REDESIGNATION REQUEST AND MAINTENANCE PLAN FOR THE OHIO PORTION OF THE CINCINNATI-HAMILTON, OH-KY-IN 1997 ANNUAL $PM_{2.5}$ NONATTAINMENT AREA

Butler, Clermont, Hamilton,
and Warren Counties, Ohio

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REDESIGNATION REQUEST AND MAINTENANCE PLAN FOR THE OHIO PORTION OF THE CINCINNATI-HAMILTON, OH-KY-IN 1997 ANNUAL $PM_{2.5}$ NONATTAINMENT AREA

Butler, Clermont, Hamilton, and Warren Counties, Ohio

CHAPTER ONE

Introduction

The Clean Air Act (CAA) requires areas failing to meet the National Ambient Air Quality Standard (NAAQS) for the annual $PM_{2.5}$ to develop State Implementation Plans (SIPs) to expeditiously attain and maintain the standard. The United States Environmental Protection Agency (U.S. EPA) revised the NAAQS for particulate matter in July 1997. It replaced the existing PM_{10} standard with a health based $PM_{2.5}$ standard and retained the PM_{10} standard as a "coarse" standard protecting welfare. The standards include an annual standard set at 15.0 micrograms per cubic meter ($\mu g/m^3$), based on the 3-year average of annual mean $PM_{2.5}$ concentrations and a 24-hour standard of 65 $\mu g/m^3$, based on the 3-year average of the 98th percentile of 24-hour concentrations.

The revised NAAQS were legally challenged in the U.S. Court of Appeals for the District of Columbia Circuit (The D.C. Circuit). On May 14, 1999, the D.C. Circuit remanded, without vacatur, the standard back to U.S. EPA. The remand did not question the level at which U.S. EPA set the standards but rather the constitutionality of the CAA provision that authorizes U.S. EPA to set national air quality standards. U.S. EPA requested a rehearing which the D.C. Circuit denied. Therefore, in December 1999, U.S. EPA appealed the D.C. Circuit decision to the U.S. Supreme Court. The U.S. Supreme Court issued a decision on February 27, 2001 that unanimously affirmed the constitutionality of the CAA provision but did remand several other issues back to the D.C. Circuit, including the issue of whether U.S. EPA acted arbitrarily and capriciously in establishing the specific levels of the standards.

The D.C. Circuit heard arguments in this remanded case in December 2001, and issued its decision on March 26, 2002. The D.C. Circuit rejected the claims that the U.S. EPA had acted arbitrarily and capriciously in setting the levels of the standards.

On December 17, 2004, U.S. EPA promulgated the initial $PM_{2.5}$ nonattainment areas designations for the $PM_{2.5}$ standards across the country. Modifications to those designations were made and an effective date was set at April 5, 2005. Unlike Subpart 2 of the CAA Amendments of 1990 which defined five ozone nonattainment classifications for the areas that exceed the NAAQS based on the

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severity of the ozone levels, $PM_{2.5}$ nonattainment designations are simply labeled "nonattainment." The CAA Amendments require states with $PM_{2.5}$ nonattainment areas to submit a plan within three years of the effective date of the designations (April 5, 2008) detailing how the $PM_{2.5}$ standards will be attained by April 5, 2010. Ohio EPA submitted its attainment demonstration for the entire State of Ohio on July 16, 2008.

Section 107(d)(3)(E) of the CAA allows states to request nonattainment areas to be redesignated to attainment provided certain criteria are met. The following are the criteria that must be met in order for an area to be redesignated from nonattainment to attainment:

i) A determination that the area has attained the $PM_{2.5}$ standard.
ii) An approved State Implementation Plan (SIP) for the area under Section 110(k).
iii) A determination that the improvement in air quality is due to permanent and enforceable reductions in emissions resulting from implementation of the SIP and other federal requirements.
iv) A fully approved maintenance plan under Section 175(A).
v) A determination that all Section 110 and Part D requirements have been met.

This document addresses each of these requirements, and provides additional information to support continued compliance with the annual $PM_{2.5}$ standard.

Geographical Description and Background

The current Cincinnati-Hamilton nonattainment area is located in southwest Ohio and includes the following counties: Butler, Clermont, Hamilton, and Warren in Ohio; Dearborn (partial nonattainment of Lawrenceburg Township only) in Indiana; and Boone, Campbell, and Kenton in Kentucky. This area is shown in Figure 1 under Chapter Three.

The Cincinnati-Hamilton area has not previously been subject to nonattainment area rulemakings for fine particles.

As a result of the 2005 $PM_{2.5}$ designations, U.S. EPA designated the Cincinnati-Hamilton area nonattainment for the 15.0 $\mu g/m^3$ annual standard[1], and Ohio EPA was required to develop a plan to reduce oxides of nitrogen (NO_x), sulfur dioxide (SO_2) and direct $PM_{2.5}$ emissions and to demonstrate that the area will meet the federal annual air quality standard by April 5, 2010. Ohio's main $PM_{2.5}$ components are primary particles (organic carbon, crustal material, and elemental carbon), SO_2 and NO_x, which were included in the attainment demonstration analysis. Volatile organic compounds (VOCs) and ammonia (NH_3) were not included in the analysis since they were not part of Ohio's

1 There were no monitors in Ohio that violated the 1997 24-hour $PM_{2.5}$ standard of 65$\mu g/m^3$.

attainment strategy for $PM_{2.5}$ (although controls for VOCs have been implemented for ozone nonattainment). This was consistent with U.S. EPA's "Clean Air Particle Implementation Rule" [74FR 20856] (hereafter referred to as "Implementation Rule"). In the Implementation Rule, U.S. EPA presumed NH_3 emissions are not a $PM_{2.5}$ attainment plan precursor and that States were not required to address VOCs unless the State or U.S. EPA made a technical demonstration that emissions of VOCs significantly contributed to nonattainment.

On December 9, 2010, Ohio submitted a request that the Ohio portions of the Cincinnati-Hamilton area be redesignated from nonattainment to attainment for the annual $PM_{2.5}$ standard. On September 29, 2011, U.S. EPA determined that the Cincinnati-Hamilton area has attained the 1997 annual $PM_{2.5}$ standard [76 FR 60373]. On December 23, 2011, U.S. EPA approved requests from Ohio and Indiana to change the legal designation of their portions of the Cincinnati-Hamilton area from nonattainment to attainment for the 1997 annual $PM_{2.5}$ standard. EPA also approved Ohio's and Indiana's 1997 annual $PM_{2.5}$ maintenance plans for the Cincinnati-Hamilton area as revisions to the respective SIPs and approved the 2005 emissions inventories for primary $PM_{2.5}$, NO_X, and SO_2 [76 FR 80253].

The Sierra Club filed a petition in the U.S. Court of Appeals for the Sixth Circuit challenging the redesignation of the Cincinnati-Hamilton area. On March 18, 2015, the Sixth Circuit vacated the Ohio and Indiana portions of the 1997 $PM_{2.5}$ attainment redesignation of the Cincinnati-Hamilton area, finding that U.S. EPA erred when it approved Ohio's redesignation because Ohio and Indiana's SIPs did not provide for reasonably available control measures, including reasonably available control technologies (RACT/RACM) as required by 42 USC 7502(c)(1) [Sierra Club v. EPA, 781 F.3d 299 (6th Cir. 2015)].

Ohio EPA and U.S. EPA requested a rehearing on May 4, 2015. On July 14, 2015 the Court issued an amended opinion upholding their decision regarding RACT/RACM [Sierra Club v. EPA, 793 F.3d 656 (6th Cir. 2015)]. U.S. EPA and Ohio EPA again requested a rehearing which the Sixth Circuit denied. On September 10, 2014, Ohio notified the Court of intention to file a petition for a writ of certiorari with the U.S. Supreme Court and asked the Court to stay its mandate pending the filing. On September 16, 2015, the Court stayed the mandate per Ohio's request. On November 23, 2015, Ohio EPA appealed the Sixth Circuit decision to the U.S. Supreme Court. On March 28, 2016, the Supreme Court denied cert. The stay on the remand of the redesignation ended on March 30, 2016, leaving the Cincinnati-Hamilton area in nonattainment for the 1997 $PM_{2.5}$ annual standard again, although the area is in attainment for the more stringent 2012 annual standard.

This document is intended to support Ohio's revised request that the Ohio portions of the Cincinnati-Hamilton area be redesignated from nonattainment to

attainment for the 1997 annual $PM_{2.5}$ standard. The maintenance plan remains approved per U.S. EPA's action on December 23, 2011 [76 FR 80253]. This redesignation request has been updated to reflect the provisions of Subpart 4 (Title I, Part D) of the CAA, including RACT/RACM analysis and updated emissions inventories to include VOCs and ammonia. In addition, the State of Indiana also intends to submit a request for its portion of the Cincinnati-Hamilton area.

Status of Air Quality

$PM_{2.5}$ complete quality-assured ambient air quality monitoring data for the most recent three (3) years, 2013 through 2015, demonstrate that the air quality has met the NAAQS for annual $PM_{2.5}$ in this nonattainment area. The NAAQS attainment, accompanied by decreases in emission levels discussed in Chapter Four, supports a redesignation to attainment for the Cincinnati-Hamilton area based on the requirements in Section 107(d)(3)(E) of the CAA.

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CHAPTER TWO

Requirements for Redesignation

U.S. EPA has published detailed guidance in a document entitled *Procedures for Processing Requests to Redesignate Areas to Attainment* (redesignation guidance), issued September 4, 1992, to Regional Air Directors. The redesignation request and maintenance plan are based on the redesignation guidance, supplemented with additional guidance received from staff of U.S. EPA Region V.

Below is a summary of each redesignation criterion as it applies to the Cincinnati-Hamilton area.

i.) Attainment of the standard (CAA Section 107(d)(3)(E)(i))

There are two components involved in making this demonstration. The first component relies on ambient air quality data. The data that are used to demonstrate attainment should be the product of ambient monitoring that is representative of the area of highest concentration. The data should be collected and quality-assured in accordance with 40 CFR 58 and recorded in the Air Quality System (AQS) in order for it to be available to the public for review.

The second component relies upon supplemental U.S. EPA-approved air quality modeling. While no modeling is required for redesignating nonattainment areas, the redesignation guidance states it is "generally necessary" for particulate matter redesignations. Appendix C and Appendix D contains the most recent modeling results showing future attainment and maintenance are provided. Chapter Three discusses this requirement in more detail and provides the attainment demonstration.

ii.) Permanent and enforceable improvement in air quality (CAA Section 107(d)(3)(E)(iii))

The state must be able to reasonably attribute the improvement in air quality to emission reductions which are permanent and enforceable. The state should estimate the percent reduction achieved from federal measures as well as control measures that have been adopted and implemented by the state.

It was not necessary for Ohio to adopt or implement control measures for these counties beyond the federal measures.

Ohio EPA has adopted several rules recently that will have an impact Statewide on $PM_{2.5}$ emissions in the future:

- Cross-State Air Pollution Rule (CSAPR)
- Clean Air Interstate Rule (CAIR)
- NOx SIP Call Rules

In addition, since the initial designations were made federally enforceable consent decrees have resulted in reductions in emissions from utilities across the state, including this area.

Chapters Four and Five discuss this requirement in more detail.

iii.) Section 110 and Part D requirements (CAA Section 107(d)(3)(E)(v))

For purposes of redesignation, a state must meet all requirements of Section 110 and Part D that were applicable prior to submittal of the complete redesignation request.

Subpart 1 of Part D, found in Sections 172-176 of the CAA, consists of general requirements applicable to all areas which are designated nonattainment based on a violation of the NAAQS. Subpart 4 of Part D, found in Section 189 of the CAA, consists of more specific requirements applicable to particulate matter.

a) Section 110(a) requirements

Section 110(a) of Title I of the CAA contains the general requirements for a SIP. Section 110(a)(1) generally directs states to submit a SIP that provides for implementation, maintenance, and enforcement of the air quality standards to the U.S. EPA after reasonable notice and public hearing. Section 110(a)(2) provides that the infrastructure SIP submitted by a state must have been adopted by the state after reasonable public notice and hearing, and that, among other things, it must include enforceable emission limitations and other control measures[2], means or techniques necessary to meet the requirements of the CAA; provide for establishment and operation of appropriate devices, methods, systems and procedures necessary to monitor ambient air quality; provide for implementation of a source permit program to regulate the modification and construction of any stationary source within the areas covered by the plan; include provisions for the implementation of Part C, prevention of significant deterioration (PSD) and Part D, NSR permit programs; include criteria for stationary source emission control

[2] Other than nonattainment emission limitations and measures which are a part of nonattainment area plans and subject to the timing requirements of Section 172 of the CAA.

measures, monitoring, and reporting; include provisions for air quality modeling; and provides for public and local agency participation in planning and emission control rule development. In Ohio's December 5, 2007 and September 4, 2009 infrastructure SIP submissions, Ohio verified that the State fulfills the requirements of Section 110(a)(2) of the Act.

Section 110(a)(2)(D) also requires State plans to prohibit emissions from within the State which contribute significantly to nonattainment or maintenance areas in any other State, or which interfere with programs under Part C to prevent significant deterioration of air quality or to achieve reasonable progress toward the national visibility goal for Federal class I areas (national parks and wilderness areas). In order to assist States in addressing their obligations regarding regionally transported pollution, U.S. EPA finalized CAIR to reduce SO_2 and NO_x emissions from large electric generating units (EGU). Ohio has met the requirements of the federal CAIR to reduce NO_x and SO_2 emissions contributing to downwind states. On February 1, 2008, U.S. EPA approved Ohio's CAIR program, which can be found in Ohio Administrative Code (OAC) Chapter 3745-109[3]. In July 2008, the D.C. Circuit court vacated CAIR and issued a subsequent remand without vacatur of CAIR in December 2008. The court then directed U.S. EPA to revise or replace CAIR in order to address the deficiencies identified by the court. On July 6, 2011, U.S. EPA finalized CSAPR as a replacement for CAIR. On August 21, 2012, the U.S. Court of Appeals for the D.C. Circuit vacated CSAPR and directed U.S. EPA to continue administering CAIR "pending the promulgation of a valid replacement." In a subsequent decision on the merits, the Court vacated CSAPR based on a subset of petitioners' claims, but on April 29, 2014, the U.S. Supreme Court reversed that decision and remanded the case to the D.C. Circuit court for further proceedings. Throughout the initial round of D.C. Circuit proceedings and the ensuing U.S. Supreme Court proceedings, the stay remained in place and U.S. EPA has continued to implement CAIR. In order to allow CSAPR to replace CAIR in an equitable and orderly manner while further D.C. Circuit Court proceedings were held to resolve petitioner's remaining claims, U.S. EPA filed a motion asking the D.C. Circuit Court to lift the

3 http://www.epa.ohio.gov/dapc/regs/regs.aspx#3745-109

stay. U.S EPA also asked the court to toll all CSAPR compliance deadlines that had not passed as of the date of the stay order by three years. On October 23, 2014, the Court granted the U.S. EPA's motion. CSAPR became effective on January 1, 2015, for SO_2 and annual NO_x, and May 1, 2015 for ozone season NO_x. Combined with other final state and U.S. EPA actions, CSAPR will reduce power plant SO_2 emissions by 73% and NO_x emissions by 54% from 2005 levels in the CSAPR region, which includes the states of Indiana, Kentucky, and Ohio.

b) Section 172(c) and 189(a) requirements

This Section contains general requirements for nonattainment plans. The requirements for reasonable further progress, identification of certain emissions increases, and other measures needed for attainment will not apply for redesignations because they only have meaning for areas not attaining the standard. The requirement for an emission inventory will be satisfied by the inventory requirements of the maintenance plan. On December 23, 2011, U.S. EPA approved Ohio's 1997 annual $PM_{2.5}$ maintenance plan for the Cincinnati-Hamilton area as a revision to the SIP and approved the 2005 emissions inventories for primary $PM_{2.5}$, NO_X, and SO_2 [76 FR 80253]. The requirement to provide for the implementation of all RACT/RACM as expeditiously as practicable will demonstrate Ohio EPA's current rules satisfy RACT/RACM for the 1997 annual $PM_{2.5}$ standard. Chapters Four and Five discuss these requirements in more detail.

c) Section 176(c) requirements

Section 176(c) of the CAA requires states to establish criteria and procedures to ensure that Federally-supported or funded activities, including highway projects, conform to the air quality planning goals in the applicable SIPs. The requirement to determine conformity applies to transportation plans, programs and projects developed, funded or approved under Title 23 of the U.S. Code and the Federal Transit Act (transportation conformity) as well as to all other Federally-supported or funded projects (general conformity). State conformity revisions must be consistent with Federal conformity regulations relating to consultation, enforcement, and enforceability, which U.S. EPA promulgated pursuant to CAA requirements.

