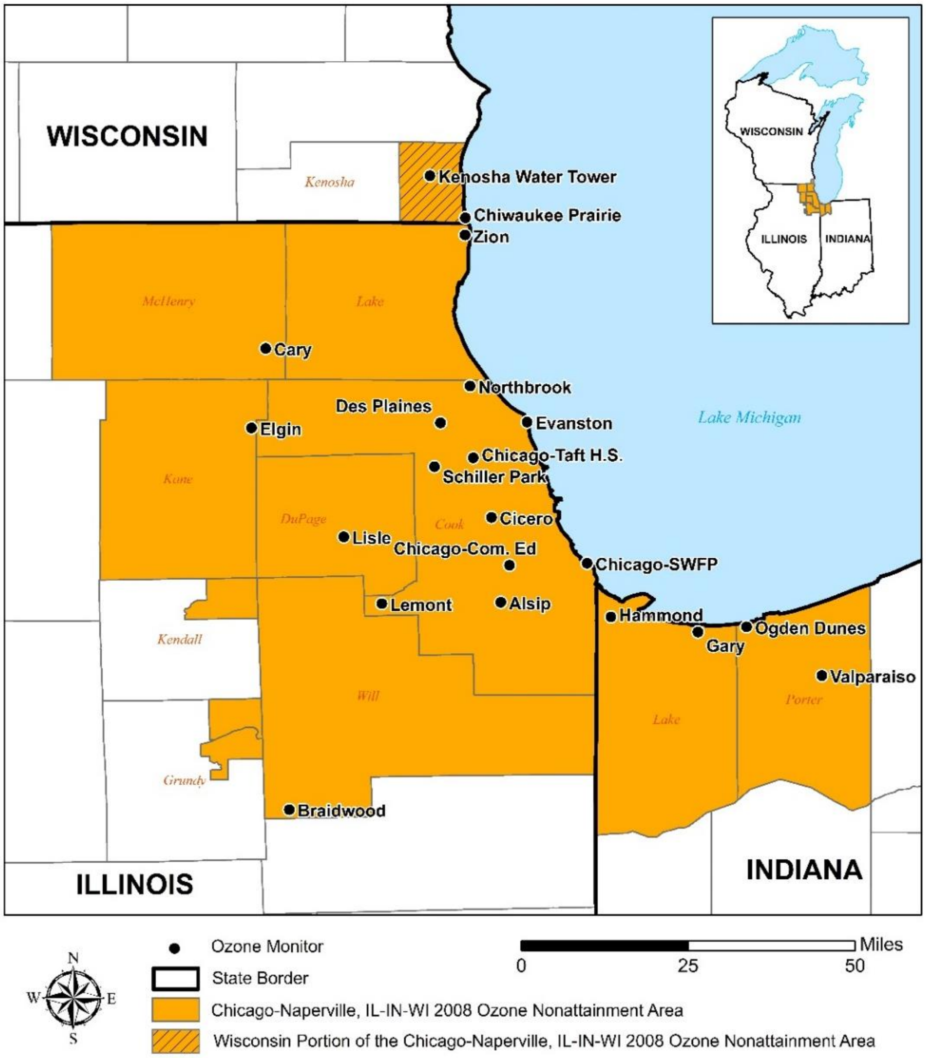
[3] EPA designated most areas based on 2008-2010 air monitoring data. However, Illinois certified its 2011 ozone monitoring data for the Chicago area early and submitted this data to EPA for consideration. This delayed the designation process for this area, which was designated nonattainment via a separate rulemaking two months after all other areas.

Figure 1.1. Map of the Chicago-Naperville, IL-IN-WI, 2008 ozone nonattainment area ("Chicago nonattainment area"), with locations of ozone monitors shown.



Chapter 4 describes the modeled attainment demonstration that was completed by the Lake Michigan Air Directors Consortium (LADCO) for the Chicago nonattainment area in support of this analysis. This chapter outlines how emission inventories for the modeling were constructed, how the models were run, and how the results of the modeled attainment test project the area will attain the NAAQS.

Chapter 5 presents weight of evidence support for this attainment plan. This includes analysis of trends in ozone and ozone precursors, as well as meteorologically adjusted trends in ozone concentrations. This chapter also demonstrates the important roles that transport and meteorology play in determining ozone concentrations in the partial Kenosha County 2008 ozone nonattainment area.

Chapter 6 describes how the state has met all other moderate nonattainment area SIP requirements. These requirements include transportation conformity, RACT programs for NOx and VOCs, RACM, an enhanced vehicle I/M program, enhanced monitoring, a clean-fuel vehicles program, a transportation control demonstration and changes to permitting programs.

Chapter 7 describes how the WDNR took public comment on this document.

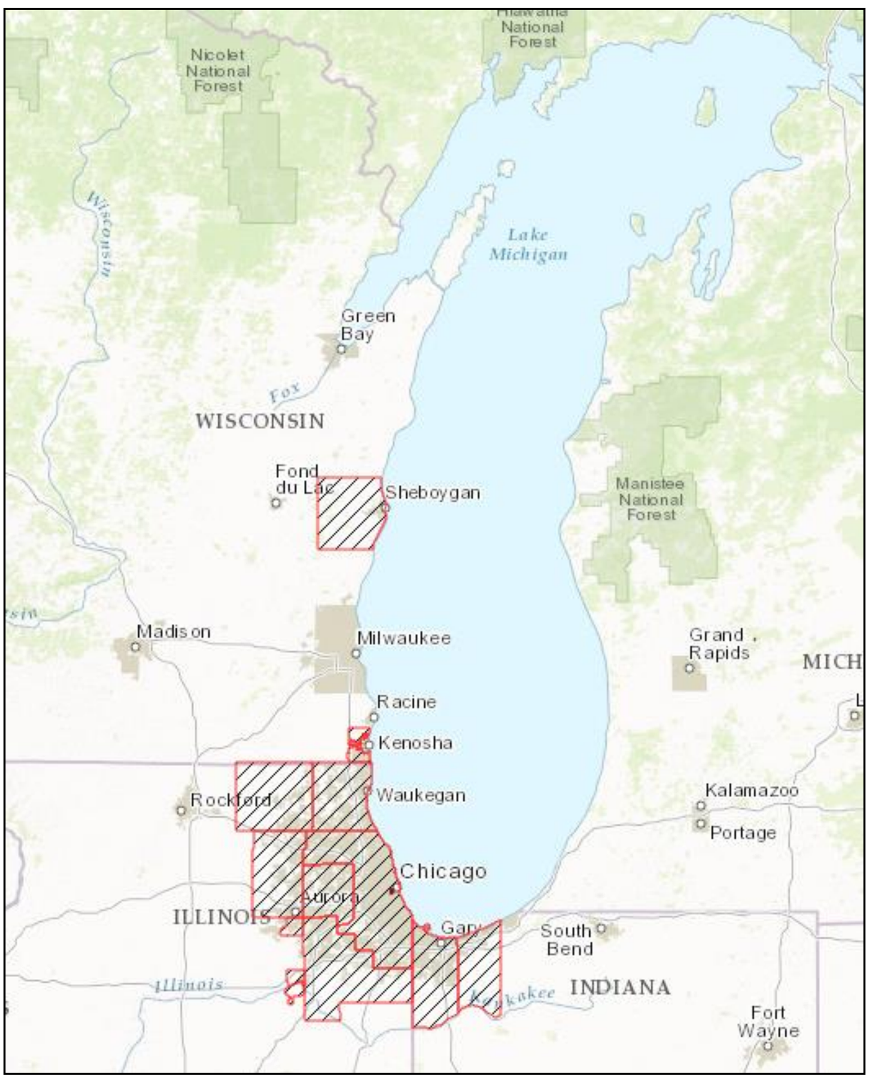
Chapter 8 presents the conclusions of this analysis.

2. OZONE DYNAMICS IN THE LAKE MICHIGAN REGION

2.1. Introduction

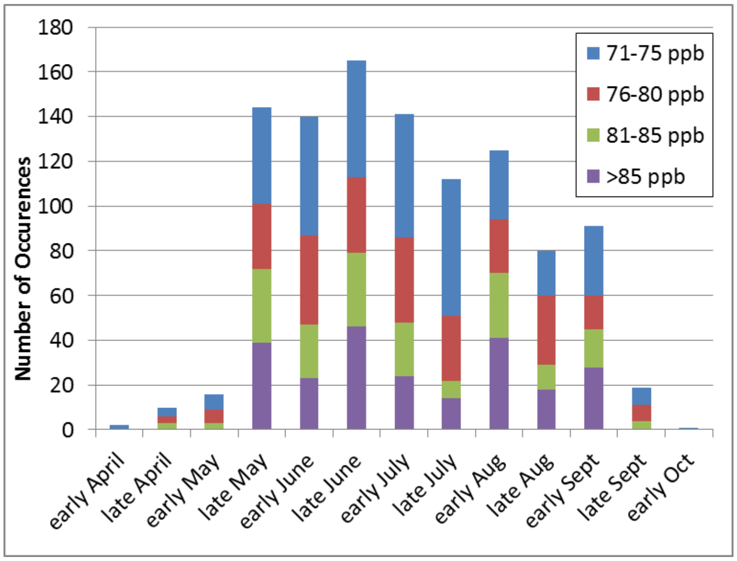
Counties around Lake Michigan have a long history of recording ozone concentrations that exceed the level of the NAAQS. Since the promulgation of the original, 1979 ozone NAAQS, lakeshore counties in Wisconsin, Illinois, Indiana and Michigan have been designated nonattainment with each subsequent standard. While ozone concentrations have decreased dramatically due to implementation of an array of measures controlling emissions of ozone precursors, two Lake Michigan areas were designated nonattainment for the 2008 ozone NAAQS: the Chicago nonattainment area and Sheboygan County, WI (Figure 2.1). Sheboygan County has since been redesignated to attainment, but the Chicago area remains nonattainment for the 2008 ozone NAAQS.

Figure 2.1. A map of the Lake Michigan region, with the Chicago and Sheboygan nonattainment areas for the 2008 ozone NAAQS indicated by hatching (from LADCO). The Sheboygan area has since been redesignated to attainment for this standard.



Wisconsin's lakeshore monitors most frequently measure ozone concentrations exceeding the 2008 ozone NAAQS from late May through early August, with peak ozone exceedances in late June (Figure 2.2). A smaller number of exceedances occur in late August and early September, but ozone concentrations very rarely exceed the 2008 NAAQS before May 15 or after September 15. Ozone concentrations peak in the late spring and early summer because of the abundance of sunlight and heat, both of which drive ozone formation. In addition, strong land-lake temperature gradients in late spring and early summer drive lake breeze circulations, which contribute to high ozone concentrations, as discussed below.

Figure 2.2. Distribution of the number of occurrences of maximum daily 8-hour average ozone concentrations (MDA8) exceeding different thresholds at monitors along Wisconsin's Lake Michigan lakeshore. Data are shown for the years 2005-2014.



The region's persistent ozone problems have been shown to be due to the unique meteorology of the Lake Michigan area. This meteorology causes transport of significant amounts of ozone from upwind sources to lakeshore counties in Wisconsin and neighboring states. Two types of meteorological patterns have been shown to affect ozone concentrations in the region:

1) Synoptic scale meteorology[4] transports high concentrations of ozone and ozone precursors northward from source regions to the south and southeast, and
2) Mesoscale meteorology[4] (via land-lake breeze circulation patterns) carries precursors over the lake, where they react to form ozone. Winds then shift to pull the high ozone air onshore.

This chapter explores the meteorology of this region in greater depth and presents a conceptual model for ozone formation in this area. Subsequent chapters then address the regulatory

[4] Synoptic-scale meteorology refers to weather features of 24-48 hours' duration, whereas mesoscale meteorology refers to weather features of shorter duration.

requirements for this attainment plan, required because of the resultant high ozone concentrations in this region.

2.2. The Role of Synoptic-Scale Meteorology on High-Ozone Days

Research has shown that high pressure systems can generate meteorological conditions favorable to elevated ozone as they move through the region from west to east during late May - early September. These systems are typified by hazy, sunny skies with generally weak, clockwise-rotating winds and relatively shallow mixing such that pollution concentrations are not diluted by mixing. These weather conditions contribute to the buildup of considerable amounts of ozone precursors and facilitate formation of ozone via photochemical reactions.

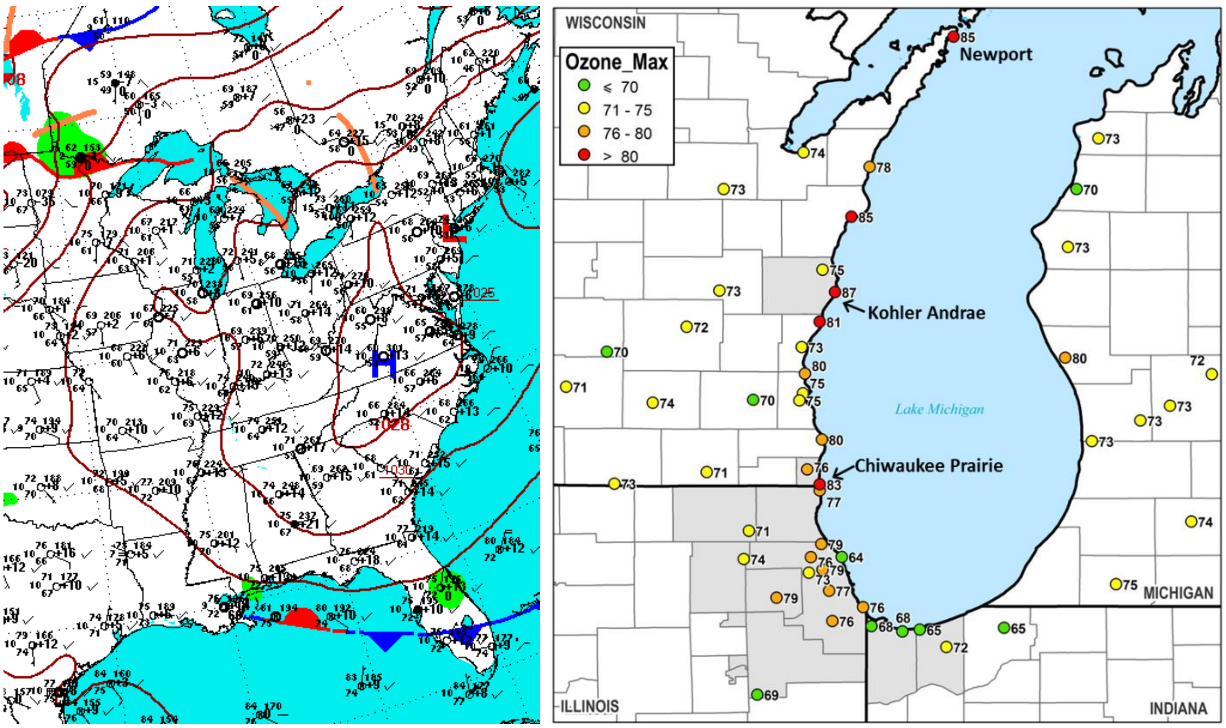
The location of surface high pressure systems is an important driver of ozone transport into the region. Research has shown that ozone episodes are generally associated with high pressure systems over the eastern United States that transport pollutants and precursors from the south and east into the region.[5,6] One study[7] estimated that 50% of Wisconsin's ozone exceedance days during 1980-1988 under the 1-hour ozone NAAQS occurred when the center of a high pressure system was situated southeast of the area (i.e., Ohio and east thereof). Under these circumstances, high ozone concentrations in the Lake Michigan region may result when polluted air from high emissions regions such as the Ohio River Valley is transported northward along the western side of a high pressure system.[8] In addition, while emissions from the heavily industrialized Chicago and Milwaukee areas have decreased dramatically in recent decades (see, e.g., Sections 3 and 5.3), sources in these large metropolitan areas still generate significant ozone precursor emissions. Pollution from sources in these local urban areas can add to pollution transported into the region from more distant, regional sources.[5]

Figure 2.3 shows the synoptic scale weather pattern for one such episode, along with the resulting patterns in ozone concentrations. On this day, a high pressure system was located to the southeast, centered over Virginia. Southeasterly to southerly winds on the western side of this system carried pollutants from the Ohio River Valley to Lake Michigan. This episode shows a common pattern for ozone distributions on episode days: ozone concentrations were lowest in the regions with the highest emissions (in central Chicago and extending into northwestern Indiana) and the highest in rural coastal areas far downwind. During such classic transport episodes, peak ozone concentrations move northward over the course of the day. For example, on the day shown in Figure 2.3, ozone peaked at Wisconsin’s southern Chiwaukee Prairie

[5] Dye, T.S., P.T. Roberts, and M.E. Korc, 1995: Observations of transport processes for ozone and ozone precursors during the 1991 Lake Michigan Ozone Study. J. App. Meteor, 34: 1877-1889.
[6] Hanna, S.R., and J.C. Chang, 1995: Relations between meteorology and ozone in the Lake Michigan region. J. Applied Meteorology, 34: 670-678.
[7] Haney, J.L., S.G. Douglas, L.R. Chinkin, D.R. Souten, C.S.Burton, and P.T. Roberts, 1989: Ozone Air Quality Scoping Study for the Lower Lake Michigan Air Quality Region, SAI report #SYSAPP-89/101, prepared for US EPA, August, 197 pp.
[8] For example, Ragland, K. and P. Samson, 1977: Ozone and visibility reduction in the Midwest: evidence for large-scale transport. J. Applied Meteorology, 16: 1101–1106.

monitor between 11 a.m. and 1 p.m., at the Kohler Andrae monitor midway up the coast between 2 p.m. and 4 p.m., and at the northern Newport monitor between 4 p.m. and 6 p.m.

Figure 2.3. (left) Surface synoptic weather map for 6 a.m. CST for the eastern U.S., and (right) the maximum daily 8-hour average (MDA8) ozone concentrations for the Lake Michigan region for June 19, 2016. The Chicago and Sheboygan, WI, nonattainment areas are shaded in gray. Note that the Sheboygan area has been redesignated to attainment.



2.3. The Role of Mesoscale Meteorology (Lake Breeze Circulation) on High-Ozone Days

Synoptic meteorological conditions often work in combination with unique lake-induced mesoscale meteorological features to produce the highest ozone concentrations in the Midwest. Wisconsin's ozone nonattainment areas are positioned along the state's coastline with Lake Michigan (Figure 2.1). With a surface area of approximately 22,400 square miles, Lake Michigan acts as a huge heat sink during the warm months. Figure 2.4 highlights the considerable difference between the over-land air temperatures (measured at Racine, WI) and over-water air temperatures (measured at a buoy in southern Lake Michigan) during a 5-day ozone episode in June 2002. The strong daytime temperature contrast between the warm land and cold lake can lead to the formation of a thermally driven circulation cell called the lake breeze, which runs approximately perpendicular to the Lake Michigan shoreline (Figure 2.5). As this figure shows, the lake breeze is generally preceded by an early morning land breeze, driven by relatively warm temperatures over the lake. The land breeze can carry ozone precursors emitted from urban areas, primarily Chicago, out over the lake, where they can react to form ozone. The onshore flow of the lake breeze circulation then transports elevated ozone from over the lake onshore into eastern Wisconsin.

Figure 2.4. Hourly surface air temperatures at Racine, WI and at the South Lake Michigan Buoy during an ozone episode on June 20-25, 2002.

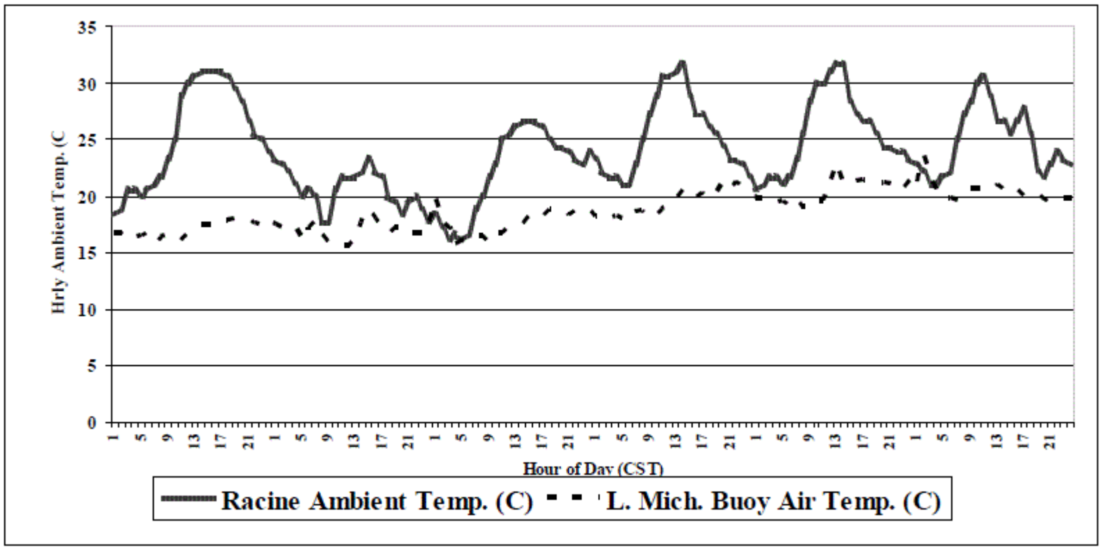
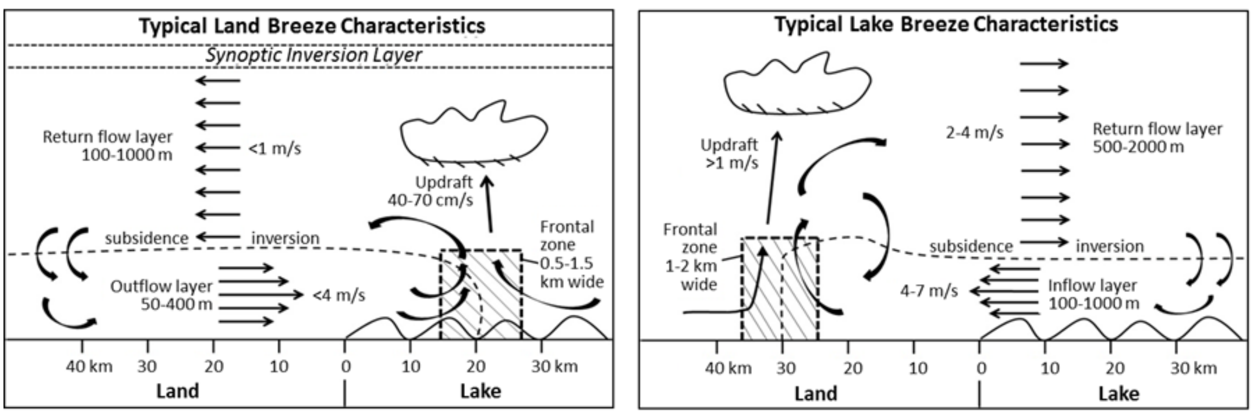


Figure 2.5. Schematic diagrams of the (left) early morning land breeze and (right) late morning/afternoon lake breeze circulations responsible for enhanced ozone production along the Lake Michigan shoreline (modified from Foley et al., 2011[9]).



2.4. Conceptual model for ozone formation in the Lake Michigan region

Synoptic and mesoscale meteorological patterns together drive ozone formation in the region, as described in a conceptual model in Dye et al. (1995).[7] Dye et al. (1995) described this model with the following series of inter-related steps. This discussion focuses on the conditions impacting Wisconsin's shoreline:

[9] Foley, T., E. A. Betterton, P.E. R. Jacko, and J. Hillery, 2011: Lake Michigan air quality: The 1994-2003 LADCO Aircraft Project (LAP), Atmos. Env., 45: 3192-3202.

1) A shallow but intensely stable conduction inversion exists just above the relatively cold lake surface (Figure 2.5). During the early morning hours the land breeze and general offshore flow (i.e., southerly to west-southwesterly winds) transport ozone and fresh precursor emissions into the stable air in the conduction layer over Lake Michigan. A primary source region is the Chicago area, located at the southern edge of the lake.

2) By midmorning a sharp horizontal temperature gradient forms along the shoreline between the cold lake air and the increasingly warmer air over the land. This gradient effectively "cuts off" air in the conduction layer from additional injections of shore-emitted precursors. Strong stability in the conduction layer limits dispersion, creating high concentrations of ozone precursors, which can react in this layer.

3) By midmorning, the developing convective boundary layer (CBL) grows and the resulting convection mixes ozone vertically, where it combines with ozone transported from sources outside the region. Ozone concentrations in this air are lower due to the dilutive effects of convective mixing. As this air is transported lakeward, it is forced to flow up and over the conduction layer (Figure 2.5).

4) The ozone-rich air in both layers is transported northward over Lake Michigan by the prevailing winds. When a lake breeze is present, it produces southerly to south-southeasterly winds along the western shore of Lake Michigan. This wind pattern transports the ozone originating from sources in the south to downwind receptor regions in eastern Wisconsin. On occasion, areas north of Ozaukee County experience elevated ozone levels as a southerly wind intercepts the shoreline where it juts into Lake Michigan.

5) When the ozone-laden air flows onshore in the downwind receptor regions, air with the highest ozone concentrations, located in the lowest 300 m, mixes down to the surface first. This causes the highest ozone concentrations to be found along the shoreline. Eventually, air from higher altitudes mixes down to the surface further inland, but ozone concentrations in this air are lower. This air mass is the remnant of the ozone-diluted CBL air that flowed up and over the conduction layer during the mid-morning hours.

This complex meteorology leads to the high ozone concentrations and persistent nonattainment issues faced by the counties along the Lake Michigan shoreline. The impact of this meteorology on the transport of ozone, NOx, and VOCs to eastern Kenosha County is explored in more detail in Chapter 5.

3. REASONABLE FURTHER PROGRESS (RFP), CONTINGENCY MEASURES, AND IMPLEMENTED CONTROL MEASURES

3.1. Introduction

Sections 172(c)(2) and 182(c)(2)(B) of the federal CAA require states with ozone nonattainment areas classified as serious or higher to submit plans that show RFP towards attaining the NAAQS. This RFP requirement is additional to the 15% reductions demonstrated for the first six years of nonattainment.[10] The implementation rule for the 2008 ozone NAAQS[11] defines RFP for serious nonattainment areas (e.g., the partial Kenosha County 2008 ozone nonattainment area) as a demonstration that there has been at least a 3% emission reduction per year from baseline emissions averaged over each consecutive 3-year period. For the partial Kenosha County 2008 ozone nonattainment area, this means that WDNR must demonstrate a 9% emission reduction between the moderate attainment year (2017) and the serious attainment year (2020), measured relative to base year emissions. Because this area has a previously approved 15% VOC rate of progress (ROP) plan (61 FR 11735), the 9% reduction requirement for the 2008 NAAQS can be satisfied with any combination of NOx and VOC reductions. These reductions may come from any SIP-approved or federally promulgated measures implemented after the base year.

States must also submit requirements for contingency measures that will be implemented if the state fails to attain the standard as required by CAA Section 172(c)(9). These contingency measures must represent one year of emissions reduction progress, equivalent to an additional 3% reduction. States may meet contingency measures by demonstrating an additional 3% reduction in combined NOx and VOC emissions within one year beyond that required for RFP. Inventories for 2021 are included to make this demonstration.

Table 3.1 provides a summary of emission inventories (in tons per ozone season day, or tposd) for NOx and VOCs for the partial Kenosha County 2008 ozone nonattainment area. Sections 3.2 and 3.3 present the emission inventories by sector (i.e., point, area, onroad and nonroad) for the nonattainment area for the base year (section 3.2) and projected years (section 3.3). Section 3.4 demonstrates that the state has met its RFP and contingency measure requirement for the partial Kenosha County 2008 ozone nonattainment area. Finally, Section 3.5 describes the enforceable control measures that led to the significant reductions in both NOx and VOC emissions.

[10] Wisconsin demonstrated this 15% RFP requirement in its Attainment Plan for the Wisconsin Portion of the Chicago-Naperville (IL-IN-WI) 2008 8-Hour Ozone Nonattainment Area, submitted to EPA in April 2017. https://dnr.wi.gov/topic/AirQuality/documents/AttainmentPlan20170417.pdf

[11] Implementation of the 2008 National Ambient Air Quality Standard for Ozone: State Implementation Plan Requirements, 80 FR 12264, March 6, 2015.

Table 3.1. NOx and VOC emissions (tons per ozone season summer day, tposd) in the partial Kenosha County 2008 ozone nonattainment area. The percent changes were calculated relative to 2011 emissions.

Pollutant	2011	2017	2020	2021	2017-2020 change (%)	2020-2021 change (%)
NOx	17.35	14.43	12.25	11.95	-12.6%	-1.7%
VOC	7.86	6.11	5.81	5.69	-3.8%	-1.5%

3.2. 2011 Base Year and 2017 Inventories for RFP

WDNR followed EPA's requirements and guidance to prepare comprehensive emission inventories of NOx and VOC emissions for 2011 and 2017. The EPA has approved Wisconsin's 2011 emission inventories for the state's nonattainment areas under the 2008 8-hour ozone standard, including the partial Kenosha County 2008 ozone nonattainment area (81 FR 11673). Upon approval by EPA, the 2011 base year inventory submitted in this document replaces the previously approved 2011 inventory. Appendix 2 includes a discussion of the methodology used to estimate sector-specific emissions for 2011 and 2017 (shown in Tables 3.2 and 3.3), and Appendices 3 through 6 detail the emissions for the different sectors. Between 2011 and 2017, NOx emissions decreased 17%, and VOC emissions decreased 22% in the partial Kenosha County 2008 ozone nonattainment area. These reductions are primarily due to decreases in NOx and VOC emissions from the onroad and nonroad mobile sectors provided by the federal and state mobile source control programs described in Sections 3.5.3 and 3.5.4.

Table 3.2. NOx emissions (tposd) in the partial Kenosha County 2008 ozone nonattainment area by source type.

Sector	2011 base year	2017 moderate attainment year	2020 serious attainment year	2021 additional year of attainment
Point - EGU	8.71	8.55	0.00	0.00
Point - Non-EGU	0.09	0.15	0.23	0.23
Area	1.03	1.13	1.04	1.01
Onroad	5.43	2.91	2.21	1.98
Nonroad	2.08	1.70	1.55	1.51
Emission Reduction Credits	---	---	7.22	7.22
TOTAL	**17.35**	**14.43**	**12.25**	**11.95**

Table 3.3. VOC emissions (tposd) in the partial Kenosha County 2008 ozone nonattainment area by source type.

Sector	2011 base year	2017 moderate attainment year	2020 serious attainment year	2021 additional year of attainment
Point - EGU	0.38	0.32	0.00	0.00
Point - Non-EGU	0.23	0.14	0.19	0.18
Area	3.64	3.49	3.39	3.36
Onroad	2.53	1.44	1.20	1.13
Nonroad	1.08	0.71	0.66	0.65
Emission Reduction Credits	---	---	0.37	0.37
TOTAL	**7.86**	**6.11**	**5.81**	**5.69**

3.3. 2020 & 2021 Projected Year Inventories for RFP

Emissions for the serious attainment year (2020) were projected using the methodological approaches described in Appendix 7. The same approaches were used to project emissions for 2021, the additional year of attainment. Appendix 7 includes information on sector-specific emissions projection methodology, and Appendices 3 through 6 detail the emissions for the different sectors. Tables 3.2 and 3.3 show the projected NOx and VOC emissions (in tposd) in 2020 and 2021 for electric generating unit (EGU) point, non-EGU point, area, onroad mobile, and nonroad mobile sources. Emission reduction credits (ERCs) are also shown for 2020 and 2021, based on a creditable VOC emission reduction of 135.3 tons per year and a creditable NOx emission reduction of 2,634.3 tons per year resulting from the permanent shutdown of boilers B20, B21, B22 and B23 at the Pleasant Prairie power plant in the nonattainment area (Construction Permit #18-RAB-050-ERC). ERC ozone season day emissions were derived by dividing the annual tons by 365 days.

3.4. Demonstration of RFP and Contingency Measures

Because the partial Kenosha County 2008 ozone nonattainment area has already met the 15% VOC ROP requirement in addressing a prior ozone NAAQS, the required 9% RFP reduction can come from any combination of NOx and VOC reductions. Table 3.4 describes the calculations used to determine the emissions targets needed to meet the RFP and contingency requirements. These targets were determined by allocating two-thirds of the required reductions to NOx emissions and the remaining one-third of the required reductions to VOC emissions. Comparing these emission targets with the projected 2020 and 2021 emissions shows that total emissions are projected to decrease more than necessary to meet RFP and contingency measure requirements.[12][13] These comparisons demonstrate that emission reductions from the mobile source and EGU sectors more than meet the required 9% RFP emission reduction requirement for 2020 and the additional 3% contingency measures requirement for 2021. The WDNR also updated the 15% RFP plan for 2017 emissions based on the revised 2011 base year emissions inventory.

The WDNR is using emission reductions from mobile sources to demonstrate that the area met the RFP and contingency measure requirements entirely through permanent and enforceable control measures. Table 3.4 demonstrates that the projected emissions reductions from the mobile source sector were greater than those required for RFP and contingency measures. The mobile source emission reductions relied upon for RFP are due to permanent and enforceable control measures enacted within the nonattainment area. Table 3.5 shows that the Motor Vehicle Emission Simulator Model (MOVES) model assumed increases of 1 to 6% in vehicle or equipment population and usage while projecting a 5 to 13% reduction in NOx and VOC emissions from these sectors from 2017 to 2020 (with a similar pattern between 2020 and 2021). These emission reductions therefore cannot be attributed to reductions in activity. MOVES incorporates the effects of a number of emissions control programs (Sections 3.5.3 and 3.5.4 and Tables A.8.4 and A.8.5 in Appendix 8) into its projections. These emission reduction measures are permanent and enforceable, are implemented in the nonattainment area, and account for the significant emission reductions projected for 2020 and 2021. The partial Kenosha County 2008 ozone nonattainment area has therefore satisfied the RFP and contingency measures requirements.

[12] Projected total 2020 emissions were 5.81 tons per summer day (tposd) VOC compared with the RFP target of 7.23 tposd. Projected 2020 NOx emissions were 12.25 tposd compared with the RFP target of 14.57 tposd.
[13] Projected onroad emissions for 2020 and 2021 already include the 7.5% safety margin.

Table 3.4 Determination of emissions targets for RFP and contingency measures and comparison to projected emissions for the partial Kenosha County 2008 ozone nonattainment area.

Description	Formula	VOC	NOx
A. 2011 RFP Base Year Inventory		7.86	17.35
15% Moderate Area RFP Requirement			
B. RFP Reductions totaling 15%		5%	10%
C. RFP Emissions Reductions Required Between 2011 & 2017	A*B	0.39	1.74
D. RFP Target Level for 2017	A-C	7.47	15.62
9% Serious Area RFP Requirement			
E. RFP Reductions Totaling 9%		3%	6%
F. 9% RFP Reductions Required by 2020	A*E	0.24	1.04
G. RFP Target Level for 2020	A-C-F	7.23	14.57
H. 2021 Contingency (3%)		1%	2%
I. 2021 Contingency Reductions	A*H	0.08	0.35
J. 2021 RFP + Contingency Target Level	A-C-F-I	7.15	14.23
K. 2020 Projected Emissions Inventory (Net of Growth)		5.81	12.25
L. 2021 Projected Emissions Inventory (Net of Growth)		5.69	11.95
M. Are RFP Requirements Are Met? (Are 2020 Projected Emissions < Target?)	K < G?	Yes	Yes
N. Are Contingency Measure Requirements Met?	L < J?	Yes	Yes
Demonstration That 9% RFP & Contingency Requirements Met Through Mobile Source Reductions			
O. Required RFP Reductions by 2020 (15% + 9% Reductions)	C + F	0.63	2.78
P. Required Contingency Reductions by 2021 (RFP + 3%)	O + I	0.71	3.12
Q. Reductions in Projected Mobile Source Emissions from 2011 to 2020		1.75	3.75
R. Reductions in Projected Mobile Source Emissions from 2011 to 2021		1.83	4.02
S. Are RFP Requirements Are Met? (Are Reductions > Required)	Q > O?	Yes	Yes
T. Are Contingency Measure Requirements Met?	R > P?	Yes	Yes

Table 3.5. Activity and emissions data for the onroad and nonroad mobile source sectors for the partial Kenosha County 2008 ozone nonattainment area. Differences are relative to 2011 emissions.

					Difference	
	2011	**2017**	**2020**	**2021**	**2017-20**	**2020-21**
Onroad Sector (hot ozone season weekday)						
Total vehicle-miles of travel	3,203,324	3,443,126	3,622,925	3,653,628	6%	1%
Vehicle population	87,207	92,379	97,756	98,603	6%	1%
Total VOC emissions (tposd)	2.53	1.44	1.20	1.13	-10%	-3%
Total NOx emissions (tposd)	5.43	2.91	2.21	1.98	-13%	-4%
Nonroad Sector (hot ozone season day)						
Total hours of use (non-MAR*)	16,563	17,621	18,316	18,470	4%	1%
Equipment population (non-MAR*)	42,683	43,604	43,858	43,904	1%	0%
VOC emissions (non-MAR, tposd)	1.03	0.66	0.61	0.60	-5%	-1%
NOx emissions (non-MAR, tposd)	1.21	0.79	0.66	0.63	-10%	-3%
Total VOC emissions (tposd)	1.08	0.71	0.66	0.65	-5%	-1%
Total NOx emissions (tposd)	2.08	1.70	1.55	1.51	-7%	-2%

* Activity data was not available for commercial marine, aircraft and rail locomotives (MAR) in the nonattainment area.

3.5. Control Measures for Ozone Precursor Emissions

This section outlines the permanent and enforceable control measures that apply to sources in the partial Kenosha County 2008 ozone nonattainment area. These control measures significantly reduced emissions in this area by the 2020 serious attainment year, leading to the emission reductions shown in Section 3.4. These control programs are described in greater detail in Appendix 8.

Table 3.6 lists the permanent and enforceable emission control programs implemented for each emission source sector. Many of the control measures have been implemented under long-standing programs that began prior to 2011. This discussion highlights those control measures or emission reductions that have occurred since the base year of 2011.

It is important to note that: (1) emissions sources located in the partial Kenosha County 2008 ozone nonattainment area are already very well-controlled in all respects; and (2) most of the ozone measured in this area comes from ozone and ozone precursors originating in upwind states. For these reasons, even though pollution control programs continue to decrease emissions within this nonattainment area, emission reductions in upwind areas will have an outsized impact on the area's air quality.

Table 3.6. Emission control programs that have reduced NOx and VOC emissions in the partial Kenosha County 2008 ozone nonattainment area and in contributing regions.[a]

Sector	NOx Control Measures	VOC Control Measures
Point	-Wisconsin NOx RACT -Federal NOx Transport Rules	-VOC RACT / CTGs -National Emission Standards for Hazardous Air Pollutants (NESHAP) Rules
	-Closure of the We Energies – Pleasant Prairie Power Plant (April 2018)	
Area		-VOC RACT / CTGs -Federal VOC emission standards for consumer/commercial products -Area source NESHAP Rules
Onroad	-Numerous federal onroad mobile source control programs[a] -Wisconsin I/M program	
Nonroad	-Numerous federal nonroad mobile source control programs[a]	

[a] See Appendix 8 for more details.

3.5.1. Point Source Control Measures

Wisconsin has implemented RACT for major NO_x sources in the state's nonattainment areas for the 1997 ozone NAAQS. This includes the area currently covered by the partial Kenosha County 2008 ozone nonattainment area.

Following a consent decree (E.D. Wis., Case No. 03-CV-0371), Boilers B20 and B21 at the We-Energies Pleasant Prairie Power Plant became subject to the NOx emission limit of 0.08 pounds/million British thermal units, based on a 12-month rolling average, by December 31, 2006 and December 31, 2003, respectively. The selective catalytic reduction technologies that were installed to comply with the consent decree were in use prior to the 2011 nonattainment year. This power plant, which was a significant NOx and VOC point source in the partial Kenosha County 2008 ozone nonattainment area, was permanently shut down on or around April 10, 2018, between the moderate and serious attainment years (Construction Permit #18-RAB-050-ERC).

EGUs in 22 states east of the Mississippi, including Wisconsin, have been subject to a series of federal NOx transport rules since 2009. These rules have included the Clean Air Interstate Rule, the Cross-State Air Pollution Rule (CSAPR) and the CSAPR Update Rule. These rules contributed to a 24% reduction from 2008 to 2014 in total EGU NOx emissions across the states that contribute > 0.75 parts per billion (ppb) to Kenosha County ozone concentrations (Appendix 8). The three states contributing the most to Kenosha County ozone concentrations (in decreasing order): Illinois, Indiana, and Wisconsin, had proportionately larger individual EGU emission reductions of 40.6%, 24.1%, and 54.5%, respectively, from 2008 to 2014.

Wisconsin has implemented VOC RACT to fulfill applicable control technique guideline (CTG) requirements for Wisconsin nonattainment areas under the 1997 ozone NAAQS. This includes the area currently covered by the partial Kenosha County 2008 ozone nonattainment area. The list of the CTGs in place in Wisconsin are provided in Appendix 9. Appendix 9 also lists the CTGs for which Wisconsin has not adopted RACT requirements and provides negative declarations for CTGs for which no affected sources exist within the partial Kenosha County 2008 ozone nonattainment area.

In the 2017 moderate attainment year, combustion from point and area sources accounted for 82% of the total VOC emissions in the nonattainment area. The remaining active combustion sources are subject to source-specific National Emission Standards for Hazardous Air Pollutant (NESHAP) requirements and/or VOC RACT/CTG rules, as applicable. The non-combustion NESHAP rules were implemented prior to 2011 with no additional reductions expected after 2011. The combustion point sources are subject to NESHAP rules that became effective since 2011. These NESHAP rules also apply to sources nationally, thereby reducing the transport of VOC emissions into the nonattainment area. See Section 1 of Appendix 8 for more information about all of these federally enforceable control programs.

3.5.2. Area Source Control Measures

Wisconsin has implemented a number of VOC RACT/CTG rules limiting VOC emissions from area sources. These rules are listed in Appendix 9. In addition, VOC emission standards for consumer and commercial products also limited VOC emissions from area sources, as did NESHAPs for gasoline distribution (Stage I vapor recovery requirements) and Area Source Industrial, Commercial and Institutional Boilers. See Section 2 of Appendix 8 for more information about all of these federally enforceable control programs.

3.5.3. Onroad Source Control Measures

Both NOx and VOC emissions from onroad mobile sources are substantially controlled through federal emission standard programs for new vehicles and low sulfur fuels. Although initial compliance dates in many cases were prior to 2011, these regulations have continued to reduce area-wide emissions as fleets turn over to newer vehicles. All of these programs apply nationally and have reduced emissions both within the nonattainment area and in contributing ozone precursor transport areas. Wisconsin's vehicle I/M program also limits onroad VOC and NOx emissions in southeastern Wisconsin, including within the partial Kenosha County 2008 ozone nonattainment area. See Section 3 of Appendix 8 for more information about these federally enforceable control programs.

3.5.4. Nonroad Source Control Measures

VOC and NOx emitted by nonroad mobile sources are significantly controlled via a number of different federal standards for new engines and low sulfur fuels. The nonroad regulations continue to slowly lower average unit and total sector emissions as equipment fleets are replaced each year, pulling the highest emitting equipment out of circulation or substantially reducing its use. Fuel programs regulating fuel sulfur content also enable achievement of various new engine tier VOC and NOx emission limits. See Section 4 of Appendix 8 for more information about these federally enforceable control programs.

4. MODELED ATTAINMENT ASSESSMENT

One of the requirements for serious nonattainment areas is a modeled demonstration that a nonattainment area will attain the NAAQS. Wisconsin, Illinois, and Indiana are relying on photochemical modeling conducted by LADCO to fulfill this requirement for the Chicago nonattainment area under the 2008 ozone NAAQS. LADCO developed an air quality modeling platform to evaluate the adequacy of current and potential emissions reduction strategies for allowing attainment of the 2008 ozone NAAQS by the attainment deadline of July 20, 2021.[14] The technical support document for this modeling analysis is included as Appendix 10. This chapter provides a high-level overview of this modeled attainment demonstration for the Chicago nonattainment area.

4.1. Emission Inventories for Photochemical Modeling

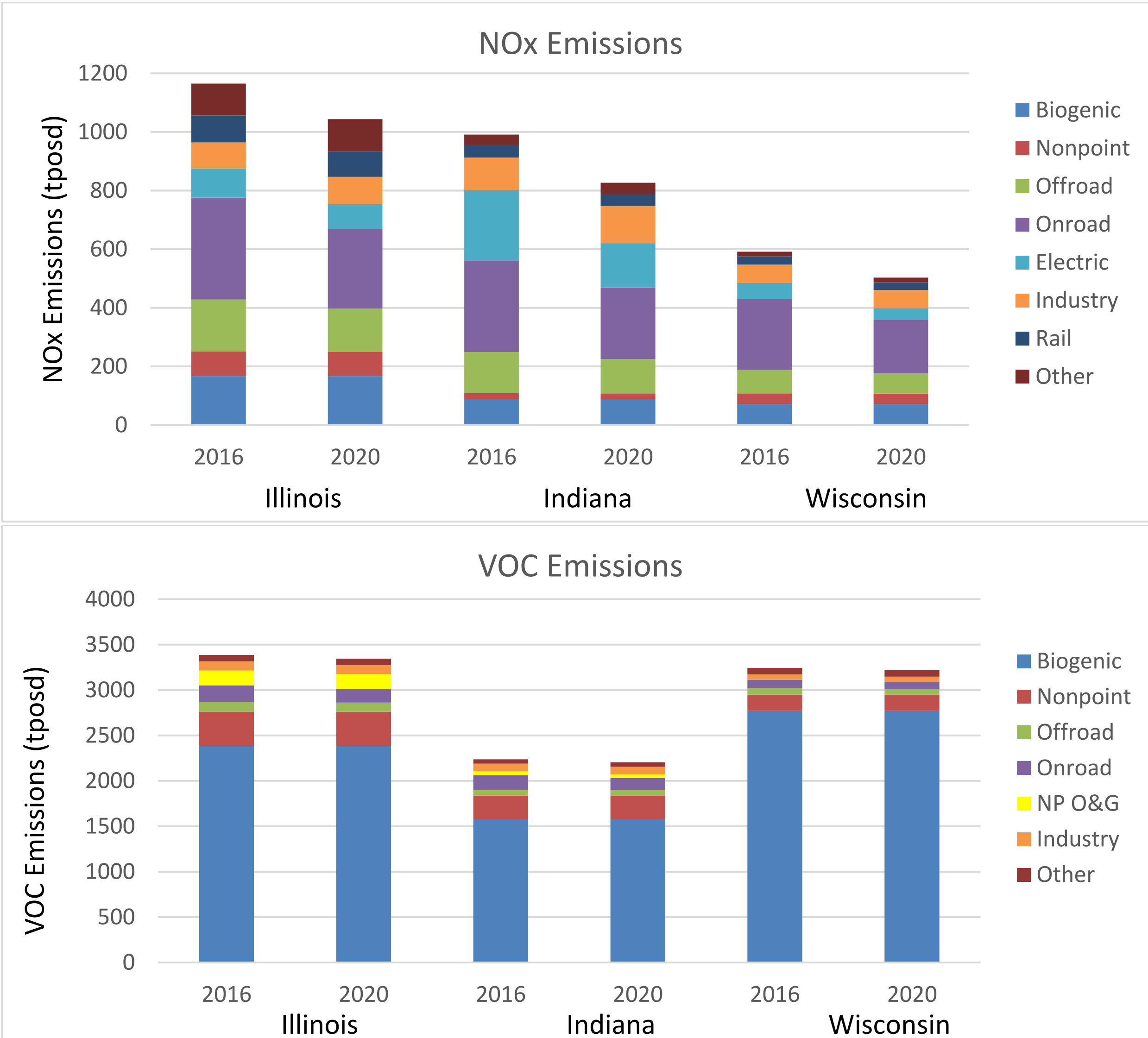
The emission inventories used for the photochemical modeling rely heavily on emissions and other model inputs prepared by EPA. Both EPA and LADCO extensively quality assure their emission inventories. LADCO's emissions modeling quality assurance procedures include reviewing emissions model output files for errors, comparing emissions between processing steps, checking that speciation, temporal, and spatial allocation factors are applied correctly, and reviewing the air quality model emissions inputs and stack parameters.

LADCO utilized emissions inventories compiled by the National Emission Inventory Collaborative ("the Collaborative") for the years 2016 and 2020 as the starting point for the modeling inventories used in this analysis. The 2016 emissions data for this study were based on the U.S. EPA v1 emissions modeling platform, generated by EPA and the Collaborative. These emissions have been speciated, temporalized and gridded to provide hourly emissions inputs to support photochemical modeling. Emissions include all criteria pollutants and precursors and some hazardous air pollutants. The Collaborative webpage provides a thorough description of the methodology used to develop the 2016v1 emissions inventory.[15] LADCO's projected future emission inventory for the year 2020 is based on interpolating between the 2016 and 2023 Inventory Collaborative 2016 v1 inventories for most sectors. For the EGU sector, LADCO used 2020 EGU forecasts from the Eastern Regional Technical Advisory Committee (ERTAC) EGU Tool version 16.1. The 2023 inventory incorporates current "on-the-books" emission control measures and sector-specific forecasts for activity changes from 2016 to 2023.

Figure 4.1 compares projected VOC and NOx emissions for 2020 (considering all control measures) with 2016 base year emissions for different emissions categories. NOx emissions are projected to decrease by 10 to 17 percent from the three states, with the largest reductions from the onroad, offroad and electricity sectors. VOC emissions (excluding from biogenic sources) are projected to decrease by 4 to 5 percent, with the largest reductions from the onroad and offroad sectors. These reductions are expected due to "on the books", enforceable control measures.

[14] Attainment will be evaluated based on 2018-2020 monitoring data.
[15] http://views.cira.colostate.edu/wiki/wiki/10202

Figure 4.1. Base year (2016) and future year (2020) emissions of (top) NOx and (bottom) VOCs from the three states in the Chicago nonattainment area. Emissions are shown in tposd for the entire state (not just the nonattainment area).[16]



4.2. Photochemical Modeling for Ozone

LADCO, in cooperation with the Illinois Environmental Protection Agency (IEPA), the Indiana Department of Environmental Management (IDEM), and WDNR, conducted the modeling assessment described here to support the development of the states' ozone attainment SIPs. The

[16] It should be noted that a large majority of Wisconsin emissions do not contribute to ozone in the Chicago nonattainment area due to the regional transport patterns described in Chapter 2. However, emissions from sources in Illinois and Indiana upwind of the nonattainment area significantly contribute to ozone in the area.

modeling analyses were conducted in accordance with EPA's attainment demonstration and related modeling guidelines.[17]

4.2.1. Selection of Modeling Years

The calendar year 2016 was selected as the base year for regional ozone modeling because model input data for 2016 were widely available and they represented the state-of-the-science for emissions and meteorology data. A group of multi-jurisdictional organizations, states, and EPA had previously established 2016 as the new base year for a national air quality modeling platform because of fairly typical ozone conditions and average wildfire conditions. EPA, LADCO and others subsequently developed data and capabilities for simulating and evaluating air quality in 2016, including development of a 2016 emissions inventory and modeling platform.

LADCO selected 2020 as the future projection year because it aligns with the last ozone season that will be used to determine attainment of the 2008 ozone NAAQS.

4.2.2. Modeling Platform

The modeling platform consists of emissions and transport models that reflect the spatial and temporal characteristics of the study region. A summary of the models used in the 2016 modeling platform are shown in Table 4.1. Meteorological modeling for the 2016 modeling platform was performed with the Weather Research and Forecast (WRF-ARW V3.8) model operated by EPA's Office of Air Quality Planning and Standards. LADCO's modeling assessment utilized the WRF meteorological outputs developed by EPA.[18] Appendix 10 describes the meteorological inputs in greater detail.

Table 4.1. LADCO 2016 air quality modeling platform components.

Platform Element	Configuration	Data source
Meteorology Data	WRFv3.8	U.S. EPA
Initial and Boundary Conditions	2016 Hemispheric Community Multi-Scale Air Quality Model	U.S. EPA
2016 Emissions Data	Inventory Collaborative 2016v1 ERTAC16.1 EGU Point	Inventory Collaborative and ERTAC
2020 Emissions Data	Inventory Collaborative 2016v1 ERTAC16.1 EGU Point	LADCO and ERTAC
Emissions Modeling Platform	U.S. EPA 2016fh_16j	U.S. EPA
Photochemical Grid Model	CAMxv7.0 beta4	LADCO

[17] EPA, 2018. Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze. Research Triangle Park, NC, https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf

[18] US EPA, 2019. Meteorological Model Performance for Annual 2016 Simulation WRF v3.8. (EPA-454/R-19-010) United States Environmental Protection Agency.

Photochemical modeling of criteria air pollutants is performed with the Comprehensive Air quality Model with Extensions (CAMx V7.0 beta 4[19]). CAMx is commonly used for attainment plans and has been extensively peer reviewed[20,21,22]. Emissions inventory data is converted into the formatted emission files required by the CAMx model using the EPA 2016fh_16j Sparse Matrix Operator Kernel Emissions modeling platform. Initial and boundary conditions are derived from a 2016 global simulation run using the Community Multiscale Air Quality model[23]. The CAMx photochemical model outputs hourly concentrations of tropospheric pollutants including ozone, NOx, and various groupings of VOCs. Hourly results are post-processed to daily averages, maximum daily 8-hour average (MDA8) ozone concentrations, or annual averages for the purpose of assessing and projecting monitor design values in the context of regional attainment demonstrations. Appendix 10 describes the model configuration in greater detail and includes a detailed model performance evaluation.

4.2.3. Modeled Attainment Test

CAA Section 182(b) requires states to use an attainment demonstration based on air quality modeling to estimate whether identified emissions reduction measures are sufficient to reduce projected pollutant concentrations to a level that meets the NAAQS by the statutory deadline established by EPA. LADCO performed this modeling assessment consistent with the guidance issued by EPA in 2018[24] and using 2020 as the projection year. LADCO has estimated the amount of emission reductions expected by 2020 and has applied the CAMx photochemical model to simulate both base year and future year ozone concentrations.

The model attainment test uses the photochemical model to estimate future year design values via version 1.2 of the Software for Modeled Attainment Test Community Edition (SMAT-CE).[25] The SMAT-CE software computes the fractional changes, or relative response factors, of ozone concentrations at each monitor location based on a comparison of the modeled air quality in the base and future years. Meteorological conditions are assumed to be unchanged for the base and projection years. Modeled relative reduction factors are then applied to a weighted baseline 2016 design value, which is determined by averaging three successive three-year design values centered on 2016 (i.e., 2014-2016, 2015-2017, 2016-2018). The resulting estimates of future ozone design values are then compared to the NAAQS. If the future ozone design values are less

[19] Ramboll. 2020. User's Guide: Comprehensive Air Quality Model with Extensions version 7.00. Novato, CA. http://www.camx.com/files/camxusersguide_v7-00.pdf
[20] Baker, K., Scheff, P., 2007. Photochemical Model Performance for $PM_{2.5}$ Sulfate, Nitrate, Ammonium, and Precursor Species SO_2, HNO_3, and NH_3 at Background Monitor Locations in the Central and Eastern United States. Atmospheric Environment, 41, 6185- 6195.
[21] Vizuete, W., Jeffries, H.E., Tesche, T.W., Olaguer, E.P., Couzo, E., 2011. Issues with Ozone Attainment Methodology for Houston, TX. J. Air Waste Manage. Assoc., 61, 238-253.
[22] Simon, H., Baker, K.R., Phillips, S., 2012. Compilation and Interpretation of Photochemical Model Performance Statistics Published Between 2006 and 2012. Atmospheric Environment, 61, 124-139.
[23] U.S. EPA, 2019. 2016 Hemispheric Modeling Platform Version 1: Implementation, Evaluation, and Attribution. Research Triangle Park, NC. U.S. Environmental Protection Agency. U.S. EPA

[24] US EPA. 2018. Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze. Research Triangle Park, NC, https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf
[25] https://www.epa.gov/scram/photochemical-modeling-tools

than or equal to the NAAQS, then the analysis suggests that attainment will be reached. LADCO has used the SMAT-CE software according to EPA's recommended approach.

Table 4.2 summarizes the results of the modeled attainment test for the 2020 future year. Projected design values at key monitors (i.e., the monitors with the highest ozone concentrations) range from 70 ppb to 75 ppb. The modeled attainment test therefore projects that all monitoring locations in the Chicago nonattainment area will meet the level of the 2008 ozone NAAQS (75 ppb) by 2020.

Subsequent to the completion of this modeling, LADCO and EPA identified several errors in the emissions inventory relied upon in that modeling. LADCO is in the process of rerunning the modeling with these updated emissions estimates. Due to the nature of the errors, it is not anticipated that the outcomes of the modeled attainment test will significantly change. WDNR intends to update this document with the revised modeling results, when available.

Table 4.2. LADCO modeled ozone design values (ppb) for 2020 compared with the base year and actual 2017-2019 design values at the highest-ozone monitors in the Chicago nonattainment area. Modeled DVs are shown truncated to the ones place following the modeled attainment test procedure.

AQS ID	Monitor	ST	LADCO 2020 DV	Base 2014-2018 DV	Actual 2017-2019 DV
170310001	Alsip	IL	71	73.0	75
170310032	Chicago SWFP	IL	70	72.3	73
170314201	Northbrook	IL	71	73.3	75
170317002	Evanston	IL	71	74.0	75
170971007	Zion	IL	71	73.7	71
550590019	Chiwaukee Prairie	WI	75	78.0	75
550590025	Kenosha Water Tower	WI	71	73.7	74

5. WEIGHT OF EVIDENCE ANALYSIS: OZONE AND OZONE PRECURSOR TRENDS

5.1. Introduction

EPA recommends that states submit supplemental analyses in support of any attainment plan. These analyses are intended to provide additional support for a finding of attainment based on the required modeled attainment assessment. Such supplemental analyses are part of a "weight of evidence" demonstration that an area will attain a standard. This section presents and discusses trends in ambient ozone and ozone precursor concentrations and forms the core of such a weight of evidence demonstration.

These weight of evidence analyses support the projection of attainment from the modeled attainment demonstration for the Chiwaukee Prairie monitor, along with all of the other ozone monitors in the Chicago nonattainment area. The modeled attainment test projects that the Chicago area will attain the 2008 ozone NAAQS in 2020 (Section 4 and Table 5.1). In reality, one Chicago area monitor is violating the 2008 ozone NAAQS based on its preliminary 2018-2020 design value, making this area potentially subject to a bump-up to severe nonattainment. However, 2021 critical values for Chicago area monitors are fairly high (Table 5.1), making it possible the area will attain the standard in the 2019-2021 design value year.

Table 5.1. Comparison of modeled 2020 design values, recent monitored design values and 2021 critical values for the highest-ozone monitors in the Chicago nonattainment area. All values are in ppb.

Monitor	Modeled 2020 DV	Monitored Design values		2021 Critical Values*
		2017-2019	2018-2020*	
Chiwaukee Prairie, WI	75	75	74	83
Kenosha WT, WI	71	74	74	84
Alsip, IL	71	75	75	82
Chicago SWFP, IL	70	73	74	80
Northbrook, IL	71	75	77	80
Evanston, IL	71	75	75	85
Zion, IL	71	71	72	86

* The critical value is the fourth high value at and above which the three-year design value would exceed the standard. 2018-2020 design values and 2021 critical values are draft as of September 28, 2020 and are subject to change.

This chapter shows that emissions of ozone precursors have decreased regionally since at least 2002 and are currently less than half of their 2002 levels. As a result of these emissions reductions, monitored concentrations of NOx and VOCs in Wisconsin have decreased by similar proportions and are continuing to decrease. Ozone concentrations adjusted for meteorology are also continuing to decrease, although these reductions may be slowing. Section 5.4 of this chapter also demonstrates the crucial role of transport of ozone and ozone precursors to the

Chiwaukee Prairie monitor, which severely limits Wisconsin's ability to reduce ozone concentrations in Kenosha County.

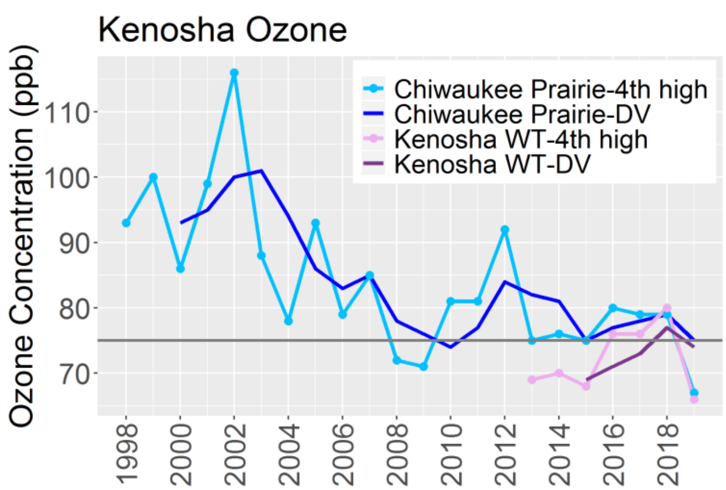
5.2. Trends in Ambient Ozone Concentrations

WDNR currently monitors ozone at two locations within the partial Kenosha County 2008 ozone nonattainment area (Figure 1.1). In addition, IEPA operates an additional 15 ozone monitors within the larger Chicago nonattainment area, and IDEM operates four monitors within this area.

5.2.1. Trends in Monitored Ozone Concentrations

Figure 5.1 shows trends in the annual fourth high MDA8 ozone concentration and design values for Wisconsin's monitors in the Chicago nonattainment area. Since 1998, ozone concentrations have decreased considerably. Annual fourth high values at the Chiwaukee Prairie monitor have decreased from 86-116 ppb before 2004 to 67-80 ppb since 2013. Design values[26] have decreased from 93-101 ppb before 2004 to 75-79 ppb since 2005. The largest reductions occurred during the early years of this period, with design values decreasing by 17 ppb from 2000 to 2009 but only 1 ppb from 2009 to 2019 (Table 5.2). [27] Meteorological variability significantly affects ozone concentrations and can obscure trends over shorter time periods. For example, 2012 had an extremely hot summer with a high frequency of elevated ozone concentrations, 2008 and 2009 had relatively cool summers with a lower frequency of elevated ozone concentrations. The next two sections discuss the impact of meteorology on ozone concentrations at these locations and show that when adjusted for meteorology, ozone concentrations are continuing to decrease.

Figure 5.1. Trends in annual fourth high maximum daily 8-hour ozone concentrations and design values for the monitors in Kenosha County, Wisconsin.



[26] Ozone design values are the three-year average of the annual fourth high MDA8 value.
[27] WDNR began operating a new monitor, Kenosha Water Tower, a few miles inland from the lakeshore in 2013. Fourth high MDA8 concentrations at this monitor have been consistently 5-7 ppb lower than those on the lakeshore, although the interannual trends are similar.

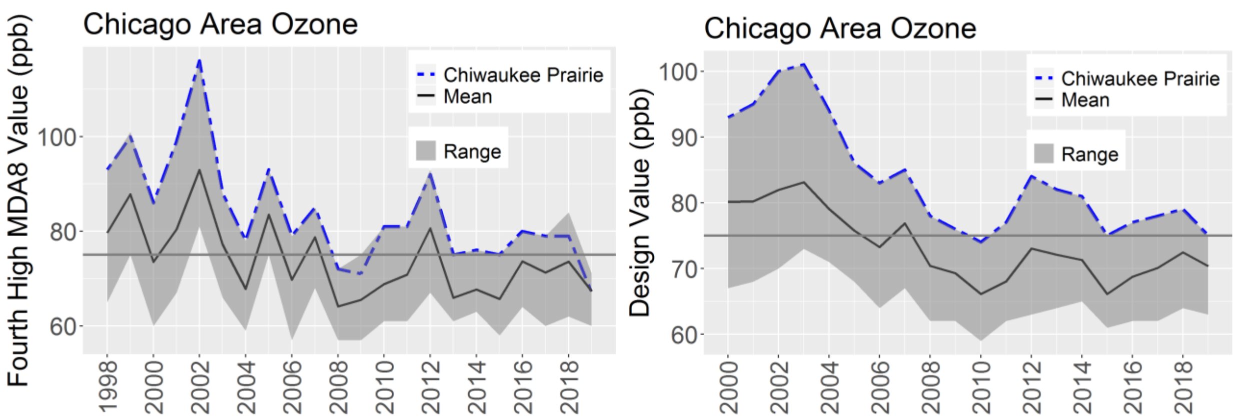
Ozone concentrations followed similar trends at the other monitors in the Chicago nonattainment area (Figure 5.2; Table 5.2). The Chiwaukee Prairie monitor almost always had the highest annual fourth high concentration and always had the highest design value (Figure 5.2) across the Chicago area.[28] Table 5.2 shows design values for 2000, 2009 and 2019 for all monitors currently operating in the area. Ozone design values decreased by an average of 9.6 ppb across the entire nonattainment area from 2000 to 2019. The largest reductions occurred south of Chicago (including monitors in Indiana and Illinois's Braidwood and Chicago-SWFP monitors), with these monitors having 13-23 ppb reductions in ozone concentrations. The smallest reductions occurred in and around Chicago itself, which saw variations from no change in ozone to a 6 ppb reduction. Most of the reductions in ozone occurred prior to the 2007-2009 design value year, except at a few monitors within the city of Chicago.

Table 5.2. Ozone design values for Chicago nonattainment area monitors for 1998-2000, 2007-2009, and 2017-2019, along with the change between these values. Data for 2009 are shown because this is near the midpoint in the record.

Site ID	County	State	Site	1998-2000	2007-2009	2017-2019	2000-2009	2009-2019	2000-2019
17-031-0001	Cook	IL	Alsip	75	73	75	-2	2	0
17-031-0032	Cook	IL	Chicago-SWFP	86	71	73	-15	2	-13
17-031-0076	Cook	IL	Chicago-Com. Ed		71	72		1	
17-031-1003	Cook	IL	Chicago-Taft H.S.	70	69	67	-1	-2	-3
17-031-1601	Cook	IL	Lemont	74	74	68	0	-6	-6
17-031-3103	Cook	IL	Schiller Park			63			
17-031-4002	Cook	IL	Cicero	70	65	68	-5	3	-2
17-031-4007	Cook	IL	Des Plaines	77	64	70	-13	6	-7
17-031-4201	Cook	IL	Northbrook	81	70	74	-11	4	-7
17-031-7002	Cook	IL	Evanston	83	67	75	-16	8	-8
17-043-6001	DuPage	IL	Lisle	67	62	70	-5	8	3
17-089-0005	Kane	IL	Elgin	75	68	70	-7	2	-5
17-097-1007	Lake	IL	Zion	81	74	71	-7	-3	-10
17-111-0001	McHenry	IL	Cary	81	68	71	-13	3	-10
17-197-1011	Will	IL	Braidwood	80	64	66	-16	2	-14
18-089-0022	Lake	IN	Gary	84		68			-16
18-089-2008	Lake	IN	Hammond	88	70	65	-18	-5	-23
18-127-0024	Porter	IN	Ogden Dunes	91	73	70	-18	-3	-21
18-127-0026	Porter	IN	Valparaiso	86	68	73	-18	5	-13
55-059-0019	Kenosha	WI	Chiwaukee Prairie	93	76	75	-17	-1	-18
55-059-0025	Kenosha	WI	Kenosha WT			74			

[28] Based on preliminary 2018-2020 design values, Illinois's Northbrook monitor had a higher design value (77 ppb) than the Chiwaukee Prairie monitor (75 ppb) for the first time in at least 20 years.

Figure 5.2. Trends in the average (left) fourth high maximum daily 8-hour average (MDA8) ozone concentration and (right) design value for ozone monitors in the Chicago nonattainment area. The shaded area shows the range of values. The values for the Chiwaukee Prairie, WI, monitor are shown for reference.

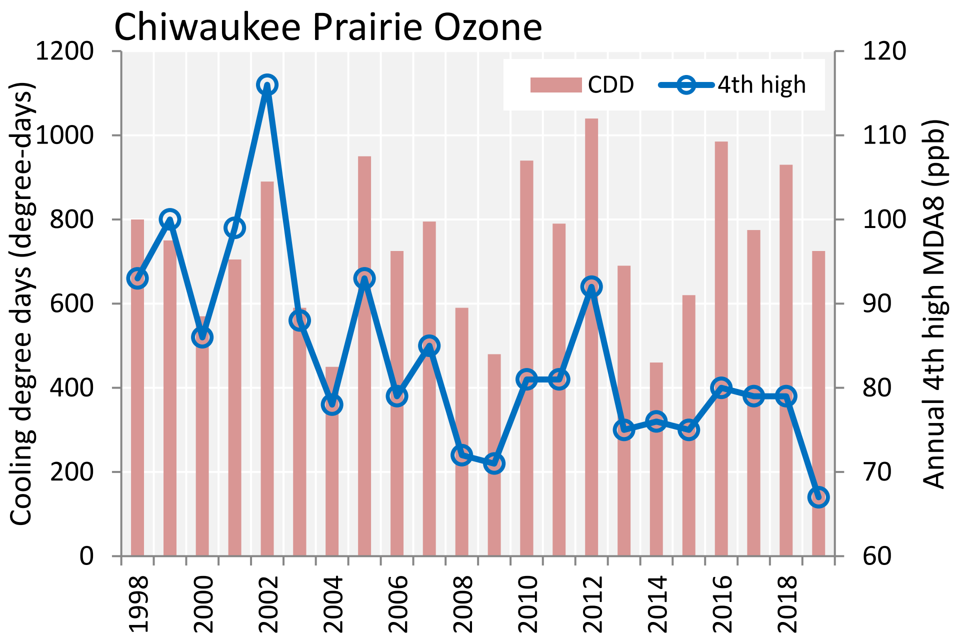


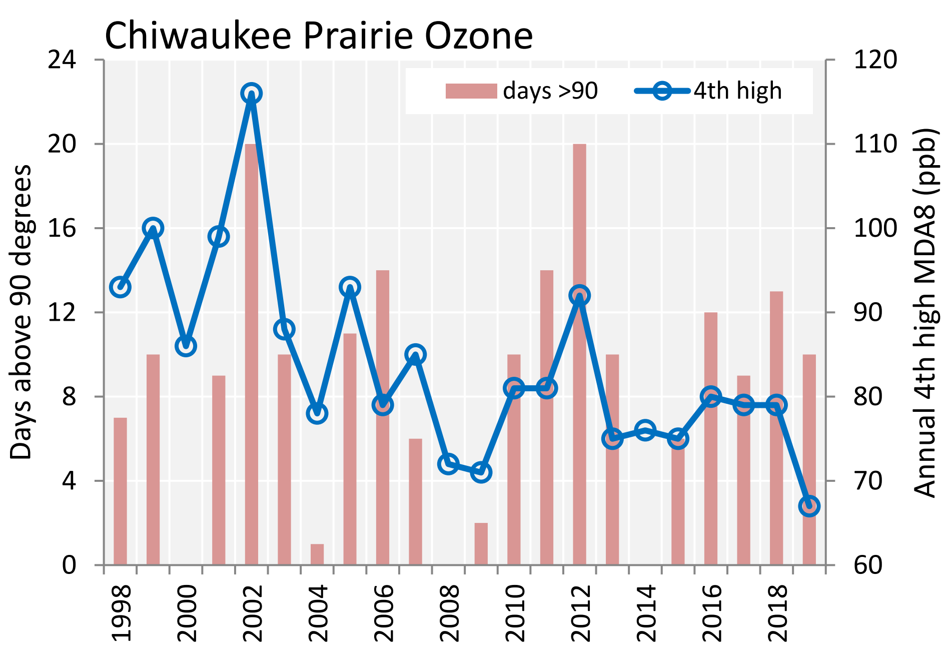
5.2.2. Influence of Temperature on Ozone Concentrations

Temperature is an important and well-known driver of ozone formation, with much more ozone produced at high temperatures than at low temperatures. Figure 5.3 compares annual fourth high MDA8 concentrations at Chiwaukee Prairie with two different measures of temperature at the Milwaukee Airport. Cooling degree days give a measure of how warm the whole year was, with higher overall temperatures leading to higher cooling degree days.[29] In comparison, the count of days with temperatures over 90° indicates how often extreme temperatures occurred in a year. The correlations between ozone concentrations and temperature are very clear from Figure 5.3. The highest ozone concentrations occurred in years with the highest temperatures, measured using both parameters, and vice versa. This figure also suggests that the amount of ozone produced for a given temperature level has decreased over time. For example, comparison of the years 2002 with 2012 shows that the fourth high MDA8 value was much lower in 2012 relative to 2002 (92 ppb versus 116 ppb) even though temperatures were similar between the years. These reductions are presumably due to reduced emissions of ozone precursors, as described in Chapter 3 and Section 5.3. The next part of this document explores these relationships in more detail and attempts to adjust ozone concentrations for different meteorological factors.

[29] Cooling degree days are measured in degree-days relative to 65° (in this case) and are a measure of the difference between the average temperature of a day and 65°, summed over an entire year. Cooling degree days are used as a relative measure of how much you would need to cool a space to keep temperatures steady at 65°.

Figure 5.3. Trends in (top) cooling degree days (relative to 65 °F) and (bottom) days with temperatures above 90 °F at Milwaukee Airport, plotted with annual 4th high maximum daily 8-hour average (MDA8) ozone concentrations. Climatological data is from the Wisconsin State Climatology Office website (http://www.aos.wisc.edu/~sco/clim-history/index.html).





5.2.3. Ozone Trends Adjusted for Meteorology

Because of the large effect of meteorology, particularly temperature, on ozone concentrations, meteorologically driven variability in ozone concentrations often obscures trends in ozone due to factors such as permanently reduced rates of precursor emissions. For this reason, it is important to adjust ozone concentrations for meteorology in order to examine trends in ozone concentrations due to precursor emission reductions and other factors. This section describes two such efforts to remove the effect of meteorology from ozone trends. Both sets of analyses show that when adjusted for meteorology, ozone concentrations in the Chicago nonattainment area are continuing to decrease.

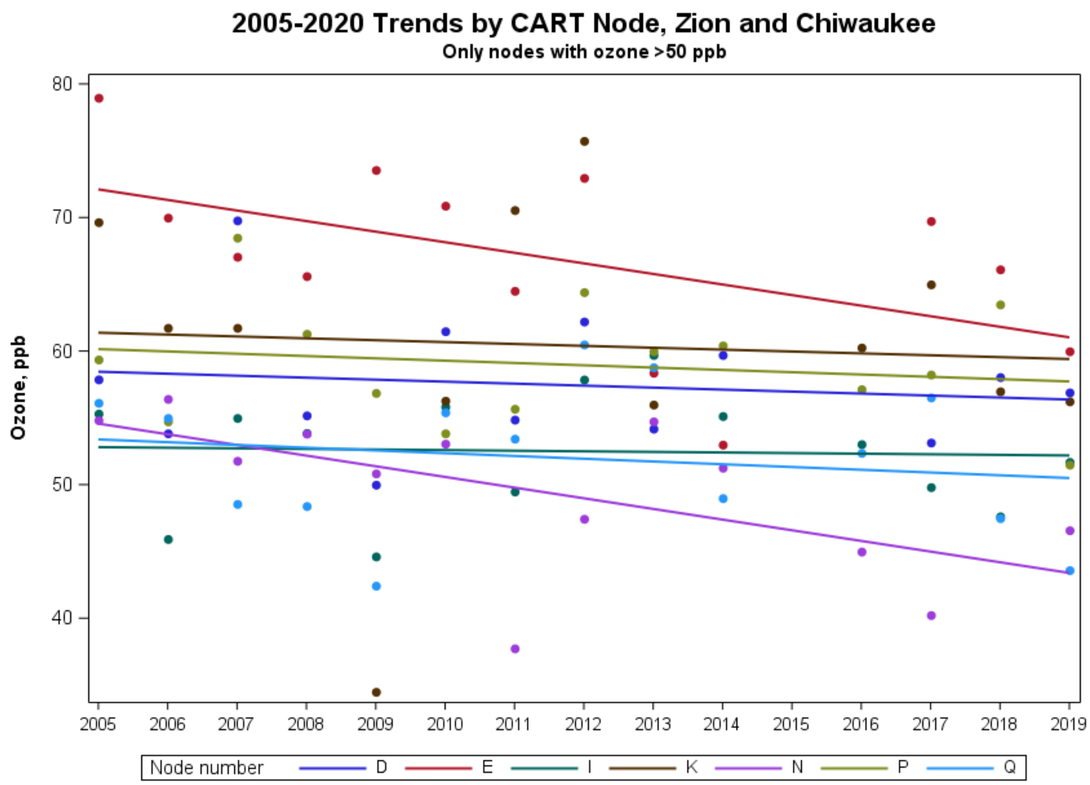
CART Analysis

Classification and Regression Tree (CART) analysis allows comparison of ozone concentrations on days with similar meteorological conditions. This analysis partially controls for the influence of year-to-year meteorological variability on ozone concentrations. CART analysis produces average ozone concentrations for a number of different classes of days (determined by meteorology) for each year under review. This analysis therefore allows examination of ozone concentration trends over long periods resulting from non-meteorological factors, including permanent and enforceable reductions in emissions of ozone precursors impacting the sites.

A CART analysis conducted by LADCO in August 2020 analyzed changes in ozone concentrations under different meteorological conditions over 15 years from 2005-2019. Figure 5.4 shows average ozone concentrations for the seven sets of meteorological conditions (“nodes”) with the highest ozone concentrations for two monitors in the northern part of the Chicago nonattainment area. The data shown for each node are the average ozone concentrations on all days with a specific set of meteorological conditions.[30] (Note that this timeframe analyzed incorporates a period predating the 2008 standard.) Average ozone concentrations decreased under all of these meteorological conditions over this time period, with the exception of node I, which remained relatively flat. The greatest decreases came from the node with the highest concentrations in the early 2000s (node E) and the node with some of the lowest concentrations (node N). This analysis suggests that the observed long-term decreases in ozone concentrations are due to reductions in ozone precursors (discussed in Chapter 3 and section 5.3) rather than solely due to meteorological factors. This analysis is presented in more detail in Appendix 11, which presents the meteorological conditions represented by each node along with a CART analysis of monitors from Cook County, IL.

[30] For example, Node E in Figure 5.4 shows the average ozone concentrations for days characterized by maximum temperatures and afternoon temperatures above 78 °F and 81 °F, respectively, and the height of the 700 mb pressure layer was more than 37 m above average.

Figure 5.4. Concentration trends from the CART analysis for Lake County, IL, and Kenosha County, WI monitors. Data points show the average ozone concentration for days sharing certain meteorological conditions ("nodes"). Only meteorological nodes with an average ozone concentration above 50 ppb are shown. (From LADCO)



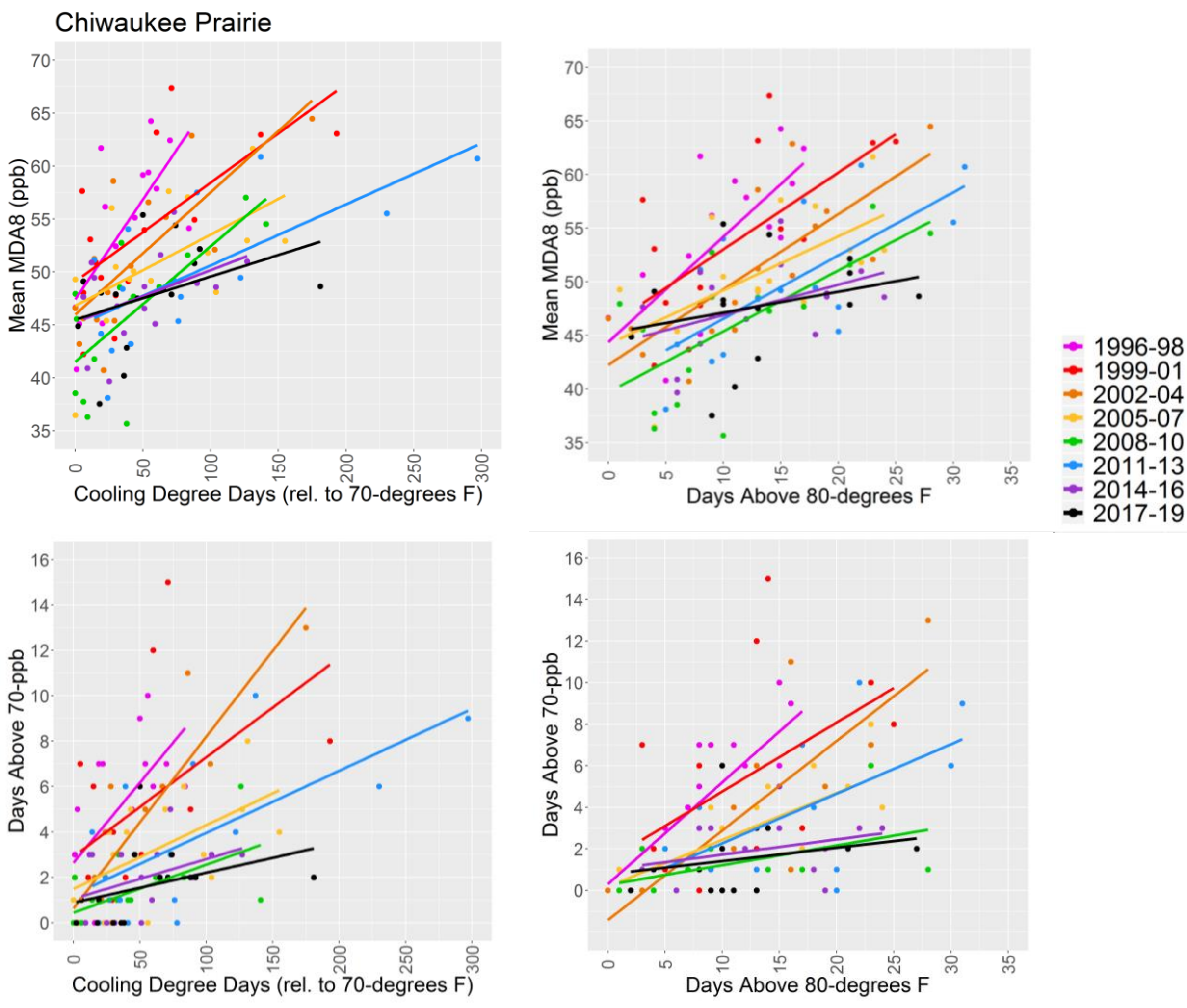
<u>Ozone-Temperature Correlations</u>

Plots of ozone versus temperature, separated by time period, also show reductions over time in the "conduciveness" of the atmosphere to form ozone given a certain amount of heat. Figure 5.5 shows plots of two ozone parameters versus two temperature parameters for individual months, with data grouped into three-year blocks.[31] (Appendix 11 shows many more of these plots, comparing different ozone and temperature parameters. The graphs shown here are those that had the best correlation coefficients.) These graphs confirm the earlier observations that ozone concentrations tend to increase with increasing temperature (Section 5.2.2). They also show that the amount of ozone produced at a given temperature level has decreased between almost every 3-year period. For example, comparison of trends in mean MDA8 values with the number of days above 80 degrees suggests that the mean MDA8 value for a month with 17 days above 80 degrees has decreased in almost every progressive time period. These values decreased from

[31] Temperature data is shown for inland monitors at Madison, WI and Rockford, IL rather than for the Chiwaukee Prairie monitor itself because temperature at the lakeshore monitor can be greatly affected by localized lake breeze events, which would not impact temperature and precursor emission rates sensitive to temperature in upwind areas where the ozone is formed. Using inland temperatures removes localized impacts and should be reflective of regional temperatures.

around 61 ppb in 1995-98 to 58 ppb in 1999-2001, 54 ppb in 2002-2004, 53 ppb in 2005-07, and 49 ppb in 2008-10. After 2010, ozone concentrations seem to increase again during 2011-2013 and then continue to decrease through 2017-19. It is likely that ozone during the years 2008-10 was lower than during 2011-13 because of the economic recession, which lowered emissions because of less economic activity. This impact is apparent in monitored NO_2 (Figure 5.9) and VOC (Figure 5.10) concentrations and was confirmed by a recent research study[32].

Figure 5.5. Trends in monthly averages of two ozone concentration parameters (mean maximum daily 8-hour average, MDA8, and maximum MDA8) plotted versus four different temperature parameters. Data are grouped into three- or four-year groups. Ozone was measured at the Chiwaukee Prairie monitor whereas temperature is an average of the Automated Surface Observing Systems (ASOS) measurements at Madison, WI (KMSN) and Rockford, IL (KRFD).[31]



[32] Tong et al. (2016) Impact of the 2008 Global Recession on air quality over the United States: Implications for surface ozone levels from changes in NOx emissions. *Geophys. Res. Letters*, 10.1002/2016GL069885.

In all of these graphs, the trend line for the most recent set of years, 2014-16, is either the lowest or among the lowest (with the low-ozone recession years, 2008-10), indicating that these years yielded the lowest amount of ozone for a given amount of warmth. This analysis confirms the conclusion of the CART analysis that ozone concentrations, when controlled for meteorology, have continued to decrease, even in the last few years. These findings suggest that, independent of meteorology, reductions in ozone precursor emissions (discussed in Chapter 3 and section 5.3) are continuing to drive decreases in ambient ozone concentrations. The analysis furthermore suggests that the apparent "flatness" of the trend in monitored ozone concentrations since 2008 likely resulted at least in part from variable meteorology. However, it also appears that the rate of ozone reduction is slowing, even as regional NOx and VOC emissions have continued to decrease substantially (Figures 5.6 and 5.7). This is likely due to the complex chemistry of ozone formation, as discussed in the next section.

5.3. Trends in Ambient Ozone Precursor Concentrations

5.3.1. NOx and VOC Roles in Ozone Formation and Emission Trends

Ozone is formed from the reaction of NOx and VOCs in the presence of sunlight. Ozone formation involves a number of different reactions. Partly because of the interactions between these different reactions, rates of ozone formation often respond non-linearly to reductions in ozone precursor concentrations. For example, under some circumstances, ozone formation may be NOx-limited, such that reductions in NOx emission cause reductions in ozone concentrations. Under NOx-limited conditions, VOC reductions may not affect ozone concentrations. Under other conditions, ozone formations may be VOC-limited. Currently, ozone formation in most of the eastern U.S. is believed to be NOx-limited[33]. The primary exception to this assumed NOx-limitation is in the largest urban centers, which often have high NOx concentrations and where ozone formation may be limited by the concentrations of the less-abundant VOCs. Because of this complex chemistry, approaches to decreasing ozone concentrations have relied on reductions in both NOx and VOC emissions.

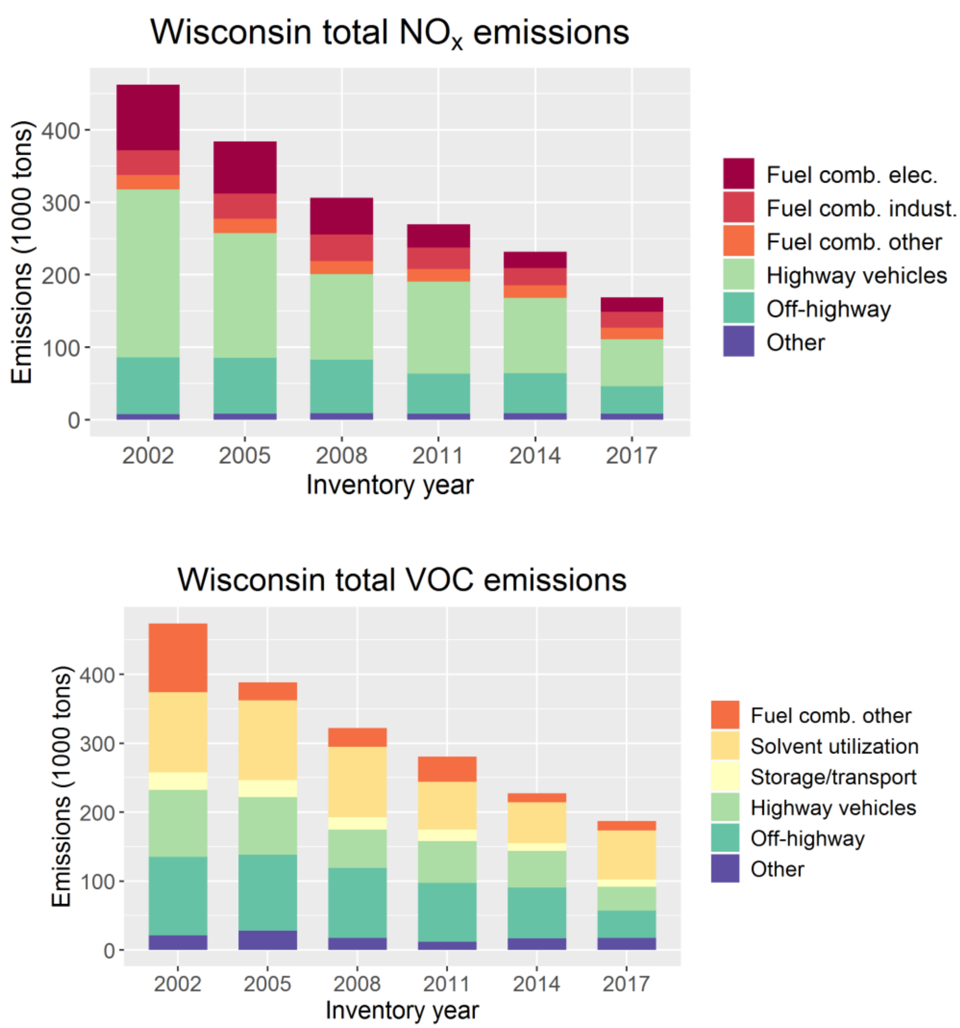
NOx consists of nitric oxide (NO) and nitrogen dioxide (NO_2). Most NOx is emitted as NO, which reacts fairly rapidly in the atmosphere to form NO_2, which has a longer lifetime in the atmosphere and can be transported longer distances. VOCs are a complex mixture of hundreds of different types of organic compounds, including compounds that contain only carbon and hydrogen ("hydrocarbons") and compounds that also include oxygen, nitrogen, sulfur and/or other elements. Some VOCs are emitted directly by anthropogenic sources, including benzene and toluene, whereas others are formed in the atmosphere from reaction of other VOCs. These "secondary VOCs" include formaldehyde and acetaldehyde, which are important "carbonyl" compounds.[34]

Emissions of both NOx and VOCs have decreased dramatically in the last few decades from Wisconsin and other U.S. states. Emissions of NOx from sources in Wisconsin decreased by

[33] See, for example, EPA (2013) Integrated Science Assessment for Ozone and Related Photochemical Oxidants. http://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=511347
[34] Carbonyl compounds contain a carbon-oxygen double bond.

