
Iowa Ambient Air Monitoring
2018 Network Plan
Air Quality Bureau
Iowa Department of
Natural Resources
DNR

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Introduction

States and other agencies delegated to perform air monitoring under the Clean Air Act are required to examine their networks annually to verify that they meet federal requirements (Appendix A). These requirements[1] include the number and type of monitors operated and the frequency of sampling. Certain monitors in the network, known as State and Local Air Monitoring Stations (SLAMS), are required by federal regulations and discontinuing a SLAMS monitor requires concurrence from the Environmental Protection Agency (EPA) (Appendix B). Special Purpose Monitors (SPMs) provide important additional air quality information (such as background concentrations for permitting activities[2,3]), but changes to the SPM network do not require concurrence from EPA.

One of the requirements of the annual network plan is to provide specific information for monitors that produce data that may be compared with federal air standards. This information, along with information concerning various types of monitors operated in the Iowa air monitoring network, is contained in Appendix C and Appendix D.

Ozone Monitoring Network Analysis

EPA's population-based monitoring requirements for ozone are reproduced in Appendix E. These requirements apply to metropolitan statistical areas (MSAs)—more recently denoted as core based statistical areas (CBSAs) by the Census Bureau—and depend on the population of the MSA (Appendix F) and the ozone levels monitored in or downwind of the MSA over the past three years (Appendix G). Based on this information, the minimum number of population-based SLAMS ozone monitoring sites is indicated below:

MSA	Number of Monitoring Sites Required
Omaha-Council Bluffs, NE-IA	2
Des Moines-West Des Moines, IA	1
Davenport-Moline-Rock Island, IA-IL	2
Cedar Rapids, IA	1
Waterloo-Cedar Falls, IA	1
Sioux City, IA-NE-SD	1

In Iowa, there is one SLAMS monitoring site for the Omaha-Council Bluffs MSA, two SLAMS monitoring sites for the Des Moines MSA, two SLAMS monitoring sites for the Davenport-

[1] For the convenience of the reader, relevant CFR sections are included in the appendices of this document. The CFR is updated continuously, for the latest version of the CFR see: CFR Title 40

[2] For examples of the way monitoring data is used to develop background concentrations for permitting activities, see the discussions of $PM_{2.5}$, NO_2 and SO_2 at: Modeling Memos

[3] The federal statute that requires baseline ambient air quality data in an area before initiating construction of a new "major source" of air pollution is a download here: US Code 2010

Moline-Rock Island MSA, one SLAMS monitoring site for the Cedar Rapids MSA, and one SLAMS monitoring site for the Waterloo-Cedar Falls MSA that fulfill the ozone monitoring requirements. The state of Iowa shares the responsibility for ozone monitoring in the Omaha-Council Bluffs MSA with Nebraska agencies, in the Sioux City MSA with South Dakota and Nebraska agencies, and in the Davenport-Moline-Rock Island MSA with Illinois agencies (Appendix H). Currently Nebraska agencies operate three SLAMS ozone sites in the Omaha, Nebraska MSA. Illinois agencies operate one SLAMS ozone site in Rock Island, Illinois which resides in the Davenport-Moline-Rock Island, IA-IL MSA. South Dakota operates one SLAMS site in the Sioux City, IA-NE-SD MSA.

In addition to population-based requirements, each state is required to operate one multi-pollutant NCore site. Year-round ozone monitoring is required at an NCore site. Iowa monitors for ozone at its NCore site in Davenport to meet this requirement.

EPA's AQI reporting requirements for ozone are reproduced in Appendix I. AQI reporting for ozone is required in MSAs with populations over 350,000. MSAs in this category include Omaha-Council Bluffs, Des Moines-West Des Moines, and Davenport-Moline-Rock Island (Appendix F). All Iowa ozone monitoring data, including data from each of these MSAs, is uploaded to EPA's AirNow[4] Real-Time Reporting System and included in the national ozone and AQI maps. Ozone concentration data and AQI values are publically available on EPA's AirData[5] web site a few days after the data is uploaded to EPA. The DNR regularly updates a list of dates when monitoring sites record AQIs greater than 100 on its web site[6]. AQI and real-time information is also available on the Polk County[7], Linn County[8] and State Hygienic Laboratory[9] websites.