Ohio EPA established two SIPs for conformity. The rules in Ohio Administrative Code (OAC) Chapter 3745-101 contained Ohio's SIP approved rules for transportation conformity, and OAC Chapter 3745-102 contained Ohio's SIP approved rules for general conformity.

Ohio EPA's transportation conformity rules in OAC Chapter 3745-101 were approved as a part of Ohio's SIP on July 31, 2000 (65 FR 34395) and April 27, 2007 (72 FR 20945). However, Ohio's transportation conformity rules in OAC Chapter 3745-101 were completely removed from Ohio's SIP on March 2, 2015 (80 FR 11134) when the rules were replaced by a series of memorandums of understanding (MOUs) between Ohio EPA, U.S. EPA, and the various state and local agencies involved in the transportation conformity process. The currently effective MOUs are available on Ohio EPA's website at: http://epa.ohio.gov/dapc/sip/trans_conform.aspx.

Ohio EPA's general conformity rules in OAC Chapter 3745-102 were approved as part of Ohio's SIP on March 11, 1996 (61 FR 9644). In April, 2010, U.S. EPA promulgated changes to 40 CFR 51.851. The language in paragraph (a) of the section was changed from "must" to "may", thereby eliminating the requirement for states to maintain a general conformity SIP. For this reason, Ohio EPA requested, and U.S. EPA granted rescission of Ohio's general conformity SIP. The rules in OAC Chapter 3745-102 were removed from the state SIP on May 26, 2015 (80 FR 29968). The state SIP was replaced by the federal rules in 40 CFR Part 93, subpart B.

iv.) Maintenance plans (CAA Section 107(d)(3)(E)(iv))

Section 107(d)(3)(E) stipulates that for an area to be redesignated, U.S. EPA must fully approve a maintenance plan that meets the requirements of Section 175(A). The maintenance plan will constitute a SIP revision and must provide for maintenance of the relevant NAAQS in the area for at least 10 years after redesignation. Section 175(A) further states that the plan shall contain such additional measures, if any, as may be necessary to ensure such maintenance.

In addition, the maintenance plan shall contain such contingency measures as the Administrator deems necessary to ensure prompt correction of any violation of the NAAQS. At a minimum, the contingency measures must include a requirement that the

state will implement all measures contained in the nonattainment SIP prior to redesignation.

States seeking redesignation of a nonattainment area should consider the following provisions:

a.) attainment inventory;
b.) maintenance demonstration;
c.) monitoring network;
d.) verification of continued attainment; and
e.) contingency plan.

Chapter Six discusses this requirement in more detail.

The U.S. EPA has fully approved a maintenance plan that meets the requirements of Section 175(A) on December 23, 2011 [76 FR 80253]. There have been no changes to the budgets or contingency measures described in the approved maintenance plan. The attainment inventory of the maintenance plan has been updated to reflect the provisions of subpart 4 (Title I, Part D) of the CAA, including updated emissions inventories to include VOCs and ammonia.

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CHAPTER THREE

$PM_{2.5}$ MONITORING

CAA Section 107(d)(3)(E)(i)

Requirement 1 of 4

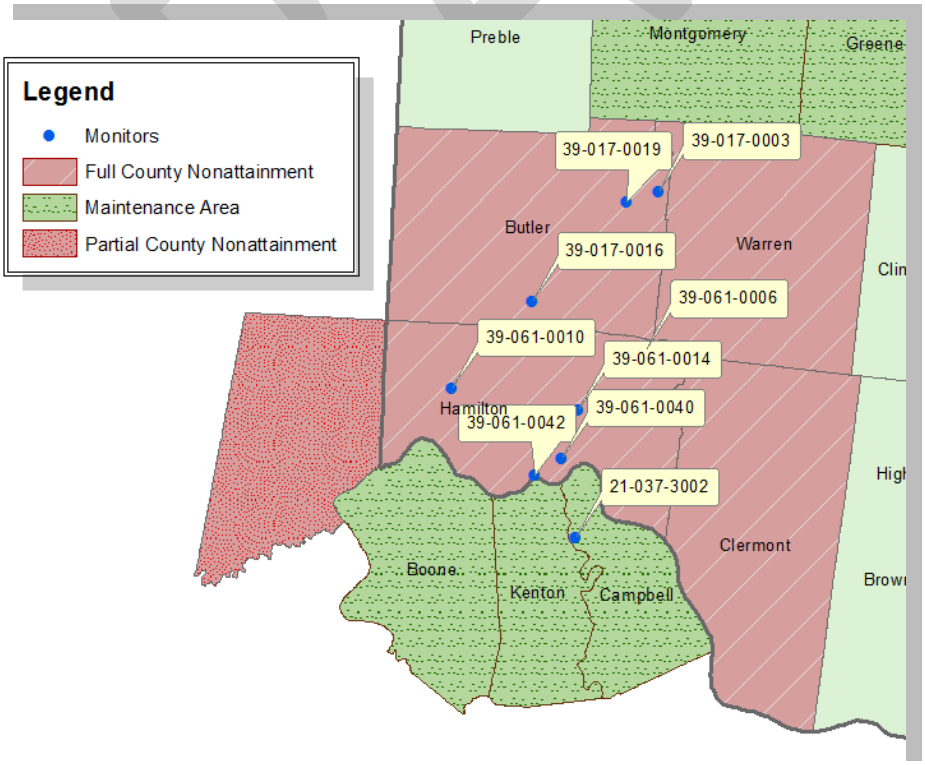
A demonstration that the NAAQS for annual $PM_{2.5}$, as published in 40 CFR 50.7, has been attained.

Background

There are nine monitors measuring $PM_{2.5}$ concentrations in this nonattainment area. Eight of the nine monitors are located in Ohio[4] and are operated by Southwest Ohio Air Quality Agency. A listing of the design values based on the three-year average of the annual mean concentrations from 2013 through 2015 is shown in Table 1. The locations of the monitoring sites for this nonattainment area are shown on Figure 1.

Demonstration

Figure 1 - Map of the Cincinnati-Hamilton, OH-KY-IN nonattainment area and monitor locations



4 The remaining $PM_{2.5}$ monitor is located in Kentucky.

Requirement 2 of 4

Ambient monitoring data quality assured in accordance with 40 CFR 58.10, recorded in the U.S. EPA air quality system (AQS) database, and available for public view.

Demonstration

The Ohio EPA has quality assured all data shown in Appendix A in accordance with 40 CFR 58.10 and all other federal requirements. Ohio EPA has recorded the data in the AQS database and, therefore, the data are available to the public.

Requirement 3 of 4

A showing that the three-year average of the annual mean values, based on data from all monitoring sites in the area or its affected downwind environs, are below 15.0 µg/m^3. (This showing must rely on three complete, consecutive calendar years of quality assured data.)

Background

The following information is taken from U.S. EPA's "Guideline on Data Handling Conventions for the PM NAAQS," U.S. EPA-454/R-99-008, April 1999.

In accordance with the CAA Amendments, three complete years of monitoring data are required to demonstrate attainment at a monitoring site. The annual $PM_{2.5}$ primary and secondary ambient air quality standards are met at an ambient air quality monitoring site when the three-year average of the annual average is less than or equal to 15.0 µg/m^3. While calculating design values, three significant digits must be carried in the computations, with final values rounded to the nearest 0.1 µg/m^3. Decimals 0.05 or greater are rounded up, and those less than 0.05 are rounded down, so that 15.049 µg/m^3 is the largest concentration that is less than, or equal to 15.0 µg/m^3. Values at or below 15.0 µg/m^3 meet the standard; values equal to or greater than 15.1 µg/m^3 exceed the standard. An area is in compliance with the annual $PM_{2.5}$ NAAQS only if every monitoring site in the area meets the NAAQS. An individual site's 3-year average of the annual average concentrations is also called the site's design value. The air quality design value for the area is the highest design value among all sites in the area.

Table 1 shows the monitoring data for 2013 – 2015 that were retrieved from the U.S. EPA AQS. The air quality design value for the area is the highest design value among all sites in the area.

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Demonstration

Table 1 - Monitoring Data for the Cincinnati-Hamilton, OH-KY-IN area for 2013 – 2015

		Annual Standard			
		Year			Average
Site	**County**	**2013**	**2014**	**2015**	**2013-2015**
39-017-0003	Butler, OH	11.1	11.3	10.3	10.9
39-017-0016		10.7	10.7	9.5	10.3
39-017-0019		11.0	11.2	10.2	10.8
39-061-0006	Hamilton, OH	10.1	10.3	9.3	9.9
39-061-0014		11.6	11.3	10.7	11.2
39-061-0040		10.6	10.4	9.2	10.1
39-061-0042		11.5	11.2	10.1	11.0
39-061-0010		10.5	10.4	9.2	10.0
21-037-3002	Campbell, KY	9.6	9.7	9.4*	9.5

* less than 75% capture in one quarter at the primary monitor, but substitution using a secondary monitor was completed resulting in an AQS 'valid' design value
Source: U.S. EPA Air Quality System (AQS); https://www.epa.gov/aqs

The design values calculated for the Cincinnati-Hamilton area demonstrates that the annual $PM_{2.5}$ NAAQS has been attained. The area's design values have trended downward as emissions have declined due to such factors as cleaner automobiles and fuels, and controls for EGUs, at the national, regional and local level. On April 1, 2010, Ohio EPA submitted a Clean Data Request to U.S. EPA for the $PM_{2.5}$ annual standard and on September 29, 2011, U.S. EPA determined that the Cincinnati-Hamilton area has attained the 1997 annual $PM_{2.5}$ standard [76 FR 60373].

National monitoring for $PM_{2.5}$ began in 1999. With respect to each of the Lake Michigan Air Directors Consortium (LADCO) states, there has been a clear downward trend in design values:

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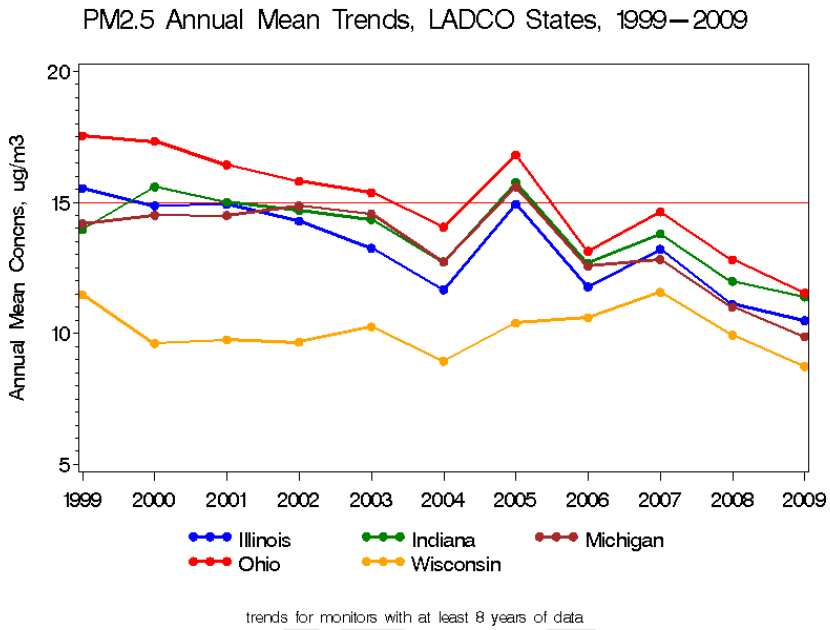
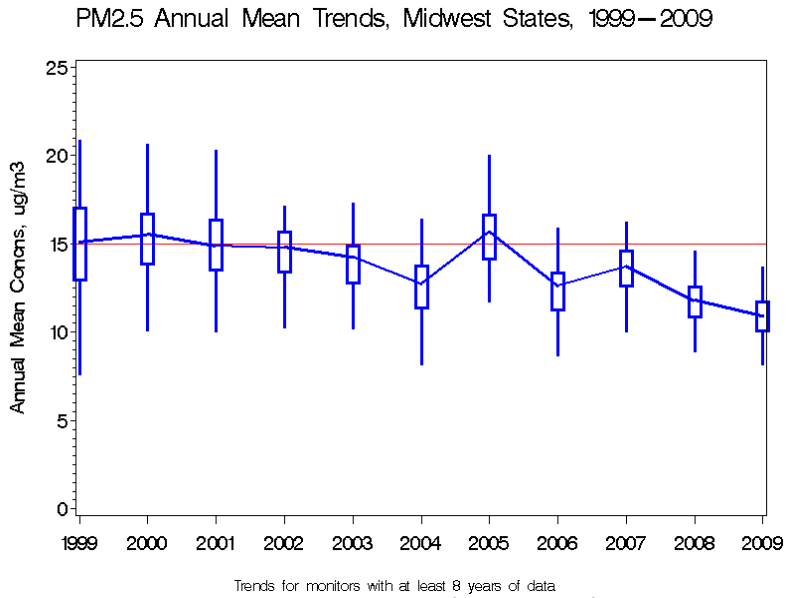
Figure 2 - $PM_{2.5}$ Annual Mean Trends LADCO States