63% from 2002 to 2017, and emissions of VOCs decreased 58% in this same timeframe (Figure 5.6). These reductions resulted from the control programs described in Section 3.5, as well as earlier programs. Most of the NOx reductions came from the utility, highway vehicle, and off-highway vehicle sectors, whose emissions have decreased by 78%, 72% and 52%, respectively. VOC emissions reductions primarily occurred in the solvent utilization, highway vehicle, off-highway vehicle and other combustion sectors, whose emissions decreased by 38%, 64%, 66% and 87%, respectively. Vehicle VOC emission reductions resulted from reduced evaporative losses and reduced exhaust levels.

Figure 5.6. Statewide annual NOx (top) and VOC (bottom) emissions by sector for the years 2002 through 2017. Data from the National Emissions Inventory (NEI), with updates to some sectors by EPA.[35]

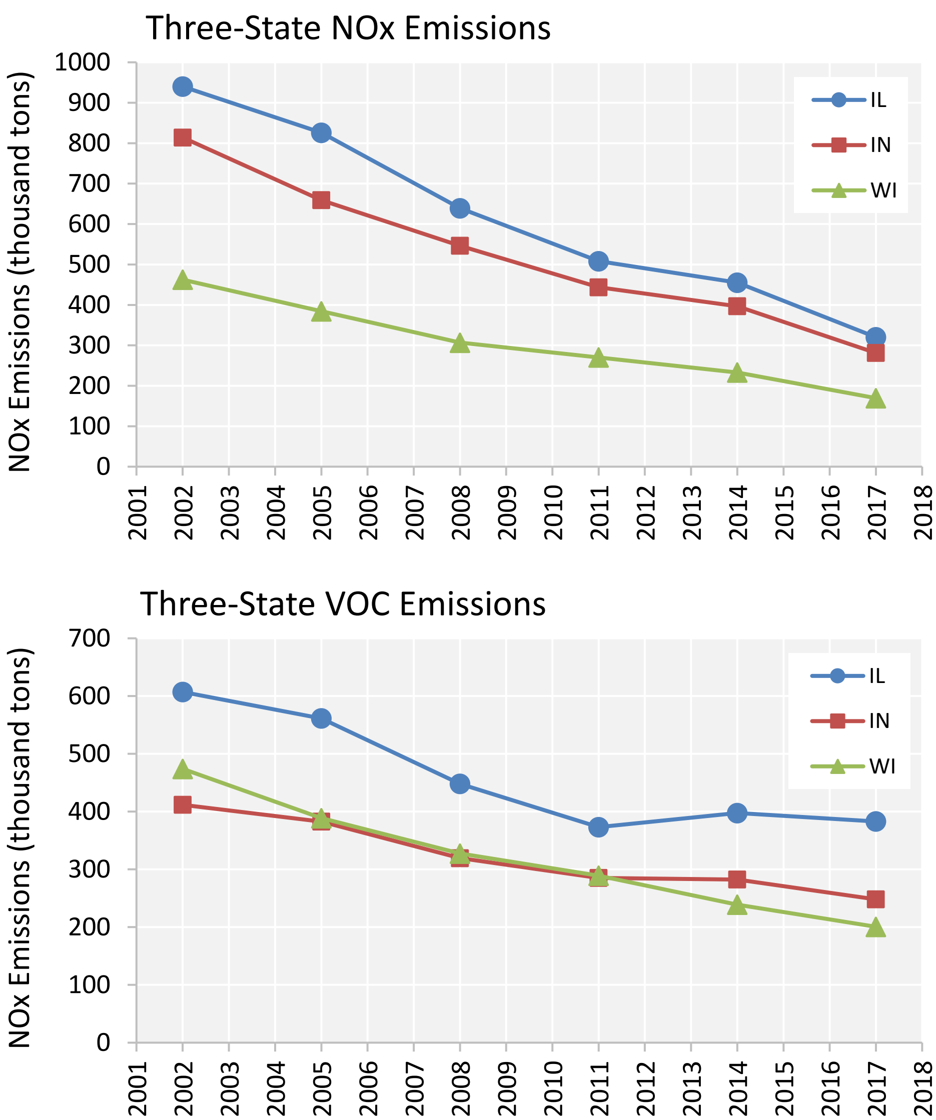


Emissions from sources in Illinois and Indiana have decreased by similar proportions (Figure 5.7)[36], although VOC emissions from these states remained relatively constant from 2011 to

[35] Data is from https://www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data.

2017. Table 5.3 shows that emissions from the Wisconsin portion of the Chicago nonattainment area are only a tiny fraction of total emissions from the area, accounting for 1.3% to 2.6% of NOx and VOC emissions. Emissions inventories for 2011 and 2017 and projections for 2020 are discussed in more detail in Chapters 3 and 4. Emissions of both pollutants are projected to continue to decrease through 2020 and beyond, both inside the nonattainment area and throughout the remainder of the three-state area.

Figure 5.7. Annual statewide emissions of (top) NOx and (bottom) VOCs from the three states in the Chicago nonattainment area. Data sources as cited in Figure 5.6.



[36] NOx emissions decreased 66% from Illinois and 65% from Indiana during this timeframe. VOC emissions decreased 37% from Illinois and 40% from Indiana.

Table 5.3. Comparison of 2011 and projected 2025 emissions of NOx and VOCs from the portions of each state in the Chicago nonattainment area. (Data were developed by each state for their 2020 redesignation requests for the Chicago nonattainment area.)

	NOx emissions		VOC emissions	
State	**2011**	**2025**	**2011**	**2025**
IL	631.84	330.94	518.91	399.90
IN	143.69	78.77	59.54	40.02
WI	17.35	11.08	7.97	5.58
Total	792.88	420.79	586.42	445.50
WI % of Total	2.2%	2.6%	1.4%	1.3%

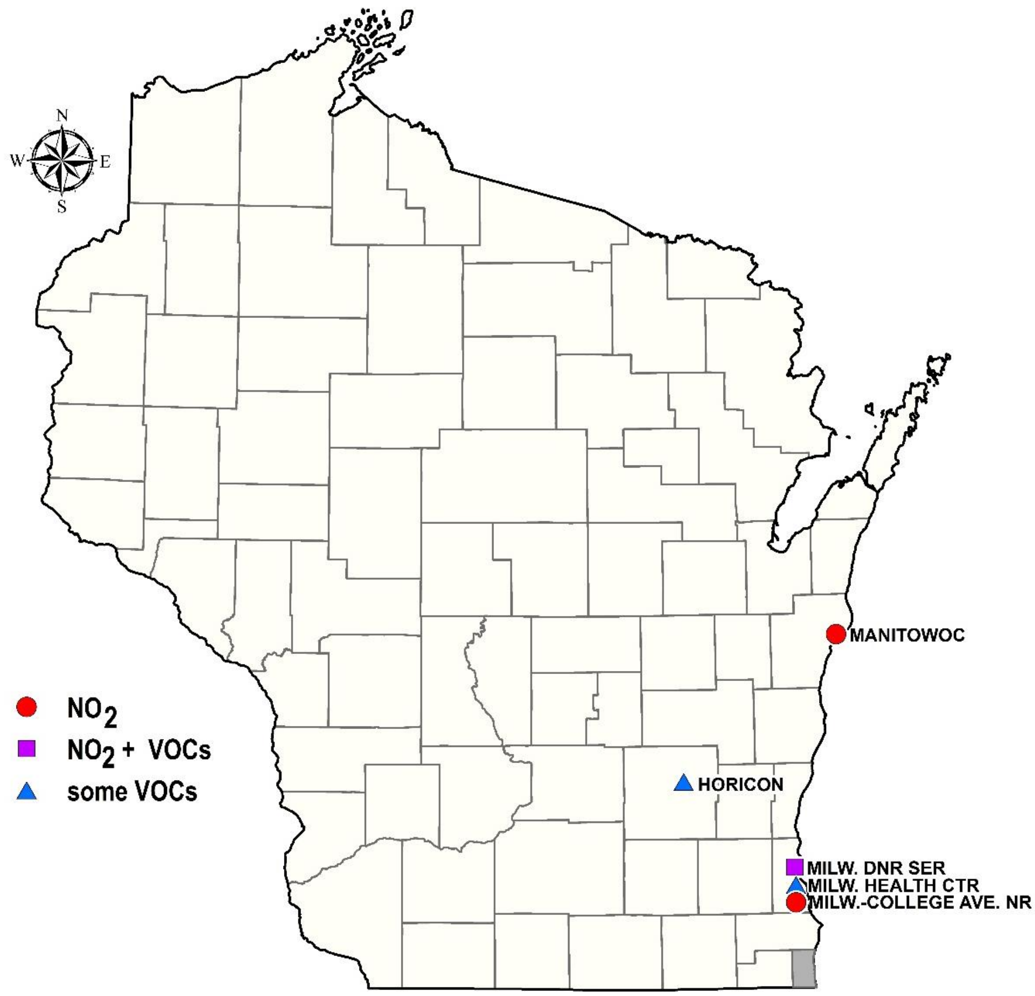
5.3.2. Trends in Ambient NOx Concentrations in Wisconsin

WDNR monitored ambient NO_2 concentrations[37] in 2019 at three locations in the eastern part of the state (Figure 5.8), two urban (Milwaukee SER and Milwaukee College Ave Near-Road) and one rural (Manitowoc).[38] None of these monitors are located within the partial Kenosha County 2008 ozone nonattainment area. However, trends at the existing monitors can provide insight into how ambient concentration along the lakeshore and in nearby inland counties have changed. Note that NO_2 may be transported significant but variable distances under the same meteorological conditions that transport ozone (discussed in Section 2.2). This means that concentrations measured at a given location may include NO_2 from both local and regional (upwind) sources.

[37] WDNR changed the methodology used to measure NO_2 from an indirect measurement of NO_2 measured by NOx-NO subtraction using a chemiluminescent method to a direct NO_2 measurement using cavity attenuated phase shift spectroscopy. This change occurred in August 2017 for the Milwaukee CA NR site and in May 2019 for the other two sites.

[38] Monitoring NOx and VOC concentrations is relatively complicated, labor-intensive and expensive. Consequently, measurements of these pollutants in Wisconsin (and in most states) have been very limited, both spatially and temporally (i.e., many measurements are only made in the summer). It is also worth noting that there was only one location in the state at which both NOx and VOCs were measured (Milwaukee SER), and VOC measurements were discontinued at this site in 2017.

Figure 5.8. Monitoring locations for ambient NOx and VOCs in Wisconsin. The partial Kenosha County 2008 ozone nonattainment area is shaded in gray. The Milwaukee SER site discontinued VOC monitoring in 2017.



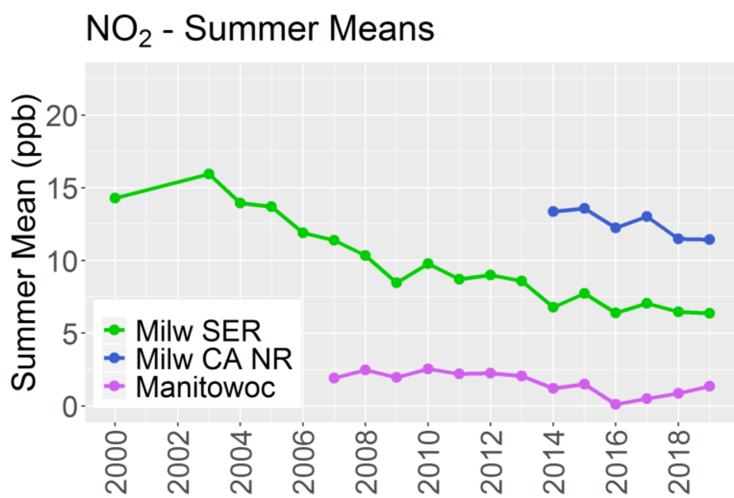
Average summer NO_2 concentrations were highest in all years at the urban near-road monitor (Milwaukee CA NR) followed by the other urban monitor (Milwaukee SER) (Figure 5.9). The lowest NO_2 concentrations were measured at Manitowoc, which is located along the northern Lake Michigan shoreline. Average NO_2 concentrations at the Milwaukee SER monitor have decreased significantly since monitoring began in 2000. From 2000 to 2019, mean summer NO_2 concentrations decreased 55%, with the largest changes coming between 2003 and 2009 (Figure 5.9). NO_2 concentrations have continued to decrease, although the rate of decrease appears to have slowed. The 55% reduction in ambient NO_2 concentrations at Milwaukee SER from 2000 to 2019 is similar in size to the reduction in NOx emissions from the entire state of Wisconsin (63% from 2002 to 2017; Figure 5.6) over a similar time period. The dip in concentrations in 2009 likely reflects the effect of the economic recession on economic activity.

Average summer NO_2 concentrations at the Milwaukee College Ave Near-Road site decreased by 14% in the six years this monitor has operated. NO_2 concentrations at Manitowoc decreased

29% from 2007 to 2019. However, given the much lower concentration of NO_2 at Manitowoc, the magnitude of these changes is much smaller than at the urban sites.

NO_2 concentrations in Kenosha County are likely heavily influenced by transport from the rest of the Chicago area. NO_2 concentrations are trending down at Illinois's Chicago monitors (as shown in Appendix 11) at similar rates to the trends shown for Milwaukee. The finding that monitored concentrations at the downwind Manitowoc monitor have also decreased in the last decade suggests a linkage between upwind and downwind NO_2 trends. This all suggests that ambient NO_2 concentrations in Kenosha County are likely decreasing.

Figure 5.9. Trends in ambient NO_2 concentrations at Wisconsin monitors during the summer months (June-August). Note that the Milw CA NR site is a near-road site whose location was selected to monitor maximum NOx concentrations.

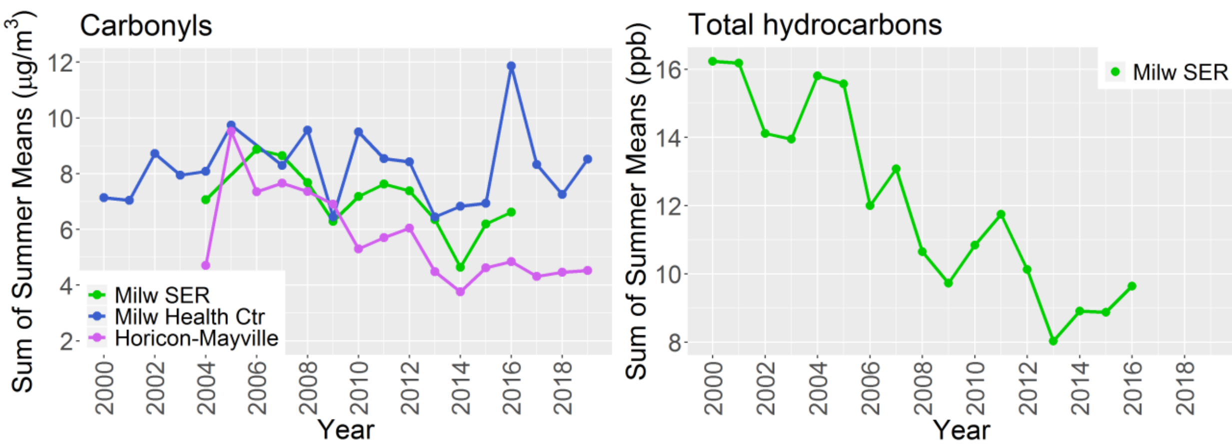


5.3.3. Trends in Ambient VOC Concentrations in Wisconsin

WDNR measured concentrations of 56 VOC compounds at one urban location through 2016 (Milwaukee SER) and a smaller set of VOC compound measurements at two other locations on an ongoing basis, one urban (Milwaukee Health Center) and one rural (Horicon; Figure 5.8).[38] None of these monitors is located within the current Kenosha County nonattainment area. However, as with NO_2, trends at the existing monitors can provide insight about concentration changes in the region. The VOC compounds monitored at the Milwaukee SER site included 53 hydrocarbons and three carbonyls (formaldehyde, acetaldehyde and acetone). At the other two monitors, the compounds measured included the three carbonyls and a smaller subset of hydrocarbons. A complete listing of the VOCs measured at the different sites, along with their concentrations for a subset of years, is in Appendix 11. This document shows trends in the sums of compound classes, with VOCs separated into carbonyl and hydrocarbon classes. Because only a subset of hydrocarbons was measured at the Milwaukee Health Center and Horicon-Mayville sites, hydrocarbon sums are not shown here for those sites. Appendix 11 also shows trends in sub-classes of hydrocarbons (including n-alkanes, branched and cyclic hydrocarbons, unsaturated hydrocarbons, aromatic hydrocarbons and isoprene). VOCs were measured yearround at the Horicon-Mayville and Milwaukee Health Center sites but only monitored during the summer months (June-August) at the Milwaukee SER site.

Summer average concentrations of carbonyls were lowest at the rural Horicon-Mayville site and highest at the Milwaukee Health Center site in most years (Figure 5.10). There was a clear though uneven decrease in carbonyls at the Horicon-Mayville site, with summer concentrations decreasing by 52% since 2005. The Milwaukee SER site showed a 6% decrease from 2004 to 2016 and a 25% decrease from 2006 to 2016. [39] The Milwaukee Health Center site showed high interannual variability in carbonyl concentrations and an overall 19% increase from 2000 to 2019, although the 2000 to 2018 trend is flat.[40]

Figure 5.10. Trends in summer (June-August) mean concentrations of two different classes of VOCs: (left) carbonyls and (right) hydrocarbons. Hydrocarbons are not shown for the Milwaukee Health Center or Horicon-Mayville monitors because only a few compounds were measured at these sites. Note that VOC monitoring at the Milwaukee SER site was discontinued after 2016.



Summer average total hydrocarbons at the Milwaukee SER site showed a large (41%) but variable decrease between 2000 and 2016 (Figure 5.10). This is similar in magnitude to the reduction in VOC emissions from the entire state over a similar time period (58% from 2002 to 2017; Figure 5.6). Concentrations of all sub-classes of anthropogenic hydrocarbons also decreased during this time period (Appendix 11). As discussed for NO_2, the minimum in 2009, and likely the lower concentrations in 2008 and 2010, probably reflect decreased emissions due to lower economic activity because of the recession. 2008 and 2009 also reflected summers with lower peak and average temperatures, conditions that would reduce seasonal average rates of evaporative fuel and uncontrolled solvent emissions of VOCs. Appendix 11 shows graphical

[39] The minimum in carbonyl VOCs in 2009 at both Milwaukee sites likely reflects decreased economic activity during the recession. Carbonyl concentrations appeared especially low in 2004, the first year of measurement at both the Milwaukee SER and Horicon-Mayville sites. This may be because the summer of 2004 was very cool, which can affect formation of secondary VOCs like formaldehyde and acetaldehyde.

[40] The larger amount of variability at the Milwaukee Health Center site likely results because these samples are only collected once every 12 days (as opposed to every 6 days at Milwaukee SER currently), so that fewer measurements are averaged together for each summer. As a result, one unusual measurement can have a greater influence on the average.

trends in these hydrocarbon compound class averages, as well as showing the concentrations and percent changes in concentrations of individual VOC compounds.

VOC concentrations in Kenosha County are likely also decreasing, as found for the nearby Milwaukee monitors, as well as the inland rural monitor at Horicon.

5.3.4. Comparison of Trends in Emissions and Monitored Concentrations

Figure 5.11 compares trends in emissions and monitored concentrations of ozone precursors, as well as monitored ozone concentrations. All trends are normalized to their value in 2010 in order to directly compare the different parameters. This comparison shows that monitored NO_2 concentrations in Milwaukee tracked inventoried statewide NOx emissions relatively well (Figure 5.11). NOx emissions and concentrations in Milwaukee were both 1.6-1.8 times higher in 2002 relative to 2010. NOx emissions and Milwaukee NO_2 concentrations in 2019 decreased by similar amounts from their 2010 values. NO_2 concentrations at the downwind, rural Manitowoc monitor were much lower than those in Milwaukee and were more decoupled from statewide emissions, although they showed similar reductions in 2019 relative to 2010.

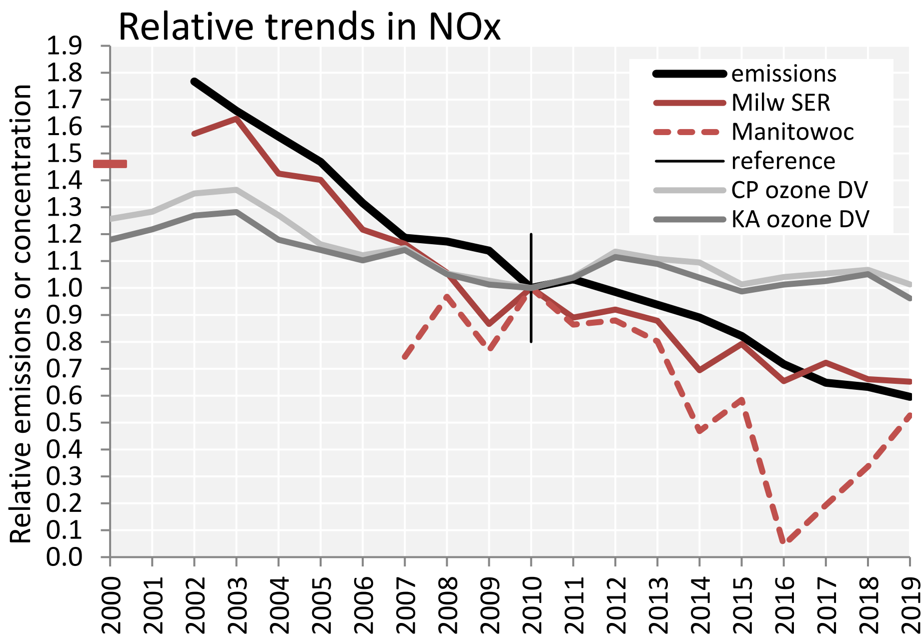
Similarly, trends in hydrocarbon VOCs at the Milwaukee SER monitor tracked statewide VOC emissions fairly well, although monitored concentrations were more variable than emissions (Figure 5.11). Emissions and monitored hydrocarbon concentrations both decreased from 1.3-1.6 times 2010 levels in 2002 to 0.7-0.9 times 2010 levels in 2016. Monitored concentrations of carbonyl VOCs were more variable than were hydrocarbons but also roughly follow the emission trends. In particular, carbonyl concentrations at the Milwaukee SER site have seemed to track emissions after 2006. Most hydrocarbon VOCs are directly emitted from sources, whereas carbonyls can be formed from reactions in the atmosphere, so it is unsurprising that these two types of VOCs have somewhat different trends. However, overall, monitored VOC concentrations have decreased as VOC emissions have decreased.

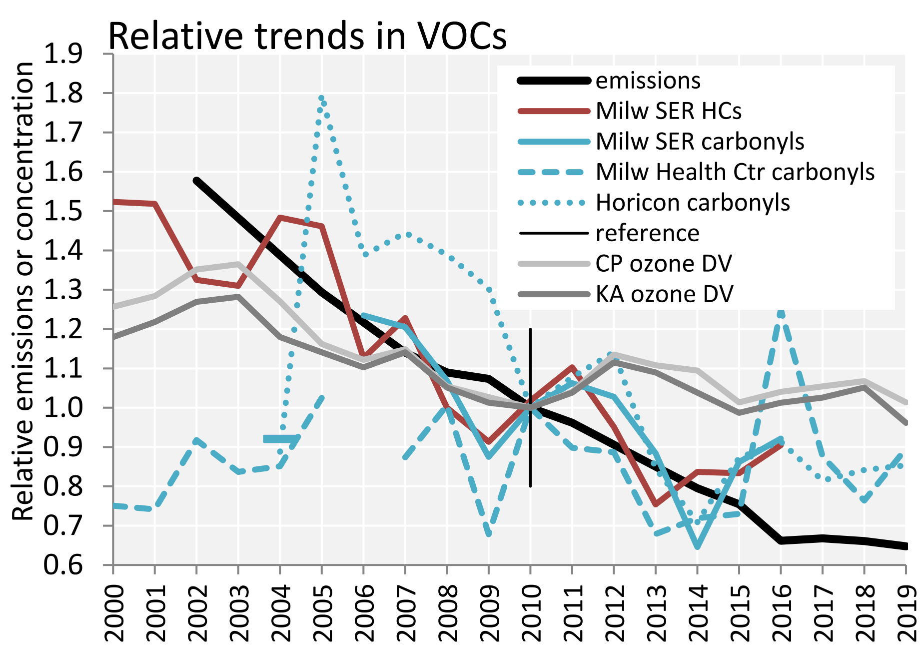
While monitored ozone concentrations have decreased during this time period, the magnitude of this decrease has not tracked NOx or VOC emission or concentration trends very closely (Figure 5.11). Ozone concentrations have decreased at a much slower rate than have either precursor emissions or monitored precursor concentrations. This slower rate of reductions likely results from a variety of factors that affect ozone formation and cause its concentrations to be nonlinear with the concentrations of ozone precursor concentrations. These factors include:

- Meteorological variability between years.
- The nonlinearity of ozone chemistry.
- The influence of ozone transported from upwind regions in the U.S. and from other countries.

The role of these different factors in contributing to ozone formation and trends are discussed in more detail in Sections 5.2 and 5.4.

Figure 5.11. Trends in (top) NOx and (bottom) VOC statewide emissions and monitored concentrations in Wisconsin, along with ozone design values at the Chiwaukee Prairie (CP) and Kohler Andrae (KA, in Sheboygan County) monitors. All values were normalized to their value in 2010 to allow comparisons of relative reductions over time. HC = hydrocarbon VOCs, and carbonyls are a class of VOCs including formaldehyde, acetaldehyde and acetone. Emissions data is from EPA ([https://www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data).](https://www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data)



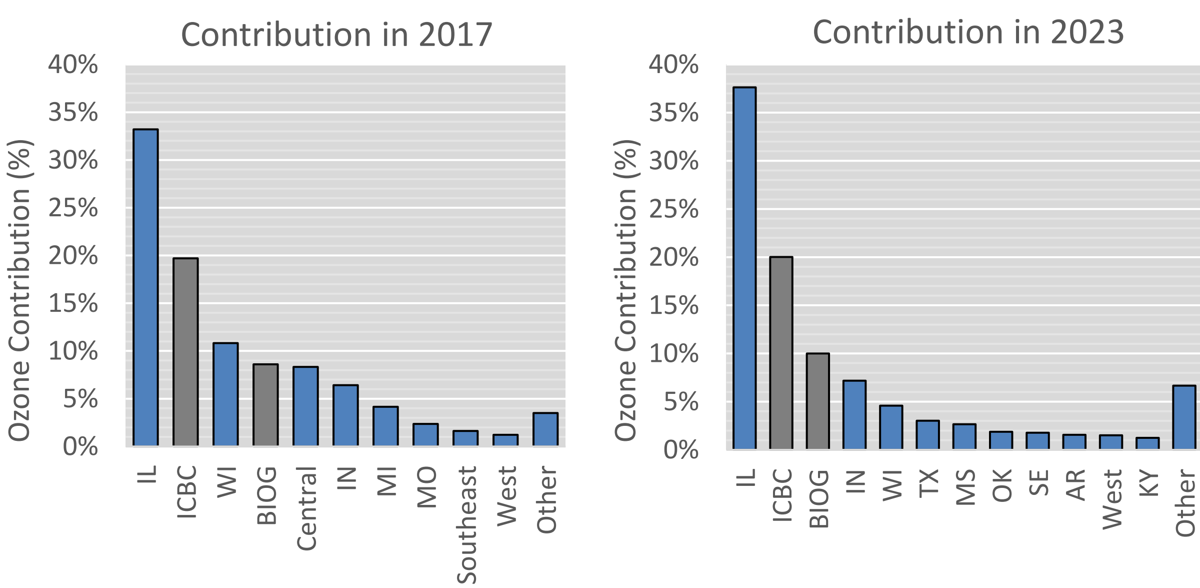


5.4. Influence of Transport Ozone, NOx and VOC Concentrations

Ozone concentrations can be influenced by several other factors besides the local concentration of ozone precursors and meteorology. These factors include transport from upwind areas and ozone formation chemistry. This part of the document examines the role of transport in driving ozone concentrations in Kenosha County.

Transport of ozone and ozone precursors from upwind areas is one of the most important factors driving high ozone concentrations in Wisconsin's ozone nonattainment areas. Recent source apportionment modeling from LADCO found that out-of-state emissions were responsible for approximately 89 to 93% of the measured ozone concentrations at the Chiwaukee Prairie monitor in 2017 and 2023; in contrast, Wisconsin sources contributed just 7 to 11% (Figure 5.12). In particular, Illinois and Indiana contributed 33 to 38% and 6 to 7% of the measured ozone, respectively. Contributions from outside the U.S. ("boundary conditions") and from natural sources ("biogenics") contributed 28 to 30%. The transport of such large amounts of ozone and ozone precursors from areas outside Wisconsin significantly limits the state's ability to reduce high ozone concentrations within its borders.

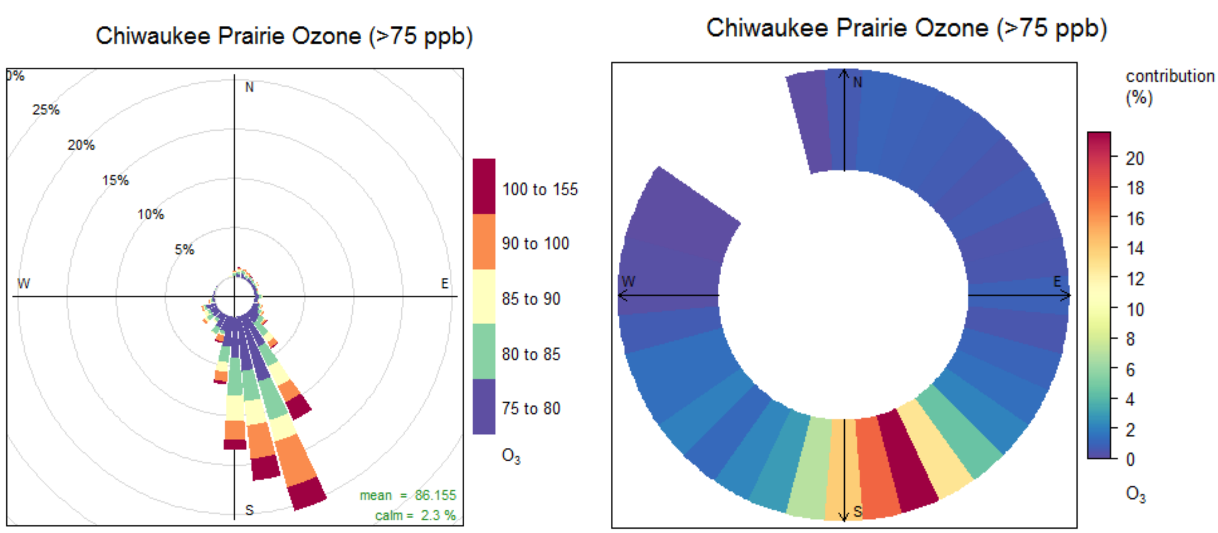
Figure 5.12. Ozone source apportionment modeling for 2017 (left) and 2023 (right) from the Lake Michigan Air Directors Consortium (LADCO) for the Chiwaukee Prairie monitor.[41]



[41] Contributions are projected from a 2011 base year. Only source regions that contributed 1% or more to ozone at the monitor are shown individually; other source regions are grouped together into the "other" category. 2017 modeling was provided by LADCO to WDNR in 2017. 2023 projected contributions come from LADCO 2015 Interstate Transport Modeling (with water): https://www.ladco.org/wp-content/uploads/Documents/Reports/TSDs/O3/LADCO_2015O3iSIP_TSD_13Aug2018.pdf. Source regions were grouped differently for the different modeling efforts. The Central region includes MN, IA, NE, KS, OK, TX, AR and LA. The Southeast region includes MS, AL, GA, FL, TN, VA, NC and SC. The West region includes WA, OR, CA, NV, ID, MT, WY, UT, CO, AZ, NM, ND and SD. ICBC refers to "boundary conditions", which are contributions from outside the U.S. BIOG represents biogenic emissions.

To further examine the role of transport on ozone at any given site, it is informative to investigate how pollutant concentrations vary with wind direction. Winds from different directions transport pollutants from different upwind origins. The coastline around the Chiwaukee Prairie monitor is oriented more or less in a straight north-south direction (Figure 1.1). Figure 5.13 shows one-hour ozone concentrations and wind data at this monitor for hours when ozone concentrations exceeded the standard. This analysis showed that high ozone concentrations almost always occurred when winds were from the south-southeast (Figure 5.13). Roughly 66% of ozone came to the Chiwaukee Prairie monitor from 146°-185° during high-ozone hours. Winds from these directions include lake breeze transport and direct transport from the south over Lake Michigan. Another 18% of the high ozone concentrations came from the south over land, from 186°-265°. This ozone presumably originated from sources to the south but was not carried over Lake Michigan. Only 7% of the ozone came with winds from the north, and only 1% came from over land to the north (e.g., from over Wisconsin's land mass). This analysis indicates that high ozone concentrations almost never occurred when winds came from directly over Wisconsin.

Figure 5.13. (left) One-hour ozone concentrations above 75 ppb plotted by wind direction and (right) percent contributions of ozone above 75 ppb from different wind directions for the Chiwaukee Prairie monitor. The length of the paddle in the pollution rose (left) indicates the frequency of that concentration-wind direction combination, and the color indicates the concentration (in ppb). Data are for 2000-2019, as available.



These findings confirm that ozone concentrations in the nonattainment area are dominated by ozone transported into the area. Transport from the south, primarily over Lake Michigan but also over land, is the primary cause of the high concentrations of ozone measured at this location. This transport most often occurs during a lake breeze event but may also occur with synoptic southerly winds (see Chapter 2).

5.5. Conclusion

These weight of evidence analyses support the modeled projection of attainment in the partial Kenosha County 2008 ozone nonattainment area. As shown above, monitored ozone concentrations have decreased since 2000. When adjusted to account for meteorological variability, ozone concentrations for equivalent conditions also show a decrease. Emissions of NOx and VOCs from Wisconsin have decreased over each three-year period from 2002 through 2017, as reflected in the periodic annual inventories (NEI) and inclusive of the economic recession in 2008-2010. Over this same period, monitored NOx and VOC concentrations along Wisconsin's Lake Michigan shoreline also decreased, following a similar pattern.

These analyses show that a majority of the ozone measured at the Chiwaukee Prairie monitor was delivered via transport from upwind states, with very little originating from sources in Wisconsin. This demonstrates that controls on sources in upwind states have been essential to reducing ozone concentrations in the partial Kenosha County 2008 ozone nonattainment area to date. Going forward, it will be crucial that such upwind sources implement effective emissions controls to enable future attainment and maintenance of the 2008 (and 2015) ozone NAAQS in the Wisconsin portion of the Chicago nonattainment area.

6. OTHER SERIOUS AREA SIP REQUIREMENTS

6.1. Transportation Conformity

Transportation conformity is required under CAA section 176 (c) (42 U.S.C 7506(c)) to ensure that federally funded or approved highway and transit activities are consistent with ("conform to") the purpose of the SIP. "Conform to" the purpose of the SIP means that transportation activities will not cause or contribute to new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS or any interim milestones. Transportation conformity applies to designated nonattainment and maintenance areas for transportation-related criteria pollutants: ozone, fine particles, coarse particles, carbon monoxide, and NO_2. EPA's transportation conformity rule (40 CFR Parts 51 and 93) establishes the criteria and procedures for determining whether metropolitan transportation plans, metropolitan transportation improvement programs, federally supported highways projects, and federally supported transit projects conform to the SIP.

The partial Kenosha County 2008 ozone nonattainment area currently demonstrates transportation conformity using the "Motor Vehicle Emissions Budget (MVEB) Test" (40 CFR 93.119). WDNR submitted a moderate area attainment plan for this nonattainment area on April 17, 2017. This submission contained MVEBs for 2017 and 2018 for this area. EPA approved these MVEBs for this area for use in transportation conformity determinations on February 13, 2019 (84 FR 3701).

EPA requirements outlined in 40 CFR 93.118(e) (4) stipulate that MVEBs for NOx and VOC are established as part of a control strategy implementation plan revision or maintenance plan. MVEBs are necessary to demonstrate conformance of transportation plans and improvement programs with the SIP.

6.1.1. Motor Vehicle Emissions Model

The EPA's MOVES2014b model is used to derive estimates of hot summer day emissions for ozone precursors of NOx and VOCs. Numerous variables can affect these emissions, especially the size of the vehicle fleet (the number of vehicles on the road), the fleet's age, the distribution of vehicle types, and the vehicle miles of travel. The transportation information is derived from a travel demand model. Appendix 5 contains key data used to develop inputs to MOVES2014b.[42]

6.1.2. Motor Vehicle Emissions Budgets (MVEBs)

Table 6.1 contains the MVEBs for the partial Kenosha County 2008 ozone nonattainment area for the years 2020 and 2021. Since assumptions change over time, it is necessary to have a margin of safety that will accommodate the impact of refined assumptions in the process. 40 CFR 93.101 defines safety margin as the amount by which the total projected emissions from all sources of a given pollutant are less than the total emissions that would satisfy the applicable requirement for RFP, attainment, or maintenance. WDNR increased the on-road mobile source

[42] The complete set of inputs to MOVES2014b is too lengthy to include in this document. However, electronic copies of the inputs can be obtained from WDNR by sending an email to christopher.bovee@wisconsin.gov or by phone at (608) 266-5542.

portions of the 2020 and 2021 projected emissions inventories by 7.5% for the partial Kenosha County 2008 ozone nonattainment area to account for uncertainties in future mobile source emissions.

For the partial Kenosha County 2008 ozone nonattainment area, transportation conformity will be based on the submitted MVEBs after EPA determines that the budgets meet the adequacy criteria of the transportation conformity rule. Once these budgets are found adequate by EPA, they will replace the MVEBs established in the 2008 ozone moderate area attainment plan submission for this area (84 FR 3701). Table 6.1 identifies the 2020 and 2021 MVEBs for this area for use in transportation conformity analyses. This level of emissions is consistent with the activity assumptions made in the inventories used for RFP and for the attainment demonstration modeling.

Table 6.1. Motor vehicle emissions budgets (MVEBs) for the partial Kenosha County 2008 ozone nonattainment area for 2020 and 2021.

Year	Emissions (tons per hot summer day)	
	VOC	NO_x
2020	1.20	2.21
2021	1.13	1.98

6.2. Reasonably Available Control Technology (RACT) Program for NOx

CAA section 182(f) requires states to adopt NOx RACT for all major sources of NOx in the ozone nonattainment areas. Wisconsin's NOx RACT program was first adopted by the state in July 2007 as codified under ss. NR 428.20 to 428.26, Wis. Adm. Code. The program was approved by EPA into the SIP in October 2009 (75 FR 64155). This program was established to fulfill NOx RACT requirements for southeast Wisconsin counties, including Kenosha County, that were designated moderate nonattainment under the 1997 ozone NAAQS. In February 2019, EPA approved Wisconsin's current NOx RACT program for compliance with moderate area requirements for the partial Kenosha County 2008 ozone nonattainment area (84 FR 3701).

WDNR has determined that Wisconsin's current NOx RACT program fulfills the RACT requirements for serious nonattainment for the partial Kenosha County 2008 ozone nonattainment area. The basis for this determination is:

1) Wisconsin's NOx RACT program currently applies to all existing major sources of NOx located in the partial Kenosha County 2008 ozone nonattainment area, as described below.

2) EPA has already approved the NOx RACT control technology assessment, which does not need updates from the approved moderate area submission.

6.2.1. Major Source Applicability

Wisconsin's current NOx RACT program (ss. NR 428.20 to 428.26, Wis. Adm. Code) was established to fulfill the moderate nonattainment requirements for the 1997 ozone NAAQS and applies to the facilities with potential to emit (PTE)[43] of NOx greater than 100 tons per year (TPY). The partial Kenosha County 2008 ozone nonattainment area has been reclassified from moderate to serious nonattainment for the 2008 ozone NAAQS. The major source threshold has decreased from 100 TPY to 50 TPY. Currently there are no facilities located in the partial Kenosha County 2008 ozone nonattainment area with PTE of NOx between 50 TPY and 100 TPY. Therefore, no additional facility in this area has become subject to NOx RACT due to the reclassification of the area from moderate to serious nonattainment.[44]

6.2.2. Control Technology

The 2008 ozone implementation rule provides that states can show that existing NOx RACT programs fulfill requirements for the 2008 NAAQS[45]. In 2017, WDNR submitted to EPA the analysis of the current NOx RACT program to demonstrate compliance with the implementation rule for the 2008 ozone NAAQS. The analysis shows that there is no incremental difference in control technologies between the existing NOx RACT program and the updated assessment for the facilities operating in 2008. In 2019, EPA approved WDNR's NOx RACT program for compliance with the 2008 ozone NAAQS for moderate nonattainment areas (84 FR 3701). Since the assessment was required for conditions in 2008 and is not dependent on the nonattainment classification level, an updated NOx RACT control technology assessment is not required for this SIP revision.

Thus, based on equivalency in major source applicability and RACT control technology, the WDNR concludes that Wisconsin's current NOx RACT program under ss. NR 428.20 to 428.26 fulfills RACT requirements for serious nonattainment for the 2008 ozone NAAQS.

6.3. Reasonably Available Control Technology (RACT) Program for VOCs

RACT represents the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility (44 FR 53761). CAA section 182(b)(2) requires states with moderate or higher ozone nonattainment areas to implement RACT under section 172(c)(1) with respect to each of the following:

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[43] The applicability of chapter NR 428, Wis. Adm. Code, is based on "maximum theoretical emissions (MTE)". MTE is defined in s. NR 428.02(7)(e), Wis., Adm. Code, and is consistent with the PTE defined in the NOx RACT program.

[44] WDNR is in the rule making process (Board Order AM-10-19) to revise s. NR 428.20, Wis. Adm. Code, to incorporate the lower NOx RACT applicability thresholds for serious and above nonattainment classifications. The revised NOx RACT applicability threshold will align with the major source thresholds for ozone nonattainment areas. The revised rule is expected to take effect in late 2021 or early 2022.

[45] EPA, 2015, *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: Requirements for State Implementation Plans*, 80 FR 12279, March 6, 2015.

- Each category of VOC sources in the nonattainment area covered by an EPA CTG document issued between the date of the enactment of the 1990 CAA and the date of attainment.
- All VOC sources in the area covered by any CTG issued before the enactment date of the 1990 CAA.
- All other major stationary VOC sources[46] (non-CTG major sources) that are located in ozone nonattainment areas.

To fulfill VOC RACT requirements under the 1997 ozone NAAQS, WDNR adopted and implemented administrative rules establishing control measure requirements for Kenosha County sources covered by the CTGs that had been issued at the time. These CTG requirements are codified under chapters NR 419 through 424, Wis. Adm. Code, and are described in Appendix 9. WDNR certifies that the VOC RACT rules listed in Table A9-1 have been approved into the Wisconsin SIP and satisfy the VOC RACT requirements of Section 182(b)(2) of the CAA for those source categories.

To fulfill moderate area VOC RACT requirements for the partial Kenosha County 2008 ozone nonattainment area, WDNR addressed the CTGs which had not been incorporated into Wisconsin's administrative code by issuing an administrative order and by providing negative declarations certifying that no other VOC sources covered by the CTGs exist within this area.[47] The WDNR also submitted a negative declaration certifying that no non-CTG major sources are located within the partial Kenosha County 2008 ozone nonattainment area.[47] EPA determined that the administrative order and negative declarations fulfilled the partial Kenosha County 2008 ozone nonattainment area's moderate area VOC RACT requirements and approved the area's VOC RACT program on September 16, 2020 (85 FR 57729). Appendix 9 provides more information about the administrative order and negative declarations.

The WDNR certifies that the partial Kenosha County 2008 ozone nonattainment area's VOC RACT program also satisfies serious area requirements. The non-CTG major source negative declaration approved by EPA establishes that there are no sources in this area with VOC emissions from non-CTG processes that meet the serious area major source threshold of 50 TPY.[48] Additionally, WDNR has determined that the approved CTG negative declarations still apply in the partial Kenosha County 2008 ozone nonattainment area. Appendix 9 uses the most

[46] The major source threshold in serious ozone nonattainment areas is 50 TPY.

[47] The VOC RACT demonstration describing VOC RACT rules and negative declarations for the partial Kenosha County 2008 ozone nonattainment area is provided in Appendix 10 of the Redesignation Request and Maintenance Plan for the Eastern Kenosha County, Wisconsin 2008 Ozone NAAQS Nonattainment Area submitted to EPA on January 21, 2020. The WDNR submitted an administrative order, which establishes RACT equivalency for a facility with operations covered by the Miscellaneous Metal and Plastic Parts Coatings CTG, to EPA for incorporation into Wisconsin's SIP on February 12, 2020.

[48] The partial Kenosha County 2008 ozone nonattainment area was reclassified to serious effective September 23, 2019 (84 FR 44238). Although the non-CTG major source negative declaration submitted on January 21, 2020 meets serious area major source requirements, EPA approved the partial Kenosha County 2008 ozone nonattainment area VOC RACT program as meeting the moderate area requirements that were in place when the document was submitted. Serious area requirements for the area were not due until August 3, 2020.

recently available inventory data to demonstrate that sources whose operations are covered by the CTGs that have not been adopted into state administrative code continue to emit below the CTGs' applicability thresholds.

Wisconsin's VOC administrative rules, administrative order, and negative declarations collectively comprise a comprehensive, permanent and enforceable serious area VOC RACT program in the partial Kenosha County 2008 ozone nonattainment area. The WDNR has determined that these VOC RACT components meet the VOC RACT requirement of Subpart 2 of the federal CAA.

6.4. Evaluation of Reasonably Available Control Measures (RACM)

CAA Section 172(c)(1) requires that states implement any reasonably available control measures necessary for attainment of the NAAQS. As detailed in 40 CFR 51.1108(d), any control measures needed for attainment must be implemented by the beginning of the attainment year ozone season, April 15, 2020. With this submittal, Wisconsin is demonstrating that attainment is achieved and therefore no additional control measures are required for that purpose.

However, additional control measures are required if it can advance the attainment date by a year or more. This means that any measures advancing the attainment date by a year would have needed to be in place by April 15, 2019. Since this date has already passed, the WDNR has concluded there is no possibility of implementing any level of additional control prior to this date. Accordingly, no additional controls or emission reductions requirements in Kenosha County are applicable for RACM under the 2008 ozone NAAQS.

6.5. Enhanced Motor Vehicle Inspection and Maintenance (I/M) Program

CAA section 182(c)(3) requires states with ozone nonattainment areas classified as serious or higher to implement an enhanced vehicle I/M program. The general purpose of motor vehicle I/M programs is to reduce emissions from in-use motor vehicles in need of repairs and thereby contribute to state and local efforts to improve air quality and to attain the NAAQS. Wisconsin's I/M program has been in operation since 1984. It was originally implemented in accordance with the 1977 CAA Amendments and operated in the six counties of Kenosha, Milwaukee, Ozaukee, Racine, Washington and Waukesha. Sheboygan County was added to the program in July 1993, resulting in a seven-county program area that has remained to the present. Vehicles were originally tested by measuring tailpipe emissions using a steady-state idle test. Tampering inspections were added in 1989. The I/M program is jointly administered by WDNR and the Wisconsin Department of Transportation.

The 1990 CAA Amendments set additional requirements for I/M programs. For moderate areas, a "basic" program was required under section 182(b)(4). For serious or worse areas, an "enhanced" program was required under section 182(c)(3). EPA's requirements for basic and enhanced I/M programs are found in 40 CFR part 51, subpart S.

Wisconsin's I/M program transitioned to an enhanced program in December 1995. The major enhancement involved adding new test procedures to more effectively identify high-emitting vehicles. These new test procedures included a transient emissions test in which tailpipe emissions were measured while the vehicle was driven on a dynamometer (a treadmill-type device). Improving repairs and public convenience were also major focuses of the enhancement effort.

Since July of 2001, all model year (MY) 1996 and later cars and light trucks have been inspected by scanning the vehicle's computerized second-generation on-board diagnostic (OBDII) system instead of measuring tailpipe emissions. As of July 2008, the program dropped tailpipe testing entirely and has inspected all vehicles by scanning the OBDII system. This change was the result of statutory changes in the State's 2007-2009 biennial budget which exempted model years of vehicles not federally required to be equipped with the OBDII technology (MY 1995 and earlier cars and light trucks and MY 2006 and earlier heavy trucks). To help offset the emissions reductions lost from exempting the pre-OBDII vehicles, the program increased the testable fleet for MYs 2007 and later by adding gasoline-powered vehicles between 10,001 to 14,000 pounds gross vehicle weight rating (GVWR) and diesel-powered vehicles of all weights up to 14,000 pounds GVWR.

EPA fully approved Wisconsin's enhanced I/M program on August 16, 2001 (66 FR 42949), including the program's legal authority and administrative requirements in the Wisconsin Statutes and Wisconsin Administrative Code. On June 7, 2012, WDNR submitted a SIP revision to EPA covering all the changes to the program since EPA approved the program in 2001. This submittal included a demonstration under section 110(l) of the CAA addressing lost emission reductions associated with the program changes. The EPA approved this SIP revision on September 19, 2013 (78 FR 57501).

Legal authority and administrative requirements for the Wisconsin I/M program are found in sections 110.20 and 285.30 of the Wisconsin Statutes and Chapters NR 485 and Trans 131 of the Wisconsin Administrative Code.

6.6. Milestone Compliance Demonstration for RFP for 2017

CAA section 182(g) requires states with ozone nonattainment areas classified as serious or higher to demonstrate that the area met the required emissions reductions for milestone compliance dates. The first milestone compliance year for serious nonattainment areas under the 2008 ozone NAAQS is the 2017 moderate attainment year. Emissions from the partial Kenosha County 2008 ozone nonattainment area were required to decrease by 15% from the 2011 base year to the 2017 moderate attainment year due to permanent and enforceable control measures. WDNR made this demonstration using emissions inventories in the moderate area attainment plan for this area.[49] WDNR relied upon emissions reductions from the mobile source sector to demonstrate that these reductions occurred entirely through permanent and enforceable control measures. This demonstration is shown in Appendix 12.

[49] Attainment Plan for the Wisconsin Portion of the Chicago-Naperville 2008 8-hour Ozone Nonattainment Area, submitted to EPA on April 17, 2017, and Clarification of Information Provided in the 2008 Ozone NAAQS Moderate-Area Attainment Plan for Eastern Kenosha County, submitted to EPA on January 23, 2018. Documents are available at https://dnr.wi.gov/topic/AirQuality/documents/AttainmentPlan20170417.pdf and in Appendix 12.

Table 6.2 shows the required 15% RFP emission targets for 2017 for mobile source emissions, along with the previously projected mobile source emissions for 2017 for the partial Kenosha County 2008 ozone area. These earlier estimates projected combined NOx and VOC emissions reductions that were 1.64 tposd larger than required, demonstrating that the area easily met its RFP targets through permanent and enforceable control measures. Table 6.2 also shows the actual mobile source emissions for 2017 as determined in this serious area attainment plan. The combined mobile source emissions from the pollutants were even lower than projected previously. Actual VOC emissions were 1.32 tposd lower than required for RFP, and actual NOx emissions were 0.64 tposd lower than required. These inventories demonstrate that the partial Kenosha County 2008 ozone nonattainment area met the required emissions reductions in its 2017 milestone compliance year.

Table 6.2. Comparison of required, projected and actual 2017 NOx and VOC emissions from the partial Kenosha County 2008 ozone nonattainment area.

		2017 Mobile sector emissions (tposd)		
Emission estimate type	**Document Source**	**VOCs**	**NOx**	**Total**
A. RFP target emissions	Clarification to moderate area plan	3.47	5.25	8.72
B. Projected emissions	Moderate area attainment plan	2.56	4.52	7.08
C. Actual emissions	Section 3.2 of this document	2.15	4.61	6.76
D. Actual excess reductions	Calculated here (A – C)	1.32	0.64	1.96

6.7. Enhanced Monitoring Plan

CAA section 182(c)(1) requires the EPA Administrator to promulgate rules for enhanced monitoring of ozone and ozone precursors. Although the CAA specifically requires enhanced monitoring for ozone, NOx, and VOCs for areas classified at least serious for an ozone NAAQS, EPA has concluded that requiring enhanced monitoring for ozone nonattainment areas classified as moderate or above is appropriate for the purposes of monitoring ambient air quality and better understanding ozone pollution. In EPA's revision to the ozone standard on October 1, 2015, EPA relied on the authority provided in Sections 103(c), 110(a)(2)(B), 114(a) and 301(a)(1) of the CAA to expand the Photochemical Assessment Monitoring Stations (PAMS) applicability to areas other than those that are serious or above ozone nonattainment and substantially revise the PAMS requirements in 40 CFR part 58 Appendix D (80 FR 65292). Specifically, this rule required states with moderate and above ozone nonattainment areas to develop and implement an Enhanced Monitoring Plan (EMP). These plans should detail enhanced ozone and ozone precursor monitoring activities to be performed to better understand area-specific ozone issues.

To meet moderate area planning requirements, WDNR submitted its initial EMP as part of the 2018 Wisconsin Air Monitoring Network Plan, which EPA approved via a letter dated

September 1, 2017. Wisconsin has submitted subsequent updates to its EMP with each year's network plan.[50] Measures included in Wisconsin's current EMP include:

- Monitoring of ozone and ozone precursors beyond federal requirements.
- Ozone event triggered VOC samples for the PAMS suite of compounds.
- Engaging and supporting external partners collecting ozone-related data.
- Analyzing data from the 2017 Lake Michigan Ozone Study and previously collected enhanced ozone monitoring data.

Wisconsin's EMP specifically includes several enhanced monitoring efforts within the partial Kenosha County 2008 ozone nonattainment area. For example, WDNR is monitoring ozone at two heights (10 m and 26.8 m) at the Kenosha Water Tower site to explore vertical gradients in ozone concentrations in this area. In addition, WDNR is monitoring NO_2 and total reactive nitrogen from June to August at the Chiwaukee Prairie site located within this area and is also conducting ozone event-triggered VOC sampling at this site. This ozone precursor monitoring will help elucidate the transport and chemical reactions of these components, as well as their relationships to monitored ozone concentrations.

Wisconsin will continue to meet its CAA section 182(c)(1) EMP requirements by including its EMP in WDNR's Air Monitoring Network Plan, which is subject to EPA review and approval on an annual basis.

6.8. Permitting Requirements

The CAA requires a number of changes to permitting programs for areas classified as serious nonattainment. These include changes to the NOx and VOC emission offsets for major source permits (CAA section 182(c)(10)), the major source threshold (CAA section 182(c)) and several other areas (CAA sections 182(c)(6), (7) and (8)). Wisconsin's approved nonattainment New Source Review (NSR) program (chapter NR 408, Wis. State. Code) fulfills these requirements as described below.

The major source and major modification thresholds for severe nonattainment areas are codified in s. NR 408.02, Wis. Adm. Code and discussed in Section 6.8.1. The requirements for emission offsets are codified in s. NR 408.05, Wis. Adm. Code. The emission offset ratios for severe nonattainment areas are codified in s. NR 408.06(4), Wis. Adm. Code. and discussed in Section 6.8.2. In addition, CAA section 182(c) includes special requirements associated with Lowest Achievable Emission Rate for the sources located in serious and higher classification ozone nonattainment areas. These special requirements are codified in ss. NR 408.03(6), 408.04(5), and 408.04(6), Wis. Adm. Code and discussed in Section 6.8.3.

Thus, based on equivalency in chapter NR 408, Wis. Adm. Code, Wisconsin's nonattainment NSR program fulfills the CAA's permitting requirements for the 2008 ozone NAAQS.

[50] The most recent network plans and EPA approval letters are available at https://dnr.wisconsin.gov/topic/AirQuality/Monitor.html.

6.8.1. Major Source and Major Modification Thresholds

The major source thresholds for the sources located in ozone nonattainment areas are specified in CAA sections 302(j), 182(c), (d) and (e). These major source thresholds are codified in s. NR 408.02(21), Wis. Adm. Code. For the partial Kenosha County 2008 ozone nonattainment area, the major source threshold has decreased from 100 TPY to 50 TPY with the change of classification from moderate to serious. The significance level for emissions changes for major modifications are specified in CAA section 182(c)(6) and 40 CFR 51.165(a)(1)(x). These significance levels are codified in ss. NR 408.02(32)(a), (c), and (d), Wis. Adm. Code. For the partial Kenosha County 2008 ozone nonattainment area, the significance level for the major modifications has decreased from 40 TPY to 25 TPY.

6.8.2. Emission Offsets

The emission offset ratios for new or modified sources subject to nonattainment NSR vary based on nonattainment classifications. The offset ratios for different nonattainment classifications are specified in CAA sections 182(a)(4), (b)(5), (c)(10), (d)(2), and (e)(1) and 40 CFR 51.165(a)(9)(ii). These offset ratios are codified in s. NR 408.06(4), Wis. Adm. Code. For the partial Kenosha County 2008 ozone nonattainment area, the emission offset ratio has changed from 1.15:1 to 1.2:1.

6.8.3. Special Requirements for Major Modifications

CAA section 182(c) includes special requirements for the major modifications that occur at major stationary sources located in a serious or higher ozone nonattainment area. These requirements are included in Wisconsin's current nonattainment NSR program (chapter NR 408, Wis. Adm. Code). CAA section 182(c)(7) establishes options for sources with a potential to emit of less than 100 TPY of VOC undergoing a major modification in a serious ozone nonattainment area. These special requirements are codified in ss. NR 408.03(6) and 408.04(6), Wis. Adm. Code. CAA section 182(c)(8) sets requirements for sources with a potential to emit of 100 TPY of VOCs or greater undergoing a major modification. This special requirement is codified in s. NR 408.04(5), Wis. Adm. Code.

6.9. Transportation Control Demonstration

CAA section 182(c)(5) requires states with ozone nonattainment areas classified as serious or higher to submit a transportation control demonstration every three years. This demonstration should evaluate "whether current aggregate vehicle mileage, aggregate vehicle emissions, congestion levels, and other relevant parameters are consistent with those used for the area's demonstration of attainment." If the state finds that actual levels exceed those projected in the attainment demonstration, they have 18 months to develop and submit a SIP revision containing transportation control measures that will reduce emissions to the levels projected.

WDNR commits to submitting such a transportation control demonstration in 2023, three years after submittal of this serious area attainment plan. This demonstration will evaluate the actual transportation parameters in the serious attainment year of 2020 to those projected in this attainment plan document. WDNR will also develop a SIP revision with additional transportation control measures if the initial demonstration finds that actual mileage, transportation emissions and related parameters were higher in 2020 than projected.

6.10. Clean Fuels Vehicles Program

CAA section 182(c)(4) requires states with ozone nonattainment areas classified as serious or higher to submit a SIP revision describing implementation of a clean-fuel vehicles program, as described in CAA Title II Part C (40 CFR 88). EPA issued a memorandum on July 21, 2005 that found that then-current emission standards for vehicles (regulated under 40 CFR 86) were as or more stringent than the emission standards specified in 40 CFR 88 for Clean Fuel Vehicles. Since vehicle emission standards have only become more stringent since the memo was issued in 2005, the CAA section 182(c)(4) clean fuel vehicles program requirement remains satisfied without the need for further action by the state.

7. PUBLIC PARTICIPATION

In accordance with section 110(a)(2) of the CAA, WDNR published a notice on the internet (**web address***) on (month/day), 2020 stating that it would hold a public hearing on the Attainment Plan for the Wisconsin Portion of the Chicago-Naperville (IL-IN-WI) 2008 8-hour Ozone Nonattainment Area. A notice of availability was also posted on the website. The public hearing took place on ***** in ***** in room ****. The redesignation request was available for public comment through *****, 2020.

8. CONCLUSION

In submitting this attainment plan, Wisconsin is fulfilling its CAA SIP requirements for the partial Kenosha County serious nonattainment area for the 2008 ozone NAAQS. The modeled attainment test projects that the partial Kenosha County 2008 ozone nonattainment area will attain the 2008 ozone NAAQS by the July 20, 2021 serious area attainment date, as will the rest of the Chicago nonattainment area. Additional air quality monitoring data confirms that concentrations of ozone (when adjusted for meteorology) and ozone precursors have decreased dramatically over the last 18 years in the nonattainment area. Wisconsin has met the required RFP emission reductions due to an array of permanent and enforceable measures. The state has also met all other obligations required of serious ozone nonattainment areas.

APPENDIX 1

2011 and 2017 Wisconsin Emission Inventories Documentation

Table of Contents

ABBREVIATIONS

AEI	Air Emissions Inventory
AADT	Average Annual Daily Traffic
CAMD	Clean Air Markets Division
DOE	Department of Energy
EGU	Electric Generating Unit
EIA	Energy Information Administration
EIs	Emission Inventories
EPA	Environmental Protection Agency
FID	Facility Identification Number
FIRE	Factor Information Retrieval
HPMS	Highway Performance Monitoring System
LADCO	Lake Michigan Air Directors Consortium
MAR	Commercial Marine Aircraft and Rail Locomotive
MOVES	Motor Vehicle Emission Simulator
NAICS	North American Industrial Classification System
NEC	Not Elsewhere Classified
NOx	Nitrogen Oxides
OBD	On-Board Diagnostics
ORVR	On-Board Refueling Vapor Recovery
SCC	Source Classification Code
SED	State Energy Data
SIP	State Implementation Plan
tposd	Tons per Ozone Season Day
TSD	Technical Support Document
VMT	Vehicle-Miles of Travel
VOC	Volatile Organic Compounds
WDNR	Wisconsin Department of Natural Resources
WDOT	Wisconsin Department of Transportation

1. Introduction

This appendix provides additional information for the sector-specific nitrogen oxides (NOx) and volatile organic compounds (VOC) tons per ozone season day (tposd) emission estimates in section 3.2 (Nonattainment Year (2011) and Attainment Year (2017) Inventories) of the Wisconsin Department of Natural Resources' (WDNR) Attainment Plan for the partial Kenosha County nonattainment area for the 2008 NAAQS. This is accomplished in part by developing and comparing a nonattainment year (2011) emissions inventory and attainment year (2017) emissions inventory.

2. Emissions Calculation Methodologies

2.1 Point Sources

Point sources are industrial, commercial or institutional stationary facilities which are normally located in permanent sites, and which emit specific air pollutants in great enough quantities to warrant individual quantification. To better enable detailed control evaluations, the point source emission inventories (EIs) include all reporting sources at that facility regardless of the magnitude of reported emissions. For this attainment demonstration, portable point sources, such as asphalt plants and rock crushers, were reported under nonpoint sources to be consistent with other states. The 2011 and 2017 point source emission inventory was created using annually reported point source emissions, the EPA's Clean Air Markets Division (CAMD) database and approved EPA techniques for emissions calculation (e.g., emission factors).

Whenever feasible, federal, state and local controls were factored into the emission calculations. Emissions were estimated by collecting process-level information from each facility that qualifies for inclusion into the state's point source database. In Wisconsin, this information is normally collected via an internet or a computer diskette submittal, and subsequently loaded into the point source database. Process, boiler, fugitive and tank emissions are typically calculated using throughput information multiplied by an emission factor for that process. Emission factor sources included mass balance, stack testing, continuous emissions monitors, engineering judgment and EPA's Factor Information Retrieval (FIRE) database. Missing data elements such as Source Classification Codes (SCC), North American Industrial Classification System (NAICS) codes and seasonal throughput percentages were added into the state's point source database. Process level confidential data were removed while retaining any associated emissions.

There was one electric generating unit (EGU) point source facility located in the partial Kenosha County 2008 ozone nonattainment area: the Pleasant Prairie coal-fired power plant. For this non-peaking facility, WDNR used the ozone season (May 1 to September 30) NOx emissions divided by the days of reported operation during the ozone season to represent ozone season day emissions. The VOC ozone season day emissions were derived by multiplying the facility's ozone season heat input by an annual average VOC emission rate. Appendix 2 provides the detailed methodology used to calculate EGU ozone season day emissions.

The 2011 and 2017 emissions inventories for non-EGU point sources were tabulated using the emissions data reported annually by each facility operator to the WDNR air emissions inventory

(AEI). The AEI calculates emissions for each individual emissions unit or process line by multiplying fuel or process throughput by the appropriate emission factor that is derived from mass balance analysis, stack testing, continuous emissions monitoring, engineering analysis, or EPA's FIRE database. The emission calculations in the AEI also account for any operating control equipment. Appendix 3 provides a list of non-EGU point source emissions by facility identification number (FID) and facility name for 2011 and 2017.

The following procedure was used to determine an average day's emissions for a typical ozone season work weekday for non-EGU point sources. The WDNR obtained the quarterly operation schedule and the normal operating days per week information for each facility as collected by the WDNR AEI. The WDNR used emissions from the third quarter of the calendar year (i.e., July 1 to September 30) to represent the typical ozone season day emissions for these sources. The equation below was then used to calculate the emissions from typical ozone season days for each emission unit and process line. The emissions from each unit/process line at a facility were then summed to arrive at the total tons per ozone season day emissions for that facility.

$$EM = (Annual \times Third\ Quarter\ Percentage)/(DPW \times N_{weeks})$$

Where:
EM = Typical ozone season day emissions in tons per day
Annual = Annual emissions of VOC or NOx in tons
Third Quarter Percentage = the percentage of time that the unit is in operation for the third quarter of the calendar year, compared to the total time the unit is in operation for the entire calendar year, as reported to the WDNR
DPW = Days per week the facility operates, as reported to the WDNR
N_{weeks} = Number of weeks (13) from July 1 to September 30

This equation inherently accounts for ozone season work weekday emissions being higher if a facility only operates during the work week (i.e., five days) instead of the entire week (i.e., seven days), consistent with EPA guidance. This method is also consistent with that used by WDNR in its 2011 baseline emissions inventory for 2008 ozone standard nonattainment areas.

2.2 Nonpoint (Area) Sources

Nonpoint sources are stationary sources that are too small and/or too numerous to be tracked individually in the point source inventory, and the nonpoint inventory quantifies emissions collectively. These sources include commercial/institutional, industrial and residential sources such as gasoline stations, dry cleaners, consumer and commercial products, industrial solvent use, auto refinishing and wood combustion.

For the 2011 nonattainment year, nonpoint source emissions inventory estimates were based on the 2011 NEI version 2, except for the residential and commercial portable fuel containers, residential wood combustion, and Stage II refueling categories as described below. Emission calculation methodologies used in developing 2011 nonpoint emissions inventory are available in the EPA's 2011 NEI, version 2 Technical Support Document (TSD).[1]

[1] https://www.epa.gov/sites/production/files/2015-10/documents/nei2011v2_tsd_14aug2015.pdf

For the 2017 attainment year, nonpoint source emissions inventory estimates were based on the 2017 NEI, except for the category "Gasoline Service Stations, Stage II: Total Refueling" as described below.

The WDNR updated EPA nonpoint emissions estimates for stationary nonpoint sources for the following sectors: fuel combustion at the industrial, commercial and institutional (ICI) sectors; degreasing; dry-cleaning; graphic arts; and most of the solvent utilization for industrial surface coating categories except industrial maintenance, traffic markings and other special purpose categories. The WDNR adopted EPA nonpoint estimates for commercial cooking, solvent utilization for non-industrial surface coating, miscellaneous non-industrial consumer and commercial solvent utilization, residential and commercial portable fuel containers, bulk gasoline terminals and gas stations, waste disposal categories, and miscellaneous non-industrial not elsewhere classified (NEC) categories.

For the WDNR updated nonpoint fuel combustion sectors, the EPA provided Source Classification Code (SCC) cross-walk between nonpoint and their corresponding point source SCCs was used for point source subtraction. These adjustments were made by subtracting the activity assigned for point sources from the total activity to estimate the adjusted nonpoint source activity. Energy consumption of these sectors for the State of Wisconsin is obtained from the U.S. Department of Energy (DOE)'s Energy Information Administration (EIA). This survey data is the source of activity data for the ICI fuel combustion. EIA's annual publication titled the State Energy Data (SED) report provided total consumption for most of the fuel oil and kerosene.[2]

In updating emission estimates for most of the solvent utilization for industrial surface coating categories, U.S. Census Bureau's employment and county business pattern data were used as activity data. [3]

In order to obtain the area source emissions for the partial Kenosha County 2008 ozone nonattainment area, the whole county emission estimates were allocated to the partial county based on population data. The Kenosha County population for 2017 was estimated by interpolating the population between 2015 and 2020 population data from the Wisconsin Department of Administration. The partial-county population was identified based on the relative population of the Minor Civil Divisions in the partial Kenosha County 2008 ozone nonattainment area compared with the entire county. For 2011 and 2017, 73% of the county's population was estimated to live in the partial Kenosha County 2008 ozone nonattainment area. Appendix 4 includes table of area source emissions by source category.

Residential and Commercial Portable Fuel Containers

For the 2011 NEI, WDNR adopted EPA estimated emissions for commercial portable fuel containers. However, for this attainment plan, WDNR staff back-calculated VOC emissions for these categories from EPA's 2017 NEI and 2023 emissions modeling estimates. This was done due to a suspected methodology change by EPA (which led to significantly lower VOC emission

[2] U.S. Energy Information Administration, http://www.eia.gov
[3] https://www.census.gov/programs-surveys/cbp/data.html

estimates) for VOC emission estimates for these categories after 2011. Back-calculating 2011 emissions from EPA's 2017 NEI and 2023 modeling estimates is assumed to more accurately reflect EPA's updated methodology after 2011.

Residential Wood Combustion

For the 2011 NEI, WDNR adopted EPA estimated emissions for residential wood combustion. However, for this attainment plan, WDNR staff back-calculated VOC emissions for selected SCCs of residential wood combustion from EPA's 2017 NEI and 2023 emissions modeling estimates. The selection was made if there is a significant negative discrepancy from 2011 to 2017 NEI emission estimates for those SCCs. This was done due to a suspected methodology change by EPA (which led to significantly lower VOC emission estimates) for VOC emission estimates for these categories after 2011. Back-calculating 2011 emissions from EPA's 2017 NEI and 2023 modeling estimates is assumed to more accurately reflect EPA's updated methodology after 2011.

Gasoline Service Stations, Stage II: Total Refueling

The WDNR estimated emissions from vehicle refueling at gasoline stations (Stage II refueling) using EPA's MOVES2014b model with the same activity inputs used for the onroad modeling.

During 2011, a Stage II vapor recovery program (vapor recovery nozzles at gas pumps) was in effect in nine eastern Wisconsin counties, including Kenosha County. This program, started during the 1990s, was effective in reducing refueling emissions in older vehicles, but was redundant or even counter-productive in reducing emissions for newer vehicles, because the newer vehicles controlled refueling emissions through on-board refueling vapor recovery (ORVR) systems.[4] Wisconsin submitted a state implementation plan (SIP) revision removing Stage II requirements, and EPA approved the revision in November 2013. By 2017 most gasoline stations in the nine eastern Wisconsin counties had removed or decommissioned their Stage II vapor recovery systems. Because of this significant decrease in Stage II systems from 2011 to 2017, WDNR used different Stage II-related inputs to MOVES2014b for those two years.

To model the effects of a Stage II program, MOVES2014b provides the following two inputs: (1) vapor displacement reductions and (2) spillage reductions.

WDNR used a vapor displacement reduction of 56% for 2011. This value is specified in EPA guidance for programs with minimal inspection frequency (less than annual).[5] Because of a near total removal of Stage II systems by 2017, WDNR used a value of 0% for 2017.

[4] The federally-required phase in for ORVR systems started with model year 1998 and was required for all light-duty vehicles by model year 2006.

[5] "Procedures for Emission Inventory Preparation; Volume IV: Mobile Sources", Section 3.3.6.1, U.S. EPA, EPA-420-R-92-009, December 1992. (The reduction percentages in this document and section are specified for use in the EPA's current technical guidance for the MOVES model: "MOVES2014, MOVES2014a, and MOVES2014b Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity", EPA-420-B-18-039, August 2018.)

WDNR used a spillage reduction percentage of 50% for 2011. This percentage is the standard percentage used in the MOVES2014b model for all areas in the United States having a Stage II vapor recovery program. Again, WDNR used a value of 0% for 2017.

2.3 Onroad Mobile Sources

Onroad mobile sources are motorized mobile equipment that are primarily used on public roadways. Examples of onroad mobile sources include cars, trucks, buses and road motorcycles. The emissions reported in this document were estimated by the Motor Vehicle Emission Simulator (MOVES), the EPA's recommended mobile source model. The model was run in inventory mode, rather than the alternative mode of emission rates. The version used was MOVES2014b, the most recent version of the model, released in August 2018. All estimates were made in accordance with the following EPA technical guidance:

- MOVES2014a User's Guide (U.S. EPA, Office of Transportation and Air Quality, Assessment and Standards Division, November 2015, EPA 420-B-15-095). This user's guide also applies to MOVES2014b.
- MOVES2014, MOVES2014a, and MOVES2014b Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity (U.S. EPA, Office of Transportation and Air Quality, Assessment and Standards Division, August 2018, EPA-420-B-18-039).

The onroad mobile NOx and VOC emissions for the partial Kenosha County 2008 ozone nonattainment area for 2011 and 2017 (as well as the 2020 and 2021 projections) are presented in Appendix 5, broken down by source type (vehicle class), fuel type and road type. A table summarizing vehicle activity data is presented in Appendix 5 after the emissions tables.[6]

2.3.1 Transportation Data

The modeling inputs to MOVES include detailed transportation data (e.g., vehicle-miles of travel by vehicle class, road class and hour of day, and average speed distributions), requiring support from the Metropolitan Planning Organization (MPO) covering the nonattainment area.

The gubernatorially designated MPO for the Kenosha urbanized area is the Southeastern Wisconsin Regional Planning Commission (SEWRPC). Under state law SEWRPC is responsible for preparing travel and traffic estimates and forecasts within their seven-county region, which includes Kenosha County. SEWRPC maintains transportation network inventory data, including traffic counts by the Wisconsin Department of Transportation (WDOT) and local agencies. SEWRPC has developed and validated travel simulation models to estimate and forecast vehicle-miles of travel (VMT) and average speed distributions for their region. SEWRPC also runs the MOVES model for transportation planning and conformity analyses. SEWRPC provided WDNR, on August 19, 25 and 26, 2020, MOVES input files for the partial Kenosha County

[6] The complete set of inputs to MOVES2014b is too lengthy to include in this document. However, electronic copies of the inputs can be obtained from WDNR by sending an email to christopher.bovee@wisconsin.gov or by phone at (608) 266-5542.

2008 ozone nonattainment area for 2011 and 2017 (as well as projections to cover the years 2020 and 2021) for the following:

- Annual VMT by five vehicle classes
- Vehicle population by 13 vehicle classes
- Average speed distributions
- VMT distributions by roadway type and vehicle class
- Temporal VMT distributions by:
    - Hour of day
    - Weekday vs. weekend
    - Month of year
- Fraction of restricted access travel time on ramps

2.3.2 Descriptions of MOVES Modeling Inputs

2.3.2.1 Vehicle-Miles of Travel (VMT)

SEWRPC provided WDNR annual VMT data for 2011 and 2017 (as well as projections to cover 2020 and 2021), broken down by five Highway Performance Monitoring System (HPMS) vehicle classes for all travel in the partial Kenosha County 2008 ozone nonattainment area. The data were obtained from their transportation network inventory data and travel demand model. WDNR then inputted those data into MOVES2014b. The data follow:

Table A1.1. Annual VMT Provided by SEWRPC and Inputted into MOVES2014b

HPMS Vehicle Class	Year	
	2011	2017
Motorcycles	6,774,406	6,973,960
Light Duty Vehicles	943,903,376	1,013,523,354
Buses	2,696,161	2,880,696
Single Unit Trucks	46,068,512	49,831,517
Combination Trucks	33,130,997	36,598,956
TOTAL	**1,032,573,452**	**1,109,808,483**

As specified in the EPA technical guidance, the onroad inventories for ozone state implementation plans (SIPs) should be based on ozone season *weekday* VMT, where "weekday" includes all five of the weekdays. WDNR has always defined "ozone season" for the mobile sector as the three months of June, July and August. To determine ozone season weekday VMT, WDNR inputted into MOVES temporal VMT distributions for month-of-year and weekday-vs.-weekend provided by SEWRPC. (SEWRPC developed these distributions from WDOT statewide data.) MOVES2014b then calculated the ozone season weekday VMT and furthermore subdivided the VMT from the five HPMS vehicle classes into 13 vehicle classes, using default vehicle class distributions. The resulting VMT outputted by MOVES2014b follows:

Table A1.2. Ozone Season Weekday VMT Outputted by MOVES2014b.

MOVES Vehicle Class	Year	
	2011	2017
Motorcycles	21,253	21,889
Passenger Cars	1,441,681	1,506,419
Passenger Trucks	1,212,672	1,332,727
Light Commercial Trucks	275,697	307,230
Intercity Buses	904	1,107
Transit Buses	1,985	2,024
School Buses	5,503	5,836
Refuse Trucks	6,166	6,412
Single Unit Short-haul Trucks	125,203	135,413
Single Unit Long-haul Trucks	6,819	7,680
Motor Homes	4,624	4,983
Combination Short-haul Trucks	22,204	26,850
Combination Long-haul Trucks	78,614	84,556
TOTAL	**3,203,324**	**3,443,126**

The total ozone season weekday VMT in 2017 is 7.5% greater than the total ozone season weekday VMT in 2011. Annual VMT divided by ozone season weekday VMT equals 322.3 for both 2011 and 2017.

2.3.2.2 VMT by Hour of Day

SEWRPC provided hourly VMT fractions based on output from their travel demand model.

2.3.2.3 Vehicle Population

SEWRPC provided vehicle populations for each of the 13 MOVES vehicle classes.

Table A1.3. Vehicle Populations Provided by SEWRPC and Outputted by MOVES2014b.

MOVES Vehicle Class	Year	
	2011	2017
Motorcycles	3,032	3,084
Passenger Cars	42,250	43,675
Passenger Trucks	30,562	32,867
Light Commercial Trucks	7,463	8,309
Intercity Buses	3	4
Transit Buses	12	14
School Buses	110	127
Refuse Trucks	76	87
Single Unit Short-haul Trucks	2,506	2,843
Single Unit Long-haul Trucks	105	121
Motor Homes	627	713
Combination Short-haul Trucks	225	251
Combination Long-haul Trucks	236	284
TOTAL	**87,207**	**92,379**

The total vehicle population in 2017 is 5.9% greater than the total vehicle population in 2011.

2.3.2.4 Average Speed Distribution

SEWRPC provided speed distributions, in MOVES input format, for the partial Kenosha County 2008 ozone nonattainment area, developed from their transportation inventory data and travel simulation models.

2.3.2.5 Vehicle Age Distribution

Year 2011: During the year 2014 WDNR developed local vehicle age distributions for that year for five source types: passenger cars, passenger trucks, light commercial trucks, intercity buses and school buses. The EPA default distributions were used for the other eight source types: motorcycles, transit buses and six medium to heavy truck classes. WDNR calculated the local distributions from a file of select fields from the state's registration database as of March 2014, provided by the WDOT. WDNR calculated a 2014 distribution for a seven-county region including Kenosha County. WDNR adjusted the 2014 distributions back to 2011 based on differences between the EPA default age distributions for those two years.

Year 2017: Using data from the Wisconsin Department of Transportation's (WDOT) registration database as of January 2018, WDNR calculated a new local vehicle age distribution for the year 2017 for all vehicle classes except the two long-haul truck classes (MOVES classes 53 and 62, for which the MOVES default distributions were used). WDNR calculated a 2017 distribution for a seven-county region including Kenosha County.

A comparison of the average vehicle ages from the 2011 and 2017 age distributions follows:

Table A1.4. Average Vehicle Ages (years old).

MOVES Vehicle Class	Year	
	2011	2017
Motorcycle	7.28	13.74
Passenger Car	9.67	9.37
Passenger Truck	8.18	7.44
Light Commercial Truck	10.33	10.27
Intercity Bus	9.18	11.29
Transit Bus	10.60	12.33
School Bus	6.71	7.42
Refuse Truck	10.64	10.95
Single Unit Short-haul Truck	11.32	11.14
Single Unit Long-haul Truck	11.84	11.95
Motor Home	10.76	15.29
Combination Short-haul Truck	13.46	13.55
Combination Long-haul Truck	7.53	10.42

The following differences between the average ages in 2011 and 2017 should be noted:

- For the light duty classes (passenger car, passenger truck and light commercial truck), the average ages in 2017 are less than those in 2011 because the model years 2009 to 2011 had lower sales than the post-2011 model years.
- For combination long-haul trucks, the average age in 2017 is greater than in 2011 because the model years 2005 to 2007 had high sales.
- For some low-population vehicle classes (especially, motorcycle and motor home) the average age in 2017 is significantly greater than in 2011 because the MOVES default distribution was used for 2011 whereas a local distribution was used for 2017. This bias produces a slight underestimation of the reduction in onroad emissions from 2011 to 2017.

2.3.2.6 Road Type Distribution

MOVES requires that VMT for each of the 13 source types be allocated to the following four roadway classes:

- Rural – Restricted Access
- Rural – Unrestricted Access
- Urban – Restricted Access
- Urban – Unrestricted Access

SEWRPC provided road type distributions for the partial Kenosha County 2008 ozone nonattainment area developed from their transportation inventory data.

A detailed breakdown of VMT by roadway class by MOVES source type is provided in Appendix 5. The proportion of heavy-duty truck travel is significantly higher on restricted access roadways than on unrestricted access roadways.

2.3.2.7 Ramp Fraction

SEWRPC provided WDNR the fraction of driving time on ramps for restricted access roadways developed from their transportation inventory data.

2.3.2.8 Fuel Formulation and Supply

The best available fuel data are those provided by EPA. For the year 2017, WDNR used the fuel data EPA developed for the 2017 National Emissions Inventory (NEI). For 2011 (and 2020 and 2021), WDNR used the EPA-developed default fuel data in the MOVES model.

2.3.2.9 Vehicle Inspection and Maintenance Program

Kenosha County is within the seven-county southeastern Wisconsin vehicle inspection program region. On-Board Diagnostic (OBD) checks were assumed for most model year 1996 and newer passenger cars, passenger trucks and light commercial trucks.

2.3.2.10 Meteorology Data

Temperatures conducive to peak ozone formation were assumed for the ozone season weekday modeling. To ensure consistent emission estimates over time, WDNR has consistently used the same minimum and maximum temperatures for onroad modeling for ozone SIPs since the early 1990s. The temperatures were developed from an analysis of peak ozone days and have minimum/maximum values of 70/94 degrees Fahrenheit for Kenosha County.

2.4 Nonroad Mobile Sources

Nonroad mobile sources are motorized mobile equipment and other small and large engines that are primarily used off public roadways. Examples of nonroad mobile sources include commercial marine, construction, lawn and garden, locomotive and agricultural equipment.

For purposes of inventory calculation, nonroad mobile sources are divided into two major groups:

- Commercial Marine, Aircraft and Rail Locomotive (MAR)
- All other nonroad categories

Nonroad categories other than MAR include:

- Recreational vehicles
- Construction equipment
- Industrial equipment
- Lawn and garden equipment
- Agricultural equipment
- Commercial equipment
- Logging equipment
- Underground mining equipment
- Oil field equipment

- Pleasure craft
- Railway maintenance equipment

A detailed listing of the nonroad emissions for each of the over 200 nonroad source subcategories, which include both the MAR and non-MAR groups, is presented in Appendix 6.

2.4.1 Non-MAR Sources

The 2011 and 2017 nonroad emissions for the non-MAR categories were developed using the nonroad component of EPA's MOVES2014b model.

The WDNR updated the default MOVES2014b database consistent with updates made by EPA for the 2016 emission modeling platform, version 1, and the 2017 NEI. These updates include:

- New 2017 fuel inputs developed by EPA.
- New allocations of agricultural and construction equipment to the state and county level, developed by the collaborative nonroad workgroup associated with the 2016 emissions modeling platform.
- Updated monthly distribution of agricultural activity in the midwestern states, developed by the Lake Michigan Air Directors Consortium (LADCO).

The model was run for Kenosha County for the months of June, July and August, using the same hot ozone season day temperatures used for the onroad modeling. The countywide hot ozone season day emissions were then calculated by dividing the total emissions over these three months by 92 (the number of days in the three months).

WDNR then allocated the countywide hot ozone season day emissions to the partial Kenosha County 2008 ozone nonattainment area based on surrogates such as population, land area and water area, depending on the category, as described below in section 2.4.4

2.4.2 MAR Sources – Aircraft and Rail Locomotive

For the year 2011, the annual emissions estimates used for Kenosha County are those in the EPA's 2011 NEI version 2.

For the year 2017, the annual emissions estimates used for Kenosha County are those in the EPA's 2017 NEI.

Ozone season day emissions for aircraft were estimated by dividing the annual emissions by 365 for both NOx and VOC. (This value was used for both 2011 and 2017, as well as for the 2020 and 2021 projections.) This same value was used in the EPA's 2011 version 6.3 emissions modeling platform.

Ozone season day emissions for rail locomotive were estimated by dividing annual emissions by 362.6 for both NOx and VOC. (This value was used for both 2011 and 2017, as well as for the 2020 and 2021 projections.) WDNR determined this value from emissions in EPA's 2016 emissions modeling platform, version 1. This platform includes emissions for each month, allowing WDNR to calculate a ratio for an average day in June, July and August vs. the annual emissions. For Kenosha County, this ratio was determined to be 362.6.

The allocation of the full county emissions to the partial Kenosha County 2008 ozone nonattainment area is described in section 2.4.4.

2.4.3 MAR Sources – Commercial Marine Vessels

For this category, the emissions from the EPA's 2011 NEI were not used since significant methodological changes for calculating commercial marine emissions, developed by the Lake Michigan Air Directors Consortium (LADCO) and EPA, were made subsequent to the 2011 NEI.

For the year 2017, WDNR obtained commercial marine emissions in Kenosha County from the 2017 NEI. For the year 2011, for each of the four commercial marine vessel classes[7], WDNR linearly back-calculated to 2011 from the 2021 value projected by WDNR (see Appendix 7) and the 2017 NEI value, with the constraint that if the 2017 value is greater than the 2021 value, the 2011 value is set equal to the 2017 value. The purpose of this constraint is to avoid a possible overestimation of the emission reduction from 2011 to 2017.

Ozone season day emissions were estimated by dividing the annual emissions by the following amounts:

- For the category C1 and C2 engines: 207.0 for NOx and 205.0 for VOC
- For the larger category C3 engines: 312.8 for NOx and 319.3 for VOC

(These values were used for both 2011 and 2017, as well as for the 2020 and 2021 projections.) As was done for rail locomotive, WDNR determined these values from emissions in EPA's 2016 emissions modeling platform, version 1. This platform includes emissions for each month, allowing WDNR to calculate a ratio for an average day in June, July and August vs. the annual emissions. For Kenosha County, these ratios calculated out to be the above-cited values.

2.4.4 Allocation of Emissions to Partial Kenosha County 2008 Ozone Nonattainment Area

Given the vast variety of nonroad mobile sources, several surrogates were employed to estimate the proportion of countywide emissions in the partial Kenosha County 2008 ozone nonattainment area. The surrogates used are as follows:

2.4.4.1 Land Area

The land area in the partial Kenosha County 2008 ozone nonattainment area comprises 30.9% of the total county land area. But excluding the City of Kenosha, where no significant agricultural activity occurs, this percentage is 24.2%.

[7] These four classes are: (1) diesel, category C1&C2, main engine; (2) diesel, category C1&C2, auxiliary engine; (3) diesel, category C3, main engine; and (4) diesel, category C3, auxiliary engine.

The nonroad categories allocated to the partial Kenosha County 2008 ozone nonattainment area based on land area are: **Agriculture**, **Logging**, **Oilfields**, **Recreational**, and **Underground Mining**. The 24.2% factor was used for agriculture and the 30.9% factor was used for the other categories. It should be noted that Kenosha County has no emissions from oilfields or underground mining.

2.4.4.2 Population

As described in section 2.2 (Nonpoint (Area) Sources), the percentage of the county's population estimated to live in the partial Kenosha County 2008 ozone nonattainment area is 73%.To one decimal place this value is 73.2% for 2011 and 73.3% for 2017.

The nonroad categories allocated to the partial Kenosha County 2008 ozone nonattainment area based on these 73.2% and 73.3% population proportions are: **Commercial, Construction, Industrial, and Lawn & Garden**.

2.4.4.3 Water Area

WDNR obtained water area data from two tables in the MOVES2014b database: WI_WIB.ALO, which provides the water area in each Wisconsin County applicable to pleasure craft having inboard engines, and WI_WOB.ALO, which provides water area in each Wisconsin County applicable to pleasure craft having outboard engines. The difference between these two tables is that WI_WIB.ALO includes water area along the Lake Michigan shore as well as inland water area while WI_WOB.ALO only includes the inland water area. For Kenosha County, WI_WIB.ALO has 81 square kilometers of water area and WI_WOB.ALO has 25 square kilometers of water area. The 81 square kilometer value for inboard engines contains Lake Michigan waters (56 square kilometers) and 25 square kilometers of water from several inland lakes (of which about one square kilometer is in the partial Kenosha County 2008 ozone nonattainment area). The 25 square kilometer value for outboard engines contains only the water from the inland lakes. Thus, for pleasure craft with inboard engines (56+1)/81 = 70% of the associated water area is in the partial Kenosha County 2008 ozone nonattainment area and for pleasure craft with outboard engines 1/25 = 4% of the associated water area is in the partial Kenosha County nonattainment area.