There are no EPA requirements for collocated ozone monitoring. EPA's collocated monitoring requirements are indicated in Appendix J. A comparison of Iowa's monitoring network to these requirements is located in Appendix K.

The total number of ozone monitoring sites needed to support the basic monitoring objectives of public data reporting, air quality mapping, compliance, and understanding ozone related atmospheric processes includes more sites than these minimum numbers. All Iowa ozone monitors are listed in Appendix D and displayed in Appendix L.

Changes to the ozone network that are expected to occur before the submission of the next network plan are indicated in Appendix M**.** Iowa's current ozone monitoring network meets federal requirements and will continue to meet the requirements after the changes described in Appendix M occur.

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[4] EPA AirNow
[5] EPA Air Data
[6] Iowa DNR Air Monitoring
[7] Polk County Air Monitoring
[8] Linn County Air Monitoring
[9] SHL Real Time Data

$PM_{2.5}$ Monitoring Network Analysis

EPA's population-based monitoring requirements for $PM_{2.5}$ are contained in 40 CFR Part 58, Appendix D (reproduced in Appendix E). These requirements apply to metropolitan statistical areas (MSAs) and depend on the population of the MSA (Appendix F) and the $PM_{2.5}$ levels monitored in the MSA over the past three years (Appendix N). Based on this information, the minimum number of required population-based SLAMS $PM_{2.5}$ monitoring sites is indicated below:

MSA	Number of Monitoring Sites Required
Omaha-Council Bluffs, NE-IA	1
Des Moines-West Des Moines, IA	1
Davenport-Moline-Rock Island, IA-IL	0
Cedar Rapids, IA	0
Waterloo-Cedar Falls, IA	0
Iowa City, IA	0

Iowa operates filter samplers at SLAMS $PM_{2.5}$ monitoring sites in Des Moines (two sites), Davenport (two sites), Cedar Rapids (one site), Waterloo (one site), and Iowa City (one site). Iowa shares the responsibility for $PM_{2.5}$ monitoring in the Omaha-Council Bluffs MSA with Nebraska agencies, and in the Davenport-Moline-Rock Island MSA with Illinois agencies (Appendix H). Currently, four SLAMS $PM_{2.5}$ monitoring sites are operated by Nebraska in the Omaha-Council Bluffs MSA; and one SLAMS $PM_{2.5}$ monitoring site is operated by Illinois in the Davenport-Moline-Rock Island MSA (Appendix H).

In addition to population-based minimum requirements, 40 CFR Part 58 also specifies that each state operate at least one $PM_{2.5}$ monitoring site to measure background concentrations, and at least one site to measure regional transport of $PM_{2.5}$. A SLAMS background monitoring site is located at Emmetsburg in northwest Iowa, and SLAMS transport monitoring sites are located at Lake Sugema in Southeast Iowa and Viking Lake in Southwest Iowa.

40 CFR Part 58 indicates that population-oriented monitoring sites near industrial sources produce data that may be compared to the 24-hour $PM_{2.5}$ NAAQS, but not to the annual $PM_{2.5}$ NAAQS. The $PM_{2.5}$ monitoring sites near Chancy Park in Clinton, and Musser Park in Muscatine, are adjacent to industrial sources and are not comparable to the annual $PM_{2.5}$ NAAQS.

EPA's AQI reporting requirements for $PM_{2.5}$ are reproduced in Appendix I. AQI reporting is required in MSAs with required $PM_{2.5}$ monitors and populations over 350,000. MSA's in this population category include Omaha-Council Bluffs, Des Moines-West Des Moines, and Davenport-Moline-Rock Island (Appendix F). Nebraska provides real-time $PM_{2.5}$ data for the Omaha-Council Bluffs MSA; Iowa provides real-time $PM_{2.5}$ monitoring data for the Des Moines-West Des Moines, and Davenport-Moline-Rock Island MSAs. This real-time data is uploaded to

EPA's AirNow[10] Real-Time Reporting System and included in the national ozone and AQI maps. $PM_{2.5}$ data and AQI values from continuous and filter samplers are publically available on EPA's AirData[11] web site a few days after the data is uploaded to EPA. The DNR regularly updates a list of dates when monitoring sites record AQIs greater than 100 on its web site[12]. AQI and real-time information is also available on the Polk County[13], Linn County[14] and State Hygienic Laboratory[15] websites.