Source: LADCO; Recent Ozone and PM2.5 Trends – Aug 26 2010.pptx

The same trend can be seen within the Midwest States as a whole:

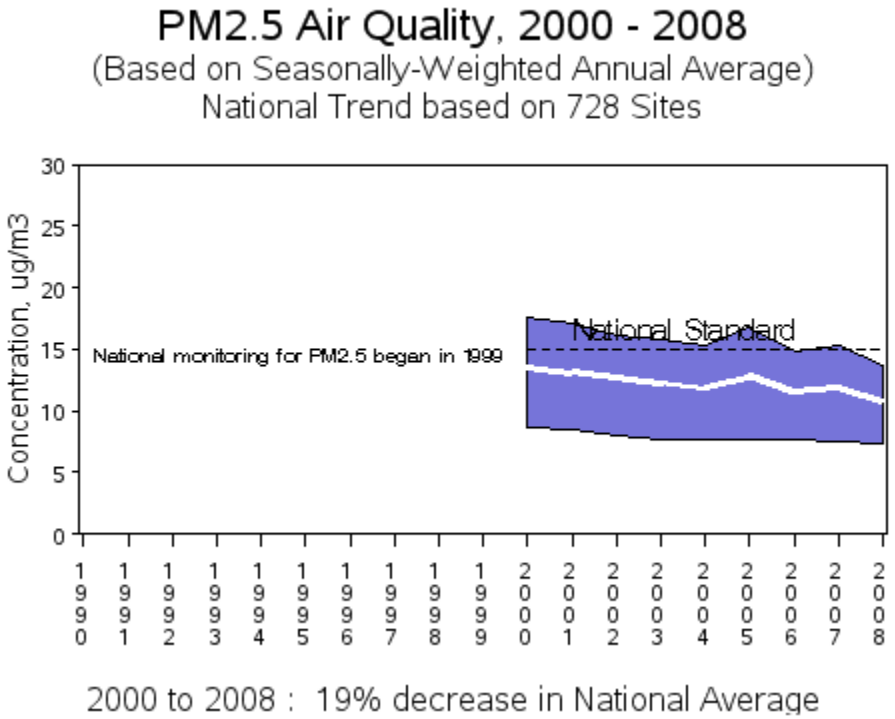
Figure 3 - $PM_{2.5}$ Annual Mean Trends Midwest States



Source: LADCO; Recent Ozone and PM25 Trends - Aug 26 2010.pptx

Design values have also trended downward nationally:

Figure 4 - $PM_{2.5}$ Annual Mean National Trends



Source: http://www.epa.gov/airtrends/pm.html

Requirement 4 of 4

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

Demonstration

Ohio EPA commits to continue monitoring $PM_{2.5}$ levels at the Ohio sites indicated in Figure 1 and Table 1. Ohio EPA will consult with U.S. EPA Region V prior to making changes to the existing monitoring network, should changes become necessary in the future. Ohio EPA will continue to quality assure the monitoring data to meet the requirements of 40 CFR 58 and all other federal requirements. Connection to a central station and updates to the Ohio EPA web site[5] will provide real time availability of the data and knowledge of any exceedances. Ohio EPA will enter all data into AQS on a timely basis in accordance with federal guidelines.

5 www.epa.ohio.gov/dapc

CHAPTER FOUR

EMISSION INVENTORY

CAA Section 107(d)(3)(E)(iii)

U.S. EPA's redesignation guidance requires the submittal of a comprehensive inventory of $PM_{2.5}$ precursor emissions (primary particles (organic carbon, crustal matter, and elemental carbon), SO_2 and NO_x) representative of the year when the area achieves attainment of the annual $PM_{2.5}$ air quality standard. On December 23, 2011, U.S. EPA approved Ohio's 1997 annual $PM_{2.5}$ maintenance plan for the Cincinnati-Hamilton area as a revision to the SIP and approved the 2005 emissions inventories for primary $PM_{2.5}$, NO_X, and SO_2 [76 FR 80253]. In accordance with the provisions of Subpart 4 (Title I, Part D) of the CAA, precursor emissions inventories must also include VOCs and ammonia. Ohio also must demonstrate that the improvement in air quality between the year that violations occurred and the year that attainment was achieved is based on permanent and enforceable emission reductions. Other emission inventory related requirements include a projection of the emission inventory to a year at least 10 years following redesignation; a demonstration that the projected level of emissions is sufficient to maintain the annual $PM_{2.5}$ standard; and a commitment to provide future updates of the inventory to enable tracking of emission levels during the 10-year maintenance period.

The emissions inventory development and emissions projection discussion below, with the exception of the mobile (on-road) emissions inventory and projections, identifies procedures used by Ohio EPA and the LADCO regarding emissions from Ohio's portion of the counties in the Cincinnati-Hamilton area. Specific emissions data are provided for all counties, including those in Ohio, Kentucky and Indiana. Indiana and Kentucky emissions data were also obtained though the LADCO emissions inventory and projections. All of these inventories and emissions projections were prepared using similar methodologies. Mobile emissions inventories and projections for all counties were prepared by the Ohio, Kentucky, Indiana Council of Governments (OKI).

Requirement 1 of 5

A comprehensive emission inventory of $PM_{2.5}$, SO_2, NO_x, VOCs and ammonia completed for the base year.

Background

The point source data are taken from Ohio's annual emissions reporting program. The 2005 periodic inventory has been identified as one of the preferred databases for SIP development and coincides with nonattainment air quality in the Cincinnati-Hamilton area.

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Periodic inventories, which include emissions from all sectors - mobile, area, non-road, and point sources - are prepared every three years. Emissions inventories for VOCs and ammonia from 2007, taken from the regulatory impact analysis (RIA) for the 2012 PM2.5 NAAQS[6], have been added as part of the 2016 revisions in accordance with the provisions of Subpart 4 (Title I, Part D) of the CAA.

Demonstration

The 2005 inventory is used as the base year for the purpose of this submittal and was submitted to U.S. EPA with Ohio's $PM_{2.5}$ attainment demonstration SIP submitted on July 18, 2008 and revised on June 7, 2010. The detailed emission inventory information for the Ohio portion of the Cincinnati-Hamilton area is provided in Appendix B. Emissions of $PM_{2.5}$, SO_2 and NO_x for 2005 are identified under Requirement Three of this Chapter. Requirement Three of this Chapter has been updated to provide emissions of VOCs and ammonia for 2007.

Requirement 2 of 5

A projection of the emission inventory to a year at least 10 years following redesignation.

Background

Ohio EPA prepared a comprehensive inventory for the Ohio portion of the Cincinnati-Hamilton area including area, mobile, and point sources for $PM_{2.5}$, $S0_2$ and NO_x for base year 2005. The 2005 inventory was submitted to U.S. EPA on July 18, 2008 as part of Ohio's $PM_{2.5}$ attainment demonstration SIP for this area. The information below describes the procedures Ohio EPA used to generate the 2005 base year inventory and to develop SIP-ready modeling inventories and future year projections (Pechan Report[7]) based on a 2005 base year inventory. The report by Pechan generated future year estimates of annual emissions for each source sector using accepted growth surrogates. These inventories were provided to the LADCO and have been processed to develop average daily emissions for use in the air quality analyses. These processed modeling inventories have been identified as the correct iteration of the inventory for use in the redesignation. In this document, references to LADCO include the Midwest Regional Planning Organization. Note, the on-road mobile source sector was addressed by specific $PM_{2.5}$ and NO_x modeling as discussed below.

6 https://www3.epa.gov/ttnecas1/regdata/RIAs/finalria.pdf

7 http://www.ladco.org/tech/emis/r5/reports/LADCO%202005%20Base%20Yr%20Growth%20and%20Controls%20Report_Final.pdf

- Area sources were taken from the Ohio 2005 periodic inventory submitted to U.S. EPA. These projections were made from the U.S. Department of Commerce Bureau of Economic Analysis (BEA) growth factors, with some updated local information.
- Mobile source emissions were calculated from MOVES2010 - produced emission factors. Only $PM_{2.5}$ and NO_x necessitate emissions inventory analysis. As documented in Ohio EPA's attainment demonstration SIP, Ohio EPA in consultation with U.S. EPA determined mobile sources are insignificant contributors for SO_2. Consistent with Ohio EPA's attainment demonstration, Ohio EPA continues to consider mobile source SO_2 to be an insignificant contributor to fine particles for this nonattainment area. Based on the demonstration below, mobile SO_2 constitutes less than one percent (<1%) of the area's total SO_2 emissions in 2005, 2008, 2015 and 2021 (ranging between 0.09% and 0.31%). Ohio is also not creating emission budgets for VOCs and ammonia because it concluded, consistent with U.S. EPA's presumptions in the 2012 conformity rule regarding these precursors, that emissions of these precursors from on-road motor vehicles are not significant contributors to the area's $PM_{2.5}$ air quality problem. Such a finding would be based on a number of factors, including the percentage of motor vehicle emissions in the context of the total SIP inventory, the current state of air quality as determined by monitoring data for that NAAQS, the absence of SIP motor vehicle control measures, and historical trends and future projections of the growth of motor vehicle emissions. Mobile VOC emissions are projected to constitute 19% of the area's total VOC emissions in 2020. Likewise, mobile ammonia emissions are projected constitute 15.7% of the area's total ammonia emissions in 2020. As noted above, the Cincinnati-Hamilton area is attaining the 1997 annual, 2006 24-hour, and 2012 annual $PM_{2.5}$ standards and there is a clear downward trend in design values for the area. In addition, VOC emissions are not significant precursors to $PM_{2.5}$ in the Cincinnati area, as reported in the 2009 Odman et al. study in the Journal of Environmental Management "Quantifying the sources of ozone, fine particulate matter, and regional haze in the Southeastern United States"[8], which indicated that in portions of the Midwest (including portions of Ohio), emissions of direct fine particulate matter ($PM_{2.5}$) and the precursor sulfur dioxide (SO_2) are more significant to ambient $PM_{2.5}$

8 Journal of Environmental Management 90 (2009) 3155–3168

concentrations than nitrogen oxides (NO_X) and VOC. Specifically, $PM_{2.5}$ sensitivities to anthropogenic VOC emissions are near zero for the entire region, including the Cincinnati region.

- Point source information was compiled from Ohio EPA's 2005 annual emissions inventory database and the 2005 U.S. EPA Air Markets acid rain database[9].
- Biogenic emissions are not included in these summaries.
- Non-road emissions were generated using U.S. EPA's National Mobile Inventory Model (NMIM) 2002 application. To address concerns about the accuracy of some of the categories in U.S. EPA's non-road emissions model, LADCO contracted with two (2) companies to review the base data and make recommendations. One of the contractors also estimated emissions for three (3) non-road categories not included in U.S. EPA's non-road model. Emissions were estimated for aircraft, commercial marine vessels, and railroads. Recreational motorboat population and spatial surrogates (used to assign emissions to each county) were significantly updated. The populations for the construction equipment category were reviewed and updated based upon surveys completed in the Midwest, and the temporal allocation for agricultural sources also was updated.

Emissions inventory projections for VOCs and ammonia for 2007 and 2020, taken from the RIA for the 2012 PM2.5 NAAQS[10], have been added as part of the 2016 revisions in accordance with the provisions of Subpart 4 (Title I, Part D) of the CAA.

Demonstration

$PM_{2.5}$, NO_X, and SO_2

On-Road Emission Estimations

In coordination with the Ohio Department of Transportation (Ohio DOT), OKI utilizes a regional travel demand forecast model to simulate traffic in the area and to forecast traffic flows for given growth expectations. The model has been validated to observed traffic volumes for the model base year 2005. The model is primarily used as a long range planning tool to evaluate the transportation system including determination of locations where additional travel capacity may be needed and to determine the infrastructure requirements necessary to meet that need. It is also used as a tool

9 http://www.epa.gov/airmarkets/acidrain
10 https://www3.epa.gov/ttnecas1/regdata/RIAs/finalria.pdf

for air quality purposes to estimate the total emissions of pollution caused by vehicles in the area. The travel demand forecasting model is used to predict traffic volumes vehicle miles traveled (VMT), travel speeds, and a U.S. EPA computer program called MOVES is used to calculate emissions per mile. The product of these is the total amount of pollution emitted by the on-road vehicles for the area.

Overview

U.S. EPA published a Federal Register notice[11] of availability on March 2, 2010, to approve MOVES2010 (Motor Vehicle Emissions Simulator), hereafter referred to as MOVES. Upon publication of the Federal Register notice, MOVES became U.S. EPA's approved motor vehicle emission factor model for estimating VOCs, NO_x, CO, PM_{10} and $PM_{2.5}$ and other pollutants and precursors from cars, trucks, motorcycles, and buses by state and local agencies. MOVES is a computer program designed by the U.S. EPA to estimate air pollution emissions from mobile sources. MOVES replaces U.S. EPA's previous emissions model for on-road mobile sources, MOBILE6.2. MOVES can be used to estimate exhaust and evaporative emissions as well as brake and tire wear emissions from all types of on-road vehicles.

The CAA requires U.S. EPA to regularly update its mobile source emission models. U.S. EPA continuously collects data and measures vehicle emissions to make sure the Agency has the best possible understanding of mobile source emissions. This assessment, in turn, informs the development of U.S. EPA's mobile source emission models. MOVES represents the Agency's most up-to-date assessment of on-road mobile source emissions. MOVES also incorporates several changes to the U.S. EPA's approach to mobile source emission modeling based upon recommendations made to the Agency by the National Academy of Sciences.

U.S. EPA believes that MOVES should be used in ozone, CO, PM, and nitrogen dioxide SIP development as expeditiously as possible. The CAA requires that SIP inventories and control measures be based on the most current information and applicable models that are available when a SIP is developed.

Regarding transportation conformity, U.S. EPA and U.S. DOT intend to establish a two-year grace period before MOVES is required for new transportation conformity analyses.

11 https://federalregister.gov/a/2010-4312

The MOVES more detailed approach (when compared with the previous MOBILE model) to modeling allows U.S. EPA to easily incorporate large amounts of in-use data from a wide variety of sources, such as data from vehicle inspection and maintenance (I/M) programs, remote sensing device (RSD) testing, certification testing, portable emission measurement systems (PEMS), etc. This approach also allows users to incorporate a variety of activity data to better estimate emission differences such as those resulting from changes to vehicle speed and acceleration patterns. MOVES has a graphical user interface which allows users to more easily set up and run the model. MOVES database-centered design provides users much greater flexibility regarding output choices. Unlike earlier models which provided emission factors in grams-per-mile in fixed output formats, MOVES output can be expressed as total mass (in tons, pounds, kilograms, or grams) or as emission factors (grams-per-mile and in some cases grams-per-vehicle). Output can be easily aggregated or disaggregated to examine emissions in a range of scales, from national emissions impacts down to the emissions impacts of individual transportation projects. The database-centered design also allows U.S. EPA to update emissions data incorporated in MOVES more easily and will allow users to incorporate a much wider array of activity data to improve estimation of local emissions. For example, the improvements in MOVES will allow project-level $PM_{2.5}$ emissions to be estimated.