The nonroad category allocated to the partial Kenosha County 2008 ozone nonattainment area based on water area is: **Pleasure Craft**. For pleasure craft with inboard engines, 70% of the full county emissions were allocated to the partial Kenosha County 2008 ozone nonattainment area and for pleasure craft with outboard engines, 4% of the full county emissions were allocated to the partial Kenosha County 2008 ozone nonattainment area.

2.4.4.4 Lake Michigan Shoreline

All (100.0%) of the Lake Michigan shoreline in Kenosha County is in the partial Kenosha County 2008 ozone nonattainment area. The nonroad category allocated to the partial Kenosha County 2008 ozone nonattainment area based on Lake Michigan shoreline is **Commercial Marine**, since all commercial marine emissions attributable to Kenosha County come from vessels traveling on Lake Michigan past the county. Kenosha County does not have any ports, inland lakes or inland rivers with commercial marine activity.

2.4.4.5 Airport Location

The EPA's 2011 NEI, version 2, and 2017 NEI provide the emissions and geographical location (longitude and latitude) for each airport in the United States.

For Kenosha County, the following percentages of aircraft emission come from airports located in the partial Kenosha County 2008 ozone nonattainment area.

Table A1.5. Percentages of Countywide Aircraft Emissions in Partial Kenosha County 2008 Ozone **Nonattainment Area.**

Aircraft Category	2011		2017	
	NOx	VOC	NOx	VOC
Airport Ground Support Equipment	100.0%	100.0%	100.0%	100.0%
Military Aircraft	100.0%	100.0%	100.0%	100.0%
General Aviation Aircraft – Piston	59.6%	59.6%	75.7%	75.7%
General Aviation Aircraft – Turbine	61.5%	61.5%	78.6%	78.0%
Taxi Aircraft – Piston	97.5%	97.5%	98.3%	98.3%
Taxi Aircraft – Turbine	97.5%	97.5%	98.3%	98.3%
Aircraft Auxiliary Power Units	100.0%	100.0%	100.0%	100.0%

Thus, **Aircraft** emissions in the partial Kenosha County 2008 ozone nonattainment area are those percentages of the total Kenosha County aircraft emissions.

2.4.4.6 Railroad Link Location

The EPA's 2014 NEI, version 2, provides the location (shape identifier) and the percentage of county rail travel for each link of railway in the United States. WDNR used these data to estimate the percentage of Kenosha County rail travel within the partial county 2008 ozone nonattainment area and assumed these travel percentages would equal the emission percentages. These percentages are 60% for commercial rail and 100% for passenger rail. The average percentages for all rail locomotive are:

- In 2011: 60.0% for both NOx and VOC
- In 2017: 63.2% for NOx and 64.2% for VOC

Thus, **Rail Locomotive** emissions in the partial Kenosha County 2008 ozone nonattainment area are those percentages of the total Kenosha County rail locomotive emissions. It should be noted that the 2011 NEI did not include emissions from passenger rail, resulting in an underestimation of the reduction in rail emissions from 2011 to 2017.

For **Railroad Maintenance** emissions, 100% of the countywide emissions are assumed to be in the partial Kenosha County 2008 ozone nonattainment area, since no railyards exist in Kenosha County outside of the partial county 2008 ozone nonattainment area.

APPENDIX 2

EGU Inventory Methodology and Emissions for 2011, 2017, 2020 and 2021

This appendix provides the methodology for electric generating unit (EGU) sector NOx and VOC tons per ozone season day (tposd) emission estimates in sections 3.2 and 3.3 of the Wisconsin Department of Natural Resources (WDNR) partial Kenosha County attainment plan for the 2008 ozone standard.

The Pleasant Prairie coal-fired power plant retired in 2018 and was the only EGU point source facility located in the partial Kenosha County 2008 ozone nonattainment area. The NOx emissions and days of operation for 2011 and 2017 for the generating units at Pleasant Prairie were derived from data reported by the utility to EPA's Clean Air Markets Division (CAMD) database. For each unit, WDNR used the ozone season (i.e., May 1 through September 30) NOx emissions divided by the days of reported operation during the ozone season to represent ozone season day emissions. This data and the tposd emissions calculated from this data are provided in Table A2.1. The NOx emissions were 8.71 tposd in 2011 and 8.55 tposd in 2017. It should be noted that the Pleasant Prairie power plant operated selective catalytic reduction (SCR) since 2006 for controlling NOx emissions.

The VOC ozone season day emissions for Pleasant Prairie were derived by multiplying the facility's ozone season heat input by an average VOC emission rate for 2011 and 2017. The base data used in the calculation and the resulting emissions are provided in Table A2.1. In this case, VOC emissions are not monitored by continuous emissions monitors and reported to the CAMD database as is done for NOx. Therefore, the VOC emission rate was derived by dividing the facility's annual VOC emissions reported to the WDNR Air Emissions Inventory (AEI) by the facility's annual heat input reported to the CAMD database. The data applied in deriving the VOC emission rate are shown in Table A2.2. Multiplying these VOC emission rates for each year by the maximum heat input resulted in 0.38 tposd of VOC in 2011 and 0.32 tposd in 2017.

Notes:

1) Emissions from non-electric generating emission units at the plant (i.e., units other than the two coal boilers) are not included because they are insignificant (less than 0.1% of the total plant emissions on a tons per year basis) compared to the boiler emissions.
2) As discussed in section 3.3 of the attainment plan, the permanent shutdown of boilers B20, B21, B22 and B23 at the Pleasant Prairie power plant generated emission reduction credits (ERCs) based on a creditable VOC emission reduction of 135.3 tons per year and a creditable NOx emission reduction of 2,634.3 tons per year (Construction Permit #18-RAB-05-ERC). These ERCs are included in the 2020 and 2021 projected year inventories shown in section 3.2 of the attainment plan.

Table A2.1. Pleasant Prairie Ozone Season Day Operation and Emissions.

Variable	2011		2017		2020	2021
	B20	B21	B20	B21	B20&B21	B20&B21
Ozone Season NOx (tons) [1]	531.1	522.8	448.6	834.3	Retired	Retired
# of Ozone Season Days Reported [1]	123	119	104	197		
NOx (tposd)	4.32	4.39	4.31	4.23		
NOx Control	SCR	SCR	SCR	SCR		
VOC Rate (lbs/mmBtu)[2]	0.0033		0.0034			
Ozone Season Heat Input (mmBtu) [3]	31,500,945		24,197,215			
# of Ozone Season Days Reported [1]	138		125			
VOC (tposd)	0.38		0.32			

SCR = Selective Catalytic Reduction
[1] Data reported to EPA CAMD database. "Ozone Season" is defined here as May 1 through September 30.
[2] Calculated in Table 2.2.
[3] Data reported to EPA CAMD database for boilers B20 and B21 combined. "Ozone Season" is defined here as May 1 through September 30.

Table A2.2. Pleasant Prairie VOC Annual Emissions and Emission Rates.

Variable	2011	2017	2020	2021
Annual VOC (tons) [1]	123.6	106.7	Retired	Retired
Annual Heat Input (mmBtu) [2]	75,084,093	63,566,574		
VOC Rate (lbs/mmBtu) [3]	0.0033	0.0034		

[1] Emissions reported to WDNR AEI.
[2] Heat input reported to EPA CAMD database for boilers B20 and B21 combined.
[3] Calculated by the equation (Annual VOC tons x 2000 lbs/ton) / Annual Heat Input (mmBtu).

APPENDIX 3

Point Non-EGU Emissions for

2011, 2017, 2020 and 2021

This appendix provides a list of the partial Kenosha County nonattainment area point source non-electric generating unit (non-EGU) tons per ozone season day (tposd) emissions by facility identification number (FID) and facility name for 2011, 2017, 2020 and 2021. The sums of NOx and VOC emissions from these facilities were used for the non-EGU sector NOx and VOC tposd emission estimates in sections 3.2 (2011 Base Year and 2017 Inventories for RFP) and 3.3 (2020 & 2021 Projected Year Inventories for RFP) of the Wisconsin Department of Natural Resources' (WDNR) partial Kenosha County attainment plan for the 2008 ozone standard.

Table A3.1 2011 and 2017 Point Non-EGU Emissions for the partial Kenosha County Area[1,2]

FID	Facility Name	NAICS	Pollutant	2011 (tposd)	2017 (tposd)	2018 (tposd)[3]	2011 (tons)	2017 (tons)	2018 (tons)[3]
230002960	KENOSHA WASTEWATER TREATMENT FACILITY	221320	NOx	Not reported	2.93E-02	-	Not reported	3.69	-
230008350	KENOSHA STEEL CASTINGS	331513	NOx	9.20E-03	3.62E-03	-	2.13	0.78	-
230009450	OCEAN SPRAY CRANBERRIES INC	311421	NOx	1.65E-02	2.30E-02	-	8.83	9.01	-
230012530	LAMINATED PRODUCTS INC	337110	NOx	1.30E-03	Shutdown	-	0.43	Shutdown	-
230035410	MONDI AKROSIL LLC	322222	NOx	1.38E-02	Not reported	1.33E-02	0.63	Not reported	4.83
230058180	WI DOA / UW-PARKSIDE POWER PLANT	611310	NOx	9.60E-03	9.78E-03	-	5.87	5.51	-
230059280	ST CATHERINES MEDICAL CENTER CAMPUS/UHSI	622110	NOx	1.17E-02	1.46E-02	-	4.26	5.30	-
230072040	RUST - OLEUM CORP	325510	NOx	4.10E-03	5.77E-03	-	1.50	2.10	-
230094590	KENOSHA MEDICAL CENTER CAMPUS	622110	NOx	1.05E-02	5.70E-03	-	3.81	2.07	-
230099100	CARTHAGE COLLEGE	611310	NOx	1.23E-02	2.50E-02	-	4.49	9.12	-
230105590	SHILOH - PLEASANT PRAIRIE	331523	NOx	Not reported	2.96E-02	-	Not reported	10.72	-
230141780	ARDENT MILLS LLC	311211	NOx	3.85E-05[4]	Not reported	3.13E-05[4]	0.01	Not reported	8.15E-03
230167520	IEA INC - KENOSHA	332322	NOx	6.08E-04	Not reported	Not reported	0.29	Not reported	Not reported
230167630	INSINKERATOR	335210	NOx	Not reported	3.97E-05	-	Not reported	0.06	-
230198760	KKSP PRECISION MACHINING LLC	332722	NOx	7.31E-05	5.47E-05	-	0.07	0.04	-
230002960	KENOSHA WASTEWATER TREATMENT FACILITY	221320	VOC	Not reported	1.39E-03	-	Not reported	0.15	-
230008350	KENOSHA STEEL CASTINGS	331513	VOC	5.26E-02	7.55E-02	-	15.66	9.82	-
230009450	OCEAN SPRAY CRANBERRIES INC	311421	VOC	3.22E-03	3.93E-03	-	1.32	1.36	-
230012530	LAMINATED PRODUCTS INC	337110	VOC	1.25E-02	Shut down	-	3.29	Shut down	-
230035410	MONDI AKROSIL LLC	322222	VOC	1.55E-02	Not reported	2.47E-03	0.69	Not reported	0.90
230058180	WI DOA / UW-PARKSIDE POWER PLANT	611310	VOC	5.27E-04	5.38E-04	-	0.32	0.30	-
230059280	ST CATHERINES MEDICAL CENTER CAMPUS/UHSI	622110	VOC	5.96E-04	7.56E-04	-	0.22	0.28	-
230072040	RUST - OLEUM CORP	325510	VOC	4.64E-02	1.65E-02	-	14.60	5.99	-
230094590	KENOSHA MEDICAL CENTER CAMPUS	622110	VOC	6.20E-04	3.33E-04	-	0.23	0.12	-
230099100	CARTHAGE COLLEGE	611310	VOC	6.79E-04	1.38E-03	-	0.25	0.50	-

FID	Facility Name	NAICS	Pollutant	2011 (tposd)	2017 (tposd)	2018 (tposd)[3]	2011 (tons)	2017 (tons)	2018 (tons)[3]
230105590	SHILOH - PLEASANT PRAIRIE	331523	VOC	Not reported	7.99E-03	-	Not reported	2.90	-
230117580	HONEYWELL AUTOMATION AND CONTROL SOLUTIONS	335921	VOC	4.60E-03	3.71E-03	-	1.20	1.06	-
230134960	LMI PACKAGING SOLUTIONS	323111	VOC	2.14E-02	1.06E-02	-	6.52	3.86	-
230141780	ARDENT MILLS LLC	311211	VOC	1.54E-06[4]	Not reported	1.73E-06[4]	4.00E-04	Not reported	4.50E-04
230167520	IEA INC - KENOSHA	332322	VOC	1.26E-02	Not reported	Not reported	3.94	Not reported	Not reported
230167630	INSINKERATOR	335210	VOC	Not reported	1.25E-02	-	Not reported	3.12	-
230198760	KKSP PRECISION MACHINING LLC	332722	VOC	6.31E-02	1.42E-03	-	16.41	0.37	-
TOTAL			**NOx**	**0.09**	**0.15**	**-**	**32.32**	**48.40**	**-**
			VOC	**0.23**	**0.14**	**-**	**64.65**	**29.83**	**-**

[1] Tons per ozone season day (tposd) emissions were calculated by WI AEI using the 3rd quarter operation information.
[2] According to Wisconsin State Code Chapter NR 438.03(a), facilities that emit less than 3 tons of VOC or less than 5 tons of NOx per year are not required to submit annual emission inventory reports. Sources that chose not to report NOx and/or VOC for a certain year are thus listed as "Not reported" for that year.
[3] Data from 2018 was used for sources that did not report for 2017.
[4] The tposd emissions information is not available in WI AEI and is estimated using the annual emissions (tpy) divided by 260 working days per year.

Table A3.2 2020 and 2021 Point Non-EGU Emissions for the partial Kenosha County Area[1]

FID	Facility Name	NAICS	Pollutant	2020 (tposd)	2021 (tposd)	2020 (tons)	2021 (tons)
230002960	KENOSHA WASTEWATER TREATMENT FACILITY	221320	NOx	2.93E-02	2.93E-02	3.69	3.69
230008350	KENOSHA STEEL CASTINGS	331513	NOx	3.97E-03	3.67E-03	0.85	0.79
230009450	OCEAN SPRAY CRANBERRIES INC	311421	NOx	2.25E-02	2.28E-02	8.82	8.94
230012530	LAMINATED PRODUCTS INC	337110	NOx	Shut down	Shut down	Shut down	Shut down
230035410	MONDI AKROSIL LLC	322222	NOx	1.22E-02	1.23E-02	4.44	4.48
230058180	WI DOA / UW-PARKSIDE POWER PLANT	611310	NOx	1.06E-02	1.08E-02	5.98	6.06
230059280	ST CATHERINES MEDICAL CENTER CAMPUS/UHSI	622110	NOx	1.58E-02	1.60E-02	5.75	5.83
230072040	RUST - OLEUM CORP	325510	NOx	6.48E-03	6.80E-03	2.36	2.47
230094590	KENOSHA MEDICAL CENTER CAMPUS	622110	NOx	6.18E-03	6.27E-03	2.24	2.28
230099100	CARTHAGE COLLEGE	611310	NOx	2.72E-02	2.76E-02	9.89	10.04
230105590	SHILOH - PLEASANT PRAIRIE	331523	NOx	3.19E-02	3.10E-02	11.55	11.22
230141780	ARDENT MILLS LLC	311211	NOx	3.07E-05	3.11E-05	7.97E-03	8.09E-03
230167520	IEA INC - KENOSHA	332322	NOx	No reporting	No reporting	No reporting	No reporting
230167630	INSINKERATOR	335210	NOx	3.19E-02	3.10E-02	0.06	0.06
230198760	KKSP PRECISION MACHINING LLC	332722	NOx	3.19E-02	3.10E-02	0.04	0.04
230002960	KENOSHA WASTEWATER TREATMENT FACILITY	221320	VOC	1.39E-03	1.39E-03	0.15	0.15
230008350	KENOSHA STEEL CASTINGS	331513	VOC	8.27E-02	7.65E-02	10.75	9.96
230009450	OCEAN SPRAY CRANBERRIES INC	311421	VOC	3.85E-03	3.90E-03	1.33	1.35
230012530	LAMINATED PRODUCTS INC	337110	VOC	Shut down	Shut down	Shut down	Shut down
230035410	MONDI AKROSIL LLC	322222	VOC	2.27E-03	2.29E-03	0.83	0.84
230058180	WI DOA / UW-PARKSIDE POWER PLANT	611310	VOC	5.84E-04	5.92E-04	0.33	0.33
230059280	ST CATHERINES MEDICAL CENTER CAMPUS/UHSI	622110	VOC	8.20E-04	8.32E-04	0.30	0.31
230072040	RUST - OLEUM CORP	325510	VOC	1.85E-02	1.94E-02	6.73	7.06
230094590	KENOSHA MEDICAL CENTER CAMPUS	622110	VOC	3.61E-04	3.66E-04	0.13	0.13
230099100	CARTHAGE COLLEGE	611310	VOC	1.49E-03	1.52E-03	0.54	0.55
230105590	SHILOH - PLEASANT PRAIRIE	331523	VOC	8.61E-03	8.36E-03	3.12	3.03

FID	Facility Name	NAICS	Pollutant	2020 (tposd)	2021 (tposd)	2020 (tons)	2021 (tons)
230117580	HONEYWELL AUTOMATION AND CONTROL SOLUTIONS	335921	VOC	3.97E-03	3.93E-03	1.13	1.12
230134960	LMI PACKAGING SOLUTIONS	323111	VOC	9.74E-03	9.84E-03	3.55	3.58
230141780	ARDENT MILLS LLC	311211	VOC	1.69E-06	1.72E-06	4.40E-04	4.47E-04
230167520	IEA INC - KENOSHA	332322	VOC	No reporting	No reporting	No reporting	No reporting
230167630	INSINKERATOR	335210	VOC	1.33E-02	1.32E-02	3.34	3.30
230198760	KKSP PRECISION MACHINING LLC	332722	VOC	1.55E-03	1.54E-03	0.40	0.40
Sub-total – Existing Sources			NOx	0.23	0.23	55.68	55.92
			VOC	0.15	0.14	32.64	32.11
New & Modified Sources[2]							
N/A	N/A	N/A	NOx	0.00	0.00	0.00	0.00
N/A	N/A	N/A	VOC	0.04	0.04	10.0	10.0
TOTAL (Existing + New/Modified Sources)			**NOx**	**0.23**	**0.23**	**55.68**	**55.92**
			VOC	**0.19**	**0.18**	**42.64**	**42.11**

[1] According to Wisconsin State Code Chapter NR 438.03(a), facilities that emit less than 3 tons of VOC or less than 5 tons of NOx per year are not required to submit annual emission inventory reports. Sources that chose not to report NOx and/or VOC for 2017 and 2018 are thus listed as "No reporting" for 2020 and 2021 as well.

[2] For new and modified sources, the tposd emissions are calculated based on the annual emissions divided by 260 weekdays.

APPENDIX 4

Nonpoint (Area) Source Emissions for 2011, 2017, 2020 and 2021

This appendix provides a list of the partial Kenosha County 2008 ozone nonattainment area nonpoint source tons per ozone season day (tposd) emissions by facility identification number (FID) and facility name for 2011, 2017, 2020 and 2021. The sums of NOx and VOC emissions from these SCCs were used for the nonpoint sector NOx and VOC tposd emission estimates in sections 3.2 (2011 Base Year and 2017 Inventories for RFP) and 3.3 (2020 & 2021 Projected Year Inventories for RFP) of the Wisconsin Department of Natural Resources' (WDNR) partial Kenosha County attainment plan for the 2008 ozone standard.

Table A4.1 2011, 2017, 2020 and 2021 Nonpoint (Area) Emissions for the Partial Kenosha County 2008 Ozone Nonattainment Area

FIPS	SCC	Pollutant	2011 (tposd)	2017 (tposd)	2020 (tposd)	2021 (tposd)
55059	2102001000	NOx	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55059	2102002000	NOx	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55059	2102004001	NOx	9.57E-04	0.00E+00	6.49E-04	8.65E-04
55059	2102004002	NOx	5.33E-03	0.00E+00	3.47E-03	4.62E-03
55059	2102005000	NOx	5.55E-04	0.00E+00	0.00E+00	0.00E+00
55059	2102006000	NOx	5.77E-02	2.09E-01	1.30E-01	1.03E-01
55059	2102007000	NOx	1.52E-04	2.33E-03	1.90E-03	1.76E-03
55059	2102008000	NOx	0.00E+00	1.29E-01	1.09E-01	1.02E-01
55059	2102011000	NOx	4.57E-05	7.51E-05	3.76E-05	2.50E-05
55059	2103001000	NOx	0.00E+00	2.15E-05	1.07E-05	7.15E-06
55059	2103002000	NOx	1.21E-02	2.89E-03	1.44E-03	9.63E-04
55059	2103004001	NOx	6.46E-03	1.27E-03	1.44E-03	1.50E-03
55059	2103004002	NOx	2.19E-01	2.02E-03	4.62E-03	5.49E-03
55059	2103005000	NOx	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55059	2103006000	NOx	1.54E-01	1.95E-01	1.81E-01	1.76E-01
55059	2103007000	NOx	1.26E-02	1.03E-02	1.02E-02	1.02E-02
55059	2103008000	NOx	1.03E-04	1.21E-02	1.20E-02	1.19E-02
55059	2103011000	NOx	2.45E-08	9.46E-05	7.37E-05	6.67E-05
55059	2104001000	NOx	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55059	2104004000	NOx	8.95E-03	4.56E-03	6.11E-03	6.63E-03
55059	2104006000	NOx	4.26E-01	4.22E-01	4.57E-01	4.69E-01
55059	2104007000	NOx	1.59E-02	6.76E-02	4.55E-02	3.81E-02
55059	2104008100	NOx	1.33E-02	7.68E-03	5.00E-03	4.10E-03
55059	2104008210	NOx	8.93E-03	4.37E-04	8.79E-04	1.03E-03
55059	2104008220	NOx	3.07E-03	1.16E-03	9.37E-04	8.62E-04
55059	2104008230	NOx	8.72E-04	6.79E-04	4.34E-04	3.53E-04
55059	2104008310	NOx	3.91E-02	2.51E-03	3.37E-03	3.66E-03
55059	2104008320	NOx	1.01E-02	6.67E-03	5.44E-03	5.03E-03
55059	2104008330	NOx	9.77E-03	3.89E-03	3.23E-03	3.01E-03
55059	2104008400	NOx	3.69E-03	3.84E-03	3.99E-03	4.03E-03
55059	2104008510	NOx	0.00E+00	2.20E-03	1.12E-03	7.63E-04
55059	2104008530	NOx	0.00E+00	4.65E-03	2.33E-03	1.55E-03
55059	2104008610	NOx	0.00E+00	2.38E-03	1.30E-03	9.33E-04
55059	2104008620	NOx	0.00E+00	1.52E-03	7.61E-04	5.07E-04
55059	2104008630	NOx	0.00E+00	1.26E-04	6.28E-05	4.19E-05
55059	2104008700	NOx	2.24E-02	8.34E-03	1.64E-02	1.91E-02
55059	2104009000	NOx	2.59E-04	2.62E-04	2.73E-04	2.76E-04
55059	2104011000	NOx	1.85E-04	8.62E-05	1.07E-04	1.14E-04
55059	2302002200	NOx	0.00E+00	0.00E+00	0.00E+00	0.00E+00

FIPS	SCC	Pollutant	2011 (tposd)	2017 (tposd)	2020 (tposd)	2021 (tposd)
55059	2610000100	NOx	0.00E+00	2.13E-04	2.33E-04	2.40E-04
55059	2610000400	NOx	0.00E+00	2.13E-04	2.09E-04	2.07E-04
55059	2610000500	NOx	0.00E+00	1.37E-02	1.52E-02	1.57E-02
55059	2610030000	NOx	0.00E+00	1.08E-02	1.16E-02	1.19E-02
55059	2801500000	NOx	7.41E-07	0.00E+00	0.00E+00	0.00E+00
55059	2810025000	NOx	0.00E+00	1.96E-03	4.01E-03	4.69E-03
55059	2810060100	NOx	1.08E-03	2.62E-04	8.38E-04	1.03E-03
55059	2810060200	NOx	0.00E+00	6.03E-08	3.01E-08	2.01E-08
55059	2102001000	VOC	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55059	2102002000	VOC	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55059	2102004001	VOC	9.57E-06	0.00E+00	6.49E-06	8.65E-06
55059	2102004002	VOC	0.00E+00	0.00E+00	2.41E-04	3.21E-04
55059	2102005000	VOC	2.83E-06	0.00E+00	0.00E+00	0.00E+00
55059	2102006000	VOC	3.17E-03	1.15E-02	7.51E-03	6.20E-03
55059	2102007000	VOC	5.54E-06	8.51E-05	6.95E-05	6.44E-05
55059	2102008000	VOC	0.00E+00	9.96E-03	8.40E-03	7.88E-03
55059	2102011000	VOC	4.51E-07	7.40E-07	3.70E-07	2.47E-07
55059	2103001000	VOC	0.00E+00	7.15E-07	3.58E-07	2.38E-07
55059	2103002000	VOC	5.52E-05	1.31E-05	6.56E-06	4.38E-06
55059	2103004001	VOC	1.10E-04	2.16E-05	2.45E-05	2.54E-05
55059	2103004002	VOC	0.00E+00	1.40E-04	3.22E-04	3.82E-04
55059	2103005000	VOC	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55059	2103006000	VOC	8.45E-03	1.07E-02	1.05E-02	1.04E-02
55059	2103007000	VOC	4.60E-04	3.78E-04	3.73E-04	3.71E-04
55059	2103008000	VOC	7.92E-06	9.38E-04	9.25E-04	9.21E-04
55059	2103011000	VOC	4.19E-10	1.61E-06	1.26E-06	1.14E-06
55059	2104001000	VOC	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55059	2104002000	VOC	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55059	2104004000	VOC	3.48E-04	1.81E-04	2.39E-04	2.59E-04
55059	2104006000	VOC	2.49E-02	2.47E-02	2.67E-02	2.74E-02
55059	2104007000	VOC	5.83E-04	2.63E-03	1.77E-03	1.48E-03
55059	2104008100	VOC	9.70E-02	5.58E-02	3.63E-02	2.98E-02
55059	2104008210	VOC	1.69E-01	8.27E-03	1.66E-02	1.94E-02
55059	2104008220	VOC	1.62E-02	6.12E-03	4.93E-03	4.54E-03
55059	2104008230	VOC	6.54E-03	5.09E-03	3.26E-03	2.64E-03
55059	2104008310	VOC	7.40E-01	4.74E-02	6.43E-02	6.99E-02
55059	2104008320	VOC	5.30E-02	3.51E-02	2.86E-02	2.65E-02
55059	2104008330	VOC	7.33E-02	2.92E-02	2.42E-02	2.26E-02
55059	2104008400	VOC	3.98E-05	2.22E-03	2.31E-03	2.33E-03
55059	2104008510	VOC	0.00E+00	1.43E-02	7.30E-03	4.95E-03
55059	2104008530	VOC	0.00E+00	2.69E-03	1.34E-03	8.97E-04
55059	2104008610	VOC	0.00E+00	8.03E-02	4.36E-02	3.14E-02

FIPS	SCC	Pollutant	2011 (tposd)	2017 (tposd)	2020 (tposd)	2021 (tposd)
55059	2104008620	VOC	0.00E+00	5.13E-02	2.56E-02	1.71E-02
55059	2104008630	VOC	0.00E+00	7.27E-05	3.63E-05	2.42E-05
55059	2104008700	VOC	1.63E-01	6.07E-02	1.19E-01	1.39E-01
55059	2104009000	VOC	1.33E-03	1.35E-03	1.40E-03	1.42E-03
55059	2104011000	VOC	7.18E-06	3.36E-06	4.16E-06	4.43E-06
55059	2302002100	VOC	2.67E-03	4.00E-03	3.44E-03	3.26E-03
55059	2302002200	VOC	7.38E-03	1.11E-02	9.54E-03	9.02E-03
55059	2302003000	VOC	1.29E-03	2.62E-03	2.01E-03	1.80E-03
55059	2302003100	VOC	9.65E-04	1.49E-03	1.27E-03	1.19E-03
55059	2302003200	VOC	4.60E-05	8.63E-05	6.80E-05	6.19E-05
55059	2401001000	VOC	3.91E-01	3.99E-01	4.01E-01	4.01E-01
55059	2401005000	VOC	6.27E-02	6.68E-02	6.73E-02	6.75E-02
55059	2401008000	VOC	3.20E-04	6.84E-02	6.94E-02	6.98E-02
55059	2401015000	VOC	2.41E-03	1.85E-03	9.26E-04	6.17E-04
55059	2401020000	VOC	8.71E-02	2.09E-02	1.05E-02	6.97E-03
55059	2401025000	VOC	2.16E-02	0.00E+00	7.02E-03	9.36E-03
55059	2401030000	VOC	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55059	2401055000	VOC	1.87E-03	2.24E-03	1.12E-03	7.47E-04
55059	2401065000	VOC	5.76E-03	2.59E-03	1.29E-03	8.63E-04
55059	2401070000	VOC	1.40E-01	3.18E-02	1.59E-02	1.06E-02
55059	2401080000	VOC	2.27E-03	7.54E-04	1.84E-03	2.21E-03
55059	2401090000	VOC	7.36E-03	2.57E-02	1.28E-02	8.56E-03
55059	2401100000	VOC	1.01E-01	6.17E-02	8.26E-02	8.96E-02
55059	2401200000	VOC	1.07E-02	9.95E-04	1.01E-03	1.02E-03
55059	2415000000	VOC	2.66E-01	2.18E-01	1.09E-01	7.28E-02
55059	2420000000	VOC	2.71E-07	8.00E-04	4.00E-04	2.67E-04
55059	2425000000	VOC	1.13E-01	0.00E+00	0.00E+00	0.00E+00
55059	2460100000	VOC	3.17E-01	3.32E-01	3.37E-01	3.39E-01
55059	2460200000	VOC	3.01E-01	3.38E-01	3.58E-01	3.64E-01
55059	2460400000	VOC	2.27E-01	3.20E-02	1.33E-01	1.66E-01
55059	2460500000	VOC	1.59E-01	1.61E-01	1.62E-01	1.62E-01
55059	2460600000	VOC	9.52E-02	3.09E-01	2.03E-01	1.68E-01
55059	2460800000	VOC	2.97E-01	3.01E-01	3.03E-01	3.04E-01
55059	2460900000	VOC	1.17E-02	1.18E-02	1.19E-02	1.20E-02
55059	2461021000	VOC	8.70E-02	1.31E-01	1.42E-01	1.46E-01
55059	2461022000	VOC	2.10E-02	7.25E-02	7.88E-02	8.09E-02
55059	2461850000	VOC	8.69E-02	4.16E-02	4.02E-02	3.98E-02
55059	2501011011	VOC	3.50E-02	6.97E-03	7.04E-03	7.07E-03
55059	2501011012	VOC	6.83E-02	7.82E-03	7.90E-03	7.93E-03
55059	2501011013	VOC	9.96E-03	9.97E-03	1.01E-02	1.01E-02
55059	2501011014	VOC	2.96E-03	1.46E-03	1.47E-03	1.48E-03
55059	2501011015	VOC	2.75E-04	2.75E-04	2.78E-04	2.79E-04

FIPS	SCC	Pollutant	2011 (tposd)	2017 (tposd)	2020 (tposd)	2021 (tposd)
55059	2501012011	VOC	1.12E-03	3.05E-04	3.08E-04	3.09E-04
55059	2501012012	VOC	2.18E-03	2.50E-04	2.52E-04	2.53E-04
55059	2501012013	VOC	1.36E-02	1.36E-02	1.37E-02	1.38E-02
55059	2501012014	VOC	5.70E-03	4.19E-03	4.24E-03	4.25E-03
55059	2501012015	VOC	5.29E-04	5.30E-04	5.35E-04	5.37E-04
55059	2501050120	VOC	3.31E-02	0.00E+00	0.00E+00	0.00E+00
55059	2501055120	VOC	1.04E-02	0.00E+00	0.00E+00	0.00E+00
55059	2501060051	VOC	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55059	2501060052	VOC	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55059	2501060053	VOC	3.87E-02	1.29E-02	2.65E-02	3.11E-02
55059	2501060100	VOC	1.43E-01	1.38E-01	1.09E-01	1.01E-01
55059	2501060201	VOC	5.29E-02	1.43E-02	3.47E-02	4.16E-02
55059	2501080050	VOC	4.82E-02	4.46E-02	3.92E-02	3.74E-02
55059	2501080100	VOC	2.50E-03	6.42E-05	4.43E-04	5.69E-04
55059	2505030120	VOC	3.46E-03	9.34E-04	2.27E-03	2.72E-03
55059	2505040120	VOC	1.13E-02	0.00E+00	0.00E+00	0.00E+00
55059	2610000100	VOC	0.00E+00	9.63E-04	1.05E-03	1.08E-03
55059	2610000400	VOC	0.00E+00	9.63E-04	8.69E-04	8.37E-04
55059	2610000500	VOC	0.00E+00	3.86E-02	3.88E-02	3.88E-02
55059	2610030000	VOC	0.00E+00	1.13E-02	1.16E-02	1.18E-02
55059	2630020000	VOC	6.26E-03	0.00E+00	2.34E-03	3.12E-03
55059	2680003000	VOC	0.00E+00	4.61E-02	4.93E-02	5.04E-02
55059	2801500000	VOC	1.18E-06	0.00E+00	0.00E+00	0.00E+00
55059	2805002000	VOC	0.00E+00	1.95E-03	1.95E-03	1.95E-03
55059	2805007100	VOC	0.00E+00	4.45E-05	4.66E-05	4.73E-05
55059	2805009100	VOC	0.00E+00	7.67E-06	8.00E-06	8.11E-06
55059	2805010100	VOC	0.00E+00	5.43E-06	5.43E-06	5.43E-06
55059	2805018000	VOC	0.00E+00	1.65E-02	1.66E-02	1.66E-02
55059	2805025000	VOC	0.00E+00	1.26E-03	1.31E-03	1.32E-03
55059	2805035000	VOC	0.00E+00	1.72E-03	1.72E-03	1.72E-03
55059	2805040000	VOC	0.00E+00	2.16E-04	2.16E-04	2.16E-04
55059	2805045000	VOC	0.00E+00	2.99E-05	2.99E-05	2.99E-05
55059	2810025000	VOC	0.00E+00	5.20E-03	5.24E-03	5.25E-03
55059	2810060100	VOC	3.78E-06	2.20E-05	1.35E-05	1.06E-05
55059	2810060200	VOC	0.00E+00	5.06E-09	2.53E-09	1.69E-09
TOTAL		**NOx**	**1.03**	**1.13**	**1.04**	**1.01**
		VOC	**4.64**	**3.49**	**3.39**	**3.36**

*Values marked in red font indicate WDNR staff estimates.

APPENDIX 5

Onroad Emissions and Activity Data for 2011, 2017, 2020 and 2021

This appendix provides detailed listings of the partial Kenosha County 2008 ozone nonattainment area onroad tons per ozone season weekday (tposwd) emissions and activity data by source type, fuel type and road type for 2011, 2017, 2020 and 2021. The sums of NOx and VOC emissions from these onroad categories were used for the onroad sector NOx and VOC tposwd emission estimates in sections 3.2 (2011 Base Year and 2017 Inventories for RFP) and 3.3 (2020 & 2021 Projected Year Inventories for RFP) of the Wisconsin Department of Natural Resources' (WDNR) partial Kenosha County attainment plan for the 2008 ozone standard.

Table A5.1. 2011 Onroad NO_X and VOC Emissions: tons per ozone season weekday (tposwd) for the partial Kenosha County 2008 ozone nonattainment area.

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 ozone Nonattainment Area – Year 2011			
			NO_x Emissions (tposwd)	VOC Emissions (tposwd)		
			Total	Exhaust	Evaporative	Total
Motorcycle	Gasoline	Off-Network	0.0001	0.0005	0.0295	0.0300
Motorcycle	Gasoline	Rural Restricted	0.0019	0.0020	0.0007	0.0027
Motorcycle	Gasoline	Rural Unrestricted	0.0035	0.0042	0.0018	0.0060
Motorcycle	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Motorcycle	Gasoline	Urban Unrestricted	0.0076	0.0141	0.0078	0.0219
Passenger Car	Gasoline	Off-Network	0.2883	0.3115	0.3716	0.6830
Passenger Car	Gasoline	Rural Restricted	0.2440	0.0473	0.0155	0.0628
Passenger Car	Gasoline	Rural Unrestricted	0.1454	0.0309	0.0137	0.0445
Passenger Car	Gasoline	Urban Restricted	0.0009	0.0003	0.0002	0.0004
Passenger Car	Gasoline	Urban Unrestricted	0.4234	0.1104	0.0589	0.1694
Passenger Car	Diesel	Off-Network	0.0013	0.0026	0.0000	0.0026
Passenger Car	Diesel	Rural Restricted	0.0011	0.0005	0.0000	0.0005
Passenger Car	Diesel	Rural Unrestricted	0.0006	0.0004	0.0000	0.0004
Passenger Car	Diesel	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Diesel	Urban Unrestricted	0.0018	0.0013	0.0000	0.0013
Passenger Car	Ethanol (E-85)	Off-Network	0.0000	0.0000	0.0000	0.0000
Passenger Car	Ethanol (E-85)	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Ethanol (E-85)	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Ethanol (E-85)	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Ethanol (E-85)	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Off-Network	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Gasoline	Off-Network	0.3052	0.3561	0.1630	0.5191
Passenger Truck	Gasoline	Rural Restricted	0.3163	0.0576	0.0076	0.0652
Passenger Truck	Gasoline	Rural Unrestricted	0.1793	0.0364	0.0067	0.0431
Passenger Truck	Gasoline	Urban Restricted	0.0010	0.0003	0.0001	0.0004
Passenger Truck	Gasoline	Urban Unrestricted	0.4906	0.1260	0.0290	0.1550
Passenger Truck	Diesel	Off-Network	0.0046	0.0034	0.0000	0.0034
Passenger Truck	Diesel	Rural Restricted	0.0137	0.0026	0.0000	0.0026
Passenger Truck	Diesel	Rural Unrestricted	0.0093	0.0019	0.0000	0.0019
Passenger Truck	Diesel	Urban Restricted	0.0001	0.0000	0.0000	0.0000
Passenger Truck	Diesel	Urban Unrestricted	0.0327	0.0069	0.0000	0.0069
Passenger Truck	Ethanol (E-85)	Off-Network	0.0000	0.0000	0.0000	0.0001
Passenger Truck	Ethanol (E-85)	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Ethanol (E-85)	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Ethanol (E-85)	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Ethanol (E-85)	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Off-Network	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Gasoline	Off-Network	0.1060	0.1236	0.0682	0.1918
Light Commercial Truck	Gasoline	Rural Restricted	0.1007	0.0209	0.0033	0.0242
Light Commercial Truck	Gasoline	Rural Unrestricted	0.0600	0.0146	0.0029	0.0176

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 ozone Nonattainment Area – Year 2011			
			NO_x Emissions (tposwd)	VOC Emissions (tposwd)		
			Total	Exhaust	Evaporative	**Total**
Light Commercial Truck	Gasoline	Urban Restricted	0.0003	0.0001	0.0000	0.0002
Light Commercial Truck	Gasoline	Urban Unrestricted	0.1650	0.0539	0.0126	0.0665
Light Commercial Truck	Diesel	Off-Network	0.0042	0.0035	0.0000	0.0035
Light Commercial Truck	Diesel	Rural Restricted	0.0120	0.0026	0.0000	0.0026
Light Commercial Truck	Diesel	Rural Unrestricted	0.0083	0.0019	0.0000	0.0019
Light Commercial Truck	Diesel	Urban Restricted	0.0001	0.0000	0.0000	0.0000
Light Commercial Truck	Diesel	Urban Unrestricted	0.0302	0.0070	0.0000	0.0070
Light Commercial Truck	Ethanol (E-85)	Off-Network	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Ethanol (E-85)	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Ethanol (E-85)	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Ethanol (E-85)	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Ethanol (E-85)	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Off-Network	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Intercity Bus	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Intercity Bus	Diesel	Rural Restricted	0.0029	0.0002	0.0000	0.0002
Intercity Bus	Diesel	Rural Unrestricted	0.0022	0.0002	0.0000	0.0002
Intercity Bus	Diesel	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Intercity Bus	Diesel	Urban Unrestricted	0.0067	0.0006	0.0000	0.0006
Transit Bus	Gasoline	Off-Network	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Transit Bus	Diesel	Rural Restricted	0.0054	0.0003	0.0000	0.0003
Transit Bus	Diesel	Rural Unrestricted	0.0035	0.0003	0.0000	0.0003
Transit Bus	Diesel	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Diesel	Urban Unrestricted	0.0095	0.0008	0.0000	0.0008
Transit Bus	CNG	Off-Network	0.0000	0.0000	0.0000	0.0000
Transit Bus	CNG	Rural Restricted	0.0005	0.0001	0.0000	0.0001
Transit Bus	CNG	Rural Unrestricted	0.0003	0.0000	0.0000	0.0000
Transit Bus	CNG	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	CNG	Urban Unrestricted	0.0007	0.0002	0.0000	0.0002
School Bus	Gasoline	Off-Network	0.0000	0.0001	0.0000	0.0001
School Bus	Gasoline	Rural Restricted	0.0001	0.0000	0.0000	0.0000
School Bus	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Urban Unrestricted	0.0001	0.0001	0.0000	0.0001
School Bus	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
School Bus	Diesel	Rural Restricted	0.0073	0.0008	0.0000	0.0008
School Bus	Diesel	Rural Unrestricted	0.0047	0.0008	0.0000	0.0008
School Bus	Diesel	Urban Restricted	0.0000	0.0000	0.0000	0.0000
School Bus	Diesel	Urban Unrestricted	0.0133	0.0024	0.0000	0.0024
Refuse Truck	Gasoline	Off-Network	0.0001	0.0001	0.0001	0.0002
Refuse Truck	Gasoline	Rural Restricted	0.0004	0.0001	0.0000	0.0001
Refuse Truck	Gasoline	Rural Unrestricted	0.0002	0.0001	0.0000	0.0001
Refuse Truck	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Gasoline	Urban Unrestricted	0.0007	0.0003	0.0000	0.0003

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 ozone Nonattainment Area – Year 2011			
			NO$_x$ Emissions (tposwd)	VOC Emissions (tposwd)		
			Total	Exhaust	Evaporative	**Total**
Refuse Truck	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Diesel	Rural Restricted	0.0206	0.0010	0.0000	0.0010
Refuse Truck	Diesel	Rural Unrestricted	0.0116	0.0007	0.0000	0.0007
Refuse Truck	Diesel	Urban Restricted	0.0001	0.0000	0.0000	0.0000
Refuse Truck	Diesel	Urban Unrestricted	0.0360	0.0025	0.0000	0.0025
Single Unit Short-haul Truck	Gasoline	Off-Network	0.0221	0.0212	0.0188	0.0401
Single Unit Short-haul Truck	Gasoline	Rural Restricted	0.0357	0.0062	0.0005	0.0067
Single Unit Short-haul Truck	Gasoline	Rural Unrestricted	0.0196	0.0042	0.0004	0.0046
Single Unit Short-haul Truck	Gasoline	Urban Restricted	0.0001	0.0001	0.0000	0.0001
Single Unit Short-haul Truck	Gasoline	Urban Unrestricted	0.0541	0.0195	0.0017	0.0212
Single Unit Short-haul Truck	Diesel	Off-Network	0.0062	0.0003	0.0000	0.0003
Single Unit Short-haul Truck	Diesel	Rural Restricted	0.1404	0.0180	0.0000	0.0180
Single Unit Short-haul Truck	Diesel	Rural Unrestricted	0.0834	0.0138	0.0000	0.0138
Single Unit Short-haul Truck	Diesel	Urban Restricted	0.0009	0.0001	0.0000	0.0001
Single Unit Short-haul Truck	Diesel	Urban Unrestricted	0.2899	0.0483	0.0000	0.0483
Single Unit Long-haul Truck	Gasoline	Off-Network	0.0006	0.0007	0.0006	0.0012
Single Unit Long-haul Truck	Gasoline	Rural Restricted	0.0015	0.0003	0.0000	0.0003
Single Unit Long-haul Truck	Gasoline	Rural Unrestricted	0.0008	0.0002	0.0000	0.0002
Single Unit Long-haul Truck	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Single Unit Long-haul Truck	Gasoline	Urban Unrestricted	0.0021	0.0008	0.0001	0.0009
Single Unit Long-haul Truck	Diesel	Off-Network	0.0002	0.0000	0.0000	0.0000
Single Unit Long-haul Truck	Diesel	Rural Restricted	0.0084	0.0012	0.0000	0.0012
Single Unit Long-haul Truck	Diesel	Rural Unrestricted	0.0049	0.0009	0.0000	0.0009
Single Unit Long-haul Truck	Diesel	Urban Restricted	0.0001	0.0000	0.0000	0.0000
Single Unit Long-haul Truck	Diesel	Urban Unrestricted	0.0172	0.0033	0.0000	0.0033
Motor Home	Gasoline	Off-Network	0.0013	0.0017	0.0043	0.0061
Motor Home	Gasoline	Rural Restricted	0.0039	0.0008	0.0001	0.0009
Motor Home	Gasoline	Rural Unrestricted	0.0020	0.0005	0.0001	0.0006
Motor Home	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Motor Home	Gasoline	Urban Unrestricted	0.0055	0.0023	0.0003	0.0025
Motor Home	Diesel	Off-Network	0.0001	0.0000	0.0000	0.0000
Motor Home	Diesel	Rural Restricted	0.0031	0.0004	0.0000	0.0004
Motor Home	Diesel	Rural Unrestricted	0.0016	0.0003	0.0000	0.0003
Motor Home	Diesel	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Motor Home	Diesel	Urban Unrestricted	0.0057	0.0010	0.0000	0.0010
Combination Short-haul Truck	Gasoline	Off-Network	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Rural Restricted	0.0001	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Diesel	Rural Restricted	0.1738	0.0082	0.0000	0.0082
Combination Short-haul Truck	Diesel	Rural Unrestricted	0.0263	0.0016	0.0000	0.0016
Combination Short-haul Truck	Diesel	Urban Restricted	0.0008	0.0001	0.0000	0.0001
Combination Short-haul Truck	Diesel	Urban Unrestricted	0.0798	0.0054	0.0000	0.0054
Combination Long-haul Truck	Diesel	Off-Network	0.5611	0.1489	0.0000	0.1489
Combination Long-haul Truck	Diesel	Rural Restricted	0.4810	0.0230	0.0000	0.0230
Combination Long-haul Truck	Diesel	Rural Unrestricted	0.0763	0.0045	0.0000	0.0045
Combination Long-haul Truck	Diesel	Urban Restricted	0.0024	0.0002	0.0000	0.0002
Combination Long-haul Truck	Diesel	Urban Unrestricted	0.2313	0.0153	0.0000	0.0153
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**5.4311**	**1.7104**	**0.8203**	**2.5307**

Source Type	**Fuel Type**	**Road Type**	**Partial Kenosha County 2008 ozone Nonattainment Area – Year 2011**			
			NO_x Emissions (tposwd)	**VOC Emissions (tposwd)**		
			Total	Exhaust	Evaporative	**Total**
Motorcycle	ALL	ALL	0.0131	0.0209	0.0397	0.0606
Passenger Car	ALL	ALL	1.1067	0.5052	0.4599	0.9650
Passenger Truck	ALL	ALL	1.3529	0.5912	0.2065	0.7977
Light Commercial Truck	ALL	ALL	0.4868	0.2282	0.0870	0.3153
Intercity Bus	ALL	ALL	0.0118	0.0009	0.0000	0.0009
Transit Bus	ALL	ALL	0.0200	0.0017	0.0000	0.0017
School Bus	ALL	ALL	0.0257	0.0042	0.0000	0.0043
Refuse Truck	ALL	ALL	0.0697	0.0048	0.0001	0.0049
Single Unit Short-haul Truck	ALL	ALL	0.6523	0.1318	0.0215	0.1533
Single Unit Long-haul Truck	ALL	ALL	0.0357	0.0074	0.0007	0.0081
Motor Home	ALL	ALL	0.0232	0.0071	0.0048	0.0119
Combination Short-haul Truck	ALL	ALL	0.2809	0.0152	0.0000	0.0153
Combination Long-haul Truck	ALL	ALL	1.3521	0.1919	0.0000	0.1919
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**5.4311**	**1.7104**	**0.8203**	**2.5307**
ALL	Gasoline	ALL	2.9907	1.3701	0.8202	2.1903
ALL	Diesel	ALL	2.4388	0.3400	0.0000	0.3400
ALL	CNG	ALL	0.0014	0.0003	0.0000	0.0003
ALL	Ethanol (E-85)	ALL	0.0002	0.0001	0.0000	0.0001
ALL	Electricity	ALL	0.0000	0.0000	0.0000	0.0000
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**5.4311**	**1.7104**	**0.8203**	**2.5307**
ALL	ALL	Off-Network	1.3014	0.9744	0.6561	1.6305
ALL	ALL	Rural Restricted	1.5745	0.1940	0.0278	0.2218
ALL	ALL	Rural Unrestricted	0.6442	0.1185	0.0257	0.1442
ALL	ALL	Urban Restricted	0.0070	0.0013	0.0003	0.0016
ALL	ALL	Urban Unrestricted	1.9040	0.4223	0.1104	0.5327
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**5.4311**	**1.7104**	**0.8203**	**2.5307**

Table A5.2. 2017 Onroad NO_X and VOC Emissions: tons per ozone season weekday (tposwd) for the partial Kenosha County 2008 ozone nonattainment area.

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area – Year 2017			
			NO_x Emissions (tposwd)	VOC Emissions (tposwd)		
			Total	Exhaust	Evaporative	Total
Motorcycle	Gasoline	Off-Network	0.0001	0.0006	0.0390	0.0396
Motorcycle	Gasoline	Rural Restricted	0.0019	0.0020	0.0007	0.0027
Motorcycle	Gasoline	Rural Unrestricted	0.0034	0.0040	0.0018	0.0057
Motorcycle	Gasoline	Urban Restricted	0.0001	0.0001	0.0000	0.0001
Motorcycle	Gasoline	Urban Unrestricted	0.0079	0.0142	0.0083	0.0225
Passenger Car	Gasoline	Off-Network	0.1661	0.1993	0.2446	0.4439
Passenger Car	Gasoline	Rural Restricted	0.0928	0.0193	0.0078	0.0271
Passenger Car	Gasoline	Rural Unrestricted	0.0452	0.0099	0.0066	0.0165
Passenger Car	Gasoline	Urban Restricted	0.0040	0.0009	0.0004	0.0012
Passenger Car	Gasoline	Urban Unrestricted	0.1388	0.0370	0.0306	0.0675
Passenger Car	Diesel	Off-Network	0.0009	0.0012	0.0000	0.0012
Passenger Car	Diesel	Rural Restricted	0.0007	0.0001	0.0000	0.0001
Passenger Car	Diesel	Rural Unrestricted	0.0003	0.0001	0.0000	0.0001
Passenger Car	Diesel	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Diesel	Urban Unrestricted	0.0009	0.0002	0.0000	0.0002
Passenger Car	Ethanol (E-85)	Off-Network	0.0002	0.0002	0.0003	0.0005
Passenger Car	Ethanol (E-85)	Rural Restricted	0.0001	0.0000	0.0000	0.0000
Passenger Car	Ethanol (E-85)	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Ethanol (E-85)	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Ethanol (E-85)	Urban Unrestricted	0.0001	0.0000	0.0000	0.0001
Passenger Car	Electricity	Off-Network	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Gasoline	Off-Network	0.1423	0.1626	0.1075	0.2701
Passenger Truck	Gasoline	Rural Restricted	0.1064	0.0210	0.0041	0.0251
Passenger Truck	Gasoline	Rural Unrestricted	0.0463	0.0094	0.0035	0.0129
Passenger Truck	Gasoline	Urban Restricted	0.0045	0.0009	0.0002	0.0011
Passenger Truck	Gasoline	Urban Unrestricted	0.1332	0.0336	0.0162	0.0498
Passenger Truck	Diesel	Off-Network	0.0065	0.0037	0.0000	0.0037
Passenger Truck	Diesel	Rural Restricted	0.0139	0.0022	0.0000	0.0022
Passenger Truck	Diesel	Rural Unrestricted	0.0082	0.0015	0.0000	0.0015
Passenger Truck	Diesel	Urban Restricted	0.0006	0.0001	0.0000	0.0001
Passenger Truck	Diesel	Urban Unrestricted	0.0307	0.0057	0.0000	0.0057
Passenger Truck	Ethanol (E-85)	Off-Network	0.0007	0.0009	0.0008	0.0017
Passenger Truck	Ethanol (E-85)	Rural Restricted	0.0006	0.0001	0.0000	0.0001
Passenger Truck	Ethanol (E-85)	Rural Unrestricted	0.0002	0.0000	0.0000	0.0001
Passenger Truck	Ethanol (E-85)	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Ethanol (E-85)	Urban Unrestricted	0.0006	0.0001	0.0001	0.0003
Passenger Truck	Electricity	Off-Network	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Gasoline	Off-Network	0.0712	0.0826	0.0496	0.1322
Light Commercial Truck	Gasoline	Rural Restricted	0.0471	0.0102	0.0019	0.0121
Light Commercial Truck	Gasoline	Rural Unrestricted	0.0231	0.0057	0.0016	0.0073

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area – Year 2017			
			NO_x Emissions (tposwd)	VOC Emissions (tposwd)		
			Total	Exhaust	Evaporative	**Total**
Light Commercial Truck	Gasoline	Urban Restricted	0.0020	0.0005	0.0001	0.0006
Light Commercial Truck	Gasoline	Urban Unrestricted	0.0681	0.0220	0.0075	0.0295
Light Commercial Truck	Diesel	Off-Network	0.0055	0.0046	0.0000	0.0046
Light Commercial Truck	Diesel	Rural Restricted	0.0114	0.0021	0.0000	0.0021
Light Commercial Truck	Diesel	Rural Unrestricted	0.0068	0.0015	0.0000	0.0015
Light Commercial Truck	Diesel	Urban Restricted	0.0005	0.0001	0.0000	0.0001
Light Commercial Truck	Diesel	Urban Unrestricted	0.0263	0.0057	0.0000	0.0057
Light Commercial Truck	Ethanol (E-85)	Off-Network	0.0001	0.0002	0.0002	0.0003
Light Commercial Truck	Ethanol (E-85)	Rural Restricted	0.0001	0.0000	0.0000	0.0000
Light Commercial Truck	Ethanol (E-85)	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Ethanol (E-85)	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Ethanol (E-85)	Urban Unrestricted	0.0001	0.0000	0.0000	0.0001
Light Commercial Truck	Electricity	Off-Network	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Intercity Bus	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Intercity Bus	Diesel	Rural Restricted	0.0027	0.0001	0.0000	0.0001
Intercity Bus	Diesel	Rural Unrestricted	0.0018	0.0001	0.0000	0.0001
Intercity Bus	Diesel	Urban Restricted	0.0001	0.0000	0.0000	0.0000
Intercity Bus	Diesel	Urban Unrestricted	0.0060	0.0005	0.0000	0.0005
Transit Bus	Gasoline	Off-Network	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Transit Bus	Diesel	Rural Restricted	0.0042	0.0003	0.0000	0.0003
Transit Bus	Diesel	Rural Unrestricted	0.0024	0.0002	0.0000	0.0002
Transit Bus	Diesel	Urban Restricted	0.0002	0.0000	0.0000	0.0000
Transit Bus	Diesel	Urban Unrestricted	0.0069	0.0006	0.0000	0.0006
Transit Bus	CNG	Off-Network	0.0000	0.0000	0.0000	0.0000
Transit Bus	CNG	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	CNG	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	CNG	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	CNG	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Off-Network	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Rural Restricted	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
School Bus	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
School Bus	Diesel	Rural Restricted	0.0042	0.0004	0.0000	0.0004
School Bus	Diesel	Rural Unrestricted	0.0023	0.0004	0.0000	0.0004
School Bus	Diesel	Urban Restricted	0.0002	0.0000	0.0000	0.0000
School Bus	Diesel	Urban Unrestricted	0.0071	0.0012	0.0000	0.0012
Refuse Truck	Gasoline	Off-Network	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Gasoline	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Gasoline	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area – Year 2017			
			NO_x Emissions (tposwd)	VOC Emissions (tposwd)		
			Total	Exhaust	Evaporative	**Total**
Refuse Truck	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Diesel	Rural Restricted	0.0137	0.0006	0.0000	0.0006
Refuse Truck	Diesel	Rural Unrestricted	0.0071	0.0005	0.0000	0.0005
Refuse Truck	Diesel	Urban Restricted	0.0006	0.0000	0.0000	0.0000
Refuse Truck	Diesel	Urban Unrestricted	0.0249	0.0018	0.0000	0.0018
Single Unit Short-haul Truck	Gasoline	Off-Network	0.0095	0.0098	0.0083	0.0181
Single Unit Short-haul Truck	Gasoline	Rural Restricted	0.0068	0.0014	0.0002	0.0016
Single Unit Short-haul Truck	Gasoline	Rural Unrestricted	0.0035	0.0009	0.0001	0.0010
Single Unit Short-haul Truck	Gasoline	Urban Restricted	0.0003	0.0001	0.0000	0.0001
Single Unit Short-haul Truck	Gasoline	Urban Unrestricted	0.0103	0.0047	0.0006	0.0053
Single Unit Short-haul Truck	Diesel	Off-Network	0.0097	0.0004	0.0000	0.0004
Single Unit Short-haul Truck	Diesel	Rural Restricted	0.0883	0.0090	0.0000	0.0090
Single Unit Short-haul Truck	Diesel	Rural Unrestricted	0.0467	0.0067	0.0000	0.0067
Single Unit Short-haul Truck	Diesel	Urban Restricted	0.0040	0.0004	0.0000	0.0004
Single Unit Short-haul Truck	Diesel	Urban Unrestricted	0.1730	0.0254	0.0000	0.0254
Single Unit Long-haul Truck	Gasoline	Off-Network	0.0003	0.0003	0.0003	0.0006
Single Unit Long-haul Truck	Gasoline	Rural Restricted	0.0004	0.0001	0.0000	0.0001
Single Unit Long-haul Truck	Gasoline	Rural Unrestricted	0.0002	0.0001	0.0000	0.0001
Single Unit Long-haul Truck	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Single Unit Long-haul Truck	Gasoline	Urban Unrestricted	0.0006	0.0003	0.0000	0.0003
Single Unit Long-haul Truck	Diesel	Off-Network	0.0002	0.0000	0.0000	0.0000
Single Unit Long-haul Truck	Diesel	Rural Restricted	0.0045	0.0005	0.0000	0.0005
Single Unit Long-haul Truck	Diesel	Rural Unrestricted	0.0023	0.0004	0.0000	0.0004
Single Unit Long-haul Truck	Diesel	Urban Restricted	0.0002	0.0000	0.0000	0.0000
Single Unit Long-haul Truck	Diesel	Urban Unrestricted	0.0089	0.0015	0.0000	0.0015
Motor Home	Gasoline	Off-Network	0.0013	0.0019	0.0062	0.0081
Motor Home	Gasoline	Rural Restricted	0.0035	0.0009	0.0001	0.0010
Motor Home	Gasoline	Rural Unrestricted	0.0016	0.0005	0.0001	0.0005
Motor Home	Gasoline	Urban Restricted	0.0002	0.0000	0.0000	0.0000
Motor Home	Gasoline	Urban Unrestricted	0.0047	0.0022	0.0004	0.0026
Motor Home	Diesel	Off-Network	0.0002	0.0000	0.0000	0.0000
Motor Home	Diesel	Rural Restricted	0.0039	0.0003	0.0000	0.0003
Motor Home	Diesel	Rural Unrestricted	0.0016	0.0003	0.0000	0.0003
Motor Home	Diesel	Urban Restricted	0.0002	0.0000	0.0000	0.0000
Motor Home	Diesel	Urban Unrestricted	0.0061	0.0010	0.0000	0.0010
Combination Short-haul Truck	Gasoline	Off-Network	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Diesel	Rural Restricted	0.0959	0.0040	0.0000	0.0040
Combination Short-haul Truck	Diesel	Rural Unrestricted	0.0127	0.0008	0.0000	0.0008
Combination Short-haul Truck	Diesel	Urban Restricted	0.0040	0.0002	0.0000	0.0002
Combination Short-haul Truck	Diesel	Urban Unrestricted	0.0423	0.0028	0.0000	0.0028
Combination Long-haul Truck	Diesel	Off-Network	0.5272	0.1176	0.0000	0.1176
Combination Long-haul Truck	Diesel	Rural Restricted	0.3240	0.0131	0.0000	0.0131
Combination Long-haul Truck	Diesel	Rural Unrestricted	0.0446	0.0025	0.0000	0.0025
Combination Long-haul Truck	Diesel	Urban Restricted	0.0136	0.0006	0.0000	0.0006
Combination Long-haul Truck	Diesel	Urban Unrestricted	0.1475	0.0092	0.0000	0.0092
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**2.9102**	**0.8927**	**0.5498**	**1.4424**

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area – Year 2017			
			NOx Emissions (tposwd)	VOC Emissions (tposwd)		
			Total	Exhaust	Evaporative	**Total**
Motorcycle	ALL	ALL	0.0135	0.0209	0.0498	0.0707
Passenger Car	ALL	ALL	0.4501	0.2682	0.2902	0.5584
Passenger Truck	ALL	ALL	0.4945	0.2418	0.1325	0.3743
Light Commercial Truck	ALL	ALL	0.2624	0.1351	0.0609	0.1961
Intercity Bus	ALL	ALL	0.0107	0.0007	0.0000	0.0007
Transit Bus	ALL	ALL	0.0138	0.0011	0.0000	0.0011
School Bus	ALL	ALL	0.0139	0.0021	0.0000	0.0021
Refuse Truck	ALL	ALL	0.0464	0.0029	0.0000	0.0029
Single Unit Short-haul Truck	ALL	ALL	0.3521	0.0588	0.0092	0.0680
Single Unit Long-haul Truck	ALL	ALL	0.0178	0.0031	0.0004	0.0035
Motor Home	ALL	ALL	0.0232	0.0071	0.0067	0.0138
Combination Short-haul Truck	ALL	ALL	0.1549	0.0078	0.0000	0.0078
Combination Long-haul Truck	ALL	ALL	1.0569	0.1430	0.0000	0.1430
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**2.9102**	**0.8927**	**0.5498**	**1.4424**
ALL	Gasoline	ALL	1.1479	0.6588	0.5482	1.2070
ALL	Diesel	ALL	1.7595	0.2321	0.0000	0.2321
ALL	CNG	ALL	0.0001	0.0000	0.0000	0.0000
ALL	Ethanol (E-85)	ALL	0.0028	0.0017	0.0016	0.0033
ALL	Electricity	ALL	0.0000	0.0000	0.0000	0.0000
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**2.9102**	**0.8927**	**0.5498**	**1.4424**
ALL	ALL	Off-Network	0.9420	0.5861	0.4568	1.0429
ALL	ALL	Rural Restricted	0.8272	0.0877	0.0148	0.1026
ALL	ALL	Rural Unrestricted	0.2605	0.0452	0.0137	0.0589
ALL	ALL	Urban Restricted	0.0353	0.0039	0.0007	0.0047
ALL	ALL	Urban Unrestricted	0.8452	0.1697	0.0637	0.2334
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**2.9102**	**0.8927**	**0.5498**	**1.4424**

Table A5.3. 2020 Onroad NO_X and VOC Emissions: tons per ozone season weekday (tposwd) for the partial Kenosha County 2008 ozone nonattainment area.

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area – Year 2020			
			NO_x Emissions (tposwd)	VOC Emissions (tposwd)		
			Total	Exhaust	Evaporative	Total
Motorcycle	Gasoline	Off-Network	0.0001	0.0007	0.0384	0.0391
Motorcycle	Gasoline	Rural Restricted	0.0015	0.0014	0.0006	0.0020
Motorcycle	Gasoline	Rural Unrestricted	0.0031	0.0032	0.0017	0.0048
Motorcycle	Gasoline	Urban Restricted	0.0005	0.0005	0.0002	0.0007
Motorcycle	Gasoline	Urban Unrestricted	0.0083	0.0130	0.0087	0.0217
Passenger Car	Gasoline	Off-Network	0.1278	0.1569	0.2162	0.3731
Passenger Car	Gasoline	Rural Restricted	0.0516	0.0103	0.0054	0.0157
Passenger Car	Gasoline	Rural Unrestricted	0.0277	0.0054	0.0052	0.0106
Passenger Car	Gasoline	Urban Restricted	0.0178	0.0036	0.0019	0.0055
Passenger Car	Gasoline	Urban Unrestricted	0.0953	0.0220	0.0275	0.0495
Passenger Car	Diesel	Off-Network	0.0007	0.0009	0.0000	0.0009
Passenger Car	Diesel	Rural Restricted	0.0005	0.0001	0.0000	0.0001
Passenger Car	Diesel	Rural Unrestricted	0.0002	0.0000	0.0000	0.0000
Passenger Car	Diesel	Urban Restricted	0.0002	0.0000	0.0000	0.0000
Passenger Car	Diesel	Urban Unrestricted	0.0007	0.0001	0.0000	0.0001
Passenger Car	Ethanol (E-85)	Off-Network	0.0005	0.0008	0.0009	0.0016
Passenger Car	Ethanol (E-85)	Rural Restricted	0.0002	0.0000	0.0000	0.0001
Passenger Car	Ethanol (E-85)	Rural Unrestricted	0.0001	0.0000	0.0000	0.0000
Passenger Car	Ethanol (E-85)	Urban Restricted	0.0001	0.0000	0.0000	0.0000
Passenger Car	Ethanol (E-85)	Urban Unrestricted	0.0003	0.0001	0.0001	0.0002
Passenger Car	Electricity	Off-Network	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Gasoline	Off-Network	0.0962	0.1082	0.0962	0.2045
Passenger Truck	Gasoline	Rural Restricted	0.0606	0.0115	0.0029	0.0144
Passenger Truck	Gasoline	Rural Unrestricted	0.0280	0.0051	0.0028	0.0080
Passenger Truck	Gasoline	Urban Restricted	0.0209	0.0040	0.0010	0.0050
Passenger Truck	Gasoline	Urban Unrestricted	0.0891	0.0196	0.0149	0.0345
Passenger Truck	Diesel	Off-Network	0.0042	0.0010	0.0000	0.0010
Passenger Truck	Diesel	Rural Restricted	0.0050	0.0005	0.0000	0.0005
Passenger Truck	Diesel	Rural Unrestricted	0.0035	0.0004	0.0000	0.0004
Passenger Truck	Diesel	Urban Restricted	0.0018	0.0002	0.0000	0.0002
Passenger Truck	Diesel	Urban Unrestricted	0.0153	0.0018	0.0000	0.0018
Passenger Truck	Ethanol (E-85)	Off-Network	0.0012	0.0017	0.0018	0.0036
Passenger Truck	Ethanol (E-85)	Rural Restricted	0.0008	0.0002	0.0001	0.0002
Passenger Truck	Ethanol (E-85)	Rural Unrestricted	0.0003	0.0001	0.0001	0.0001
Passenger Truck	Ethanol (E-85)	Urban Restricted	0.0003	0.0001	0.0000	0.0001
Passenger Truck	Ethanol (E-85)	Urban Unrestricted	0.0010	0.0002	0.0003	0.0005
Passenger Truck	Electricity	Off-Network	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Gasoline	Off-Network	0.0551	0.0594	0.0439	0.1034
Light Commercial Truck	Gasoline	Rural Restricted	0.0276	0.0056	0.0013	0.0069
Light Commercial Truck	Gasoline	Rural Unrestricted	0.0152	0.0032	0.0013	0.0045

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area – Year 2020			
			NO_x Emissions (tposwd)	VOC Emissions (tposwd)		
			Total	Exhaust	Evaporative	**Total**
Light Commercial Truck	Gasoline	Urban Restricted	0.0095	0.0019	0.0005	0.0024
Light Commercial Truck	Gasoline	Urban Unrestricted	0.0504	0.0138	0.0068	0.0206
Light Commercial Truck	Diesel	Off-Network	0.0035	0.0017	0.0000	0.0017
Light Commercial Truck	Diesel	Rural Restricted	0.0045	0.0007	0.0000	0.0007
Light Commercial Truck	Diesel	Rural Unrestricted	0.0031	0.0005	0.0000	0.0005
Light Commercial Truck	Diesel	Urban Restricted	0.0016	0.0002	0.0000	0.0002
Light Commercial Truck	Diesel	Urban Unrestricted	0.0136	0.0023	0.0000	0.0023
Light Commercial Truck	Ethanol (E-85)	Off-Network	0.0003	0.0005	0.0004	0.0009
Light Commercial Truck	Ethanol (E-85)	Rural Restricted	0.0002	0.0000	0.0000	0.0001
Light Commercial Truck	Ethanol (E-85)	Rural Unrestricted	0.0001	0.0000	0.0000	0.0000
Light Commercial Truck	Ethanol (E-85)	Urban Restricted	0.0001	0.0000	0.0000	0.0000
Light Commercial Truck	Ethanol (E-85)	Urban Unrestricted	0.0003	0.0001	0.0001	0.0001
Light Commercial Truck	Electricity	Off-Network	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Intercity Bus	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Intercity Bus	Diesel	Rural Restricted	0.0013	0.0001	0.0000	0.0001
Intercity Bus	Diesel	Rural Unrestricted	0.0011	0.0001	0.0000	0.0001
Intercity Bus	Diesel	Urban Restricted	0.0005	0.0000	0.0000	0.0000
Intercity Bus	Diesel	Urban Unrestricted	0.0041	0.0003	0.0000	0.0003
Transit Bus	Gasoline	Off-Network	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Transit Bus	Diesel	Rural Restricted	0.0022	0.0001	0.0000	0.0001
Transit Bus	Diesel	Rural Unrestricted	0.0014	0.0001	0.0000	0.0001
Transit Bus	Diesel	Urban Restricted	0.0008	0.0000	0.0000	0.0000
Transit Bus	Diesel	Urban Unrestricted	0.0048	0.0005	0.0000	0.0005
Transit Bus	CNG	Off-Network	0.0000	0.0000	0.0000	0.0000
Transit Bus	CNG	Rural Restricted	0.0003	0.0000	0.0000	0.0000
Transit Bus	CNG	Rural Unrestricted	0.0002	0.0000	0.0000	0.0000
Transit Bus	CNG	Urban Restricted	0.0001	0.0000	0.0000	0.0000
Transit Bus	CNG	Urban Unrestricted	0.0005	0.0001	0.0000	0.0001
School Bus	Gasoline	Off-Network	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Rural Restricted	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
School Bus	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
School Bus	Diesel	Rural Restricted	0.0023	0.0002	0.0000	0.0002
School Bus	Diesel	Rural Unrestricted	0.0015	0.0002	0.0000	0.0002
School Bus	Diesel	Urban Restricted	0.0008	0.0001	0.0000	0.0001
School Bus	Diesel	Urban Unrestricted	0.0052	0.0007	0.0000	0.0007
Refuse Truck	Gasoline	Off-Network	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Gasoline	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Gasoline	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area – Year 2020			
			NO_x Emissions (tposwd)	VOC Emissions (tposwd)		
			Total	Exhaust	Evaporative	**Total**
Refuse Truck	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Diesel	Rural Restricted	0.0068	0.0002	0.0000	0.0002
Refuse Truck	Diesel	Rural Unrestricted	0.0042	0.0002	0.0000	0.0002
Refuse Truck	Diesel	Urban Restricted	0.0024	0.0001	0.0000	0.0001
Refuse Truck	Diesel	Urban Unrestricted	0.0166	0.0007	0.0000	0.0007
Single Unit Short-haul Truck	Gasoline	Off-Network	0.0125	0.0127	0.0109	0.0236
Single Unit Short-haul Truck	Gasoline	Rural Restricted	0.0070	0.0013	0.0002	0.0015
Single Unit Short-haul Truck	Gasoline	Rural Unrestricted	0.0042	0.0010	0.0002	0.0011
Single Unit Short-haul Truck	Gasoline	Urban Restricted	0.0024	0.0005	0.0001	0.0005
Single Unit Short-haul Truck	Gasoline	Urban Unrestricted	0.0140	0.0059	0.0008	0.0067
Single Unit Short-haul Truck	Diesel	Off-Network	0.0090	0.0004	0.0000	0.0004
Single Unit Short-haul Truck	Diesel	Rural Restricted	0.0405	0.0036	0.0000	0.0036
Single Unit Short-haul Truck	Diesel	Rural Unrestricted	0.0249	0.0031	0.0000	0.0031
Single Unit Short-haul Truck	Diesel	Urban Restricted	0.0142	0.0013	0.0000	0.0013
Single Unit Short-haul Truck	Diesel	Urban Unrestricted	0.1042	0.0135	0.0000	0.0135
Single Unit Long-haul Truck	Gasoline	Off-Network	0.0001	0.0002	0.0002	0.0004
Single Unit Long-haul Truck	Gasoline	Rural Restricted	0.0001	0.0000	0.0000	0.0000
Single Unit Long-haul Truck	Gasoline	Rural Unrestricted	0.0001	0.0000	0.0000	0.0000
Single Unit Long-haul Truck	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Single Unit Long-haul Truck	Gasoline	Urban Unrestricted	0.0002	0.0001	0.0000	0.0001
Single Unit Long-haul Truck	Diesel	Off-Network	0.0003	0.0000	0.0000	0.0000
Single Unit Long-haul Truck	Diesel	Rural Restricted	0.0031	0.0003	0.0000	0.0003
Single Unit Long-haul Truck	Diesel	Rural Unrestricted	0.0019	0.0003	0.0000	0.0003
Single Unit Long-haul Truck	Diesel	Urban Restricted	0.0011	0.0001	0.0000	0.0001
Single Unit Long-haul Truck	Diesel	Urban Unrestricted	0.0081	0.0012	0.0000	0.0012
Motor Home	Gasoline	Off-Network	0.0012	0.0017	0.0055	0.0072
Motor Home	Gasoline	Rural Restricted	0.0020	0.0005	0.0001	0.0006
Motor Home	Gasoline	Rural Unrestricted	0.0011	0.0003	0.0001	0.0004
Motor Home	Gasoline	Urban Restricted	0.0007	0.0002	0.0000	0.0002
Motor Home	Gasoline	Urban Unrestricted	0.0037	0.0016	0.0003	0.0019
Motor Home	Diesel	Off-Network	0.0002	0.0000	0.0000	0.0000
Motor Home	Diesel	Rural Restricted	0.0024	0.0002	0.0000	0.0002
Motor Home	Diesel	Rural Unrestricted	0.0012	0.0002	0.0000	0.0002
Motor Home	Diesel	Urban Restricted	0.0008	0.0001	0.0000	0.0001
Motor Home	Diesel	Urban Unrestricted	0.0049	0.0009	0.0000	0.0009
Combination Short-haul Truck	Gasoline	Off-Network	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Diesel	Rural Restricted	0.0513	0.0019	0.0000	0.0019
Combination Short-haul Truck	Diesel	Rural Unrestricted	0.0080	0.0004	0.0000	0.0004
Combination Short-haul Truck	Diesel	Urban Restricted	0.0177	0.0007	0.0000	0.0007
Combination Short-haul Truck	Diesel	Urban Unrestricted	0.0304	0.0018	0.0000	0.0018
Combination Long-haul Truck	Diesel	Off-Network	0.4076	0.0796	0.0000	0.0796
Combination Long-haul Truck	Diesel	Rural Restricted	0.1714	0.0060	0.0000	0.0060
Combination Long-haul Truck	Diesel	Rural Unrestricted	0.0277	0.0013	0.0000	0.0013
Combination Long-haul Truck	Diesel	Urban Restricted	0.0590	0.0021	0.0000	0.0021
Combination Long-haul Truck	Diesel	Urban Unrestricted	0.1059	0.0057	0.0000	0.0057
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**2.0527**	**0.6182**	**0.4998**	**1.1181**

Source Type	**Fuel Type**	**Road Type**	**Partial Kenosha County 2008 Ozone Nonattainment Area – Year 2020**			
			NO_x Emissions (tposwd)	**VOC Emissions (tposwd)**		
			Total	Exhaust	Evaporative	**Total**
Motorcycle	ALL	ALL	0.0136	0.0188	0.0496	0.0684
Passenger Car	ALL	ALL	0.3235	0.2003	0.2572	0.4575
Passenger Truck	ALL	ALL	0.3283	0.1545	0.1203	0.2748
Light Commercial Truck	ALL	ALL	0.1851	0.0901	0.0543	0.1445
Intercity Bus	ALL	ALL	0.0069	0.0005	0.0000	0.0005
Transit Bus	ALL	ALL	0.0103	0.0010	0.0000	0.0010
School Bus	ALL	ALL	0.0100	0.0012	0.0000	0.0012
Refuse Truck	ALL	ALL	0.0300	0.0011	0.0000	0.0011
Single Unit Short-haul Truck	ALL	ALL	0.2328	0.0432	0.0121	0.0553
Single Unit Long-haul Truck	ALL	ALL	0.0151	0.0022	0.0002	0.0025
Motor Home	ALL	ALL	0.0182	0.0057	0.0060	0.0117
Combination Short-haul Truck	ALL	ALL	0.1074	0.0049	0.0000	0.0049
Combination Long-haul Truck	ALL	ALL	0.7715	0.0948	0.0000	0.0948
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**2.0527**	**0.6182**	**0.4998**	**1.1181**
ALL	Gasoline	ALL	0.8362	0.4755	0.4959	0.9714
ALL	Diesel	ALL	1.2100	0.1390	0.0000	0.1390
ALL	CNG	ALL	0.0010	0.0002	0.0000	0.0002
ALL	Ethanol (E-85)	ALL	0.0056	0.0037	0.0039	0.0076
ALL	Electricity	ALL	0.0000	0.0000	0.0000	0.0000
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**2.0527**	**0.6182**	**0.4998**	**1.1181**
ALL	ALL	Off-Network	0.7206	0.4265	0.4146	0.8410
ALL	ALL	Rural Restricted	0.4433	0.0449	0.0105	0.0555
ALL	ALL	Rural Unrestricted	0.1586	0.0253	0.0113	0.0366
ALL	ALL	Urban Restricted	0.1533	0.0156	0.0038	0.0194
ALL	ALL	Urban Unrestricted	0.5770	0.1059	0.0596	0.1655
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**2.0527**	**0.6182**	**0.4998**	**1.1181**
Safety Margin			7½%			7½%
Emissions Budget			**2.2067**			**1.2019**

Table A5.4. 2021 Onroad NO_X and VOC Emissions: tons per ozone season weekday (tposwd) for the partial Kenosha County 2008 ozone nonattainment area.

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area – Year 2021			
			NO_x Emissions (tposwd)	VOC Emissions (tposwd)		
			Total	Exhaust	Evaporative	Total
Motorcycle	Gasoline	Off-Network	0.0001	0.0007	0.0382	0.0389
Motorcycle	Gasoline	Rural Restricted	0.0015	0.0014	0.0006	0.0019
Motorcycle	Gasoline	Rural Unrestricted	0.0031	0.0031	0.0016	0.0047
Motorcycle	Gasoline	Urban Restricted	0.0005	0.0005	0.0002	0.0007
Motorcycle	Gasoline	Urban Unrestricted	0.0084	0.0127	0.0088	0.0215
Passenger Car	Gasoline	Off-Network	0.1162	0.1475	0.2076	0.3551
Passenger Car	Gasoline	Rural Restricted	0.0467	0.0095	0.0052	0.0147
Passenger Car	Gasoline	Rural Unrestricted	0.0244	0.0049	0.0050	0.0099
Passenger Car	Gasoline	Urban Restricted	0.0162	0.0033	0.0019	0.0052
Passenger Car	Gasoline	Urban Unrestricted	0.0846	0.0198	0.0266	0.0464
Passenger Car	Diesel	Off-Network	0.0008	0.0009	0.0000	0.0009
Passenger Car	Diesel	Rural Restricted	0.0005	0.0001	0.0000	0.0001
Passenger Car	Diesel	Rural Unrestricted	0.0002	0.0000	0.0000	0.0000
Passenger Car	Diesel	Urban Restricted	0.0002	0.0000	0.0000	0.0000
Passenger Car	Diesel	Urban Unrestricted	0.0007	0.0001	0.0000	0.0001
Passenger Car	Ethanol (E-85)	Off-Network	0.0006	0.0009	0.0011	0.0020
Passenger Car	Ethanol (E-85)	Rural Restricted	0.0002	0.0000	0.0000	0.0001
Passenger Car	Ethanol (E-85)	Rural Unrestricted	0.0001	0.0000	0.0000	0.0000
Passenger Car	Ethanol (E-85)	Urban Restricted	0.0001	0.0000	0.0000	0.0000
Passenger Car	Ethanol (E-85)	Urban Unrestricted	0.0003	0.0001	0.0002	0.0002
Passenger Car	Electricity	Off-Network	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Car	Electricity	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Gasoline	Off-Network	0.0842	0.0975	0.0926	0.1901
Passenger Truck	Gasoline	Rural Restricted	0.0547	0.0105	0.0028	0.0134
Passenger Truck	Gasoline	Rural Unrestricted	0.0243	0.0045	0.0027	0.0072
Passenger Truck	Gasoline	Urban Restricted	0.0189	0.0036	0.0010	0.0047
Passenger Truck	Gasoline	Urban Unrestricted	0.0777	0.0169	0.0146	0.0315
Passenger Truck	Diesel	Off-Network	0.0041	0.0009	0.0000	0.0009
Passenger Truck	Diesel	Rural Restricted	0.0045	0.0004	0.0000	0.0004
Passenger Truck	Diesel	Rural Unrestricted	0.0031	0.0003	0.0000	0.0003
Passenger Truck	Diesel	Urban Restricted	0.0016	0.0002	0.0000	0.0002
Passenger Truck	Diesel	Urban Unrestricted	0.0137	0.0015	0.0000	0.0015
Passenger Truck	Ethanol (E-85)	Off-Network	0.0014	0.0021	0.0023	0.0045
Passenger Truck	Ethanol (E-85)	Rural Restricted	0.0010	0.0002	0.0001	0.0003
Passenger Truck	Ethanol (E-85)	Rural Unrestricted	0.0004	0.0001	0.0001	0.0001
Passenger Truck	Ethanol (E-85)	Urban Restricted	0.0003	0.0001	0.0000	0.0001
Passenger Truck	Ethanol (E-85)	Urban Unrestricted	0.0012	0.0002	0.0004	0.0006
Passenger Truck	Electricity	Off-Network	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Passenger Truck	Electricity	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Gasoline	Off-Network	0.0486	0.0526	0.0413	0.0938
Light Commercial Truck	Gasoline	Rural Restricted	0.0243	0.0049	0.0013	0.0061
Light Commercial Truck	Gasoline	Rural Unrestricted	0.0130	0.0027	0.0012	0.0040

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area – Year 2021			
			NOx Emissions (tposwd)	VOC Emissions (tposwd)		
			Total	Exhaust	Evaporative	**Total**
Light Commercial Truck	Gasoline	Urban Restricted	0.0084	0.0017	0.0005	0.0022
Light Commercial Truck	Gasoline	Urban Unrestricted	0.0437	0.0117	0.0065	0.0182
Light Commercial Truck	Diesel	Off-Network	0.0034	0.0015	0.0000	0.0015
Light Commercial Truck	Diesel	Rural Restricted	0.0042	0.0006	0.0000	0.0006
Light Commercial Truck	Diesel	Rural Unrestricted	0.0029	0.0005	0.0000	0.0005
Light Commercial Truck	Diesel	Urban Restricted	0.0015	0.0002	0.0000	0.0002
Light Commercial Truck	Diesel	Urban Unrestricted	0.0128	0.0021	0.0000	0.0021
Light Commercial Truck	Ethanol (E-85)	Off-Network	0.0004	0.0006	0.0006	0.0012
Light Commercial Truck	Ethanol (E-85)	Rural Restricted	0.0002	0.0000	0.0000	0.0001
Light Commercial Truck	Ethanol (E-85)	Rural Unrestricted	0.0001	0.0000	0.0000	0.0000
Light Commercial Truck	Ethanol (E-85)	Urban Restricted	0.0001	0.0000	0.0000	0.0000
Light Commercial Truck	Ethanol (E-85)	Urban Unrestricted	0.0003	0.0001	0.0001	0.0002
Light Commercial Truck	Electricity	Off-Network	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Light Commercial Truck	Electricity	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Intercity Bus	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Intercity Bus	Diesel	Rural Restricted	0.0012	0.0001	0.0000	0.0001
Intercity Bus	Diesel	Rural Unrestricted	0.0010	0.0001	0.0000	0.0001
Intercity Bus	Diesel	Urban Restricted	0.0004	0.0000	0.0000	0.0000
Intercity Bus	Diesel	Urban Unrestricted	0.0037	0.0003	0.0000	0.0003
Transit Bus	Gasoline	Off-Network	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Gasoline	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Transit Bus	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Transit Bus	Diesel	Rural Restricted	0.0021	0.0001	0.0000	0.0001
Transit Bus	Diesel	Rural Unrestricted	0.0014	0.0001	0.0000	0.0001
Transit Bus	Diesel	Urban Restricted	0.0007	0.0000	0.0000	0.0000
Transit Bus	Diesel	Urban Unrestricted	0.0046	0.0004	0.0000	0.0004
Transit Bus	CNG	Off-Network	0.0000	0.0000	0.0000	0.0000
Transit Bus	CNG	Rural Restricted	0.0003	0.0000	0.0000	0.0000
Transit Bus	CNG	Rural Unrestricted	0.0002	0.0000	0.0000	0.0000
Transit Bus	CNG	Urban Restricted	0.0001	0.0000	0.0000	0.0000
Transit Bus	CNG	Urban Unrestricted	0.0005	0.0001	0.0000	0.0001
School Bus	Gasoline	Off-Network	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Rural Restricted	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
School Bus	Gasoline	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
School Bus	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
School Bus	Diesel	Rural Restricted	0.0021	0.0002	0.0000	0.0002
School Bus	Diesel	Rural Unrestricted	0.0014	0.0002	0.0000	0.0002
School Bus	Diesel	Urban Restricted	0.0007	0.0001	0.0000	0.0001
School Bus	Diesel	Urban Unrestricted	0.0048	0.0006	0.0000	0.0006
Refuse Truck	Gasoline	Off-Network	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Gasoline	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Gasoline	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area – Year 2021			
			NOx Emissions (tposwd)	VOC Emissions (tposwd)		
			Total	Exhaust	Evaporative	**Total**
Refuse Truck	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Refuse Truck	Diesel	Rural Restricted	0.0053	0.0002	0.0000	0.0002
Refuse Truck	Diesel	Rural Unrestricted	0.0032	0.0001	0.0000	0.0001
Refuse Truck	Diesel	Urban Restricted	0.0019	0.0001	0.0000	0.0001
Refuse Truck	Diesel	Urban Unrestricted	0.0127	0.0006	0.0000	0.0006
Single Unit Short-haul Truck	Gasoline	Off-Network	0.0113	0.0116	0.0102	0.0219
Single Unit Short-haul Truck	Gasoline	Rural Restricted	0.0064	0.0012	0.0002	0.0014
Single Unit Short-haul Truck	Gasoline	Rural Unrestricted	0.0038	0.0009	0.0002	0.0010
Single Unit Short-haul Truck	Gasoline	Urban Restricted	0.0023	0.0004	0.0001	0.0005
Single Unit Short-haul Truck	Gasoline	Urban Unrestricted	0.0128	0.0054	0.0008	0.0061
Single Unit Short-haul Truck	Diesel	Off-Network	0.0090	0.0003	0.0000	0.0003
Single Unit Short-haul Truck	Diesel	Rural Restricted	0.0353	0.0031	0.0000	0.0031
Single Unit Short-haul Truck	Diesel	Rural Unrestricted	0.0216	0.0026	0.0000	0.0026
Single Unit Short-haul Truck	Diesel	Urban Restricted	0.0124	0.0011	0.0000	0.0011
Single Unit Short-haul Truck	Diesel	Urban Unrestricted	0.0917	0.0115	0.0000	0.0115
Single Unit Long-haul Truck	Gasoline	Off-Network	0.0002	0.0002	0.0003	0.0005
Single Unit Long-haul Truck	Gasoline	Rural Restricted	0.0001	0.0000	0.0000	0.0000
Single Unit Long-haul Truck	Gasoline	Rural Unrestricted	0.0001	0.0000	0.0000	0.0000
Single Unit Long-haul Truck	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Single Unit Long-haul Truck	Gasoline	Urban Unrestricted	0.0003	0.0001	0.0000	0.0001
Single Unit Long-haul Truck	Diesel	Off-Network	0.0003	0.0000	0.0000	0.0000
Single Unit Long-haul Truck	Diesel	Rural Restricted	0.0027	0.0003	0.0000	0.0003
Single Unit Long-haul Truck	Diesel	Rural Unrestricted	0.0017	0.0002	0.0000	0.0002
Single Unit Long-haul Truck	Diesel	Urban Restricted	0.0010	0.0001	0.0000	0.0001
Single Unit Long-haul Truck	Diesel	Urban Unrestricted	0.0073	0.0010	0.0000	0.0010
Motor Home	Gasoline	Off-Network	0.0011	0.0016	0.0052	0.0069
Motor Home	Gasoline	Rural Restricted	0.0019	0.0005	0.0001	0.0006
Motor Home	Gasoline	Rural Unrestricted	0.0010	0.0003	0.0001	0.0003
Motor Home	Gasoline	Urban Restricted	0.0007	0.0002	0.0000	0.0002
Motor Home	Gasoline	Urban Unrestricted	0.0035	0.0015	0.0003	0.0018
Motor Home	Diesel	Off-Network	0.0002	0.0000	0.0000	0.0000
Motor Home	Diesel	Rural Restricted	0.0022	0.0002	0.0000	0.0002
Motor Home	Diesel	Rural Unrestricted	0.0011	0.0002	0.0000	0.0002
Motor Home	Diesel	Urban Restricted	0.0008	0.0001	0.0000	0.0001
Motor Home	Diesel	Urban Unrestricted	0.0046	0.0008	0.0000	0.0008
Combination Short-haul Truck	Gasoline	Off-Network	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Rural Restricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Rural Unrestricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Urban Restricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Gasoline	Urban Unrestricted	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Diesel	Off-Network	0.0000	0.0000	0.0000	0.0000
Combination Short-haul Truck	Diesel	Rural Restricted	0.0445	0.0017	0.0000	0.0017
Combination Short-haul Truck	Diesel	Rural Unrestricted	0.0069	0.0004	0.0000	0.0004
Combination Short-haul Truck	Diesel	Urban Restricted	0.0154	0.0006	0.0000	0.0006
Combination Short-haul Truck	Diesel	Urban Unrestricted	0.0266	0.0016	0.0000	0.0016
Combination Long-haul Truck	Diesel	Off-Network	0.4003	0.0762	0.0000	0.0762
Combination Long-haul Truck	Diesel	Rural Restricted	0.1434	0.0050	0.0000	0.0050
Combination Long-haul Truck	Diesel	Rural Unrestricted	0.0231	0.0011	0.0000	0.0011
Combination Long-haul Truck	Diesel	Urban Restricted	0.0496	0.0017	0.0000	0.0017
Combination Long-haul Truck	Diesel	Urban Unrestricted	0.0898	0.0049	0.0000	0.0049
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**1.8458**	**0.5662**	**0.4825**	**1.0487**

Source Type	**Fuel Type**	**Road Type**	**Partial Kenosha County 2008 Ozone Nonattainment Area – Year 2021**			
			NO_x Emissions (tposwd)	**VOC Emissions (tposwd)**		
			Total	Exhaust	Evaporative	**Total**
Motorcycle	ALL	ALL	0.0137	0.0184	0.0494	0.0678
Passenger Car	ALL	ALL	0.2917	0.1873	0.2476	0.4349
Passenger Truck	ALL	ALL	0.2913	0.1391	0.1167	0.2558
Light Commercial Truck	ALL	ALL	0.1640	0.0794	0.0514	0.1308
Intercity Bus	ALL	ALL	0.0064	0.0004	0.0000	0.0004
Transit Bus	ALL	ALL	0.0099	0.0009	0.0000	0.0009
School Bus	ALL	ALL	0.0091	0.0010	0.0000	0.0011
Refuse Truck	ALL	ALL	0.0230	0.0009	0.0000	0.0009
Single Unit Short-haul Truck	ALL	ALL	0.2067	0.0382	0.0114	0.0496
Single Unit Long-haul Truck	ALL	ALL	0.0136	0.0020	0.0003	0.0023
Motor Home	ALL	ALL	0.0170	0.0053	0.0057	0.0110
Combination Short-haul Truck	ALL	ALL	0.0933	0.0042	0.0000	0.0042
Combination Long-haul Truck	ALL	ALL	0.7062	0.0890	0.0000	0.0890
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**1.8458**	**0.5662**	**0.4825**	**1.0487**
ALL	Gasoline	ALL	0.7453	0.4341	0.4776	0.9117
ALL	Diesel	ALL	1.0928	0.1274	0.0000	0.1274
ALL	CNG	ALL	0.0010	0.0002	0.0000	0.0002
ALL	Ethanol (E-85)	ALL	0.0067	0.0045	0.0049	0.0095
ALL	Electricity	ALL	0.0000	0.0000	0.0000	0.0000
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**1.8458**	**0.5662**	**0.4825**	**1.0487**
ALL	ALL	Off-Network	0.6824	0.3953	0.3995	0.7948
ALL	ALL	Rural Restricted	0.3854	0.0402	0.0102	0.0505
ALL	ALL	Rural Unrestricted	0.1379	0.0223	0.0110	0.0333
ALL	ALL	Urban Restricted	0.1338	0.0141	0.0037	0.0178
ALL	ALL	Urban Unrestricted	0.5064	0.0942	0.0582	0.1524
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**1.8458**	**0.5662**	**0.4825**	**1.0487**
Safety Margin			7½%			7½%
Emissions Budget			**1.9843**			**1.1274**

Table A5.5. Vehicle Activity Data Output from the MOVES2014b Model for Years 2011, 2017, 2020 and 2021 for the partial Kenosha County 2008 ozone nonattainment area.