EPA's collocated monitoring requirements for $PM_{2.5}$ are indicated in Appendix J. Iowa's monitoring network meets these requirements (Appendix K).

40 CFR Part 58 specifies that the minimum frequency for manual $PM_{2.5}$ sampling at required SLAMS sites is one sample every three days. Required SLAMS sites with a 24-hour design value within 5% of the 24-hour $PM_{2.5}$ NAAQS (34 $\mu g/m^3$ to 36 $\mu g/m^3$) must assume a daily sampling schedule until the design value no longer meets the criteria for three consecutive years. The maximum 24-hour $PM_{2.5}$ design values recorded in the Iowa Network for the past three years are: 2015 (i.e. 2013-2015): 28 $\mu g/m^3$, 2016: 26 $\mu g/m^3$ and 2017: 23 $\mu g/m^3$.[16] No $PM_{2.5}$ samplers recorded design values from 34-36 $\mu g/m^3$ for the past three years.

In addition to these $PM_{2.5}$ monitoring requirements, EPA requires that each state operate at least one multi-pollutant NCore site (Appendix O). Continuous and filter-based $PM_{2.5}$ monitors as well as $PM_{2.5}$ chemical speciation samplers are required at each NCore site. Iowa operates these three types of $PM_{2.5}$ samplers at its NCore site in Davenport to meet this requirement.

EPA also requires CBSAs with a population of 1,000,000 or more persons to collocate at least one $PM_{2.5}$ monitor at a near-road NO_2 station (Appendix P). Iowa does not contain or share any MSAs with populations this large, so additional near-road monitors are not required.

The total number of $PM_{2.5}$ monitoring sites needed to support the basic monitoring objectives of public data reporting, air quality mapping, compliance, and understanding $PM_{2.5}$-related atmospheric processes includes more sites than these minimum numbers. Iowa's complete $PM_{2.5}$ monitoring network is listed in Appendix D and displayed in Appendix L. Note: The map of speciation sites in Appendix L includes sites where the full suite of $PM_{2.5}$ speciation measurements (metals, ions and carbon) are performed on filter samples. Changes to monitors in the SLAMS and SPM $PM_{2.5}$ network that are expected to occur before the submission of the next network plan are detailed in Appendix M**.** Iowa's current $PM_{2.5}$ monitoring network meets federal requirements and will continue to meet the requirements after the changes described in Appendix M occur.

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[10] EPA AirNow
[11] EPA Air Data
[12] Iowa DNR Air Monitoring
[13] Polk County Air Monitoring
[14] Linn County Air Monitoring
[15] SHL Real Time Data
[16] See: Iowa $PM_{2.5}$ Design Values (PDF Downloads) for 2015, 2016 and 2017

PM_{10} Monitoring Network Analysis

EPA's population-based monitoring requirements for PM_{10} are reproduced in Appendix E. These requirements apply to metropolitan statistical areas (MSAs) and depend on the population of the MSA (Appendix F) and PM_{10} levels in the MSA (Appendix Q). Based on this information, the minimum numbers of population-based SLAMS PM_{10} monitoring sites is indicated below:

MSA	Number of Monitoring Sites Required
Omaha-Council Bluffs, NE-IA	2-4
Des Moines-West Des Moines, IA	1-2
Davenport-Moline-Rock Island, IA-IL	1-2
Cedar Rapids, IA	0-1
Waterloo-Cedar Falls, IA	0
Sioux City, IA-NE-SD	0
Iowa City, IA	0

Iowa operates one SLAMS PM_{10} monitoring site in the Des Moines-West Des Moines MSA, two in the Davenport-Moline-Rock Island MSA, and one in the Cedar Rapids MSA. Iowa shares the responsibility for PM_{10} monitoring in the Omaha-Council Bluffs MSA with Nebraska agencies, and in the Davenport-Moline-Rock Island MSA with Illinois agencies (Appendix H). Currently four SLAMS PM_{10} sites are operated by Nebraska in the Omaha MSA, and no SLAMS PM_{10} monitors are operated by Illinois in the Davenport-Moline-Rock Island MSA.