OKI utilized U.S.EPA's emissions model MOVES to develop emissions factors for SO_2, NO_x and $PM_{2.5}$. Further details on the use of MOVES are found on Appendix C. Transportation system performance was estimated using the OKI Travel Demand Model Version 7.6. The model uses demographic and land use data and capacity and free-flow speed characteristics for each roadway segment in the network to produce a "loaded" highway network with forecasted traffic volumes with revised speeds based on specified speed/capacity relationships.

Travel analysis zones are the basic geographic unit for estimating travel in the OKI model. The OKI region is subdivided into 1608 traffic analysis zones to permit detail as well as manageability. A variety of socioeconomic data items are used in the OKI transportation planning process. These data are used primarily to forecast future travel patterns by serving as independent variables in OKI trip generation equations. The following categories of planning data are utilized:

- Population.
- Households.

- Household vehicles.
- Employment.
- Labor force participation.
- Area type.

The principal data requirements of the OKI travel demand forecasting model are population and employment, from these variables other characteristics including household, labor force, and personal vehicles may be derived (OKI 2030 Regional Transportation Plan 2008 Update provides a complete demographic overview of the region).

OKI utilizes both base year (2005) and future year data (2010, 2020 and 2030) in the planning process. Planning data are maintained at the Traffic Analysis Zone (TAZ) level, and originate in the 2000 Census of Population and Housing. Base year 2005 and future year data for each variable are developed through various methods.

OKI's Travel Demand Model has been validated to observed traffic volumes for the model base year 2005. The modeling network encompasses the entire $PM_{2.5}$ nonattainment area. The modeling network also includes Greene, Miami and Montgomery counties in Ohio and the remainder of Dearborn County, Indiana. The differences between estimated vehicle miles traveled (VMT) and 2005 observed VMT is less than 1%. A highway screenline analysis compares the screenline observed and simulated traffic volume discrepancies with the Ohio Department of Transportation (ODOT) standard of maximum desirable deviation. The comparison shows that the model performs at a satisfactory level and all the errors were under the ODOT curve (OKI's 2007 report, "OKI/MVRPC Travel Demand Model Methodology/Validation Report"). For the calibration, OKI used over 3000 traffic counts collected through 2006 by the ODOT, the Kentucky Transportation Cabinet, many county and local governments, transportation engineering consultants, and OKI. These traffic counts cover nearly 50% of the links in the OKI portion of the modeling network. The methodology provides consistency with past emission inventory and conformity analysis work performed by OKI.

OKI incorporates a variety of sources of local data to both improve and confirm the accuracy of VMT, as well as other travel-related parameters. Free flow speeds used on the highway and transit networks are based on travel time studies performed locally. An OKI post-processing program uses the loaded highway network to generate VMT by hour, VMT by speed distribution, and VMT by facility type. These tables are then included as input into

MOVES. The VMT by hour tables utilize hourly traffic distribution and directional split factors for different roadway types as developed by OKI. The main source of the data was the permanent traffic counting stations located throughout the OKI region for the years of 1998-2002. These data were supplemented with data collected at coverage count stations (locations with counts taken on only one-two days). The stations were classified by area type (urban and rural) and functional classification (freeway, arterial and collector). Speeds representing various "loaded" conditions (with traffic volumes) are estimated using techniques from the 1997 Highway Capacity Manual. This permits the estimation of speeds as conditions vary from hour to hour on the different facility types throughout the region. The post-processing program performs the appropriate summation by area and roadway type as well as regional totals. OKI has also developed seasonal conversion factors to adjust traffic volumes to summer conditions. The factors were derived from local data collected at permanent traffic counting stations during 1994-1997 utilizing the average daily traffic monthly conversion factors for June, July and August.

On-Road Mobile Emission Estimations

Tables 2 through 12 contain the results of the emissions analysis for the appropriate years. All emissions estimations are expressed in tons per year (tpy).

Table 2 - Butler County, Ohio Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2021
$PM_{2.5}$ (tpy)	413.970	377.640	301.16	215.76
NO_x (tpy)	10,910.37	9,803.70	6,064.61	3,757.91
SO_2 (tpy)	30.01	34.25	34.28	37.90
Annual VMT	2,469,168,490	2,598,061,793	2,792,190,918	2,966,040,396

Table 3 – Clermont County, Ohio Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2021
$PM_{2.5}$ (tpy)	281.790	256.600	204.32	145.39
NO_x (tpy)	7,295.87	6,516.40	3,993.63	2,449.31
SO_2 (tpy)	20.51	23.32	23.34	25.66
Annual VMT	1,684,261,582	1,765,146,867	1,899,319,930	2,005,373,961

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Table 4 – Hamilton County, Ohio Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2021
$PM_{2.5}$ (tpy)	1,222.020	1,080.540	826.00	571.48
NO_x (tpy)	31,127.09	27,020.93	15,925.19	9,530.16
SO_2 (tpy)	88.85	98.30	94.43	100.82
Annual VMT	7,241,536,812	7,421,012,594	7,630,239,650	7,811,745,310

Table 5 – Warren County, Ohio Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2021
$PM_{2.5}$ (tpy)	320.740	289.560	242.05	177.61
NO_x (tpy)	8,224.57	7,267.18	4,598.44	2,875.72
SO_2 (tpy)	23.54	26.57	27.77	31.58
Annual VMT	1,949,619,088	2,031,755,542	2,285,057,933	2,498,434,852

Table 6 – Dearborn County, Indiana Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2021
$PM_{2.5}$ (tpy)	33.980	29.890	25.14	18.11
NO_x (tpy)	865.46	748.81	482.33	297.95
SO_2 (tpy)	2.45	2.69	2.87	3.19
Annual VMT	196,738,031	199,778,078	223,644,622	240,321,759

Table 7 – Summary of Ohio and Indiana Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2021
$PM_{2.5}$ (tpy)	2,272.50	2,034.23	1,598.67	1,128.35
NO_x (tpy)	58,423.36	51,357.02	31,064.20	18,911.05
SO_2 (tpy)	165.36	185.13	182.69	199.15
Annual VMT	13,541,324,003	14,015,754,874	14,830,453,053	15,521,916,278

Table 8 – Boone County, Kentucky Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2021
$PM_{2.5}$ (tpy)	205.210	251.850	151.35	114.05
NO_x (tpy)	5,126.88	5,067.94	2,788.45	1,772.72
SO_2 (tpy)	15.91	16.71	20.67	24.37
Annual VMT	1,273,226,967	1,350,001,539	1,628,041,282	1,800,571,684

Table 9 – Campbell County, Kentucky Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2021
$PM_{2.5}$ (tpy)	120.300	146.460	82.36	60.09
NO_x (tpy)	3,041.21	2,988.33	1,570.14	985.28
SO_2 (tpy)	9.30	9.69	11.21	12.77
Annual VMT	741,790,595	774,762,718	875,774,487	936,445,352

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Table 10 – Kenton County, Kentucky Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2021
$PM_{2.5}$ (tpy)	212.290	29.890	137.40	101.24
NO_x (tpy)	5,328.44	5,057.93	2,637.63	1,677.96
SO_2 (tpy)	16.24	16.34	18.62	21.48
Annual VMT	1,274,091,641	1,300,575,248	1,427,569,972	1,549,817,325

Table 11 – Summary of Kentucky Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2021
$PM_{2.5}$ (tpy)	537.8	645.62	371.11	275.38
NO_x (tpy)	13,496.53	13,114.20	6,996.22	6,421.15
SO_2 (tpy)	41.45	42.74	50.50	72.15
Annual VMT	3,289,109,203.00	3,425,339,505.00	3,931,385,741.00	5,452,303,073.00

Table 12 – Emissions Estimations Totals for On-Road Mobile Sources for the Cincinnati-Hamilton Area

	2005	2008	2015	2021
$PM_{2.5}$ (tpy)	2,810.30	2,679.85	1,969.78	1,403.73
NO_x (tpy)	71,919.89	64,471.22	38,060.42	25,332.20
SO_2 (tpy)	206.81	227.87	233.19	271.30
Annual VMT	16,830,433,206.00	17,441,094,379.00	18,761,838,794.00	20,974,219,351.00

Motor Vehicle Emission Budget

Table 13 and Table 14 contain the motor vehicle emissions budgets for the Cincinnati-Hamilton area. For planning purposes, budgets are established for the combined Ohio and Indiana portions and for the separate Kentucky portion.

The 2015 and 2021 motor vehicle emission budgets for NO_x and $PM_{2.5}$ established below were approved by U.S. EPA into Ohio's SIP on December 23, 2011 [76 FR 80253]. Any future years beyond 2021 would be consistent with these budgets. Only $PM_{2.5}$ and NO_x necessitate motor vehicle emissions budgets. As documented in Ohio EPA's attainment demonstration SIP, Ohio EPA in consultation with U.S. EPA determined mobile sources are insignificant contributors for SO_2. Consistent with Ohio EPA's attainment demonstration, Ohio EPA continues to consider mobile source SO_2 to be an insignificant contributor to fine particles for this nonattainment area. Based on the demonstration below, mobile SO_2 constitutes less than one percent (<1%) of the area's total SO_2 emissions in 2005, 2008, 2015 and 2021 (ranging between 0.09% and 0.31%). Ohio is also not creating emission budgets for VOCs

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and ammonia because it concluded, consistent with U.S. EPA's presumptions in the 2012 conformity rule regarding these precursors, that emissions of these precursors from on-road motor vehicles are not significant contributors to the area's $PM_{2.5}$ air quality problem. Such a finding would be based on a number of factors, including the percentage of motor vehicle emissions in the context of the total SIP inventory, the current state of air quality as determined by monitoring data for that NAAQS, the absence of SIP motor vehicle control measures, and historical trends and future projections of the growth of motor vehicle emissions. Mobile VOC emissions are projected to constitute 19% of the area's total VOC emissions in 2020. Likewise, mobile ammonia emissions are projected constitute 15.7% of the area's total ammonia emissions in 2020. As noted above, the Cincinnati-Hamilton area is attaining the 1997 annual, 2006 24-hour, and 2012 annual $PM_{2.5}$ standards and there is a clear downward trend in design values for the area. In addition, VOC emissions are not significant precursors to $PM_{2.5}$ in the Cincinnati area, as reported in the 2009 Odman et al. study in the Journal of Environmental Management "Quantifying the sources of ozone, fine particulate matter, and regional haze in the Southeastern United States"[12], which indicated that in portions of the Midwest (including portions of Ohio), emissions of direct fine particulate matter ($PM_{2.5}$) and the precursor sulfur dioxide (SO_2) are more significant to ambient $PM_{2.5}$ concentrations than nitrogen oxides (NO_X) and VOC. Specifically, $PM_{2.5}$ sensitivities to anthropogenic VOC emissions are near zero for the entire region, including the Cincinnati region.

Table 13 - Mobile Vehicle Emissions Budget for Ohio and Indiana

	2015 Estimated Emissions	2015 Mobile Safety Margin Allocation*	2015 Total Mobile Budget	2021 Estimated Emissions	2021 Mobile Safety Margin Allocation*	2021 Total Mobile Budget
PM2.5 (tpy)	1598.67	79.93	1678.60	1128.35	112.84	1241.19
NOx (tpy)	31,064.20	4659.63	35,723.83	18,911.05	2836.65	21,747.71
Annual VMT	14,830,453,053	-	-	15,521,916,278	-	-

*The 5 to15 percent margin of safety was calculated by taking 5 to15 percent of the mobile source emission estimates

Table 14 - Mobile Vehicle Emissions Budget for Kentucky

	2015 Estimated Emissions	2015 Mobile Safety Margin Allocation*	2015 Total Mobile Budget	2021 Estimated Emissions	2021 Mobile Safety Margin Allocation*	2021 Total Mobile Budget
PM2.5 (tpy)	371.11	18.56	389.67	275.38	27.54	302.92
NOx (tpy)	6,996.22	1049.43	8,045.65	6,421.15	963.17	7,384.32
Annual VMT	3,931,385,741			5,452,303,073		

*The 5 to15 percent margin of safety was calculated by taking 5 to15 percent of the mobile source emission estimates

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The above budgets for the Ohio and Indiana portion and for the Kentucky portion of the area, agreed upon as part of the interagency consultation process, include the emission estimates calculated for 2015 and 2021 (from Table 7 and Table 11) with an additional 5 percent margin of safety allocated for $PM_{2.5}$ in 2015, 10 percent margin of safety allocated to $PM_{2.5}$ in 2021 and 15 percent margin of safety allocated to NO_x in 2015 and 2021.

In an effort to accommodate future variations in travel demand models and VMT forecast when no change to the network is planned, Ohio EPA consulted with U.S. EPA to determine a reasonable approach to address this variation. Based on this discussion, a 5 to15 percent margin of safety allocation was agreed upon and has been added to the emissions estimates for the Ohio and Indiana portions of this nonattainment area.

All methodologies, the latest planning assumptions, and the safety margins allocations were determined through the interagency consultation process described in the Transportation Conformity Memorandum of Understanding (MOU) among OKI, Ohio DOT, and Ohio EPA.

A 5 to 15 percent margin of safety is appropriate because: 1) there is an acknowledged potential variation in VMT forecast and potential estimated mobile source emissions due to expected modifications to TDM and mobile emissions models; and 2) the total decrease in emissions from all sources is sufficient to accommodate this 5 to 15 percent allocation of safety margin (as defined in 40 CFR 93.101[13]) to mobile sources while still continuing to maintain the total emissions in the Cincinnati-Hamilton area well below the 2008 attainment level of emissions.

The 5 to 15 percent margin of safety was calculated by taking 5 to 15 percent of the mobile source emission estimates. Safety margin, as defined by the conformity rule, looks at the total emissions from all sources in the nonattainment area. The actual allocation is less than 5 to 15 percent of the total emission reduction from all sources as can be seen from Table 45.

In summary, for all three states combined, the mobile budget safety margin allocation translates into an additional 98.49 tpy for $PM_{2.5}$ and 5,709.06 tpy for NO_x for 2015 and an additional 140.38 tpy for $PM_{2.5}$ and 3,799.82 tpy for NO_x for 2021.

13 "Safety margin" means 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 reasonable further progress, attainment, or maintenance.

When compared to the overall safety margin, as defined in 40 CFR 93.101, discussed under "Requirement 3 of 5" below, it is evident this allocation is significantly below the total safety margin for this area.

The current $PM_{2.5}$ and NO_x mobile budgets for the fine particle NAAQS will no longer be applicable either after the effective date of the approved redesignation or after the effective date of any U.S. EPA action approving a finding that the $PM_{2.5}$ and NO_x conformity budgets included in this submittal are adequate for transportation conformity purposes, whichever date comes first.