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area							
			Vehicle Population				Vehicle-Miles of Travel Ozone Season Weekday			
			2011	2017	2020	2021	2011	2017	2020	2021
Motorcycle	Gasoline	Off-Network	3,032	3,084	3,204	3,233				
Motorcycle	Gasoline	Rural Restricted					2,535	2,629	2,156	2,166
Motorcycle	Gasoline	Rural Unrestricted					5,011	4,848	4,519	4,509
Motorcycle	Gasoline	Urban Restricted					10	129	776	786
Motorcycle	Gasoline	Urban					13,697	14,284	15,174	15,361
Passenger Car	Gasoline	Off-Network	42,069	43,252	45,246	45,495				
Passenger Car	Gasoline	Rural Restricted					423,206	445,927	360,293	361,331
Passenger Car	Gasoline	Rural Unrestricted					270,907	259,790	243,970	242,668
Passenger Car	Gasoline	Urban Restricted					1,731	19,423	125,397	126,357
Passenger Car	Gasoline	Urban					739,851	765,569	818,636	826,165
Passenger Car	Diesel	Off-Network	178	312	387	412				
Passenger Car	Diesel	Rural Restricted					1,727	3,430	3,360	3,535
Passenger Car	Diesel	Rural Unrestricted					1,105	1,998	2,275	2,374
Passenger Car	Diesel	Urban Restricted					7	149	1,169	1,236
Passenger Car	Diesel	Urban					3,019	5,888	7,633	8,082
Passenger Car	Ethanol (E-85)	Off-Network	3	90	254	319				
Passenger Car	Ethanol (E-85)	Rural Restricted					38	1,014	2,129	2,644
Passenger Car	Ethanol (E-85)	Rural Unrestricted					24	591	1,441	1,776
Passenger Car	Ethanol (E-85)	Urban Restricted					0	44	741	925
Passenger Car	Ethanol (E-85)	Urban					66	1,742	4,837	6,046
Passenger Car	Electricity	Off-Network	0	21	0	0				
Passenger Car	Electricity	Rural Restricted					0	255	0	0
Passenger Car	Electricity	Rural Unrestricted					0	149	0	0
Passenger Car	Electricity	Urban Restricted					0	11	0	0
Passenger Car	Electricity	Urban					0	438	0	0
Passenger Truck	Gasoline	Off-Network	30,049	31,793	33,633	33,780				
Passenger Truck	Gasoline	Rural Restricted					351,237	385,986	314,771	315,290
Passenger Truck	Gasoline	Rural Unrestricted					224,838	224,877	213,101	211,700
Passenger Truck	Gasoline	Urban Restricted					1,437	16,813	109,549	110,252
Passenger Truck	Gasoline	Urban					614,035	662,704	715,030	720,718
Passenger Truck	Diesel	Off-Network	506	781	682	691				
Passenger Truck	Diesel	Rural Restricted					6,138	8,809	6,437	6,495
Passenger Truck	Diesel	Rural Unrestricted					3,929	5,132	4,358	4,361
Passenger Truck	Diesel	Urban Restricted					25	384	2,240	2,271

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area							
			Vehicle Population				Vehicle-Miles of Travel Ozone Season Weekday			
			2011	2017	2020	2021	2011	2017	2020	2021
Passenger Truck	Diesel	Urban					10,731	15,125	14,623	14,846
Passenger Truck	Ethanol (E-85)	Off-Network	7	294	695	884				
Passenger Truck	Ethanol (E-85)	Rural Restricted					89	3,858	6,838	8,597
Passenger Truck	Ethanol (E-85)	Rural Unrestricted					57	2,248	4,629	5,773
Passenger Truck	Ethanol (E-85)	Urban Restricted					0	168	2,380	3,006
Passenger Truck	Ethanol (E-85)	Urban					156	6,624	15,533	19,652
Passenger Truck	Electricity	Off-Network	0	0	0	0				
Passenger Truck	Electricity	Rural Restricted					0	0	0	0
Passenger Truck	Electricity	Rural Unrestricted					0	0	0	0
Passenger Truck	Electricity	Urban Restricted					0	0	0	0
Passenger Truck	Electricity	Urban					0	0	0	0
Light Commercial Truck	Gasoline	Off-Network	7,063	7,724	8,292	8,332				
Light Commercial Truck	Gasoline	Rural Restricted					76,861	85,804	70,742	70,921
Light Commercial Truck	Gasoline	Rural Unrestricted					49,201	49,990	47,893	47,620
Light Commercial Truck	Gasoline	Urban Restricted					314	3,737	24,620	24,800
Light Commercial Truck	Gasoline	Urban					134,368	147,318	160,697	162,119
Light Commercial Truck	Diesel	Off-Network	399	535	470	481				
Light Commercial Truck	Diesel	Rural Restricted					4,392	5,449	4,018	4,079
Light Commercial Truck	Diesel	Rural Unrestricted					2,811	3,175	2,720	2,739
Light Commercial Truck	Diesel	Urban Restricted					18	237	1,398	1,426
Light Commercial Truck	Diesel	Urban					7,678	9,356	9,127	9,324
Light Commercial Truck	Ethanol (E-85)	Off-Network	1	47	136	176				
Light Commercial Truck	Ethanol (E-85)	Rural Restricted					16	600	1,301	1,655
Light Commercial Truck	Ethanol (E-85)	Rural Unrestricted					10	349	881	1,111
Light Commercial Truck	Ethanol (E-85)	Urban Restricted					0	26	453	579
Light Commercial Truck	Ethanol (E-85)	Urban					28	1,030	2,956	3,783
Light Commercial Truck	Electricity	Off-Network	0	3	0	0				
Light Commercial Truck	Electricity	Rural Restricted					0	47	0	0
Light Commercial Truck	Electricity	Rural Unrestricted					0	27	0	0
Light Commercial Truck	Electricity	Urban Restricted					0	2	0	0
Light Commercial Truck	Electricity	Urban					0	81	0	0
Intercity Bus	Diesel	Off-Network	3	4	4	4				
Intercity Bus	Diesel	Rural Restricted					222	277	215	215
Intercity Bus	Diesel	Rural Unrestricted					187	213	191	189
Intercity Bus	Diesel	Urban Restricted					1	12	75	76
Intercity Bus	Diesel	Urban					494	606	622	627
Transit Bus	Gasoline	Off-Network	0	0	0	0				
Transit Bus	Gasoline	Rural Restricted					6	15	8	8

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area							
			Vehicle Population				Vehicle-Miles of Travel Ozone Season Weekday			
			2011	2017	2020	2021	2011	2017	2020	2021
Transit Bus	Gasoline	Rural Unrestricted					5	11	7	7
Transit Bus	Gasoline	Urban Restricted					0	1	3	3
Transit Bus	Gasoline	Urban					14	32	23	23
Transit Bus	Diesel	Off-Network	11	13	13	13				
Transit Bus	Diesel	Rural Restricted					424	478	354	353
Transit Bus	Diesel	Rural Unrestricted					358	367	315	311
Transit Bus	Diesel	Urban Restricted					2	21	124	124
Transit Bus	Diesel	Urban					943	1,046	1,026	1,030
Transit Bus	CNG	Off-Network	1	0	2	2				
Transit Bus	CNG	Rural Restricted					57	13	59	60
Transit Bus	CNG	Rural Unrestricted					48	10	52	53
Transit Bus	CNG	Urban Restricted					0	1	21	21
Transit Bus	CNG	Urban					127	29	170	175
School Bus	Gasoline	Off-Network	2	1	1	1				
School Bus	Gasoline	Rural Restricted					24	8	13	12
School Bus	Gasoline	Rural Unrestricted					20	6	11	11
School Bus	Gasoline	Urban Restricted					0	0	4	4
School Bus	Gasoline	Urban					52	17	36	36
School Bus	Diesel	Off-Network	108	126	134	135				
School Bus	Diesel	Rural Restricted					1,327	1,451	1,190	1,200
School Bus	Diesel	Rural Unrestricted					1,121	1,114	1,058	1,058
School Bus	Diesel	Urban Restricted					5	65	417	422
School Bus	Diesel	Urban					2,954	3,175	3,450	3,503
Refuse Truck	Gasoline	Off-Network	5	0	1	0				
Refuse Truck	Gasoline	Rural Restricted					82	6	9	6
Refuse Truck	Gasoline	Rural Unrestricted					49	3	6	4
Refuse Truck	Gasoline	Urban Restricted					0	0	3	2
Refuse Truck	Gasoline	Urban					130	10	19	12
Refuse Truck	Diesel	Off-Network	71	87	93	95				
Refuse Truck	Diesel	Rural Restricted					1,849	2,031	1,662	1,720
Refuse Truck	Diesel	Rural Unrestricted					1,112	1,109	1,048	1,075
Refuse Truck	Diesel	Urban Restricted					8	88	578	601
Refuse Truck	Diesel	Urban					2,936	3,164	3,422	3,564
Single Unit Short-haul	Gasoline	Off-Network	842	531	965	972				
Single Unit Short-haul	Gasoline	Rural Restricted					11,979	7,538	11,270	11,379
Single Unit Short-haul	Gasoline	Rural Unrestricted					7,205	4,115	7,107	7,115
Single Unit Short-haul	Gasoline	Urban Restricted					49	328	3,919	3,976
Single Unit Short-haul	Gasoline	Urban					19,020	11,745	23,203	23,584

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area							
			Vehicle Population				Vehicle-Miles of Travel Ozone Season Weekday			
			2011	2017	2020	2021	2011	2017	2020	2021
Single Unit Short-haul	Diesel	Off-Network	1,664	2,312	2,078	2,097				
Single Unit Short-haul	Diesel	Rural Restricted					27,228	35,483	24,471	24,543
Single Unit Short-haul	Diesel	Rural Unrestricted					16,377	19,373	15,432	15,345
Single Unit Short-haul	Diesel	Urban Restricted					111	1,542	8,510	8,576
Single Unit Short-haul	Diesel	Urban					43,234	55,288	50,384	50,864
Single Unit Long-haul Truck	Gasoline	Off-Network	28	24	6	8				
Single Unit Long-haul Truck	Gasoline	Rural Restricted					400	511	29	34
Single Unit Long-haul Truck	Gasoline	Rural Unrestricted					240	279	19	21
Single Unit Long-haul Truck	Gasoline	Urban Restricted					2	22	10	12
Single Unit Long-haul Truck	Gasoline	Urban					634	796	61	71
Single Unit Long-haul Truck	Diesel	Off-Network	77	97	122	121				
Single Unit Long-haul Truck	Diesel	Rural Restricted					1,736	1,929	1,984	1,986
Single Unit Long-haul Truck	Diesel	Rural Unrestricted					1,044	1,053	1,251	1,242
Single Unit Long-haul Truck	Diesel	Urban Restricted					7	84	690	694
Single Unit Long-haul Truck	Diesel	Urban					2,756	3,006	4,084	4,116
Motor Home	Gasoline	Off-Network	409	436	473	470				
Motor Home	Gasoline	Rural Restricted					946	968	802	791
Motor Home	Gasoline	Rural Unrestricted					569	529	506	494
Motor Home	Gasoline	Urban Restricted					4	42	279	276
Motor Home	Gasoline	Urban					1,501	1,509	1,651	1,639
Motor Home	Diesel	Off-Network	218	277	293	304				
Motor Home	Diesel	Rural Restricted					502	615	497	510
Motor Home	Diesel	Rural Unrestricted					302	336	313	319
Motor Home	Diesel	Urban Restricted					2	27	173	178
Motor Home	Diesel	Urban					798	958	1,022	1,057
Combination Short-haul	Gasoline	Off-Network	0	0	0	0				
Combination Short-haul	Gasoline	Rural Restricted					5	0	0	0
Combination Short-haul	Gasoline	Rural Unrestricted					1	0	0	0
Combination Short-haul	Gasoline	Urban Restricted					0	0	0	0
Combination Short-haul	Gasoline	Urban					2	0	0	0
Combination Short-haul	Diesel	Off-Network	225	251	259	259				
Combination Short-haul	Diesel	Rural Restricted					13,917	16,712	13,121	13,058
Combination Short-haul	Diesel	Rural Unrestricted					2,261	2,451	2,224	2,193
Combination Short-haul	Diesel	Urban Restricted					58	696	4,511	4,506
Combination Short-haul	Diesel	Urban					5,960	6,992	7,255	7,265
Combination Long-haul	Diesel	Off-Network	236	284	314	318				
Combination Long-haul	Diesel	Rural Restricted					49,291	52,628	44,118	44,554
Combination Long-haul	Diesel	Rural Unrestricted					8,008	7,718	7,477	7,483

Source Type	Fuel Type	Road Type	Partial Kenosha County 2008 Ozone Nonattainment Area							
			Vehicle Population				Vehicle-Miles of Travel Ozone Season Weekday			
			2011	2017	2020	2021	2011	2017	2020	2021
Combination Long-haul	Diesel	Urban Restricted					205	2,192	15,169	15,375
Combination Long-haul	Diesel	Urban					21,110	22,018	24,393	24,786
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**87,207**	**92,379**	**97,756**	**98,603**	**3,203,324**	**3,443,126**	**3,622,925**	**3,653,628**
Motorcycle	ALL	ALL	3,032	3,084	3,204	3,233	21,253	21,889	22,624	22,822
Passenger Car	ALL	ALL	42,250	43,675	45,887	46,226	1,441,681	1,506,419	1,571,881	1,583,137
Passenger Truck	ALL	ALL	30,562	32,867	35,009	35,355	1,212,672	1,332,727	1,409,490	1,422,961
Light Commercial Truck	ALL	ALL	7,463	8,309	8,898	8,990	275,697	307,230	326,806	330,156
Intercity Bus	ALL	ALL	3	4	4	4	904	1,107	1,103	1,107
Transit Bus	ALL	ALL	12	14	15	15	1,985	2,024	2,160	2,168
School Bus	ALL	ALL	110	127	135	136	5,503	5,836	6,179	6,248
Refuse Truck	ALL	ALL	76	87	94	95	6,166	6,412	6,748	6,984
Single Unit Short-haul	ALL	ALL	2,506	2,843	3,043	3,069	125,203	135,413	144,296	145,383
Single Unit Long-haul Truck	ALL	ALL	105	121	128	129	6,819	7,680	8,128	8,177
Motor Home	ALL	ALL	627	713	766	774	4,624	4,983	5,242	5,264
Combination Short-haul	ALL	ALL	225	251	259	259	22,204	26,850	27,111	27,023
Combination Long-haul	ALL	ALL	236	284	314	318	78,614	84,556	91,157	92,198
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**87,207**	**92,379**	**97,756**	**98,603**	**3,203,324**	**3,443,126**	**3,622,925**	**3,653,628**
ALL	Gasoline	ALL	83,500	86,845	91,822	92,293	2,952,178	3,118,319	3,276,321	3,292,285
ALL	Diesel	ALL	3,695	5,079	4,847	4,929	250,429	305,450	302,184	305,488
ALL	CNG	ALL	1	0	2	2	233	53	301	309
ALL	Ethanol (E-85)	ALL	11	431	1,085	1,379	484	18,293	44,119	55,546
ALL	Electricity	ALL	0	24	0	0	0	1,011	0	0
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**87,207**	**92,379**	**97,756**	**98,603**	**3,203,324**	**3,443,126**	**3,622,925**	**3,653,628**
ALL	ALL	Off-Network	87,207	92,379	97,756	98,603				
ALL	ALL	Rural Restricted					976,231	1,064,472	871,846	877,143
ALL	ALL	Rural Unrestricted					596,803	591,861	562,803	561,551
ALL	ALL	Urban Restricted					3,997	46,245	303,209	306,485
ALL	ALL	Urban					1,626,294	1,740,549	1,885,067	1,908,449
ALL (Total)	**ALL (Total)**	**ALL (Total)**	**87,207**	**92,379**	**97,756**	**98,603**	**3,203,324**	**3,443,126**	**3,622,925**	**3,653,628**

APPENDIX 6

Nonroad Emissions for 2011, 2017, 2020 and 2021

This appendix provides detailed listings of the estimated nonroad tons per ozone season day (tposd) emissions for over 200 subcategories for the partial Kenosha County 2008 ozone nonattainment area, as well as the entire county, for 2011, 2017, 2020 and 2021. The sums of NOx and VOC emissions from these nonroad subcategories were used for the nonroad sector NOx and VOC tposd emission estimates in sections 3.2 (2011 Base Year and 2017 Inventories for RFP) and 3.3 (2020 & 2021 Projected Year Inventories for RFP) of the Wisconsin Department of Natural Resources' (WDNR) partial Kenosha County attainment plan for the 2008 ozone standard.

These inventories are based on two primary sources of data:

MOVES: The U.S. EPA's MOVES2014b model run by WDNR. This model was used for most source categories. The exceptions are cited below.

EPA: Emissions inventories prepared by EPA were used for commercial marine, aircraft and rail locomotive. These inventories are the EPA's 2011 National Emissions Inventory (NEI), version 2, the EPA's 2017 NEI, and the EPA's 2016 emissions modeling platform, version 1 (which includes projections to 2023 and 2028).

Table A6.1. 2011 Nonroad NO_X and VOC Emissions: tons per ozone season day (tposd)
Kenosha County and the Partial Kenosha County 2008 ozone nonattainment area

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2011 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2011 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2260001010	Recreational	2-Stroke Motorcycles: Off-Road	MOVES	0.0004	0.0694	30.9%	30.9%	land area	0.0001	0.0214
2260001030	Recreational	2-Stroke All Terrain Vehicles	MOVES	0.0002	0.0300	30.9%	30.9%	land area	0.0001	0.0093
2260001060	Recreational	2-Stroke Specialty Vehicle Carts	MOVES	0.0004	0.0013	30.9%	30.9%	land area	0.0001	0.0004
2260002006	Construction	2-Stroke Tampers/Rammers	MOVES	0.0001	0.0054	73.2%	73.2%	population	0.0001	0.0039
2260002009	Construction	2-Stroke Plate Compactors	MOVES	0.0000	0.0002	73.2%	73.2%	population	0.0000	0.0001
2260002021	Construction	2-Stroke Paving Equipment	MOVES	0.0000	0.0002	73.2%	73.2%	population	0.0000	0.0002
2260002027	Construction	2-Stroke Signal Boards	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2260002039	Construction	2-Stroke Concrete/Industrial Saws	MOVES	0.0003	0.0135	73.2%	73.2%	population	0.0003	0.0099
2260002054	Construction	2-Stroke Crushing/Proc. Equipment	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2260003030	Industrial	2-Stroke Sweepers/Scrubbers	MOVES	0.0000	0.0002	73.2%	73.2%	population	0.0000	0.0002
2260003040	Industrial	2-Stroke Other General Industrial Equipment	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2260004015	Lawn/Garden	2-Stroke Rotary Tillers < 6 HP (Residential)	MOVES	0.0001	0.0019	73.2%	73.2%	population	0.0000	0.0014
2260004016	Lawn/Garden	2-Stroke Rotary Tillers < 6 HP (Commercial)	MOVES	0.0002	0.0040	73.2%	73.2%	population	0.0001	0.0029
2260004020	Lawn/Garden	2-Stroke Chain Saws < 6 HP (Residential)	MOVES	0.0004	0.0142	73.2%	73.2%	population	0.0003	0.0104
2260004021	Lawn/Garden	2-Stroke Chain Saws < 6 HP (Commercial)	MOVES	0.0010	0.0440	73.2%	73.2%	population	0.0007	0.0322
2260004025	Lawn/Garden	2-Stroke Trimmers/Edgers/Brush Cutters (Res.)	MOVES	0.0011	0.0339	73.2%	73.2%	population	0.0008	0.0248
2260004026	Lawn/Garden	2-Stroke Trimmers/Edgers/Brush Cutters (Com.)	MOVES	0.0017	0.0445	73.2%	73.2%	population	0.0013	0.0326
2260004030	Lawn/Garden	2-Stroke Leafblowers/Vacuums (Residential)	MOVES	0.0007	0.0224	73.2%	73.2%	population	0.0005	0.0164
2260004031	Lawn/Garden	2-Stroke Leafblowers/Vacuums (Commercial)	MOVES	0.0016	0.0443	73.2%	73.2%	population	0.0012	0.0324
2260004035	Lawn/Garden	2-Stroke Snowblowers (Residential)	MOVES	0.0000	0.0041	73.2%	73.2%	population	0.0000	0.0030
2260004036	Lawn/Garden	2-Stroke Snowblowers (Commercial)	MOVES	0.0000	0.0004	73.2%	73.2%	population	0.0000	0.0003
2260004071	Lawn/Garden	2-Stroke Commercial Turf Equipment	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2260005035	Agriculture	2-Stroke Sprayers	MOVES	0.0000	0.0001	24.2%	24.2%	land area (1)	0.0000	0.0000
2260006005	Commercial	2-Stroke Light Commercial Generator Set	MOVES	0.0000	0.0009	73.2%	73.2%	population	0.0000	0.0006
2260006010	Commercial	2-Stroke Light Commercial Pumps	MOVES	0.0002	0.0061	73.2%	73.2%	population	0.0002	0.0045
2260006015	Commercial	2-Stroke Light Commercial Air Compressors	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2260006035	Commercial	2-Stroke Hydro Power Units	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2260007005	Logging	2-Stroke Logging Equipment Chain Saws > 6 HP	MOVES	0.0000	0.0001	30.9%	30.9%	land area	0.0000	0.0000
2265001010	Recreational	4-Stroke Motorcycles: Off-Road	MOVES	0.0003	0.0028	30.9%	30.9%	land area	0.0001	0.0009
2265001030	Recreational	4-Stroke All Terrain Vehicles	MOVES	0.0027	0.0288	30.9%	30.9%	land area	0.0008	0.0089
2265001050	Recreational	4-Stroke Golf Carts	MOVES	0.0045	0.0139	30.9%	30.9%	land area	0.0014	0.0043
2265001060	Recreational	4-Stroke Specialty Vehicle Carts	MOVES	0.0003	0.0014	30.9%	30.9%	land area	0.0001	0.0004
2265002003	Construction	4-Stroke Asphalt Pavers	MOVES	0.0002	0.0004	73.2%	73.2%	population	0.0002	0.0003
2265002006	Construction	4-Stroke Tampers/Rammers	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2265002009	Construction	4-Stroke Plate Compactors	MOVES	0.0003	0.0013	73.2%	73.2%	population	0.0002	0.0010
2265002015	Construction	4-Stroke Rollers	MOVES	0.0003	0.0006	73.2%	73.2%	population	0.0002	0.0004
2265002021	Construction	4-Stroke Paving Equipment	MOVES	0.0006	0.0022	73.2%	73.2%	population	0.0004	0.0016

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2011 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2011 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2265002024	Construction	4-Stroke Surfacing Equipment	MOVES	0.0002	0.0007	73.2%	73.2%	population	0.0002	0.0005
2265002027	Construction	4-Stroke Signal Boards	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2265002030	Construction	4-Stroke Trenchers	MOVES	0.0007	0.0015	73.2%	73.2%	population	0.0005	0.0011
2265002033	Construction	4-Stroke Bore/Drill Rigs	MOVES	0.0003	0.0009	73.2%	73.2%	population	0.0002	0.0007
2265002039	Construction	4-Stroke Concrete/Industrial Saws	MOVES	0.0008	0.0021	73.2%	73.2%	population	0.0006	0.0015
2265002042	Construction	4-Stroke Cement & Mortar Mixers	MOVES	0.0005	0.0030	73.2%	73.2%	population	0.0004	0.0022
2265002045	Construction	4-Stroke Cranes	MOVES	0.0002	0.0001	73.2%	73.2%	population	0.0001	0.0001
2265002054	Construction	4-Stroke Crushing/Proc. Equipment	MOVES	0.0001	0.0002	73.2%	73.2%	population	0.0001	0.0001
2265002057	Construction	4-Stroke Rough Terrain Forklifts	MOVES	0.0002	0.0001	73.2%	73.2%	population	0.0002	0.0001
2265002060	Construction	4-Stroke Rubber Tire Loaders	MOVES	0.0003	0.0002	73.2%	73.2%	population	0.0003	0.0002
2265002066	Construction	4-Stroke Tractors/Loaders/Backhoes	MOVES	0.0003	0.0008	73.2%	73.2%	population	0.0002	0.0006
2265002072	Construction	4-Stroke Skid Steer Loaders	MOVES	0.0006	0.0006	73.2%	73.2%	population	0.0004	0.0005
2265002078	Construction	4-Stroke Dumpers/Tenders	MOVES	0.0001	0.0005	73.2%	73.2%	population	0.0001	0.0003
2265002081	Construction	4-Stroke Other Construction Equipment	MOVES	0.0002	0.0002	73.2%	73.2%	population	0.0002	0.0001
2265003010	Industrial	4-Stroke Aerial Lifts	MOVES	0.0034	0.0033	73.2%	73.2%	population	0.0025	0.0024
2265003020	Industrial	4-Stroke Forklifts	MOVES	0.0087	0.0049	73.2%	73.2%	population	0.0064	0.0036
2265003030	Industrial	4-Stroke Sweepers/Scrubbers	MOVES	0.0012	0.0020	73.2%	73.2%	population	0.0009	0.0015
2265003040	Industrial	4-Stroke Other General Industrial Equipment	MOVES	0.0022	0.0099	73.2%	73.2%	population	0.0016	0.0072
2265003050	Industrial	4-Stroke Other Material Handling Equipment	MOVES	0.0002	0.0002	73.2%	73.2%	population	0.0002	0.0002
2265003060	Industrial	4-Stroke Industrial AC/Refrigeration	MOVES	0.0000	0.0001	73.2%	73.2%	population	0.0000	0.0001
2265003070	Industrial	4-Stroke Terminal Tractors	MOVES	0.0003	0.0002	73.2%	73.2%	population	0.0002	0.0001
2265004010	Lawn/Garden	4-Stroke Lawn mowers (Residential)	MOVES	0.0132	0.1521	73.2%	73.2%	population	0.0096	0.1114
2265004011	Lawn/Garden	4-Stroke Lawn mowers (Commercial)	MOVES	0.0058	0.0442	73.2%	73.2%	population	0.0043	0.0323
2265004015	Lawn/Garden	4-Stroke Rotary Tillers < 6 HP (Residential)	MOVES	0.0011	0.0133	73.2%	73.2%	population	0.0008	0.0097
2265004016	Lawn/Garden	4-Stroke Rotary Tillers < 6 HP (Commercial)	MOVES	0.0033	0.0275	73.2%	73.2%	population	0.0024	0.0201
2265004025	Lawn/Garden	4-Stroke Trimmers/Edgers/Brush Cutters (Res.)	MOVES	0.0001	0.0008	73.2%	73.2%	population	0.0001	0.0006
2265004026	Lawn/Garden	4-Stroke Trimmers/Edgers/Brush Cutters (Com.)	MOVES	0.0001	0.0009	73.2%	73.2%	population	0.0001	0.0007
2265004030	Lawn/Garden	4-Stroke Leafblowers/Vacuums (Residential)	MOVES	0.0001	0.0014	73.2%	73.2%	population	0.0001	0.0010
2265004031	Lawn/Garden	4-Stroke Leafblowers/Vacuums (Commercial)	MOVES	0.0078	0.0195	73.2%	73.2%	population	0.0057	0.0143
2265004035	Lawn/Garden	4-Stroke Snowblowers (Residential)	MOVES	0.0000	0.0078	73.2%	73.2%	population	0.0000	0.0057
2265004036	Lawn/Garden	4-Stroke Snowblowers (Commercial)	MOVES	0.0000	0.0007	73.2%	73.2%	population	0.0000	0.0005
2265004040	Lawn/Garden	4-Stroke Rear Engine Riding Mowers (Res.)	MOVES	0.0029	0.0154	73.2%	73.2%	population	0.0021	0.0113
2265004041	Lawn/Garden	4-Stroke Rear Engine Riding Mowers (Comm.)	MOVES	0.0007	0.0020	73.2%	73.2%	population	0.0005	0.0015
2265004046	Lawn/Garden	4-Stroke Front Mowers (Commercial)	MOVES	0.0010	0.0032	73.2%	73.2%	population	0.0007	0.0024
2265004051	Lawn/Garden	4-Stroke Shredders < 6 HP (Commercial)	MOVES	0.0004	0.0034	73.2%	73.2%	population	0.0003	0.0025
2265004055	Lawn/Garden	4-Stroke Lawn & Garden Tractors (Residential)	MOVES	0.0393	0.1602	73.2%	73.2%	population	0.0287	0.1173
2265004056	Lawn/Garden	4-Stroke Lawn & Garden Tractors (Commercial)	MOVES	0.0101	0.0252	73.2%	73.2%	population	0.0074	0.0185
2265004066	Lawn/Garden	4-Stroke Chippers/Stump Grinders (Comm.)	MOVES	0.0019	0.0029	73.2%	73.2%	population	0.0014	0.0021
2265004071	Lawn/Garden	4-Stroke Commercial Turf Equipment (Comm.)	MOVES	0.0304	0.0875	73.2%	73.2%	population	0.0222	0.0641
2265004075	Lawn/Garden	4-Stroke Other Lawn & Garden Equip. (Res.)	MOVES	0.0014	0.0092	73.2%	73.2%	population	0.0010	0.0068

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2011 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2011 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2265004076	Lawn/Garden	4-Stroke Other Lawn & Garden Equip. (Com.)	MOVES	0.0011	0.0072	73.2%	73.2%	population	0.0008	0.0052
2265005010	Agriculture	4-Stroke 2-Wheel Tractors	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005015	Agriculture	4-Stroke Agricultural Tractors	MOVES	0.0001	0.0001	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005020	Agriculture	4-Stroke Combines	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005025	Agriculture	4-Stroke Balers	MOVES	0.0003	0.0003	24.2%	24.2%	land area (1)	0.0001	0.0001
2265005030	Agriculture	4-Stroke Agricultural Mowers	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005035	Agriculture	4-Stroke Sprayers	MOVES	0.0004	0.0010	24.2%	24.2%	land area (1)	0.0001	0.0002
2265005040	Agriculture	4-Stroke Tillers > 5 HP	MOVES	0.0006	0.0033	24.2%	24.2%	land area (1)	0.0001	0.0008
2265005045	Agriculture	4-Stroke Swathers	MOVES	0.0005	0.0005	24.2%	24.2%	land area (1)	0.0001	0.0001
2265005055	Agriculture	4-Stroke Other Agricultural Equipment	MOVES	0.0006	0.0005	24.2%	24.2%	land area (1)	0.0001	0.0001
2265005060	Agriculture	4-Stroke Irrigation Sets	MOVES	0.0001	0.0001	24.2%	24.2%	land area (1)	0.0000	0.0000
2265006005	Commercial	4-Stroke Light Commercial Generator Set	MOVES	0.0093	0.0431	73.2%	73.2%	population	0.0068	0.0315
2265006010	Commercial	4-Stroke Light Commercial Pumps	MOVES	0.0025	0.0100	73.2%	73.2%	population	0.0018	0.0073
2265006015	Commercial	4-Stroke Light Commercial Air Compressors	MOVES	0.0014	0.0040	73.2%	73.2%	population	0.0010	0.0029
2265006025	Commercial	4-Stroke Light Commercial Welders	MOVES	0.0027	0.0067	73.2%	73.2%	population	0.0020	0.0049
2265006030	Commercial	4-Stroke Light Commercial Pressure Wash	MOVES	0.0038	0.0188	73.2%	73.2%	population	0.0028	0.0138
2265006035	Commercial	4-Stroke Hydro Power Units	MOVES	0.0002	0.0006	73.2%	73.2%	population	0.0001	0.0004
2265007010	Logging	4-Stroke Logging Equipment Shredders > 6 HP	MOVES	0.0000	0.0001	30.9%	30.9%	land area	0.0000	0.0000
2265007015	Logging	4-Stroke Logging Equipment Skidders	MOVES	0.0000	0.0000	30.9%	30.9%	land area	0.0000	0.0000
2265008005	Airport Support	4-Stroke Airport Ground Support Equipment	EPA	0.0000	0.0000	#DIV/	100.0%	airport location	0.0000	0.0000
2267001060	Recreational	LPG Specialty Vehicle Carts	MOVES	0.0001	0.0000	30.9%	30.9%	land area	0.0000	0.0000
2267002003	Construction	LPG Asphalt Pavers	MOVES	0.0001	0.0000	73.2%	73.2%	population	0.0001	0.0000
2267002015	Construction	LPG Rollers	MOVES	0.0001	0.0000	73.2%	73.2%	population	0.0001	0.0000
2267002021	Construction	LPG Paving Equipment	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2267002024	Construction	LPG Surfacing Equipment	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2267002030	Construction	LPG Trenchers	MOVES	0.0003	0.0001	73.2%	73.2%	population	0.0002	0.0001
2267002033	Construction	LPG Bore/Drill Rigs	MOVES	0.0002	0.0000	73.2%	73.2%	population	0.0001	0.0000
2267002039	Construction	LPG Concrete/Industrial Saws	MOVES	0.0001	0.0000	73.2%	73.2%	population	0.0001	0.0000
2267002045	Construction	LPG Cranes	MOVES	0.0002	0.0000	73.2%	73.2%	population	0.0001	0.0000
2267002054	Construction	LPG Crushing/Proc. Equipment	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2267002057	Construction	LPG Rough Terrain Forklifts	MOVES	0.0002	0.0001	73.2%	73.2%	population	0.0002	0.0000
2267002060	Construction	LPG Rubber Tire Loaders	MOVES	0.0004	0.0001	73.2%	73.2%	population	0.0003	0.0001
2267002066	Construction	LPG Tractors/Loaders/Backhoes	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2267002072	Construction	LPG Skid Steer Loaders	MOVES	0.0006	0.0001	73.2%	73.2%	population	0.0004	0.0001
2267002081	Construction	LPG Other Construction Equipment	MOVES	0.0003	0.0001	73.2%	73.2%	population	0.0002	0.0000
2267003010	Industrial	LPG Aerial Lifts	MOVES	0.0032	0.0007	73.2%	73.2%	population	0.0023	0.0005
2267003020	Industrial	LPG Forklifts	MOVES	0.1575	0.0349	73.2%	73.2%	population	0.1153	0.0255
2267003030	Industrial	LPG Sweepers/Scrubbers	MOVES	0.0008	0.0002	73.2%	73.2%	population	0.0006	0.0001
2267003040	Industrial	LPG Other General Industrial Equipment	MOVES	0.0003	0.0001	73.2%	73.2%	population	0.0002	0.0000
2267003050	Industrial	LPG Other Material Handling Equipment	MOVES	0.0002	0.0000	73.2%	73.2%	population	0.0001	0.0000

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2011 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2011 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2267003070	Industrial	LPG Terminal Tractors	MOVES	0.0003	0.0000	73.2%	73.2%	population	0.0002	0.0000
2267004066	Lawn/Garden	LPG Chippers/Stump Grinders (Commercial)	MOVES	0.0011	0.0002	73.2%	73.2%	population	0.0008	0.0002
2267005055	Agriculture	LPG Other Agricultural Equipment	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2267005060	Agriculture	LPG Irrigation Sets	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2267006005	Commercial	LPG Light Commercial Generator Sets	MOVES	0.0042	0.0007	73.2%	73.2%	population	0.0031	0.0005
2267006010	Commercial	LPG Light Commercial Pumps	MOVES	0.0007	0.0001	73.2%	73.2%	population	0.0005	0.0001
2267006015	Commercial	LPG Light Commercial Air Compressors	MOVES	0.0006	0.0001	73.2%	73.2%	population	0.0005	0.0001
2267006025	Commercial	LPG Light Commercial Welders	MOVES	0.0009	0.0002	73.2%	73.2%	population	0.0006	0.0001
2267006030	Commercial	LPG Light Commercial Pressure Washers	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2267006035	Commercial	LPG Hydro Power Units	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2267008005	Airport Support	LPG Airport Ground Support Equipment	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
2268002081	Construction	CNG Other Construction Equipment	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2268003020	Industrial	CNG Forklifts	MOVES	0.0123	0.0097	73.2%	73.2%	population	0.0090	0.0071
2268003030	Industrial	CNG Sweepers/Scrubbers	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2268003040	Industrial	CNG Other General Industrial Equipment	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2268003060	Industrial	CNG AC/Refrigeration	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2268003070	Industrial	CNG Terminal Tractors	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2268005055	Agriculture	CNG Other Agricultural Equipment	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2268005060	Agriculture	CNG Irrigation Sets	MOVES	0.0002	0.0001	24.2%	24.2%	land area (1)	0.0000	0.0000
2268006005	Commercial	CNG Light Commercial Generator Sets	MOVES	0.0016	0.0010	73.2%	73.2%	population	0.0012	0.0007
2268006010	Commercial	CNG Light Commercial Pumps	MOVES	0.0001	0.0000	73.2%	73.2%	population	0.0000	0.0000
2268006015	Commercial	CNG Light Commercial Air Compressors	MOVES	0.0001	0.0000	73.2%	73.2%	population	0.0000	0.0000
2268006020	Commercial	CNG Light Commercial Gas Compressors	MOVES	0.0005	0.0002	73.2%	73.2%	population	0.0003	0.0002
2270001060	Recreational	Diesel Specialty Vehicle Carts	MOVES	0.0009	0.0003	30.9%	30.9%	land area	0.0003	0.0001
2270002003	Construction	Diesel Pavers	MOVES	0.0095	0.0008	73.2%	73.2%	population	0.0070	0.0006
2270002006	Construction	Diesel Tampers/Rammers (unused)	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2270002009	Construction	Diesel Plate Compactors	MOVES	0.0003	0.0001	73.2%	73.2%	population	0.0002	0.0000
2270002015	Construction	Diesel Rollers	MOVES	0.0252	0.0023	73.2%	73.2%	population	0.0185	0.0017
2270002018	Construction	Diesel Scrapers	MOVES	0.0293	0.0016	73.2%	73.2%	population	0.0214	0.0012
2270002021	Construction	Diesel Paving Equipment	MOVES	0.0017	0.0002	73.2%	73.2%	population	0.0012	0.0001
2270002024	Construction	Diesel Surfacing Equipment	MOVES	0.0013	0.0001	73.2%	73.2%	population	0.0009	0.0001
2270002027	Construction	Diesel Signal Boards	MOVES	0.0031	0.0004	73.2%	73.2%	population	0.0023	0.0003
2270002030	Construction	Diesel Trenchers	MOVES	0.0135	0.0014	73.2%	73.2%	population	0.0099	0.0010
2270002033	Construction	Diesel Bore/Drill Rigs	MOVES	0.0181	0.0015	73.2%	73.2%	population	0.0132	0.0011
2270002036	Construction	Diesel Excavators	MOVES	0.0827	0.0062	73.2%	73.2%	population	0.0605	0.0046
2270002039	Construction	Diesel Concrete/Industrial Saws	MOVES	0.0009	0.0001	73.2%	73.2%	population	0.0006	0.0001
2270002042	Construction	Diesel Cement & Mortar Mixers	MOVES	0.0007	0.0001	73.2%	73.2%	population	0.0005	0.0001
2270002045	Construction	Diesel Cranes	MOVES	0.0285	0.0019	73.2%	73.2%	population	0.0209	0.0014
2270002048	Construction	Diesel Graders	MOVES	0.0215	0.0017	73.2%	73.2%	population	0.0157	0.0012
2270002051	Construction	Diesel Off-highway Trucks	MOVES	0.0796	0.0044	73.2%	73.2%	population	0.0582	0.0032

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2011 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2011 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2270002054	Construction	Diesel Crushing/Proc. Equipment	MOVES	0.0053	0.0004	73.2%	73.2%	population	0.0039	0.0003
2270002057	Construction	Diesel Rough Terrain Forklifts	MOVES	0.0357	0.0036	73.2%	73.2%	population	0.0261	0.0026
2270002060	Construction	Diesel Rubber Tire Loaders	MOVES	0.1303	0.0090	73.2%	73.2%	population	0.0954	0.0066
2270002066	Construction	Diesel Tractors/Loaders/Backhoes	MOVES	0.0965	0.0206	73.2%	73.2%	population	0.0706	0.0150
2270002069	Construction	Diesel Crawler Tractors	MOVES	0.1040	0.0069	73.2%	73.2%	population	0.0761	0.0051
2270002072	Construction	Diesel Skid Steer Loaders	MOVES	0.0667	0.0184	73.2%	73.2%	population	0.0488	0.0134
2270002075	Construction	Diesel Off-Highway Tractors	MOVES	0.0146	0.0009	73.2%	73.2%	population	0.0107	0.0007
2270002078	Construction	Diesel Dumpers/Tenders	MOVES	0.0002	0.0001	73.2%	73.2%	population	0.0002	0.0000
2270002081	Construction	Diesel Other Construction Equipment	MOVES	0.0149	0.0010	73.2%	73.2%	population	0.0109	0.0007
2270003010	Industrial	Diesel Aerial Lifts	MOVES	0.0049	0.0013	73.2%	73.2%	population	0.0036	0.0010
2270003020	Industrial	Diesel Forklifts	MOVES	0.0396	0.0030	73.2%	73.2%	population	0.0290	0.0022
2270003030	Industrial	Diesel Sweepers/Scrubbers	MOVES	0.0212	0.0018	73.2%	73.2%	population	0.0155	0.0013
2270003040	Industrial	Diesel Other General Industrial Equipment	MOVES	0.0248	0.0020	73.2%	73.2%	population	0.0182	0.0015
2270003050	Industrial	Diesel Other Material Handling Equipment	MOVES	0.0014	0.0003	73.2%	73.2%	population	0.0010	0.0002
2270003060	Industrial	Diesel AC/Refrigeration	MOVES	0.0502	0.0047	73.2%	73.2%	population	0.0367	0.0035
2270003070	Industrial	Diesel Terminal Tractors	MOVES	0.0250	0.0020	73.2%	73.2%	population	0.0183	0.0015
2270004031	Lawn/Garden	Diesel Leafblowers/Vacuums (Commercial)	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2270004036	Lawn/Garden	Diesel Snowblowers (Commercial)	MOVES	0.0000	0.0000	73.2%	73.2%	population	0.0000	0.0000
2270004046	Lawn/Garden	Diesel Front Mowers (Commercial)	MOVES	0.0133	0.0018	73.2%	73.2%	population	0.0098	0.0013
2270004056	Lawn/Garden	Diesel Lawn & Garden Tractors (Commercial)	MOVES	0.0026	0.0004	73.2%	73.2%	population	0.0019	0.0003
2270004066	Lawn/Garden	Diesel Chippers/Stump Grinders (Commercial)	MOVES	0.0211	0.0020	73.2%	73.2%	population	0.0154	0.0015
2270004071	Lawn/Garden	Diesel Commercial Turf Equipment (Comm.)	MOVES	0.0018	0.0002	73.2%	73.2%	population	0.0013	0.0001
2270004076	Lawn/Garden	Diesel Other Lawn & Garden Equipment	MOVES	0.0001	0.0000	73.2%	73.2%	population	0.0000	0.0000
2270005010	Agriculture	Diesel 2-Wheel Tractors	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005015	Agriculture	Diesel Agricultural Tractors	MOVES	0.1301	0.0121	24.2%	24.2%	land area (1)	0.0315	0.0029
2270005020	Agriculture	Diesel Combines	MOVES	0.0157	0.0013	24.2%	24.2%	land area (1)	0.0038	0.0003
2270005025	Agriculture	Diesel Balers	MOVES	0.0001	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005030	Agriculture	Diesel Agricultural Mowers	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005035	Agriculture	Diesel Sprayers	MOVES	0.0012	0.0001	24.2%	24.2%	land area (1)	0.0003	0.0000
2270005040	Agriculture	Diesel Tillers > 6 HP	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005045	Agriculture	Diesel Swathers	MOVES	0.0011	0.0001	24.2%	24.2%	land area (1)	0.0003	0.0000
2270005055	Agriculture	Diesel Other Agricultural Equipment	MOVES	0.0030	0.0003	24.2%	24.2%	land area (1)	0.0007	0.0001
2270005060	Agriculture	Diesel Irrigation Sets	MOVES	0.0015	0.0001	24.2%	24.2%	land area (1)	0.0004	0.0000
2270006005	Commercial	Diesel Light Commercial Generator Sets	MOVES	0.0225	0.0029	73.2%	73.2%	population	0.0165	0.0021
2270006010	Commercial	Diesel Light Commercial Pumps	MOVES	0.0053	0.0007	73.2%	73.2%	population	0.0039	0.0005
2270006015	Commercial	Diesel Light Commercial Air Compressors	MOVES	0.0121	0.0012	73.2%	73.2%	population	0.0089	0.0009
2270006025	Commercial	Diesel Light Commercial Welders	MOVES	0.0067	0.0021	73.2%	73.2%	population	0.0049	0.0015
2270006030	Commercial	Diesel Light Commercial Pressure Washer	MOVES	0.0007	0.0001	73.2%	73.2%	population	0.0005	0.0001
2270006035	Commercial	Diesel Hydro Power Units	MOVES	0.0005	0.0001	73.2%	73.2%	population	0.0004	0.0000
2270007015	Logging	Diesel Logging Equip Fell/Bunch/Skidders	MOVES	0.0007	0.0000	30.9%	30.9%	land area	0.0002	0.0000

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2011 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2011 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2270008005	Airport Support	Diesel Airport Ground Support Equipment	EPA	0.0000	0.0000	#DIV/	#DIV/	airport location	0.0000	0.0000
2275001000	Airport	Military Aircraft	EPA	0.0000	0.0002	100.0%	100.0%	airport location	0.0000	0.0002
2275050011	Airport	General Aviation Aircraft, Piston	EPA	0.0024	0.0056	59.6%	59.6%	airport location	0.0014	0.0033
2275050012	Airport	General Aviation Aircraft, Turbine	EPA	0.0046	0.0097	61.5%	61.5%	airport location	0.0028	0.0060
2275060011	Airport	Taxi Aircraft, Piston	EPA	0.0001	0.0001	97.5%	97.5%	airport location	0.0001	0.0001
2275060012	Airport	Taxi Aircraft, Turbine	EPA	0.0009	0.0012	97.5%	97.5%	airport location	0.0009	0.0012
2275070000	Airport	Aircraft Auxiliary Power Units	EPA	0.0000	0.0000	#DIV/	#DIV/	airport location	0.0000	0.0000
2280002201	Comm. Mar.	CM Vessels, Diesel, Underway, C1&C2, Main Eng.	EPA	0.1235	0.0048	100.0%	100.0%	Lk. Mich. Shoreline	0.1235	0.0048
2280002202	Comm. Mar.	CM Vessels, Diesel, Underway, C1&C2, Aux. Eng.	EPA	0.2425	0.0071	100.0%	100.0%	Lk. Mich. Shoreline	0.2425	0.0071
2280002203	Comm. Mar.	CM Vessels, Diesel, Underway, C3, Main Eng.	EPA	0.0816	0.0032	100.0%	100.0%	Lk. Mich. Shoreline	0.0816	0.0032
2280002204	Comm. Mar.	CM Vessels, Diesel, Underway, C3, Aux. Eng.	EPA	0.0067	0.0003	100.0%	100.0%	Lk. Mich. Shoreline	0.0067	0.0003
2282005010	Pleasure Craft	2-Stroke Outboards	MOVES	0.0373	0.4678	4.0%	4.0%	water area	0.0015	0.0187
2282005015	Pleasure Craft	2-Stroke Personal Watercraft	MOVES	0.0151	0.1208	70.0%	70.0%	water area	0.0105	0.0846
2282010005	Pleasure Craft	4-Stroke Inboards	MOVES	0.1044	0.0991	70.0%	70.0%	water area	0.0731	0.0694
2282020005	Pleasure Craft	Diesel Inboards	MOVES	0.0860	0.0037	70.0%	70.0%	water area	0.0602	0.0026
2282020010	Pleasure Craft	Diesel Outboards	MOVES	0.0001	0.0000	4.0%	4.0%	water area	0.0000	0.0000
228500200x	Railroad	All Diesel Locomotives	EPA	0.6881	0.0338	60.0%	60.0%	rail links	0.4127	0.0203
2285002015	Railway Maint.	Diesel Railway Maintenance	MOVES	0.0020	0.0004	100.0%	100.0%	rail links	0.0020	0.0004
2285004015	Railway Maint.	4-Stroke Gasoline Railway Maintenance	MOVES	0.0000	0.0001	100.0%	100.0%	rail links	0.0000	0.0001
2285006015	Railway Maint.	LPG Railway Maintenance	MOVES	0.0000	0.0000	100.0%	100.0%	rail links	0.0000	0.0000
ALL (Total)	**ALL (Total)**	**ALL (Total)**		**2.9564**	**2.0290**	**70.4%**	**53.2%**		**2.0816**	**1.0798**
22xx005xxx	Agriculture	All	MOVES	0.1556	0.0203	24.2%	24.2%	land area (1)	0.0377	0.0049
22750xxxxx	Airport	All	EPA	0.0080	0.0167	65.4%	64.0%	airport location	0.0052	0.0107
22xx008005	Airport Support	All	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
22xx006xxx	Commercial	All	MOVES	0.0768	0.0996	73.2%	73.2%	population	0.0562	0.0729
2280002xxx	Comm. Mar	All	EPA	0.4543	0.0152	100.0%	100.0%	Lk. Mich. Shoreline	0.4543	0.0152
22xx002xxx	Construction	All	MOVES	0.7929	0.1187	73.2%	73.2%	population	0.5804	0.0869
22xx003xxx	Industrial	All	MOVES	0.3577	0.0817	73.2%	73.2%	population	0.2618	0.0598
22xx004xxx	Lawn/Garden	All	MOVES	0.1674	0.8027	73.2%	73.2%	population	0.1225	0.5876
22xx007xxx	Logging	All	MOVES	0.0007	0.0002	30.9%	30.9%	land area	0.0002	0.0001
22820xxxxx	Pleasure Craft	All	MOVES	0.2429	0.6915	59.8%	25.3%	water area	0.1453	0.1753
228500200x	Railroad	All	EPA	0.6881	0.0338	60.0%	60.0%	rail links	0.4127	0.0203
228500x015	Railway Maint.	All	MOVES	0.0021	0.0005	100.0%	100.0%	rail links	0.0021	0.0005
22xx001xxx	Recreational	All	MOVES	0.0099	0.1479	30.9%	30.9%	land area	0.0031	0.0457
ALL (Total)	**ALL (Total)**	**ALL (Total)**		**2.9564**	**2.0290**	**70.4%**	**53.2%**		**2.0816**	**1.0798**

(1) City of Kenosha excluded.

Table A6.2. 2017 Nonroad NO_X and VOC Emissions: tons per ozone season day (tposd)
Kenosha County and the Partial Kenosha County 2008 ozone nonattainment area

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2017 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2017 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2260001010	Recreational	2-Stroke Motorcycles: Off-Road	MOVES	0.0005	0.0512	30.9%	30.9%	land area	0.0002	0.0158
2260001030	Recreational	2-Stroke All Terrain Vehicles	MOVES	0.0003	0.0136	30.9%	30.9%	land area	0.0001	0.0042
2260001060	Recreational	2-Stroke Specialty Vehicle Carts	MOVES	0.0002	0.0008	30.9%	30.9%	land area	0.0001	0.0002
2260002006	Construction	2-Stroke Tampers/Rammers	MOVES	0.0002	0.0072	73.3%	73.3%	population	0.0001	0.0053
2260002009	Construction	2-Stroke Plate Compactors	MOVES	0.0000	0.0003	73.3%	73.3%	population	0.0000	0.0002
2260002021	Construction	2-Stroke Paving Equipment	MOVES	0.0000	0.0003	73.3%	73.3%	population	0.0000	0.0002
2260002027	Construction	2-Stroke Signal Boards	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260002039	Construction	2-Stroke Concrete/Industrial Saws	MOVES	0.0005	0.0185	73.3%	73.3%	population	0.0003	0.0135
2260002054	Construction	2-Stroke Crushing/Proc. Equipment	MOVES	0.0000	0.0001	73.3%	73.3%	population	0.0000	0.0000
2260003030	Industrial	2-Stroke Sweepers/Scrubbers	MOVES	0.0000	0.0003	73.3%	73.3%	population	0.0000	0.0002
2260003040	Industrial	2-Stroke Other General Industrial Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260004015	Lawn/Garden	2-Stroke Rotary Tillers < 6 HP (Residential)	MOVES	0.0001	0.0014	73.3%	73.3%	population	0.0000	0.0010
2260004016	Lawn/Garden	2-Stroke Rotary Tillers < 6 HP (Commercial)	MOVES	0.0002	0.0040	73.3%	73.3%	population	0.0001	0.0030
2260004020	Lawn/Garden	2-Stroke Chain Saws < 6 HP (Residential)	MOVES	0.0004	0.0140	73.3%	73.3%	population	0.0003	0.0103
2260004021	Lawn/Garden	2-Stroke Chain Saws < 6 HP (Commercial)	MOVES	0.0010	0.0458	73.3%	73.3%	population	0.0007	0.0336
2260004025	Lawn/Garden	2-Stroke Trimmers/Edgers/Brush Cutters (Res.)	MOVES	0.0011	0.0281	73.3%	73.3%	population	0.0008	0.0206
2260004026	Lawn/Garden	2-Stroke Trimmers/Edgers/Brush Cutters (Com.)	MOVES	0.0018	0.0458	73.3%	73.3%	population	0.0013	0.0336
2260004030	Lawn/Garden	2-Stroke Leafblowers/Vacuums (Residential)	MOVES	0.0007	0.0173	73.3%	73.3%	population	0.0005	0.0127
2260004031	Lawn/Garden	2-Stroke Leafblowers/Vacuums (Commercial)	MOVES	0.0017	0.0458	73.3%	73.3%	population	0.0012	0.0336
2260004035	Lawn/Garden	2-Stroke Snowblowers (Residential)	MOVES	0.0000	0.0012	73.3%	73.3%	population	0.0000	0.0008
2260004036	Lawn/Garden	2-Stroke Snowblowers (Commercial)	MOVES	0.0000	0.0001	73.3%	73.3%	population	0.0000	0.0001
2260004071	Lawn/Garden	2-Stroke Commercial Turf Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260005035	Agriculture	2-Stroke Sprayers	MOVES	0.0000	0.0001	24.2%	24.2%	land area (1)	0.0000	0.0000
2260006005	Commercial	2-Stroke Light Commercial Generator Set	MOVES	0.0000	0.0010	73.3%	73.3%	population	0.0000	0.0007
2260006010	Commercial	2-Stroke Light Commercial Pumps	MOVES	0.0003	0.0068	73.3%	73.3%	population	0.0002	0.0050
2260006015	Commercial	2-Stroke Light Commercial Air Compressors	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260006035	Commercial	2-Stroke Hydro Power Units	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260007005	Logging	2-Stroke Logging Equipment Chain Saws > 6 HP	MOVES	0.0000	0.0001	30.9%	30.9%	land area	0.0000	0.0000
2265001010	Recreational	4-Stroke Motorcycles: Off-Road	MOVES	0.0003	0.0023	30.9%	30.9%	land area	0.0001	0.0007
2265001030	Recreational	4-Stroke All Terrain Vehicles	MOVES	0.0023	0.0239	30.9%	30.9%	land area	0.0007	0.0074
2265001050	Recreational	4-Stroke Golf Carts	MOVES	0.0035	0.0115	30.9%	30.9%	land area	0.0011	0.0036
2265001060	Recreational	4-Stroke Specialty Vehicle Carts	MOVES	0.0003	0.0010	30.9%	30.9%	land area	0.0001	0.0003
2265002003	Construction	4-Stroke Asphalt Pavers	MOVES	0.0001	0.0003	73.3%	73.3%	population	0.0001	0.0002
2265002006	Construction	4-Stroke Tampers/Rammers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2265002009	Construction	4-Stroke Plate Compactors	MOVES	0.0002	0.0008	73.3%	73.3%	population	0.0002	0.0006
2265002015	Construction	4-Stroke Rollers	MOVES	0.0002	0.0006	73.3%	73.3%	population	0.0002	0.0004
2265002021	Construction	4-Stroke Paving Equipment	MOVES	0.0004	0.0016	73.3%	73.3%	population	0.0003	0.0012

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2017 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2017 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2265002024	Construction	4-Stroke Surfacing Equipment	MOVES	0.0002	0.0006	73.3%	73.3%	population	0.0001	0.0004
2265002027	Construction	4-Stroke Signal Boards	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2265002030	Construction	4-Stroke Trenchers	MOVES	0.0004	0.0011	73.3%	73.3%	population	0.0003	0.0008
2265002033	Construction	4-Stroke Bore/Drill Rigs	MOVES	0.0002	0.0005	73.3%	73.3%	population	0.0002	0.0004
2265002039	Construction	4-Stroke Concrete/Industrial Saws	MOVES	0.0008	0.0023	73.3%	73.3%	population	0.0006	0.0017
2265002042	Construction	4-Stroke Cement & Mortar Mixers	MOVES	0.0004	0.0020	73.3%	73.3%	population	0.0003	0.0015
2265002045	Construction	4-Stroke Cranes	MOVES	0.0001	0.0001	73.3%	73.3%	population	0.0001	0.0001
2265002054	Construction	4-Stroke Crushing/Proc. Equipment	MOVES	0.0001	0.0002	73.3%	73.3%	population	0.0000	0.0001
2265002057	Construction	4-Stroke Rough Terrain Forklifts	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2265002060	Construction	4-Stroke Rubber Tire Loaders	MOVES	0.0001	0.0001	73.3%	73.3%	population	0.0001	0.0000
2265002066	Construction	4-Stroke Tractors/Loaders/Backhoes	MOVES	0.0002	0.0007	73.3%	73.3%	population	0.0002	0.0005
2265002072	Construction	4-Stroke Skid Steer Loaders	MOVES	0.0004	0.0005	73.3%	73.3%	population	0.0003	0.0003
2265002078	Construction	4-Stroke Dumpers/Tenders	MOVES	0.0001	0.0003	73.3%	73.3%	population	0.0001	0.0002
2265002081	Construction	4-Stroke Other Construction Equipment	MOVES	0.0002	0.0001	73.3%	73.3%	population	0.0001	0.0001
2265003010	Industrial	4-Stroke Aerial Lifts	MOVES	0.0019	0.0020	73.3%	73.3%	population	0.0014	0.0015
2265003020	Industrial	4-Stroke Forklifts	MOVES	0.0034	0.0016	73.3%	73.3%	population	0.0025	0.0012
2265003030	Industrial	4-Stroke Sweepers/Scrubbers	MOVES	0.0007	0.0013	73.3%	73.3%	population	0.0005	0.0010
2265003040	Industrial	4-Stroke Other General Industrial Equipment	MOVES	0.0014	0.0053	73.3%	73.3%	population	0.0011	0.0039
2265003050	Industrial	4-Stroke Other Material Handling Equipment	MOVES	0.0001	0.0001	73.3%	73.3%	population	0.0001	0.0001
2265003060	Industrial	4-Stroke Industrial AC/Refrigeration	MOVES	0.0000	0.0001	73.3%	73.3%	population	0.0000	0.0001
2265003070	Industrial	4-Stroke Terminal Tractors	MOVES	0.0003	0.0001	73.3%	73.3%	population	0.0002	0.0001
2265004010	Lawn/Garden	4-Stroke Lawn mowers (Residential)	MOVES	0.0078	0.0686	73.3%	73.3%	population	0.0057	0.0503
2265004011	Lawn/Garden	4-Stroke Lawn mowers (Commercial)	MOVES	0.0038	0.0238	73.3%	73.3%	population	0.0028	0.0175
2265004015	Lawn/Garden	4-Stroke Rotary Tillers < 6 HP (Residential)	MOVES	0.0007	0.0061	73.3%	73.3%	population	0.0005	0.0045
2265004016	Lawn/Garden	4-Stroke Rotary Tillers < 6 HP (Commercial)	MOVES	0.0020	0.0148	73.3%	73.3%	population	0.0015	0.0109
2265004025	Lawn/Garden	4-Stroke Trimmers/Edgers/Brush Cutters (Res.)	MOVES	0.0000	0.0004	73.3%	73.3%	population	0.0000	0.0003
2265004026	Lawn/Garden	4-Stroke Trimmers/Edgers/Brush Cutters (Com.)	MOVES	0.0001	0.0006	73.3%	73.3%	population	0.0001	0.0005
2265004030	Lawn/Garden	4-Stroke Leafblowers/Vacuums (Residential)	MOVES	0.0001	0.0006	73.3%	73.3%	population	0.0001	0.0004
2265004031	Lawn/Garden	4-Stroke Leafblowers/Vacuums (Commercial)	MOVES	0.0039	0.0151	73.3%	73.3%	population	0.0029	0.0111
2265004035	Lawn/Garden	4-Stroke Snowblowers (Residential)	MOVES	0.0000	0.0027	73.3%	73.3%	population	0.0000	0.0020
2265004036	Lawn/Garden	4-Stroke Snowblowers (Commercial)	MOVES	0.0000	0.0002	73.3%	73.3%	population	0.0000	0.0002
2265004040	Lawn/Garden	4-Stroke Rear Engine Riding Mowers (Res.)	MOVES	0.0016	0.0091	73.3%	73.3%	population	0.0012	0.0067
2265004041	Lawn/Garden	4-Stroke Rear Engine Riding Mowers (Comm.)	MOVES	0.0004	0.0015	73.3%	73.3%	population	0.0003	0.0011
2265004046	Lawn/Garden	4-Stroke Front Mowers (Commercial)	MOVES	0.0007	0.0022	73.3%	73.3%	population	0.0005	0.0016
2265004051	Lawn/Garden	4-Stroke Shredders < 6 HP (Commercial)	MOVES	0.0002	0.0017	73.3%	73.3%	population	0.0002	0.0013
2265004055	Lawn/Garden	4-Stroke Lawn & Garden Tractors (Residential)	MOVES	0.0219	0.0971	73.3%	73.3%	population	0.0160	0.0712
2265004056	Lawn/Garden	4-Stroke Lawn & Garden Tractors (Commercial)	MOVES	0.0057	0.0192	73.3%	73.3%	population	0.0042	0.0141
2265004066	Lawn/Garden	4-Stroke Chippers/Stump Grinders (Comm.)	MOVES	0.0010	0.0020	73.3%	73.3%	population	0.0007	0.0015
2265004071	Lawn/Garden	4-Stroke Commercial Turf Equipment (Comm.)	MOVES	0.0183	0.0563	73.3%	73.3%	population	0.0134	0.0413
2265004075	Lawn/Garden	4-Stroke Other Lawn & Garden Equip. (Res.)	MOVES	0.0009	0.0048	73.3%	73.3%	population	0.0007	0.0035

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				NOx	VOC	NOx	VOC		NOx	VOC
2265004076	Lawn/Garden	4-Stroke Other Lawn & Garden Equip. (Com.)	MOVES	0.0007	0.0037	73.3%	73.3%	population	0.0005	0.0027
2265005010	Agriculture	4-Stroke 2-Wheel Tractors	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005015	Agriculture	4-Stroke Agricultural Tractors	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005020	Agriculture	4-Stroke Combines	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005025	Agriculture	4-Stroke Balers	MOVES	0.0002	0.0003	24.2%	24.2%	land area (1)	0.0001	0.0001
2265005030	Agriculture	4-Stroke Agricultural Mowers	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005035	Agriculture	4-Stroke Sprayers	MOVES	0.0003	0.0006	24.2%	24.2%	land area (1)	0.0001	0.0001
2265005040	Agriculture	4-Stroke Tillers > 5 HP	MOVES	0.0005	0.0026	24.2%	24.2%	land area (1)	0.0001	0.0006
2265005045	Agriculture	4-Stroke Swathers	MOVES	0.0004	0.0004	24.2%	24.2%	land area (1)	0.0001	0.0001
2265005055	Agriculture	4-Stroke Other Agricultural Equipment	MOVES	0.0004	0.0004	24.2%	24.2%	land area (1)	0.0001	0.0001
2265005060	Agriculture	4-Stroke Irrigation Sets	MOVES	0.0001	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265006005	Commercial	4-Stroke Light Commercial Generator Set	MOVES	0.0060	0.0271	73.3%	73.3%	population	0.0044	0.0199
2265006010	Commercial	4-Stroke Light Commercial Pumps	MOVES	0.0016	0.0056	73.3%	73.3%	population	0.0012	0.0041
2265006015	Commercial	4-Stroke Light Commercial Air Compressors	MOVES	0.0008	0.0023	73.3%	73.3%	population	0.0006	0.0017
2265006025	Commercial	4-Stroke Light Commercial Welders	MOVES	0.0016	0.0052	73.3%	73.3%	population	0.0012	0.0038
2265006030	Commercial	4-Stroke Light Commercial Pressure Wash	MOVES	0.0025	0.0110	73.3%	73.3%	population	0.0018	0.0081
2265006035	Commercial	4-Stroke Hydro Power Units	MOVES	0.0001	0.0004	73.3%	73.3%	population	0.0001	0.0003
2265007010	Logging	4-Stroke Logging Equipment Shredders > 6 HP	MOVES	0.0000	0.0000	30.9%	30.9%	land area	0.0000	0.0000
2265007015	Logging	4-Stroke Logging Equipment Skidders	MOVES	0.0000	0.0000	30.9%	30.9%	land area	0.0000	0.0000
2265008005	Airport Support	4-Stroke Airport Ground Support Equipment	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
2267001060	Recreational	LPG Specialty Vehicle Carts	MOVES	0.0001	0.0000	30.9%	30.9%	land area	0.0000	0.0000
2267002003	Construction	LPG Asphalt Pavers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002015	Construction	LPG Rollers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002021	Construction	LPG Paving Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002024	Construction	LPG Surfacing Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002030	Construction	LPG Trenchers	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267002033	Construction	LPG Bore/Drill Rigs	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267002039	Construction	LPG Concrete/Industrial Saws	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002045	Construction	LPG Cranes	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267002054	Construction	LPG Crushing/Proc. Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002057	Construction	LPG Rough Terrain Forklifts	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267002060	Construction	LPG Rubber Tire Loaders	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267002066	Construction	LPG Tractors/Loaders/Backhoes	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002072	Construction	LPG Skid Steer Loaders	MOVES	0.0003	0.0001	73.3%	73.3%	population	0.0002	0.0001
2267002081	Construction	LPG Other Construction Equipment	MOVES	0.0002	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267003010	Industrial	LPG Aerial Lifts	MOVES	0.0017	0.0004	73.3%	73.3%	population	0.0013	0.0003
2267003020	Industrial	LPG Forklifts	MOVES	0.0561	0.0083	73.3%	73.3%	population	0.0411	0.0061
2267003030	Industrial	LPG Sweepers/Scrubbers	MOVES	0.0004	0.0001	73.3%	73.3%	population	0.0003	0.0000
2267003040	Industrial	LPG Other General Industrial Equipment	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267003050	Industrial	LPG Other Material Handling Equipment	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000

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2267003070	Industrial	LPG Terminal Tractors	MOVES	0.0002	0.0000	73.3%	73.3%	population	0.0002	0.0000
2267004066	Lawn/Garden	LPG Chippers/Stump Grinders (Commercial)	MOVES	0.0004	0.0001	73.3%	73.3%	population	0.0003	0.0000
2267005055	Agriculture	LPG Other Agricultural Equipment	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2267005060	Agriculture	LPG Irrigation Sets	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2267006005	Commercial	LPG Light Commercial Generator Sets	MOVES	0.0031	0.0005	73.3%	73.3%	population	0.0023	0.0004
2267006010	Commercial	LPG Light Commercial Pumps	MOVES	0.0004	0.0001	73.3%	73.3%	population	0.0003	0.0000
2267006015	Commercial	LPG Light Commercial Air Compressors	MOVES	0.0002	0.0000	73.3%	73.3%	population	0.0002	0.0000
2267006025	Commercial	LPG Light Commercial Welders	MOVES	0.0003	0.0001	73.3%	73.3%	population	0.0002	0.0000
2267006030	Commercial	LPG Light Commercial Pressure Washers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267006035	Commercial	LPG Hydro Power Units	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267008005	Airport Support	LPG Airport Ground Support Equipment	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
2268002081	Construction	CNG Other Construction Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268003020	Industrial	CNG Forklifts	MOVES	0.0045	0.0024	73.3%	73.3%	population	0.0033	0.0018
2268003030	Industrial	CNG Sweepers/Scrubbers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268003040	Industrial	CNG Other General Industrial Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268003060	Industrial	CNG AC/Refrigeration	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268003070	Industrial	CNG Terminal Tractors	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268005055	Agriculture	CNG Other Agricultural Equipment	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2268005060	Agriculture	CNG Irrigation Sets	MOVES	0.0001	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2268006005	Commercial	CNG Light Commercial Generator Sets	MOVES	0.0012	0.0007	73.3%	73.3%	population	0.0009	0.0005
2268006010	Commercial	CNG Light Commercial Pumps	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268006015	Commercial	CNG Light Commercial Air Compressors	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268006020	Commercial	CNG Light Commercial Gas Compressors	MOVES	0.0005	0.0002	73.3%	73.3%	population	0.0004	0.0002
2270001060	Recreational	Diesel Specialty Vehicle Carts	MOVES	0.0007	0.0002	30.9%	30.9%	land area	0.0002	0.0001
2270002003	Construction	Diesel Pavers	MOVES	0.0055	0.0003	73.3%	73.3%	population	0.0041	0.0002
2270002006	Construction	Diesel Tampers/Rammers (unused)	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2270002009	Construction	Diesel Plate Compactors	MOVES	0.0003	0.0001	73.3%	73.3%	population	0.0002	0.0000
2270002015	Construction	Diesel Rollers	MOVES	0.0156	0.0010	73.3%	73.3%	population	0.0114	0.0007
2270002018	Construction	Diesel Scrapers	MOVES	0.0140	0.0007	73.3%	73.3%	population	0.0103	0.0005
2270002021	Construction	Diesel Paving Equipment	MOVES	0.0011	0.0001	73.3%	73.3%	population	0.0008	0.0001
2270002024	Construction	Diesel Surfacing Equipment	MOVES	0.0010	0.0001	73.3%	73.3%	population	0.0007	0.0000
2270002027	Construction	Diesel Signal Boards	MOVES	0.0030	0.0003	73.3%	73.3%	population	0.0022	0.0002
2270002030	Construction	Diesel Trenchers	MOVES	0.0104	0.0008	73.3%	73.3%	population	0.0076	0.0006
2270002033	Construction	Diesel Bore/Drill Rigs	MOVES	0.0141	0.0010	73.3%	73.3%	population	0.0103	0.0008
2270002036	Construction	Diesel Excavators	MOVES	0.0461	0.0023	73.3%	73.3%	population	0.0338	0.0017
2270002039	Construction	Diesel Concrete/Industrial Saws	MOVES	0.0007	0.0001	73.3%	73.3%	population	0.0005	0.0000
2270002042	Construction	Diesel Cement & Mortar Mixers	MOVES	0.0006	0.0001	73.3%	73.3%	population	0.0004	0.0000
2270002045	Construction	Diesel Cranes	MOVES	0.0156	0.0008	73.3%	73.3%	population	0.0114	0.0006
2270002048	Construction	Diesel Graders	MOVES	0.0107	0.0006	73.3%	73.3%	population	0.0079	0.0004
2270002051	Construction	Diesel Off-highway Trucks	MOVES	0.0564	0.0024	73.3%	73.3%	population	0.0413	0.0017

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2270002054	Construction	Diesel Crushing/Proc. Equipment	MOVES	0.0035	0.0002	73.3%	73.3%	population	0.0025	0.0001
2270002057	Construction	Diesel Rough Terrain Forklifts	MOVES	0.0223	0.0015	73.3%	73.3%	population	0.0163	0.0011
2270002060	Construction	Diesel Rubber Tire Loaders	MOVES	0.0773	0.0043	73.3%	73.3%	population	0.0566	0.0031
2270002066	Construction	Diesel Tractors/Loaders/Backhoes	MOVES	0.0739	0.0137	73.3%	73.3%	population	0.0542	0.0101
2270002069	Construction	Diesel Crawler Tractors	MOVES	0.0568	0.0029	73.3%	73.3%	population	0.0417	0.0021
2270002072	Construction	Diesel Skid Steer Loaders	MOVES	0.0565	0.0128	73.3%	73.3%	population	0.0414	0.0094
2270002075	Construction	Diesel Off-Highway Tractors	MOVES	0.0095	0.0005	73.3%	73.3%	population	0.0069	0.0003
2270002078	Construction	Diesel Dumpers/Tenders	MOVES	0.0002	0.0000	73.3%	73.3%	population	0.0001	0.0000
2270002081	Construction	Diesel Other Construction Equipment	MOVES	0.0100	0.0006	73.3%	73.3%	population	0.0074	0.0004
2270003010	Industrial	Diesel Aerial Lifts	MOVES	0.0041	0.0009	73.3%	73.3%	population	0.0030	0.0007
2270003020	Industrial	Diesel Forklifts	MOVES	0.0246	0.0010	73.3%	73.3%	population	0.0180	0.0008
2270003030	Industrial	Diesel Sweepers/Scrubbers	MOVES	0.0125	0.0007	73.3%	73.3%	population	0.0092	0.0005
2270003040	Industrial	Diesel Other General Industrial Equipment	MOVES	0.0157	0.0011	73.3%	73.3%	population	0.0115	0.0008
2270003050	Industrial	Diesel Other Material Handling Equipment	MOVES	0.0010	0.0002	73.3%	73.3%	population	0.0007	0.0001
2270003060	Industrial	Diesel AC/Refrigeration	MOVES	0.0411	0.0024	73.3%	73.3%	population	0.0301	0.0018
2270003070	Industrial	Diesel Terminal Tractors	MOVES	0.0115	0.0006	73.3%	73.3%	population	0.0084	0.0004
2270004031	Lawn/Garden	Diesel Leafblowers/Vacuums (Commercial)	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2270004036	Lawn/Garden	Diesel Snowblowers (Commercial)	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2270004046	Lawn/Garden	Diesel Front Mowers (Commercial)	MOVES	0.0113	0.0012	73.3%	73.3%	population	0.0083	0.0009
2270004056	Lawn/Garden	Diesel Lawn & Garden Tractors (Commercial)	MOVES	0.0023	0.0003	73.3%	73.3%	population	0.0017	0.0002
2270004066	Lawn/Garden	Diesel Chippers/Stump Grinders (Commercial)	MOVES	0.0173	0.0015	73.3%	73.3%	population	0.0127	0.0011
2270004071	Lawn/Garden	Diesel Commercial Turf Equipment (Comm.)	MOVES	0.0012	0.0001	73.3%	73.3%	population	0.0009	0.0001
2270004076	Lawn/Garden	Diesel Other Lawn & Garden Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2270005010	Agriculture	Diesel 2-Wheel Tractors	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005015	Agriculture	Diesel Agricultural Tractors	MOVES	0.0763	0.0061	24.2%	24.2%	land area (1)	0.0185	0.0015
2270005020	Agriculture	Diesel Combines	MOVES	0.0116	0.0009	24.2%	24.2%	land area (1)	0.0028	0.0002
2270005025	Agriculture	Diesel Balers	MOVES	0.0001	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005030	Agriculture	Diesel Agricultural Mowers	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005035	Agriculture	Diesel Sprayers	MOVES	0.0009	0.0001	24.2%	24.2%	land area (1)	0.0002	0.0000
2270005040	Agriculture	Diesel Tillers > 6 HP	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005045	Agriculture	Diesel Swathers	MOVES	0.0008	0.0001	24.2%	24.2%	land area (1)	0.0002	0.0000
2270005055	Agriculture	Diesel Other Agricultural Equipment	MOVES	0.0020	0.0002	24.2%	24.2%	land area (1)	0.0005	0.0000
2270005060	Agriculture	Diesel Irrigation Sets	MOVES	0.0007	0.0001	24.2%	24.2%	land area (1)	0.0002	0.0000
2270006005	Commercial	Diesel Light Commercial Generator Sets	MOVES	0.0188	0.0020	73.3%	73.3%	population	0.0137	0.0014
2270006010	Commercial	Diesel Light Commercial Pumps	MOVES	0.0045	0.0005	73.3%	73.3%	population	0.0033	0.0003
2270006015	Commercial	Diesel Light Commercial Air Compressors	MOVES	0.0089	0.0007	73.3%	73.3%	population	0.0065	0.0005
2270006025	Commercial	Diesel Light Commercial Welders	MOVES	0.0059	0.0013	73.3%	73.3%	population	0.0043	0.0010
2270006030	Commercial	Diesel Light Commercial Pressure Washer	MOVES	0.0006	0.0001	73.3%	73.3%	population	0.0005	0.0001
2270006035	Commercial	Diesel Hydro Power Units	MOVES	0.0004	0.0000	73.3%	73.3%	population	0.0003	0.0000
2270007015	Logging	Diesel Logging Equip Fell/Bunch/Skidders	MOVES	0.0003	0.0000	30.9%	30.9%	land area	0.0001	0.0000

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2270008005	Airport Support	Diesel Airport Ground Support Equipment	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
2275001000	Airport	Military Aircraft	EPA	0.0041	0.0020	100.0%	100.0%	airport location	0.0041	0.0020
2275050011	Airport	General Aviation Aircraft, Piston	EPA	0.0019	0.0045	75.7%	75.7%	airport location	0.0015	0.0034
2275050012	Airport	General Aviation Aircraft, Turbine	EPA	0.0038	0.0079	78.6%	78.0%	airport location	0.0030	0.0061
2275060011	Airport	Taxi Aircraft, Piston	EPA	0.0001	0.0001	98.3%	98.3%	airport location	0.0001	0.0001
2275060012	Airport	Taxi Aircraft, Turbine	EPA	0.0013	0.0017	98.3%	98.3%	airport location	0.0013	0.0017
2275070000	Airport	Aircraft Auxiliary Power Units	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
2280002201	Comm. Mar.	CM Vessels, Diesel, Underway, C1&C2, Main Eng.	EPA	0.1235	0.0048	100.0%	100.0%	Lk. Mich. Shoreline	0.1235	0.0048
2280002202	Comm. Mar.	CM Vessels, Diesel, Underway, C1&C2, Aux. Eng.	EPA	0.2425	0.0071	100.0%	100.0%	Lk. Mich. Shoreline	0.2425	0.0071
2280002203	Comm. Mar.	CM Vessels, Diesel, Underway, C3, Main Eng.	EPA	0.0904	0.0037	100.0%	100.0%	Lk. Mich. Shoreline	0.0904	0.0037
2280002204	Comm. Mar.	CM Vessels, Diesel, Underway, C3, Aux. Eng.	EPA	0.0074	0.0003	100.0%	100.0%	Lk. Mich. Shoreline	0.0074	0.0003
2282005010	Pleasure Craft	2-Stroke Outboards	MOVES	0.0416	0.2636	4.0%	4.0%	water area	0.0017	0.0105
2282005015	Pleasure Craft	2-Stroke Personal Watercraft	MOVES	0.0185	0.0472	70.0%	70.0%	water area	0.0130	0.0331
2282010005	Pleasure Craft	4-Stroke Inboards	MOVES	0.0837	0.0783	70.0%	70.0%	water area	0.0586	0.0548
2282020005	Pleasure Craft	Diesel Inboards	MOVES	0.0799	0.0041	70.0%	70.0%	water area	0.0560	0.0029
2282020010	Pleasure Craft	Diesel Outboards	MOVES	0.0001	0.0000	4.0%	4.0%	water area	0.0000	0.0000
228500200x	Railroad	All Diesel Locomotives	EPA	0.6911	0.0328	63.2%	64.2%	rail links	0.4367	0.0210
2285002015	Railway Maint.	Diesel Railway Maintenance	MOVES	0.0015	0.0003	100.0%	100.0%	rail links	0.0015	0.0003
2285004015	Railway Maint.	4-Stroke Gasoline Railway Maintenance	MOVES	0.0000	0.0001	100.0%	100.0%	rail links	0.0000	0.0001
2285006015	Railway Maint.	LPG Railway Maintenance	MOVES	0.0000	0.0000	100.0%	100.0%	rail links	0.0000	0.0000
ALL (Total)	**ALL (Total)**	**ALL (Total)**		**2.3541**	**1.2923**	**72.1%**	**55.2%**		**1.6967**	**0.7128**
22xx005xxx	Agriculture	All	MOVES	0.0945	0.0120	24.2%	24.2%	land area (1)	0.0229	0.0029
22750xxxxx	Airport	All	EPA	0.0112	0.0161	88.4%	82.3%	airport location	0.0099	0.0133
22xx008005	Airport Support	All	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
22xx006xxx	Commercial	All	MOVES	0.0577	0.0655	73.3%	73.3%	population	0.0423	0.0480
2280002xxx	Comm. Mar	All	EPA	0.4638	0.0158	100.0%	100.0%	Lk. Mich. Shoreline	0.4638	0.0158
22xx002xxx	Construction	All	MOVES	0.5111	0.0854	73.3%	73.3%	population	0.3746	0.0626
22xx003xxx	Industrial	All	MOVES	0.1814	0.0291	73.3%	73.3%	population	0.1330	0.0214
22xx004xxx	Lawn/Garden	All	MOVES	0.1093	0.5374	73.3%	73.3%	population	0.0801	0.3939
22xx007xxx	Logging	All	MOVES	0.0003	0.0002	30.9%	30.9%	land area	0.0001	0.0001
22820xxxxx	Pleasure Craft	All	MOVES	0.2238	0.3932	57.7%	25.7%	water area	0.1292	0.1012
228500200x	Railroad	All	EPA	0.6911	0.0328	63.2%	64.2%	rail links	0.4367	0.0210
228500x015	Railway Maint.	All	MOVES	0.0016	0.0003	100.0%	100.0%	rail links	0.0016	0.0003
22xx001xxx	Recreational	All	MOVES	0.0081	0.1046	30.9%	30.9%	land area	0.0025	0.0323
ALL (Total)	**ALL (Total)**	**ALL (Total)**		**2.3541**	**1.2923**	**72.1%**	**55.2%**		**1.6967**	**0.7128**

(1) City of Kenosha excluded.