In addition to population-oriented PM_{10} monitoring requirements, EPA requires that each State operate at least one multi-pollutant NCore site (Appendix O). PM_{10} samplers are required at each NCore site. Iowa operates a PM_{10} sampler at its NCore site in Davenport to meet this requirement.

EPA's AQI reporting requirements for PM_{10} are reproduced in Appendix I. AQI reporting is required in MSAs with required PM_{10} monitors and populations over 350,000. MSA's in this category include Omaha-Council Bluffs, Des Moines-West Des Moines, and Davenport-Moline-Rock Island (Appendix F)**.** Nebraska provides real-time PM_{10} data for the Omaha-Council Bluffs MSA. Iowa has only one site that produces real-time PM_{10} monitoring data. It is located near Buffalo inside the Davenport-Moline-Rock Island MSA. A graph of the real-time data from this site is publically available on the SHL website[17]. The AQI associated with PM_{10} data from all filter samplers, including data from monitoring sites in each of the three MSA's, is publically available on EPA's AirData[18] web site a few days after the data is uploaded to EPA. The DNR regularly updates a list of dates when monitoring sites recorded AQIs greater than 100 on its web site[19].

[17] SHL Real Time Data
[18] EPA Air Data
[19] Iowa DNR Air Monitoring

EPA's collocated monitoring requirements for PM_{10} are indicated in Appendix J. Iowa's monitoring network meets these requirements (Appendix K).

Iowa's complete PM_{10} monitoring network is listed in Appendix D and displayed in Appendix L**.** Changes to monitors in the SLAMS and SPM PM_{10} network that are expected to occur before the submission of the next network plan are detailed in Appendix M**.** Iowa's current PM_{10} monitoring network meets federal requirements and will continue to meet the requirements after the changes described in Appendix M occur.

Sulfur Dioxide Monitoring Network Analysis

Federal requirements for SO_2 monitoring are reproduced in Appendix R and Appendix S. These rules require monitors in populated areas with high SO_2 emissions as well as characterizing the SO_2 levels around large sources (>2,000 tons per year) with either monitoring or modeling data.

To implement the populated area requirements EPA uses the population weighted emissions index (PWEI) to determine if SO_2 monitoring is required in an MSA. The PWEI is calculated by multiplying the population of the MSA by the total tons of SO_2 emissions in the MSA and dividing by 1,000,000. The PWEI for Iowa Metropolitan Statistical Areas is computed in Appendix T. Based on this information, the minimum number of SLAMS SO_2 monitoring sites for Iowa MSAs where monitoring is required are indicated below:

MSA	Number of Monitoring Sites Required
Omaha-Council Bluffs, NE-IA	1

Nebraska's NCORE site (AQS ID 310550019) is located in Omaha and the required SO_2 monitor at this location fulfills this PWEI requirement.

After a new NAAQS is promulgated, states are required to designate the attainment status of the counties of their state relative to the new NAAQS. In the case of the 1 hour SO_2 NAAQS finalized on 6/22/2010, the size of the national SO_2 monitoring network was deemed too small to establish whether or not ambient SO_2 levels near large SO_2 emitters would meet the new more stringent 1 hour standard. On 8/21/2015, EPA finalized a rule (known as the Data Requirements Rule or "DRR") to clarify states responsibilities in establishing the NAAQS attainment near large SO_2 emitters (Appendix S). As defined in this rule, a large SO_2 emitter is defined as one that emits more than 2,000 tons per year (tpy) of SO_2. Under the provisions of the DRR, these large sources must either take permit limits to reduce their emissions below the 2,000 tpy threshold, or establish the attainment status near the source by performing ambient air monitoring or dispersion modeling.

According to deadlines of the DRR, the State was required to send its list of facilities that emit over 2,000 tpy to EPA by January 15, 2016 and indicate whether monitoring, modeling or

emissions limits will be used to comply with the rule by July 1, 2016. Monitoring required under the rule needed to be initiated by January 1, 2017. Emissions limits reducing facility emissions below the 2,000 tpy threshold needed to be in place by January 13, 2017. Dispersion modeling required under the rule needed to be submitted to EPA by January 13, 2017.