Finally, it is important to underline that all motor vehicle emission budgets in this Redesignation submittal, which are based on MOVES2010, will replace previous motor vehicle emission budgets on Attainment Demonstration submittals based on MOBILE6.2.

VOCs and ammonia

Emissions inventory projections for VOCs and ammonia for 2007 and 2020, taken from the RIA for the 2012 PM2.5 NAAQS[14], have been added as part of the 2016 revisions in accordance with the provisions of Subpart 4 (Title I, Part D) of the CAA.

On-Road Mobile Emission Estimations

Table 15 contains the results of the emissions analysis for 2007 and 2020. All emissions estimations are expressed in tons per year (tpy).

Table 15 - Summary of VOC and Ammonia Emissions Estimations for On-Road Mobile Sources

	Ammonia		VOCs	
County, State	**2007**	**2020**	**2007**	**2020**
Butler, OH	127.57	67.89	2948.17	1196.66
Clermont, OH	69.51	40.51	1642.83	693.45
Hamilton, OH	394.97	203.10	8767.52	3585.36
Warren, OH	89.37	44.08	2066.05	742.46
Dearborn, OH	44.74	26.77	1167.24	420.16
Boone, OH	50.71	29.41	1083.04	400.14
Campbell, OH	35.67	26.07	926.90	374.82
Kenton, OH	77.42	43.54	1714.95	628.44
Total	889.96	481.37	20316.70	8041.49

14 https://www3.epa.gov/ttnecas1/regdata/RIAs/finalria.pdf

Requirement 3 of 5

A demonstration that the projected level of emissions is sufficient to maintain the $PM_{2.5}$ standard.

Background

In consultation with U.S. EPA, Ohio EPA selected the year 2021 as the maintenance year for this redesignation request. This document contains projected emissions inventories for 2015 and 2021.

Emission projections for $PM_{2.5}$, NO_X and SO_2 for the Cincinnati-Hamilton area were performed using the following approaches:

- As performed by OKI, mobile source emission projections are based on the U.S. EPA MOVES model. The analysis is described in more detail in Appendix C. All projections were made in accordance with "Procedures for Preparing Emissions Projections" U.S. EPA-45/4-91-019.

- Emissions inventories are required to be projected to future dates to assess the influence growth and future controls will have. LADCO has developed growth and control files for point, area, and non-road categories. These files were used to develop the future-year emissions estimates used in this document. This was done so the inventories used for redesignation are consistent with modeling performed in the future. Appendix D contains LADCO's technical support document detailing the analysis used to project emissions (Base M[15]).

- For the Ohio portion of the Cincinnati-Hamilton area, for the 2008 attainment year, emissions were grown from the 2005 LADCO modeling inventory, using LADCO's growth factors, for all sectors except point sources (electrical generating units and non-electrical generating units). Point source emissions for 2008 were compiled from Ohio EPA's 2008 annual emissions inventory database. The 2015 interim year emissions were estimated based on the 2009 and 2018 LADCO modeling inventory, using LADCO's growth factors, for all sectors. The 2021 maintenance year is based on emissions estimates from the 2018 LADCO modeling.

The detailed inventory information for the Ohio portion of the Cincinnati-Hamilton area for 2005 is in Appendix B. Emission trends are an important gauge for continued compliance with the $PM_{2.5}$ standard. Therefore, Ohio EPA performed an initial comparison of

[15] http://www.ladco.org/tech/emis/current/index.php

the inventories for the base year and maintenance years. Mobile source emission inventories are described in Section 5 of Appendix B.

Sectors included in the following tables are: Electrical Generating Unit (EGU-Point); Non-Electrical Generating Unit (Non-EGU); Non-road Mobile (Non-road); Other Area (Other); Marine; Aircraft; Rail (MAR); and On-road Mobile (On-road).

Ohio EPA is identifying emissions projections for 2015 and 2021 for EGUs with implementation of the CAIR program. U.S. EPA has raised concerns regarding the CAIR program and its remand. However, as discussed below, with the proposed CAIR replacement, CSAPR, Ohio EPA believes these are the most appropriate and accurate future projections.

On March 10, 2004, the U.S. EPA promulgated the CAIR. Beginning in 2009, U.S. EPA's CAIR rule requires EGUs in 28 eastern states and the District of Columbia to significantly reduce emissions of NO_x and SO_2. CAIR replaced the NO_x SIP Call for EGUs. The intent of the CAIR program is for national NO_x emissions to be cut from 4.5 million tons in 2004, to a cap of 1.5 million tons by 2009, and 1.3 million tons in 2018 in 28 states. States were required to submit a CAIR SIP as part of this effort. Ohio submitted a CAIR SIP which was approved by U.S. EPA on February 1, 2007. Revisions to the CAIR SIP were again submitted on July 15, 2009. The revised CAIR SIP was approved as a direct final action on September 25, 2009 (74 FR 48857). As a result of CAIR, U.S. EPA projects that in 2009 emissions of NO_x will decrease from a baseline of 264,000 tons per year to 93,000 tons per year while in 2010 emissions of SO_2 will decrease from a baseline of 1,373,000 tons per year to 298,000 tons per year, within Ohio. And by 2015 U.S. EPA projects emissions of NO_x will decrease to 83,000 tons per year while emissions of SO_2 will decrease to 208,000 tons per year, within Ohio[16].

On December 23, 2008, U.S. EPA's CAIR program was remanded without vacatur by the D.C. Circuit Court. As mentioned above, Ohio EPA has not incorporated these expected CAIR reductions into this redesignation request. It should also be noted that Ohio's SIP-approved NOx SIP Call program and regulations are still in place.

As can be seen in Table 16 below, Ohio has seen a significant decline in the 264,000 tons of NO_x and 1,373,000 tons of SO_2

16 https://archive.epa.gov/airmarkets/programs/cair/web/html/oh.html

emitted in 2005. In 2008 and 2009 facilities began preparing for and implementing control programs to address CAIR[17] and consent decrees.

Table 16 - Reductions in SO_2 and NO_x EGU Emissions Between 2008 and 2009

	SO_2			NO_x		
	2008	**2009**	**Change**	**2008**	**2009**	**Change**
Ohio	709,444	601,101	15%	235,018	96,351	59%
LADCO States	2,019,036	1,620,071	20%	702,384	393,930	44%
National	7,616,262	5,747,353	25%	2,996,287	1,990,385	34%

Source: Clean Air Markets Quarterly Emissions Tracking[18]

Significant reductions also occurred regionally and nationally as can be seen from the above. Data is also available for the first two quarters of 2010, the year SO_2 reductions are to be implemented under CAIR:

Table 17 – Reductions in SO_2 and NO_x EGU Emissions Between the First Half of 2008 and 2010

	SO_2			NO_x		
	2008 (1st half)	**2010 (1st half)**	**Change**	**2008 (1st half)**	**2010 (1st half)**	**Change**
Ohio	373,798	279,854	25%	130,598	53,187	59%
LADCO States	1,190,497	854,282	28%	419,114	220,907	47%
National	3,895,472	2,502,965	36%	1,487,179	930,148	37%

Source: Clean Air Markets Quarterly Emissions Tracking[19]

The following was reported by U.S. EPA's Clean Markets Division:

"Based on emissions monitoring data, EPA has observed substantial reductions in SO_2 emissions from 2005 to 2009 and in the first two quarters of 2010 as companies installed more controls, electric demand declined, and low natural gas prices made combined-cycle gas-fired units more competitive in several parts of the country. Thus, even after CAIR's vacatur and subsequent remand in late 2008, the controls in place generally have continued to operate, helping to drive continued progress in reducing emissions.[20]"

On July 6, 2011, U.S. EPA finalized CSAPR as a replacement for CAIR. On August 21, 2012, the U.S. Court of Appeals for the D.C.

17 Under CAIR, NOx reductions are to occur beginning in 2009 while SO2 reductions are to occur beginning in 2010.
18 http://www.epa.gov/airmarkets/quarterlytracking.html
19 http://www.epa.gov/airmarkets/quarterlytracking.html
20 http://www.epa.gov/airmarkets/background.htm

Circuit vacated CSAPR and directed U.S. EPA to continue administering CAIR "pending the promulgation of a valid replacement." In a subsequent decision on the merits, the Court vacated CSAPR based on a subset of petitioners' claims, but on April 29, 2014, the U.S. Supreme Court reversed that decision and remanded the case to the D.C. Circuit court for further proceedings. Throughout the initial round of D.C. Circuit proceedings and the ensuing U.S. Supreme Court proceedings, the stay remained in place and U.S. EPA has continued to implement CAIR. In order to allow CSAPR to replace CAIR in an equitable and orderly manner while further D.C. Circuit Court proceedings were held to resolve petitioner's remaining claims, U.S. EPA filed a motion asking the D.C. Circuit Court to lift the stay. U.S EPA also asked the court to toll all CSAPR compliance deadlines that had not passed as of the date of the stay order by three years. On October 23, 2014, the Court granted the U.S. EPA's motion. CSAPR became effective on January 1, 2015, for SO_2 and annual NO_x, and May 1, 2015 for ozone season NO_x. Combined with other final state and U.S. EPA actions, CSAPR will reduce power plant SO_2 emissions by 73% and NO_x emissions by 54% from 2005 levels in the CSAPR region, which includes the states of Indiana, Kentucky, and Ohio.
Ohio EPA is in agreement with the analysis by U.S.EPA that the CAIR program provided real reductions during this period; Ohio believes these reductions have assisted with $PM_{2.5}$ attainment in this nonattainment area and throughout Ohio. It is also Ohio EPA's belief that the CSAPR will continue to provide the necessary reductions, and likely even greater reductions, that will be necessary for maintenance of the annual $PM_{2.5}$ standard to occur. Therefore, it is Ohio EPA's belief it is most appropriate to evaluate Ohio EPA's demonstration that the projected level of emissions is sufficient to maintain the annual $PM_{2.5}$ standard by assessing future year emissions that include the CAIR program.

Maintenance is demonstrated when the future-year (2021) projected emission totals are below the 2008 attainment year totals.

The Ohio emissions data in the tables below are based on the following data sources:

- All On-Road data source: OKI Transportation Modeling Department.
- 2008 EGU and non-EGU: Ohio EPA's 2008 annual emissions inventory database.
- All other data source: Lake Michigan Air Directors Consortium (LADCO).

The U.S. EPA has fully approved a maintenance plan that meets the requirements of Section 175(A) on December 23, 2011 [76 FR 80253], and there have been no changes to the budgets or contingency measures described in the approved maintenance plan. The attainment inventory of the maintenance plan has been updated to reflect the provisions of subpart 4 (Title I, Part D) of the CAA, including updated emissions inventories to include VOCs and ammonia taken from the RIA for the 2012 $PM_{2.5}$ NAAQS[21]. Emissions for any future years beyond 2021 would be the same as those in the approved maintenance plan.

Demonstration

$PM_{2.5}$

The 2005 and 2008 actual $PM_{2.5}$ emissions data below generally contains particulate fraction emissions only and not the condensable fractions as Ohio EPA did not have a consistent reporting requirement at those years. U.S. EPA Integrated Planning Model (IPM) modeling was used to generate future year EGU emissions with the CAIR program. The IPM modeling added additional $PM_{2.5}$ condensable emissions into future years. Therefore, comparing base and attainment year emissions with the future year predictions is not accurate in the IPM CAIR modeling. This step leads to a false perception of significant $PM_{2.5}$ emissions growth. Modeling performed by LADCO, without CAIR, did not incorporate added condensable fraction emissions. Although Ohio EPA has stated that it is most appropriate to evaluate future year emissions that include the CAIR program, because of this flaw it will be more accurate and appropriate for the purposes of $PM_{2.5}$ to evaluate future year emissions without the CAIR program.

21 https://www3.epa.gov/ttnecas1/regdata/RIAs/finalria.pdf

Table 18 - Butler County[22], Ohio $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	15.27	16.78	15.86	15.59	1.19
Non-EGU	944.29	1045.15	1254.70	1337.03	-291.88
Non-road	185.28	158.41	109.75	66.98	91.43
Other	173.24	180.43	180.86	182.45	-2.02
MAR	31.19	27.40	16.01	6.43	20.97
On-road	413.97	377.64	301.16	215.76	161.88
TOTAL	**1763.24**	**1805.81**	**1878.34**	**1824.24**	**-18.43**

Table 19 - Clermont County, Ohio $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	648.21	532.61	651.88	711.22	-178.61
Non-EGU	7.93	3.86	6.42	7.33	-3.47
Non-road	104.54	89.84	62.51	38.56	51.28
Other	193.70	196.15	193.49	191.83	4.32
MAR	6.11	5.64	3.54	1.81	3.83
On-road	281.79	256.60	204.32	145.39	111.21
TOTAL	**1242.28**	**1084.70**	**1122.16**	**1096.14**	**-11.44**

Table 20 - Hamilton County, Ohio $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	648.64	202.88	554.65	708.74	-505.86
Non-EGU	161.88	158.14	171.28	179.45	-21.31
Non-road	355.97	307.30	218.86	141.16	166.14
Other	303.61	323.94	330.03	338.37	-14.43
MAR	42.04	37.82	23.54	11.64	26.18
On-road	1222.02	1080.54	826.00	571.48	509.06
TOTAL	**2734.16**	**2110.62**	**2124.36**	**1950.84**	**159.78**

22 Ohio EPA has revised the Butler County, Ohio PM2.5, NOx and SO2 Emissions Inventory (non-EGU) to incorporate the total emissions reduction credits available and used to offset the allowed emissions of a major source modified within the maintenance area that will begin operating during the maintenance period. The total emissions included in the inventory, and in all the Butler County tables below for this facility in 2015 and 2021, are 117.81 tpy PM2.5, 479.57 tpy NOx and 1209.92 tpy SO2. The emissions increase does not significantly impact the safety margin for this area or prevent the area from maintaining the standard in future years.

Table 21 - Warren County, Ohio $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	18.75	19.91	19.01	18.60	1.31
Non-road	143.72	122.20	79.69	42.68	79.52
Other	236.92	238.33	233.88	230.65	7.68
MAR	2.95	2.58	1.53	0.64	1.94
On-road	320.74	289.56	242.05	177.61	111.95
TOTAL	**723.08**	**672.58**	**576.16**	**470.18**	**202.40**

Table 22 - Dearborn County, Indiana $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	673.94	804.18	847.16	922.81	-118.63
Non-EGU	67.38	62.02	60.00	57.32	4.70
Non-road	23.96	19.91	13.34	9.07	10.84
Other	4.29	4.29	4.11	3.98	0.31
MAR					
On-road	33.98	29.89	25.14	18.11	11.78
TOTAL	**803.55**	**920.29**	**949.75**	**1011.29**	**-91.00**
*MAR emissions are included in Non-road emissions					

Table 23 - Boone County, Kentucky $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment[23]	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	76.85	76.70	80.70	83.42	-6.72
Non-EGU	58.77	68.81	84.35	98.94	-30.13
Non-road	89.15	82.90	62.42	45.30	37.60
Other	351.27	353.71	359.57	364.58	-10.87
MAR	215.61	227.62	206.01	191.23	36.39
On-road	205.21	251.85	151.35	114.05	137.80
TOTAL	**996.86**	**1061.59**	**944.40**	**897.52**	**164.07**

23 Kentucky 2008 data is grown from the 2005 LADCO modeling inventory, using LADCO's growth factors, for all sectors, including EGUs.