Table A6.3. 2020 Nonroad NO_X and VOC Emissions: tons per ozone season day (tposd) Kenosha County and the Partial Kenosha County 2008 ozone nonattainment area

SCC	Segment Description	SCC Description	Emissions from	Kenosha County 2020 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2020 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2260001010	Recreational	2-Stroke Motorcycles: Off-Road	MOVES	0.0006	0.0457	30.9%	30.9%	land area	0.0002	0.0141
2260001030	Recreational	2-Stroke All Terrain Vehicles	MOVES	0.0003	0.0075	30.9%	30.9%	land area	0.0001	0.0023
2260001060	Recreational	2-Stroke Specialty Vehicle Carts	MOVES	0.0002	0.0007	30.9%	30.9%	land area	0.0001	0.0002
2260002006	Construction	2-Stroke Tampers/Rammers	MOVES	0.0002	0.0081	73.3%	73.3%	population	0.0001	0.0059
2260002009	Construction	2-Stroke Plate Compactors	MOVES	0.0000	0.0003	73.3%	73.3%	population	0.0000	0.0002
2260002021	Construction	2-Stroke Paving Equipment	MOVES	0.0000	0.0003	73.3%	73.3%	population	0.0000	0.0002
2260002027	Construction	2-Stroke Signal Boards	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260002039	Construction	2-Stroke Concrete/Industrial Saws	MOVES	0.0005	0.0207	73.3%	73.3%	population	0.0004	0.0152
2260002054	Construction	2-Stroke Crushing/Proc. Equipment	MOVES	0.0000	0.0001	73.3%	73.3%	population	0.0000	0.0001
2260003030	Industrial	2-Stroke Sweepers/Scrubbers	MOVES	0.0000	0.0003	73.3%	73.3%	population	0.0000	0.0002
2260003040	Industrial	2-Stroke Other General Industrial Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260004015	Lawn/Garden	2-Stroke Rotary Tillers < 6 HP (Residential)	MOVES	0.0001	0.0014	73.3%	73.3%	population	0.0000	0.0010
2260004016	Lawn/Garden	2-Stroke Rotary Tillers < 6 HP (Commercial)	MOVES	0.0002	0.0040	73.3%	73.3%	population	0.0001	0.0029
2260004020	Lawn/Garden	2-Stroke Chain Saws < 6 HP (Residential)	MOVES	0.0004	0.0140	73.3%	73.3%	population	0.0003	0.0102
2260004021	Lawn/Garden	2-Stroke Chain Saws < 6 HP (Commercial)	MOVES	0.0010	0.0457	73.3%	73.3%	population	0.0007	0.0335
2260004025	Lawn/Garden	2-Stroke Trimmers/Edgers/Brush Cutters (Res.)	MOVES	0.0011	0.0278	73.3%	73.3%	population	0.0008	0.0203
2260004026	Lawn/Garden	2-Stroke Trimmers/Edgers/Brush Cutters (Com.)	MOVES	0.0018	0.0457	73.3%	73.3%	population	0.0013	0.0335
2260004030	Lawn/Garden	2-Stroke Leafblowers/Vacuums (Residential)	MOVES	0.0007	0.0170	73.3%	73.3%	population	0.0005	0.0125
2260004031	Lawn/Garden	2-Stroke Leafblowers/Vacuums (Commercial)	MOVES	0.0017	0.0457	73.3%	73.3%	population	0.0012	0.0335
2260004035	Lawn/Garden	2-Stroke Snowblowers (Residential)	MOVES	0.0000	0.0010	73.3%	73.3%	population	0.0000	0.0007
2260004036	Lawn/Garden	2-Stroke Snowblowers (Commercial)	MOVES	0.0000	0.0001	73.3%	73.3%	population	0.0000	0.0001
2260004071	Lawn/Garden	2-Stroke Commercial Turf Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260005035	Agriculture	2-Stroke Sprayers	MOVES	0.0000	0.0001	24.2%	24.2%	land area (1)	0.0000	0.0000
2260006005	Commercial	2-Stroke Light Commercial Generator Set	MOVES	0.0000	0.0010	73.3%	73.3%	population	0.0000	0.0007
2260006010	Commercial	2-Stroke Light Commercial Pumps	MOVES	0.0003	0.0071	73.3%	73.3%	population	0.0002	0.0052
2260006015	Commercial	2-Stroke Light Commercial Air Compressors	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260006035	Commercial	2-Stroke Hydro Power Units	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260007005	Logging	2-Stroke Logging Equipment Chain Saws > 6 HP	MOVES	0.0000	0.0001	30.9%	30.9%	land area	0.0000	0.0000
2265001010	Recreational	4-Stroke Motorcycles: Off-Road	MOVES	0.0003	0.0021	30.9%	30.9%	land area	0.0001	0.0007
2265001030	Recreational	4-Stroke All Terrain Vehicles	MOVES	0.0021	0.0220	30.9%	30.9%	land area	0.0007	0.0068
2265001050	Recreational	4-Stroke Golf Carts	MOVES	0.0035	0.0114	30.9%	30.9%	land area	0.0011	0.0035
2265001060	Recreational	4-Stroke Specialty Vehicle Carts	MOVES	0.0002	0.0008	30.9%	30.9%	land area	0.0001	0.0003
2265002003	Construction	4-Stroke Asphalt Pavers	MOVES	0.0001	0.0004	73.3%	73.3%	population	0.0001	0.0003
2265002006	Construction	4-Stroke Tampers/Rammers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2265002009	Construction	4-Stroke Plate Compactors	MOVES	0.0002	0.0009	73.3%	73.3%	population	0.0002	0.0007
2265002015	Construction	4-Stroke Rollers	MOVES	0.0002	0.0006	73.3%	73.3%	population	0.0002	0.0005
2265002021	Construction	4-Stroke Paving Equipment	MOVES	0.0005	0.0017	73.3%	73.3%	population	0.0003	0.0012

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2020 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2020 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2265002024	Construction	4-Stroke Surfacing Equipment	MOVES	0.0002	0.0007	73.3%	73.3%	population	0.0001	0.0005
2265002027	Construction	4-Stroke Signal Boards	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2265002030	Construction	4-Stroke Trenchers	MOVES	0.0004	0.0012	73.3%	73.3%	population	0.0003	0.0009
2265002033	Construction	4-Stroke Bore/Drill Rigs	MOVES	0.0002	0.0006	73.3%	73.3%	population	0.0002	0.0004
2265002039	Construction	4-Stroke Concrete/Industrial Saws	MOVES	0.0009	0.0026	73.3%	73.3%	population	0.0006	0.0019
2265002042	Construction	4-Stroke Cement & Mortar Mixers	MOVES	0.0004	0.0020	73.3%	73.3%	population	0.0003	0.0014
2265002045	Construction	4-Stroke Cranes	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0000	0.0000
2265002054	Construction	4-Stroke Crushing/Proc. Equipment	MOVES	0.0001	0.0002	73.3%	73.3%	population	0.0000	0.0001
2265002057	Construction	4-Stroke Rough Terrain Forklifts	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0000	0.0000
2265002060	Construction	4-Stroke Rubber Tire Loaders	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2265002066	Construction	4-Stroke Tractors/Loaders/Backhoes	MOVES	0.0003	0.0008	73.3%	73.3%	population	0.0002	0.0006
2265002072	Construction	4-Stroke Skid Steer Loaders	MOVES	0.0003	0.0004	73.3%	73.3%	population	0.0002	0.0003
2265002078	Construction	4-Stroke Dumpers/Tenders	MOVES	0.0001	0.0003	73.3%	73.3%	population	0.0001	0.0002
2265002081	Construction	4-Stroke Other Construction Equipment	MOVES	0.0001	0.0001	73.3%	73.3%	population	0.0001	0.0001
2265003010	Industrial	4-Stroke Aerial Lifts	MOVES	0.0016	0.0018	73.3%	73.3%	population	0.0011	0.0013
2265003020	Industrial	4-Stroke Forklifts	MOVES	0.0033	0.0015	73.3%	73.3%	population	0.0024	0.0011
2265003030	Industrial	4-Stroke Sweepers/Scrubbers	MOVES	0.0008	0.0014	73.3%	73.3%	population	0.0006	0.0011
2265003040	Industrial	4-Stroke Other General Industrial Equipment	MOVES	0.0016	0.0060	73.3%	73.3%	population	0.0012	0.0044
2265003050	Industrial	4-Stroke Other Material Handling Equipment	MOVES	0.0001	0.0001	73.3%	73.3%	population	0.0001	0.0001
2265003060	Industrial	4-Stroke Industrial AC/Refrigeration	MOVES	0.0000	0.0001	73.3%	73.3%	population	0.0000	0.0001
2265003070	Industrial	4-Stroke Terminal Tractors	MOVES	0.0003	0.0001	73.3%	73.3%	population	0.0002	0.0001
2265004010	Lawn/Garden	4-Stroke Lawn mowers (Residential)	MOVES	0.0072	0.0593	73.3%	73.3%	population	0.0053	0.0435
2265004011	Lawn/Garden	4-Stroke Lawn mowers (Commercial)	MOVES	0.0037	0.0237	73.3%	73.3%	population	0.0027	0.0174
2265004015	Lawn/Garden	4-Stroke Rotary Tillers < 6 HP (Residential)	MOVES	0.0006	0.0054	73.3%	73.3%	population	0.0005	0.0039
2265004016	Lawn/Garden	4-Stroke Rotary Tillers < 6 HP (Commercial)	MOVES	0.0019	0.0140	73.3%	73.3%	population	0.0014	0.0102
2265004025	Lawn/Garden	4-Stroke Trimmers/Edgers/Brush Cutters (Res.)	MOVES	0.0000	0.0004	73.3%	73.3%	population	0.0000	0.0003
2265004026	Lawn/Garden	4-Stroke Trimmers/Edgers/Brush Cutters (Com.)	MOVES	0.0001	0.0006	73.3%	73.3%	population	0.0001	0.0005
2265004030	Lawn/Garden	4-Stroke Leafblowers/Vacuums (Residential)	MOVES	0.0001	0.0005	73.3%	73.3%	population	0.0001	0.0004
2265004031	Lawn/Garden	4-Stroke Leafblowers/Vacuums (Commercial)	MOVES	0.0036	0.0148	73.3%	73.3%	population	0.0027	0.0109
2265004035	Lawn/Garden	4-Stroke Snowblowers (Residential)	MOVES	0.0000	0.0023	73.3%	73.3%	population	0.0000	0.0017
2265004036	Lawn/Garden	4-Stroke Snowblowers (Commercial)	MOVES	0.0000	0.0002	73.3%	73.3%	population	0.0000	0.0002
2265004040	Lawn/Garden	4-Stroke Rear Engine Riding Mowers (Res.)	MOVES	0.0015	0.0081	73.3%	73.3%	population	0.0011	0.0060
2265004041	Lawn/Garden	4-Stroke Rear Engine Riding Mowers (Comm.)	MOVES	0.0004	0.0015	73.3%	73.3%	population	0.0003	0.0011
2265004046	Lawn/Garden	4-Stroke Front Mowers (Commercial)	MOVES	0.0006	0.0019	73.3%	73.3%	population	0.0004	0.0014
2265004051	Lawn/Garden	4-Stroke Shredders < 6 HP (Commercial)	MOVES	0.0002	0.0016	73.3%	73.3%	population	0.0002	0.0012
2265004055	Lawn/Garden	4-Stroke Lawn & Garden Tractors (Residential)	MOVES	0.0195	0.0884	73.3%	73.3%	population	0.0143	0.0648
2265004056	Lawn/Garden	4-Stroke Lawn & Garden Tractors (Commercial)	MOVES	0.0056	0.0190	73.3%	73.3%	population	0.0041	0.0139
2265004066	Lawn/Garden	4-Stroke Chippers/Stump Grinders (Comm.)	MOVES	0.0009	0.0020	73.3%	73.3%	population	0.0007	0.0015
2265004071	Lawn/Garden	4-Stroke Commercial Turf Equipment (Comm.)	MOVES	0.0181	0.0558	73.3%	73.3%	population	0.0133	0.0409
2265004075	Lawn/Garden	4-Stroke Other Lawn & Garden Equip. (Res.)	MOVES	0.0008	0.0040	73.3%	73.3%	population	0.0006	0.0029

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2020 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2020 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2265004076	Lawn/Garden	4-Stroke Other Lawn & Garden Equip. (Com.)	MOVES	0.0006	0.0031	73.3%	73.3%	population	0.0005	0.0023
2265005010	Agriculture	4-Stroke 2-Wheel Tractors	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005015	Agriculture	4-Stroke Agricultural Tractors	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005020	Agriculture	4-Stroke Combines	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005025	Agriculture	4-Stroke Balers	MOVES	0.0002	0.0002	24.2%	24.2%	land area (1)	0.0001	0.0001
2265005030	Agriculture	4-Stroke Agricultural Mowers	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005035	Agriculture	4-Stroke Sprayers	MOVES	0.0003	0.0005	24.2%	24.2%	land area (1)	0.0001	0.0001
2265005040	Agriculture	4-Stroke Tillers > 5 HP	MOVES	0.0004	0.0021	24.2%	24.2%	land area (1)	0.0001	0.0005
2265005045	Agriculture	4-Stroke Swathers	MOVES	0.0003	0.0003	24.2%	24.2%	land area (1)	0.0001	0.0001
2265005055	Agriculture	4-Stroke Other Agricultural Equipment	MOVES	0.0004	0.0003	24.2%	24.2%	land area (1)	0.0001	0.0001
2265005060	Agriculture	4-Stroke Irrigation Sets	MOVES	0.0001	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265006005	Commercial	4-Stroke Light Commercial Generator Set	MOVES	0.0057	0.0257	73.3%	73.3%	population	0.0042	0.0188
2265006010	Commercial	4-Stroke Light Commercial Pumps	MOVES	0.0015	0.0058	73.3%	73.3%	population	0.0011	0.0042
2265006015	Commercial	4-Stroke Light Commercial Air Compressors	MOVES	0.0008	0.0024	73.3%	73.3%	population	0.0006	0.0017
2265006025	Commercial	4-Stroke Light Commercial Welders	MOVES	0.0016	0.0053	73.3%	73.3%	population	0.0012	0.0039
2265006030	Commercial	4-Stroke Light Commercial Pressure Wash	MOVES	0.0025	0.0112	73.3%	73.3%	population	0.0018	0.0082
2265006035	Commercial	4-Stroke Hydro Power Units	MOVES	0.0001	0.0004	73.3%	73.3%	population	0.0001	0.0003
2265007010	Logging	4-Stroke Logging Equipment Shredders > 6 HP	MOVES	0.0000	0.0000	30.9%	30.9%	land area	0.0000	0.0000
2265007015	Logging	4-Stroke Logging Equipment Skidders	MOVES	0.0000	0.0000	30.9%	30.9%	land area	0.0000	0.0000
2265008005	Airport Support	4-Stroke Airport Ground Support Equipment	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
2267001060	Recreational	LPG Specialty Vehicle Carts	MOVES	0.0001	0.0000	30.9%	30.9%	land area	0.0000	0.0000
2267002003	Construction	LPG Asphalt Pavers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002015	Construction	LPG Rollers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002021	Construction	LPG Paving Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002024	Construction	LPG Surfacing Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002030	Construction	LPG Trenchers	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267002033	Construction	LPG Bore/Drill Rigs	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267002039	Construction	LPG Concrete/Industrial Saws	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002045	Construction	LPG Cranes	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002054	Construction	LPG Crushing/Proc. Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002057	Construction	LPG Rough Terrain Forklifts	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002060	Construction	LPG Rubber Tire Loaders	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267002066	Construction	LPG Tractors/Loaders/Backhoes	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002072	Construction	LPG Skid Steer Loaders	MOVES	0.0002	0.0000	73.3%	73.3%	population	0.0002	0.0000
2267002081	Construction	LPG Other Construction Equipment	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267003010	Industrial	LPG Aerial Lifts	MOVES	0.0013	0.0003	73.3%	73.3%	population	0.0010	0.0002
2267003020	Industrial	LPG Forklifts	MOVES	0.0521	0.0064	73.3%	73.3%	population	0.0382	0.0047
2267003030	Industrial	LPG Sweepers/Scrubbers	MOVES	0.0004	0.0000	73.3%	73.3%	population	0.0003	0.0000
2267003040	Industrial	LPG Other General Industrial Equipment	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267003050	Industrial	LPG Other Material Handling Equipment	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0000	0.0000

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2020 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2020 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2267003070	Industrial	LPG Terminal Tractors	MOVES	0.0002	0.0000	73.3%	73.3%	population	0.0002	0.0000
2267004066	Lawn/Garden	LPG Chippers/Stump Grinders (Commercial)	MOVES	0.0003	0.0000	73.3%	73.3%	population	0.0002	0.0000
2267005055	Agriculture	LPG Other Agricultural Equipment	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2267005060	Agriculture	LPG Irrigation Sets	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2267006005	Commercial	LPG Light Commercial Generator Sets	MOVES	0.0025	0.0004	73.3%	73.3%	population	0.0018	0.0003
2267006010	Commercial	LPG Light Commercial Pumps	MOVES	0.0003	0.0000	73.3%	73.3%	population	0.0002	0.0000
2267006015	Commercial	LPG Light Commercial Air Compressors	MOVES	0.0002	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267006025	Commercial	LPG Light Commercial Welders	MOVES	0.0002	0.0000	73.3%	73.3%	population	0.0002	0.0000
2267006030	Commercial	LPG Light Commercial Pressure Washers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267006035	Commercial	LPG Hydro Power Units	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267008005	Airport Support	LPG Airport Ground Support Equipment	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
2268002081	Construction	CNG Other Construction Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268003020	Industrial	CNG Forklifts	MOVES	0.0042	0.0019	73.3%	73.3%	population	0.0031	0.0014
2268003030	Industrial	CNG Sweepers/Scrubbers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268003040	Industrial	CNG Other General Industrial Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268003060	Industrial	CNG AC/Refrigeration	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268003070	Industrial	CNG Terminal Tractors	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268005055	Agriculture	CNG Other Agricultural Equipment	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2268005060	Agriculture	CNG Irrigation Sets	MOVES	0.0001	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2268006005	Commercial	CNG Light Commercial Generator Sets	MOVES	0.0010	0.0006	73.3%	73.3%	population	0.0007	0.0004
2268006010	Commercial	CNG Light Commercial Pumps	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268006015	Commercial	CNG Light Commercial Air Compressors	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268006020	Commercial	CNG Light Commercial Gas Compressors	MOVES	0.0005	0.0003	73.3%	73.3%	population	0.0004	0.0002
2270001060	Recreational	Diesel Specialty Vehicle Carts	MOVES	0.0006	0.0001	30.9%	30.9%	land area	0.0002	0.0000
2270002003	Construction	Diesel Pavers	MOVES	0.0044	0.0002	73.3%	73.3%	population	0.0033	0.0002
2270002006	Construction	Diesel Tampers/Rammers (unused)	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2270002009	Construction	Diesel Plate Compactors	MOVES	0.0003	0.0001	73.3%	73.3%	population	0.0003	0.0000
2270002015	Construction	Diesel Rollers	MOVES	0.0128	0.0007	73.3%	73.3%	population	0.0094	0.0005
2270002018	Construction	Diesel Scrapers	MOVES	0.0084	0.0004	73.3%	73.3%	population	0.0062	0.0003
2270002021	Construction	Diesel Paving Equipment	MOVES	0.0008	0.0001	73.3%	73.3%	population	0.0006	0.0000
2270002024	Construction	Diesel Surfacing Equipment	MOVES	0.0008	0.0000	73.3%	73.3%	population	0.0006	0.0000
2270002027	Construction	Diesel Signal Boards	MOVES	0.0031	0.0003	73.3%	73.3%	population	0.0023	0.0002
2270002030	Construction	Diesel Trenchers	MOVES	0.0088	0.0005	73.3%	73.3%	population	0.0064	0.0004
2270002033	Construction	Diesel Bore/Drill Rigs	MOVES	0.0122	0.0008	73.3%	73.3%	population	0.0089	0.0006
2270002036	Construction	Diesel Excavators	MOVES	0.0286	0.0013	73.3%	73.3%	population	0.0210	0.0009
2270002039	Construction	Diesel Concrete/Industrial Saws	MOVES	0.0006	0.0000	73.3%	73.3%	population	0.0005	0.0000
2270002042	Construction	Diesel Cement & Mortar Mixers	MOVES	0.0005	0.0001	73.3%	73.3%	population	0.0004	0.0000
2270002045	Construction	Diesel Cranes	MOVES	0.0107	0.0006	73.3%	73.3%	population	0.0078	0.0004
2270002048	Construction	Diesel Graders	MOVES	0.0068	0.0003	73.3%	73.3%	population	0.0050	0.0002
2270002051	Construction	Diesel Off-highway Trucks	MOVES	0.0491	0.0015	73.3%	73.3%	population	0.0360	0.0011

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2020 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2020 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2270002054	Construction	Diesel Crushing/Proc. Equipment	MOVES	0.0026	0.0001	73.3%	73.3%	population	0.0019	0.0001
2270002057	Construction	Diesel Rough Terrain Forklifts	MOVES	0.0179	0.0009	73.3%	73.3%	population	0.0131	0.0007
2270002060	Construction	Diesel Rubber Tire Loaders	MOVES	0.0542	0.0027	73.3%	73.3%	population	0.0397	0.0020
2270002066	Construction	Diesel Tractors/Loaders/Backhoes	MOVES	0.0619	0.0107	73.3%	73.3%	population	0.0454	0.0079
2270002069	Construction	Diesel Crawler Tractors	MOVES	0.0403	0.0018	73.3%	73.3%	population	0.0296	0.0013
2270002072	Construction	Diesel Skid Steer Loaders	MOVES	0.0525	0.0103	73.3%	73.3%	population	0.0385	0.0075
2270002075	Construction	Diesel Off-Highway Tractors	MOVES	0.0070	0.0003	73.3%	73.3%	population	0.0052	0.0002
2270002078	Construction	Diesel Dumpers/Tenders	MOVES	0.0002	0.0000	73.3%	73.3%	population	0.0001	0.0000
2270002081	Construction	Diesel Other Construction Equipment	MOVES	0.0076	0.0004	73.3%	73.3%	population	0.0056	0.0003
2270003010	Industrial	Diesel Aerial Lifts	MOVES	0.0038	0.0008	73.3%	73.3%	population	0.0028	0.0006
2270003020	Industrial	Diesel Forklifts	MOVES	0.0184	0.0005	73.3%	73.3%	population	0.0135	0.0004
2270003030	Industrial	Diesel Sweepers/Scrubbers	MOVES	0.0090	0.0004	73.3%	73.3%	population	0.0066	0.0003
2270003040	Industrial	Diesel Other General Industrial Equipment	MOVES	0.0115	0.0007	73.3%	73.3%	population	0.0084	0.0005
2270003050	Industrial	Diesel Other Material Handling Equipment	MOVES	0.0009	0.0001	73.3%	73.3%	population	0.0006	0.0001
2270003060	Industrial	Diesel AC/Refrigeration	MOVES	0.0417	0.0018	73.3%	73.3%	population	0.0306	0.0013
2270003070	Industrial	Diesel Terminal Tractors	MOVES	0.0063	0.0003	73.3%	73.3%	population	0.0046	0.0002
2270004031	Lawn/Garden	Diesel Leafblowers/Vacuums (Commercial)	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2270004036	Lawn/Garden	Diesel Snowblowers (Commercial)	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2270004046	Lawn/Garden	Diesel Front Mowers (Commercial)	MOVES	0.0103	0.0010	73.3%	73.3%	population	0.0075	0.0007
2270004056	Lawn/Garden	Diesel Lawn & Garden Tractors (Commercial)	MOVES	0.0021	0.0002	73.3%	73.3%	population	0.0016	0.0002
2270004066	Lawn/Garden	Diesel Chippers/Stump Grinders (Commercial)	MOVES	0.0148	0.0012	73.3%	73.3%	population	0.0109	0.0009
2270004071	Lawn/Garden	Diesel Commercial Turf Equipment (Comm.)	MOVES	0.0010	0.0001	73.3%	73.3%	population	0.0007	0.0000
2270004076	Lawn/Garden	Diesel Other Lawn & Garden Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2270005010	Agriculture	Diesel 2-Wheel Tractors	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005015	Agriculture	Diesel Agricultural Tractors	MOVES	0.0552	0.0039	24.2%	24.2%	land area (1)	0.0133	0.0010
2270005020	Agriculture	Diesel Combines	MOVES	0.0092	0.0007	24.2%	24.2%	land area (1)	0.0022	0.0002
2270005025	Agriculture	Diesel Balers	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005030	Agriculture	Diesel Agricultural Mowers	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005035	Agriculture	Diesel Sprayers	MOVES	0.0007	0.0001	24.2%	24.2%	land area (1)	0.0002	0.0000
2270005040	Agriculture	Diesel Tillers > 6 HP	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005045	Agriculture	Diesel Swathers	MOVES	0.0007	0.0001	24.2%	24.2%	land area (1)	0.0002	0.0000
2270005055	Agriculture	Diesel Other Agricultural Equipment	MOVES	0.0015	0.0001	24.2%	24.2%	land area (1)	0.0004	0.0000
2270005060	Agriculture	Diesel Irrigation Sets	MOVES	0.0005	0.0000	24.2%	24.2%	land area (1)	0.0001	0.0000
2270006005	Commercial	Diesel Light Commercial Generator Sets	MOVES	0.0168	0.0016	73.3%	73.3%	population	0.0123	0.0012
2270006010	Commercial	Diesel Light Commercial Pumps	MOVES	0.0040	0.0004	73.3%	73.3%	population	0.0029	0.0003
2270006015	Commercial	Diesel Light Commercial Air Compressors	MOVES	0.0070	0.0004	73.3%	73.3%	population	0.0051	0.0003
2270006025	Commercial	Diesel Light Commercial Welders	MOVES	0.0054	0.0010	73.3%	73.3%	population	0.0040	0.0008
2270006030	Commercial	Diesel Light Commercial Pressure Washer	MOVES	0.0006	0.0001	73.3%	73.3%	population	0.0004	0.0000
2270006035	Commercial	Diesel Hydro Power Units	MOVES	0.0003	0.0000	73.3%	73.3%	population	0.0002	0.0000
2270007015	Logging	Diesel Logging Equip Fell/Bunch/Skidders	MOVES	0.0001	0.0000	30.9%	30.9%	land area	0.0000	0.0000

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2020 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2020 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2270008005	Airport Support	Diesel Airport Ground Support Equipment	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
2275001000	Airport	Military Aircraft	EPA	0.0034	0.0016	100.0%	100.0%	airport location	0.0034	0.0016
2275050011	Airport	General Aviation Aircraft, Piston	EPA	0.0020	0.0047	76.7%	76.7%	airport location	0.0015	0.0036
2275050012	Airport	General Aviation Aircraft, Turbine	EPA	0.0040	0.0082	79.5%	78.9%	airport location	0.0032	0.0065
2275060011	Airport	Taxi Aircraft, Piston	EPA	0.0001	0.0001	98.5%	98.5%	airport location	0.0001	0.0001
2275060012	Airport	Taxi Aircraft, Turbine	EPA	0.0015	0.0019	98.5%	98.5%	airport location	0.0015	0.0019
2275070000	Airport	Aircraft Auxiliary Power Units	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
2280002201	Comm. Mar.	CM Vessels, Diesel, Underway, C1&C2, Main Eng.	EPA	0.1092	0.0042	100.0%	100.0%	Lk. Mich. Shoreline	0.1092	0.0042
2280002202	Comm. Mar.	CM Vessels, Diesel, Underway, C1&C2, Aux. Eng.	EPA	0.2145	0.0062	100.0%	100.0%	Lk. Mich. Shoreline	0.2145	0.0062
2280002203	Comm. Mar.	CM Vessels, Diesel, Underway, C3, Main Eng.	EPA	0.0948	0.0039	100.0%	100.0%	Lk. Mich. Shoreline	0.0948	0.0039
2280002204	Comm. Mar.	CM Vessels, Diesel, Underway, C3, Aux. Eng.	EPA	0.0078	0.0003	100.0%	100.0%	Lk. Mich. Shoreline	0.0078	0.0003
2282005010	Pleasure Craft	2-Stroke Outboards	MOVES	0.0430	0.1932	4.0%	4.0%	water area	0.0017	0.0077
2282005015	Pleasure Craft	2-Stroke Personal Watercraft	MOVES	0.0200	0.0302	70.0%	70.0%	water area	0.0140	0.0212
2282010005	Pleasure Craft	4-Stroke Inboards	MOVES	0.0722	0.0685	70.0%	70.0%	water area	0.0505	0.0480
2282020005	Pleasure Craft	Diesel Inboards	MOVES	0.0778	0.0044	70.0%	70.0%	water area	0.0545	0.0031
2282020010	Pleasure Craft	Diesel Outboards	MOVES	0.0001	0.0000	4.0%	4.0%	water area	0.0000	0.0000
228500200x	Railroad	All Diesel Locomotives	EPA	0.6819	0.0312	66.7%	67.4%	rail links	0.4548	0.0210
2285002015	Railway Maint.	Diesel Railway Maintenance	MOVES	0.0013	0.0002	100.0%	100.0%	rail links	0.0013	0.0002
2285004015	Railway Maint.	4-Stroke Gasoline Railway Maintenance	MOVES	0.0000	0.0001	100.0%	100.0%	rail links	0.0000	0.0001
2285006015	Railway Maint.	LPG Railway Maintenance	MOVES	0.0000	0.0000	100.0%	100.0%	rail links	0.0000	0.0000
ALL (Total)	**ALL (Total)**	**ALL (Total)**		**2.1196**	**1.1350**	**73.2%**	**57.8%**		**1.5513**	**0.6556**
22xx005xxx	Agriculture	All	MOVES	0.0697	0.0087	24.2%	24.2%	land area (1)	0.0169	0.0021
22750xxxxx	Airport	All	EPA	0.0110	0.0166	88.1%	82.8%	airport location	0.0097	0.0137
22xx008005	Airport Support	All	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
22xx006xxx	Commercial	All	MOVES	0.0514	0.0639	73.3%	73.3%	population	0.0377	0.0469
2280002xxx	Comm. Mar	All	EPA	0.4262	0.0146	100.0%	100.0%	Lk. Mich. Shoreline	0.4262	0.0146
22xx002xxx	Construction	All	MOVES	0.3982	0.0764	73.3%	73.3%	population	0.2919	0.0560
22xx003xxx	Industrial	All	MOVES	0.1577	0.0247	73.3%	73.3%	population	0.1156	0.0181
22xx004xxx	Lawn/Garden	All	MOVES	0.1011	0.5116	73.3%	73.3%	population	0.0741	0.3750
22xx007xxx	Logging	All	MOVES	0.0001	0.0002	30.9%	30.9%	land area	0.0000	0.0000
22820xxxxx	Pleasure Craft	All	MOVES	0.2130	0.2964	56.7%	27.0%	water area	0.1207	0.0799
228500200x	Railroad	All	EPA	0.6819	0.0312	66.7%	67.4%	rail links	0.4548	0.0210
228500x015	Railway Maint.	All	MOVES	0.0013	0.0003	100.0%	100.0%	rail links	0.0013	0.0003
22xx001xxx	Recreational	All	MOVES	0.0079	0.0906	30.9%	30.9%	land area	0.0024	0.0280
ALL (Total)	**ALL (Total)**	**ALL (Total)**		**2.1196**	**1.1350**	**73.2%**	**57.8%**		**1.5513**	**0.6556**

(1) City of Kenosha excluded.

Table A6.4. 2021 Nonroad NO_X and VOC Emissions: tons per ozone season day (tposd)
Kenosha County and the Partial Kenosha County 2008 ozone nonattainment area

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2021 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2021 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2260001010	Recreational	2-Stroke Motorcycles: Off-Road	MOVES	0.0006	0.0448	30.9%	30.9%	land area	0.0002	0.0138
2260001030	Recreational	2-Stroke All Terrain Vehicles	MOVES	0.0003	0.0064	30.9%	30.9%	land area	0.0001	0.0020
2260001060	Recreational	2-Stroke Specialty Vehicle Carts	MOVES	0.0002	0.0007	30.9%	30.9%	land area	0.0001	0.0002
2260002006	Construction	2-Stroke Tampers/Rammers	MOVES	0.0002	0.0082	73.3%	73.3%	population	0.0001	0.0060
2260002009	Construction	2-Stroke Plate Compactors	MOVES	0.0000	0.0003	73.3%	73.3%	population	0.0000	0.0002
2260002021	Construction	2-Stroke Paving Equipment	MOVES	0.0000	0.0003	73.3%	73.3%	population	0.0000	0.0003
2260002027	Construction	2-Stroke Signal Boards	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260002039	Construction	2-Stroke Concrete/Industrial Saws	MOVES	0.0005	0.0209	73.3%	73.3%	population	0.0004	0.0153
2260002054	Construction	2-Stroke Crushing/Proc. Equipment	MOVES	0.0000	0.0001	73.3%	73.3%	population	0.0000	0.0001
2260003030	Industrial	2-Stroke Sweepers/Scrubbers	MOVES	0.0000	0.0003	73.3%	73.3%	population	0.0000	0.0002
2260003040	Industrial	2-Stroke Other General Industrial Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260004015	Lawn/Garden	2-Stroke Rotary Tillers < 6 HP (Residential)	MOVES	0.0001	0.0014	73.3%	73.3%	population	0.0000	0.0010
2260004016	Lawn/Garden	2-Stroke Rotary Tillers < 6 HP (Commercial)	MOVES	0.0002	0.0040	73.3%	73.3%	population	0.0001	0.0029
2260004020	Lawn/Garden	2-Stroke Chain Saws < 6 HP (Residential)	MOVES	0.0004	0.0140	73.3%	73.3%	population	0.0003	0.0102
2260004021	Lawn/Garden	2-Stroke Chain Saws < 6 HP (Commercial)	MOVES	0.0010	0.0456	73.3%	73.3%	population	0.0007	0.0334
2260004025	Lawn/Garden	2-Stroke Trimmers/Edgers/Brush Cutters (Res.)	MOVES	0.0011	0.0277	73.3%	73.3%	population	0.0008	0.0203
2260004026	Lawn/Garden	2-Stroke Trimmers/Edgers/Brush Cutters (Com.)	MOVES	0.0018	0.0457	73.3%	73.3%	population	0.0013	0.0335
2260004030	Lawn/Garden	2-Stroke Leafblowers/Vacuums (Residential)	MOVES	0.0007	0.0170	73.3%	73.3%	population	0.0005	0.0125
2260004031	Lawn/Garden	2-Stroke Leafblowers/Vacuums (Commercial)	MOVES	0.0017	0.0457	73.3%	73.3%	population	0.0012	0.0335
2260004035	Lawn/Garden	2-Stroke Snowblowers (Residential)	MOVES	0.0000	0.0010	73.3%	73.3%	population	0.0000	0.0007
2260004036	Lawn/Garden	2-Stroke Snowblowers (Commercial)	MOVES	0.0000	0.0001	73.3%	73.3%	population	0.0000	0.0001
2260004071	Lawn/Garden	2-Stroke Commercial Turf Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260005035	Agriculture	2-Stroke Sprayers	MOVES	0.0000	0.0001	24.2%	24.2%	land area (1)	0.0000	0.0000
2260006005	Commercial	2-Stroke Light Commercial Generator Set	MOVES	0.0000	0.0010	73.3%	73.3%	population	0.0000	0.0008
2260006010	Commercial	2-Stroke Light Commercial Pumps	MOVES	0.0003	0.0072	73.3%	73.3%	population	0.0002	0.0053
2260006015	Commercial	2-Stroke Light Commercial Air Compressors	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260006035	Commercial	2-Stroke Hydro Power Units	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2260007005	Logging	2-Stroke Logging Equipment Chain Saws > 6 HP	MOVES	0.0000	0.0001	30.9%	30.9%	land area	0.0000	0.0000
2265001010	Recreational	4-Stroke Motorcycles: Off-Road	MOVES	0.0003	0.0021	30.9%	30.9%	land area	0.0001	0.0007
2265001030	Recreational	4-Stroke All Terrain Vehicles	MOVES	0.0021	0.0217	30.9%	30.9%	land area	0.0006	0.0067
2265001050	Recreational	4-Stroke Golf Carts	MOVES	0.0035	0.0114	30.9%	30.9%	land area	0.0011	0.0035
2265001060	Recreational	4-Stroke Specialty Vehicle Carts	MOVES	0.0002	0.0008	30.9%	30.9%	land area	0.0001	0.0002
2265002003	Construction	4-Stroke Asphalt Pavers	MOVES	0.0001	0.0004	73.3%	73.3%	population	0.0001	0.0003
2265002006	Construction	4-Stroke Tampers/Rammers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2265002009	Construction	4-Stroke Plate Compactors	MOVES	0.0002	0.0009	73.3%	73.3%	population	0.0002	0.0007
2265002015	Construction	4-Stroke Rollers	MOVES	0.0002	0.0006	73.3%	73.3%	population	0.0002	0.0005
2265002021	Construction	4-Stroke Paving Equipment	MOVES	0.0005	0.0017	73.3%	73.3%	population	0.0003	0.0012

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2021 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2021 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2265002024	Construction	4-Stroke Surfacing Equipment	MOVES	0.0002	0.0007	73.3%	73.3%	population	0.0001	0.0005
2265002027	Construction	4-Stroke Signal Boards	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2265002030	Construction	4-Stroke Trenchers	MOVES	0.0004	0.0012	73.3%	73.3%	population	0.0003	0.0009
2265002033	Construction	4-Stroke Bore/Drill Rigs	MOVES	0.0002	0.0006	73.3%	73.3%	population	0.0002	0.0004
2265002039	Construction	4-Stroke Concrete/Industrial Saws	MOVES	0.0009	0.0026	73.3%	73.3%	population	0.0006	0.0019
2265002042	Construction	4-Stroke Cement & Mortar Mixers	MOVES	0.0004	0.0020	73.3%	73.3%	population	0.0003	0.0014
2265002045	Construction	4-Stroke Cranes	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0000	0.0000
2265002054	Construction	4-Stroke Crushing/Proc. Equipment	MOVES	0.0001	0.0002	73.3%	73.3%	population	0.0000	0.0001
2265002057	Construction	4-Stroke Rough Terrain Forklifts	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0000	0.0000
2265002060	Construction	4-Stroke Rubber Tire Loaders	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2265002066	Construction	4-Stroke Tractors/Loaders/Backhoes	MOVES	0.0003	0.0008	73.3%	73.3%	population	0.0002	0.0006
2265002072	Construction	4-Stroke Skid Steer Loaders	MOVES	0.0003	0.0004	73.3%	73.3%	population	0.0002	0.0003
2265002078	Construction	4-Stroke Dumpers/Tenders	MOVES	0.0001	0.0003	73.3%	73.3%	population	0.0001	0.0002
2265002081	Construction	4-Stroke Other Construction Equipment	MOVES	0.0001	0.0001	73.3%	73.3%	population	0.0001	0.0000
2265003010	Industrial	4-Stroke Aerial Lifts	MOVES	0.0015	0.0018	73.3%	73.3%	population	0.0011	0.0013
2265003020	Industrial	4-Stroke Forklifts	MOVES	0.0033	0.0015	73.3%	73.3%	population	0.0024	0.0011
2265003030	Industrial	4-Stroke Sweepers/Scrubbers	MOVES	0.0008	0.0015	73.3%	73.3%	population	0.0006	0.0011
2265003040	Industrial	4-Stroke Other General Industrial Equipment	MOVES	0.0017	0.0062	73.3%	73.3%	population	0.0012	0.0045
2265003050	Industrial	4-Stroke Other Material Handling Equipment	MOVES	0.0001	0.0001	73.3%	73.3%	population	0.0001	0.0001
2265003060	Industrial	4-Stroke Industrial AC/Refrigeration	MOVES	0.0000	0.0001	73.3%	73.3%	population	0.0000	0.0001
2265003070	Industrial	4-Stroke Terminal Tractors	MOVES	0.0003	0.0001	73.3%	73.3%	population	0.0002	0.0001
2265004010	Lawn/Garden	4-Stroke Lawn mowers (Residential)	MOVES	0.0071	0.0582	73.3%	73.3%	population	0.0052	0.0426
2265004011	Lawn/Garden	4-Stroke Lawn mowers (Commercial)	MOVES	0.0037	0.0237	73.3%	73.3%	population	0.0027	0.0174
2265004015	Lawn/Garden	4-Stroke Rotary Tillers < 6 HP (Residential)	MOVES	0.0006	0.0053	73.3%	73.3%	population	0.0005	0.0039
2265004016	Lawn/Garden	4-Stroke Rotary Tillers < 6 HP (Commercial)	MOVES	0.0019	0.0139	73.3%	73.3%	population	0.0014	0.0102
2265004025	Lawn/Garden	4-Stroke Trimmers/Edgers/Brush Cutters (Res.)	MOVES	0.0000	0.0004	73.3%	73.3%	population	0.0000	0.0003
2265004026	Lawn/Garden	4-Stroke Trimmers/Edgers/Brush Cutters (Com.)	MOVES	0.0001	0.0006	73.3%	73.3%	population	0.0001	0.0005
2265004030	Lawn/Garden	4-Stroke Leafblowers/Vacuums (Residential)	MOVES	0.0001	0.0005	73.3%	73.3%	population	0.0001	0.0004
2265004031	Lawn/Garden	4-Stroke Leafblowers/Vacuums (Commercial)	MOVES	0.0036	0.0148	73.3%	73.3%	population	0.0026	0.0108
2265004035	Lawn/Garden	4-Stroke Snowblowers (Residential)	MOVES	0.0000	0.0023	73.3%	73.3%	population	0.0000	0.0017
2265004036	Lawn/Garden	4-Stroke Snowblowers (Commercial)	MOVES	0.0000	0.0002	73.3%	73.3%	population	0.0000	0.0002
2265004040	Lawn/Garden	4-Stroke Rear Engine Riding Mowers (Res.)	MOVES	0.0014	0.0080	73.3%	73.3%	population	0.0011	0.0059
2265004041	Lawn/Garden	4-Stroke Rear Engine Riding Mowers (Comm.)	MOVES	0.0004	0.0015	73.3%	73.3%	population	0.0003	0.0011
2265004046	Lawn/Garden	4-Stroke Front Mowers (Commercial)	MOVES	0.0005	0.0019	73.3%	73.3%	population	0.0004	0.0014
2265004051	Lawn/Garden	4-Stroke Shredders < 6 HP (Commercial)	MOVES	0.0002	0.0016	73.3%	73.3%	population	0.0002	0.0012
2265004055	Lawn/Garden	4-Stroke Lawn & Garden Tractors (Residential)	MOVES	0.0192	0.0875	73.3%	73.3%	population	0.0141	0.0641
2265004056	Lawn/Garden	4-Stroke Lawn & Garden Tractors (Commercial)	MOVES	0.0056	0.0190	73.3%	73.3%	population	0.0041	0.0139
2265004066	Lawn/Garden	4-Stroke Chippers/Stump Grinders (Comm.)	MOVES	0.0009	0.0020	73.3%	73.3%	population	0.0007	0.0015
2265004071	Lawn/Garden	4-Stroke Commercial Turf Equipment (Comm.)	MOVES	0.0181	0.0557	73.3%	73.3%	population	0.0133	0.0409
2265004075	Lawn/Garden	4-Stroke Other Lawn & Garden Equip. (Res.)	MOVES	0.0008	0.0038	73.3%	73.3%	population	0.0006	0.0028

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				NOx	VOC	NOx	VOC		NOx	VOC
2265004076	Lawn/Garden	4-Stroke Other Lawn & Garden Equip. (Com.)	MOVES	0.0006	0.0030	73.3%	73.3%	population	0.0005	0.0022
2265005010	Agriculture	4-Stroke 2-Wheel Tractors	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005015	Agriculture	4-Stroke Agricultural Tractors	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005020	Agriculture	4-Stroke Combines	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005025	Agriculture	4-Stroke Balers	MOVES	0.0002	0.0002	24.2%	24.2%	land area (1)	0.0000	0.0001
2265005030	Agriculture	4-Stroke Agricultural Mowers	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265005035	Agriculture	4-Stroke Sprayers	MOVES	0.0002	0.0004	24.2%	24.2%	land area (1)	0.0001	0.0001
2265005040	Agriculture	4-Stroke Tillers > 5 HP	MOVES	0.0004	0.0020	24.2%	24.2%	land area (1)	0.0001	0.0005
2265005045	Agriculture	4-Stroke Swathers	MOVES	0.0003	0.0003	24.2%	24.2%	land area (1)	0.0001	0.0001
2265005055	Agriculture	4-Stroke Other Agricultural Equipment	MOVES	0.0003	0.0003	24.2%	24.2%	land area (1)	0.0001	0.0001
2265005060	Agriculture	4-Stroke Irrigation Sets	MOVES	0.0001	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2265006005	Commercial	4-Stroke Light Commercial Generator Set	MOVES	0.0057	0.0257	73.3%	73.3%	population	0.0042	0.0188
2265006010	Commercial	4-Stroke Light Commercial Pumps	MOVES	0.0015	0.0058	73.3%	73.3%	population	0.0011	0.0043
2265006015	Commercial	4-Stroke Light Commercial Air Compressors	MOVES	0.0008	0.0024	73.3%	73.3%	population	0.0006	0.0017
2265006025	Commercial	4-Stroke Light Commercial Welders	MOVES	0.0016	0.0054	73.3%	73.3%	population	0.0012	0.0040
2265006030	Commercial	4-Stroke Light Commercial Pressure Wash	MOVES	0.0025	0.0114	73.3%	73.3%	population	0.0019	0.0083
2265006035	Commercial	4-Stroke Hydro Power Units	MOVES	0.0001	0.0004	73.3%	73.3%	population	0.0001	0.0003
2265007010	Logging	4-Stroke Logging Equipment Shredders > 6 HP	MOVES	0.0000	0.0000	30.9%	30.9%	land area	0.0000	0.0000
2265007015	Logging	4-Stroke Logging Equipment Skidders	MOVES	0.0000	0.0000	30.9%	30.9%	land area	0.0000	0.0000
2265008005	Airport Support	4-Stroke Airport Ground Support Equipment	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
2267001060	Recreational	LPG Specialty Vehicle Carts	MOVES	0.0000	0.0000	30.9%	30.9%	land area	0.0000	0.0000
2267002003	Construction	LPG Asphalt Pavers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002015	Construction	LPG Rollers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002021	Construction	LPG Paving Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002024	Construction	LPG Surfacing Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002030	Construction	LPG Trenchers	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267002033	Construction	LPG Bore/Drill Rigs	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267002039	Construction	LPG Concrete/Industrial Saws	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002045	Construction	LPG Cranes	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002054	Construction	LPG Crushing/Proc. Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002057	Construction	LPG Rough Terrain Forklifts	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002060	Construction	LPG Rubber Tire Loaders	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267002066	Construction	LPG Tractors/Loaders/Backhoes	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267002072	Construction	LPG Skid Steer Loaders	MOVES	0.0002	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267002081	Construction	LPG Other Construction Equipment	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267003010	Industrial	LPG Aerial Lifts	MOVES	0.0012	0.0002	73.3%	73.3%	population	0.0009	0.0002
2267003020	Industrial	LPG Forklifts	MOVES	0.0529	0.0063	73.3%	73.3%	population	0.0388	0.0047
2267003030	Industrial	LPG Sweepers/Scrubbers	MOVES	0.0004	0.0000	73.3%	73.3%	population	0.0003	0.0000
2267003040	Industrial	LPG Other General Industrial Equipment	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267003050	Industrial	LPG Other Material Handling Equipment	MOVES	0.0001	0.0000	73.3%	73.3%	population	0.0000	0.0000

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2267003070	Industrial	LPG Terminal Tractors	MOVES	0.0002	0.0000	73.3%	73.3%	population	0.0002	0.0000
2267004066	Lawn/Garden	LPG Chippers/Stump Grinders (Commercial)	MOVES	0.0003	0.0000	73.3%	73.3%	population	0.0002	0.0000
2267005055	Agriculture	LPG Other Agricultural Equipment	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2267005060	Agriculture	LPG Irrigation Sets	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2267006005	Commercial	LPG Light Commercial Generator Sets	MOVES	0.0023	0.0004	73.3%	73.3%	population	0.0017	0.0003
2267006010	Commercial	LPG Light Commercial Pumps	MOVES	0.0003	0.0000	73.3%	73.3%	population	0.0002	0.0000
2267006015	Commercial	LPG Light Commercial Air Compressors	MOVES	0.0002	0.0000	73.3%	73.3%	population	0.0001	0.0000
2267006025	Commercial	LPG Light Commercial Welders	MOVES	0.0002	0.0000	73.3%	73.3%	population	0.0002	0.0000
2267006030	Commercial	LPG Light Commercial Pressure Washers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267006035	Commercial	LPG Hydro Power Units	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2267008005	Airport Support	LPG Airport Ground Support Equipment	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
2268002081	Construction	CNG Other Construction Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268003020	Industrial	CNG Forklifts	MOVES	0.0043	0.0019	73.3%	73.3%	population	0.0032	0.0014
2268003030	Industrial	CNG Sweepers/Scrubbers	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268003040	Industrial	CNG Other General Industrial Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268003060	Industrial	CNG AC/Refrigeration	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268003070	Industrial	CNG Terminal Tractors	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268005055	Agriculture	CNG Other Agricultural Equipment	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2268005060	Agriculture	CNG Irrigation Sets	MOVES	0.0001	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2268006005	Commercial	CNG Light Commercial Generator Sets	MOVES	0.0009	0.0005	73.3%	73.3%	population	0.0007	0.0004
2268006010	Commercial	CNG Light Commercial Pumps	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268006015	Commercial	CNG Light Commercial Air Compressors	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2268006020	Commercial	CNG Light Commercial Gas Compressors	MOVES	0.0006	0.0003	73.3%	73.3%	population	0.0004	0.0002
2270001060	Recreational	Diesel Specialty Vehicle Carts	MOVES	0.0006	0.0001	30.9%	30.9%	land area	0.0002	0.0000
2270002003	Construction	Diesel Pavers	MOVES	0.0040	0.0002	73.3%	73.3%	population	0.0030	0.0001
2270002006	Construction	Diesel Tampers/Rammers (unused)	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2270002009	Construction	Diesel Plate Compactors	MOVES	0.0003	0.0001	73.3%	73.3%	population	0.0003	0.0000
2270002015	Construction	Diesel Rollers	MOVES	0.0120	0.0006	73.3%	73.3%	population	0.0088	0.0004
2270002018	Construction	Diesel Scrapers	MOVES	0.0073	0.0004	73.3%	73.3%	population	0.0054	0.0003
2270002021	Construction	Diesel Paving Equipment	MOVES	0.0008	0.0001	73.3%	73.3%	population	0.0006	0.0000
2270002024	Construction	Diesel Surfacing Equipment	MOVES	0.0008	0.0000	73.3%	73.3%	population	0.0006	0.0000
2270002027	Construction	Diesel Signal Boards	MOVES	0.0031	0.0003	73.3%	73.3%	population	0.0022	0.0002
2270002030	Construction	Diesel Trenchers	MOVES	0.0084	0.0004	73.3%	73.3%	population	0.0061	0.0003
2270002033	Construction	Diesel Bore/Drill Rigs	MOVES	0.0115	0.0008	73.3%	73.3%	population	0.0085	0.0006
2270002036	Construction	Diesel Excavators	MOVES	0.0240	0.0011	73.3%	73.3%	population	0.0176	0.0008
2270002039	Construction	Diesel Concrete/Industrial Saws	MOVES	0.0006	0.0000	73.3%	73.3%	population	0.0004	0.0000
2270002042	Construction	Diesel Cement & Mortar Mixers	MOVES	0.0005	0.0001	73.3%	73.3%	population	0.0004	0.0000
2270002045	Construction	Diesel Cranes	MOVES	0.0092	0.0005	73.3%	73.3%	population	0.0067	0.0003
2270002048	Construction	Diesel Graders	MOVES	0.0054	0.0003	73.3%	73.3%	population	0.0039	0.0002
2270002051	Construction	Diesel Off-highway Trucks	MOVES	0.0469	0.0013	73.3%	73.3%	population	0.0343	0.0010

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				NOx	VOC	NOx	VOC		NOx	VOC
2270002054	Construction	Diesel Crushing/Proc. Equipment	MOVES	0.0023	0.0001	73.3%	73.3%	population	0.0017	0.0001
2270002057	Construction	Diesel Rough Terrain Forklifts	MOVES	0.0168	0.0008	73.3%	73.3%	population	0.0123	0.0006
2270002060	Construction	Diesel Rubber Tire Loaders	MOVES	0.0477	0.0023	73.3%	73.3%	population	0.0350	0.0017
2270002066	Construction	Diesel Tractors/Loaders/Backhoes	MOVES	0.0565	0.0095	73.3%	73.3%	population	0.0414	0.0070
2270002069	Construction	Diesel Crawler Tractors	MOVES	0.0356	0.0015	73.3%	73.3%	population	0.0261	0.0011
2270002072	Construction	Diesel Skid Steer Loaders	MOVES	0.0509	0.0095	73.3%	73.3%	population	0.0373	0.0070
2270002075	Construction	Diesel Off-Highway Tractors	MOVES	0.0066	0.0003	73.3%	73.3%	population	0.0049	0.0002
2270002078	Construction	Diesel Dumpers/Tenders	MOVES	0.0002	0.0000	73.3%	73.3%	population	0.0001	0.0000
2270002081	Construction	Diesel Other Construction Equipment	MOVES	0.0068	0.0004	73.3%	73.3%	population	0.0050	0.0003
2270003010	Industrial	Diesel Aerial Lifts	MOVES	0.0038	0.0007	73.3%	73.3%	population	0.0028	0.0005
2270003020	Industrial	Diesel Forklifts	MOVES	0.0176	0.0004	73.3%	73.3%	population	0.0129	0.0003
2270003030	Industrial	Diesel Sweepers/Scrubbers	MOVES	0.0083	0.0004	73.3%	73.3%	population	0.0061	0.0003
2270003040	Industrial	Diesel Other General Industrial Equipment	MOVES	0.0103	0.0006	73.3%	73.3%	population	0.0076	0.0004
2270003050	Industrial	Diesel Other Material Handling Equipment	MOVES	0.0008	0.0001	73.3%	73.3%	population	0.0006	0.0001
2270003060	Industrial	Diesel AC/Refrigeration	MOVES	0.0422	0.0017	73.3%	73.3%	population	0.0309	0.0012
2270003070	Industrial	Diesel Terminal Tractors	MOVES	0.0052	0.0003	73.3%	73.3%	population	0.0038	0.0002
2270004031	Lawn/Garden	Diesel Leafblowers/Vacuums (Commercial)	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2270004036	Lawn/Garden	Diesel Snowblowers (Commercial)	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2270004046	Lawn/Garden	Diesel Front Mowers (Commercial)	MOVES	0.0100	0.0009	73.3%	73.3%	population	0.0073	0.0007
2270004056	Lawn/Garden	Diesel Lawn & Garden Tractors (Commercial)	MOVES	0.0021	0.0002	73.3%	73.3%	population	0.0015	0.0002
2270004066	Lawn/Garden	Diesel Chippers/Stump Grinders (Commercial)	MOVES	0.0140	0.0011	73.3%	73.3%	population	0.0103	0.0008
2270004071	Lawn/Garden	Diesel Commercial Turf Equipment (Comm.)	MOVES	0.0009	0.0000	73.3%	73.3%	population	0.0007	0.0000
2270004076	Lawn/Garden	Diesel Other Lawn & Garden Equipment	MOVES	0.0000	0.0000	73.3%	73.3%	population	0.0000	0.0000
2270005010	Agriculture	Diesel 2-Wheel Tractors	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005015	Agriculture	Diesel Agricultural Tractors	MOVES	0.0504	0.0035	24.2%	24.2%	land area (1)	0.0122	0.0008
2270005020	Agriculture	Diesel Combines	MOVES	0.0085	0.0007	24.2%	24.2%	land area (1)	0.0020	0.0002
2270005025	Agriculture	Diesel Balers	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005030	Agriculture	Diesel Agricultural Mowers	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005035	Agriculture	Diesel Sprayers	MOVES	0.0007	0.0001	24.2%	24.2%	land area (1)	0.0002	0.0000
2270005040	Agriculture	Diesel Tillers > 6 HP	MOVES	0.0000	0.0000	24.2%	24.2%	land area (1)	0.0000	0.0000
2270005045	Agriculture	Diesel Swathers	MOVES	0.0006	0.0001	24.2%	24.2%	land area (1)	0.0001	0.0000
2270005055	Agriculture	Diesel Other Agricultural Equipment	MOVES	0.0013	0.0001	24.2%	24.2%	land area (1)	0.0003	0.0000
2270005060	Agriculture	Diesel Irrigation Sets	MOVES	0.0005	0.0000	24.2%	24.2%	land area (1)	0.0001	0.0000
2270006005	Commercial	Diesel Light Commercial Generator Sets	MOVES	0.0162	0.0015	73.3%	73.3%	population	0.0119	0.0011
2270006010	Commercial	Diesel Light Commercial Pumps	MOVES	0.0038	0.0004	73.3%	73.3%	population	0.0028	0.0003
2270006015	Commercial	Diesel Light Commercial Air Compressors	MOVES	0.0066	0.0004	73.3%	73.3%	population	0.0048	0.0003
2270006025	Commercial	Diesel Light Commercial Welders	MOVES	0.0053	0.0009	73.3%	73.3%	population	0.0039	0.0007
2270006030	Commercial	Diesel Light Commercial Pressure Washer	MOVES	0.0005	0.0001	73.3%	73.3%	population	0.0004	0.0000
2270006035	Commercial	Diesel Hydro Power Units	MOVES	0.0003	0.0000	73.3%	73.3%	population	0.0002	0.0000
2270007015	Logging	Diesel Logging Equip Fell/Bunch/Skidders	MOVES	0.0001	0.0000	30.9%	30.9%	land area	0.0000	0.0000

SCC	Segment Description	SCC Description	Emis-sions from	Kenosha County 2021 Emissions		% in Partial Kenosha Co.		Allocate by	Partial Ken. Co. 2021 Emissions	
				NOx	VOC	NOx	VOC		NOx	VOC
2270008005	Airport Support	Diesel Airport Ground Support Equipment	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
2275001000	Airport	Military Aircraft	EPA	0.0031	0.0015	100.0%	100.0%	airport location	0.0031	0.0015
2275050011	Airport	General Aviation Aircraft, Piston	EPA	0.0020	0.0047	77.1%	77.1%	airport location	0.0016	0.0036
2275050012	Airport	General Aviation Aircraft, Turbine	EPA	0.0040	0.0084	79.8%	79.2%	airport location	0.0032	0.0066
2275060011	Airport	Taxi Aircraft, Piston	EPA	0.0001	0.0001	98.5%	98.5%	airport location	0.0001	0.0001
2275060012	Airport	Taxi Aircraft, Turbine	EPA	0.0015	0.0020	98.5%	98.5%	airport location	0.0015	0.0020
2275070000	Airport	Aircraft Auxiliary Power Units	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
2280002201	Comm. Mar.	CM Vessels, Diesel, Underway, C1&C2, Main Eng.	EPA	0.1045	0.0040	100.0%	100.0%	Lk. Mich. Shoreline	0.1045	0.0040
2280002202	Comm. Mar.	CM Vessels, Diesel, Underway, C1&C2, Aux. Eng.	EPA	0.2051	0.0059	100.0%	100.0%	Lk. Mich. Shoreline	0.2051	0.0059
2280002203	Comm. Mar.	CM Vessels, Diesel, Underway, C3, Main Eng.	EPA	0.0962	0.0040	100.0%	100.0%	Lk. Mich. Shoreline	0.0962	0.0040
2280002204	Comm. Mar.	CM Vessels, Diesel, Underway, C3, Aux. Eng.	EPA	0.0079	0.0003	100.0%	100.0%	Lk. Mich. Shoreline	0.0079	0.0003
2282005010	Pleasure Craft	2-Stroke Outboards	MOVES	0.0433	0.1750	4.0%	4.0%	water area	0.0017	0.0070
2282005015	Pleasure Craft	2-Stroke Personal Watercraft	MOVES	0.0203	0.0280	70.0%	70.0%	water area	0.0142	0.0196
2282010005	Pleasure Craft	4-Stroke Inboards	MOVES	0.0680	0.0655	70.0%	70.0%	water area	0.0476	0.0459
2282020005	Pleasure Craft	Diesel Inboards	MOVES	0.0769	0.0045	70.0%	70.0%	water area	0.0539	0.0031
2282020010	Pleasure Craft	Diesel Outboards	MOVES	0.0001	0.0000	4.0%	4.0%	water area	0.0000	0.0000
228500200x	Railroad	All Diesel Locomotives	EPA	0.6789	0.0307	67.9%	68.6%	rail links	0.4608	0.0210
2285002015	Railway Maint.	Diesel Railway Maintenance	MOVES	0.0012	0.0002	100.0%	100.0%	rail links	0.0012	0.0002
2285004015	Railway Maint.	4-Stroke Gasoline Railway Maintenance	MOVES	0.0000	0.0001	100.0%	100.0%	rail links	0.0000	0.0001
2285006015	Railway Maint.	LPG Railway Maintenance	MOVES	0.0000	0.0000	100.0%	100.0%	rail links	0.0000	0.0000
ALL (Total)	**ALL (Total)**	**ALL (Total)**		**2.0532**	**1.1010**	**73.6%**	**58.6%**		**1.5105**	**0.6452**
22xx005xxx	Agriculture	All	MOVES	0.0637	0.0079	24.2%	24.2%	land area (1)	0.0154	0.0019
22750xxxxx	Airport	All	EPA	0.0109	0.0167	88.0%	82.9%	airport location	0.0096	0.0139
22xx008005	Airport Support	All	EPA	0.0000	0.0000	100.0%	100.0%	airport location	0.0000	0.0000
22xx006xxx	Commercial	All	MOVES	0.0498	0.0641	73.3%	73.3%	population	0.0365	0.0470
2280002xxx	Comm. Mar	All	EPA	0.4136	0.0142	100.0%	100.0%	Lk. Mich. Shoreline	0.4136	0.0142
22xx002xxx	Construction	All	MOVES	0.3641	0.0731	73.3%	73.3%	population	0.2669	0.0536
22xx003xxx	Industrial	All	MOVES	0.1551	0.0243	73.3%	73.3%	population	0.1137	0.0178
22xx004xxx	Lawn/Garden	All	MOVES	0.0994	0.5085	73.3%	73.3%	population	0.0729	0.3727
22xx007xxx	Logging	All	MOVES	0.0001	0.0001	30.9%	30.9%	land area	0.0000	0.0000
22820xxxxx	Pleasure Craft	All	MOVES	0.2086	0.2730	56.3%	27.7%	water area	0.1174	0.0756
228500200x	Railroad	All	EPA	0.6789	0.0307	67.9%	68.6%	rail links	0.4608	0.0210
228500x015	Railway Maint.	All	MOVES	0.0012	0.0003	100.0%	100.0%	rail links	0.0012	0.0003
22xx001xxx	Recreational	All	MOVES	0.0078	0.0881	30.9%	30.9%	land area	0.0024	0.0272
ALL (Total)	ALL (Total)	ALL (Total)		**2.0532**	**1.1010**	**73.6%**	**58.6%**		**1.5105**	**0.6452**

(1) City of Kenosha excluded.

APPENDIX 7

2020 and 2021 Wisconsin Emissions Projections Documentation – Methodology

This appendix provides information for the sector-specific NOx and VOC tons per ozone season day (tposd) emission estimates in section 3.3 (2020 & 2021 Projected Year Inventories) of the Wisconsin Department of Natural Resources' (WDNR) Attainment Plan for the partial Kenosha County Nonattainment Area for the 2008 Ozone NAAQS. As part of this demonstration, the WDNR is providing a projection of emissions for 2020 as the serious attainment year and 2021 as the "additional year of attainment" year.

This appendix includes:

1. EGU Inventory Methodology for 2020 and 2021

See Appendix 2 for the projection methodology related to electric generating units (EGUs).

2. Point Non-EGU Inventory Methodology for 2020 and 2021

Non-EGU point source emissions are projected for 2020 and 2021 by applying growth factors to the 2017 base year inventory, as well as considering new and modified sources. A detailed description of the methodology is provided below, and a list of sources with the applied growth rates and calculated emissions is provided in Appendix 3.

2.1 Growth Factors from AEO 2019 for Existing Sources

Non-EGU point source projected 2020 and 2021 emissions were derived by applying growth factors to the 2017 base year inventory. Growth factors were developed from Annual Energy Outlook (AEO) 2019 industry-specific energy consumption data, summarized in Table A7.1. Growth in energy consumption was assumed to correspond linearly with growth in emissions. A second step in projecting emissions – accounting for potential emissions increases resulting from the modification of existing sources or the installation of new sources – is described in section 2.2 below.

Table A7.1. Growth Factors from AEO 2019 Used for Projecting Wisconsin Non-EGU Point Source Emissions for the Partial Kenosha County 2008 Ozone Nonattainment Area

NAICS	NAICS Description	AEO Industrial or Commercial Sub-sector	AEO Energy Consumption (trillion Btu) [1]			Growth Factors (from 2017) [2]	
			2017	2020	2021	2020 GF	2021 GF
311211	Flour Milling and Malt Manufacturing	Food Industry	1,220	1,194	1,210	0.98	0.99
311421	Fruit and Vegetable Canning	Food Industry	1,220	1,194	1,210	0.98	0.99
322222	Paper Bag and Coated and Treated Paper Manufacturing	Paper Industry	1,570	1,443	1,457	0.92	0.93
323111	Commercial Printing	Paper Industry	1,570	1,443	1,457	0.92	0.93
325510	Paint and Coating Manufacturing	Bulk Chemical Industry	6,941	7,795	8,180	1.12	1.18
331513	Steel Foundries	Iron and Steel Industry	1,198	1,312	1,215	1.10	1.01
331523	Nonferrous Metal Die-Casting Foundries	Aluminum Industry	209	225	219	1.08	1.05
332322	Sheet Metal Work Manufacturing	Metal Based Durables Industry - Fabricated Metal Products	332	366	359	1.10	1.08
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing	Metal Based Durables Industry - Machinery	145	159	157	1.09	1.08
335210	Small Electrical Appliance Manufacturing	Metal Based Durables Industry - Electrical Equipment	80	85	85	1.07	1.06

335921	Fiber Optic Cable Manufacturing	Metal Based Durables Industry - Electrical Equipment	80	85	85	1.07	1.06
337110	Wood Kitchen Cabinet and Countertop Manufacturing	Other Manufacturing - Wood Products	460	448	462	0.97	1.01
611310	Colleges, Universities, and Professional Schools	Commercial sector energy consumption (natural gas) for East North Central U.S.	729	791	803	1.08	1.10
622110	General Medical and Surgical Hospitals	Commercial sector energy consumption (natural gas) for East North Central U.S.	729	791	803	1.08	1.10

[1] Source: http://www.eia.gov/forecasts/aeo/index.cfm
[2] Growth factors for the entire 2017-2020 and 2017-2021 periods were calculated by dividing the 2020 or 2021 energy consumption values by the 2017 energy consumption value. If energy consumption values were not available from AEO for a NAICS category, a growth factor of 1.00 (i.e., no growth) was applied.

2.2. Modified and New Source Emissions

Section 172(c)(4) of the Clean Air Act (CAA) requires identification and quantification of potential emissions from new or modified sources when developing emission inventories for attainment and maintenance purposes. The point source emissions inventory described in section 2.1 above includes projections of emissions growth determined by applying general regional growth factors. However, this methodology alone does not distinguish emissions associated with modified and new sources. Therefore, as a second step the WDNR reviewed permitting actions for sources in the partial Kenosha County 2008 ozone nonattainment area from 2015 to 2019 (five years). A summary of the permitting activity and associated potential emissions is shown in Table A7.2. The resulting emissions from this exercise are added to the projected emissions for *existing* point source non-EGU, to yield the *total* projected point source non-EGU emissions for 2020 and 2021 found in section 3.3 of the attainment plan (see also Appendix 3, Table A3.2 for the addition of new/modified sources to existing sources). This approach may add emissions which overlap with existing source grown emissions, but it provides a more conservative estimate of future emissions. It should be noted that this future projection of emissions does not limit the amount of future emissions allowed from modified and new sources.

Table A7.2. Permitting Actions for Existing Source and New Emission Sources in the Partial Kenosha County 2008 Ozone Nonattainment Area – 2015 to 2019.

Construction Permit Class	Year	Potential Emissions Increase (tpy)		Estimated Ozone Season Emissions (tposd) [1]		Project Description	Construction Permit #
		NOx	VOC	NOx	VOC		
Minor action [2]	2015	0	0	0.00	0.00	N/A	
Minor action [2]	2016	0	10	0.00	0.04	Replacement of an existing 2,200 gal mixing tank with a 10,000 gal tank.	16-RSG-208-EXM
Minor action [2]	2017	0	0	0.00	0.00	N/A	
Minor action [2]	2018	0	0	0.00	0.00	N/A	
Minor action [2]	2019	0	0	0.00	0.00	N/A	
Total		**0**	**10**	**0.00**	**0.04**		

[1] Tons per ozone season day emissions are calculated based on the annual potential emissions divided by 260 weekdays.
[2] A minor action is a permitting action that is not subject to PSD or nonattainment NSR review.

3. Area Source Inventory Methodology for 2020 and 2021

EPA's 2016 Emissions Modeling Platform, Version 1 includes base year 2016 and projections for the years 2023 and 2028.[1] Wisconsin's 2020 and 2021 area source emissions were estimated primarily by interpolating between EPA's 2017 NEI and 2023 projections from 2016 modeling inventory. Methodologies used to develop 2023 emissions modeling platform projection data are available in the EPA's National Emissions Inventory Collaborative Wiki v1 release page.[2] The exception is that WDNR staff projected emissions from vehicle refueling at gasoline stations (Stage II refueling) using EPA's MOVES2014b model with the same activity inputs used for the onroad modeling. As was done for 2017, no Stage II vapor recovery program was modeled for 2020 and 2021. Owing to most vehicles now having their own vapor recovery system, called on-board refueling vapor recovery or ORVR, Stage II controls at the pump are largely redundant or even counter-productive. Wisconsin submitted a SIP revision removing Stage II requirements, and EPA approved the revision in November 2013. Even without a Stage II program in the projection years, emissions from Stage II refueling are less in 2020 and 2021 than in 2011 and 2017, owing to the larger percentage of vehicles having ORVR.

In order to obtain the areas source emissions for the partial Kenosha County 2008 ozone nonattainment area, the whole county emission estimates were allocated to the partial county area based on population data. The Kenosha County population data projections for 2020 and 2021 from the Wisconsin Department of Administration were used to calculate the emission estimates. The partial-county population was identified based on the relative population of the Minor Civil Divisions in the partial Kenosha County 2008 ozone nonattainment area compared with the entire county. For 2020 and 2021, the county's population, estimated to live in the partial Kenosha nonattainment area was 73% and 73% respectively. Appendix 4 includes tables of projected area source emissions for partial Kenosha County 2008 ozone nonattainment area by source category.

[1] ftp://newftp.epa.gov/Air/emismod/2016/v1/

[2] http://views.cira.colostate.edu/wiki/wiki/10202

4. Onroad Inventory Methodology for 2020 and 2021

The 2020 and 2021 projected onroad emissions were developed using the MOVES2014b model, as was done for the 2011 and 2017 emissions. Unless otherwise stated in this section, the methodology WDNR used for 2020 and 2021 is the same methodology WDNR used for years 2011 and 2017, as described in Appendix 1, section 2.3.

SEWRPC provided WDNR the same suite of MOVES inputs they provided for 2011 and 2017 for two projections years: 2021 and 2022. To obtain MOVES inputs for 2020, WDNR linearly back-casted to 2020 from 2022 and 2021 for each set of MOVES inputs.

The resulting annual VMTs WDNR inputted into MOVES2014b and the ozone season weekday VMT outputted by MOVES2014b are shown in the following two tables:

Table A7.3. Annual VMT Provided by SEWRPC and Inputted into MOVES2014b.

HPMS Vehicle Class	Year				
	2011	2017	2020 (back-casted)	2021	2022 (not inputted)
Motorcycles	6,774,406	6,973,960	7,222,187	7,285,014	7,347,840
Light Duty Vehicles	943,903,376	1,013,523,354	1,065,539,403	1,074,561,729	1,083,584,055
Buses	2,696,161	2,880,696	3,034,193	3,060,143	3,086,094
Single Unit Trucks	46,068,512	49,831,517	53,016,150	53,464,745	53,913,341
Combination Trucks	33,130,997	36,598,956	38,714,422	39,027,073	39,339,724
TOTAL	**1,032,573,452**	**1,109,808,483**	**1,167,526,355**	**1,177,398,704**	**1,187,271,054**

Table A7.4. Ozone Season Weekday VMT Outputted by MOVES2014b.

MOVES Vehicle Class	Year			
	2011	2017	2020	2021
Motorcycles	21,253	21,889	22,624	22,822
Passenger Cars	1,441,681	1,506,419	1,571,881	1,583,137
Passenger Trucks	1,212,672	1,332,727	1,409,490	1,422,961
Light Commercial Trucks	275,697	307,230	326,806	330,156
Intercity Buses	904	1,107	1,103	1,107
Transit Buses	1,985	2,024	2,160	2,168
School Buses	5,503	5,836	6,179	6,248
Refuse Trucks	6,166	6,412	6,748	6,984
Single Unit Short-haul Trucks	125,203	135,413	144,296	145,383
Single Unit Long-haul Trucks	6,819	7,680	8,128	8,177
Motor Homes	4,624	4,983	5,242	5,264
Combination Short-haul Trucks	22,204	26,850	27,111	27,023
Combination Long-haul Trucks	78,614	84,556	91,157	92,198
TOTAL	**3,203,324**	**3,443,126**	**3,622,925**	**3,653,628**

The total ozone season weekday VMT increases by 7.5% from 2011 to 2017, increases by 5.2% from 2017 to 2020, and increases by 0.8% from 2020 to 2021. In terms of annual VMT growth rates, these rates are 1.21% from 2011 to 2017, 1.71% from 2017 to 2020, and 0.85% from 2020 to 2021.

Annual VMT divided by ozone season weekday VMT equals 322.3 for all four years.

The vehicle populations for each of the years are:

Table A7.5. Vehicle Populations Provided by SEWRPC and Outputted by MOVES2014b.

MOVES Vehicle Class	Year				
	2011	2017	2020 (back-casted)	2021	2022 (not used)
Motorcycles	3,032	3,084	3,204	3,233	3,262
Passenger Cars	42,250	43,675	45,887	46,226	46,565
Passenger Trucks	30,562	32,867	35,009	35,355	35,701
Light Commercial Trucks	7,463	8,309	8,898	8,990	9,082
Intercity Buses	3	4	4	4	4
Transit Buses	12	14	15	15	15
School Buses	110	127	135	136	137
Refuse Trucks	76	87	94	95	96
Single Unit Short-haul Trucks	2,506	2,843	3,043	3,069	3,095
Single Unit Long-haul Trucks	105	121	128	129	130
Motor Homes	627	713	766	774	782
Combination Short-haul Trucks	225	251	259	259	259
Combination Long-haul Trucks	236	284	314	318	322
TOTAL	**87,207**	**92,379**	**97,756**	**98,603**	**99,450**

The total vehicle population increases by 5.9% from 2011 to 2017, increases by 5.8% from 2017 to 2020, and increases by 0.9% from 2020 to 2021. In terms of annual population growth rates, these rates are 0.96% from 2011 to 2017, 1.90% from 2017 to 2020, and 0.87% from 2020 to 2021.

WDNR projected the 2017 vehicle age distribution to 2020 and 2021 using the methodology presented in the memorandum: “New Method to Project Age Distribution”, from Allison DenBleyker, ERG, to Alison Eyth, EPA, dated August 14, 2019. This new method does not attempt to predict any future growth, and only shifts the economic recession “dip” for model years 2009 to 2011 downstream while dampening the recession’s effect with increasing calendar year. No other features of the age distribution change, except for minor shifts due to re-normalizing the distribution. EPA used this same methodology to project age distributions to the years 2020, 2023 and 2028 for their 2016 Emissions Modeling Platform. Table A3.5 presents the resulting average vehicle ages for all four inventory years.

Table A7.6. Average Vehicle Ages (years old).

MOVES Vehicle Class	Year			
	2011	2017	2020	2021
Motorcycle	7.28	13.74	13.65	13.61
Passenger Car	9.67	9.37	9.28	9.26
Passenger Truck	8.18	7.44	7.37	7.36
Light Commercial Truck	10.33	10.27	10.19	10.17
Intercity Bus	9.18	11.29	11.01	10.91
Transit Bus	10.60	12.33	12.33	12.33
School Bus	6.71	7.42	7.36	7.35
Refuse Truck	10.64	10.95	11.03	10.63
Single Unit Short-haul Truck	11.32	11.14	10.97	10.91
Single Unit Long-haul Truck	11.84	11.95	11.73	11.69
Motor Home	10.76	15.29	15.23	15.20
Combination Short-haul Truck	13.46	13.55	13.52	13.55
Combination Long-haul Truck	7.53	10.42	10.42	10.42

Emissions for 2020 and 2021 were increased by a 7.5% safety margin, as agreed through the transportation conformity consultative process.

The motor vehicle inspection and maintenance (I/M) program was assumed to remain in effect for 2020 and 2021.

Detailed listing of the projected onroad emissions and activity data are provided in Appendix 5.

5. Nonroad Inventory Methodology for 2020 and 2021

The methodology for determining the 2020 and 2021 projected nonroad emissions is parallel to the methodology used to determine the 2011 and 2017 estimates, as described in Appendix 1, section 2.4.

For all source categories except commercial marine, aircraft and rail locomotive (MAR), the nonroad component of the MOVES2014b model was run for Kenosha County at hot ozone season day temperatures. The updates to the default database, as described in Appendix 1, section 2.4.1, were also done for the runs for 2020 and 2021. Otherwise, the model's default growth projections were assumed.

In general, for the three MAR categories, the 2020 and 2021 emissions were calculated by linearly interpolating between emission values for years earlier than 2020 and later than 2021. Also, since the 2017 NEI incorporated recent methodological updates for commercial marine and aircraft, after the interpolation, the 2020 and 2021 emissions for those two MAR categories were normalized to the 2017 NEI. (An example of this interpolation and normalization calculation is shown in the table below.)

In particular, the 2020 and 2021 emissions for the three MAR categories were determined as follows:

- Commercial Marine: As a first step, 2020 and 2021 emissions were estimated by linearly interpolating between 2016 and 2028[3] emissions in EPA's 2016 emission modeling platform, version 1. Then, these 2020 and 2021 emission values were normalized to the 2017 NEI. See the below table for an example calculation.
- Aircraft: As a first step, 2020 and 2021 emissions were estimated by linearly interpolating between 2016 and 2023 emissions in EPA's 2016 emission modeling platform, version 1. Then, these 2020 and 2021 emission values were normalized to the 2017 NEI. See the below table for an example calculation.
- Rail Locomotive: 2020 and 2021 emissions were estimated by linearly interpolating between 2017 emissions in the 2017 NEI and 2023 emissions in EPA's 2016 emissions modeling platform, version 1.

[3] No 2023 commercial marine emissions from the 2016 emissions modeling platform were available.

Table A7.7. Example Calculation of the Interpolation and Normalization to Determine 2020 and 2021 Emissions for Commercial Marine and Aircraft.

Sample Category: Commercial Marine, Diesel, Category C3, Underway, Auxiliary Engine; Source Classification Code: 2280002202					
Emission Units: tons per ozone season day (tposd)					
Year →	2016 (EMP)	2017 (NEI)	2020	2021	2028 (EMP)
Original Values →	0.2368	0.2425			0.1312
Interpolate between 2016 and 2028 →	0.2368	0.2280	0.2016	0.1928	0.1312
Normalize to 2017 NEI; that is increase each value by 0.2425/0.2280 = 1.0636; **Final Values →**	**0.2516**	**0.2425**	**0.2145**	**0.2051**	**0.1395**

NOTE: EMP = Emissions Modeling Platform; NEI = National Emissions Inventory

In allocating the full Kenosha County emissions to the partial Kenosha County 2008 ozone nonattainment area, the only adjustment factors that changed for 2020 and 2021 from those used for 2017 (see Appendix 1, section 2.4.4) are the following two:

- **Aircraft:** The following percentages of aircraft emissions in Kenosha County come from airports located in the partial Kenosha County 2008 ozone nonattainment area.

Table A7.8. Percentages of Countywide Aircraft Emissions in Partial Kenosha County 2008 Ozone Nonattainment Area.

Aircraft Category	2011		2017		2020		2021	
	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC
Airport Ground Support Equipment	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Military Aircraft	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
General Aviation Aircraft – Piston	59.6%	59.6%	75.7%	75.7%	76.7%	76.7%	77.1%	77.1%
General Aviation Aircraft – Turbine	61.5%	61.5%	78.6%	78.0%	79.5%	78.9%	79.8%	79.2%
Taxi Aircraft – Piston	97.5%	97.5%	98.3%	98.3%	98.5%	98.5%	98.5%	98.5%
Taxi Aircraft – Turbine	97.5%	97.5%	98.3%	98.3%	98.5%	98.5%	98.5%	98.5%
Aircraft Auxiliary Power Units	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

- **Rail locomotive:** Although the percentages of countywide rail locomotive emissions in the partial Kenosha County 2008 ozone nonattainment area remained the same for all four years for the subcategories of commercial rail (60.0%) and passenger rail (100.0%), the average percentages for all rail locomotive changed as follows:
  - In 2011: 60.0% for both NOx and VOC
  - In 2017: 63.2% for NOx and 64.2% for VOC
  - In 2020: 66.7% for NOx and 67.4% for VOC
  - In 2021: 67.9% for NOx and 68.6% for VOC

Detailed listings of the projected nonroad emissions for over 200 subcategories are provided in Appendix 6.

APPENDIX 8

Permanent and Enforceable Control Measures in the Partial Kenosha County Nonattainment Area for the 2008 Ozone NAAQS

This appendix provides additional details about the permanent and enforceable control measures that have reduced emissions of ozone precursors in the partial Kenosha County nonattainment area for the 2008 ozone NAAQS. This information expands upon that presented in Section 3.5 of the Attainment Plan for the Partial Kenosha County Nonattainment Area for the 2008 Ozone NAAQS.

1. Point Source Control Measures

NO_x Control Measures

Wisconsin NO_x RACT – Wisconsin has implemented RACT for major NO_x sources in nonattainment areas as part of compliance requirements for the 1997 ozone NAAQS and the 2008 ozone NAAQS. The NOx RACT requirements are codified under ss. NR 428.20 to 428.26, Wis. Adm. Code and apply to the entire Kenosha County.

In 2017, there were 2,128.5 tons of NOx emissions from We Energies - Pleasant Prairie Power Plant (FID #230006260) and approximately 44 individual NOx emission units with 48.4 tons of NOx emissions from point sources in the partial Kenosha County nonattainment area for the 2008 ozone NAAQS (Table A8.1).

The NOx emission units at We Energies - Pleasant Prairie Power Plant (FID #230006260) include two coal fired boilers (B20 and B21), two auxiliary natural gas fired boilers (B22 and B23), and four emergency generators (P30-P33). Boilers B20 and B21 are subject to the NOx RACT requirements in s. NR 428.22(1)(a)1.a., Wis. Adm. Code and shall comply with the NOx emission limit of 0.1 lbs/MMBtu, based on a 30-day rolling average, by May 1, 2009. Pursuant to a consent decree (Civil Action No. 03-C-0371), Boilers B20 and B21 became subject to the NOx emission limit of 0.08 lbs/MMBtu, based on a 12-month rolling average, by December 31, 2006 and December 31, 2003, respectively. As noted in the source's construction permit #18-RAB-05-ERC, issued on September 7, 2018, boilers B20-B23 were permanently shut down on or around April 10, 2018. As discussed in section 3.3 of the attainment plan, these shutdowns generated emission reduction credits (ERCs) based on a creditable VOC emission reduction of 135.3 tons per year and a creditable NOx emission reduction of 2,634.3 tons per year. These ERCs are included in the 2020 and 2021 projected year inventories shown in section 3.2 of the attainment plan.

The remainder of the NOx emission units are located at smaller facilities that have PTEs below 50 TPY (the major source threshold for serious nonattainment areas) or individual emissions units that have relatively small PTE or operate infrequently (e.g., batch heat treat furnaces, emergency generators, auxiliary boilers) and therefore are not subject to NOx RACT requirements. If the owners of these small facilities modify or add sources such that total facility potential emissions increase above 50 tons per year, the facilities and emission units become subject to NOx RACT requirements. WDNR is in the rulemaking process to revise the applicability thresholds in s. NR 428.20, Wis. Adm. Code to cover any future major sources of NOx located in ozone nonattainment areas, including the partial Kenosha County nonattainment area for the 2008 ozone NAAQS.

Wisconsin NO_x RACM – Wisconsin has implemented RACM for NO_x sources in nonattainment areas as part of compliance requirements for the 1997 ozone NAAQS. The NOx RACM requirements are codified under ss. NR 428.01 to 428.12, Wis. Adm. Code and apply to new and existing NOx emission units located in the southeast of Wisconsin including the entire Kenosha County. Section NR 428.04, Wis. Adm. Code lists NOx performance standards for the NOx emission units that are constructed or modified after February 1, 2001 and have design capacities greater than the capacity thresholds listed in this provision. Section NR 428.05, Wis. Adm. Code includes NOx performance standards for the NOx emission units that is constructed on or before February 1, 2001 and have capacities greater than the capacity thresholds listed in this provision. All the emission units subject to this section are required to install continuous emission monitoring equipment to demonstrate compliance with the NOx emission limit specified in this rule.

Table A8.1. 2008-2017 NOx emissions and requirements for point sources in the partial Kenosha County 2008 ozone nonattainment area.

Facility		2008	2011	2017	2008 – 2017 Change	Permanent and Enforceable Control Measures
We Energies - Pleasant Prairie Power Plant (FID #230006260)	Annual NOx Emissions (TPY)	2,861.7	2,498.5	2,128.5	-25.6%	**For coal fired boilers B20 and B21:** < 0.1 lbs/MMBtu [NR 428.22(1)(a)1.a.] < 0.08 lbs/MMBtu [Consent Decree]
Other NOx Emissions Units	Annual NOx Emissions (TPY)	53.0	32.3	48.4	-8.5%	NOx RACM Requirements Emission units become subject to NOx RACT if facilities exceed major source threshold
	Number of Units	52	36	44	-15.3%	
Total NOx Emissions (TPY)		2,914.7	2,530.8	2,176.9	-25.3%	

Federal NOx Transport Rules – Beginning January 1, 2009, EGUs in 22 states east of the Mississippi (including Wisconsin) became subject to ozone season NOx emission budgets under the Clean Air Interstate Rule (CAIR). CAIR addresses the broad regional interstate transport of NOx affecting attainment and maintenance of the 1997 ozone NAAQS as required under CAA s. 110(a)(2)(D). CAIR resulted in a significant reduction of NOx emissions during the ozone season in areas contributing to Kenosha County over the 2009-2014 period.

Table A8.2 shows emission levels for EGUs affected by the CAIR rule through 2014 for states upwind of the partial Kenosha County 2008 ozone nonattainment area. The states listed (in decreasing order of contribution) are those states contributing more than 1% of the 2008 standard (0.75 ppb) to the Chiwaukee Prairie monitor. Between 2008 and 2014, total EGU emissions across these states decreased by approximately 24%. Emission reductions were proportionately larger, ranging from 24.1% to 54.5%, for the three states contributing the most to partial Kenosha County 2008 ozone nonattainment area ozone concentrations: Illinois, Indiana, and Wisconsin.

Table A8.2. EGU NOx emitted under the CAIR program in states contributing > 0.75 ppb (1% of the 2008 NAAQS) in Kenosha County.

State	CSAPR Modeled Contribution to Kenosha County[1] (ppb)	Ozone Season NOx Emissions (Tons)			Percent Reduction		
		2008	2011	2014	2008 - 2011	2011 – 2014	2008 – 2014
Illinois	31.090	31,106	26,894	18,489	13.5%	31.3%	40.6%
Indiana	12.888	53,016	48,926	40,247	7.7%	17.7%	24.1%
Wisconsin	3.990	19,951	13,818	9,087	30.7%	34.2%	54.5%
Ohio	2.354	52,603	43,346	32,181	17.6%	25.8%	38.8%
Kentucky	1.875	39,324	40,055	33,896	-1.9%	15.4%	13.8%
Missouri	1.349	34,820	26,912	31,235	22.7%	-16.1%	10.3%
W. Virginia	1.069	25,398	23,431	28,681	7.7%	-22.4%	-12.9%
Virginia	0.958	17,392	15,620	9,695	10.2%	37.9%	44.3%
Pennsylvania	0.878	53,800	65,109	44,243	-21.0%	32.0%	17.8%
Total		**327,410**	**304,110**	**247,754**	**7.1%**	**18.5%**	**24.3%**

[1] Ozone contributions as determined by EPA in the final CSAPR rule, 76 FR 48208, August 8, 2011.
Source: EPA Clean Air Markets Division, Database of reported emissions.

Starting with the 2015 ozone season, the Cross-State Air Pollution Rule (CSAPR) replaced CAIR to reduce interstate NOx transport relative to the 1997 ozone NAAQS. CSAPR implemented NOx budgets for the impacted states in two phases. Phase I limits NOx emissions in 2015 and 2016. EPA published the CSAPR Update (81 FR 74504) in 2016 to address NOx transport affecting the attainment and maintenance of the 2008 ozone NAAQS (79 FR 16436). The CSAPR Update establishes Phase II NOx budgets starting with the 2017 ozone season.

<u>VOC Control Measures</u>

VOC RACT/CTG – The 2008 Ozone NAAQS Implementation Rule states that RACT requirements can be met through previously adopted RACT controls approved by EPA under prior ozone NAAQS (80 FR 12264). Wisconsin has implemented VOC Control Techniques Guidelines (CTG) to fulfill RACT requirements for Wisconsin nonattainment areas, including the partial Kenosha County 2008 ozone nonattainment area, under the 1997 ozone NAAQS.

These VOC RACT/CTG requirements are codified under chapters NR 419 through 424, Wis. Adm. Code. The list of the CTGs in place in Wisconsin are provided in Appendix 9.

There are several CTGs which have not been incorporated into state administrative code that have been addressed through negative declarations or an administrative order. Administrative order AM-20-01 establishes, through permanent and enforceable emission limits and other requirements, RACT equivalency for a facility with operations covered by the Miscellaneous Metal and Plastic Parts Coatings CTG. VOC RACT presumptively defined in this CTG are not codified in Wisconsin administrative code at this time. As noted in Appendix 9, WDNR certified with negative declarations that there are no other sources within the partial Kenosha County 2008 ozone nonattainment area subject to the CTGs that have not been incorporated into Wisconsin's Administrative Code as part of Appendix 10 of the Redesignation Request and Maintenance Plan for the Eastern Kenosha County, Wisconsin 2008 Ozone NAAQS Nonattainment Area. The WDNR also provided a non-CTG major source negative declaration as part of that submittal. EPA approved all components of the eastern Kenosha County ozone 2008 ozone nonattainment area's VOC RACT program as satisfying moderate area VOC RACT requirements on September 16, 2020 (85 FR 57729).

The WDNR certifies that the Wisconsin VOC RACT program for Kenosha County also satisfies serious area VOC RACT requirements. The approved non-CTG major source negative declaration certifies that there are no sources within the partial Kenosha County 2008 ozone nonattainment area for the 2008 ozone NAAQS that produce non-CTG VOC emissions in excess of 50 TPY, the serious nonattainment area major source threshold. The WDNR has verified with recent emissions data that there continue to be no sources within the partial Kenosha County 2008 ozone nonattainment area that meet the non-CTG major source threshold or the applicability criteria for CTGs not incorporated into the State's administrative code.

Point source VOC emissions in the nonattainment area – Table A8.3 lists the point sources emitting VOCs in the partial Kenosha County 2008 ozone nonattainment area in 2017. This assessment shows that approximately 82% of 2017 VOC emissions come from combustion sources. The majority of these combustion-related emissions were from two utility boilers at the We-Energies Pleasant Prairie Power Plant, which was shut down in the spring of 2018. As noted above for NOx control measures, the ERCs generated by this shutdown are included in the 2020 and 2021 projected year inventories shown in section 3.2 of the attainment plan.

Other combustion emissions originated from a number of industrial boilers, reciprocating engines, and various space and process heating units. As indicated in Table A8.3, the majority of these combustion-related emissions are subject to various National Emission Standards for Hazardous Air Pollutant (NESHAP) rules that have become effective since 2011. These NESHAP rules implement good combustion practices that minimize VOC emissions or apply direct emission limitations on total hydrocarbons (including VOCs). The specifics of the NESHAP rules are further described below in the section "Federal / Regional VOC Control Measures". It should be noted, however, that although the combustion NESHAP requirements are expected to minimize VOC emissions, the incremental emission reductions due to these rules are expected to be relatively small and difficult to quantify.

Table A8.3. 2017 VOC emissions and requirements for point sources in the partial Kenosha County 2008 ozone nonattainment area.

FID	Facility	Unit	Annual VOC (Tons)	Percent of Total	Permanent and Enforceable Control Measures
Combustion Sources					
230006260	We-Energies Pleasant Prairie Power Plant B20 & B21	2 units	106.5	78.1%	MATS Combustion requirements (Permanently shut down)
Multiple	Reciprocating Engines	7 units	0.02	0.02%	RICE NESHAP requirements[1]
Multiple	Natural Gas-Fired Boilers, Fuel Oil-Fired Boilers, Process Heaters	53 units	5.3	3.9%	ICI boiler and process heater NESHAP combustion requirements[1]
Subtotal =		**62 units**	**111.8**	**82.0%**	
Non-Combustion Sources					
Multiple	Non-combustion sources	38 units	24.7	18.0%	Individual emission units subject to VOC RACT / CTGs as applicable
Total =			**136.5**	**100.0%**	

ICI = Industrial, Commercial and Institutional, RICE = Reciprocating Internal Combustion Engine.
[1] The emissions units are subject to either major source or area source NESHAP emission requirements based on size thresholds. The applicability of requirements and exemptions for each unit has not been determined for purposes of this assessment. Natural gas-fired boilers and processes at area sources are not subject to requirements.