DNR sent its list of affected facilities to EPA on December 15, 2015, and indicated its choice of compliance method for each affected facility in a letter to EPA on June 20, 2016.[20] No Iowa facilities opted to use monitoring to comply with the DRR. In the Omaha-Council Bluffs MSA, there was a facility subject to the DRR on the Nebraska side that opted for monitoring. The Nebraska DEQ /Douglas County Health Department sited a monitor to establish the attainment status near this facility (OPPD North Omaha Power station), and began operation of a SLAMs SO_2 site (AQS ID 310550057) near the facility in 2017. The Iowa DNR[21] and EPA[22] exchanged technical analyses, and EPA posted designations under the DRR rule in December 2017.[23]

In addition to the PWEI-based and large source monitoring requirements, sulfur dioxide is included in the suite of pollutants to be monitored at EPA National Core (NCore) monitoring sites. Iowa operates a sulfur dioxide analyzer at its NCore site in Davenport to meet this requirement.

EPA's AQI reporting requirements for SO_2 are reproduced in Appendix I. AQI reporting is required in MSAs with required SO_2 monitors and populations over 350,000. MSAs in this population category include Omaha-Council Bluffs, Des Moines-West Des Moines, and Davenport-Moline-Rock Island (Appendix F). As indicated above, there are requirements for SO_2 monitors in Omaha and Davenport, but not in Des Moines. Nebraska provides real-time SO_2 data for the Omaha-Council Bluffs MSA; Iowa provides real-time SO_2 monitoring data for the Davenport-Moline-Rock Island MSA. This real-time data is uploaded to EPA's AirNow[24] Real-Time Reporting System. SO_2 concentration data and AQI values are publically available on EPA's AirData[25] web site a few days after the data is uploaded to EPA. The DNR regularly updates a list of dates when monitoring sites recorded AQIs greater than 100 on its web site[26]. AQI and real-time information is also available on the Polk County[27], Linn County[28] and State Hygienic Laboratory[29] websites.

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[20] Iowa Source Characterization Download PDF
[21] Iowa Technical Support Download PDF
[22] EPA Round 3 Designations Download PDF
[23] EPA Final SO2 Designations Download PDF
[24] EPA AirNow
[25] EPA Air Data
[26] Iowa DNR Air Monitoring
[27] Polk County Air Monitoring
[28] Linn County Air Monitoring
[29] SHL Real Time Data

There are no EPA requirements for collocated SO_2 monitoring. EPA's collocated monitoring requirements are indicated in Appendix J. A comparison of Iowa's monitoring network to these requirements is located in Appendix K.

Existing SO_2 monitors are listed in Appendix D and displayed in Appendix L. There are no planned reductions to the SLAMS monitoring network for sulfur dioxide scheduled before submission of the next network plan. Changes to SPM monitors in the SO_2 network that are anticipated before the submission of the next network plan are indicated in Appendix M. Iowa's current SO_2 monitoring network meets federal requirements and will continue to meet the requirements after the changes described in Appendix M occur.

Nitrogen Dioxide Monitoring Network Analysis

On January 22, 2010, the U.S. Environmental Protection Agency revised the nitrogen dioxide (NO_2) NAAQS. The new NAAQS included population-based monitoring requirements and traffic-based (near-road) monitoring requirements.

EPA's population-based NO_2 monitoring requirements are reproduced in Appendix E. EPA requires one monitor in any CBSA with a population of more than 1 million in order to measure community-wide concentrations. Iowa does not contain or share any MSAs with populations this large and these monitors are not required.

EPA's updated near-road based NO_2 monitoring requirements are reproduced in Appendix P. There are no near-road monitors required in Iowa based on the updated federal requirements. At NCore sites, EPA requires NO_y instead of NO_2 monitoring in order to quantify more of the oxidation products of NO. These additional oxidation products are relevant to secondary formation of ozone and $PM_{2.5}$.

There are currently no minimum federal requirements for NO_2 monitors applicable to Iowa, and there are no monitors designated as SLAMS monitors in the Iowa network. SPM NO_2 monitors are operated to provide a general knowledge of pollutant levels and to support permitting activities.