Table 24 - Campbell County, Kentucky $PM_{2.5}$ Emission Inventory Total for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	84.26	89.52	101.84	112.39	-22.87
Non-road	25.29	22.35	16.18	10.84	11.51
Other	200.08	201.26	200.05	199.32	1.94
MAR	55.66	53.74	41.25	31.15	22.59
On-road	120.30	146.46	82.36	60.09	86.37
TOTAL	**485.59**	**513.33**	**441.68**	**413.79**	**99.54**

Table 25 - Kenton County, Kentucky $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	9.53	11.11	13.50	15.76	-4.65
Non-road	56.44	50.98	38.18	27.22	23.76
Other	365.74	366.69	363.77	361.65	5.04
MAR	62.64	59.63	44.85	32.76	26.87
On-road	212.29	247.31	137.40	101.24	146.07
TOTAL	**706.64**	**735.72**	**597.70**	**538.63**	**197.09**

Table 26 – Cincinnati-Hamilton Area $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and projected 2015 and 2021 (tpy) – Without CAIR

$PM_{2.5}$	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
Butler	1763.24	1805.81	1878.34	1824.24	-18.43
Clermont	1242.28	1084.70	1122.16	1096.14	-11.44
Hamilton	2734.16	2110.62	2124.36	1950.84	159.78
Warren	723.08	672.58	576.16	470.18	202.40
Dearborn	803.55	920.29	949.75	1011.29	-91.00
Boone	996.86	1061.59	944.40	897.52	164.07
Campbell	485.59	513.33	441.68	413.79	99.54
Kenton	706.64	735.72	597.70	538.63	197.09
COMBINED $PM_{2.5}$ TOTAL	**9455.40**	**8904.64**	**8634.55**	**8202.63**	**702.01**

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NO_x

Table 27 - Butler County, Ohio NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	743.27	856.92	343.95	124.10	732.82
Non-EGU	4367.15	3940.28	4626.45	4686.11	-745.83
Non-road	2348.42	1986.81	1228.83	572.69	1414.12
Other	796.34	807.64	811.94	817.28	-9.64
MAR	919.91	847.08	545.76	297.37	549.71
On-road	10910.37	9803.70	6064.61	3757.91	6045.79
TOTAL	**20085.46**	**18242.43**	**13621.54**	**10255.46**	**7986.97**

Table 28 - Clermont County, Ohio NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	28063.56	24233.18	16491.26	10451.28	13781.90
Non-EGU	67.50	42.71	60.83	68.68	-25.97
Non-road	1218.23	1039.67	655.01	322.89	716.78
Other	612.97	619.27	620.94	623.36	-4.09
MAR	259.07	245.25	159.04	89.20	156.05
On-road	7295.87	6516.40	3993.63	2449.31	4067.09
TOTAL	**37517.20**	**32696.48**	**21980.71**	**14004.72**	**18691.76**

Table 29 - Hamilton County, Ohio NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	15236.04	12372.00	7236.90	5036.15	7335.85
Non-EGU	2756.21	2652.79	2943.73	3139.37	-486.58
Non-road	4845.98	4029.63	2464.90	1098.14	2931.49
Other	1923.27	1955.47	1974.77	1995.51	-40.04
MAR	1463.80	1372.41	909.89	532.19	840.22
On-road	31127.09	27020.93	15925.19	9530.16	17490.77
TOTAL	**57352.39**	**49403.23**	**31455.38**	**21331.52**	**28071.71**

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Table 30 - Warren County, Ohio NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	1024.95	1043.27	1035.29	1034.26	9.01
Non-road	1789.97	1517.53	919.21	403.56	1113.97
Other	426.57	432.28	434.26	436.82	-4.54
MAR	96.07	89.92	60.22	35.92	54.00
On-road	8224.57	7267.18	4598.44	2875.72	4391.46
TOTAL	**11562.13**	**10350.18**	**7047.42**	**4786.28**	**5563.90**

Table 31 - Dearborn County, Indiana NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	7961.30	7429.20	9862.76	11229.31	-3800.11
Non-EGU	2024.68	1979.83	1965.19	1943.22	36.61
Non-road	382.53	318.09	219.83	154.18	163.91
Other	141.37	145.42	143.39	142.90	2.52
MAR*					
On-road	865.46	748.81	482.33	297.95	450.86
TOTAL	**11375.34**	**10621.35**	**12673.50**	**13767.56**	**-3146.21**
*MAR emissions are included in Non-road emissions					

Table 32 - Boone County, Kentucky NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	3926.27	1962.59	1504.39	1308.03	654.56
Non-EGU	58.03	61.66	66.48	71.21	-9.55
Non-road	931.11	845.72	582.34	361.41	484.31
Other	1844.50	1897.28	1985.25	2063.30	-166.02
MAR	2927.85	2926.70	2310.38	1828.25	1098.45
On-road	5126.88	5067.94	2788.45	1772.72	3295.22
TOTAL	**14814.64**	**12761.89**	**9237.29**	**7404.92**	**5356.97**

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Table 33 – Campbell County, Kentucky NO_x Emission Inventory Total for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	53.68	49.52	53.81	55.21	-5.69
Non-road	284.66	261.59	189.27	128.67	132.92
Other	523.45	536.71	563.83	587.37	-50.66
MAR	1617.89	1571.87	1156.10	822.91	748.96
On-road	3041.21	2988.33	1570.14	985.28	2003.05
TOTAL	**5520.89**	**5408.02**	**3533.15**	**2579.44**	**2828.58**

Table 34 – Kenton County, Kentucky NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	19.50	20.44	21.79	23.09	-2.65
Non-road	616.67	562.88	395.18	254.61	308.27
Other	1542.27	1581.60	1654.75	1718.86	-137.26
MAR	2068.01	1999.72	1453.68	1014.71	985.01
On-road	5328.44	5057.93	2637.63	1677.96	3379.97
TOTAL	**9574.89**	**9222.57**	**6163.03**	**4689.23**	**4533.34**

Table 35 - Cincinnati-Hamilton Area NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

NOx	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
Butler	20085.46	18242.43	13621.54	10255.46	7986.97
Clermont	37517.20	32696.48	21980.71	14004.72	18691.76
Hamilton	57352.39	49403.23	31455.38	21331.52	28071.71
Warren	11562.13	10350.18	7047.42	4786.28	5563.90
Dearborn	11375.34	10621.35	12673.50	13767.56	-3146.21
Boone	14814.64	12761.89	9237.29	7404.92	5356.97
Campbell	5520.89	5408.02	3533.15	2579.44	2828.58
Kenton	9574.89	9222.57	6163.03	4689.23	4533.34
COMBINED NOx TOTAL	**167802.94**	**148706.15**	**105712.02**	**78819.13**	**69887.02**

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SO_2

Table 36 - Butler County, Ohio SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	1959.10	2181.63	654.49	0.00	2181.63
Non-EGU	6185.26	5442.54	6847.48	6828.13	-1385.59
Non-road	260.36	95.29	15.09	0.80	94.49
Other	224.54	221.09	209.01	198.96	22.13
MAR	80.84	79.05	62.61	49.44	29.61
On-road	30.01	34.25	34.28	37.90	-3.65
TOTAL	**8740.11**	**8053.85**	**7822.96**	**7115.23**	**938.62**

Table 37 - Clermont County, Ohio SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	88876.65	42918.28	32590.92	20589.16	22329.12
Non-EGU	162.19	118.05	148.28	160.98	-42.93
Non-road	138.93	50.86	8.05	0.43	50.43
Other	164.72	162.20	151.29	142.32	19.88
MAR	22.73	15.39	5.26	0.78	14.61
On-road	20.51	23.32	23.34	25.66	-2.34
TOTAL	**89385.73**	**43288.10**	**32927.14**	**20919.33**	**22368.77**

Table 38 - Hamilton County, Ohio SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	77381.13	24693.00	16390.65	7508.46	17184.54
Non-EGU	7819.40	6552.65	7739.34	8309.88	-1757.23
Non-road	474.85	174.16	28.47	1.93	172.23
Other	163.45	161.80	151.81	143.71	18.09
MAR	117.60	100.46	64.96	34.20	66.26
On-road	88.85	98.30	94.43	100.82	-2.52
TOTAL	**86045.28**	**31780.37**	**24469.66**	**16099.00**	**15681.37**

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Table 39 - Warren County, Ohio SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	3.39	3.53	3.45	3.42	0.11
Non-road	23.54	26.57	27.77	31.58	-5.01
Other	140.25	138.31	131.36	125.59	12.72
MAR	8.13	7.99	6.34	5.03	2.96
On-road	208.73	76.29	11.87	1.73	74.56
TOTAL	**384.4**	**252.69**	**180.79**	**167.35**	**85.34**

Table 40 - Dearborn County, Indiana SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	46533.70	25729.10	39295.70	36843.66	-11114.56
Non-EGU	1331.15	1334.33	1335.94	1337.95	-3.62
Non-road	40.16	17.38	4.73	1.14	16.24
Other	78.72	81.02	77.64	75.69	5.33
MAR*					
On-road	2.45	2.69	2.87	3.19	-0.50
TOTAL	**47986.18**	**27164.52**	**40716.88**	**38261.63**	**-111097.11**
*MAR emissions are included in Non-road emissions					

Table 41 - Boone County, Kentucky SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	3644.98	2812.16	2617.84	2534.56	277.60
Non-EGU	16.82	17.97	19.50	21.01	-3.04
Non-road	59.56	26.45	5.98	0.51	25.94
Other	1054.33	1066.79	1093.47	1116.53	-49.74
MAR	434.71	409.48	322.39	249.85	159.63
On-road	15.91	16.71	20.67	24.37	-7.66
TOTAL	**5226.31**	**4349.56**	**4079.85**	**3946.83**	**402.73**

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Table 42 - Campbell County, Kentucky SO_2 Emission Inventory Total for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	0.97	0.96	1.04	1.09	-0.13
Non-road	18.01	7.89	1.78	0.17	7.72
Other	471.77	479.14	491.66	502.75	-23.61
MAR	221.98	198.32	147.50	103.61	94.71
On-road	9.30	9.69	11.21	12.77	-3.08
TOTAL	**722.03**	**696.00**	**653.19**	**620.39**	**75.61**

Table 43 - Kenton County, Kentucky SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	12.91	13.89	15.16	16.41	-2.52
Non-road	41.75	18.27	4.01	0.31	17.96
Other	1196.61	1210.42	1238.92	1263.63	-53.21
MAR	206.59	172.13	123.08	78.68	93.45
On-road	16.24	16.34	18.62	21.48	-5.14
TOTAL	**1474.10**	**1431.05**	**1399.79**	**1380.51**	**50.54**

Table 44 - Cincinnati-Hamilton Area SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2021 (tpy) – With CAIR

SO_2	2005 Base	2008 Attainment	2015 Interim	2021 Maintenance	Safety Margin
Butler	8740.11	8053.85	7822.96	7115.23	938.62
Clermont	89385.73	43288.10	32927.14	20919.33	22368.77
Hamilton	86045.28	31780.37	24469.66	16099.00	15681.37
Warren	384.04	252.69	180.79	167.35	85.34
Dearborn	47986.18	27164.52	40716.88	38261.63	-11097.11
Boone	5226.31	4349.56	4079.85	3946.83	402.73
Campbell	722.03	696.00	653.19	620.39	75.61
Kenton	1474.10	1431.05	1399.79	1380.51	50.54
COMBINED SO_2 TOTAL	**239963.78**	**117016.14**	**112250.26**	**88510.27**	**28505.87**

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$PM_{2.5}$, NO_x, and SO_2

Table 45 - Cincinnati-Hamilton Area Comparison of 2008 attainment year and 2015 and 2021 projected emission estimates (tpy)

	2008 Attainment	2015 Interim	2015 Projected Decrease	2021 Maintenance	2021 Projected Decrease
$PM_{2.5}$	8,904.64	8,634.55	270.09	8,202.63	702.01
NO_x	148,706.15	105,712.02	42,994.13	78,819.13	69,887.02
SO_2	117,016.14	112,250.26	4,765.88	88,510.27	28,505.87

As shown in the table above (Table 45), $PM_{2.5}$ emissions in the nonattainment area are projected to decrease by 270.09 tpy in 2015 and 702.01 tpy in 2021. NO_x emissions in the nonattainment area are projected to decrease by 42,994.13 tpy in 2015 and 69,887.02 tpy in 2021. SO_2 emissions in the nonattainment area are projected to decline by 4,765.88 tpy in 2015 and 28,505.87 in 2021.

Area source emissions and, to a lesser extent, point sources show an increase due to expectations that the population will grow in this area; however, cleaner vehicles and fuels are expected to be in place in 2009 and 2018, and the CSAPR will be implemented in 2015 and 2017 and these programs should cause an overall drop in all three pollutants emissions. Decreases from U.S. EPA rules covering Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements[24], Highway Heavy-Duty Engine Rule[25], and the Non-Road Diesel Engine Rule[26] are factored into the changes.

In addition to the above, the Miami Fort Station in Hamilton County implemented important changes in 2007. Two units, B005 (# 5-1) and B006 (# 5-2) permanently shut down effective December 31, 2007. Each were 50 megawatt coal fired boilers. In addition, units B015 (# 7) and B017 (# 8) were issued a new source review permit-to-install scrubbers, accepting a restricted SO_2 allowable emissions rate that will not cause or contribute to a violation of a National Ambient Air Quality Standard (NAAQS) and/or Prevention of Significant Deterioration (PSD) increment violation based upon air dispersion modeling. These scrubbers began operating in April 2007 and December 2007.[27] The following summarizes Miami Fort's

24 http://www.epa.gov/fedrgstr/EPA-AIR/2000/February/Day-10/a19a.htm
25 http://www.epa.gov/fedrgstr/EPA-AIR/1997/October/Day-21/a27494.htm
26 http://www.epa.gov/fedrgstr/EPA-AIR/1998/October/Day-23/a24836.htm
27 The lower rates will be incorporated into the facility's Title V operating permit at renewal.

emissions changes from the base year (2005), to the attainment year (2008), and for 2009:

Table 46 - Miami Fort Station, Hamilton County, Emission Reductions (tpy) as Reported by Clean Air Markets Division

	SO2	NOx
2005	77,583	12,264
2008	24,693	12,371
2009	25,340	4,338

VOCs and Ammonia

Emissions inventories used in the RIA for the 2012 $PM_{2.5}$ NAAQS[28] are provided in tables 47 through 63 below. In the RIA analysis, the projected 2020 emissions include CAIR and CSAPR, as well as the Final Mercury and Air Toxics (MATS) rule announced on December 21, 2011.