Table A8.3 shows that approximately 18% of VOC emissions in 2017 came from non-combustion activities or processes, which are subject to VOC RACT rules codified under chapters NR 419 through 424, Wis. Adm. Code. These rules aid in controlling VOC emissions but were implemented prior to 2011 with no additional incremental reduction expected between 2011 and 2017.

<u>Federal VOC Control Measures for Point Sources</u>

A number of federal NESHAP rules were implemented to control hazardous pollutants. These rules include requirements to control hazardous organic pollutants through ensuring complete combustion of fuels or implementing requirements for emissions of total hydrocarbons. Under either approach, the rules act to reduce total VOC emitted by the affected sources. These NESHAP rules apply to both major and area source facilities. Major sources are those facilities emitting more than 10 tons per year of a single hazardous air pollutant or more than 25 tons per year of all hazardous air pollutants in total. Area sources are those facilities that emit less than the major source thresholds for hazardous air pollutants.

These NESHAP measures apply to sources within the partial Kenosha County 2008 ozone nonattainment area but also apply nationally, thereby reducing the transport of VOC emissions into the nonattainment area. The NESHAP rules that have likely contributed to attainment by 2017 include the following:

- *Mercury and Air Toxics (MATS) NESHAP* – On February 16, 2012 EPA promulgated the MATS rule under part 63 subpart UUUUU. Emission requirements were fully applicable by

April 16, 2015. Affected sources were required to conduct energy assessments and combustion tuning to ensuring complete combustion.

- *Major Source ICI Boiler and Process Heater NESHAP* – On March 21, 2011, EPA promulgated the "National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters" under part 63 subpart DDDDD. This NESHAP requires all boilers and process heaters, including natural gas fired units, at major source facilities to perform an initial energy assessment and perform periodic tune-ups by January 31, 2016. This action is intended to ensure complete combustion.

- *Area Source (non-major point sources) ICI Boiler and Process Heater NESHAP* – On March 21, 2011 EPA promulgated the "National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers" under part 63 subpart JJJJJJ. This NESHAP requires solid fuel and oil fuel fired boilers operated by sources that are below the major source threshold to begin periodic combustion tuning by March 21, 2014.

- *Internal Combustion Engine Rules* – EPA has promulgated three rules which limit the total amount of hydrocarbon emissions from internal combustion engines - the "National Emission Standards for Hazardous Pollutants for Reciprocating Internal Combustion Engines" (RICE MACT) was promulgated on June 15, 2004 under Part 63, subpart ZZZZ and revised in January 2008 and March 2010, with the two revisions impacting additional RICE units; the "Standards of Performance for Stationary Spark Ignition Internal Combustion Engines" promulgated on January 18, 2008 under Part 60, subpart JJJJ; and "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines promulgated on July 11, 2006 under Part 60, subpart IIII. These rules implement hydrocarbon emission limitations prior to and after 2011 based on compliance dates. These rules also act to continuously reduce emissions as existing stationary engines are replaced by new, cleaner-burning engines.

2. Area Source Control Measures

As noted for point sources, Wisconsin has implemented the necessary VOC RACT/CTG rules under chs. NR 419 through 424, Wis. Adm. Code. A number of these rules limit VOC emissions from area sources as noted in Appendix 10. Wisconsin previously had a Stage 2 vehicle refueling vapor recovery program in place. However, this program was removed from Wisconsin's ozone SIP on November 4, 2013 (78 FR 65875) with EPA approval because the equipment was found to defeat onboard vapor recovery systems for some new vehicles. As stage 2 equipment is removed, actual VOC emissions are anticipated to decrease slightly. This SIP revision was based on a technical showing of net benefit as required under the CAA in order to prevent SIP backsliding.

There are also a number of federal programs in place which reduce area source VOC emissions. VOC emission standards for consumer and commercial products were promulgated under 40 CFR Part 59. This program was implemented prior to 2011 and will continue to maintain reduced VOCs emitted from this source category. Actual emission levels going into the future will vary depending on population and activity use factors. Two other federal rules, the NESHAPs for Gasoline Distribution (Stage I) and Area Source ICI Boilers, also control area source VOC emissions associated with fuel storage and transfer activities.

3. Onroad Source Control Measures

Both NOx and VOC emissions from onroad mobile sources are substantially controlled through federal new vehicle emission standards programs and fuel standards. Although initial compliance dates in many cases were prior to 2011, these regulations have continued to reduce area-wide emissions as fleets turn over to newer vehicles. All of these programs apply nationally and have reduced emissions both within the nonattainment area and contributing ozone precursor transport areas. The federal programs contributing to attainment of the 2008 ozone NAAQS include those listed in Table A9.4.

The Wisconsin-administered I/M program also limits on-road VOC and NOx emissions from onroad sources and is required for partial Kenosha County 2008 ozone nonattainment area. The Wisconsin I/M program was first implemented in 1984 and has gone through several modifications and enhancements since that time. The I/M program requirements are codified in chs. NR 485 and Trans 131, Wis. Adm. Code. The I/M program reduces average vehicle VOC and NOx emissions and garners some level of continued incremental reduction as fleets turn over to new vehicles.

Table A9.4. Federal onroad mobile source regulations contributing to attainment.

On-road Control Program	Pollutants	Model Year[1]	Regulation
Passenger vehicles, SUVs, and light duty trucks – emissions and fuel standards	VOC & NOx	2004 – 2009+ (Tier 2) 2017+ (Tier 3)	40 CFR Part 85 & 86
Light-duty trucks and medium duty passenger vehicle – evaporative standards	VOC	2004 - 2010	40 CFR Part 86
Heavy-duty highway compression engines	VOC & NOx	2007+	40 CFR Part 86
Heavy-duty spark ignition engines	VOC & NOx	2005 – 2008+	40 CFR Part 86
Motorcycles	VOC & NOx	2006 – 2010 (Tier 1 & 2)	40 CFR Part 86
Mobile Source Air Toxics – fuel formulation, passenger vehicle emissions, and portable container emissions	Organic Toxics & VOC	2009 - 2015[2]	40 CFR Part 59, 80, 85, & 86
Light duty vehicle corporate average fuel economy (CAFE) standards	Fuel efficiency (VOC and NOx)	2012-2016 & 2017-2025	40 CFR Part 600

[1]The range in model years affected can reflect phasing of requirements based on engine size or initial years for replacing earlier tier requirements.
[2]The range in model years reflects phased implementation of fuel, passenger vehicle, and portable container emission requirements as well as the phasing by vehicle size and type.

4. Nonroad Source Control Measures

Similar to onroad sources, VOC and NOx emitted by nonroad mobile sources are significantly controlled via federal standards for new engines. These programs therefore reduce ozone precursor emissions generated within partial Kenosha County 2008 ozone nonattainment area and in the broader regional areas contributing to ozone transport. Table A9.5 lists the nonroad source categories and applicable federal regulations. The nonroad regulations continue to slowly lower average unit and total sector emissions as equipment fleets are replaced each year (approximately 20 years for complete fleet turnover) pulling the highest emitting equipment out of circulation or substantially reducing its use. The new engine tier requirements are implemented in conjunction with fuel programs regulating fuel sulfur content. The fuel programs enable achievement of various new engine tier VOC and NOx emission limits.

Table A9.5. Federal nonroad mobile source regulations contributing to attainment.

Nonroad Control Program	Pollutants	Model Year[1]	Regulation
Aircraft	HC & NOx	2000 – 2005+	40 CFR Part 87
Compression Ignition[2]	NMHC & NOx	2000 – 2015+ (Tier 4)	40 CFR Part 89 & 1039
Large Spark Ignition	HC & NOx	2007+	40 CFR Part 1048
Locomotive Engines	HC & NOx	2012 – 2014 (Tier 3) 2015+ (Tier 4)	40 CFR Part 1033
Marine Compression Ignition	HC & NOx	2012 – 2018	40 CFR Part 1042
Marine Spark Ignition	HC & NOx	2010+	40 CFR Part 1045
Recreational Vehicle[3]	HC & NOx	2006 – 2012 (Tier 1 – 3) (phasing dependent on vehicle type)	40 CFR Part 1051
Small Spark Ignition Engine[4] < 19d Kw – emission standards	HC & NOx	2005 – 2012 (Tier 2 & 3)	

HC – Hydrocarbon (VOCs)
NMHC – Non-Methane Hydrocarbon (VOCs)
[1]The range in model years affected can reflect phasing of requirements based on engine size or initial years for replacing earlier tier requirements.
[2]Compression ignition applies to diesel non-road compression engines including engines operated in construction, agricultural, and mining equipment.
[3]Recreational vehicles include snowmobiles, off-road motorcycles, and ATVs
[4]Small spark ignition engines include engines operated in lawn and hand-held equipment.

5. New Source Requirements

In addition to NOx RACT requirement, s. NR 428.04, Wis. Adm. Code includes NOx performance standards for any NOx emission unit that is constructed or modified after February 1, 2001 and is located in one of the six southeast counties of Wisconsin, including Kenosha County. The types of emission units covered by this rule include boilers, cement or lime kilns, furnaces, asphalt plants, process heating units, combustion turbines, and reciprocating engines. All the emission units subject to this section are required to install continuous emission monitoring equipment to demonstrate compliance with the NOx emission limit specified in this rule.

APPENDIX 9

VOC RACT Demonstration for the Partial Kenosha County 2008 Ozone Nonattainment Area

This appendix provides additional details about the permanent and enforceable VOC RACT program presented in Section 6.3 of the Attainment Plan for the Partial Kenosha County 2008 Ozone Nonattainment Area.

Background

Reasonably Available Control Technology (RACT) represents the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility (44 FR 53761). Section 182(b)(2) of the Clean Air Act (CAA) requires nonattainment areas classified as moderate or higher to implement RACT for sources of Volatile Organic Compounds (VOCs). In such areas, RACT is required for sources covered in Control Technique Guidelines (CTGs) issued by EPA, as well as sources that meet the major stationary source definition after subtracting their CTG-applicable emissions (non-CTG major sources). The Wisconsin Department of Natural Resources (WDNR) has implemented a VOC RACT program for the partial Kenosha County 2008 ozone nonattainment area through:

(1) Implementation of CTG-recommended control measures through state administrative rules and an administrative order,

(2) Negative declarations certifying that no sources exist in the nonattainment area that are subject to the CTGs whose control measures have not been codified in state administrative rules or enforced through an administrative order, and

(3) A negative declaration certifying that no non-CTG major source of VOCs exists in the nonattainment area.

A VOC RACT demonstration describing VOC RACT rules and negative declarations for the partial Kenosha County 2008 ozone nonattainment area is provided in Appendix 10 of the Redesignation Request and Maintenance Plan for the Eastern Kenosha County, Wisconsin 2008 Ozone NAAQS Nonattainment Area submitted to EPA on January 21, 2020. The WDNR submitted an administrative order, which demonstrates RACT equivalency, to EPA for incorporation into Wisconsin's SIP on February 12, 2020.[1] EPA approved these components of the partial Kenosha County 2008 ozone nonattainment area's VOC RACT program as satisfying moderate area VOC RACT requirements on September 16, 2020 (85 FR 57729).

Serious Area Requirements

The WDNR certifies that the partial Kenosha County 2008 ozone nonattainment area's VOC RACT program also satisfies serious area VOC RACT requirements. The approved non-CTG major source negative declaration certifies that there are no sources within the partial Kenosha

[1] Administrative order AM-20-01 establishes, through permanent and enforceable emission limits and other requirements, RACT equivalency for a facility with operations covered by the Miscellaneous Metal and Plastic Parts Coatings CTG. VOC RACT presumptively defined in this CTG are not codified in Wisconsin administrative code at this time.

County 2008 ozone nonattainment area that produce non-CTG VOC emissions in excess of 50 TPY, the serious nonattainment area major source threshold.[2] The WDNR has verified with recent emissions data that there continue to be no sources within the partial Kenosha County 2008 ozone nonattainment area that meet the non-CTG major source threshold or the applicability criteria for CTGs not incorporated into the state's administrative code.

The partial Kenosha County 2008 ozone nonattainment area's VOC RACT program is summarized in the remainder of this document.

RACT Requirements for CTG Sources

Section 183 of the CAA requires EPA to issue guidance for RACT controls for reducing emissions from stationary sources. EPA has issued such guidance in the form of CTGs, which represent "presumptive norms" for RACT for specific source categories of VOCs. States with nonattainment areas subject to section 182(b)(2) are required to implement RACT for CTGs issued between the date of the CAA Amendments of 1990 and the date of attainment (section 182(b)(2)(A)), and for CTGs issued before the date of enactment of the CAA Amendments of 1990 (section 182(b)(2)(B)). Generally, states meet RACT requirements by codifying control requirements established in CTG documents. Table A9-1 lists the CTGs and source categories for which Wisconsin has codified control requirements. WDNR certifies that the existing VOC rules listed in Table A9-1 have been approved into the Wisconsin SIP and satisfy the VOC RACT requirements of Section 182(b)(2) of the CAA for those source categories.

[2] The partial Kenosha County 2008 ozone nonattainment area was reclassified to serious effective September 23, 2019 (84 FR 44238). Although the non-CTG major source negative declaration submitted on January 21, 2020 meets serious area major source requirements, EPA approved the partial Kenosha County 2008 ozone nonattainment area VOC RACT program as meeting the moderate area requirements that were in place when the document was submitted. Serious area requirements for the area were not due until August 3, 2020.

Table A9-1. Volatile Organic Compounds (VOC) Control Technique Guidelines Incorporated into Wisconsin Administrative Code.

Source	Title (Description)	EPA CTG Report No.	Wis. Adm. Code Incorporation	Emissions Inventory Classification[1]
Petroleum and Gasoline Sources				
Bulk Gasoline Plants	Control of Volatile Organic Emissions from Bulk Gasoline Plants [bulk gasoline plant unloading, loading and storage]	EPA-450/2-77-035	NR 420.04(2)	Stationary Point Source
Refinery Equipment - Vacuum Producing Systems, Wastewater Separators, and Process Unit Turnarounds	Control of Refinery Vacuum Producing Systems, Wastewater Separators, and Process Unit Turnarounds	EPA-450/2-77-025	NR 420.05(1), (2) and (3)	Stationary Point Source
Refinery Equipment - Control of VOC Leaks	Control of Volatile Organic Compound Leaks from Petroleum Refinery Equipment	EPA-450/2-78-036	NR 420.05(4)	Stationary Point Source
Refinery Equipment - Control of VOC Leaks	Control of Volatile Organic Compound Equipment Leaks from Natural Gas/Gasoline Processing Plants	EPA-450/3-83-007	NR 420.05(4)	Stationary Point Source
Tanks - Fixed Roof	Control of Volatile Organic Emissions from Storage of Petroleum Liquids in Fixed-Roof Tanks	EPA-450/2-77-036	NR 420.03(5)	Stationary Point Source
Tanks - External Floating Roofs	Control of Volatile Organic Emissions from Petroleum Liquid Storage in External Floating Roof Tanks	EPA-450/2-78-047	NR 420.03(6) and (7)	Stationary Point Source
Gasoline Loading Terminals	Control of Hydrocarbons from Tank Truck Gasoline Loading Terminals	EPA-450/2-77-026	NR 420.04(1)	Stationary Point Source
Tank Trucks	Control of Volatile Organic Compound Leaks from Gasoline Tank Trucks and Vapor Collection Systems	EPA-450/2-78-051	NR 420.04(4)	Stationary Area Source

Source	Title (Description)	EPA CTG Report No.	Wis. Adm. Code Incorporation	Emissions Inventory Classification[1]
Gasoline Delivery - Stage I Vapor Control Systems	Design Criteria for Stage I Vapor Control Systems – Gasoline Service Stations	EPA-450/R-75-102	NR 420.04(3)	Stationary Area Source
Surface Coating				
Automobile & Light-duty Truck	Control Techniques Guidelines for Automobile and Light-Duty Truck Assembly Coatings	EPA 453/R-08-006	NR 422.09	Stationary Point Source
Cans	Control of Volatile Organic Emissions from Existing Stationary Sources – Volume II: Surface Coating of Cans, Coils, Paper, Fabrics, Automobiles, and Light-Duty Trucks	EPA-450/2-77-008	NR 422.05	Stationary Point Source
Coils	Control of Volatile Organic Emissions from Existing Stationary Sources – Volume II: Surface Coating of Cans, Coils, Paper, Fabrics, Automobiles, and Light-Duty Trucks	EPA-450/2-77-008	NR 422.06	Stationary Point Source
Fabric & Vinyl	Control of Volatile Organic Emissions from Existing Stationary Sources – Volume II: Surface Coating of Cans, Coils, Paper, Fabrics, Automobiles, and Light-Duty Trucks	EPA-450/2-77-008	NR 422.08	Stationary Point Source
Flat Wood Paneling	Control of Volatile Organic Emissions from Existing Stationary Sources – Volume VII: Factory Surface Coating of Flat Wood Paneling	EPA-450/2-78-032	NR 422.13	Stationary Point Source
	Control Techniques Guidelines for Flat Wood Paneling Coatings	EPA-453/R-06-004	NR 422.131	Stationary Point Source
Large Appliances	Control of Volatile Organic Emissions from Existing Stationary Sources – Volume V: Surface Coating of Large Appliances	EPA-450/2-77-034	NR 422.11	Stationary Point Source

Source	Title (Description)	EPA CTG Report No.	Wis. Adm. Code Incorporation	Emissions Inventory Classification[1]
	Control Techniques Guidelines for Large Appliance Coatings	EPA 453/R-07-004	NR 422.115	Stationary Point Source
Magnet Wire	Control of Volatile Organic Emissions from Existing Stationary Sources – Volume IV: Surface Coating of Insulation of Magnet Wire	EPA-450/2-77-033	NR 422.12	Stationary Point Source
Metal Furniture	Control of Volatile Organic Emissions from Existing Stationary Sources – Volume III: Surface Coating of Metal Furniture	EPA-450/2-77-032	NR 422.1	Stationary Point Source
	Control Techniques Guidelines for Metal Furniture Coatings	EPA 453/R-07-005	NR 422.105	Stationary Point Source
Metal Parts, miscellaneous	Control Techniques Guidelines for Miscellaneous Metal and Plastic Parts Coatings	EPA 453/R-08-003	NR 422.15	Stationary Point Source
	Fire Truck and Emergency Response Vehicle Manufacturing - surface coating	(covered under Misc. Metal Parts CTG)	NR 422.151	Stationary Point Source
Paper, Film and Foil	Control of Volatile Organic Emissions from Existing Stationary Sources – Volume II: Surface Coating of Cans, Coils, Paper, Fabrics, Automobiles, and Light-Duty Trucks	EPA-450/2-77-008	NR 422.07	Stationary Point Source
	Control Techniques Guidelines for Paper, Film, and Foil Coatings	EPA 453/R-07-003	NR 422.075	Stationary Point Source
Plastic Parts - Coatings	Control Techniques Guidelines for Miscellaneous Metal and Plastic Parts Coatings	EPA 453/R-08-003	NR 422.083	Stationary Point Source

Source	Title (Description)	EPA CTG Report No.	Wis. Adm. Code Incorporation	Emissions Inventory Classification[1]
Traffic Markings	Reduction of Volatile Organic Compound Emissions from the Application of Traffic Markings	EPA-450/3-88-007	NR 422.17	Stationary Area Source
Wood Furniture	Control of Volatile Organic Compound Emissions from Wood Furniture Manufacturing Operations	EPA-453/R-96-007	NR 422.125	Stationary Point Source
Graphic Arts				
Rotogravure & Flexography	Control of Volatile Organic Emissions from Existing Stationary Sources – Volume VIII: Graphic Arts-Rotogravure and Flexography	EPA-450/2-78-033	NR 422.14	Stationary Point Source
Flexible Packaging	Control Techniques Guidelines for Flexible Package Printing	EPA-453/R-06-003	NR 422.141	Stationary Point Source
Letterpress	Control Techniques Guidelines for Offset Lithographic Printing and Letterpress Printing	EPA-453/R-06-002	NR 422.144	Stationary Point Source
Lithographic	Control Techniques Guidelines for Offset Lithographic Printing and Letterpress Printing	EPA-453/R-06-002	NR 422.142 and 422.143	Stationary Point Source
Solvents				
Dry Cleaning	Control of Volatile Organic Emissions from Perchloroethylene Dry Cleaning Systems	EPA-450/2-78-050	NR 423.05	Stationary Area Source
Dry Cleaning	Control of Volatile Organic Compound Emissions from Large Petroleum Dry Cleaners	EPA-450/3-82-009	NR 423.05	Stationary Area Source
Industrial Cleaning	Control Techniques Guidelines for Industrial Cleaning Solvents	EPA-453/R-06-001	NR 423.035 and 423.037	Stationary Area Source
Metal Cleaning	Control of Volatile Organic Emissions from Solvent Metal Cleaning	EPA-450/2-77-022	NR 423.03	Stationary Area Source

Source	Title (Description)	EPA CTG Report No.	Wis. Adm. Code Incorporation	Emissions Inventory Classification[1]
Chemical				
Pharmaceutical	Control of Volatile Organic Emissions from Manufacture of Synthesized Pharmaceutical Products	EPA-450/2-78-029	NR 421.03	Stationary Point Source
Polystyrene	Control of Volatile Organic Compound Emissions from Manufacture of High-Density Polyethylene, Polypropylene, and Polystyrene Resins	EPA-450/3-83-008	NR 421.05	Stationary Point Source
Rubber	Control of Volatile Organic Emissions from Manufacture of Pneumatic Rubber Tires	EPA-450/2-78-030	NR 421.04	Stationary Point Source
Synthetic Organic	Control of Volatile Organic Compound Emissions from Air Oxidation Processes in Synthetic Organic Chemical Manufacturing Industry	EPA-450/3-84-015	NR 421.07	Stationary Point Source
Synthetic Organic	Control of Volatile Organic Compound Emissions from Reactor Processes and Distillation Operations in Synthetic Organic Chemical Manufacturing Industry	EPA-450/4-91-031	NR 421.07	Stationary Point Source
Synthetic Resin	Control of Volatile Organic Compound Leaks from Synthetic Organic Chemical Polymer and Resin Manufacturing Equipment	EPA-450/3-83-006	NR 421.05	Stationary Point Source
Manufacturing				
Asphalt	Control of Volatile Organic Emissions from Use of Cutback Asphalt	EPA-450/2-77-037	NR 422.16	Stationary Area Source

[1]For purposes of this table, an "Area" source is defined as a nonpoint or fugitive emission source.

Negative Declarations

CTG Sources

To satisfy Section 182(b)(2)(A) and (B) requirements for the partial Kenosha County 2008 ozone nonattainment area, WDNR certified that there are no facilities within the nonattainment area for which RACT requirements have not be codified or for which Wisconsin's Administrative Code does not reflect the most recently published CTG.[3]

The WDNR's VOC RACT applicability analysis has previously been described for each CTG category for which Wisconsin has not adopted/updated RACT requirements.[3] Negative declarations have been approved for the following CTGs (year published):

- Shipbuilding and Ship Repair (1996),
- Aerospace Manufacturing (1997),
- Fiberglass Boat Manufacturing (2008),
- Oil and Natural Gas Industry (2016),
- Miscellaneous Industrial Adhesives (2008),
- Automobile and Light-Duty Truck Assembly Coatings (2008), and
- Miscellaneous Metal and Plastic Parts Coatings (2008).

Operations at three facilities in the partial Kenosha County 2008 ozone nonattainment area are covered under the Miscellaneous Metal and Plastic Parts Coatings CTG (Table A9-2). No other active facilities in the area are covered by the other CTGs for which Wisconsin has approved negative declarations. Emissions data from 2019 shows that the metal and plastic coating facilities continue to emit coating-related VOC below the CTG applicability threshold of 3 TPY. As noted in Table A9-2, Administrative order AM-20-01 ensures that Insinkerator complies with emission limits and other requirements to maintain RACT equivalency with the CTG. This administrative order was necessary because the facility's coating-related VOC emissions in 2017 met the CTG's applicability threshold.

[3] Negative declarations for CTG and non-CTG sources were based on 2018 emissions data and were included in Appendix 10 of the Redesignation Request and Maintenance Plan for the Eastern Kenosha County, Wisconsin 2008 Ozone NAAQS Nonattainment Area submitted to EPA on January 21, 2020. EPA approved these negative declarations on September 16, 2020 (85 FR 57729).

Table A9-2. Sources Analyzed for Miscellaneous Metal and Plastic Parts Coatings CTG Applicability

Facility	Facility Identification (FID)	Coating-related VOC Emissions in 2019	Administrative Order
Insinkerator	230167630	2.4 TPY	AM-20-01
KKSP Precision Machining LLC	230198760	0.6 TPY	NA
IEA, Inc.	230167520	UTN* submitted for 2019	NA

* The facility submitted an Under-Thresholds-Notification to WDNR officially stating that the facility's 2019 VOC emissions were below Wisconsin's reporting threshold for VOC. Wisconsin State Code Chapter NR 438.03(a) requires facilities that emit equal to or greater than 3 tons of VOC per year to submit annual emission inventory reports to the State.

Non-CTG Major Sources

The WDNR submitted a non-CTG major source negative declaration to EPA on January 21, 2020, certifying that there are no sources in the area that meet the serious area major source threshold of 50 TPY of non-CTG VOC emissions. On September 16, 2020, EPA approved the partial Kenosha County 2008 ozone nonattainment area VOC RACT program as meeting the area's moderate area requirements that were in place when the document was submitted (85 FR 57729), since serious area requirements for the area were not due until August 3, 2020. As noted in the non-CTG major source negative declaration, the WE Energies – Pleasant Prairie Power Plant ceased operations in 2018, and was previously the only facility within area that had the potential to emit over 50 TPY of VOC from non-CTG processes.[3] The WDNR certifies that the partial Kenosha County 2008 ozone nonattainment area continues to not have any serious area non-CTG major sources of VOC.

APPENDIX 10

Modeling Demonstration for the 2008 Ozone National Ambient Air Quality Standard for the Lake Michigan Region – Technical Support Document

Attainment Demonstration Modeling for the 2008 Ozone National Ambient Air Quality Standard

DRAFT Technical Support Document

Lake Michigan Air Directors Consortium

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Rosemont, IL 60018

Please direct question/comments to adelman@ladco.org

July 29, 2020

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Contents

Document Change Log

Version	Date	Comments/Changes
Draft 1	July 1, 2020	First draft to LADCO states
Draft 2	July 29, 2020	Integrated comments from WI DNR

Errata/Known Issues

#	Description

Acknowledgements

Figures

Tables

Executive Summary

LADCO prepared this Technical Support Document to support the development of the O_3 NAA SIPs for the states of Wisconsin, Illinois, and Indiana pursuant to the 2008 O_3 NAAQS. LADCO used the Comprehensive Air Quality Model with Extensions (CAMx) v7.0 beta 4 to support these analyses. The LADCO CAMx modeling results are used here to identify O_3 monitoring sites that may have nonattainment or maintenance problems for the 2008 O_3 NAAQS by the attainment date in July 2021. Because the attainment deadline occurs during the 2021 O_3 season, the effective attainment deadline is the end of the 2020 O_3 season and thus resulted in the selection of 2020 as the projection year for this modeling application. LADCO used 2016 as the base modeling year from which we projected air quality in 2020.

LADCO based our 2020 O_3 air quality and NAA attainment forecasts on the CAMx modeling platform released by the U.S. EPA in September 2019 to support regional haze progress assessments. LADCO estimated 2020 emissions for most of the anthropogenic inventory sectors by interpolating between the 2016 and 2023 Inventory Collaborative 2016v1 inventories. We used linear interpolation for the emissions because 2020 inventories were not readily available for all of the sectors at the time that this application initiated. LADCO replaced the Electricity Generating Unit (EGU) emissions in the U.S. EPA 2016fh_16j platform with 2020 EGU forecasts estimated with the ERTAC EGU Tool version 16.1. ERTAC EGU 16.1 integrated state-reported information on EGU operations and forecasts as of December 2019. Overall both the NOx and VOC ozone season day emissions are projected to decrease in 2020 relative to 2016 in all of the LADCO states. The NOx reductions range from 10%-17%, driven primarily by reductions in mobile source emissions. The VOC reductions are more modest, at around 1% in each of the LADCO states and are also driven by reductions in mobile sources. For the

anthropogenic sectors only (i.e., excluding biogenics), the ozone season day VOC emissions reductions are closer to 5% in each of the LADCO states.

The LADCO 2020 CAMx simulation predicted lower seasonal maximum O_3 concentrations across the majority of the modeling domain with the largest reductions occurring in the southeast U.S., east Texas, and the Central Valley of California. CAMx predicts that in 2020 the seasonal maximum daily maximum 8-hour average (MDA8) O_3 concentrations will decline along the western Lake Michigan shoreline in the range of 1-5 ppb compared with 2016.

The LADCO 2020 CAMx simulation predicts that only the Sheboygan, WI Kohler-Andrae monitor will have an average future year design value (DV_{2020}) that exceeds the 2008 O_3 NAAQS. The Kohler-Andrae monitor is predicted to have an average DV_{2020} of 76.6 ppbV. The O_3 relative reduction factors (RRFs) in the Chicago and Sheboygan NAAs are in the range of 4-5%. The modest changes to the DVs in 2020 are due primarily to the short time period between the base and future years. Despite being forecast to be above the 2008 O_3 NAAQS in 2020, the Sheboygan Kohler-Andrae monitor has a mean DV_{2020} that is less than 1% above the standard.

Excluding water cells in the attainment test calculation results in lower DVs_{2020} for the lakeshore monitors in the LADCO region.

1 Introduction

The Lake Michigan Air Directors Consortium (LADCO) was established by the states of Illinois, Indiana, Michigan, and Wisconsin in 1989. The four states and EPA signed a Memorandum of Agreement (MOA) that initiated the Lake Michigan Ozone Study and identified LADCO as the organization to oversee the study. Additional MOAs were signed by the states in 1991 (to establish the Lake Michigan Ozone Control Program), January 2000 (to broaden LADCO's responsibilities), and June 2004 (to update LADCO's mission and reaffirm the commitment to regional planning). In March 2004, Ohio joined LADCO. Minnesota joined the Consortium in 2012. LADCO consists of a Board of Directors (i.e., the State Air Directors), a technical staff, and various workgroups. The main purposes of LADCO are to provide technical assessments for and assistance to its member states, to provide a forum for its member states to discuss regional air quality issues, and to facilitate training for staff in the member states.

On March 12, 2008, the U.S. EPA revised the primary and secondary National Ambient Air Quality Standard (NAAQS) for ozone (O_3), strengthening the standard to a level of 0.075 parts per million (ppm) for a maximum daily 8-hour average. The form of the 8-hour O_3 NAAQS remained the same as the previous standard, the annual fourth-highest daily maximum averaged over three consecutive years. When U.S. EPA adopts a new or revises an existing NAAQS, it is required by Section 107(d)(1) of the Clean Air Act (CAA) to designate areas as nonattainment, attainment, or unclassifiable. Accordingly, on May 21, 2012, U.S. EPA designated Sheboygan County in eastern Wisconsin as a "marginal" O_3 nonattainment area (NAA) based on 2008-2010 ambient air quality data. On June 11, 2012, U.S. EPA designated the Chicago metropolitan area, including all or portions of eight counties in Illinois, two counties in northwest Indiana (Lake and Porter), and one partial county in southeast Wisconsin (Kenosha) as a "marginal" O_3 NAA based on monitoring data from 2009-2011. The attainment deadline for marginal NAAs to meet the 2008 O_3 NAAQS was July 20, 2015.

On April 11, 2016, U.S. EPA determined that the Chicago metropolitan area failed to attain the 2008 O_3 NAAQS by the applicable attainment date and thus reclassified the area as a "moderate" O_3 NAA. On September 28, 2016, U.S. EPA made a similar determination for Sheboygan County. The attainment deadline for moderate NAAs to meet the 2008 O_3 NAAQS was July 20, 2018.

On August 23, 2019, U.S. EPA determined that the entire Chicago metropolitan area again failed to attain the NAAQS and thus reclassified the area as a "serious" O_3 NAA. On July 15, 2019 EPA approved a revision to the Sheboygan County designation that splits the county into two distinct O_3 NAAs: shoreline and inland. In this same action, U.S. EPA approved a clean data determination for inland Sheboygan County. On February 5, 2020 U.S. EPA proposed to find that shoreline Sheboygan County, WI failed to attain the NAAQS and reclassify the area as a "serious" O_3 NAA. In May 2020, U.S. EPA proposed to redesignate shoreline Sheboygan County as a maintenance area for the 2008 O_3 NAAQS.

The Chicago and Sheboygan nonattainment areas are shown in Figure 1. As a result of the recent actions described above, the states of Illinois, Indiana, and Wisconsin must submit State Implementation Plans (SIPs) that meet the requirements applicable to "serious" O_3 NAAs. The NAA SIPs, or attainment demonstrations, must include a demonstration which identifies emissions reduction strategies sufficient to achieve the NAAQS by July 20, 2021, the attainment date for serious NAAs. Because the attainment deadline occurs during the 2021 O_3 season, the effective attainment deadline is the end of the 2020 O_3 season.

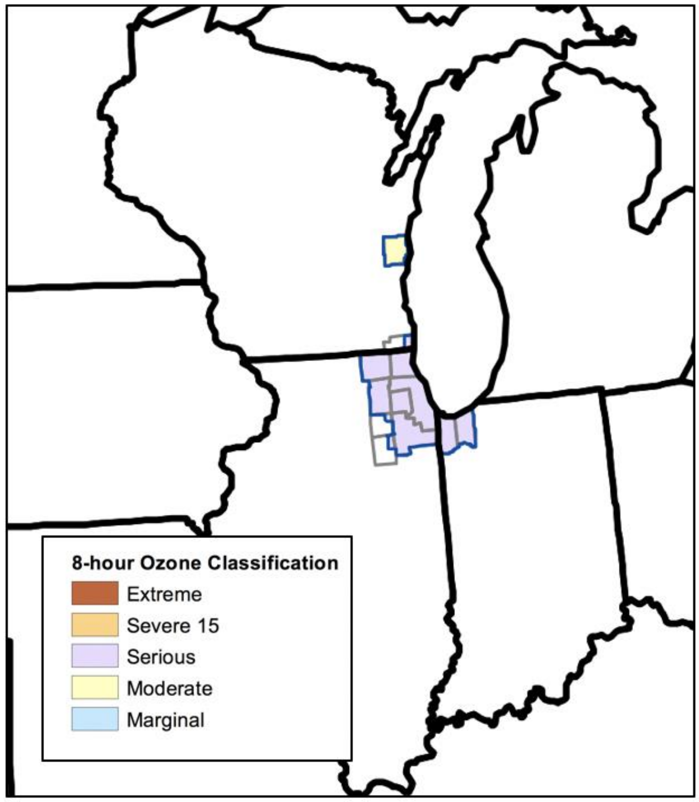


Figure 1. Nonattainment areas in the Lake Michigan region for the 2008 O_3 NAAQS (Source: U.S. EPA, May 2020).

One of LADCO's responsibilities is to provide technical air quality modeling guidance and support to the LADCO states. LADCO prepared this Technical Support Document (TSD) to support the development of the O_3 NAA SIPs for the states of Wisconsin, Illinois, and Indiana pursuant to the 2008 O_3 NAAQS. The analyses prepared by LADCO include preparation of modeling emissions inventories for the base year (2016) and the projected year of attainment (2020), evaluation and application of meteorological and photochemical grid models, analysis of ambient monitoring data, and a modeled attainment test for surface O_3 monitors in the Chicago and Sheboygan NAAs.

1.1 Project Overview

LADCO conducted regional air quality modeling to support the statutory obligations of the LADCO states under Clean Air Section 172**.** These SIP revisions are plans that describe how states with designated NAAs will bring those areas back into attainment of the NAAQS. LADCO used the Comprehensive Air Quality Model with Extensions (CAMx[1]) to support these analyses. In particular, LADCO used CAMx version 7.0 beta 4 to predict O_3 concentrations in 2020 to determine if current emissions control programs in the region will lead to attainment of the 2008 O_3 NAAQS.

This document describes how LADCO used CAMx modeling to project air quality from a 2016 base year to 2020, and to evaluate if the 2008 O_3 NAAQS NAAs in the LADCO region are predicted to attain the standard. The CAMx modeling outputs of this work are being presented to the IL, IN, and WI state air programs to support their 2008 O_3 NAAQS NAA SIP revisions that are due to EPA on August 3, 2020.

1.2 Organization of the Technical Support Document

This technical support document (TSD) is presented to the LADCO member states for estimating year 2020 O_3 future design values (DVFs). The TSD is organized into the following sections.

- Section 2 describes current surface O_3 conditions in the LADCO region and trends in O_3 concentrations over the past decade
- Section 3 describes the 2016 base year modeling and performance evaluation.
- Section 4 describes the 2020 CAMx air quality modeling platform that LADCO used to predict surface O_3 concentrations in 2020.

[1] www.camx.com

- Section 5 describes the approach used for estimating the O_3 DVFs. This section also includes a discussion on the methods used for identifying sites that are forecast to have O_3 NAAQS attainment problems.
- Section 6 presents a discussion of the performance evaluation and modeling results that the LADCO states can use to support their 2008 O_3 NAAQS NAA SIPs.
- The TSD concludes with a summary of significant findings and observations from the LADCO modeling.

2 2016 Ambient Air Quality Data Analysis

LADCO retrieves and conducts analysis on surface O_3 data collected at routine and special-purpose ambient monitors throughout the region. The current monitored O_3 design values (DVs), or the three-year average of the 4th highest daily maximum, 8-hour average O_3 concentrations, are presented in this section along with a discussion of trends in O_3 DVs and other metrics for tracking the changes in surface O_3 concentrations in the region. Design values are labeled by the last year of the three year average. For example, the 2019 O_3 DV is the average of the annual 4th highest daily maximum 8-hour average O_3 concentrations for the years 2017-2019.

2.1 Current Conditions

Figure 2 and Figure 3 are maps of the 2019 and 2020 O_3 design values (DVs) for the surface monitors around Lake Michigan. In Figure 2 warm colors represent O_3 concentrations approaching the 2008 O_3 NAAQS of 75 ppb; sites that are colored red in these plots indicate a violation of the 2008 standard. The 2019 DVs are based on validated data reported to the U.S. EPA. The 2020 DVs plot uses a different color scale, and these data are preliminary and based on unvalidated data reported through July 29, 2020. Note that several months remain in the O_3 season in 2020 and the values will change before the 2020 data become official. Table 1 and Table 2 show the same DVs data in tabulated form. Table 1 shows the annual DVs by 2008 O_3 NAAQS NAA from 2013 to present; the NAA DV is a reading from the “controlling” monitor, or the monitor with the highest 3-year DV in the entire NAA. Table 2 shows the annual DVs for key monitors in the Chicago and Sheboygan 2008 O_3 NAAQS NAAs from 2013 to present.

The DV tables and figures show that no monitors in either the Chicago or Sheboygan NAAs have 2019 3-year DVs that violate the 2008 O_3 NAAQS. Through July 29, 2020 one monitor in the Chicago NAA (Northbrook, IL) has a 2020 3-year DVs that violate the standard. Between 2013 and 2018, 2015 was the last DV year in which there were no violations of the 2008 O_3 NAAQS in the Chicago NAA; Sheboygan experienced violations of the standard every year between 2013 and 2018.

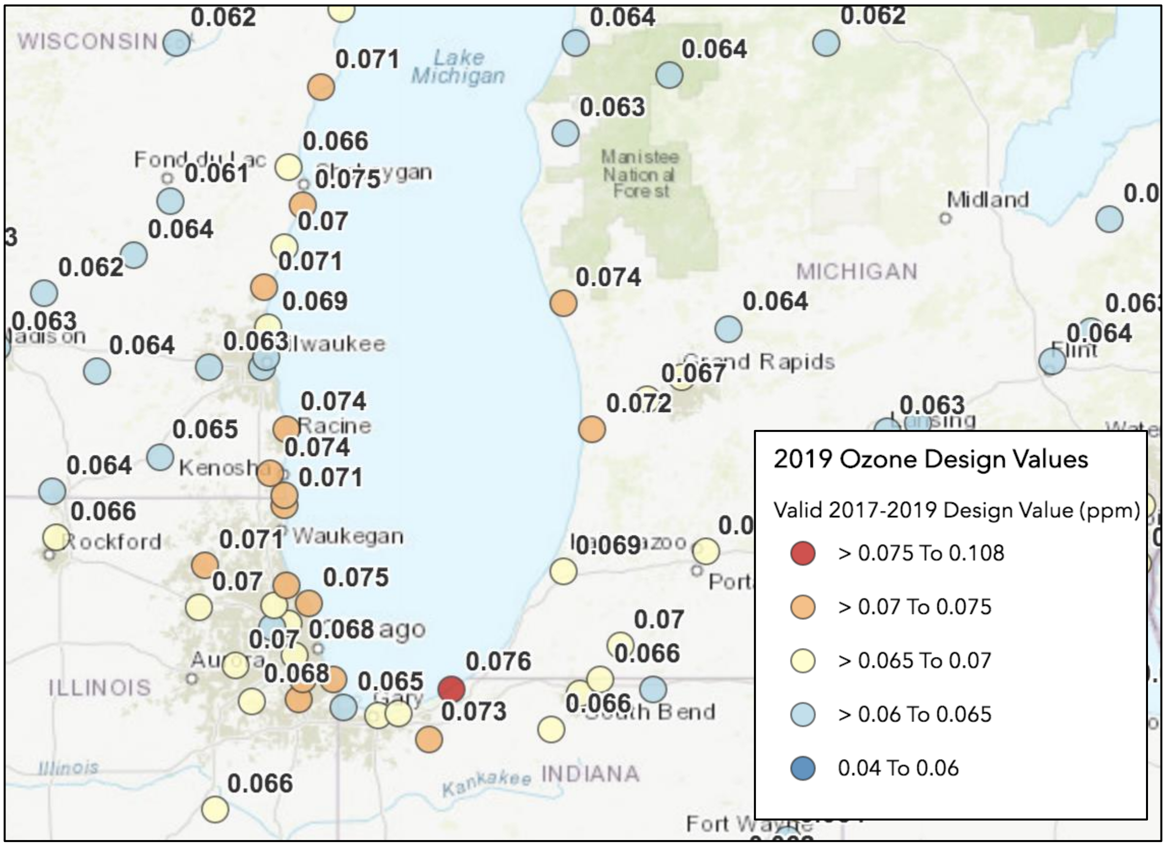


Figure 2. 2019 O_3 design values

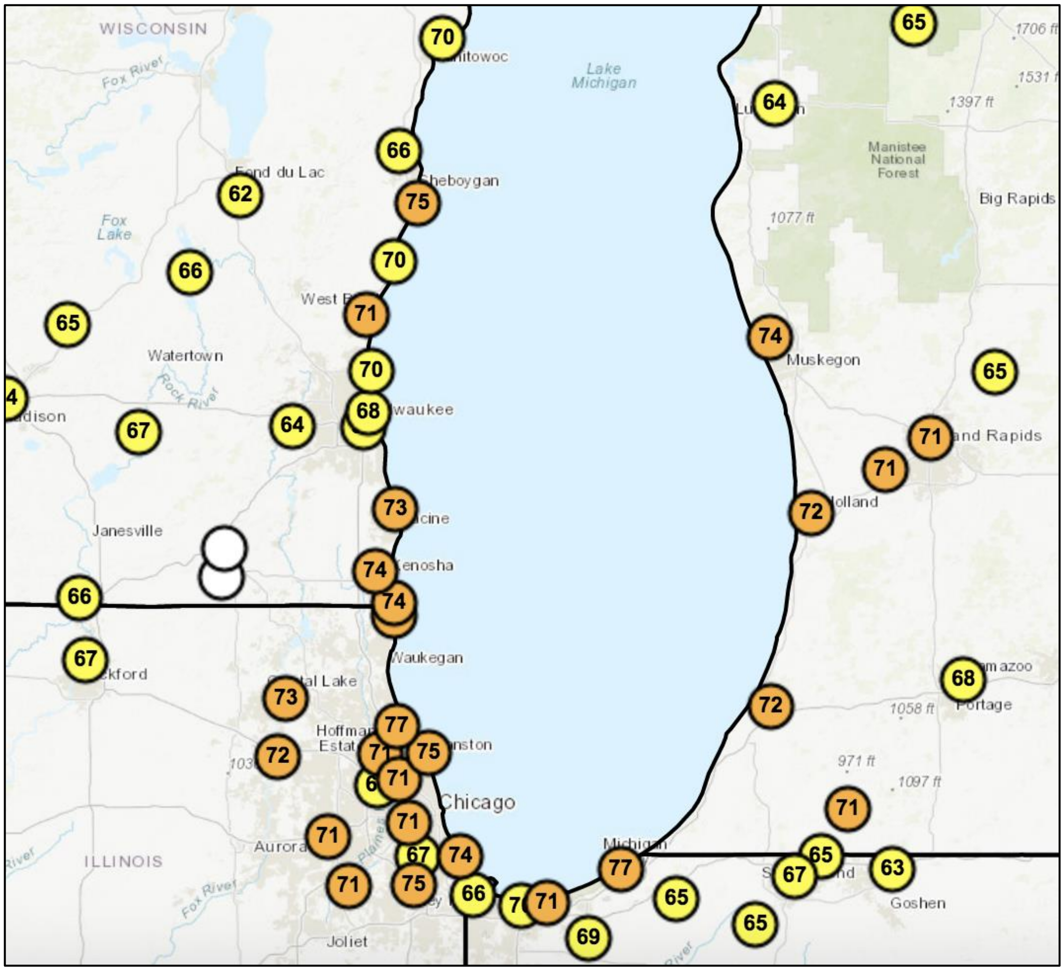


Figure 3. 2020 O_3 design values through July 29, 2020

Table 1. Western Lake Michigan 2008 O_3 NAAQS NAA design values (ppb) [Source: U.S. EPA Green Book, May 2020]

Designated Area	2013	2014	2015	2016	2017	2018	2019	2020*
Chicago-Naperville, IL-IN-WI	82	81	75	77	78	79	75	77
Inland Sheboygan County, WI				69	70	71	66	66
Shoreline Sheboygan County, WI	85	81	77	79	80	81	75	75

* 2020 data are preliminary and incomplete; they were retrieved July 29, 2020 from AirNow Tech.

Table 2. Western Lake Michigan 2008 O_3 NAAQS NAA monitor design values (ppb) [Source: U.S. EPA Green Book, May 2020]

State	County	AQS Site ID	2013	2014	2015	2016	2017	2018	2019	2020*
NAA: Chicago, IL-IN-WI										
IL	Cook	170310001	71	69	65	69	73	77	75	71
IL	Cook	170310032	80	76	68	70	72	75	73	74
IL	Cook	170310076	72	70	64	69	72	75	72	67
IL	Cook	170311003	70		66	69	67	69	67	67
IL	Cook	170311601	71	71	66	69	69	70	68	68
IL	Cook	170313103			61	62	62	64	63	63
IL	Cook	170314002	72	69	62	66	68	72	68	68
IL	Cook	170314007	68	69	68	71	71	74	70	71
IL	Cook	170314201	77	74	68	71	72	77	74	75
IL	Cook	170317002	80	78	70	72	73	77	75	75
IL	DuPage	170436001	68	67	64	68	70	71	70	66
IL	Kane	170890005	69	68	65	68	69	71	70	72
IL	Lake	170971007	80	79	71	73	73	75	71	71
IL	Will	171971011	64	65	63	64	65	67	66	64
IN	Lake	180890022	69	69	65	67	68	70	68	70
IN	Lake	180892008			63	65		66	65	65
WI	Kenosha	550590019	82	81	75	77	78	79	75	72
WI	Kenosha	550590025			69	71	73	77	74	72
NAA: Sheboygan County, WI										
WI	Sheboygan	551170006	85	81	77	79	80	81	75	73

* 2020 data are preliminary and incomplete; they were retrieved June 25, 2020 from AirNow-Tech.

2.2 Meteorology and Transport

Ozone concentrations are significantly influenced by meteorological factors. Ozone production is driven by high temperatures and sunlight, as well as precursor concentrations. Ozone concentrations at a given location are also dependent on wind direction, which governs which sources or source regions are upwind. Wind-drive transport in turn affects how much ozone and ozone precursors impact a given area.

Qualitatively, O_3 episodes in the region are associated with hot weather, clear skies (sometimes hazy), low wind speeds, high solar radiation, and winds with a southerly component. These conditions are often a result of a slow-moving high pressure system to the east of the region. The relative importance of various meteorological factors is discussed later in this section. Transport of O_3 and its precursors is a significant factor and occurs on several spatial scales. Regionally, over a multi-day period, somewhat stagnant summertime conditions can lead to the build-up in O_3 and O_3 precursor concentrations over a large spatial area. This polluted air mass can be transported long distances, resulting in elevated O_3 levels in locations far downwind. Locally, emissions from urban areas add to the regional background leading to O_3 concentration hot spots downwind. Depending on the synoptic wind patterns (and local land-lake breezes), different downwind areas are affected.

The following key findings related to transport can be made:

- Ozone transport is an issue affecting many portions of the eastern U.S. The Lake Michigan area (and other areas in the LADCO region) both receives high levels of incoming (transported) O_3 and O_3 precursors from upwind source areas on many hot summer days, and contributes to the high levels of O_3 and O_3 precursors affecting downwind receptor areas.
- The presence of Lake Michigan influences the formation and transport of O_3 in the region, particularly at sites within a few kilometers of the shoreline . Depending on

large-scale synoptic winds and local-scale lake breezes, different parts of the area experience high O_3 concentrations. For example, during southerly flow, high O_3 can occur in eastern Wisconsin, and during southwesterly flow, high O_3 can occur in western Michigan.

- Downwind shoreline areas around Lake Michigan are affected by transport of O_3 from major cities in the Lake Michigan area and from areas further upwind.

2.3 Ozone Trends

Figure 4 and Figure 5 illustrate the 19-year trends in 3-year O_3 DVs at individual surface monitors in the Chicago NAA and shoreline WI, respectively. The red horizontal lines on these figures mark the 2015 and 2008 O_3 NAAQS. After the decadal high year in 2012, surface O_3 concentrations in both regions have declined through 2019. While there has been an increasing trend in O_3 concentrations in the Chicago NAA monitors since the decadal low year in 2015, 2018 was the only year since 2015 that monitored 2008 O_3 NAAQS violations at multiple sites in the NAA. While the 3-year O_3 DVs measured at the Kohler-Andrae (551170006) monitor in Sheboygan, WI increased every year from 2015 to 2018, Figure 5 illustrates that 2019 was the first 3-year DV in the last 19 years that did not violate the 2008 O_3 NAAQS.

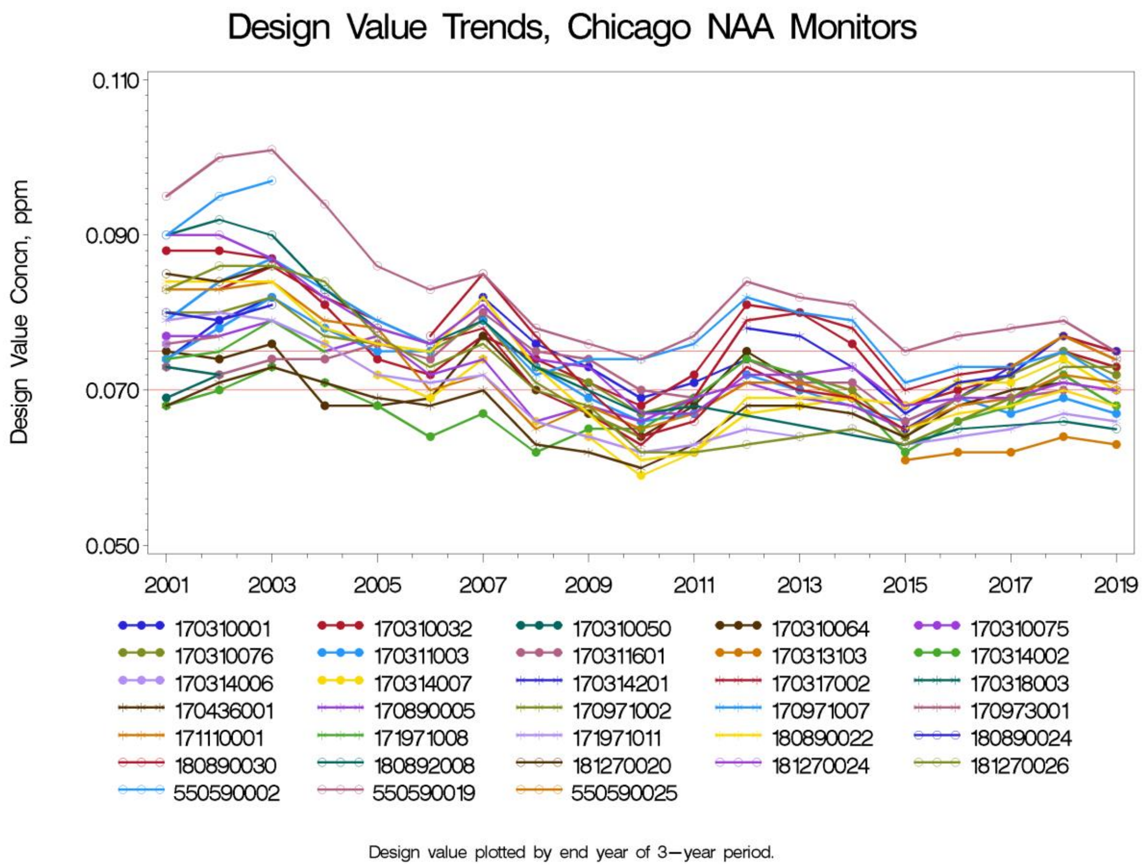


Figure 4. 3-year O_3 design value trends from 2001 to 2019 at all monitors in the Chicago NAA

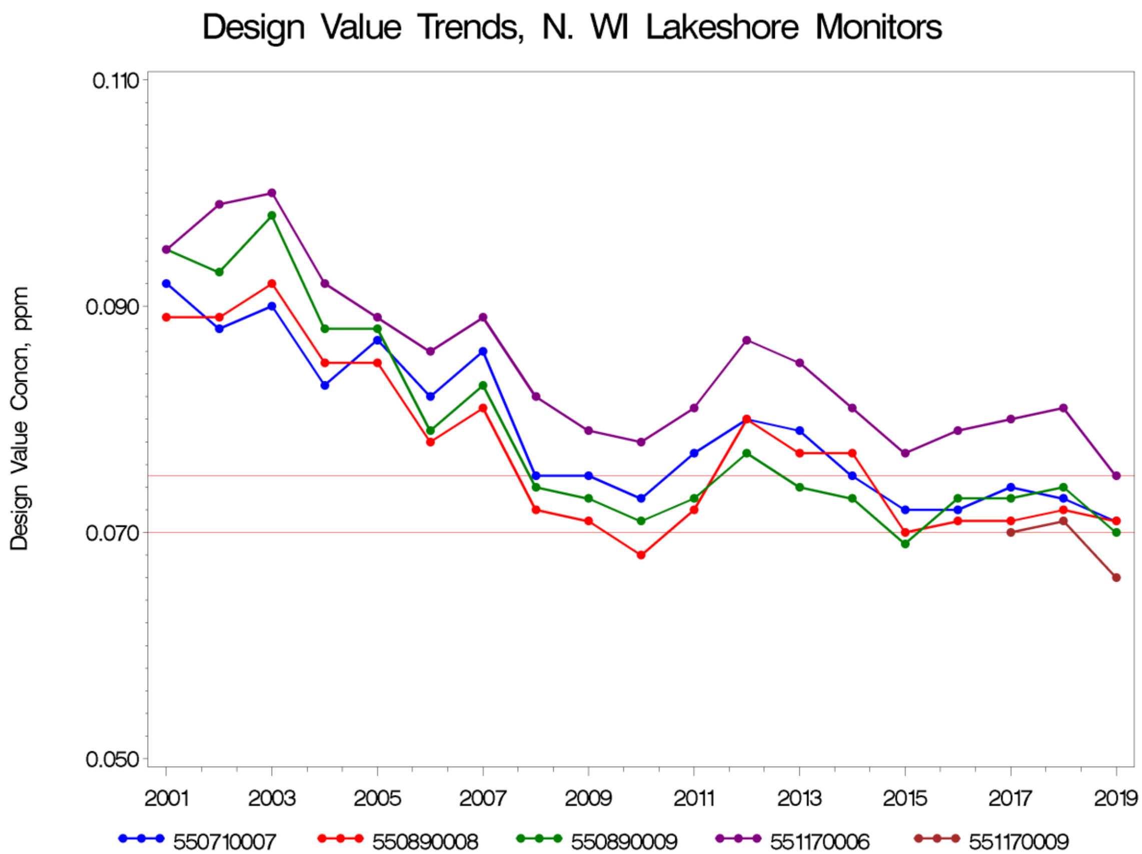


Figure 5. 3-year O_3 design value trends from 2001 to 2019 at Wisconsin lakeshore monitors

Given the effect of meteorology on ambient O_3 levels, year-to-year variations in meteorology can make it difficult to assess short term (e.g. – less than 10 years) trends in O_3 concentrations. One approach to adjust the trends in O_3 concentrations for meteorological influences is through the use of Classification and Regression Trees (CART). CART is a statistical technique which partitions data sets into similar groups (Breiman et al., 1984). LADCO performed a CART analysis using data for the period 2005-2018 for urban and downwind monitors in the 2008 O_3 NAAQS NAAs. The CART model searches through over thirty National Weather Service meteorological variables collected at airports[2] to determine which are most efficient in predicting O_3. Although the exact selection of predictive variables changes from site to site, the most common predictors of high surface O_3 concentrations during the period we analyzed are temperature, wind direction, and relative humidity. Only occasionally were upper air variables, transport time or distance, lake breeze, or other variables significant as predictors.

For each group of monitors in the NAAs we analyzed, LADCO developed regression trees that classify each summer day (May-September) by its meteorological conditions. Similar days are assigned to nodes, which are equivalent to branches of the regression tree. By grouping days with similar meteorology, the influence of meteorological variability on changes in O_3 concentrations is partially controlled for in the trend; the remaining trend is presumed to be due to trends in precursor emissions or other non-meteorological influences.

Trends over the 13-year period ending in 2018 were found to be declining for each monitor or composite area noted. These plots reflect long term trends and are not meant to depict trends over shorter time periods.

2.3.1 Northern Chicago NAA CART Analysis

LADCO used O_3 data from the Zion, IL and Chiwaukee, WI monitoring sites to identify trends in the surface concentrations downwind of Chicago using CART. Meteorological surface and aloft data used in this analysis are from the National Climatic Data Center's Integrated Surface Database and Integrated Radiosonde Archive; we used HYSPLIT trajectories to develop transport vectors.

Figure 6 shows the distribution of O_3 among Zion and Chiwaukee CART nodes. Each boxplot represents a group of days with common meteorological conditions. Node U

[2] National Climatic Data Center Integrated Surface Database

identifies the predictor variables that are associated with the highest mean observed O_3 concentrations at these monitors during the period of analysis (2005-2018). The days captured by this node have an average daily maximum O_3 concentration of 74 ppb and the following meteorological conditions:

- 24-hr southerly transport vector distance is >39 km
- average relative humidity is <70%
- afternoon wind direction is <211 deg
- max temperature is >85 F

Node T identifies the predictor variables that are associated with the second highest mean observed O_3 concentrations at these monitors during the period of analysis. Node T captures days with an average daily maximum O_3 concentration of 65 ppb and the following meteorological conditions:

- 24-hr southerly transport vector is >39 km
- average relative humidity is <70%
- afternoon wind direction is < 211 deg
- max temperature is <85 F and >78 F

CART identifies that the most significant predictors of high O_3 concentrations at Zion and Chiwaukee are warm and dry conditions with southerly flow. Daily maximum temperature is the only meteorological difference between nodes T and U. With all transport variables being equal, the cooler conditions represented by node T group days with an average O_3 concentration that is 9 ppb lower than the warmer days (>85 F) captured in node U.

Figure 7 shows the Zion, IL and Chiwaukee, WI O_3 trends by CART node. The node associated with the highest O_3 concentrations (node U) shows a distinct downward trend in O_3 concentrations during the 13 year CART analysis period. By controlling for the meteorological influence on O_3 concentrations during the most polluted days, this trend indicates that O_3 concentrations in the northern part of the Chicago 2008 O_3 NAAQS NAA are declining as the result of changes to emissions and other non-meteorological predictors.

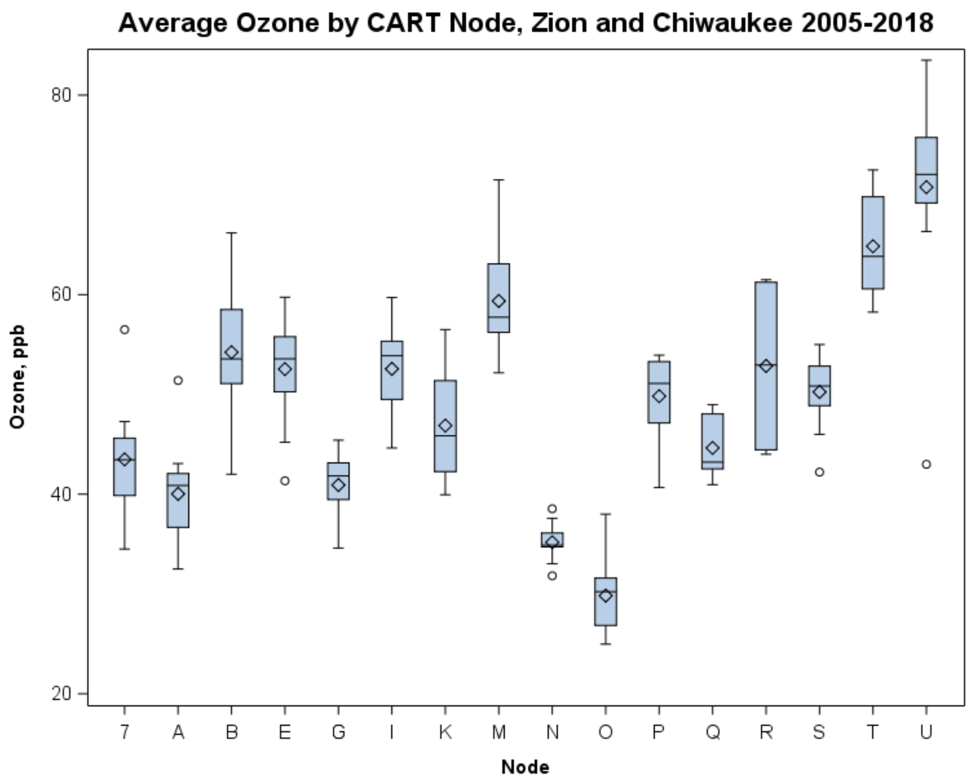


Figure 6. Northern Chicago NAA ozone concentrations by CART node.

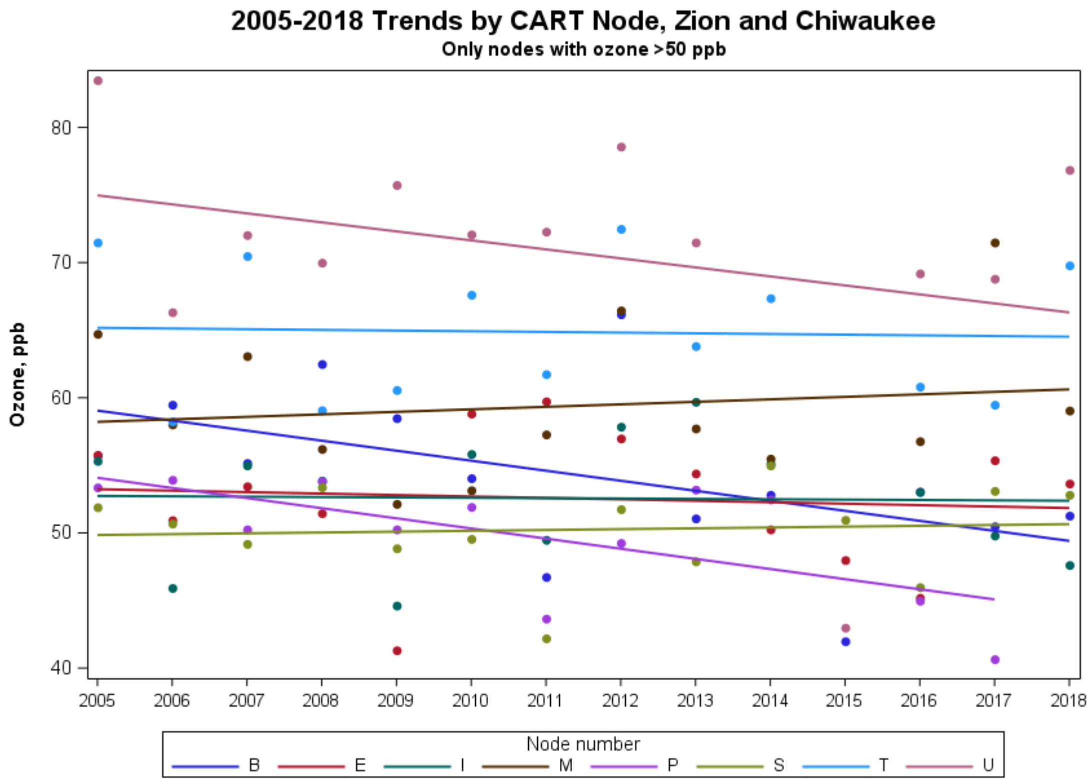


Figure 7. Northern Chicago NAA O_3 trends by CART node

2.3.2 Sheboygan, WI NAA CART Analysis

LADCO used O_3 data from the Kohler-Andrae monitor (551170061) for 2005-2018 to identify trends in the surface concentrations using CART. The meteorological data for the same period came from a variety of sources, including ambient data from the Manitowoc airport; the National Climatic Data Center's Integrated Surface Database and Integrated Radiosonde Archive; and HYSPLIT trajectories.

Figure 8 shows the distribution of O_3 among the Sheboygan, WI CART nodes. Node C identifies the predictor variables that are associated with the highest mean observed O_3 concentrations during the period of analysis (2015-2018). The separation of node C from the rest of the nodes indicates that the CART model effectively identified a unique set of meteorological conditions that distinguish the most polluted days from the rest of the distribution. The days captured by node C have an average daily maximum O_3 concentration of 75 ppb and the following meteorological conditions:

- 24-hr southerly transport vector >5.3 km
- average south wind vector (v) is >4.7 m/s
- temperature at 850mb is 4.1 deg > 10 yr mean temperature

Two of the three important predictors for Sheboygan Kohler-Andrae are transport-related and CART clearly identifies transport from the south as the dominant predictor of high O_3. After controlling for the meteorology predictors that are associated with the highest O_3 concentrations, there was a marked decrease in O_3 concentrations in Sheboygan from 2005-2018 as illustrated by the node C trend line in Figure 9. As with the downwind Chicago NAA sites, this trend indicates that O_3 concentrations in the Sheboygan, WI 2008 O_3 NAAQS NAA are declining as the result of changes to emissions and other non-meteorological predictors.

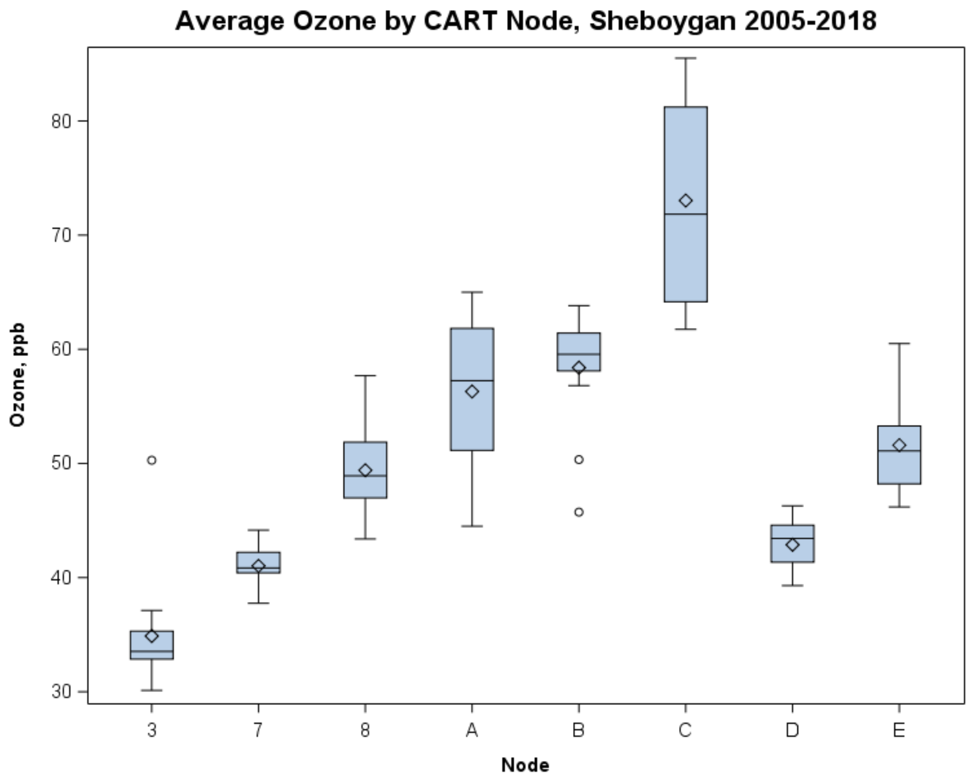


Figure 8. Sheboygan, WI NAA ozone concentrations by CART node.

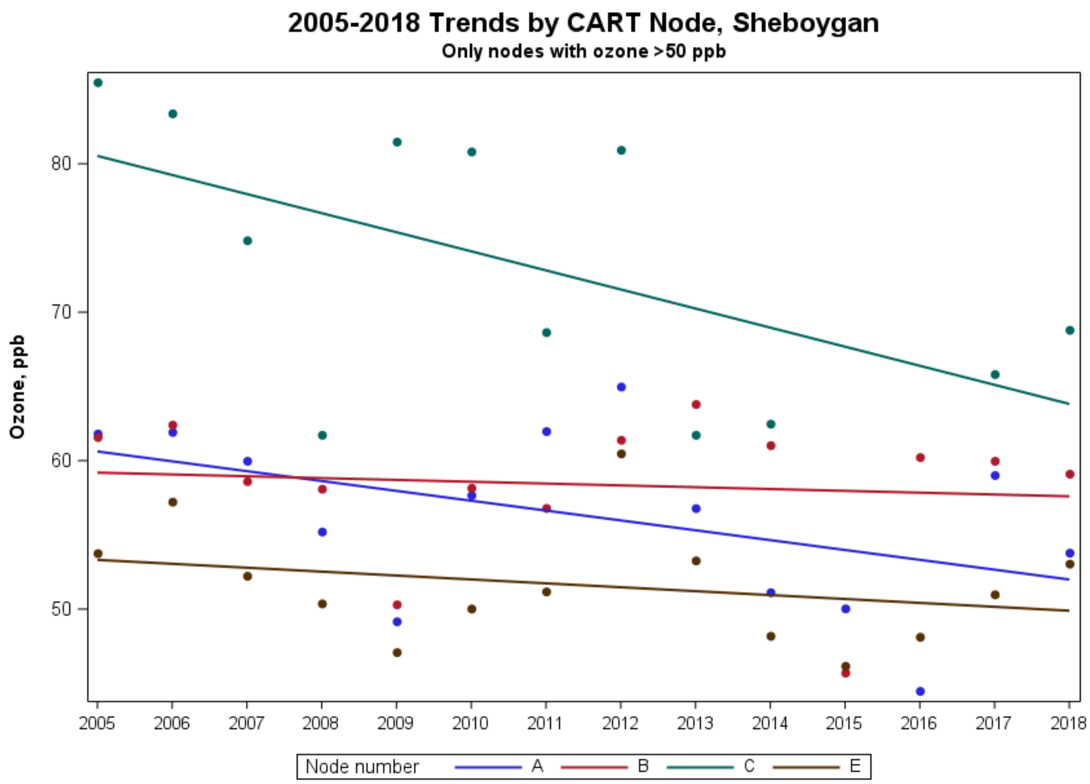


Figure 9. Sheboygan, WI NAA O_3 trends by CART node

We focused the CART analysis in this TSD on the highest nodes in the downwind Chicago and Sheboygan Kohler-Andrae monitors because these are the “controlling” monitors for the two 2008 O_3 NAAQS NAAs that are the focus of the current attainment demonstration. While some of the other CART nodes for these monitors, and other sub-groups of monitors (i.e., Chicago urban monitors) show flatter trends during the analysis period, they capture low to moderate O_3 concentrations. These other nodes and monitor groups do not lead to violations of the O_3 NAAQS as frequently as do the group of “controlling” monitors that are the subject of the CART analysis presented here.

2.4 Conceptual Model of Ozone in the Chicago and Sheboygan NAAs

A conceptual model is a qualitative summary of the physical, chemical, and meteorological processes that control the formation and distribution of pollutants in a given region. Based on the data and analyses presented above, and of previous conceptual models and technical support documents developed for the Lake Michigan region, a conceptual model of the behavior, meteorological influences, and causes of high O_3 in the Chicago and Sheboygan nonattainment areas is summarized below:

- Current monitoring data show that as of 2019 all of the surface O_3 monitoring sites in the western Lake Michigan region are meeting the 2008 8-hour O_3 NAAQS. Historical O_3 data show a downward trend over the past 19 years, due likely to federal and state emission control programs. Concentrations declined sharply from 2002 through 2010, and again from 2012 through 2015. Although ozone concentrations at the "controlling" monitors have been on the rise since 2015, there were no 3-year DVs in violation of the 2008 O_3 NAAQS at any monitor in the region in 2019.
- Ozone concentrations are strongly influenced by meteorological conditions, with more high O_3 days and higher O_3 levels during summers with above normal temperatures. Nevertheless, meteorologically adjusted trends at the controlling monitors show that concentrations have declined even on hot days, providing strong evidence that emission reductions of O_3 precursors have been effective.
- Inter- and intra-regional transport of O_3 and O_3 precursors affects many portions of the LADCO states, and is the principal cause of nonattainment in some areas far from population or industrial centers.
- The presence of Lake Michigan influences the formation, transport, and duration of elevated O_3 concentrations along its shoreline. Depending on large-scale synoptic winds and local-scale lake breezes, different parts of the area experience high O_3 concentrations. For example, under southerly flow, high surface O_3 concentrations can occur in eastern Wisconsin, and under southwesterly flow, high surface O_3 can occur in western Michigan.

- Areas in closer proximity to the Lake shoreline display the most frequent and most elevated O_3 concentrations.

3 2016 Air Quality Modeling and Model Performance Evaluation

3.1 2016 Modeling Platform

LADCO based our 2016 O_3 air quality predictions on the 2016v1 National Emission Inventory Collaborative emissions inventory[3] and the U.S. EPA 2016ff CAMx modeling platform. The meteorology and initial and boundary conditions came from the U.S. EPA 2016ff CAMx modeling platform. LADCO processed most of the 2016 emissions using the U.S. EPA 2016fh_16j Sparse Matrix Operator Kernel Emissions (SMOKE) modeling platform. The CAMx inputs, including the meteorology data simulated with the Weather Research Forecast (WRF) model, emissions data, and boundary conditions represent year 2016 conditions. LADCO used the majority of the data and software provided by U.S. EPA for this platform, with a few exceptions described below.

3.2 Modeling Year Justification

LADCO selected 2016 as a modeling year for this study because at the initiation of this project in late 2019 CAMx input data for 2016 were widely available and they represented the state-of-the-science for emissions and meteorology data. In 2017 a group of multi-jurisdictional organizations (MJOs), states, and EPA established 2016 as the new base year for a national air quality modeling platform[4]. The group concluded that if only one recent year could be selected, that 2016 would serve as a good base

[3] http://views.cira.colostate.edu/wiki/wiki/10202
[4] Base Year Selection Workgroup Final Report

year because of fairly typical O_3 conditions and average wildfire conditions. Following from the base year recommendations from that group, several modeling centers, including U.S. EPA and LADCO, developed data and capabilities for simulating and evaluating air quality in 2016.

Following from the selection of 2016 as the base year for a national modeling platform, starting in late 2017, the MJOs, states, and EPA formed the National Emissions Inventory Collaborative to develop a 2016 emissions inventory and modeling platform. Over 200 participants collaborated across 12 workgroups to develop base and future year emissions to support upcoming regulatory modeling applications. This effort was designed to involve a broad group of emissions experts in the development of a new national emissions modeling platform. LADCO used the 2016 and 2023 inventories developed by the Collaborative for the modeling presented here as they were the most recent inventory data available at the initiation of this project.

LADCO selected 2020 as the future projection year because it aligns with the last O_3 season that will be used to determine attainment of the 2008 O_3 NAAQS.

3.3 Air Quality Model Configuration

LADCO based our CAMx air quality modeling platform for this application on the configuration that the U.S. EPA used for recent regional haze modeling (US EPA, 2019). LADCO used CAMx 7.0 beta 4 (Ramboll, 2018) as the photochemical grid model for this application. CAMx is a three-dimensional, Eulerian air quality model that simulates the chemical transformation and physical transport processes of air pollutants in the troposphere. It includes capabilities to estimate the concentrations of primary and secondary gas and particle phase air pollutants, and dry and wet deposition, from urban to continental spatial scales. As CAMx associates source-level air pollution emissions estimates with air pollution concentrations, it can be used to design and assess emissions reduction strategies pursuant to NAAQS attainment goals.

LADCO selected CAMx for this study because it is a component of recent U.S. EPA modeling platforms for investigating the drivers of ground level O_3 in the U.S. CAMx is a three-dimensional, Eulerian air quality model that simulates the chemical transformation and physical transport processes of air pollutants in the troposphere. It includes capabilities to estimate the concentrations of primary and secondary gas and particle phase air pollutants, and dry and wet deposition, from urban to continental spatial scales. As CAMx associates source-level air pollution emissions estimates with air pollution concentrations, it can be used to design and assess emissions reduction strategies pursuant to NAAQS attainment goals. As CAMx is a component of U.S. EPA studies with a similar scope to this project, LADCO was able to leverage the data and software elements that are distributed with recent U.S. EPA regulatory modeling platforms. Using these elements saved LADCO significant resources relative to building a modeling platform from scratch.

Figure 10 shows the U.S. EPA transport modeling domain for the continental U.S. A 12-km uniform grid (12US2) covers all of the continental U.S. and includes parts of Southern Canada and Northern Mexico. The domain has 36 vertical layers with a model top at about 17,550 meters (50 mb). LADCO used the same U.S. EPA 12-km domain for this project because it supported the use of meteorology, initial and boundary conditions, and emissions data that were freely available from U.S. EPA.

Table 3 summarizes the CAMx science configurations and options LADCO used for the 2016 and 2020 CAMx modeling for this application. We used the Piecewise Parabolic Method (PPM) advection solver for horizontal transport along with the spatially varying (Smagorinsky) horizontal diffusion approach. We used K-theory for vertical diffusion using the CMAQ-like vertical diffusivities from WRFCAMx. The CB6r4 gas-phase chemical mechanism was selected because it includes the latest chemical kinetic rates and represents improvements over the other alternative CB05 and SAPRC chemical mechanisms as well as active methane chemistry. Additional CAMx inputs were as follows:

Meteorological Inputs: The U.S. EPA WRF-derived meteorological fields were processed to generate CAMx meteorological inputs using the WRFCAMx processor, as described in Section 3.4.

Initial/Boundary Conditions: LADCO used 2016 chemical boundary conditions for the 12-km continental U.S. modeling domain derived from the U.S. EPA northern hemisphere CMAQ simulations of 2016 (U.S. EPA, 2019c). The EPA 2016 ICBCs are hourly, vertically resolved up to 50 mb, and use the Carbon Bond 6 photochemical mechanism.

Photolysis Rates: LADCO prepared the photolysis rate inputs as well as albedo/haze/ozone/snow inputs for CAMx. Day-specific O_3 column data were based on the Total Ozone Mapping Spectrometer (TOMS) data measured using the satellite-based Ozone Monitoring Instrument (OMI). Albedo were based on land use data. For CAMx there is an ancillary snow cover input that will override the land use based albedo input. LADCO used the TUV photolysis rate processor to prepare clear-sky photolysis rates for CAMx. If there were periods of more than a couple of days where daily TOMS data were unavailable in 2016, the TOMS measurements were interpolated between the days with valid data; in the case where large periods of TOMS data were missing, monthly average TOMS data were used. CAMx was also configured to use the in-line TUV to adjust for cloud cover and account for the effects that modeled aerosol loadings have on photolysis rates; this latter effect on photolysis may be especially important in adjusting the photolysis rates due to the occurrence of PM concentrations associated with emissions from fires.

Landuse: LADCO used landuse/landcover data from the U.S. EPA WRF simulation.

<u>Spin-Up Initialization:</u> A minimum of ten days of model spin up (e.g., December 21-31, 2015) was used for the 12 km modeling domain. LADCO ran monthly CAMx simulations, initializing each month with a 10-day spin-up period.

As the focus of this study is on O_3, LADCO used CAMx to simulate the O_3 season. LADCO simulated April 1 through October 31, 2016 as individual months using 10-day model spin-up periods for each month. LADCO selected a CAMx configuration that was consistent with previous O_3 modeling applications performed by LADCO and U.S. EPA. U.S. EPA (2019) provided completed details their 2016 CAMx simulation, including a performance evaluation.

Table 3. LADCO 2016 CAMx modeling platform configuration

Science Options	Configuration
Model Codes	CAMx V7.0 beta 4
Simulation Period	March 20-October 31, 2016
Horizontal Grid Mesh	12 km, 396 col x 246 rows
Vertical Grid Mesh	36 layers as in WRF outputs
Grid Interaction	None
Initial Conditions	10 day spin-up on 12 km grid
Boundary Conditions	12km from hemispheric CMAQ (U.S. EPA 2016ff)
Emissions	
Baseline Emissions Processing	SMOKE, MOVES and BEIS
Sub-grid-scale Plumes	None
Chemistry	
Gas Phase Chemistry	CB6r4
Aerosol Chemistry	CF + SOAP
Meteorological Processor	WRFCAMx_v4.7
Horizontal Diffusion	Spatially varying
Vertical Diffusion	CMAQ-like in WRF2CAMx
Diffusivity Lower Limit	Kz_min = 0.1 to 1.0 m^2/s or 2.0 m^2/s
Dry Deposition	Zhang dry deposition scheme (CAMx)
Wet Deposition	CAMx-specific formulation
Gas Phase Chemistry Solver	Euler Backward Iterative (EBI) -- Fast Solver
Vertical Advection Scheme	Implicit scheme w/ vertical velocity update (CAMx)
Horizontal Advection Scheme	Piecewise Parabolic Method (PPM) scheme
Integration Time Step	Wind speed dependent

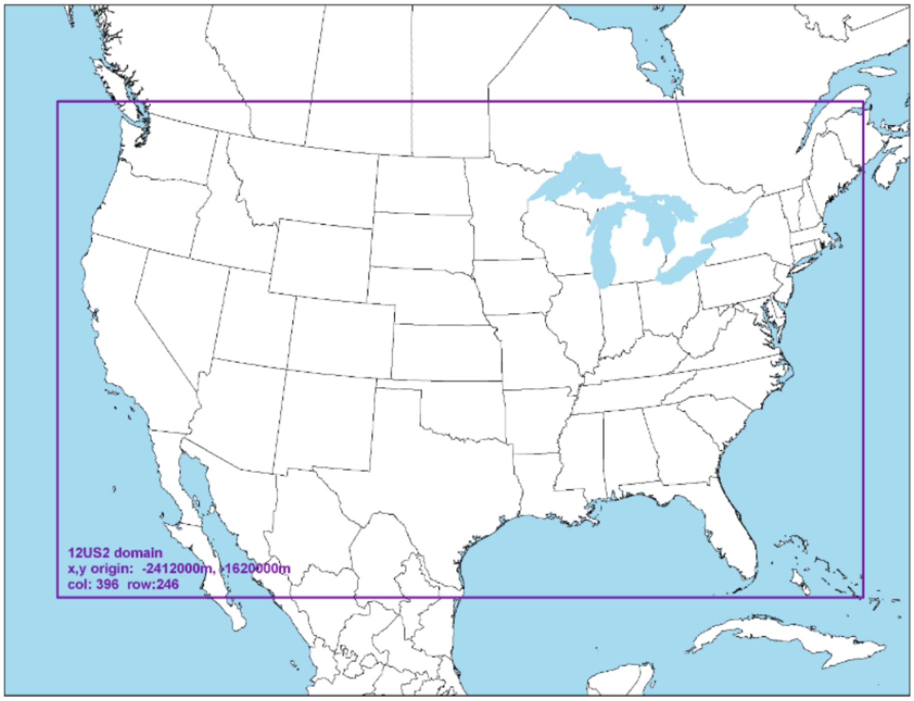


Figure 10. CAMx 12-km modeling domain (12US2)

3.4 Meteorology Data

LADCO used the U.S. EPA 2016 WRF data for this study (US EPA, 2019b). The U.S. EPA used version 3.8 of the WRF model, initialized with the 12-km North American Model (NAM) from the National Climatic Data Center (NCDC) to simulate 2016 meteorology. Complete details of the WRF simulation, including the input data, physics options, and four-dimensional data assimilation (FDDA) configuration are detailed in the Meteorology Model Performance for Annual 2016 Simulation WRFv3.8 report (US EPA, 2019b). LADCO prepared the WRF data for input to CAMx with version 4.6 of the WRFCAMx software.

3.5 Initial and Boundary Conditions

LADCO used 2016 initial and boundary conditions for CAMx generated by the U.S. EPA from a northern hemisphere simulation of the Community Multiscale Air Quality

(CMAQ) model (US EPA, 2019c). EPA generated hourly, one-way nested boundary conditions (i.e., hemispheric-scale to regional-scale) from a 2016 108-km x 108-km polar stereographic CMAQ simulation of the northern hemisphere. Following the convention of the U.S. EPA 2016 regional haze modeling (U.S. EPA, 2019), LADCO used year 2016 CMAQ boundary conditions for modeling 2016 and 2020 air quality with CAMx.

3.6 Emissions Data

The 2016 emissions data for this study were based on the U.S. EPA 2016 v1 ("2016fh_16") emissions modeling platform (http://views.cira.colostate.edu/wiki/wiki/10202). U.S. EPA and the 2016 Collaborative generated this platform for use O_3 NAAQS and Regional Haze SIPs. Twelve different workgroups collaborated to construct 2016 and future year emissions estimates. The first version of the 2016 inventories used 2014 inventory data; later versions of the inventory fully integrated 2016 estimates of emissions activities, growth and controls, and the latest emissions factors. Table 4 lists the 2016 base year inventory components that LADCO used to simulate 2016 air quality for this application.

Table 4. LADCO 2016 emissions modeling platform inventory components

Sector	Abbreviation	Data Source	Year
Agriculture	ag	U.S. EPA 2016fh	2016
Airports	airports	U.S. EPA 2016fh	2016
Biogenic	beis	U.S. EPA 2016fh	2016 meteorology
C1/C2 Commercial Marine	cmv_c1c2	U.S. EPA 2016fh	2016
C3 Commercial Marine	cmv_c2	U.S. EPA 2016fh	2016
Nonpoint	nonpt	U.S. EPA 2016fh	2016
Offroad Mobile	nonroad	U.S. EPA 2016fh	2016
Nonpoint Oil & Gas	np_oilgas	U.S. EPA 2016fh	2016
Onroad Mobile	onroad	U.S. EPA 2016fh	2016
Point Oil & Gas	pt_oilgas	U.S. EPA 2016fh	2016
Agricultural Fires	ptagfire	U.S. EPA 2016fh	2016
Electricity Generation	ptertac	ERTAC 16.1	2016
Wild and Prescribed Fires	ptfire	U.S. EPA 2016fh	2016

Industrial Point	ptnonertac	U.S. EPA 2016fh	2016
Rail	rail	U.S. EPA 2016fh	2016
Residential Wood Combustion	rwc	U.S. EPA 2016fh	2016
Mexico Anthropogenic	othar/othpt/	U.S. EPA 2016fh	2016
Canada Anthropogenic	othar/othpt	U.S. EPA 2016fh	2015

3.6.1 LADCO 2016 Emissions Summary

The tables in this section summarize the emissions used in the LADCO 2016 CAMx simulation. Figure 11 and Figure 12 are tile plots of the 12-km gridded, daily total NOx and VOC emissions, respectively, for a summer weekday (June 7, 2016). The NOx plot illustrates that the highest emissions occur in proximity urban areas and roadways. The VOC plot shows that biogenic sources dominate VOCs in the southern U.S and along the coasts. Table 5 shows the 2016 O_3 season (May-September) weekday NOx and volatile organic compound (VOC) emissions totals by LADCO member state. Table 6 and Table 7 include inventory sector level O_3 season weekday NOx and VOC emissions by state for 2016.

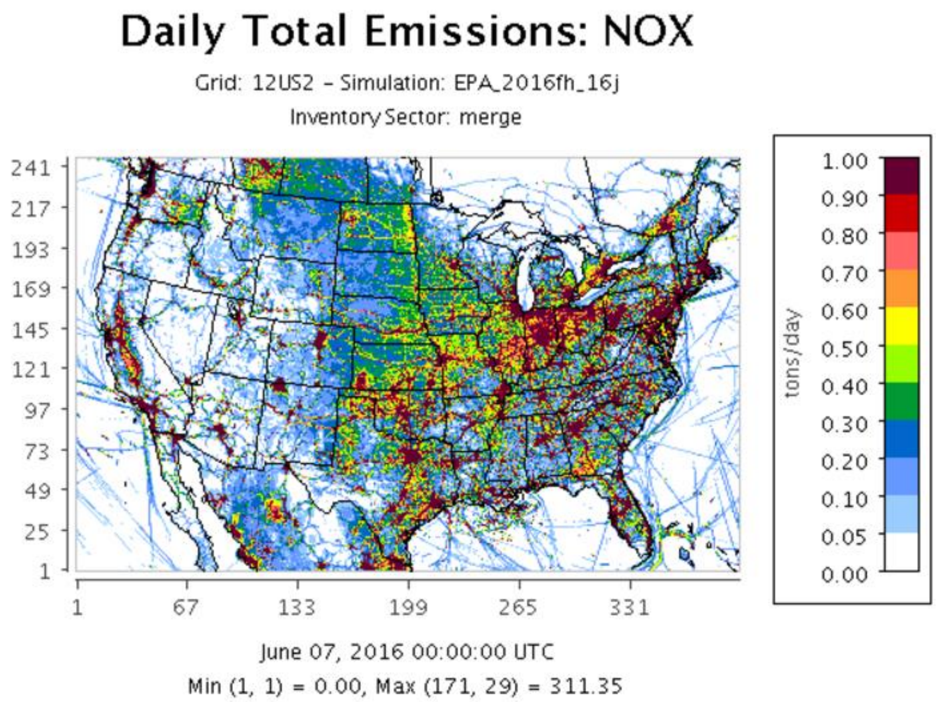


Figure 11. Daily total gridded 2016 NOx emissions for a summer weekday (tons/day)

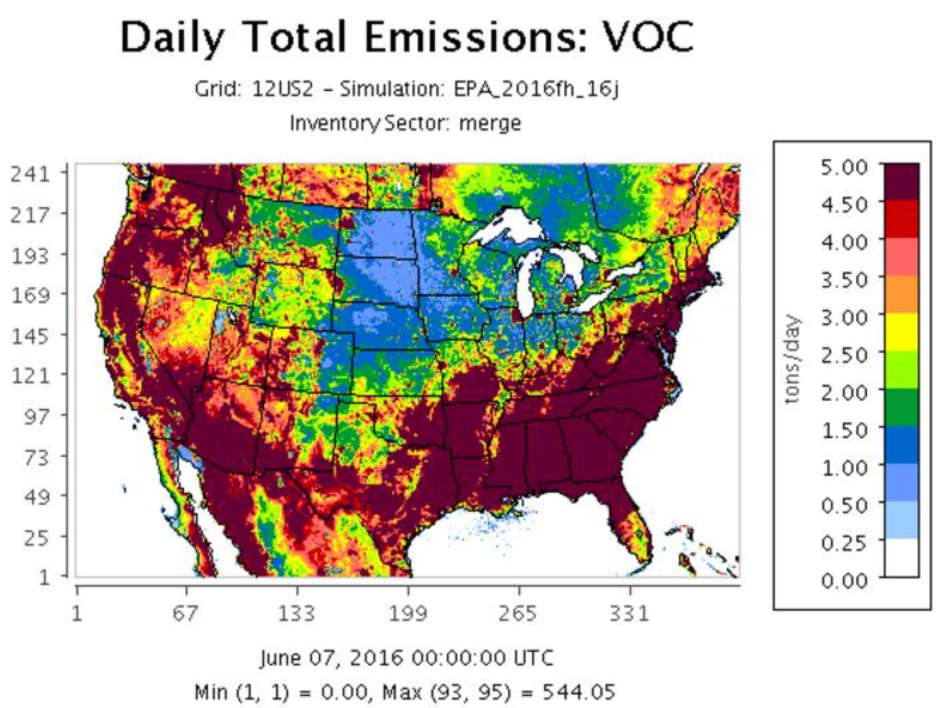


Figure 12. Daily total gridded 2016 VOC emissions for a summer weekday (tons/day)

Table 5. 2016 ozone season weekday emissions total, excluding biogenics (tons/day)

State	NOX	VOC
Illinois	998.0	999.7
Indiana	901.3	661.7
Michigan	803.3	822.8
Minnesota	620.5	713.5
Ohio	970.8	929.9
Wisconsin	519.7	473.2

Table 6. 2016 ozone season weekday NOx emissions by inventory sector (tons/day)

Sector	Illinois	Indiana	Michigan	Minnesota	Ohio	Wisconsin
Agriculture	0.0	0.0	0.0	0.0	0.0	0.0
Airports	28.7	5.1	10.9	9.9	6.3	3.4
Biogenic	167.0	89.6	61.7	126.9	74.0	71.8
C1/C2 Commercial Marine	17.1	4.5	15.8	3.0	7.6	5.7
C3 Commercial Marine	0.6	1.0	19.7	1.9	2.0	2.3
Nonpoint	83.8	18.9	66.4	41.6	62.0	36.5
Offroad Mobile	177.6	140.7	85.9	159.6	151.0	80.3
Nonpoint Oil & Gas	38.4	9.8	35.5	0.0	4.4	0.0
Onroad Mobile	347.9	312.6	291.6	193.9	368.1	241.2
Point Oil & Gas	23.5	14.1	29.3	7.8	31.2	1.5
Agricultural Fires	0.0	0.0	0.0	0.2	0.0	0.0
Electricity Generation	99.6	239.7	113.0	63.2	168.7	55.2
Wild and Prescribed Fires	1.0	0.4	1.6	6.5	0.8	1.9
Industrial Point	88.4	111.2	119.2	90.8	102.7	62.5
Rail	91.3	43.0	12.8	38.2	65.5	28.2
Residential Wood Combustion	0.3	0.3	1.5	3.9	0.5	1.1

Table 7. 2016 ozone season weekday VOC emissions by inventory sector (tons/day)

Sector	Illinois	Indiana	Michigan	Minnesota	Ohio	Wisconsin
Agriculture	28.3	27.4	12.6	51.5	25.5	20.4
Airports	9.4	2.4	4.2	3.6	3.2	1.9
Biogenic	2386.1	1575.4	3390.2	2894.4	2038.9	2770.9
C1/C2 Commercial Marine	0.9	0.2	0.5	0.1	0.4	0.2
C3 Commercial Marine	0.0	0.1	0.9	0.1	0.1	0.1
Nonpoint	372.5	261.8	351.7	183.9	417.8	177.5
Offroad Mobile	110.6	64.7	91.8	85.6	116.0	71.4
Nonpoint Oil & Gas	162.5	41.3	61.2		42.2	
Onroad Mobile	182.4	160.9	177.7	108.3	217.0	93.6
Point Oil & Gas	3.7	1.0	3.6	0.5	4.6	0.6
Agricultural Fires	0.0	0.0	0.0	0.5	0.0	0.0
Electricity Generation	4.5	3.9	3.2	1.5	3.1	2.3
Wild and Prescribed Fires	16.2	5.8	38.9	187.2	11.9	35.0
Industrial Point	101.0	85.7	62.5	50.8	78.9	59.1
Rail	4.3	2.0	0.6	1.8	3.1	1.3
Residential Wood Combustion	3.6	4.6	13.4	38.1	6.2	9.7

3.7 LADCO Modeling Platform Summary

Table 8 summarizes the LADCO 2016 air quality modeling platform elements.

Table 8. Listing of the LADCO 2016 air quality modeling platform components

Platform Element	Configuration	Reference	Data source
Meteorology Data	WRFv3.8	U.S. EPA, 2019b	U.S. EPA
Initial and Boundary Conditions	2016 Hemispheric CMAQ	U.S. EPA, 2019c	U.S. EPA
2016 Emissions Data	Inventory Collaborative 2016v1 ERTAC16.1 EGU Point		Inventory Collaborative and ERTAC
2020 Emissions Data	Inventory Collaborative 2016v1 ERTAC16.1 EGU Point		LADCO and ERTACT
Emissions Modeling Platform	U.S. EPA 2016fh_16j		U.S. EPA
Photochemical Grid Model	CAMxv7.0 beta4	Ramboll, 2018	LADCO

3.8 2016 CAMx Model Performance Evaluation

LADCO simulated 2016 air quality with CAMx using data derived from the U.S. EPA "2016fg" and "2016fh" modeling platforms. The only input data difference between the EPA and LADCO CAMx modeling was the emissions inventories. For their regional haze modeling platform, U.S. EPA used a modified version of the National Inventory Collaborative 2016beta inventory (U.S. EPA, 2019). LADCO used the Inventory Collaborative 2016v1 inventories for this application, and prepared these emissions for CAMx using the U.S. EPA 2016fh_16j SMOKE modeling platform.

The differences between the LADCO and U.S. EPA 2016 modeling configurations are significant enough to warrant a new performance evaluation of LADCO's CAMx simulation. The CAMx model performance evaluation (MPE) presented here focuses on ozone at surface monitors in the states of Illinois (IL), Indiana (IN), and Wisconsin (WI) as these are the states for which this TSD will be used to support NAA SIPs. LADCO used the Atmospheric Model Evaluation Tool (AMET) version 1.3 to pair the model results and surface observations in space and time, generate bi-variate statistics of model performance, and to produce MPE plots.

LADCO evaluated the CAMx 2016 modeled O_3 concentrations against concurrent measured surface ambient O_3 concentrations using graphical displays of model performance and statistical model performance measures. The statistical measures were compared against established model performance goals and criteria following the procedures recommended in EPA's photochemical modeling guidance documents (e.g., EPA, 1991; 2018).

3.8.1 Available Aerometric Data for the Model Evaluation

The following routine air quality measurement data networks operating in in 2016 were used by LADCO in assessing CAMx O_3 model performance:

> **EPA AQS Surface Air Quality Data**: Data files containing hourly-averaged concentration measurements at a wide variety of state and EPA monitoring networks are available in the Air Quality System (AQS) database throughout the U.S. The AQS consists of many sites that tend to be mainly located in and near major cities. There are several types of networks within AQS that measure different species. The standard hourly AQS AIRS monitoring stations typically measure hourly O_3, NO_2, NO_X and CO concentration and there are thousands of sites across the U.S. Figure 13 shows the locations of AQS surface monitors in the region around Lake Michigan.

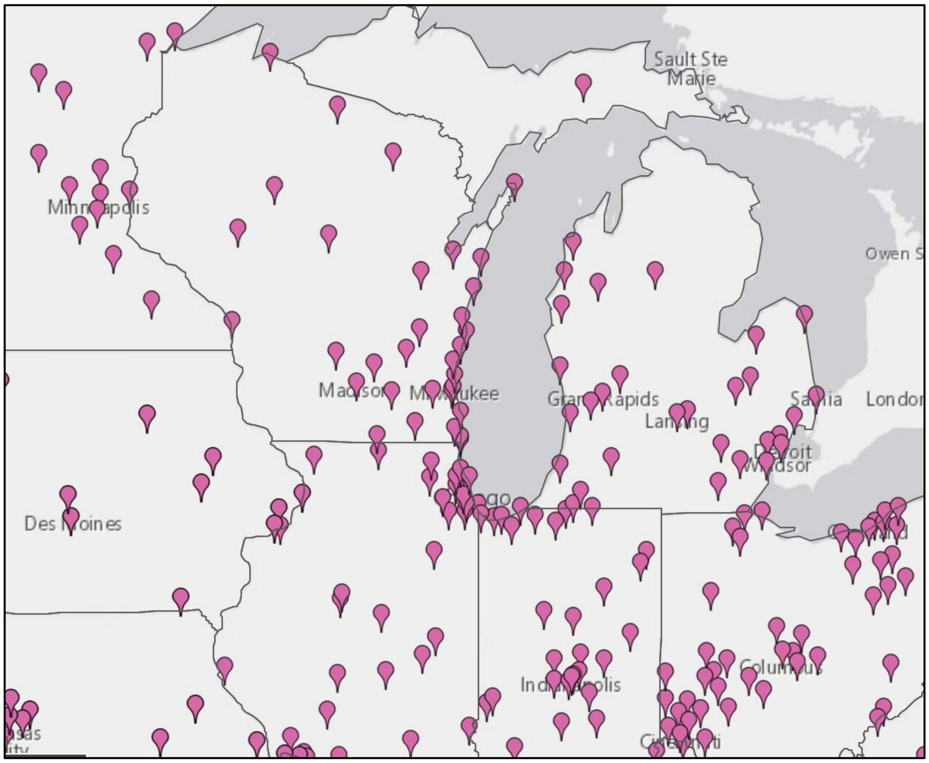


Figure 13. Locations of AQS monitors around Lake Michigan; source: U.S. EPA AirData

CASTNet Monitoring Network: The Clean Air Status and Trends Network (CASTNet) operates approximately 80 monitoring sites in mainly rural areas across the U.S. CASTNet sites typically collect hourly O_3, temperature, wind speed and direction, sigma theta, solar radiation, relative humidity, precipitation and surface wetness. CASTNet also collects weekly (Tuesday to Tuesday) samples of speciated $PM_{2.5}$ sulfate, nitrate, ammonium and other relevant ions and weekly gaseous SO_2 and nitric acid (HNO_3). Figure 14 displays the locations of the approximately 80 CASTNet sites across the U.S.

Figure 14. Locations of CASTNet monitoring sites; source: https://www.epa.gov/castnet

3.8.2 Model Performance Statistics, Goals and Criteria

For nearly three decades, O_3 model performance has been compared against EPA's 1991 O_3 modeling guidance performance goals as follows (EPA, 1991):

- Unpaired Peak Accuracy (UPA) ≤ ±20%
- Normalized Mean Bias (NMB) ≤ ±15%
- Normalized Mean Error (NME) ≤ 35%

In EPA's 1991 O_3 modeling guidance, these performance metrics were for hourly O_3 concentrations. The UPA compared the daily maximum 1-hour predicted and observed O_3 concentration that was matched by day, but not necessarily by location and by hour of the day. Since a photochemical grid model predicts O_3 concentrations everywhere and the observed O_3 is limited to a monitoring network, it would be fortuitous that the actual highest hourly O_3 concentration in a region occurred at a monitoring site, so one would expect a perfect model to have an overestimation tendency for the UPA performance metric.

The NMB statistic uses predicted and observed O_3 concentrations paired by time and location and is defined as the difference between the predicted and the observed O_3 divided by the observed O_3 concentrations averaged over all predicted/observed pairs (see Table 10) within a given region and for a given time period (e.g., by day, month or modeling period). The NME is defined similarly only it uses the absolute value of the difference between the predicted and observed O_3 concentrations so is an unsigned metric. These metrics may be calculated by using the predicted and observed O_3 pairs for which the observed O_3 concentration is above a threshold concentration. As recommended by EPA, LADCO used a 60 ppb observed O_3 cut-off threshold when calculating O_3 model performance statistics for this application.

Table 9. Ozone model performance goals

Fractional Bias (FB)	Fractional Error (FE)	Comment
≤±15%	≤35%	Ozone model performance goal that would be considered very good

It should be pointed out that these model performance goals are not used to assign passing or failing grades to model performance, but rather to help interpret the model performance and intercompare across locations, species, time periods and model applications. The model inputs to CAMx vary hourly, but tend to represent average conditions that do not account for unusual or extreme conditions. For example, an accident or large event could cause significant increases in congestion and motor vehicle emissions that are not accounted for in the average emissions inputs used in the model.

More recently, EPA compiled and interpreted the model performance from 69 air quality modeling studies in the peer-reviewed literature between 2006 and March 2012 and developed recommendations on what should be reported in a model performance evaluation (Simon, Baker and Phillips, 2012). Although these recommendations are not official EPA guidance, they are useful and were used by LADCO in our model performance evaluation:

- Photochemical modeling MPE studies should at a minimum report the Mean Bias (MB) and Error (ME or RMSE), and Normalized Mean Bias (NMB) and Error (NME) and/or Fractional Bias (FB) and Error (FE). Both the MNB and FB are symmetric around zero with the FB bounded by -200% to +200%.
- The model evaluation statistics should be calculated for the highest temporal resolution available and for important regulatory averaging times (e.g., daily maximum 8-hour O_3).
- It is important to report processing steps in the model evaluation and how the predicted and observed data were paired and whether data are spatially/temporally averaged before the statistics are calculated.
- Predicted values should be taken from the grid cell that contains the monitoring site, although bilinear interpolation to the monitoring site point can be used for higher resolution modeling (< 12 km).
- Evaluation should be performed for subsets of the data including, high observed concentrations (e.g., O_3 > 60 ppb), by subregions and by season or month.
- Evaluation should include more than just O_3 and $PM_{2.5}$, such as SO_2, NO_2 and CO.
- Spatial displays should be used in the model evaluation to evaluate model predictions away from the monitoring sites. Time series of predicted and observed concentrations at a monitoring site should also be used.
- It is necessary to understand measurement artifacts in order to make meaningful interpretation of the model performance evaluation.

We incorporated the recommendations of Simon, Baker and Philips (2012) into the LADCO CAMx model performance evaluation. The LADCO evaluation products include qualitative and quantitative evaluation for maximum daily 1-hour and maximum daily 8-hour average (MDA8) O_3, including MDA8 with a 60 ppb threshold.

Table 10. Definition of model performance evaluation statistical measures used to evaluate the CTMs.

Statistical Measure	Mathematical Expression	Notes
Accuracy of paired peak (Ap)	$\frac{P-O_{peak}}{O_{peak}}$	Comparison of the peak observed value (O_{peak}) with the predicted value at same time and location
Coefficient of determination (r2)	$\frac{\left[\sum_{i=1}^{N}(P_i-\overline{P})(O_i-\overline{O})\right]^2}{\sum_{i=1}^{N}(P_i-\overline{P})^2\sum_{i=1}^{N}(O_i-\overline{O})^2}$	Pi = prediction at time and location i; Oi = observation at time and location i; $\overline{P}$ = arithmetic average of Pi, i=1,2,…, N; $\overline{O}$ = arithmetic average of Oi, i=1,2,…,N
Normalized Mean Error (NME)	$\frac{\sum_{i=1}^{N}\lvert P_i-O_i\rvert}{\sum_{i=1}^{N}O_i}$	Reported as %
Root Mean Square Error (RMSE)	$\left[\frac{1}{N}\sum_{i=1}^{N}(P_i-O_i)^2\right]^{1/2}$	Reported as %
Fractional Gross Error (FE)	$\frac{2}{N}\sum_{i=1}^{N}\left\lvert\frac{P_i-O_i}{P_i+O_i}\right\rvert$	Reported as % and bounded by 0% to 200%
Mean Absolute Gross Error (MAGE)	$\frac{1}{N}\sum_{i=1}^{N}\lvert P_i-O_i\rvert$	Reported as concentration (e.g., $\mu g/m^3$)
Mean Normalized Gross Error (MNGE)	$\frac{1}{N}\sum_{i=1}^{N}\frac{\lvert P_i-O_i\rvert}{O_i}$	Reported as %
Mean Bias (MB)	$\frac{1}{N}\sum_{i=1}^{N}(P_i-O_i)$	Reported as concentration (e.g., $\mu g/m^3$)
Mean Normalized Bias (MNB)	$\frac{1}{N}\sum_{i=1}^{N}\frac{(P_i-O_i)}{O_i}$	Reported as %
Mean Fractionalized Bias (Fractional Bias, FB)	$\frac{2}{N}\sum_{i=1}^{N}\left(\frac{P_i-O_i}{P_i+O_i}\right)$	Reported as %, bounded by -200% to +200%
Normalized Mean Bias (NMB)	$\frac{\sum_{i=1}^{N}(P_i-O_i)}{\sum_{i=1}^{N}O_i}$	Reported as %

Statistical Measure	Mathematical Expression	Notes
Bias Factor (BF)	$\frac{1}{N}\sum_{i=1}^{N}\left(\frac{P_i}{O_i}\right)$	Reported as BF:1 or 1: BF or in fractional notation (BF/1 or 1/BF).

3.8.3 Subregional Evaluation of Model Performance

The evaluation of the LADCO 2016 CAMx 12-km simulation focuses on monthly and O_3 season model performance at monitors in IL, IN, and WI. We also examined summer season high O_3 episodes in different parts of the region to determine how well the model performs on O_3 exceedance days and locations.

4 2020 Air Quality Projections

LADCO based our 2020 O_3 air quality and NAA attainment forecasts on the CAMx modeling platform released by the U.S. EPA in September 2019 to support regional haze progress assessments. The U.S. EPA 2016fh_16j emissions modeling platform included an emissions projection to 2023. Given the absence of available emissions data for 2020 at the time that this application initiated in late 2019, LADCO used linear interpolation between 2016 and 2023 for most of the emissions sectors to estimate 2020 emissions. An exception was for the stationary point source electricity generating unit (EGU) sector, which used a 2020 forecast estimated by the ERTAC EGU 16.1 model (MARAMA, 2012).

For the CAMx modeling used to predict 2020 air quality, LADCO kept all of the CAMx inputs other than the emissions the same as the 2016 simulation.

4.1 2020 Emissions Data

LADCO estimated 2020 emissions for most of the anthropogenic inventory sectors by interpolating between the 2016 and 2023 Inventory Collaborative 2016v1 inventories. We used linear interpolation for the emissions because 2020 inventories were not readily available for all of the sectors at the time that this application initiated. While LADCO recognizes that emissions do not change linearly, given the relatively short period between the base and future years (4 years), LADCO considers that linear interpolation was justified for this application. LADCO also considers linear interpolation of the emissions to 2020 better than the alternatives of either holding the emissions constant at 2016 levels or using 2023 emissions estimates to simulate air quality in 2020.

LADCO applied two distinct linear interpolation techniques to estimate 2020 emissions. The first method was applied to gridded non-point, low-level emissions (e.g., area and mobile sources) sectors that had already been processed through SMOKE for 2016 and 2023. LADCO calculated the 2020 gridded emissions using Equation 1,

$$E_{2020,i,j,t,p} = 3/7 \times E_{2016,i,j,t,p} + 4/7 \times E_{2023,i,j,t,p} \quad \text{(Equation 1)}$$

where, E = hourly, gridded emissions
i = column
j = row
t = hour
p = pollutant

As Equation 1 would not work for point sources because new units came online and other units shut down between the 2016 base and 2020 future years, LADCO applied Equation 2 to interpolate the non-EGU industrial point sources to 2020.

For each process and pollutant:

$$E_{2020,s,p} = (2020\text{-}2016)*(E_{2023,s.p} - E_{2016,s,p})/(2023\text{-}2016) + E_{2016,s,p} \quad \text{(Equation 2)}$$

where, E = annual emissions
s = point source process
p = pollutant

LADCO developed work-arounds to Equation 2 for (1) units that began operations after 2016 and were included in the 2023 inventory; and (2) units that were in the 2016 inventory but were shut down in the 2023 inventory. After reviewing the sources included in the first list, LADCO established that U.S. EPA developed the 2023 inventories for the new units based on state 2017 NEI submittals. We found that most of the new units that were added to the 2023 inventory by U.S. EPA were already operating by 2020. Without being able to identify all of the unit level startup date information, LADCO made the assumption that all new units listed as operating in 2023 would also be operating in 2020. We calculated the 2020 emissions for these sources using Equation 2, which simplifies to $E_{2020,s.p} = 4/7 \times E_{2023,s.p}$ when we consider that these sources had zero emissions in 2016.

For the second list of sources, or those units that were in the 2016 inventory but not in the 2023 inventory, LADCO found that most of the shutdowns were scheduled before 2020. Several units that we reviewed had already shut down by late-2019 when we were developing the 2020 inventory for this modeling application. LADCO assumed that all units identified to be shut down by 2023 would also be shut down in the 2020 inventory that we developed for this modeling application. We validated this assumption using internet searches to confirm that the largest units in this second list of sources were in fact shut down by 2020.

LADCO replaced the EGU emissions in the U.S. EPA “2016fh” emissions modeling platform with 2020 EGU forecasts estimated with the ERTAC EGU Tool version 16.1 (MARAMA, 2012). ERTAC EGU 16.1 integrates state-reported information on EGU operations and forecasts as of December 2019. LADCO considers that the ERTAC EGU Tool provides more accurate estimates of the growth and control forecasts for EGUs in the Midwest and Northeast states than the U.S. EPA approach used in U.S. EPA’s “2016fh” modeling platform.

4.1.1 LADCO 2020 Electricity Generating Unit Emissions

The ERTAC EGU model for growth was developed around activity pattern matching algorithms designed to provide hourly EGU emissions data for air quality planning. The original goal of the model was to create low-cost software that air quality planning agencies could use for developing EGU emissions projections. States needed a transparent model that was numerically stable and did not produce dramatic changes to the emissions forecasts with small changes in inputs. A key feature of the model includes data transparency; all of the inputs to the model are publicly available. The code is also operationally transparent and includes extensive documentation, open source code, and a diverse user community to support new users of the software.

Operation of the model is straightforward given the complexity of the projection calculations and inputs. The model imports base year Continuous Emissions Monitoring

(CEM) data from U.S. EPA and sorts the data from the peak to the lowest generation hour. It applies hour specific growth rates that include peak and off peak rates. The model then balances the system for all units and hours that exceed physical or regulatory limits. ERTAC EGU applies future year controls to the emissions estimates and tests for reserve capacity, generates quality assurance reports, and converts the outputs to SMOKE-ready modeling files.

ERTAC EGU has distinct advantages over other growth methodologies because it is capable of generating hourly future year estimates which are key to understanding O_3 episodes. The model does not shutdown or mothball existing units because economics algorithms suggest they are not economically viable. Additionally, alternate control scenarios are easy to simulate with the model. In recent years significant effort has been put into the model to help users to prevent the generation of new coal plants to fit demand. The model now allows portability of generation to different fuels like renewables and natural gas to prevent this.

Differences between the U.S. EPA and ERTAC EGU emissions forecasts arise from alternative forecast algorithms and from the data used to inform the model predictions. The U.S. EPA based the EGU emissions forecast in their “2016fh” modeling platform on comments from states and stakeholders received through April 2019. ERTAC EGU 16.1 used CEM data from 2016 and state-reported changes to EGUs received through December 2019. The ERTAC EGU 16.1 emissions used for this modeling application represent the best available information on EGU forecasts for the Midwest and Eastern U.S. available December 2019.

Figure 15 through Figure 20 show gridded daily total 2020 NOx and VOC emissions for a summer weekday (June 7). The spatial patterns seen in these figures match with the patterns in the 2016 emissions figures shown previously. The difference and ratio plots illustrate the locations where emissions are projected to change in 2020 relative to 2016. The NOx ratio plot (Figure 17) shows that the largest NOx emissions reductions will occur along roadways and in urban areas; emissions increases are projected in oil and gas development regions, in Mexico, and in Canadian offshore sources in the Great Lakes. The VOC ratio plot (Figure 20) illustrates small emissions reductions in urban areas and emissions increases in oil and gas development areas.

Table 11 shows the LADCO state total 2020 O_3 season (May 1 – September 30) weekday NOx and VOC emissions. Table 12 and Table 13 show the total 2020 O_3 season weekday NOx and VOC emissions for each LADCO state by emissions inventory sector. Table 14 and Table 15 compare 2020 and 2016 ozone season day NOx and VOC emissions, respectively, by inventory sector for each LADCO state. Negative numbers in these tables indicate emissions reductions in 2020 relative to 2016. Comparisons of the EGU and industrial point source emissions changes between 2016 and 2020 is confounded by the different methods used by the U.S EPA and ERTAC EGU projection models for distinguishing EGU from non-EGU industrial point sources. Some of the decreases in EGU emissions in 2020 are due to sources being reclassified from the EGU to the non-EGU industrial point sector by ERTAC EGU.

Overall both the NOx and VOC ozone season day emissions are projected to decrease in 2020 relative to 2016 in all of the LADCO states. The NOx reductions range from 10%-17%, driven primarily by reductions in mobile source emissions. The VOC reductions are more modest, at around 1% in each of the LADCO states and also driven by reductions in mobile sources. For the anthropogenic sectors only (i.e., excluding biogenics), the ozone season day VOC emissions reductions are closer to 5% in each of the LADCO states.

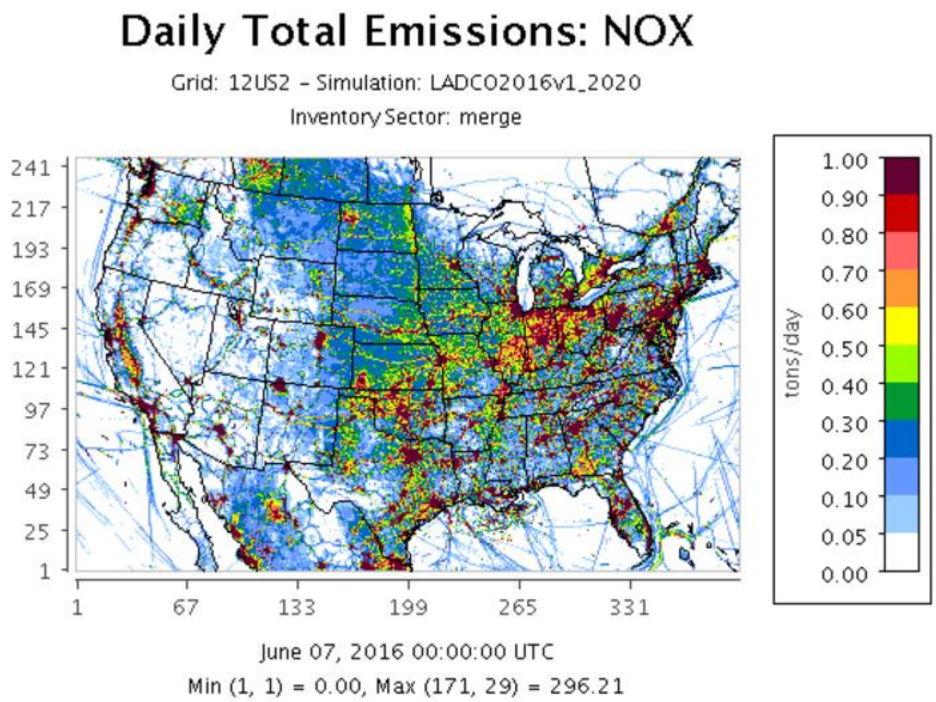


Figure 15. Daily total gridded 2020 NOx emissions for a summer weekday (tons/day)

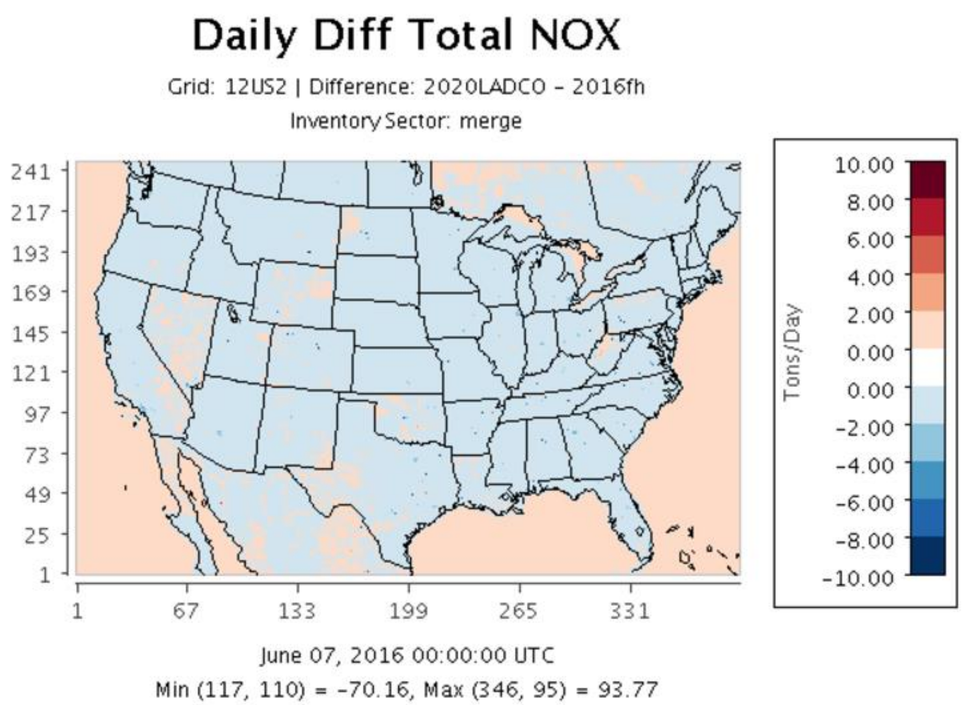


Figure 16. Difference (2020-2016) in daily total gridded NOx emissions for a summer weekday (tons/day)

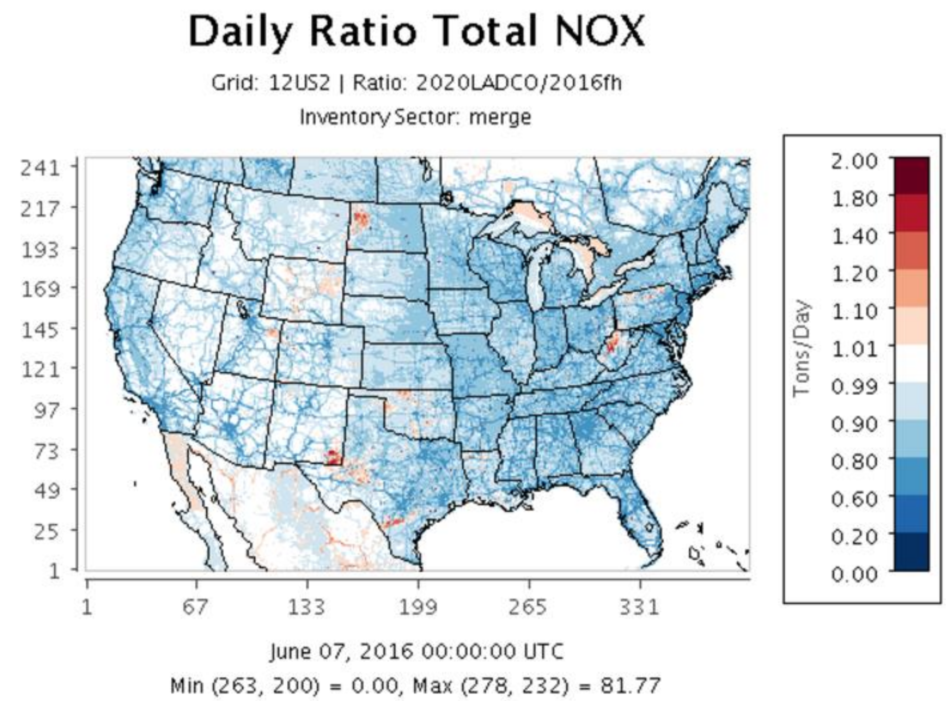


Figure 17. Ratio (2020/2016) of daily total gridded NOx emissions for a summer weekday (unitless)

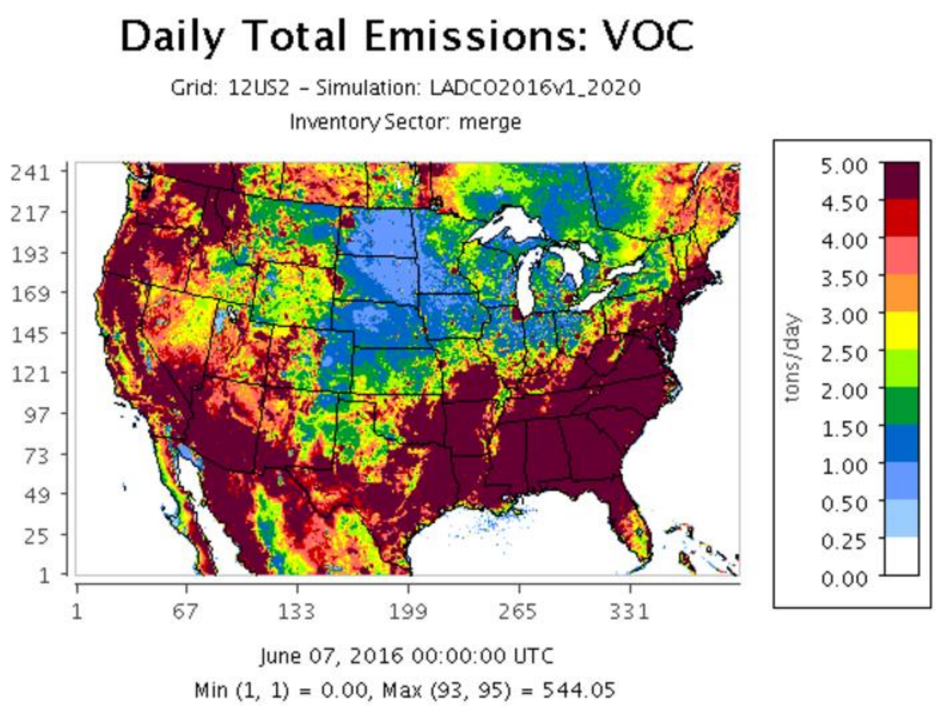


Figure 18. Daily total gridded 2020 VOC emissions for a summer weekday (tons/day)

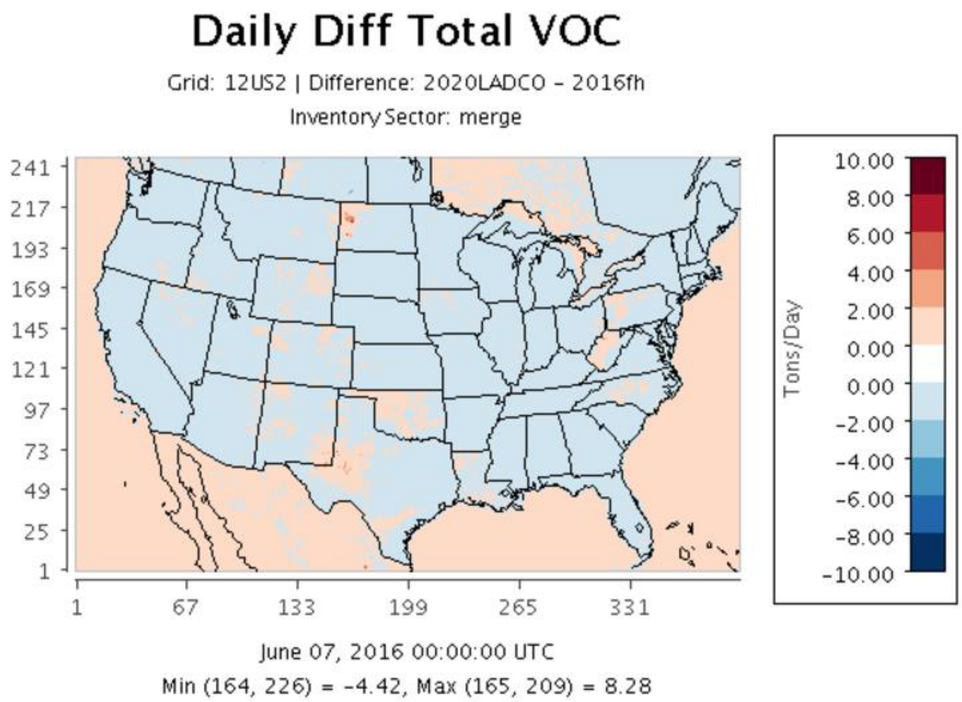


Figure 19. Difference (2020-2016) in daily total gridded VOC emissions for a summer weekday (tons/day)

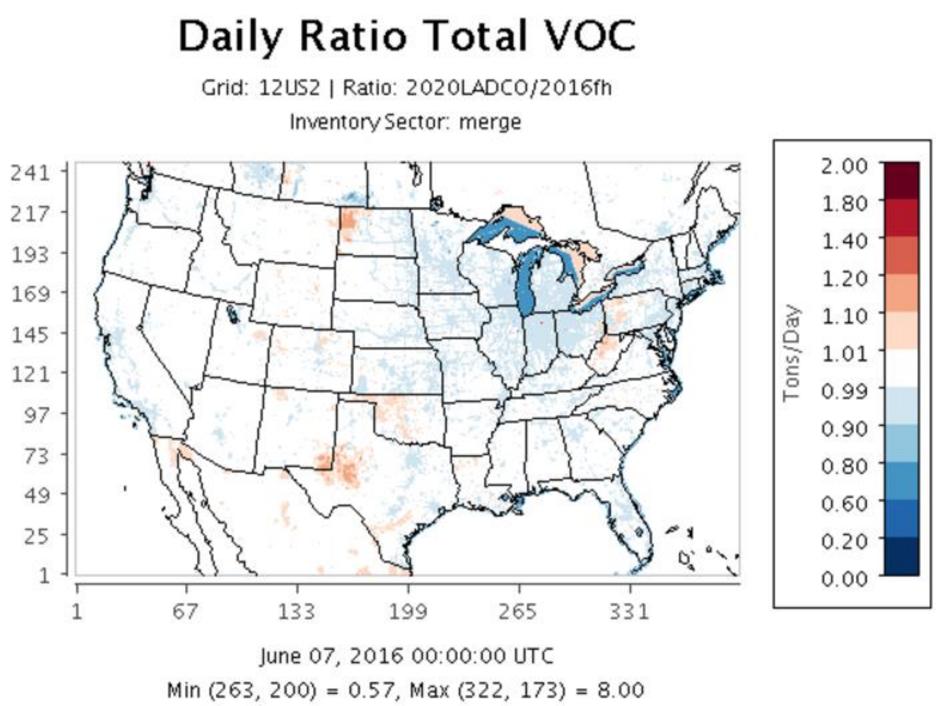


Figure 20. Ratio (2020/2016) of daily total gridded VOC emissions for a summer

weekday (unitless)

Table 11. 2020 ozone season weekday emissions total by LADCO state, excluding biogenics (tons/day)

State	NOX	VOC
Illinois	876.7	959.4
Indiana	737.0	628.8
Michigan	699.1	778.7
Minnesota	531.1	687.7
Ohio	809.6	885.1
Wisconsin	431.1	448.8

Table 12. 2020 ozone season weekday NOx emissions by inventory sectors (tons/day)

Sector	Illinois	Indiana	Michigan	Minnesota	Ohio	Wisconsin
Agriculture	0.0	0.0	0.0	0.0	0.0	0.0
Airports	31.7	5.6	12.1	10.6	6.7	3.8
Biogenic	167.0	89.6	61.7	126.9	74.0	71.8
C1/C2 Commercial Marine	14.8	3.9	13.8	2.5	6.6	5.0
C3 Commercial Marine	0.6	1.1	20.5	2.0	2.2	2.5
Nonpoint	82.0	18.8	65.2	41.4	61.0	36.1
Offroad Mobile	148.6	117.2	74.0	135.9	127.8	67.8
Nonpoint Oil & Gas	37.7	9.6	33.6	0.0	5.7	0.0
Onroad Mobile	271.7	244.1	224.2	149.8	283.3	183.6
Point Oil & Gas	25.1	17.5	30.1	7.6	34	1.6
Agricultural Fires	0.0	0.0	0.0	0.2	0.0	0.0
Electricity Generation	84.7	150.6	92.3	48.1	118.1	39.7
Wild and Prescribed Fires	1.0	0.4	1.6	6.5	0.8	1.9
Industrial Point	93.1	127.6	118.0	87	101.9	61.8
Rail	85.4	40.3	12.2	35.6	61.0	26.2
Residential Wood Combustion	0.3	0.3	1.5	3.9	0.5	1.1

Table 13. 2020 ozone season weekday VOC emissions by inventory sectors (tons/day)

Sector	Illinois	Indiana	Michigan	Minnesota	Ohio	Wisconsin
Agriculture	29.4	28.4	13.0	53.2	26.3	20.6
Airports	9.8	2.4	4.3	3.6	3.1	1.9
Biogenic	2386.1	1575.4	3390.2	2894.4	2038.8	2770.9
C1/C2 Commercial Marine	0.7	0.2	0.4	0.1	0.3	0.2
C3 Commercial Marine	0.0	0.1	1.0	0.1	0.2	0.2
Nonpoint	374.3	262.8	351.6	185.3	420.0	178.3
Offroad Mobile	101.9	60.2	82.4	76.0	105.9	63.2
Nonpoint Oil & Gas	161.0	41.3	59.9	0.0	44.3	0.0
Onroad Mobile	150.3	131.4	145.6	89.0	177.8	77.1
Point Oil & Gas	4.5	1.2	3.7	0.5	6.1	0.8
Agricultural Fires	0.0	0.0	0.0	0.5	0.0	0.0
Electricity Generation	3.5	3.9	2.4	1.1	2.4	2.1
Wild and Prescribe Fires	16.2	5.8	38.9	187.2	11.8	35.0
Industrial Point	100.3	84.7	61.3	50.8	77.9	58.4
Rail	3.9	1.8	0.6	1.6	2.8	1.2
Residential Wood Combustion	3.6	4.6	13.6	38.7	6.2	9.8

Table 14. Difference between base and future year ozone season weekday NOx emissions (2020-2016; tons/day)

Sector	Illinois	Indiana	Michigan	Minnesota	Ohio	Wisconsin
Agriculture	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
Airports	3.0 (10%)	0.5 (10%)	1.2 (11%)	0.7 (7%)	0.4 (6%)	0.4 (12%)
Biogenic	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
C1/C2 Commercial Marine	-2.3 (-13%)	-0.6 (-13%)	-2.0 (-13%)	-0.5 (-17%)	-1.0 (-13%)	-0.7 (-12%)
C3 Commercial Marine	0.0 (0%)	0.1 (10%)	0.8 (4%)	0.1 (5%)	0.2 (10%)	0.2 (9%)
Nonpoint	-1.8 (-2%)	-0.1 (-1%)	-1.2 (-2%)	-0.2 (0%)	-1.0 (-2%)	-0.4 (-1%)
Offroad Mobile	-29.0 (-16%)	-23.5 (-17%)	-11.9 (-14%)	-23.7 (-15%)	-23.2 (-15%)	-12.5 (-16%)
Nonpoint Oil & Gas	-0.7 (-2%)	-0.2 (-2%)	-1.9 (-5%)	0.0 (0%)	1.3 (30%)	0.0 (0%)

Onroad Mobile	-76.2 (-22%)	-68.5 (-22%)	-67.4 (-23%)	-44.1 (-23%)	-84.8 (-23%)	-57.6 (-24%)
Point Oil & Gas	1.6 (7%)	3.4 (24%)	0.8 (3%)	-0.2 (-3%)	2.8 (9%)	0.1 (7%)
Agricultural Fires	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
Electricity Generation	-14.9 (-15%)	-89.1 (-37%)	-20.7 (-18%)	-15.1 (-24%)	-50.6 (-30%)	-15.5 (-28%)
Wild and Prescribe Fires	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
Industrial Point	4.7 (5%)	16.4 (15%)	-1.2 (-1%)	-3.8 (-4%)	-0.8 (-1%)	-0.7 (-1%)
Rail	-5.9 (-6%)	-2.7 (-6%)	-0.6 (-5%)	-2.6 (-7%)	-4.5 (-7%)	-2.0 (-7%)
Residential Wood Combustion	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
Total	-121.5 (-10%)	-164.3 (-17%)	-104.1 (-12%)	-89.4 (-12%)	-161.2 (-15%)	-88.7 (-15%)

Table 15. Difference between base and future year ozone season weekday VOC emissions comparison (2020-2016; tons/day)

Sector	Illinois	Indiana	Michigan	Minnesota	Ohio	Wisconsin
Agriculture	1.1 (4%)	1.0 (4%)	0.4 (3%)	1.7 (3%)	0.8 (3%)	0.2 (1%)
Airports	0.4 (4%)	0.0 (0%)	0.1 (2%)	0.0 (0%)	-0.1 (-3%)	0.0 (0%)
Biogenic	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	-0.1 (0%)	0.0 (0%)
C1/C2 Commercial Marine	-0.2 (-22%)	0.0 (0%)	-0.1 (-20%)	0.0 (0%)	-0.1 (-25%)	0.0 (0%)
C3 Commercial Marine	0.0 (0%)	0.0 (0%)	0.1 (11%)	0.0 (0%)	0.1 (100%)	0.1 (100%)
Nonpoint	1.8 (0%)	1.0 (0%)	-0.1 (0%)	1.4 (1%)	2.2 (1%)	0.8 (0%)
Offroad Mobile	-8.7 (-8%)	-4.5 (-7%)	-9.4 (-10%)	-9.6 (-11%)	-10.1 (-9%)	-8.2 (-11%)
Nonpoint Oil & Gas	-1.5 (-1%)	0.0 (0%)	-1.3 (-2%)	0.0 (0%)	2.1 (5%)	0.0 (0%)
Onroad Mobile	-32.1 (-18%)	-29.5 (-18%)	-32.1 (-18%)	-19.3 (-18%)	-39.2 (-18%)	-16.5 (-18%)
Point Oil & Gas	0.8 (22%)	0.2 (20%)	0.1 (3%)	0.0 (0%)	1.5 (33%)	0.2 (33%)
Agricultural Fires	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
Electricity Generation	-1.0 (-22%)	0.0 (0%)	-0.8 (-25%)	-0.4 (-27%)	-0.7 (-23%)	-0.2 (-9%)

Wild and Prescribe Fires	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	-0.1 (-1%)	0.0 (0%)
Industrial Point	-0.7 (-1%)	-1.0 (-1%)	-1.2 (-2%)	0.0 (0%)	-1.0 (-1%)	-0.7 (-1%)
Rail	-0.4 (-9%)	-0.2 (-10%)	0.0 (0%)	-0.2 (-11%)	-0.3 (-10%)	-0.1 (-8%)
Residential Wood Combustion	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)	0.0 (0%)
Total	-40.5 (-1%)	-33.0 (-1%)	-44.3 (-1%)	-26.4 (-1%)	-45.0 (-2%)	-24.4 (-1%)

4.2 Evaluation of the LADCO 2020 CAMx Simulation

As future year air quality forecasts cannot be compared to observations for evaluation, LADCO relied on our 2016 MPE results to establish validity in the modeling platform. In addition to the MPE for the base year CAMx simulation, the U.S. EPA reported full MPE results for the 2016 WRF modeling (US EPA, 2019b) and for the 2016 hemispheric CMAQ modeling (U.S. EPA, 2019c) used to drive the LADCO 2020 CAMx simulation.

5 Future Year Ozone Design Values

LADCO followed the U.S. EPA Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze (US EPA, 2018) to calculate design values in 2020 (DV_{2020}) for monitors in IL, IN, and WI. As we used a base year of 2016, we estimated the base year design values using surface observations for the years 2014-2018 ($DV_{2014-2018}$). LADCO estimated the DV_{2020} with version 1.2 of the Software for Modeled Attainment Test Community Edition (SMAT-CE)[5]. SMAT-CE was configured to use the average O_3 concentration in a 3x3 matrix around each monitor across the 10 highest modeled days, per the U.S. EPA Guidance.

SMAT-CE uses a four step process to estimate DVs_{2020}:

1. Calculate $DV_{2014-2018}$ for each monitor
    - The O_3 design value is a three-year average of the 4th highest daily maximum 8 hour average O_3 ($MDA8_4$):

$$DV_{2016} = (MDA8_{4,2014} + MDA8_{4,2015} + MDA8_{4,2016})/3$$

    - Weighted 5-year average of design values centered on the base model year (2016):

$$DV_{2014\text{-}2018} = (DV_{2016} + DV_{2017} + DV_{2018})/3$$

2. Find highest base year modeled days surrounding each monitor
    - Find ten days with the highest base year modeled MDA8 from within a 3x3 matrix of grid cells surrounding each monitor
    - At least 5 days with modeled MDA8 >= 60 ppb are needed to retain the monitor for the future year DV calculation
3. Calculate relative response factor (RRF) for each monitor
    - Calculate averaged MDA8 for the base and future years from the average of the values in the 3x3 matrix in each of the selected top 10 modeled days
    - Calculate the RRF as the ratio of the future to base year averaged MDA8:

[5] https://www.epa.gov/scram/photochemical-modeling-tools

$$RRF = MDA8_{2020,avg}/MDA8_{2016,avg}$$

4. Calculate DV_{2020} for each monitor

$$DV_{2020} = RRF * DV_{2014\text{-}2018}$$

LADCO used the DV_{2020} to identify nonattainment and maintenance sites in 2020 using the most recent 3-year monitored design values (2017-2019) per the CSAPR Update methodology (CSAPR Update, 2016). Under this methodology, sites with average DVs_{2020} that exceed the 2008 O_3 NAAQS (76 ppb or greater) and that are currently measuring nonattainment would be considered nonattainment receptors in 2020.

6 Results and Discussion

6.1 2016 CAMx Model Performance Evaluation Results

LADCO simulated the entire O_3 season (April 1 – October 31, 2016) with CAMx using the 2016 CAMx modeling platform described previously. Figure 21 is a spatial plot of the O_3 season average normalized mean bias (NMB) of daily maximum 8-hour average (MDA8) O_3 concentrations. Each colored symbol on the figure is an AQS or CASTNet monitoring location. Cool colors represent monitors at which the observed MDA O_3 concentrations were underestimated by the CAMx simulation; warm colors represent where CAMx overestimated the observations. Grey and lighter shades represent low bias, or acceptable model performance, relative to the model performance goals discussed in Section 3.8.2. Averaged across the entire O_3 season, there is a relatively low negative bias (i.e., underprediction bias) in the CAMx MDA8 O_3 predictions for sites in the LADCO region. The model overestimated observed O_3 concentrations in the southeast, mid-Atlantic, and west coast regions of the country; CAMx underpredicted observed O_3 in inland California, the southwest and Rocky Mountain states, and across the Great Lakes and much of the northeastern U.S.

The CAMx average monthly NMB for MDA8 O_3 shown in Figure 22 reveals a seasonal trend in the bias. Early in the O_3 season (April – June) CAMx underpredicted O_3 throughout the LADCO region. For many of the northern and near-shore monitors in the LADCO region the monthly averaged NMB values miss the model performance goal for O_3 (+/- 15%) in April and May. In the latter part of the season (July – October), CAMx overpredicted O_3 at most of the monitors in the region. Despite the overpredictions in the later months of the season, the absolute model biases are not as high as they are in April and May.

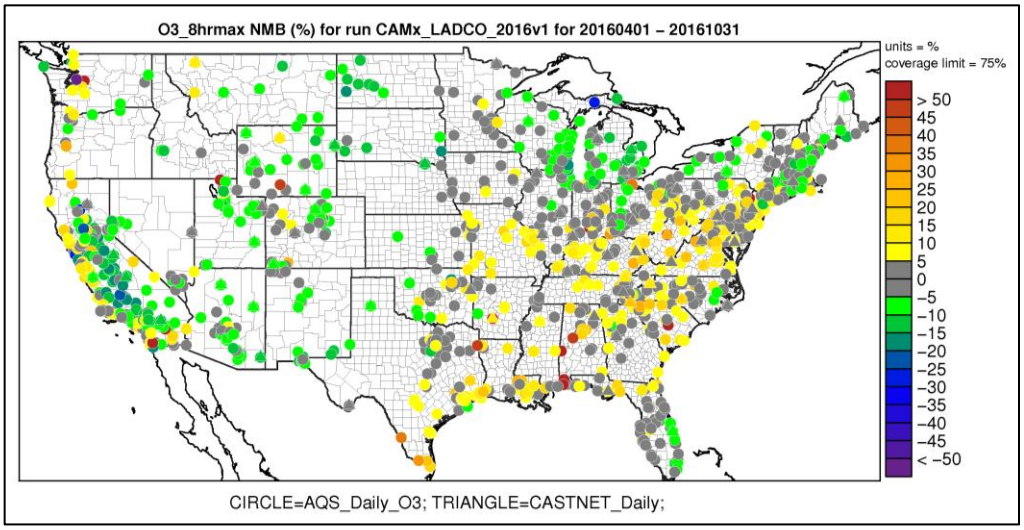
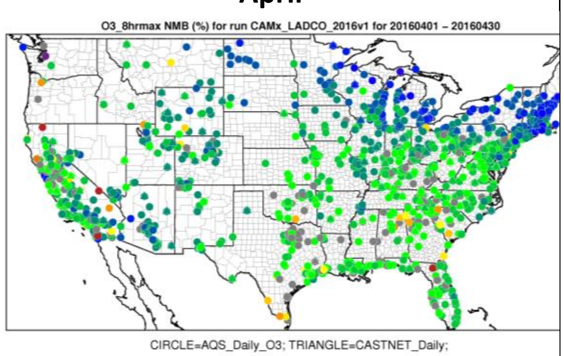
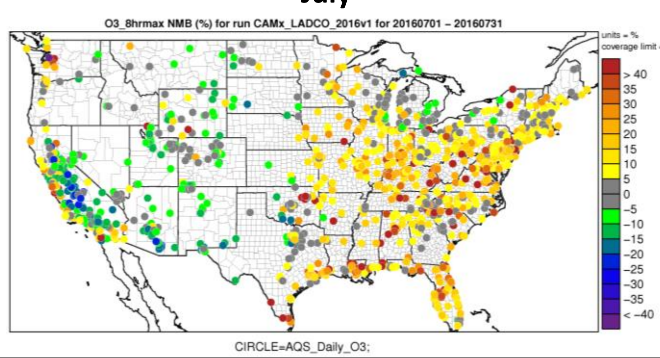
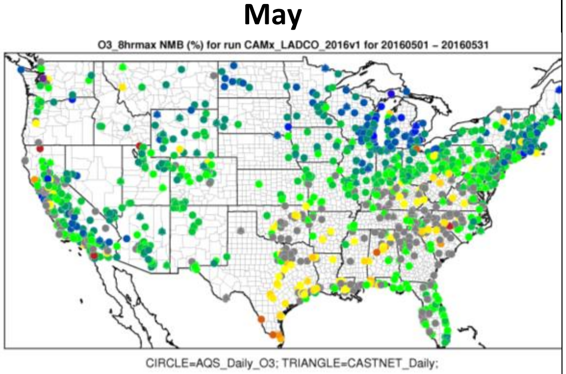
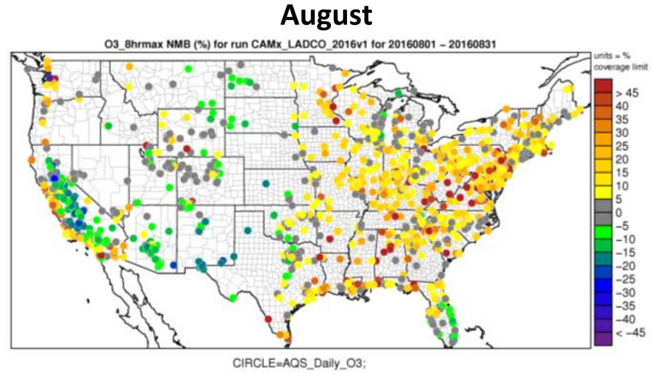


Figure 21. 2016 O_3 season MDA8 O_3 normalized mean bias spatial plot

April	July
	
May	**August**
	
June	**September**

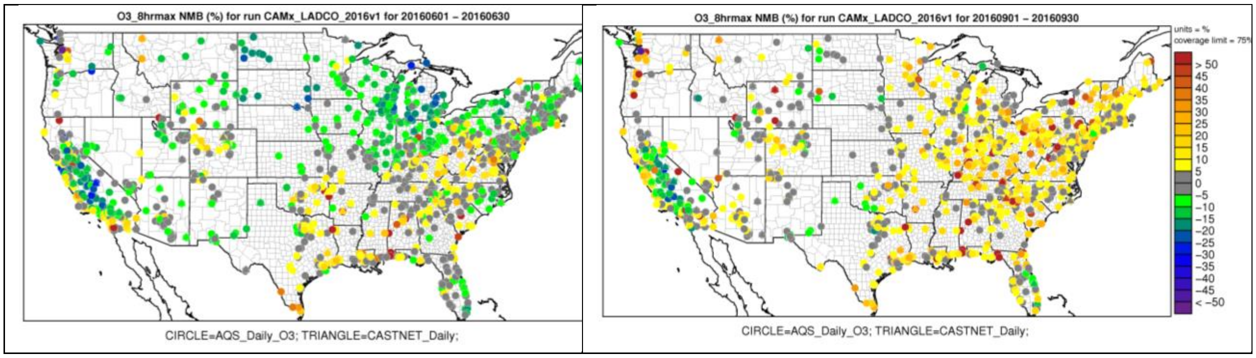


Figure 22. Monthly 2016 MDA8 O_3 normalized mean bias spatial plots

Table 16 and Table 17 show the daily maximum 8-hour average O_3 (MDA8) and daily maximum 1-hour O_3 performance statistics, respectively, for the LADCO 2016 CAMx simulation. Model biases and errors in these tables are O_3 season (April – October) averages across all Air Quality System (AQS) sites in the 12-km modeling domain, and across all AQS sites in each of the states of IL, IN, and WI. Each statistic is calculated for all observations and for only observations > 60 ppb. The latter is used to determine the performance of the model estimates for high observed concentrations.

As described above, these statistics quantify the LADCO CAMx simulation O_3 underpredictions and also show that the model performance degrades at higher observed concentrations. Despite the model performance deficits shown in these statistics, the O_3 model performance goal for bias (<=15%) is missed only for high concentrations at the WI AQS monitors. The performance goal for error (<=35%) is met across all of the locations and O_3 levels presented here.

Figure 23 through Figure 26 are scatter plots of O_3 season MDA8 O_3 concentrations for AQS and CASTNet monitoring sites in the 12-km domain, and for sites in the states of IL, IN, and WI. Plots are shown both with and without a 60 ppb observed O_3 cutoff. These plots indicate that the CAMx O_3 predictions are slightly better at the urban and suburban AQS sites than at the more rural CASTNet monitoring locations.

Table 16. CAMx ozone season MDA8 O_3 performance at AQS monitoring locations

Region	FB (ppb)		FE (ppb)		NMB (%)		NME (%)	
	All	> 60ppb	All	> 60ppb	All	> 60ppb	All	> 60ppb
12-km	-3.2	-13.3	15.7	15.6	-3.3	-12.0	14.7	14.3
IL	-6.0	-15.0	16.4	17.1	-5.3	-13.2	15.3	15.4
IN	-1.3	-11.5	16.0	13.7	-0.9	-10.3	15.1	12.5
WI	-9.5	-21.7	17.5	22.3	-9.4	-18.9	16.7	19.5

Table 17. CAMx ozone season daily maximum O_3 performance at AQS monitoring locations

Region	FB (ppb)		FE (ppb)		NMB (%)		NME (%)	
	All	> 60ppb	All	> 60ppb	All	> 60ppb	All	> 60ppb
12-km	-4.8	-13.4	15.7	16.2	-4.9	-12.0	14.8	15.0
IL	-6.0	-12.9	15.8	16.0	-5.4	-11.4	14.9	14.7
IN	-1.9	-10.0	15.2	13.1	-1.6	-9.0	14.5	12.2
WI	-11.0	-22.3	18.0	23.4	-10.7	-19.5	17.1	20.6

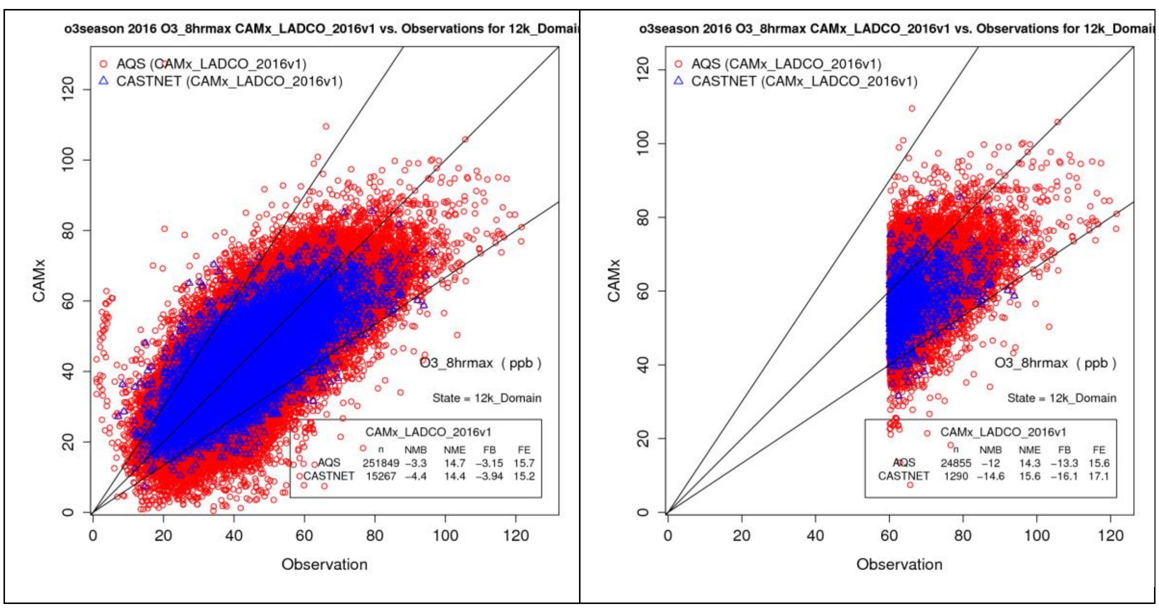


Figure 23. 2016 O_3 season MDA8 O_3 scatter plots for all sites in the 12-km modeling domain; all days (left), days > 60 ppb (right)

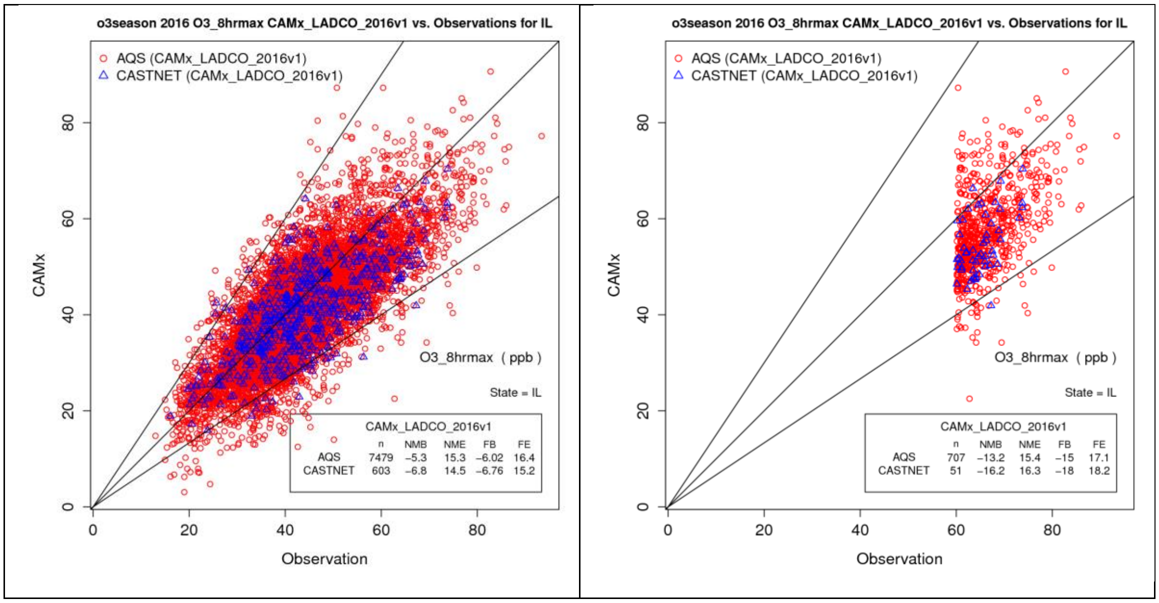


Figure 24. 2016 O_3 season MDA8 O_3 scatter plots for sites in IL; all days (left), days > 60 ppb (right)

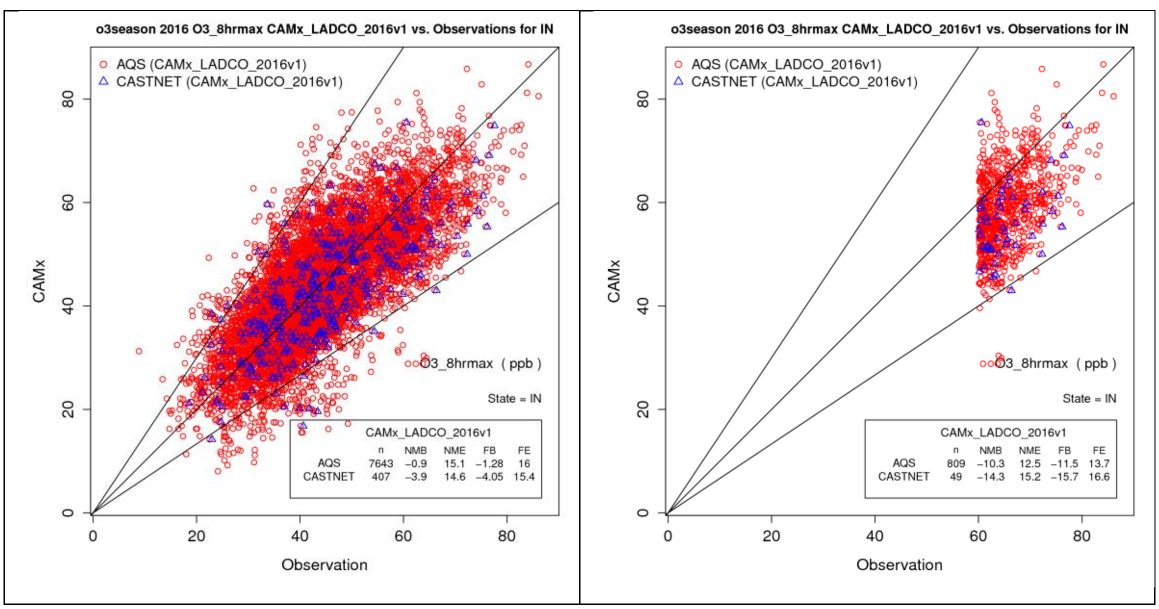


Figure 25. 2016 O_3 season MDA8 O_3 scatter plots for sites in IN; all days (left), days > 60 ppb (right)

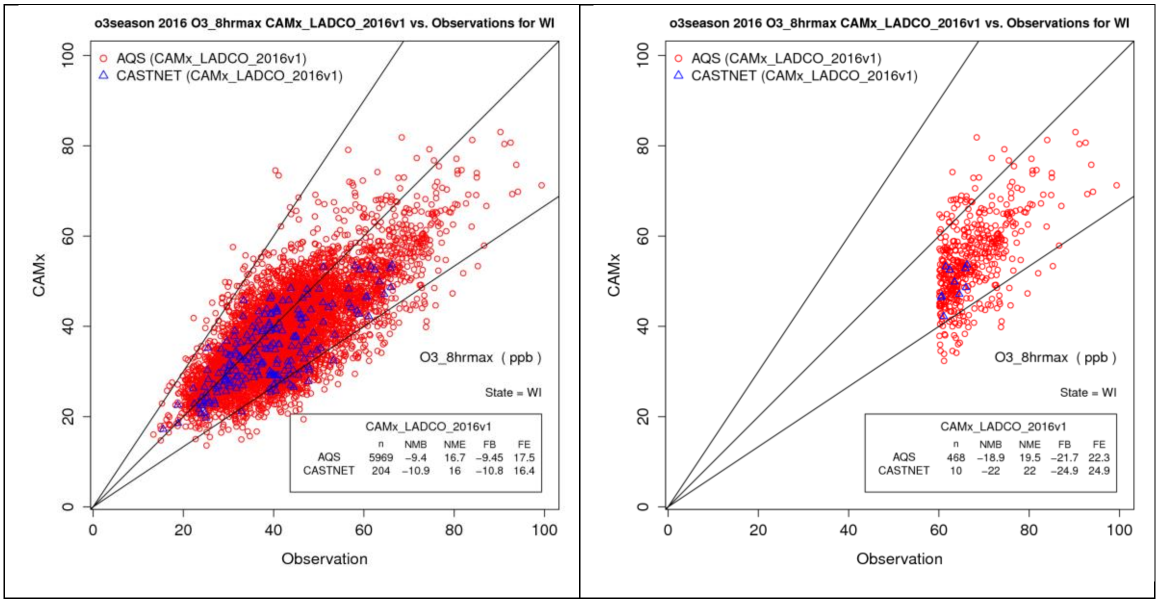


Figure 26. 2016 O_3 season MDA8 O_3 scatter plots for sites in WI; all days (left), days > 60 ppb (right)

Figure 27 through Figure 29 are monthly box and whisker plots of CAMx and observed MDA8 O_3 concentrations for AQS and CASTNet sites in IL, IN, and WI, respectively. The box and whisker plots show the observed and model median concentrations as symbols connected by lines (blue for CAMx and black for observations), the 25th and 75th percentile concentrations as the bottom and top of each box, and the 5th and 95th percentile concentrations as the bottom and top of each whisker. These plots further highlight the underpredictions during April – June, as seen by the lower median values for CAMx relative to the observations across in all three states during this period. The skill of CAMx to simulate the distribution of observed O_3 concentrations incrementally improves in July – October as seen by the closer correspondence of the median, 75th and 95th percentile observed and predicted concentrations for most of the months in the three states. In general, CAMx has an underprediction bias at the highest end of the observed O_3 distribution.

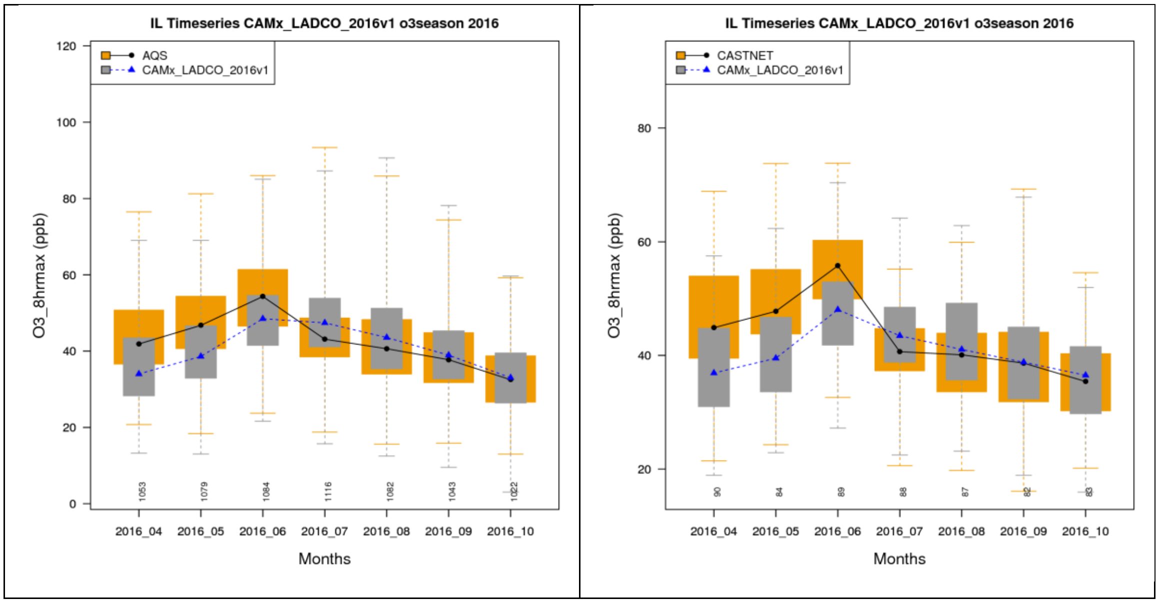


Figure 27. 2016 monthly MDA8 O_3 box and whisker plots comparing CAMx with AQS (left) and CASTNet (right) monitors for sites in IL.

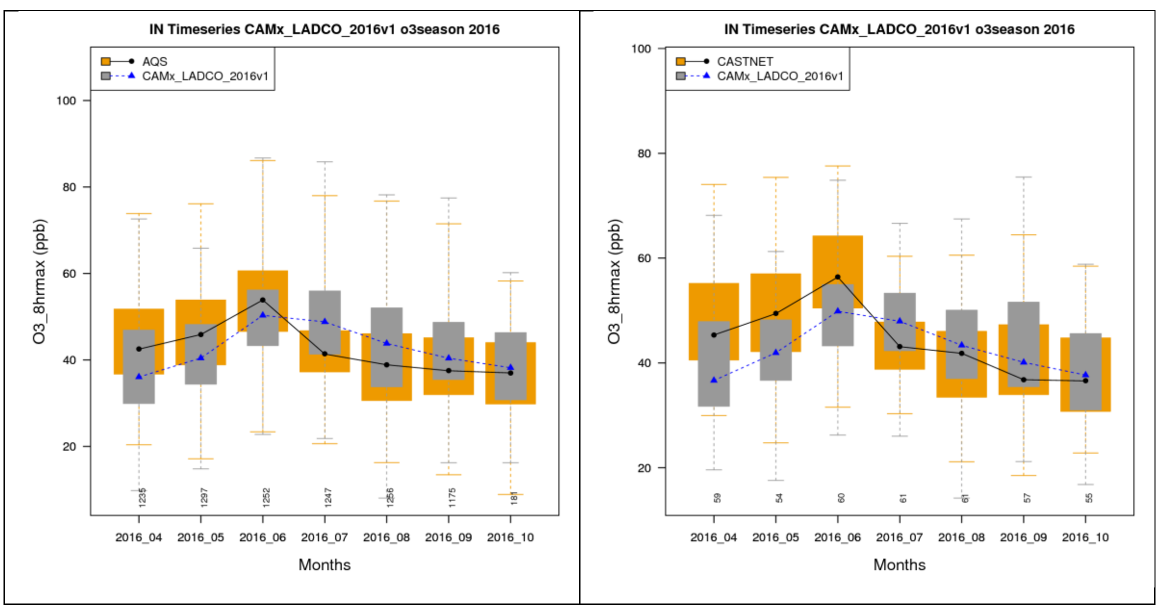


Figure 28. 2016 monthly MDA8 O_3 box and whisker plots comparing CAMx with AQS (left) and CASTNet (right) monitors for sites in IN.

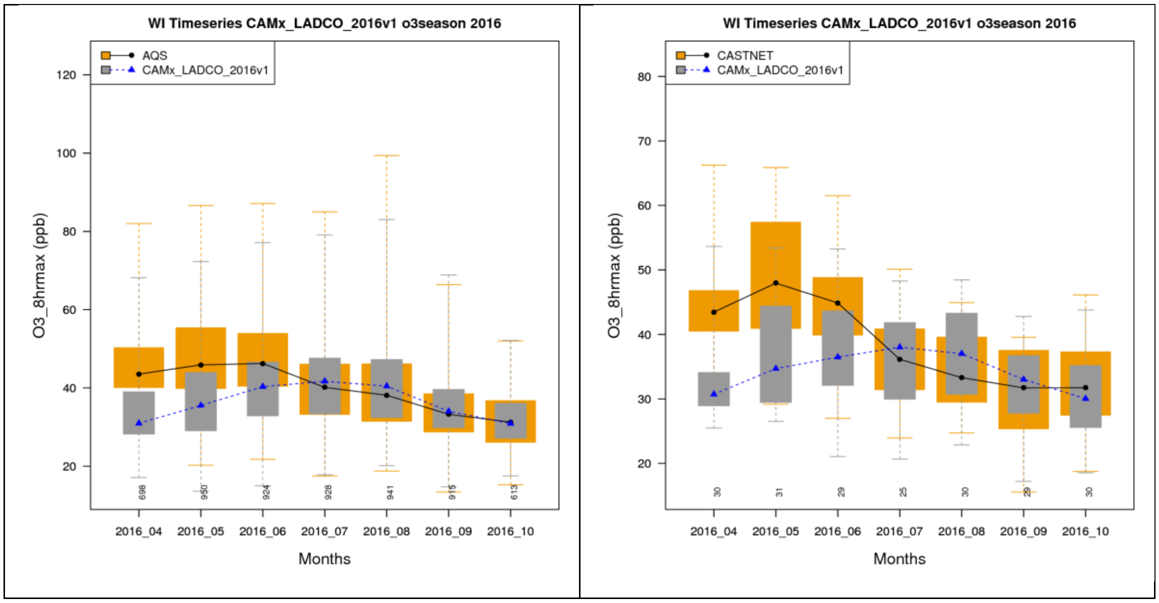


Figure 29. 2016 monthly MDA8 O_3 box and whisker plots comparing CAMx with AQS (left) and CASTNet (right) monitors for sites in WI.

Figure 30 through Figure 32 are monthly concentration-bias plots for MDA8 O_3 in IL, IN, and WI, respectively. These plots superimpose lines of the monthly average MDA8 O_3 CAMx predictions and AQS observed concentrations (right axis) on a bar plot of the monthly average NMB (left axis). The green and red horizontal lines on these plots are the +/- 15% and 35% bias and error goals and criteria for O_3 modeling. The value that these plots provide is a clear image of the switch in the bias signal from negative to positive biases moving from June to July in all three states, and also a reduction in the absolute bias of the model in the later months of the season, particularly for the AQS sites in IL and WI.

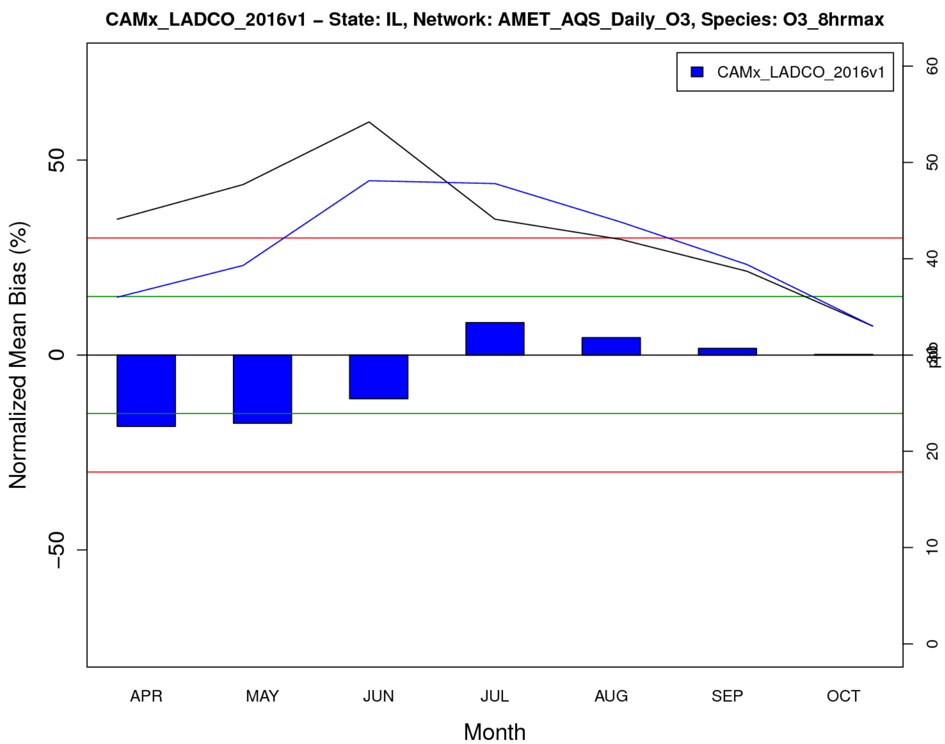


Figure 30. MDA8 O_3 monthly concentration-bias plot for IL AQS sites. Bars plot the average monthly normalized mean bias (left axis), lines are observed (black) and modeled (blue) monthly mean MDA8 O3 concentrations (right axis).

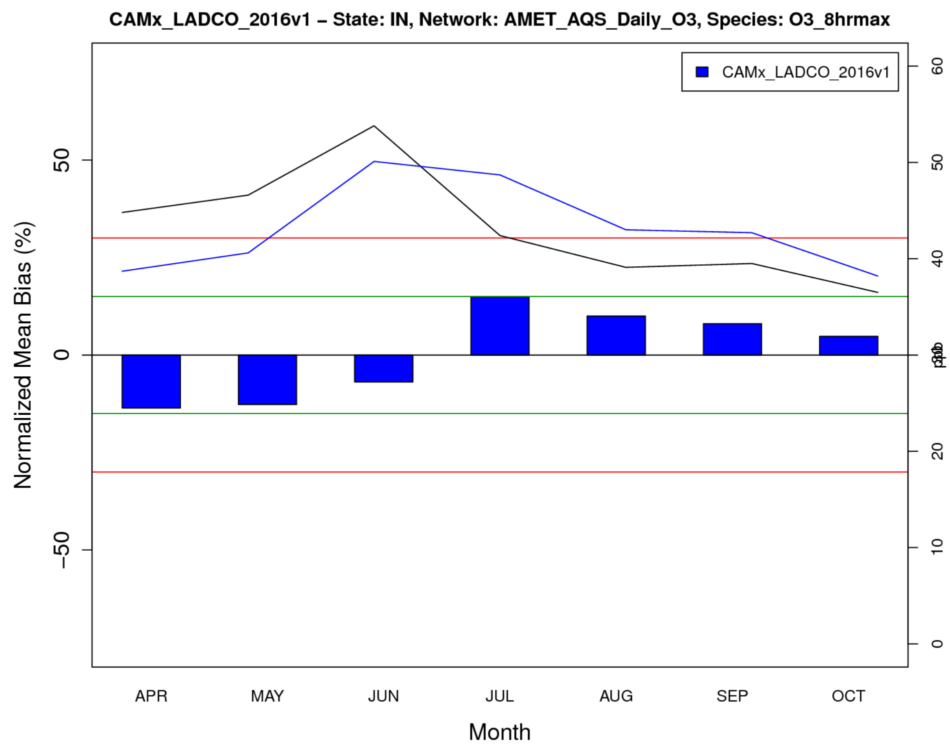


Figure 31. MDA8 O_3 monthly concentration-bias plot for IN AQS sites. Bars plot the average monthly normalized mean bias (left axis), lines are observed (black) and modeled (blue) monthly mean MDA8 O3 concentrations (right axis).

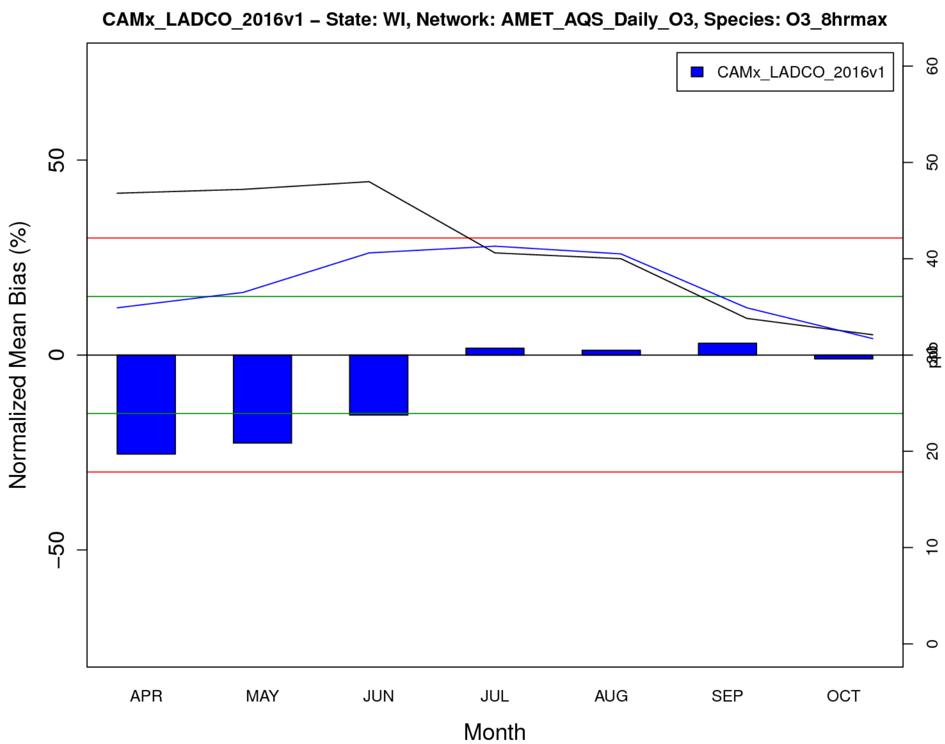


Figure 32. MDA8 O_3 monthly concentration-bias plot for IN AQS sites. Bars plot the average monthly normalized mean bias (left axis), lines are observed (black) and modeled (blue) monthly mean MDA8 O3 concentrations (right axis).

The Appendix of this document includes MDA8 O_3 time series plots for key sites in the Chicago and Sheboygan O_3 NAAs. These plots compare the observed MDA8 O_3 concentrations to the CAMx 2016 and 2020 MDA8 O_3 predictions. Each plot shows the concentration comparisons in a top panel and a time series of the model bias in a bottom panel. The green line on the plots is the 2008 O_3 NAAQS (75 ppb).

6.2 CAMx Model Performance Discussion

U.S. EPA (2019) reported model performance for the 2016 CAMx modeling platform upon which we based the LADCO 2016 modeling platform. The U.S. EPA evaluated the model by comparing CAMx-predicted MDA8 O_3 to observations at the U.S. EPA AQS and CASTNet networks. They performed statistical evaluations using modeled and observed data that were paired in space and time. U.S. EPA developed statistics across spatial and temporal scales and in aggregate across multiple sites by climate region.

The results provided by U.S. EPA from their operational model performance evaluation (MPE) of their 2016 simulation are very similar to the results of the LADCO MPE. U.S. EPA and LADCO both found that the 2016 CAMx modeling platform on average underpredicts April – June MDA8 O_3 and overpredicts July – October MDA8 O_3. The biases in the April – June period are more severe than in the later months. In July – October the mean bias is within +/- 5 ppb at many sites in the LADCO region.

Investigation of the diurnal variability at key monitors demonstrated that CAMx generally captured day to day fluctuations in observed MDA8 O_3 but missed the peaks on many of the highest observed days, particularly during April – June. Figure 39 through Figure 43 compare daily AQS observations of MDA8 O_3 to the LADCO 2016 and 2020 CAMx simulations at monitors in the Chicago and Sheboygan NAAs.

Despite persistent deficiencies in model performance on days when the observed MDA8 $O_3 \geqq 60$ ppb, the statistics in

Table 18 shows that CAMx performance was still within acceptable model performance criteria at key controlling sites within the Chicago and Sheboygan NAAs.