Table 47 - Butler County, Ohio VOC Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	10.57	10.57
nonpoint	4473.08	4447.33
nonroad	1446.42	836.15
onroad	2948.17	1196.66
point	1005.27	956.70
Total	9883.51	7447.41

Table 48 - Clermont County, Ohio VOC Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	0.00	0.00
nonpoint	2543.10	2524.71
nonroad	916.79	527.21
onroad	1642.83	693.45
point	175.79	230.44
Total	5278.51	3975.81

28 https://www3.epa.gov/ttnecas1/regdata/RIAs/finalria.pdf

Table 49 - Hamilton County, Ohio VOC Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	72.21	72.21
nonpoint	10914.60	10967.52
nonroad	3636.49	2012.61
onroad	8767.52	3585.36
point	1014.06	820.45
Total	24404.88	17458.15

Table 50 - Warren County, Ohio VOC Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	3.52	3.52
nonpoint	2151.67	2182.31
nonroad	1017.30	564.49
onroad	2066.05	742.46
point	285.48	183.38
Total	5524.02	3676.16

Table 51 - Dearborn County, Indiana VOC Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	41.86	41.86
nonpoint	804.35	778.66
nonroad	198.18	109.36
onroad	1167.24	420.16
point	1431.91	1401.46
Total	3643.54	2751.50

Table 52 - Boone County, Kentucky VOC Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	7.05	7.05
nonpoint	1208.37	1113.49
nonroad	1161.68	668.35
onroad	1083.04	400.14
point	846.53	873.91
Total	4306.67	3062.94

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Table 53 - Campbell County, Kentucky VOC Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	0.00	0.00
nonpoint	721.06	695.11
nonroad	360.14	178.32
onroad	926.90	374.82
point	146.03	146.18
Total	2154.13	1394.43

Table 54 - Kenton County, Kentucky VOC Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	89.09	89.09
nonpoint	1332.32	1370.57
nonroad	556.62	331.02
onroad	1714.95	628.44
point	232.46	218.74
Total	3925.44	2637.86

Table 55 - Butler County, Ohio Ammonia Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	0.74	0.74
nonpoint	521.18	535.09
nonroad	2.37	2.68
onroad	127.57	67.89
point	32.12	30.81
Total	683.98	637.21

Table 56 - Clermont County, Ohio Ammonia Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	0.00	0.00
nonpoint	158.80	162.58
nonroad	1.23	1.40
onroad	69.51	40.51
point	3.84	99.45
Total	233.38	303.94

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Table 57 - Hamilton County, Ohio Ammonia Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	5.02	5.02
nonpoint	447.04	457.96
nonroad	4.70	5.26
onroad	394.97	203.10
point	41.45	84.42
Total	893.18	755.76

Table 58 - Warren County, Ohio Ammonia Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	0.25	0.25
nonpoint	558.59	583.03
nonroad	1.51	1.73
onroad	89.37	44.08
point	0.68	0.71
Total	650.40	629.80

Table 59 - Dearborn County, Indiana Ammonia Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	2.91	2.91
nonpoint	151.35	155.94
nonroad	0.32	0.39
onroad	44.74	26.77
point	6.54	80.81
Total	205.86	266.82

Table 60 - Boone County, Kentucky Ammonia Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	0.49	0.49
nonpoint	136.84	140.38
nonroad	1.27	1.53
onroad	50.71	29.41
point	24.53	35.44
Total	213.84	207.25

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Table 61 - Campbell County, Kentucky Ammonia Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	0.00	0.00
nonpoint	83.95	85.15
nonroad	0.74	0.81
onroad	35.67	26.07
point	0.00	0.00
Total	120.36	112.03

Table 62 - Kenton County, Kentucky Ammonia Emission Inventory Totals for Year 2007 and Projected 2020 (tpy)

Sector	2007	2020
fires	6.20	6.20
nonpoint	100.20	103.21
nonroad	0.96	1.14
onroad	77.42	43.54
point	0.02	0.02
Total	184.80	154.11

Table 63 - Cincinnati-Hamilton Area Comparison of 2007 year and 2020 projected emission estimates (tpy)

	2007	2020	2020 Projected Decrease
VOCs	59,120.70	42,404.26	16,716.44
Ammonia	3,185.80	3,066.92	118.88

Ohio EPA believes that the maintenance plan for Cincinnati-Hamilton area need not include any additional emission reductions of VOC or ammonia in order to provide for continued maintenance of the 1997 annual $PM_{2.5}$ standard. First, VOC emission levels in this area have historically been well-controlled under SIP requirements related to ozone and other pollutants. Second, total ammonia emissions throughout the Cincinnati-Hamilton area are very low, estimated to be less than 4,000 tpy. See Table 63 above. This amount of ammonia emissions appears especially small in comparison to the total amounts of SO_2, NO_X, and even direct $PM_{2.5}$ emissions from sources in the area. Third, as described below, available information shows that no precursor, including VOC and ammonia, is expected to increase over the maintenance period so as to interfere with or undermine the state's maintenance demonstration.

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Ohio's maintenance plan shows that emissions of direct $PM_{2.5}$, SO_2, and NO_X are projected to decrease by 702.01 tpy, 28,505.873 tpy, and 69,887.02 tpy, respectively, over the maintenance period. See Table 45 above. In addition, emissions inventories used the RIA for the 2012 $PM_{2.5}$ NAAQS[29] show that VOC and ammonia emissions are projected to decrease by 16,716 tpy and 119 tpy, respectively between 2007 and 2020. While the RIA emissions inventories are only projected out to 2020, there is no reason to believe that this downward trend would not continue through 2021. Given that the Cincinnati-Hamilton area is already attaining the 1997 annual, 2006 24-hour and 2012 annual $PM_{2.5}$ standards even with the current level of emissions from sources in the area, the downward trend of emissions inventories would be consistent with continued attainment. Indeed, projected emissions reductions for the precursors that the state is addressing for purposes of the 1997 $PM_{2.5}$ standard indicate that the area should continue to attain the NAAQS following the precursor control strategy that the state has already elected to pursue. Even if VOC and ammonia emissions were to increase unexpectedly between 2020 and 2021, the overall emissions reductions projected in direct $PM_{2.5}$, SO_2, and NO_X would be sufficient to offset any increases. For these reasons, Ohio EPA believes that local emissions of all of the potential $PM_{2.5}$ precursors will not increase to the extent that they will cause monitored $PM_{2.5}$ levels to violate the 1997 annual $PM_{2.5}$ standard during the maintenance period. In addition, any unexpected increases in emissions will be accounted for in the updated maintenance plan required within eight years following redesignation.

In addition, the modeling analysis conducted for the RIA for the 2012 $PM_{2.5}$ NAAQS indicates that the design values for this area are expected to continue to decline through 2020. In the RIA analysis, the highest 2020 modeled design value[30] for the Cincinnati-Hamilton area is 10.5 ug/m^3. Given that precursor emissions are projected to decrease through 2021, it is reasonable to conclude that monitored $PM_{2.5}$ levels in this area will also continue to decrease through 2021.

Requirement 4 of 5

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

Background

Ambient air quality data from all monitoring sites indicate that air quality met the NAAQS for $PM_{2.5}$ in 2013-2015. U.S. EPA's redesignation

29 https://www3.epa.gov/ttnecas1/regdata/RIAs/finalria.pdf
30 https://www3.epa.gov/pm/2012/2020table.pdf

guidance (p 9) states: "A state may generally demonstrate maintenance of the NAAQS by either showing that future emissions of a pollutant or its precursors will not exceed the level of the attainment inventory, or by modeling to show that the future mix of sources and emissions rates will not cause a violation of the NAAQS."

Demonstration

Permanent and enforceable reductions of $PM_{2.5}$, NO_x, SO_2, VOCs and ammonia emissions have contributed to the attainment of the annual $PM_{2.5}$ standard. Some of these reductions were due to the application of tighter federal standards on new vehicles. Also Title IV of the CAA, the NO_x SIP Call, CAIR, and federal consent decrees required the reductions of SO_2 and NO_x emissions from utility sources. Permanent and enforceable reductions are also expected due to CSAPR, despite the D.C. Circuit Court's remand of the CSAPR rule on July 28, 2015. Among other key issues requiring correction, the D.C. Circuit found the Ohio 2014 NO_x budget (as related to the 1997 8-hour ozone NAAQS) was invalid, stating that based on U.S. EPA's own data Ohio made no contribution to downwind states' nonattainment. However, the court left the 2014 NO_x budget in place, and remanded it to U.S. EPA for reconsideration. On November 16, 2015, U.S. EPA proposed the CSAPR Update Rule[31] which, when finalized, will establish permanent and enforceable reductions through revised NO_x budgets for Ohio. The revised NO_x ozone season budget for Ohio is proposed to be 16,660 tons (the vacated budget was 39,013 tons). Regardless of the revised ozone season budgets, modeling and analysis conducted by U.S. EPA[32] show that all areas in Ohio are expected to attain and maintain the more stringent 2012 $PM_{2.5}$ standard by 2017 with current budgets. Reductions achieved are discussed in greater detail under Chapter Five.

Table 64 - Cincinnati-Hamilton Area Combined Comparison of 2005 base year and 2008 attainment year on-road and EGU reductions

	2005	2008
On-road $PM_{2.5}$	2810.30	2679.85
On-road NO_x	71919.89	64471.22
On-road SO_2	392.00	277.59
EGU $PM_{2.5}$	2062.91	1633.15
EGU NO_x	55930.44	46853.89
EGU SO_2	218395.56	98334.17

31 https://www.gpo.gov/fdsys/pkg/FR-2015-12-03/pdf/2015-29796.pdf
32 https://www3.epa.gov/pm/pdfs/good-neighbor-memo.pdf and https://www3.epa.gov/pm/pdfs/good-neighbor-att1.pdf

Requirement 5 of 5

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

Demonstration

In Ohio, major point sources in all counties are required to submit air emissions information annually, in accordance with U.S. EPA's Consolidated Emissions Reporting Rule (CERR). Ohio EPA prepares a new periodic inventory for all $PM_{2.5}$ precursor emission sectors every three years. These $PM_{2.5}$ precursor inventories will be prepared for future years as necessary to comply with the inventory reporting requirements established in the CFR. Emissions information will be compared to the 2005 base year and the 2021 projected maintenance year inventories to assess emission trends, as necessary, and to assure continued compliance with the annual $PM_{2.5}$ standard.

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CHAPTER FIVE

CONTROL MEASURES AND REGULATIONS

CAA Section107 (d)(3)(E)(ii), 107(d)(3)(iv), 107(d)(3)(E)(v), and 189(c)

Requirement 1 of 6

Section 172(c)(1) and 189(c) of the 1990 Clean Air Act Amendments requires states with nonattainment areas to implement RACM and RACT.

Background

Sections 172(c)(1) and 189(c) of the 1990 Clean Air Act Amendments requires states with nonattainment areas to submit a SIP providing for implementation of all reasonably available control measures and expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonable available control technology).

U.S. EPA's Implementation Rule interprets this requirement in great detail. Under U.S. EPA's approach, RACT is determined as part of the broader RACM analysis and identification of all measures (for stationary, mobile, and area sources) that are technically and economically feasible, and that would collectively contribute to advancing the attainment date (i.e. by one year or more). States are required to use a combined approach to RACT and RACM, that (1) identifies potential measures that are reasonable, (2) uses modeling to identify the attainment date that is as expeditious as practicable, and (3) selects the appropriate RACT and RACM.

Demonstration

In 1972, 1980, and 1991, Ohio promulgated rules requiring reasonably available controls measures for particulate emissions from stationary sources.

Statewide RACT rules have been applied to all new sources locating in Ohio since that time. RACT requirements are incorporated into permits along with monitoring, recordkeeping, and reporting necessary to ensure ongoing compliance. Ohio EPA also has an active enforcement program to address violations discovered by field office staff. The Ohio RACT rules are found in OAC Chapter 3745-17[33].

LADCO, in consultation with two contractors, performed a series of studies exploring control measures for reducing both ozone precursors and $PM_{2.5}$ precursors in Ohio, Illinois, Indiana, Michigan,

33 http://www.epa.ohio.gov/dapc/regs/3745_17.aspx

and Wisconsin area. The first consultant, MACTEC, prepared a series of white papers[34] researching different stationary source categories. The results were compiled into two reports[35]. The second consultant, Environ, investigated control options for mobile sources. The results were compiled into two reports[36]. The stationary and mobile source sectors (and associated control measures) were selected by the LADCO States based on several factors presented in the report (See Chapter 2). These analyses constitute Ohio EPA's RACT/RACM analysis as discussed below.

Photochemical modeling was then conducted (as part of LADCO Round 4 modeling) to assess the air quality benefit of the candidate control measures and a modeling report was developed[37]. Based on the results, the LADCO project team and Ohio EPA determined it would not be possible to advance the attainment date for $PM_{2.5}$ based upon any of the selected control measures. Ohio EPA, in its attainment demonstration submitted on July 18, 2008, demonstrated (using a weight of evidence approach) that attainment would be achieved in this area by 2009. Because of a projected 2009 attainment date, it would not have been reasonably possible or practicable for Ohio to develop RACT/RACM requirements, promulgate regulations and implement a control program prior to the projected attainment date. Therefore, Ohio EPA's RACT/RACM analysis demonstrates Ohio EPA's current rules as described above satisfy RACT/RACM for the 1997 annual $PM_{2.5}$ standard.

In addition, Ohio EPA promulgated NO_x SIP Call rules (OAC Chapter 3745-14[38]), CAIR (OAC Chapter 3745-109[39]), and NO_x Reasonably Available Control Technology rules (OAC Chapter 3745-110[40]) over the past five years. Emissions from EGUs make up a significant contribution to Ohio's inventory. Beginning in 2009, Ohio implemented CAIR which has, and will, provide for significant reductions in NO_x, $PM_{2.5}$, and SO_2. CAIR's replacement, CSAPR, will provide for even greater reductions.

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34 http://www.ladco.org/reports/control/white_papers
35 http://www.ladco.org/reports/control/final_reports/identification_and_evaluation_of_candidate_control_measures_i_april_2005.pdf; http://www.ladco.org/reports/control/final_reports/identification_and_evaluation_of_candidate_control_measures_ii_june_2006.pdf
36 http://www.ladco.org/reports/control/final_reports/final_report_evaluation_of_candidate_mobile_source_control_measures_february_2006.pdf; http://www.ladco.org/reports/control/final_reports/final_report_evaluation_of_candidate_mobile_source_control_measures_for_ladco_states_in_2009_and_2012_march_2007.pdf
37 http://www.ladco.org/reports/control/modeling/round4_modeling.pdf
38 http://www.epa.ohio.gov/dapc/regs/3745_14.aspx
39 http://www.epa.ohio.gov/dapc/regs/3745_109.aspx
40 http://www.epa.ohio.gov/dapc/regs/3745_110.aspx

Requirement 2 of 6

Section 172(c)(2) of the 1990 CAA Amendments requires attainment demonstration SIPs for nonattainment areas to show reasonable further progress (RFP).