Table 18. LADCO CAMx April – September 2016 MDA8 O_3 model performance statistics at key monitors where observations >= 60 ppb

Site_ID	County, ST	Mean Obs	Mean Mod	MB (ppb)	ME (ppb)
170314201	Cook, IL	68.9	58.4	-10.5	12.0
170317002	Cook, IL	68.2	60.8	-7.3	9.3
170971007	Lake, IL	68.2	61.6	-6.6	11.0
550590019	Kenosha, WI	70.3	54.4	-15.9	17.1
550590025	Kenosha, WI	68.0	58.9	-9.1	10.4
551170006	Sheboygan, WI	72.7	58.7	-14.0	14.2

6.3 LADCO 2020 Air Quality Projections

LADCO modified the emissions in the U.S. EPA 2016fg CAMx modeling platform to create a LADCO 2016 modeling platform with a projection year to 2020 (see Section 4.1). The LADCO 2020 simulation forecasted air quality for the continental U.S. using the best available information for North American emissions, including EGU emissions forecasts from the ERTAC v16.1 model. Figure 33 and Figure 34 show the O_3 season (April through October) maximum of MDA8 O_3 for the LADCO 2016 and 2020 CAMx simulations, respectively on the CONUS12 modeling domain. Figure 35 shows the difference in O_3 season maximum (2020-2016) between the two simulations. Cool colors indicate that the 2020 simulation forecasted lower O_3 than the 2016 simulation; warm colors indicate higher O_3 in the 2020 forecast. The 2020 CAMx simulation predicted lower seasonal maximum O_3 concentrations across the majority of the modeling domain with the largest reductions occurring in the southeast U.S., east Texas, and the Central Valley of California. Figure 36 zooms into the Lake Michigan area of the difference plot to highlight the predicted changes in O_3 season maximum MDA8 O_3 concentrations. This figure shows that in 2020 CAMx predicts that the seasonal maximum MDA8 O_3 concentrations will decline along the western Lake Michigan shoreline in the range of 1-5 ppb. Note that the trends shown in these figures mask finer temporal resolution features (i.e., hourly and daily) that also exist between the base and future year simulations.

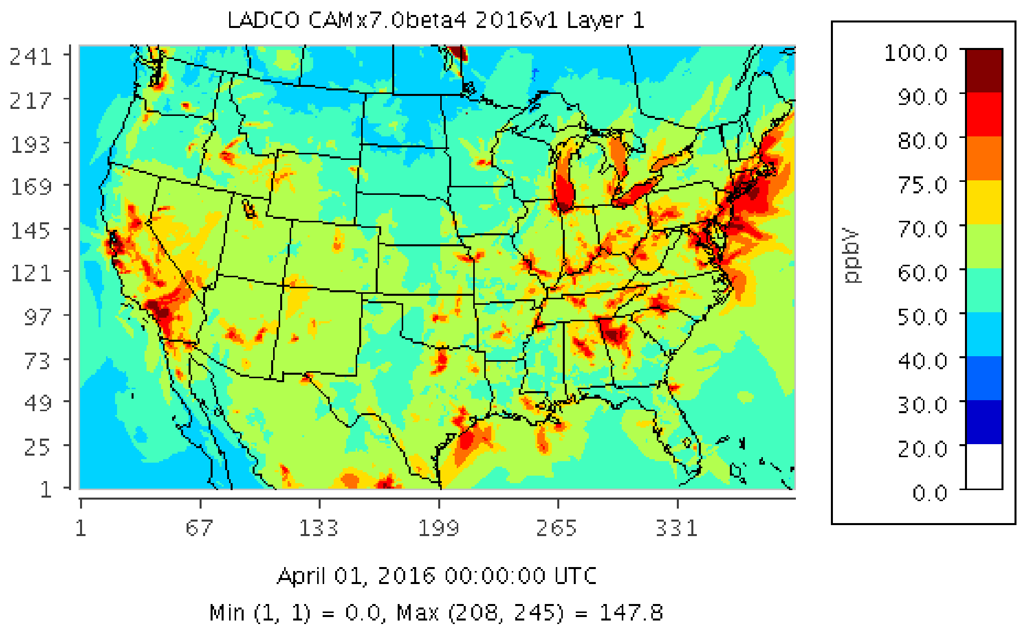


Figure 33. LADCO CAMx 2016v1 O_3 season maximum MDA8 O_3 concentrations

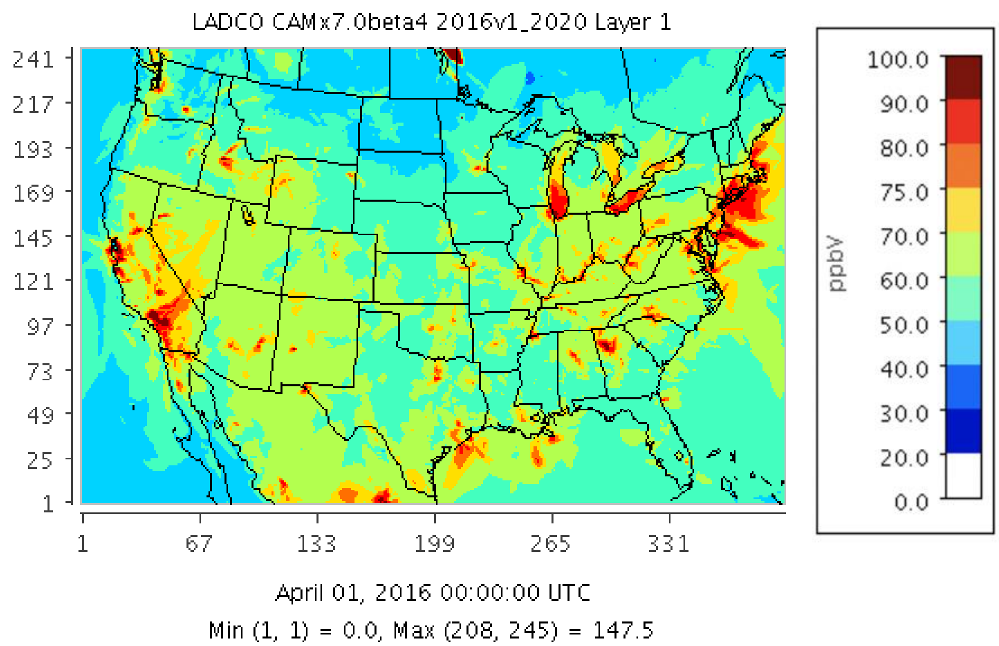


Figure 34. LADCO CAMx 2020 O_3 season maximum MDA8 O_3 concentrations

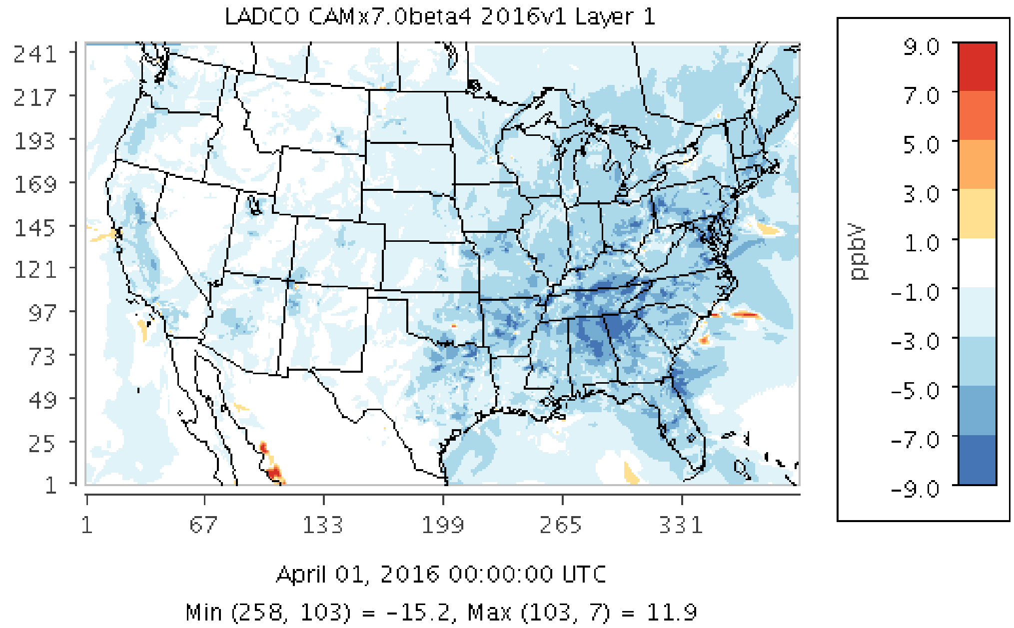


Figure 35. LADCO CAMx difference (2020-2016) in O_3 season maximum MDA8 O_3 concentrations

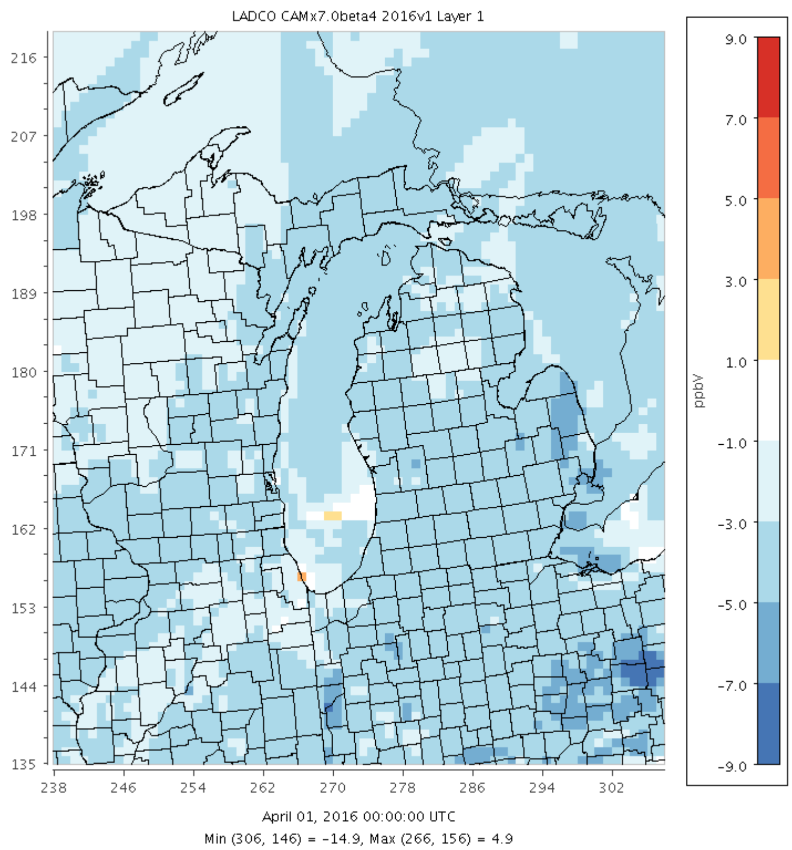


Figure 36. LADCO CAMx difference (2020-2016) in O_3 season maximum MDA8 O_3 concentrations; zoom to the Lake Michigan area

Figure 37 and Figure 38 show the O_3 DV_{2020} and RRFs from the LADCO 2020 simulation, respectively. LADCO generated these results with SMAT-CE using the standard U.S. EPA attainment test configuration (top 10 modeled days, 3x3 cell matrix around the monitor, including water cells). The LADCO O_3 DVs_{2020} presented here used observational data completeness criteria based on the 2015 O_3 NAAQS. The completeness criteria are tied to the level of the standard in cases in which the number of valid observations falls below a statutory threshold but when at least one of the valid observations is greater than the NAAQS (see 40 CFR Part 50 Appendix U). By using the 2015 O_3 NAAQS for determining completeness, LADCO includes more available data points in the DV calculations than if we had used the 2008 O_3 NAAQS completeness criteria because the lower standard is more inclusive of the available monitoring data (i.e., there are more MDA8 O_3 observations >= 70 ppb than there are observations >= 75 ppb).

The LADCO 2020 CAMx simulation predicts that only the Sheboygan, WI Kohler-Andrae monitor will have an average DV_{2020} that exceeds the 2008 O_3 NAAQS. The Kohler-Andrae monitor is predicted to have a mean DV_{2020} of 76.6 ppbV. The RRF plot indicates that most of the DV decreases in the Chicago and Sheboygan NAAs are in the range of 4-5%. The modest changes to the DVs in 2020 are due primarily to the short time period between the base and future years. Despite being forecast to be above the 2008 O_3 NAAQS in 2020, the Sheboygan Kohler-Andrae monitor has a mean DV_{2020} that is less than 1% above the standard.

Table 19 presents the average and maximum DVs_{2020} for key monitors in the Chicago and Sheboygan 2008 O_3 NAAQS NAAs. As of July 29, 2020, the Chicago NAA has one monitor (Northbrook, IL) that is in violation of the 2008 O3 NAAQS; the Sheboygan NAA has no monitors that are forecast to be nonattainment in 2020.

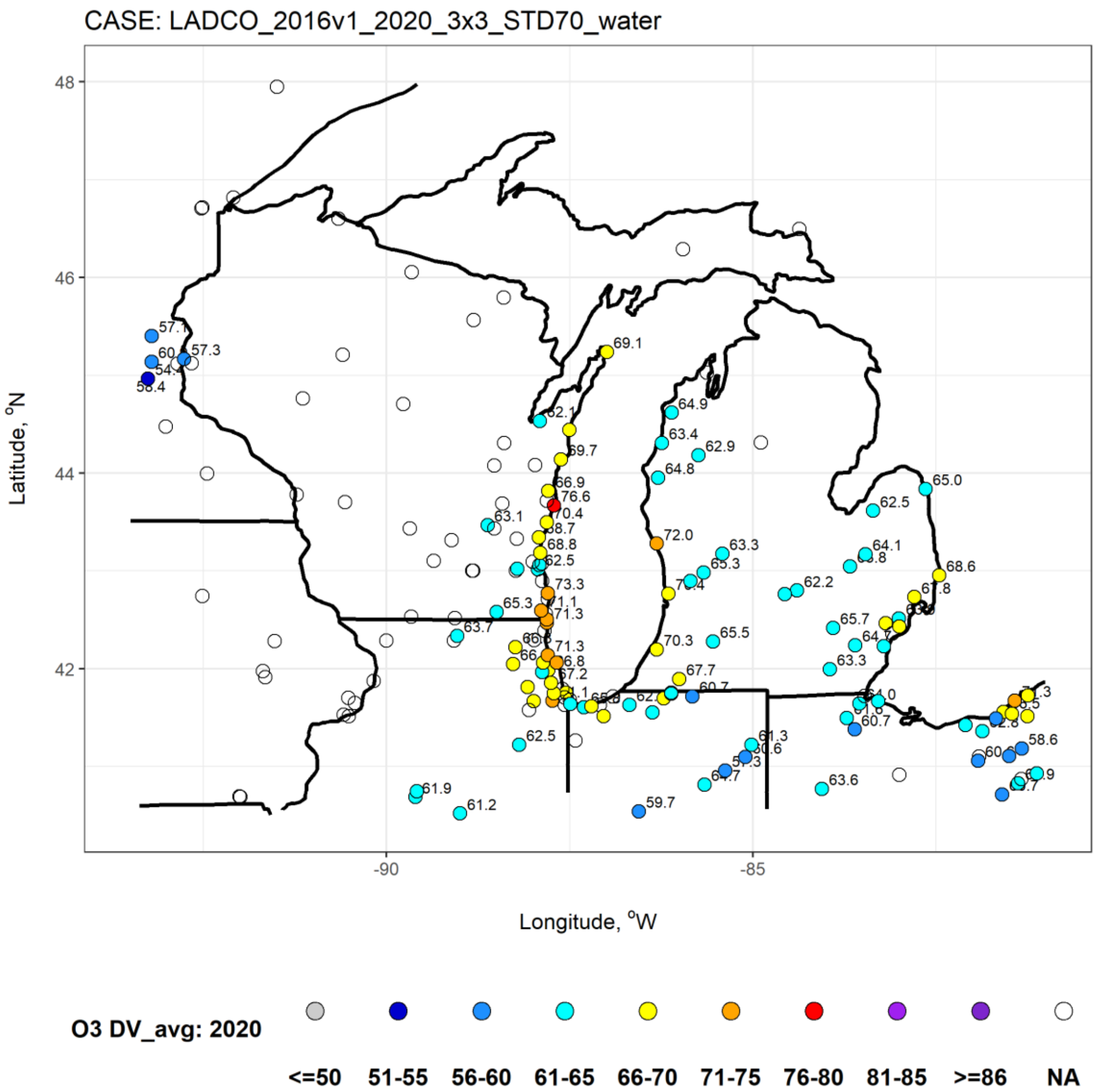


Figure 37. Future year O_3 design values calculated with WATER from the LADCO 2020 CAMx simulation.

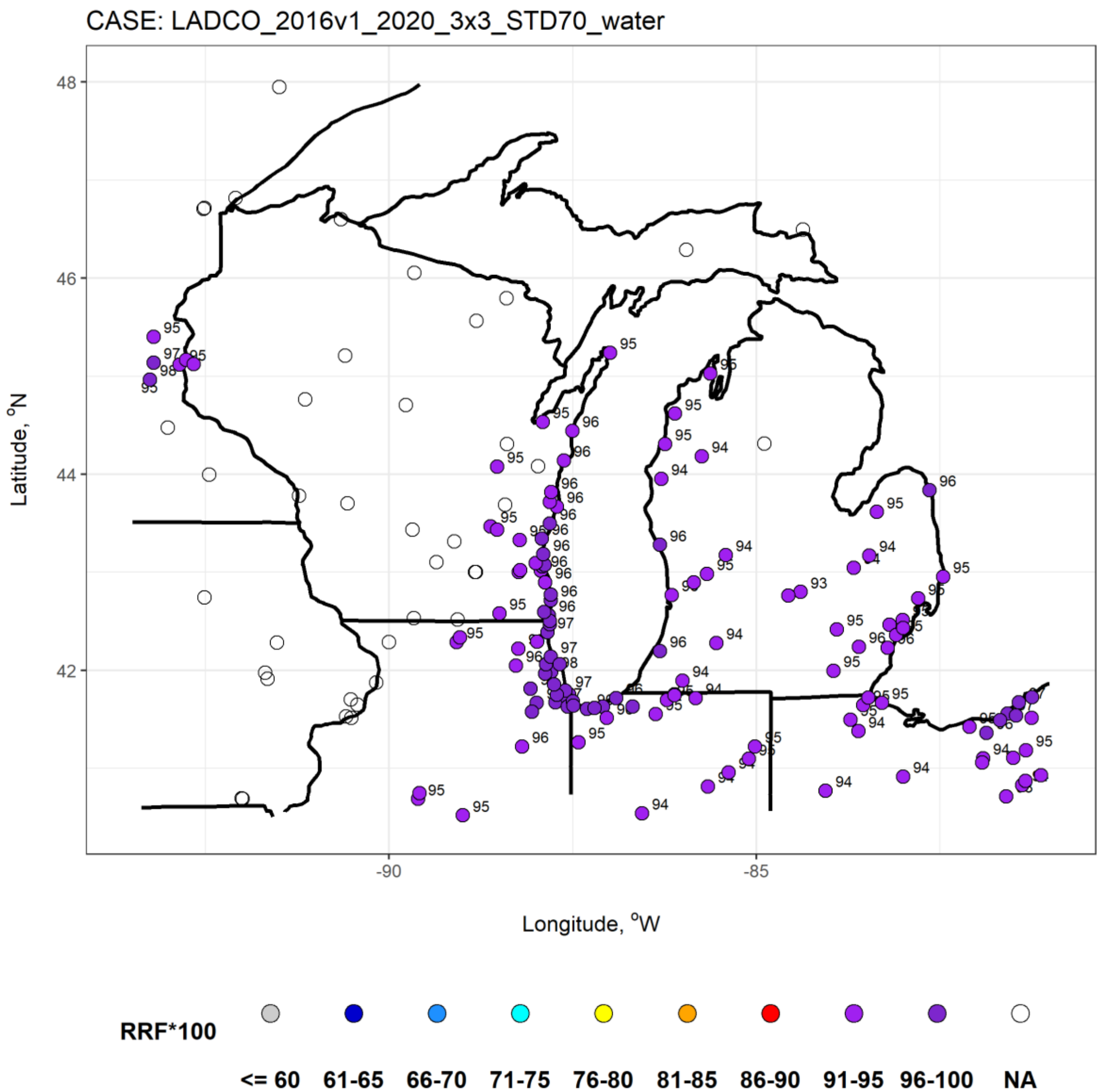


Figure 38. Future year O_3 relative response factors calculated with WATER from the LADCO 2020 CAMx simulation.

Table 19. LADCO 2020 O_3 design values with WATER at key monitors in the Chicago and Sheboygan 2008 O_3 NAAQS NAAs

AQS ID	Monitor	ST	LADCO 2020 DVF	2014-2018 DVB	2017-2019 DV
170310001	Alsip	IL	71.1	73.0	75.0
170310032	South Water Filtration Plan	IL	70.3	72.3	73.0
170314201	Northbrook	IL	71.3	73.3	75.0
170317002	Evanston	IL	71.8	74.0	75.0
170971007	Zion	IL	71.3	73.7	71.0
550590019	Chiwaukee Prairie	WI	75.2	78.0	75.0
550590025	Kenosha Water Tower	WI	71.1	73.7	74.0
551170006	Kohler Andrae	WI	76.6	80.0	75.0

6.3.1 Impacts of Water Cells on Design Values

Confidence in the ability of photochemical models to accurately estimate O_3 over water is a persistent concern with the use of the models for air quality planning. This concern recently prompted measurement campaigns in the Eastern U.S. to address the issue (see the 2017 Lake Michigan Ozone Study, Long Island Sound Tropospheric Ozone Study, and OWLETS). The meteorology and chemistry processes in model grid cells that are dominated by water (> 50% landuse area) are a challenge to simulate because the conventional technical formulations of the models were not optimized for water cells. Even with the introduction of new algorithms to simulate the dynamical and chemical features of water cells, a lack of over-water observations hinders our ability to verify the accuracy of the models in simulating these conditions. In consideration that the models may not perform well in simulating water cells, EPA and others have presented alterative DVF calculation approaches that exclude water cells. Although not explicitly listed in Attachment A of the EPA's March 2018 memo on O_3 Transport Modeling as a flexibility to consider in developing a Good Neighbor SIP, the EPA used the exclusion of water cells in their own DVF calculations (US EPA, 2017; US EPA, 2018b). EPA implicitly endorses the exclusion of water cells when calculating DVFs in their most recent technical guidance for Good Neighbor SIPs (US EPA, 2018b).

Factoring in the impact of water cells on the DV calculation does not require additional CAMx simulations. It is implemented through a postprocessing sequence per U.S. EPA (2018b) in which model grid cells that are dominated by water (> 50% landuse area) are removed from the 3x3 matrix in the RRF and DVF calculation. One important modification to this process is to override the exclusion condition for cells that contain monitors; in other words, grid cells that contain monitors will be included in the 3x3 matrix regardless of the amount of water coverage in the cell.

Table 20 presents the impacts of excluding water cells from the DV_{2020} calculations for the LADCO 2020 CAMx simulation. In general, excluding water cells in the attainment test calculation results in lower DVs_{2020} for the lakeshore monitors in the LADCO region.

Table 20. LADCO 2020 O_3 design values with NO WATER at key monitors in the Chicago and Sheboygan 2008 O_3 NAAQS NAAs

AQS ID	Monitor ID	ST	LADCO 2020		2014-2018		2017-2019 DV
			3x3 avrg	3x3 max	3x3 avrg	3x3 max	
170310001	Alsip	IL	71.1	75.0	73.0	77.0	75.0
170310032	South Water Filtration Plan	IL	70.4	73.0	72.3	75.0	73.0
170314201	Northbrook	IL	71.3	74.9	73.3	77.0	75.0
170317002	Evanston	IL	71.4	74.2	74.0	77.0	75.0
170971007	Zion	IL	70.4	71.6	73.7	75.0	71.0
550590019	Chiwaukee Prairie	WI	74.4	75.3	78.0	79.0	75.0
550590025	Kenosha Water Tower	WI	70.1	73.3	73.7	77.0	74.0
551170006	Kohler Andrae	WI	76.6	77.6	80.0	81.0	75.0

7 Conclusions and Significant Findings

LADCO presents in this TSD a regional air quality modeling platform for quantifying and evaluating future year O_3 concentrations pursuant to testing attainment of the 2008 O_3 NAAQS serious designations for the Chicago and Sheboygan NAAs. After establishing that the LADCO 2016-based modeling platform is a valid tool for simulating regional O_3 concentrations, we presented the results from our projections of future O_3 concentrations and for calculating DVs_{2020}. A summary of the significant findings from the LADCO modeling follows.

- Finding 1: While the 2016 CAMx modeling platform has an underprediction bias for high O_3 concentrations, the platform skill is consistent with the U.S. EPA 2016 modeling platform used to support recent air quality analyses.
- Finding 2: The LADCO 2020 CAMx simulation predicts that only the Sheboygan, WI Kohler-Andrae monitor will have an average DV_{2020} that exceeds the 2008 O_3 NAAQS.
- Finding 3: Excluding water cells in the attainment test calculation results in lower DVs_{2020} for the lakeshore monitors in the LADCO region.

As with all regional air quality modeling applications, there are uncertainties in the model inputs and in the model formulation that produce biases in the results presented here. LADCO determined that as of the writing of this TSD the EPA 2016fh emissions modeling platform and the ERTAC EGU 16.1 emissions were the best available data for forecasting air quality in 2020.

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US EPA. 2017. Memorandum: Supplemental Information on the Interstate Transport SIP Submissions for the 2008 Ozone NAAQS under Clean Air Act Section 110(a)(2)(D)(i)(I), Research Triangle Park, NC. https://www.epa.gov/sites/production/files/2017-10/documents/final_2008_o3_naaqs_transport_memo_10-27-17b.pdf.

US EPA. 1991. Guideline on the Regulatory Application of the Urban Airshed Model. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, technical Support Division, Source Receptor Analysis Branch, Research Triangle Park, North Carolina. July. (http://www.epa.gov/ttn/scram/guidance/guide/uamreg.pdf)

Appendix A: Monitor-specific Ozone Timeseries

Additional LADCO CAMx 2016v1 simulation MPE plots are available on the LADCO website:

https://www.ladco.org/technical/modeling-results/ladco-2016-modeling/#Air_Quality/CAMx_LADCO_2016v1

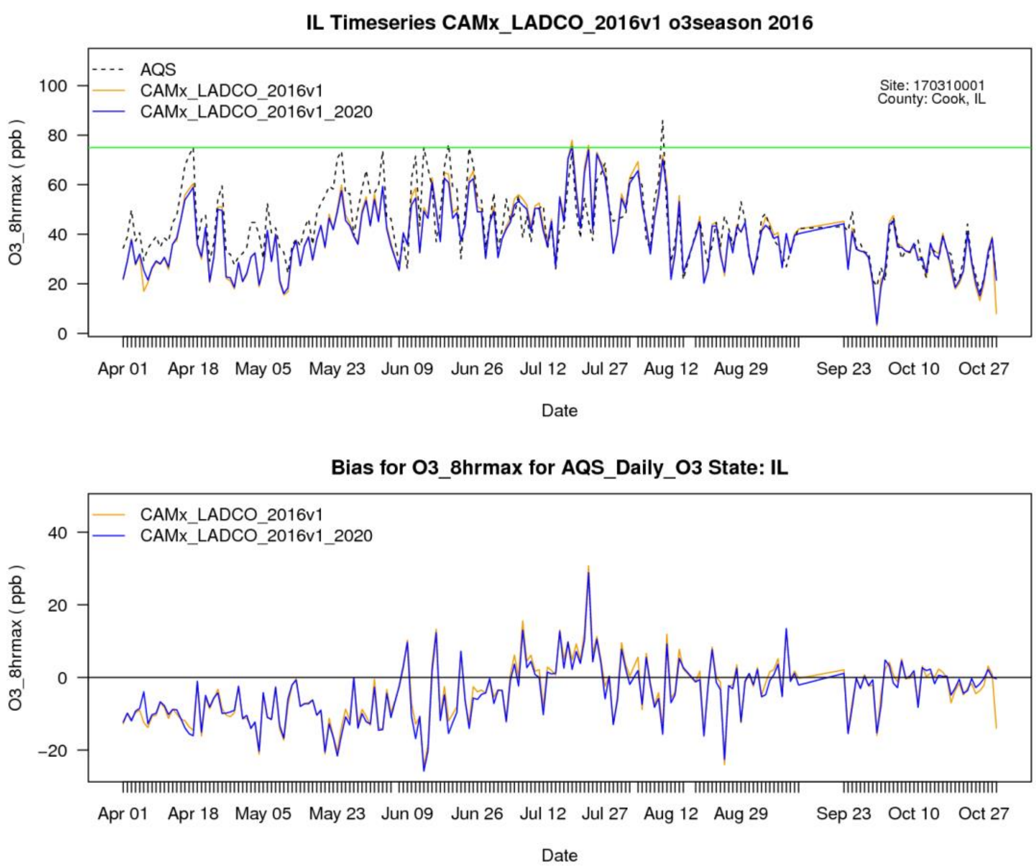


Figure 39. MDA8 O_3 observed, CAMx 2016, and CAMx 2020 concentrations (top) and bias (bottom) at the Alsip, IL monitor

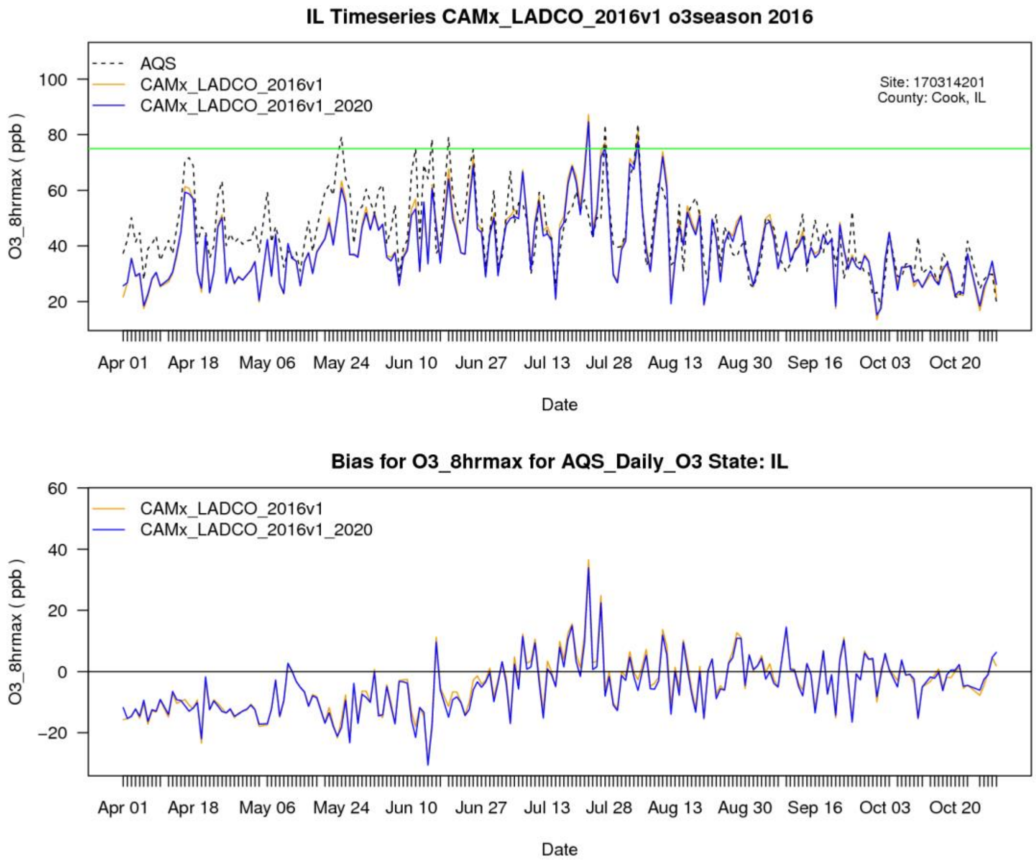


Figure 40. MDA8 O_3 observed, CAMx 2016, and CAMx 2020 concentrations (top) and bias (bottom) at the Northbrook, IL monitor

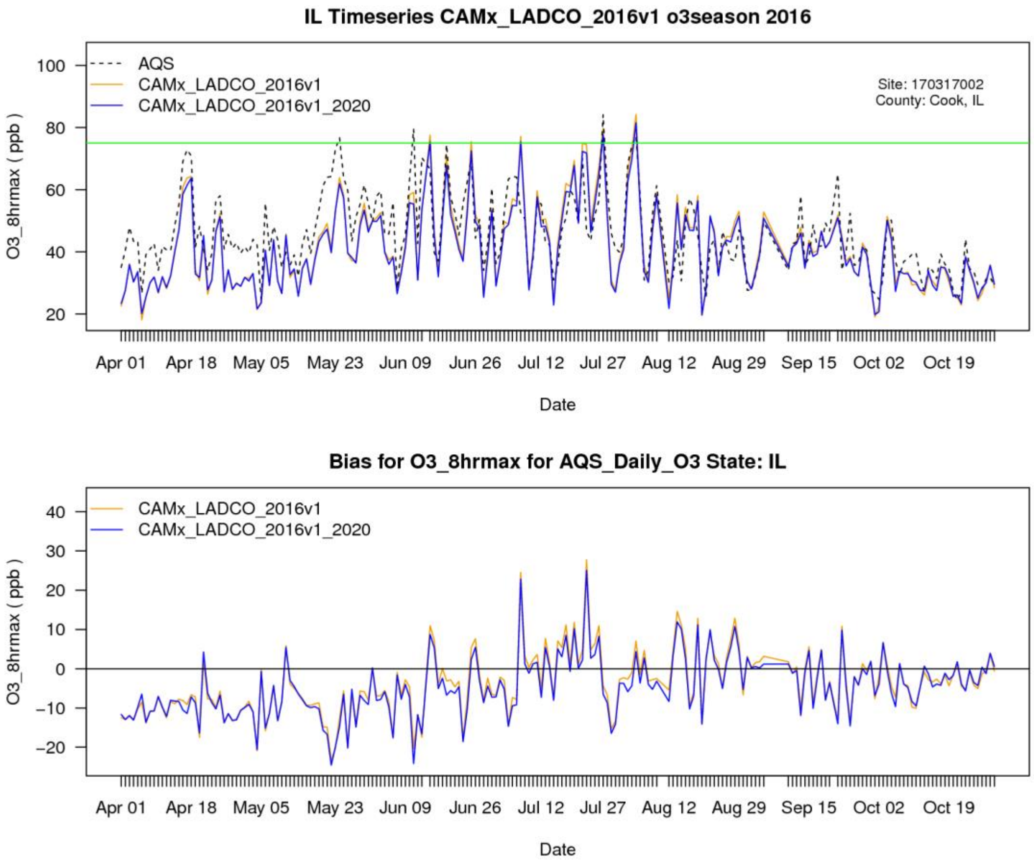


Figure 41. MDA8 O_3 observed, CAMx 2016, and CAMx 2020 concentrations (top) and bias (bottom) at the Evanston, IL monitor

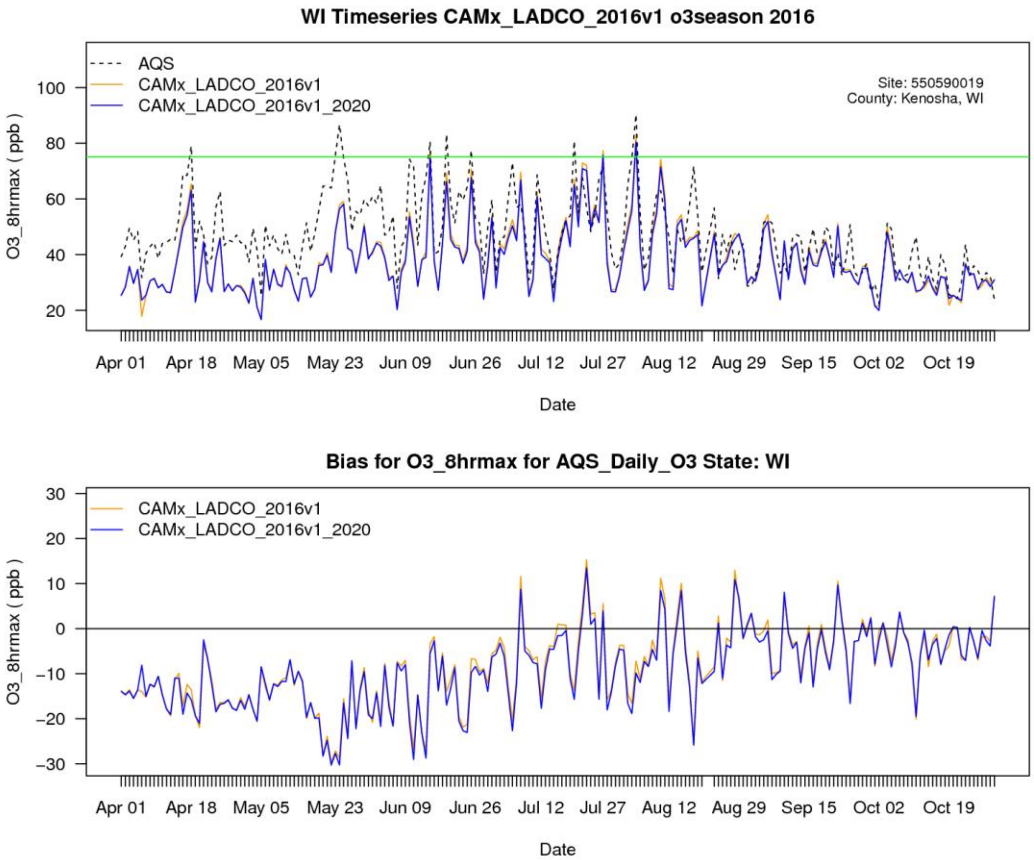


Figure 42. MDA8 O_3 observed, CAMx 2016, and CAMx 2020 concentrations (top) and bias (bottom) at the Chiwaukee Prairie, WI monitor

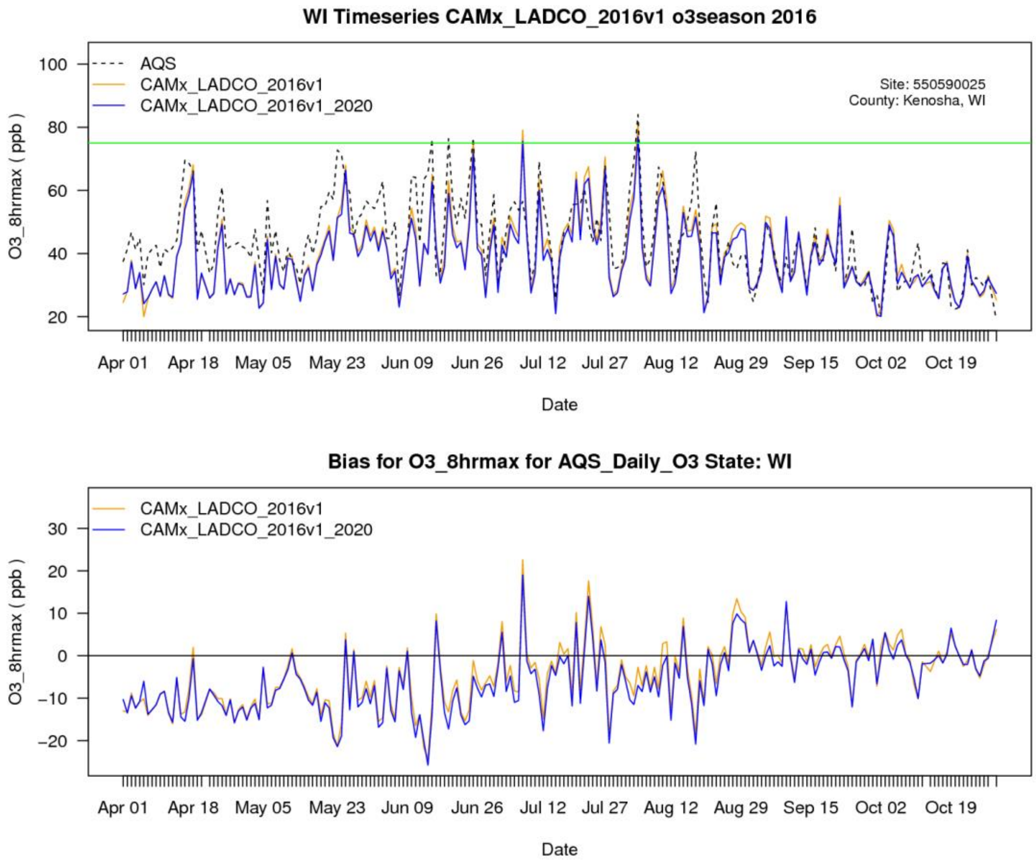
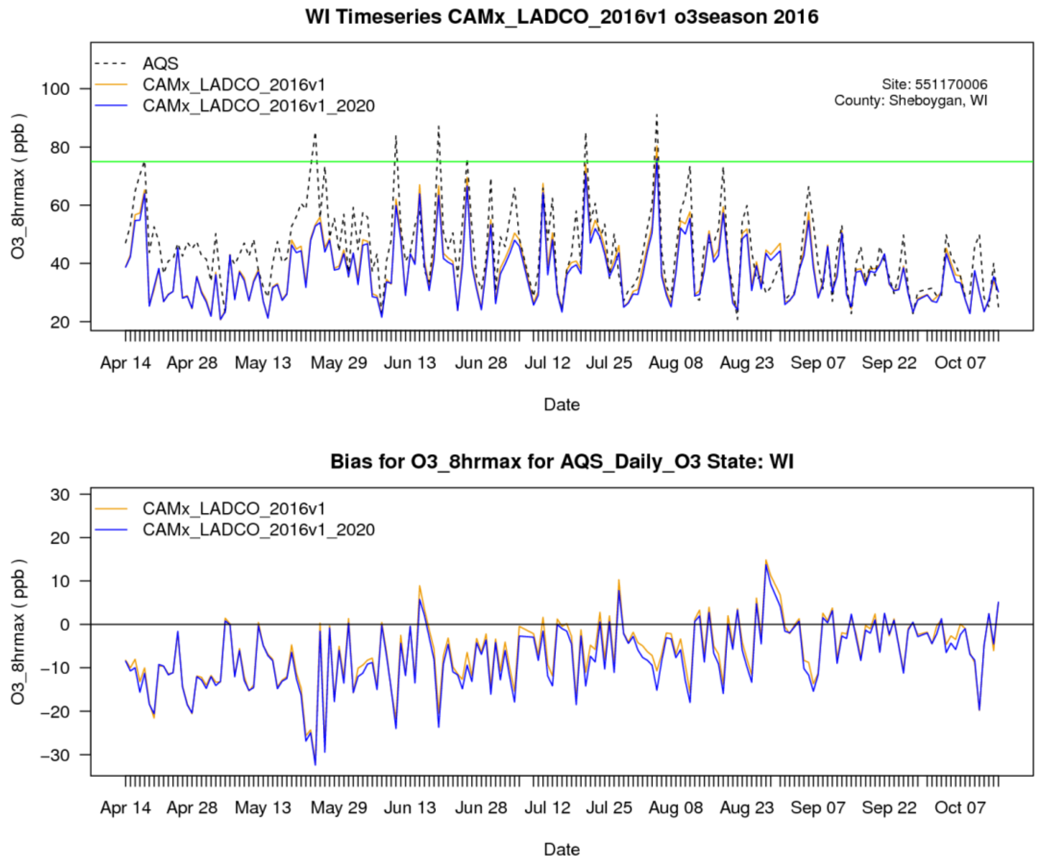


Figure 43. MDA8 O_3 observed, CAMx 2016, and CAMx 2020 concentrations (top) and bias (bottom) at the Kenosha Water Tower, WI monitor


WI Timeseries CAMx_LADCO_2016v1 o3season 2016
AQS
CAMx_LADCO_2016v1
CAMx_LADCO_2016v1_2020
Site: 551170006
County: Sheboygan, WI
O3_8hrmax (ppb)
100
80
60
40
20
Apr 14
Apr 28
May 13
May 29
Jun 13
Jun 28
Jul 12
Jul 25
Aug 08
Aug 23
Sep 07
Sep 22
Oct 07
Date
Bias for O3_8hrmax for AQS_Daily_O3 State: WI
CAMx_LADCO_2016v1
CAMx_LADCO_2016v1_2020
O3_8hrmax (ppb)
30
20
10
0
−10
−20
−30
Apr 14
Apr 28
May 13
May 29
Jun 13
Jun 28
Jul 12
Jul 25
Aug 08
Aug 23
Sep 07
Sep 22
Oct 07
Date

Appendix B: Description of CART Analysis

What is CART Analysis?

- Classification and Regression Tree, aka binary recursive partitioning, decision tree
- Classifies data by yes/no questions -- is temp. < 75, is RH < 80; easy to interpret
- Nonparametric, so insensitive to distributions of variables
- Insensitive to transformations of variables
- Insensitive to outliers and missing data
- Frequently more accurate than parametric models

The beauty of CART is the ease of interpreting the results--you get back a natural-language sequence of questions that anyone can use to classify a new data set You can also adjust the sensitivity of the model to various parameters or outcomes, if it's more important to accurately classify group 1 rather than group 2, for example.

How do you use CART for ozone analysis?

- CART is used to categorize each day by ozone concentration and associated met conditions
- Incorporates 30+ meteorological variables
- Results in a decision tree with 10-15 branches, each describing the meteorological conditions associated with a particular ozone concentration
- Trends are then developed for meteorologically similar days to minimize the effects of meteorological variability on ozone trends

Which meteorology variables were used in the LADCO CART analysis?

These variables were selected from previous model runs that had many more variables included; these are just those that had any influence in previous models:

- Daily precipitation
- Cloud cover
- 850 and 700 mb temperatures at 6 am
- Maximum daily temperature, dew point, relative humidity, pressure
- Average daily wind spee
- Average daily, morning, and afternoon wind direction as N/S and E/W vectors
- Morning, afternoon and evening dewpoint and pressure
- Day of week
- Previous day’s average temperature, pressure, wind speed, wind direction
- Change in temperature and pressure from previous day
- 2- and 3-day average wind speed and temperature
- 24-hour transport direction and distance (from Hysplit trajectories)
- Deviation from 10-year averages of 850 and 700 mb temperature and height

Where did the meteorology data come from that were used in the LADCO CART analysis?

- Hourly surface observations from 2379 sites around the US collected from National Climatic Data Center’s (NCDC) Integrated Surface Database (mostly airports)
- Upper air observations from 85 sites collected from NCDC’s Integrated Global Radiosonde Archive
- Each surface site is paired with closest upper air site (upper air data can be less spatially representative than surface obs)
- Hysplit back trajectories calculated for each site at noon every day to provide transport distance and u,v,w vectors
- Data for each year/site is acquired from NCDC, processed to calculated derived values (daily max/min, mixing heights, e.g.)

- QA flags assigned based on completeness, upper air site proximity
- Lags and deviation from long term means are calculated
- Data are combined and formatted into ASCII and SAS datasets
- Years 2005 to 2018

APPENDIX 11

Supplemental Information for Ozone, NOx and VOC Trends Analysis

Table of Contents

1. SUPPLEMENTAL INFORMATION ON OZONE TRENDS

1.1. Explanation of CART Analysis

Classification and regression tree (CART) analysis is a statistical tool to classify data. Here, it is applied to 8-hour ozone and meteorological data to determine the meteorological conditions most commonly associated with high-ozone days. Once days are classified by their meteorology, ozone concentration trends among days with the same conditions can be developed. By examining trends only on days with similar meteorology, the influence of year-to-year meteorological variability on ozone concentrations is minimized and we assume that any remaining trend is the result of reductions in emissions of ozone precursors and other non-meteorological factors.

A CART analysis was conducted by LADCO using 8-hour ozone monitoring data for two monitors in the northern part of the nonattainment area: Chiwaukee Prairie (ID number 55-059-0019) and Zion (17-097-1007). These monitors are located within a few miles of each other in the northern part of the Chicago nonattainment area. A second analysis was conducted for a group of monitoring sites in Cook County, Illinois, including Alsip (17-031-0001), Chicago-SWFP (17-031-0032), Chicago-Com. Ed. (17-031-0076), Chicago-Taft H.S. (17-031-1003), Lemont (17-031-1601), Cicero (17-031-4002), Des Plaines (17-031-4007), Northbrook (17-031-4201), and Evanston (17-031-7002). The analysis included data from the years 2005-2019, and therefore addresses long-term trends. The goal of the analysis was to determine the meteorological conditions associated with high ozone episodes in the Chicago airshed and to construct linear trends for the high-ozone days identified as sharing similar meteorological characteristics.

The CART analyses for the Chicago area processed multiple meteorological variables for each day to determine which are the most effective at predicting ozone. Meteorological data for the Chiwaukee/Zion monitors were taken from Mitchell Field (Milwaukee) NWS station and processed by LADCO. Upper air observations were taken from the Green Bay, Wisconsin NWS site. Meteorological data for the Cook County monitor analysis were taken from the Chicago O'Hare Airport National Weather Service (NWS) station and the National Climatic Data Center's (NCDC) Integrated Surface Database and processed by LADCO. Upper air observations were downloaded from the NCDC's Integrated Global Radiosonde Archive. HYSPLIT trajectories were also used for both sets of analyses. Meteorological variables for both analyses included maximum and average daily temperature, dew point, relative humidity and air pressure at the surface and different levels of the atmosphere, wind direction and wind speed, change in temperatures and air pressure from the previous day, average wind speed and temperature over a 2 or 3-day period, day of the week, cloud cover, daily precipitation and many other parameters.[1]

Regression trees, in which each branch describes the meteorological conditions associated with different ozone concentrations, were developed to classify each summer day (May – September). Although the exact selection of predictive variables changes from site to site, temperature, wind

[1] The original meteorological database used to support this effort, called MetDat, was developed by EPA Office of Air Quality Planning and Standards (OAQPS) and subsequently revised by both Sonoma Technology and LADCO.

direction, and relative humidity are common predictors. These are included in the dataset as daily averages and maximums as well as averages at specific times throughout the day (morning 7-10 am, afternoon 1-4 pm, etc.). Similar days were assigned to nodes, which are equivalent to branches of the regression tree. By grouping days with similar meteorology, the influence of meteorological variability on the underlying trend in ozone concentrations is partially removed; the remaining trend is presumed to be due to trends in precursor emissions combined with other non-meteorological influences. Ozone trends in these nodes were then plotted.

For the Chiwaukee Prairie and Zion monitors, the CART analysis determined that seven sets of meteorological conditions had average ozone concentrations above 50 ppb. Analysis of the Cook County monitors identified four high-ozone nodes (with average concentrations above 50 ppb). Tables 1 and 2 show the shared meteorological conditions for each high-ozone node along with the frequency and average ozone concentration for each node. All of the high-ozone nodes had high temperatures, and many were distinguished by southerly winds and/or low relative humidity. The highest average ozone concentrations (69.0 ppb) were observed for node E for the northern monitors. This node was characterized by maximum temperatures above 79 °F, 700 mb height of 36 m above the 10-year average, and maximum afternoon temperatures above 81 °F.

Figure 5.4 in the main document shows the trends in average ozone concentration at the Chiwaukee Prairie and Zion monitors for the four primary nodes from the year 2005 through 2019. Figure 1 in this appendix shows the same trends for the Cook County monitors. These analyses demonstrate that ozone concentrations for a given set of high-ozone meteorological conditions have decreased over time. In particular, this analysis shows that ozone concentrations have decreased on days with high average temperatures and the right combination of (mostly south-southeasterly) winds, low relative humidity and other characteristics. While maximum temperatures play an important role in the formation of ozone, the CART analysis reveals that other meteorological parameters (such as transport distance, relative humidity and morning temperature) also play significant roles in creating conditions conducive for ozone formation. This analysis demonstrates that the observed reductions in ozone concentrations have not been driven solely by favorable meteorological conditions. These results further suggest that progress in reducing ozone precursor emissions was likely an important driver of the observed reductions in 8-hour ozone concentrations in the Chicago nonattainment area over this 15-year time period.

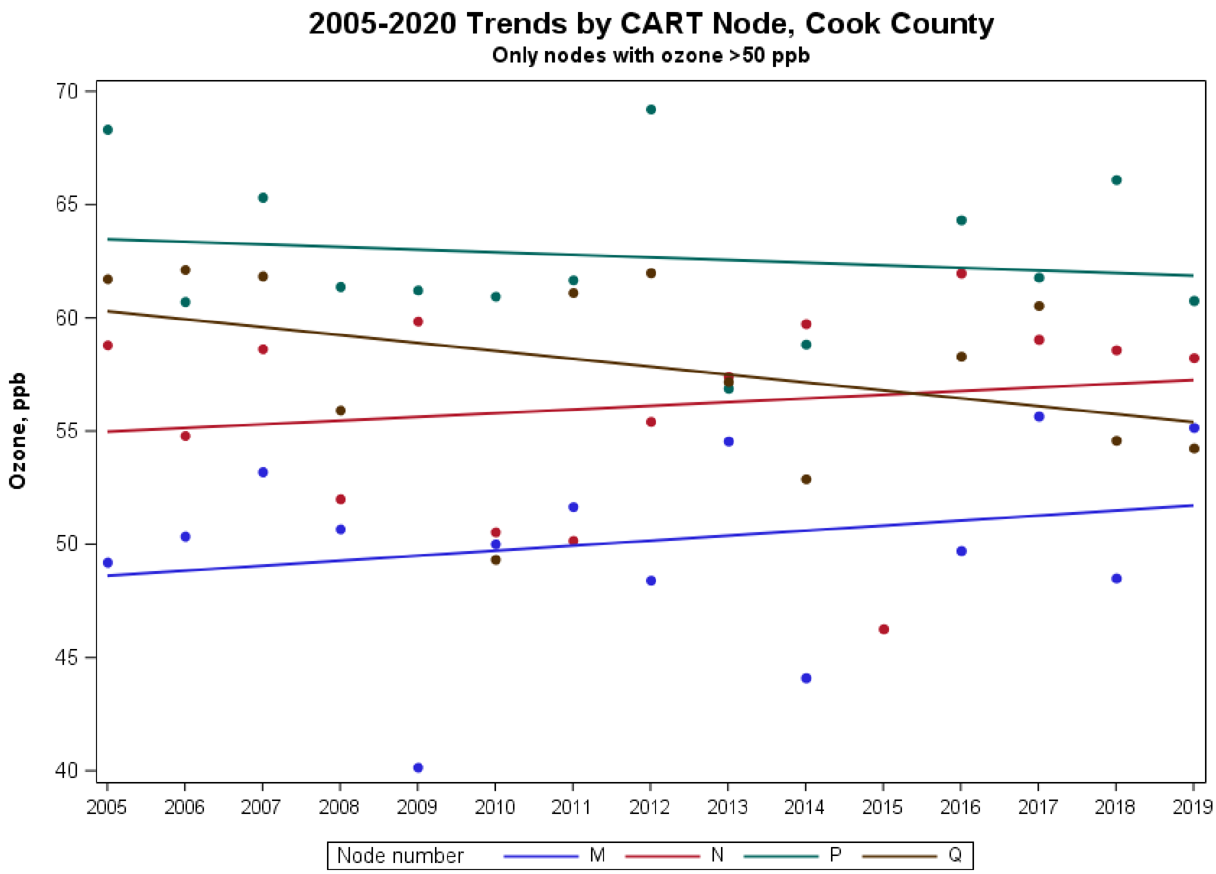
Table 1. Meteorological conditions, occurrence and average ozone for the four highest-ozone nodes identified by CART from Chiwaukee Prairie and Zion monitoring data

<table>
<tr><th rowspan="2">Conditions</th><th colspan="4">Node</th></tr>
<tr><th>D</th><th>E</th><th>K</th><th>P</th></tr>
<tr><td>Maximum temperature</td><td colspan="4">> 79 °F</td></tr>
<tr><td>700 mb height</td><td colspan="2">>36 m above 10-yr average</td><td colspan="2"><36 m above 10-yr average</td></tr>
<tr><td>Average afternoon temperature</td><td>< 81 °F</td><td>≥ 81 °F</td><td colspan="2"></td></tr>
<tr><td>Average pm wind southerly vector</td><td colspan="2" rowspan="3"></td><td colspan="2">≥ 1.108</td></tr>
<tr><td>Average morning temperature</td><td>≥ 80.3 °F</td><td>< 80.3 °F</td></tr>
<tr><td>Minimum apparent temperature</td><td></td><td>≥ 64.9 °F</td></tr>
<tr><td>Average ozone (ppb)</td><td>59.0</td><td>69.0</td><td>62.6</td><td>52.4</td></tr>
<tr><td>Number of days</td><td>209</td><td>295</td><td>172</td><td>304</td></tr>
</table>

Table 2. Meteorological conditions, occurrence and average ozone for the four high-ozone nodes identified by CART from Cook County monitoring data

<table>
<tr><th rowspan="2">Conditions</th><th colspan="4">Node</th></tr>
<tr><th>N</th><th>M</th><th>P</th><th>Q</th></tr>
<tr><td>Average afternoon temperature</td><td>77-84.7 °F</td><td colspan="3">≥ 84.7 °F</td></tr>
<tr><td>Average midday relative humidity</td><td>< 59.9 %</td><td></td><td></td><td></td></tr>
<tr><td>Average relative humidity</td><td></td><td>≥ 67.7 %</td><td colspan="2">< 67.7 %</td></tr>
<tr><td>24-hour southerly transport</td><td>≥ 194 km</td><td colspan="3"></td></tr>
<tr><td>Previous day pressure</td><td></td><td colspan="3">≥ 983 mb</td></tr>
<tr><td>24-hour transport distance</td><td></td><td></td><td>< 499 km</td><td>≥ 499 km</td></tr>
<tr><td>Average ozone (ppb)</td><td>56.5</td><td>50.4</td><td>64.3</td><td>58.6</td></tr>
<tr><td>Number of days</td><td>1190</td><td>843</td><td>1513</td><td>1203</td></tr>
</table>

Figure 1. Concentration trends from the CART analysis for Cook County, IL, monitors.



1.2. Additional Ozone-Temperature Correlation Plots

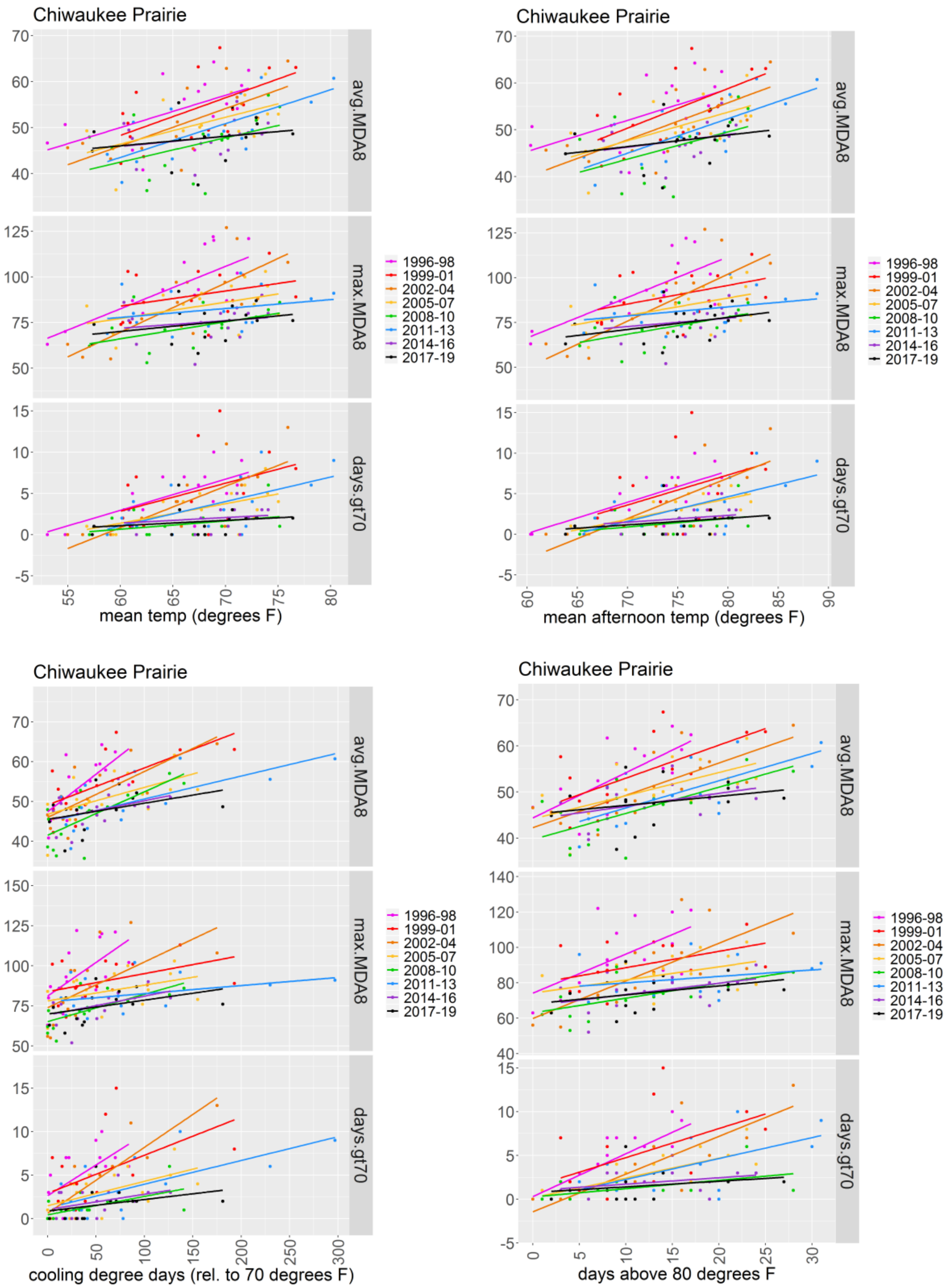
Section 5.2.3 of the main document presents and discusses trends in monthly averages of two ozone concentration parameters with four temperature parameters. However, that document only incorporates the four plots with the best correlation coefficients comparing ozone at the Chiwaukee Prairie monitor with temperature at the inland Madison and Rockford ASOS monitors. Figure 2 shows all of the correlations for these locations. This includes plots of three ozone concentration parameters (average maximum daily 8-hour average ozone (MDA8), maximum MDA8, and days with MDA8 above 70 ppb)[2] versus four temperature parameters[3] (number of ozone season days with temperatures above 80 degrees, cooling degree days relative to 70 degrees, mean afternoon temperature, and mean temperature). These figures show that the trends discussed in the main document are representative of all of the ozone-temperature correlations. Namely, ozone concentrations observed for a given temperature level have

[2] One of these ozone parameters is a measure of ozone concentrations over the whole month (average MDA8) and includes data from each day in that month. The other two parameters are measures of maximum ozone days only. These parameters only consider extreme days (the highest-ozone day in a month or days with MDA8 ozone above 70 ppb).

[3] Three of these temperature parameters measure temperature over the whole month (cooling degree days, mean afternoon temperatures and mean temperature) and include data from each day in that month. The other parameter (number of days above 80 degrees) is a measure of just the hottest days in that month.

consistently decreased over each three-year period, although these reductions appear to be slowing over time. The one regular exception to this trend is the recession years (2008-2010), which often had levels of ozone that were similar to, or even lower than, the most recent set of years (2017-2019), presumably due to lower emissions resulting from reduced economic activity because of the recession. In all of these plots, 2017-2019 had the lowest or near-lowest amounts of ozone for a given temperature level. This analysis supports the conclusion that when adjusted for meteorology, ozone concentrations have decreased consistently through the most recent years in the nonattainment area.

Figure 2. Trends in monthly averages of three ozone concentration parameters (average MDA8, maximum MDA8, and days with MDA8 above 70 ppb) plotted versus four temperature parameters. Temperature is an average of the Automated Surface Observing Systems (ASOS) measurements at Madison, WI (KMSN) and Rockford, IL (KRFD).



2. TRENDS IN NOx CONCENTRATIONS IN WISCONSIN

NOx consists of both nitric oxide (NO) and nitrogen dioxide (NO_2). WDNR measured concentrations of NO, NO_2 and NOx at three sites along Wisconsin's Lake Michigan lakeshore. Monitored concentrations for the first and last years of monitoring are shown in Table 3.

Table 3. Concentrations and concentration changes of NOx compounds at Wisconsin's Lake Michigan shoreline monitors.*

			Summer means		Percent Change
Compound	First year monitored	Last year monitored	First year	Last year	First - Last
Milwaukee SER					
NO	2000	2018	6.37	1.19	-81%
NO_2*	2000	2019	14.29	6.38	-55%
NOx	2000	2018	20.40	7.66	-62%
Milwaukee College Ave. Near-Road					
NO	2014	2017	11.68	9.41	-19%
NO_2*	2014	2019	13.37	11.44	-14%
NOx	2014	2017	25.04	22.56	-10%
Manitowoc					
NO	2007	2018	0.08	0.25	232%
NO_2*	2007	2019	1.90	1.35	-29%
NOx	2007	2018	1.95	1.12	-43%

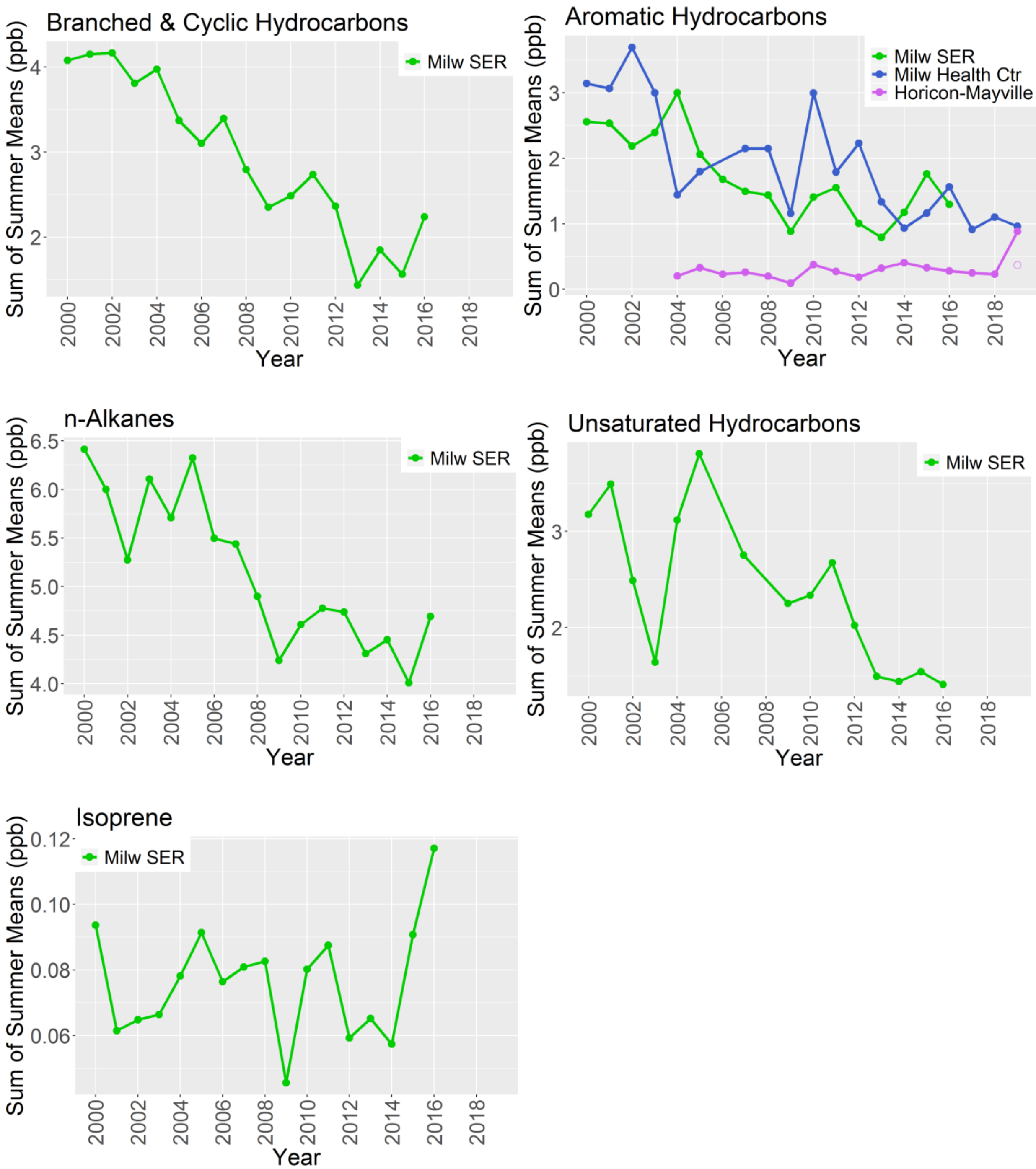
*NO_2 was measured via NOx-NO subtraction using a chemiluminescence method until 2018 (Milwaukee College Ave NR) or 2019 (Milwaukee SER and Manitowoc), at which point this compound was measured via a direct NO_2 measurement using cavity attenuated phase shift (CAPS) spectroscopy. Measurement of NO and NOx was discontinued at these times.

3. TRENDS IN VOC CONCENTRATIONS IN WISCONSIN

Concentrations of up to 56 different VOC compounds were measured at Wisconsin monitors. These compounds include both carbonyl (compounds containing carbon-oxygen double bonds) and hydrocarbon (which contain only carbon and hydrogen) VOCs. The hydrocarbons can be further grouped into four classes based on their chemical properties. These compound classes include branched and cyclic hydrocarbons, aromatic hydrocarbons, n-alkanes, and unsaturated hydrocarbons. In addition, isoprene is a hydrocarbon that comes from biogenic (not anthropogenic) sources. These different compound classes often have different origins.

Concentrations of all of the sub-classes of anthropogenic hydrocarbons also decreased during this time period (Figure 3), with the largest decrease from unsaturated hydrocarbons and the smallest decrease from aromatic hydrocarbons. Concentrations of isoprene were variable but did not show any apparent trend during this time period. Figure 5.10 in the main document shows plots for total hydrocarbons and carbonyls.

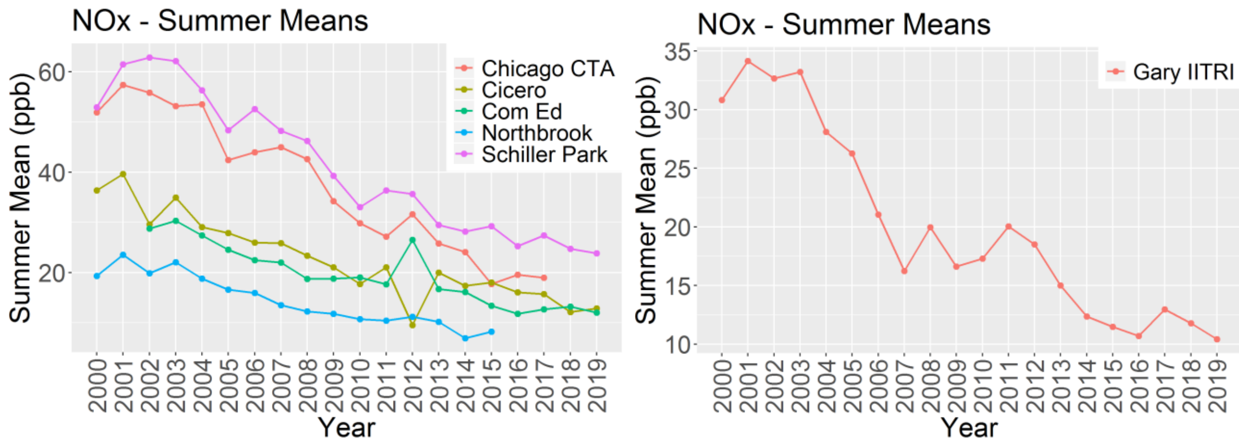
Figure 3. Trends in sums of compound classes of hydrocarbons. Note that trends for most compound classes are only shown for the Milwaukee SER monitor because the other monitors either did not measure any of these compounds or only measured a few. VOC monitoring at the Milwaukee SER monitor was discontinued after 2016. The mean aromatic hydrocarbon concentrations at Horicon in 2019 were strongly influenced by exceptionally high concentrations on one day (August 13). The open circle shows the mean concentration without data from this day.



4. TRENDS IN NOx AND VOCs IN THE CHICAGO AREA (ILLINOIS AND INDIANA)

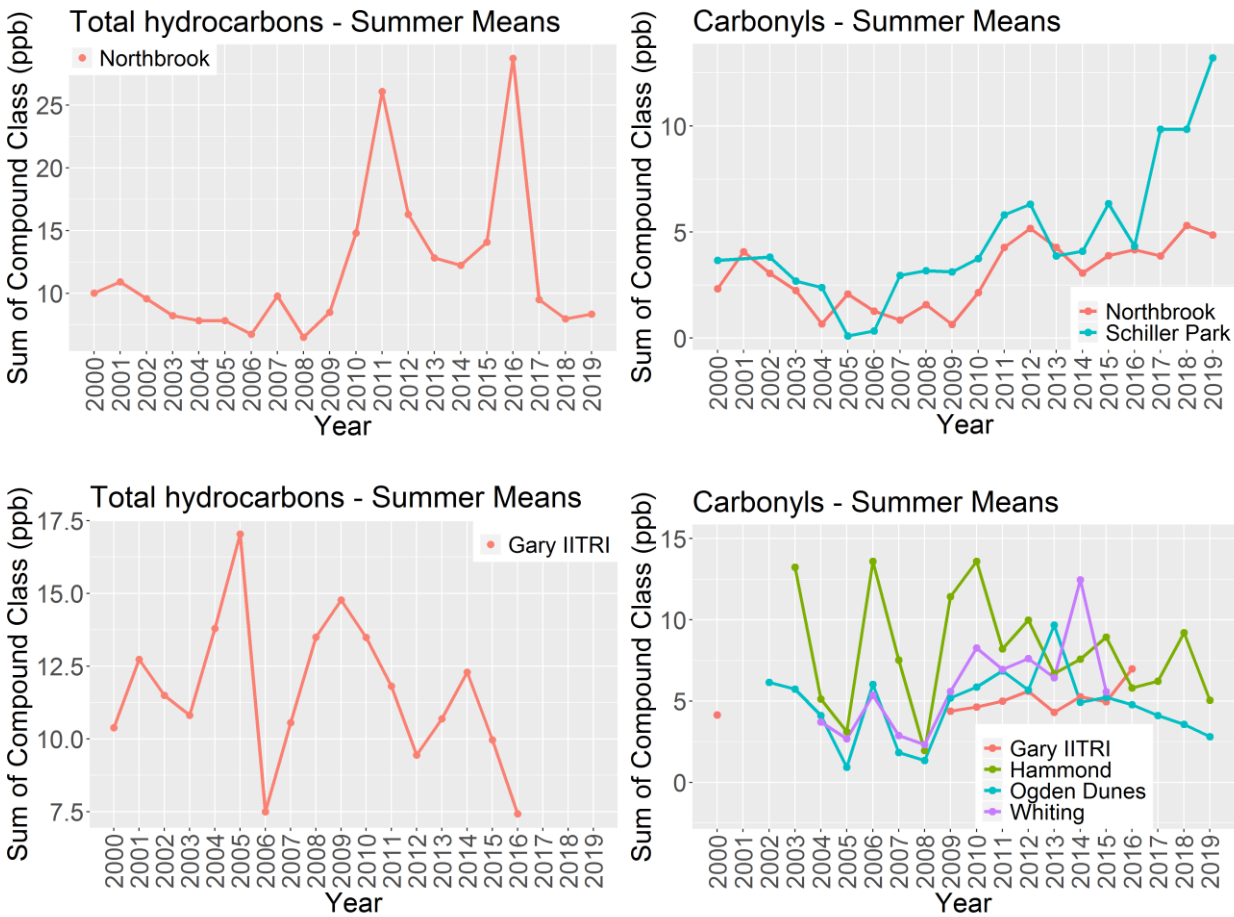
Figure 4 shows monitored NOx concentrations[4] in the upwind Illinois and Indiana portions of the Chicago nonattainment area. Similarly, Figure 5 shows trends in monitored VOC concentrations in these same areas for both total hydrocarbon VOCs and total carbonyl VOCs.

Figure 4. Trends in mean summer NOx concentrations for monitors in the (left) Illinois and (right) Indiana portions of the Chicago nonattainment area.



[4] NOx and VOC data were downloaded from EPA's Air Quality Systems database.

Figure 5. Trends in mean summer VOC concentrations of (left) hydrocarbons and (right) carbonyls for (top) Chicago area monitors in Illinois and (bottom) Chicago area monitors in Indiana.



APPENDIX 12

Clarification of Information Provided in the 2008 Ozone NAAQS Moderate-Area Attainment Plan for Eastern Kenosha County

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
101 S. Webster Street
Box 7921
Madison WI 53707-7921

Scott Walker, Governor
Daniel L. Meyer, Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463
TTY Access via relay - 711

WISCONSIN
DEPT. OF NATURAL RESOURCES

January 23, 2018

Cathy Stepp
Regional Administrator
U.S. Environmental Protection Agency - Region 5
77 West Jackson Blvd.
Chicago IL 60604-3507

Subject: Clarification of Information Provided in the 2008 Ozone NAAQS Moderate-Area Attainment Plan for Eastern Kenosha County

Dear Regional Administrator Stepp:

On April 17, 2017, the Wisconsin Department of Natural Resources (DNR) submitted a State Implementation Plan (SIP) revision for the 2008 ozone National Ambient Air Quality Standard (NAAQS). That submittal requested that the U.S. Environmental Protection Agency (EPA) approve the attainment plan for the Wisconsin portion (Kenosha County-Partial) of the Chicago-Naperville (IL-IN-WI) 2008 ozone NAAQS nonattainment area. EPA subsequently requested additional clarification about several specific aspects of the attainment plan during a phone call on August 2, 2017 and via email on October 24, 2017.

The enclosed document addresses EPA's request for clarification. Specifically, this document clarifies that the required reasonable further progress and contingency measure emission reductions were met through permanent and enforceable control measures. It also clarifies the emission inventory approaches used by DNR, addresses Nonattainment New Source Review Program requirements, and requests that EPA act upon a previously submitted emission statement for Kenosha County.

If you have any questions regarding these clarifications, please contact David Bizot of my staff at (608) 267-7543 or David.Bizot@wisconsin.gov.

Sincerely,

Gail E. Good
Director
Air Management

cc: David Bizot, AM/7

Enclosure

Wisconsin Department of Natural Resources
2008 Ozone NAAQS Moderate-Area Attainment Plan for Eastern Kenosha County: Clarifying Information

1. Reasonable Further Progress (RFP) and Contingency Measures

In its 2008 ozone NAAQS moderate area attainment plan for eastern Kenosha County, the Wisconsin Department of Natural Resources (DNR) demonstrated that the state met the 15% RFP requirement and the 3% contingency measures requirement. The information included below shows that the area met these emission reduction requirements entirely through permanent and enforceable control measures within the mobile source sector.

Table 1 (next page) describes the calculations used to determine mobile source emissions targets needed to meet the RFP and contingency requirements. These targets were determined by allocating the required reductions to volatile organic compounds (VOC) and nitrogen oxides (NOx) in the same proportion as they were emitted in 2011. Comparison of these emission targets with the projected 2017 and 2018 mobile source emissions shows that emissions from this sector decreased more than necessary to meet RFP and contingency measure requirements[1] and indicates projected excess emissions reductions of 0.91 tpsd VOC and 0.73 tpsd NOx.[2] Similar levels of excess reductions are also projected for 2018. These comparisons demonstrate that emission reductions from the mobile source sector more than meet the required 15% RFP emission reduction requirement for 2017 and the additional 3% contingency measures requirement for 2018.

Further, these mobile source emission reductions are due to permanent and enforceable control measures enacted within the nonattainment area. Table 2 (next page) shows that the Motor Vehicle Emissions Simulator Model (MOVES) model assumed increases of 11-13% in vehicle or equipment population and usage while projecting a 34-41% reduction in NOx and VOC emissions from these sectors from 2011 to 2017 (with a similar pattern between 2017 and 2018). These emission reductions therefore cannot be attributed to reductions in source activity. MOVES incorporates the effects of a number of emissions control programs (Tables 3 and 4, following pages) into its projections. These emission reduction measures are permanent and enforceable, are implemented in the nonattainment area, and account for the significant emission reductions projected for 2017 and 2018. The eastern Kenosha County nonattainment area has therefore more than met the RFP and contingency measures requirements.

[1] Projected 2017 emissions were 2.56 tons per summer day (tpsd) VOC compared with the RFP target of 3.47 tpsd. Projected 2017 NOx emissions were 4.52 tpsd compared with the RFP target of 5.25 tpsd.
[2] Projected onroad emissions for 2017 and 2018 already include the 7.5% safety margin.

Table 1. Determination of mobile source emissions targets for RFP and contingency measures and comparison to projected emissions for eastern Kenosha County.

		Tons per summer day		
Description	**Formula**	**VOC**	**NOx**	**Total**
Determination of Required Reductions				
A. 2011 Reasonable Further Progress Base Year Inventory		9.43	19.47	28.90
B. Percentage of Total 2011 Emissions		33%	67%	100%
C. RFP Reductions totaling 15%	15% * B	5%	10%	15%
D. RFP Emissions Reductions Required Between 2011 & 2017	A * C	0.46	1.97	2.43
E. Contingency Percentage	3% * B	1%	2%	3%
F. Contingency Emission Reduction Requirements	A * E	0.09	0.39	0.49
Determination of Mobile Source Emissions Targets				
G. 2011 Baseline Mobile Source Emissions		3.93	7.22	11.15
H. RFP Target Mobile Source Emissions for 2017	G - D	3.47	5.25	8.72
I. Contingency Measure Target Mobile Source Emissions for 2018	G - D - F	3.38	4.86	8.24
Comparison of Projected Emissions and Emission Targets				
J. Projected 2017 Mobile Source Emissions		2.56	4.52	7.08
K. Projected 2018 Mobile Source Emissions		2.40	4.15	6.56
L. Excess Reductions in 2017 Mobile Source Emissions	H - J	0.91	0.73	1.64
M. Excess Reductions in 2018 Mobile Source Emissions	I - K	0.98	0.71	1.68

Table 2. Activity and emissions data for the onroad and nonroad mobile source sectors for eastern Kenosha County. Differences are relative to 2011 emissions.

				Difference	
	2011	**2017**	**2018**	**2011-17**	**2017-18**
Onroad Sector (hot summer weekday)					
Total vehicle-miles of travel	3,074,892	3,463,833	3,493,710	13%	1%
Vehicle population	86,026	95,601	96,399	11%	1%
Total VOC emissions (tpsd)	2.42	1.56	1.44	-35%	-5%
Total NOx emissions (tpsd)	5.15	3.05	2.75	-41%	-6%
Nonroad Sector (hot summer day)					
Total hours of use (non-MAR*)	23,325	26,091	26,478	12%	2%
Equipment population (non-MAR*)	55,350	61,361	62,341	11%	2%
VOC emissions (non-MAR, tpsd)	1.48	0.97	0.94	-34%	-2%
NOx emissions (non-MAR, tpsd)	1.53	1.00	0.94	-35%	-4%
Total VOC emissions (tpsd)	1.51	1.00	0.96	-34%	-2%
Total NOx emissions (tpsd)	2.07	1.47	1.40	-29%	-3%

* Activity data was not available for commercial marine, aircraft and rail locomotives (MAR) in the nonattainment area.

Table 3. Permanent and enforceable control programs modeled by the MOVES model for the onroad sector.

On-road Control Program	Pollutants	Model year*	Regulation
Passenger vehicles, SUVs, and light duty trucks – emissions and fuel standards	VOC & NOx	2004-09+ (Tier 2) 2017+ (Tier 3)	40 CFR Part 85 & 86
Light-duty trucks and medium duty passenger vehicle – evaporative standards	VOC	2004-10	40 CFR Part 86
Heavy-duty highway compression engines	VOC & NOx	2007+	40 CFR Part 86
Heavy-duty spark ignition engines	VOC & NOx	2005-08+	40 CFR Part 86
Motorcycles	VOC & NOx	2006-10 (Tier 1 & 2)	40 CFR Part 86
Mobile Source Air Toxics – fuel formulation, passenger vehicle emissions, and portable container emissions	Organic Toxics & VOC	2009-15**	40 CFR Part 59, 80, 85, & 86
Light duty vehicle corporate average fuel economy standards	Fuel efficiency (VOC & NOx)	2012-16 & 2017-25	40 CFR Part 600

* The range in model years affected can reflect phasing of requirements based on engine size or initial years for replacing earlier tier requirements.
** The range in model years reflects phased implementation of fuel, passenger vehicle, and portable container emission requirements as well as the phasing by vehicle size and type.

Table 4. Permanent and enforceable control programs modeled by the MOVES model or considered in development of the MAR inventory for the nonroad sector.

Nonroad Control Program*	Pollutants	Model Year**	Regulation
Aircraft	VOC & NOx	2000 – 2005+	40 CFR Part 87
Compression Ignition	VOC & NOx	2000 – 2015+ (Tier 4)	40 CFR Part 89 & 1039
Large Spark Ignition	VOC & NOx	2007+	40 CFR Part 1048
Locomotive Engines	VOC & NOx	2012 – 2014 (Tier 3) 2015+ (Tier 4)	40 CFR Part 1033
Marine Compression Ignition	VOC & NOx	2012 – 2018	40 CFR Part 1042
Marine Spark Ignition	VOC & NOx	2010+	40 CFR Part 1045
Recreational Vehicle	VOC & NOx	2006 – 2012 (Tier 1 – 3)	40 CFR Part 1051
Small Spark Ignition Engine < 19 Kw – emission standards	VOC & NOx	2005 – 2012 (Tier 2 & 3)	40 CFR Part 90 & 1054
Small Spark Ignition Engine < 19 Kw – evaporative standards	VOC	2008 – 2016	40 CFR Part 1045, 54, & 60

* Compression ignition applies to diesel non-road compression engines including engines operated in construction, agricultural, and mining equipment. Recreational vehicles include snowmobiles, off-road motorcycles, and all-terrain vehicles. Small spark ignition engines include engines operated in lawn and hand-held equipment.
** The range in model years affected can reflect phasing of requirements based on engine size or initial years for replacing earlier tier requirements.

2. Emissions inventories

This discussion clarifies the different emissions inventories conducted for eastern Kenosha County. As stated in the Kenosha attainment plan, EPA has already approved a nonattainment area inventory for eastern Kenosha (81 FR 11673, referred to herein as the "approved inventory"). The two inventories DNR included in the attainment plan, the "RFP inventory" and the "modeling inventory," were similar to the approved inventory with a few important differences, as shown in Table 5 (next page).

DNR developed the approved and RFP inventories, whereas LADCO developed the modeling inventory with input from DNR and other member states. The most significant differences between the inventories are that DNR relied upon a conservative estimate of electric generating unit (EGU) emissions in developing the RFP inventory relative to the other inventories. In addition, the RFP and modeling inventories used more recent versions of the MOVES model to develop mobile source emissions estimates. Table 5 shows other minor differences in determination of emissions estimates.

The different inventory methodologies had some impact on estimated emissions for 2011 for the approved and RFP inventories for eastern Kenosha County.[3] Table 6 (next page) shows that the greatest differences between these two inventories occurred in point source NOx emissions; this is due almost entirely to the differences in EGU emissions methodology described above. In addition, both onroad and nonroad emissions varied between the two inventories due to the different mobile source models and versions of MOVES used. Total VOC emissions in the two inventories were within 6% of each other, and total NOx emissions were within 15% of each other.

3. Emissions statement

DNR submitted a source emission statement to the U.S. Environmental Protection Agency (EPA) as part of its redesignation request for the eastern Kenosha County 2008 ozone nonattainment area.[4] DNR asks EPA to act upon this earlier submittal as part of its action on the Kenosha County attainment plan.

4. Nonattainment New Source Review (NNSR) Program

DNR certified that its existing NNSR program and rules meet the SIP requirements in a letter submitted to EPA on November 17, 2017.

[3] The modeling inventory did not separate emissions from the eastern Kenosha County nonattainment area from those from the rest of the county, so these emissions cannot be directly compared to the other inventories.
[4] Redesignation Request and Maintenance Plan for the Wisconsin Portion of the Chicago-Naperville (IL-IN-WI) 2008 Ozone Nonattainment Area (Kenosha County-Partial), submitted to EPA on August 15, 2016.

Table 5. Comparison of methodology used to develop three different types inventories for 2011 for eastern Kenosha County. Note that the approved and RFP inventories estimated the tons per summer day whereas the modeling inventory temporalized emissions for the modeling period (May-September).

Sector	Approved Inventory	RFP Inventory	Modeling Inventory
Point	EGUs & non-EGUs: WI AEI for an average day in the third quarter	EGUs: CAMD for a maximum day non-EGU: WI AEI for an average day in the year	EGUs & non-EGUs: NEI v2 (from EPA's inventory v 2011EH)
Area	NEI v2	NEI v2	NEI v2 (from EPA's inventory v 2011EH)
Onroad	MOVES 2010b (Min/Max Temps: 70/94 °F)	MOVES 2014a (Min/Max Temps: 70/94 °F)	MOVES 2014 (NEI v2 with corrections) (Temps vary by grid cell)
Nonroad	air & rail: NEI v1 com.mar.: LADCO/NEI v1 non-MAR: NMIM model	MAR: NEI v2 non-MAR: MOVES 2014a	NEI v2 (from EPA's inventory v 2011EH)

CAMD = EPA's Clean Air Markets Division database, com.mar. = commercial marine, EGU = electric generating unit, MAR = commercial marine, aircraft and rail locomotive, MOVES = Motor Vehicle Emissions Simulator, NEI = National Emissions Inventory, NMIM = National Mobile Inventory Model, WI AEI = Wisconsin's Air Emissions Inventory (which is used to develop NEI emissions).

Table 6. Comparison of 2011 emissions eastern Kenosha County for the EPA-approved inventory and the RFP inventory. Emissions for the modeling inventory were not determined for the sub-county area, so they are not shown here.

	VOC		NOx	
Sector	**Approved Inventory**	**RFP Inventory**	**Approved Inventory**	**RFP Inventory**
Point	0.70	0.72	8.80	11.16
Area	4.78	4.78	1.09	1.09
Onroad	2.14	2.42	4.67	5.15
Nonroad	2.42	1.51	2.33	2.07
TOTAL	**10.04**	**9.43**	**16.89**	**19.47**