Background

U.S. EPA's Implementation Rule requires RFP only for any area which a State projects an attainment date beyond 2010. The RFP would provide emission reductions showing linear progress between 2002 and 2009. If a State demonstrates attainment will occur by 2010 or earlier, U.S. EPA considers the attainment demonstration to demonstrate achievement of RFP.

Demonstration

In Ohio's attainment demonstration submitted on July 18, 2008, Ohio demonstrated (using a weight of evidence approach) that attainment would be achieved in this area by 2009; and therefore, it was not necessary to submit a separate RFP plan.

Requirement 3 of 6

Section 172(c)(3) requires states to submit a comprehensive inventory of actual emissions.

Background

Section 172(c)(3) requires states to submit a comprehensive inventory of actual emissions in the area, including the requirement for periodic revisions as determined necessary. 40 CFR 51.1008 requires such inventory to be submitted within three years of designation and requires a baseline emission inventory for calendar year 2002 or other suitable year to be used for attainment planning.

Demonstration

The 2005 comprehensive inventory was submitted to U.S. EPA with Ohio's $PM_{2.5}$ attainment demonstration SIP submitted on July 18, 2008. It was then subsequently revised and resubmitted on June 7, 2010.

Ohio also updates its inventory in accordance with U.S. EPA's CERR rule (i.e. emissions statements). Ohio EPA submitted its emissions statement SIP on March 18, 1994 which was approved by U.S. EPA on October 13, 1995 (59 FR 51863). As discussed in Chapter 4 (Requirement 4), Ohio EPA submits, and commits to submit, emission inventories (statements) every three years.

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Requirement 4 of 6

Evidence that control measures required in past $PM_{2.5}$ SIP revisions have been fully implemented.

Background

In addition to the historic RACT requirements for PM, the U.S. EPA NO_x SIP Call required 22 states to pass rules that would result in significant emission reductions from large EGUs, industrial boilers, and cement kilns in the eastern United States. Ohio passed this rule in 2001. NOx SIP Call requirements are incorporated into permits along with monitoring, recordkeeping, and reporting necessary to ensure ongoing compliance. Ohio EPA also has an active enforcement program to address violations discovered by field office staff. Compliance is tracked through the Clean Air Markets data monitoring program. Beginning in 2004, this rule accounts for a reduction of approximately 31 percent of all NO_x emissions statewide compared to previous uncontrolled years. The other 21 states also have adopted these rules.

On March 10, 2004, the U.S. EPA promulgated the CAIR. Beginning in 2009, U.S. EPA's CAIR rule requires EGUs in 28 eastern states and the District of Columbia to significantly reduce emissions of NO_x and SO_2. CAIR replaced the NOx SIP Call for EGUs. National NO_x emissions were cut from 4.5 million tons in 2004, to a cap of 1.5 million tons by 2009, and 1.3 million tons in 2018 in 28 states. States were required to submit a CAIR SIP as part of this effort. Ohio submitted a CAIR SIP which was approved by U.S. EPA on February 1, 2007. Revisions to the CAIR SIP were again submitted on July 15, 2009. The revised CAIR SIP was approved as a direct final action on September 25, 2009 (74 FR 48857).

Demonstration

Controls for EGUs under the NO_x SIP Call formally commenced May 31, 2004. Emissions covered by this program have been generally trending downward since 1998 with larger reductions occurring in 2002 and 2003. Data taken from the U.S. EPA Clean Air Markets web site, quantify the gradual NO_x reductions that have occurred in Ohio as a result of Title IV of the 1990 CAA Amendments and the beginning of the NO_x SIP Call Rule. Ohio developed the NO_x Budget Trading Program rules in OAC Chapter 3745-14[41] in response to the SIP Call. OAC Chapter 3745-14 regulates EGUs and certain non-EGUs under a cap and trade program based on an 85 percent reduction of NOx emissions from EGUs and a 60 percent reduction of NO_x emissions from non-EGUs, compared to historical levels.

41 http://www.epa.ohio.gov/dapc/regs/3745_14.aspx

This cap was in place through 2008, at which time the CAIR program superseded it as discussed above. Requirement 3 of 5 under Chapter 4 above discussed the reductions Ohio has seen as a result of CAIR.

On April 21, 2004, U.S. EPA published Phase II of the NO_x SIP Call that establishes a budget for large (greater than 1 ton per day emissions) stationary internal combustion engines. Ohio EPA's OAC rule 3745-14-12 addresses stationary internal combustion engines, all used in natural gas pipeline transmissions. U.S. EPA approved this revision to the SIP on April 4, 2008. An 82 percent NO_x reduction from 1995 levels is anticipated. Completion of the compliance plan occurred by May 1, 2006, and the compliance demonstration began May 1, 2007.

Tier II Emission Standards for Vehicles and Gasoline Sulfur Standards

In February 2000, U.S. EPA finalized a federal rule to significantly reduce emissions from cars and light trucks, including sport utility vehicles (SUVs). Under this proposal, automakers will be required to sell cleaner cars, and refineries will be required to make cleaner, lower sulfur gasoline. This rule will apply nationwide. The federal rules were phased in between 2004 and 2009. U.S. EPA has estimated that NO_x emission reductions will be approximately 77 percent for passenger cars, 86 percent for smaller SUVs, light trucks, and minivans, and 65 to 95 percent reductions for larger SUVs, vans, and heavier trucks. The sulfur content of gasoline is estimated to be reduced by up to 90 percent. VOC emission reductions will be approximately 12 percent for passenger cars, 18 percent for smaller SUVs, light trucks, and minivans, and 15 percent for larger SUVs, vans, and heavier trucks.

Heavy-Duty Diesel Engines

In July 2000, U.S. EPA issued a final rule for Highway Heavy Duty Engines, a program which includes low-sulfur diesel fuel standards, which were phased in from 2004 through 2007. This rule applies to heavy-duty gasoline and diesel trucks and buses. This rule will result in a 40 percent reduction in NO_x from diesel trucks and buses, a large sector of the mobile sources NO_x inventory. It also estimated the level of sulfur in highway diesel fuel will be reduced by 97 percent by mid-2006.

Clean Air Non-road Diesel Rule

In May 2004, U.S. EPA issued the Clean Air Non-road Diesel Rule. This rule applies to diesel engines used in industries such as construction, agriculture, and mining. It also contains a cleaner fuel

standard similar to the highway diesel program. The new standards will cut emissions from non-road diesel engines by more than 90 percent. Non-road diesel equipment, as described in this rule, currently accounts for 47 percent of diesel particulate matter (PM) and 25 percent of NO_x from mobile sources nationwide. Sulfur levels will be reduced in non-road diesel fuel by 99 percent from current levels, from approximately 3,000 parts per million (ppm) now to 15 ppm in 2009. New engine standards take effect, based on engine horsepower, starting in 2008. Together, these rules will substantially reduce local and regional sources of $PM_{2.5}$ precursors.

Requirement 5 of 6

Acceptable provisions to provide for new source review.

Background

Ohio has a longstanding and fully implemented New Source Review (NSR) program. This is addressed in OAC Chapter 3745-31[42]. The Chapter includes provisions for the Prevention of Significant Deterioration (PSD) permitting program in OAC rules 3745-31-01 to 3745-31-20. Ohio's PSD program was conditionally approved on October 10, 2001 (66 FR 51570) and received final approval on January 22, 2003 (68FR 2909) by U.S. EPA as part of the SIP.

Demonstration

Any facility that is not listed in the 2005 emission inventory, or for the closing of which credit was taken in demonstrating attainment, will not be allowed to construct, reopen, modify, or reconstruct without meeting all applicable NSR requirements. Once the area is redesignated, Ohio EPA will implement NSR through the PSD program.

Requirement 6 of 6

Assure that all existing control measures will remain in effect after redesignation unless the State demonstrates through modeling that the standard can be maintained without one or more control measures.

Demonstration

Ohio commits to maintaining the aforementioned control measures after redesignation. Ohio hereby commits that any changes to its rules or emission limits applicable to $PM_{2.5}$, SO_2, NO_x, VOCs and ammonia as required for maintenance of the annual $PM_{2.5}$ standard in the Cincinnati-Hamilton area, will be submitted to U.S. EPA for approval as a SIP revision.

42 http://www.epa.ohio.gov/dapc/regs/3745_31.aspx

Ohio, through Ohio EPA's Legal section, has the legal authority and necessary resources to actively enforce any violations of its rules or permit provisions. After redesignation, it intends to continue enforcing all rules that relate to the emission of $PM_{2.5}$ precursors in the Cincinnati-Hamilton area.

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CHAPTER SIX

CONTINGENCY MEASURES

CAA Section 107(d)(3)(E)(v)

Requirement 1 of 4

A commitment to submit a revised plan eight years after redesignation.

Demonstration

Ohio hereby commits to review its maintenance plan eight years after redesignation, as required by Section 175(A) of the CAA.

Requirement 2 of 4

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

Demonstration

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

Warning Level Response

A warning level response shall be prompted whenever the $PM_{2.5}$ average of the weighted annual mean of 15.5 µg/m^3 or greater occurs in a single calendar year within the maintenance area. A warning level response will consist of a study to determine whether the $PM_{2.5}$ value indicates a trend toward higher $PM_{2.5}$ values or whether emissions appear to be increasing. The study will evaluate whether the trend, if any, is likely to continue and, if so, the control measures necessary to reverse the trend taking into consideration ease and timing for implementation as well as economic and social considerations. Implementation of necessary controls in response to a warning level response trigger will take place as expeditiously as possible, but in no event later than 12 months from the conclusion of the most recent calendar year.

Should it be determined through the warning level study that action is necessary to reverse the noted trend, the procedures for control selection and implementation outlined under "action level response" shall be followed.

Action Level Response

An action level response shall be prompted whenever a two-year average of the weighted annual means of 15.0 µg/m^3 or greater occurs within the maintenance area. A violation of the standard

(three-year average of the weighted annual means of 15.0 µg/m^3 or greater) shall also prompt an action level response. In the event that the action level is triggered and is not found to be due to an exceptional event, malfunction, or noncompliance with a permit condition or rule requirement, Ohio EPA in conjunction with the metropolitan planning organization or regional council of governments, will determine additional control measures needed to assure future attainment of the NAAQS for annual $PM_{2.5}$. In this case, measures that can be implemented in a short time will be selected in order to be in place within 18 months from the close of the calendar year that prompted the action level. Ohio EPA will also consider the timing of an action level trigger and determine if additional, significant new regulations not currently included as part of the maintenance provisions will be implemented in a timely manner and will constitute our response.

Control Measure Selection and Implementation

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

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

Requirement 3 of 4

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

Demonstration

Contingency measures to be considered will be selected from a comprehensive list of measures deemed appropriate and effective at the time the selection is made. The selection of measures will be based on cost-effectiveness, emission reduction potential, economic and social considerations or other factors that Ohio EPA deems appropriate. Ohio EPA will solicit input from all interested and affected persons in the maintenance area prior to selecting appropriate contingency measures. Because it is not possible at this time to determine what control measures will be appropriate at an unspecified time in the future, the list of contingency measures outlined below is not exhaustive.

1) Diesel reduction emission strategies.
2) Alternative fuel (e.g., liquid propane and compressed natural gas) and diesel retrofit programs for fleet vehicle operations.
3) Tighter $PM_{2.5}$, SO_2, and NO_x emissions offsets for new and modified major sources.
4) Impact crushers located at recycle scrap yards – upgrade wet suppression.
5) Concrete manufacturing – upgrade wet suppression.
6) Additional NO_x RACT statewide.

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

Requirement 4 of 4

A list of $PM_{2.5}$, SO_2, and NO_x sources potentially subject to future additional control requirements.

Demonstration

The following is a list of $PM_{2.5}$, SO_2, and NO_x sources potentially subject to future controls.

- ICI Boilers - SO_2 and NO_x controls;
- EGUs;
- process heaters;
- internal combustion engines;
- combustion turbines;
- other sources greater than 100 tons per year;
- Fleet vehicles;
- Concrete manufacturers;
- Aggregate processing plants;

A list of VOC and ammonia sources are not included here because, as described in Chapter 4 above, the precursors VOC and ammonia from major stationary sources do not contribute significantly to levels exceeding the 1997 PM2.5 standard in the Cincinnati-Hamilton area.

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CHAPTER SEVEN

PUBLIC PARTICIPATION

2010 Redesignation Request and Maintenance Plan

Ohio published notification for a public hearing and solicitation for public comment concerning the draft redesignation petition and maintenance plan in the widely distributed county publications on October 28, 2010.

The public hearing to receive comments on the redesignation request was held on November 29, 2010 at 2:30 P.M. at the Hamilton County Department of Environmental Services, Cincinnati, Ohio. The public comment period closed on November 30, 2010. No testimony was provided at the public hearing. Comments were received during the public comment period. Appendix E includes a copy of the public notice, the transcript from the public hearing, and the response to comments.

2016 Revised Redesignation Request

Ohio published notification for a public hearing and solicitation for public comment concerning the draft revised redesignation petition and updated maintenance plan in the widely distributed county publications on _____.

The public hearing to receive comments on the revised redesignation request was held on [date/time] at the Hamilton County Department of Environmental Services, Cincinnati, Ohio. The public comment period closed on _____. _____ testimony was provided at the public hearing and _____ comments were received during the public comment period. Comments were received during the public comment period. Appendix E includes a copy of the public notice, the transcript from the public hearing, and the response to comments.

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CHAPTER EIGHT

CONCLUSIONS

The Cincinnati-Hamilton annual $PM_{2.5}$ nonattainment area has attained the 1997 annual NAAQS for $PM_{2.5}$ and complied with the applicable provisions of the 1990 Amendments to the CAA regarding redesignations of $PM_{2.5}$ nonattainment areas. Documentation to that effect is contained herein. Ohio EPA has prepared a revised redesignation request and updated maintenance plan that meet the requirements of Section 110 (a)(1) and Part D of the 1990 CAA.

Based on this presentation, the Cincinnati-Hamilton annual $PM_{2.5}$ nonattainment area meets the requirements for redesignation under the CAA and U.S. EPA guidance. Ohio has performed an analysis that shows the air quality improvements are due to permanent and enforceable measures. Furthermore, because this area is subject to significant transport of pollutants, significant regional SO_2 and NO_x reductions will ensure continued compliance (maintenance) with the standard with an increasing margin of safety.

The State of Ohio hereby requests that the Cincinnati-Hamilton annual $PM_{2.5}$ nonattainment area be redesignated to attainment simultaneously with U.S. EPA approval of the updated maintenance plan provisions contained herein.

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