EPA's AQI reporting requirements for NO_2 are reproduced in Appendix I. As indicated above, Iowa does not contain or share any MSAs that require NO_2 monitoring. AQI reporting is required in MSAs with required NO_2 monitors and populations over 350,000. Iowa provides real-time NO_2 monitoring data for the Des Moines-West Des Moines MSA and at a background site near Lake Sugema in the southeast corner of the state. This real-time data is uploaded to EPA's AirNow[30] Real-Time Reporting System. NO_2 concentration data and the AQI are publically available on EPA's AirData[31] web site a few days after the data is uploaded to EPA. The DNR

[30] EPA AirNow
[31] EPA Air Data

regularly updates a list of dates and locations of recorded AQIs greater than 100 on its web site[32]. AQI information is also available on the Polk County[33], Linn County[34] and State Hygienic Laboratory[35] websites.

There are no EPA requirements for collocated NO_2 monitoring. EPA's collocated monitoring requirements are indicated in Appendix J. A comparison of Iowa's monitoring network to these requirements is located in Appendix K.

NO_2 monitors are listed in Appendix D and displayed in Appendix L. Changes to SPM monitors that are anticipated before the submission of the next network plan are indicated in Appendix M. Iowa's current NO_2 monitoring network meets federal requirements and will continue to meet the requirements after the changes described in Appendix M occur.

Carbon Monoxide Monitoring Network Analysis

EPA requires that each State operate at least one multi-pollutant NCore site (Appendix O). Carbon monoxide monitoring is required at each NCore site. Iowa operates a carbon monoxide monitor at its NCore site in Davenport to meet this requirement.

EPA also requires CBSA's with a population of 1,000,000 or more persons to collocate at least one CO monitor at a near-road NO_2 station (Appendix P). Iowa does not contain or share any MSAs with populations this large, so these near-road CO monitors are not required.

EPA's AQI reporting requirements for CO are reproduced in Appendix I. AQI reporting is required in MSAs with required CO monitors and populations over 350,000. MSAs in this population category include Omaha-Council Bluffs, Des Moines-West Des Moines, and Davenport-Moline-Rock Island (Appendix F)**.** Nebraska provides real-time CO data for the Omaha-Council Bluffs MSA; Iowa provides real-time CO monitoring data for the Des Moines-West Des Moines, and Davenport-Moline-Rock Island MSAs. This real-time data is uploaded to EPA's AirNow[36] Real-Time Reporting System. CO data and the AQI are publically available on EPA's AirData[37] web site a few days after the data is uploaded to EPA. The DNR regularly updates a list of dates when monitoring sites recorded AQIs greater than 100 on its web site[38]. AQI information is also available on the Polk County[39], Linn County[40] and State Hygienic Laboratory[41] websites.

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[32] Iowa DNR Air Monitoring
[33] Polk County Air Monitoring
[34] Linn County Air Monitoring
[35] SHL Real Time Data
[36] EPA AirNow
[37] EPA Air Data
[38] Iowa DNR Air Monitoring
[39] Polk County Air Monitoring
[40] Linn County Air Monitoring
[41] SHL Real Time Data

There are no EPA requirements for collocated CO monitoring. EPA's collocated monitoring requirements are indicated in Appendix J. A comparison of Iowa's monitoring network to these requirements is located in Appendix K.

Iowa's carbon monoxide monitors are listed in Appendix D and displayed in Appendix L. There are no planned reductions to the SLAMS monitoring network for carbon monoxide scheduled before submission of the next network plan. Changes to SPM monitors in the CO network that are anticipated before the submission of the next network plan are indicated in Appendix M. Iowa's current carbon monoxide monitoring network meets federal requirements and will continue to meet the requirements after the changes described in Appendix M occur.

Toxics Monitoring Network Analysis

There are no federal requirements for minimum numbers of air toxics sites contained in 40 CFR Part 58.

Iowa currently operates five SPM air toxics sites. Details concerning Iowa's air toxics network are contained in Appendix D and displayed in Appendix L. Changes to SPM monitors in the toxics network that are anticipated before the submission of the next network plan are indicated in Appendix M.

NCore Monitoring Network Analysis

Requirements for a multi-pollutant "NCore" site are contained in 40 CFR Part 58, and reproduced in Appendix O. The Department operates an NCore site at Jefferson School in Davenport (AQS ID 191630015) to meet this requirement.

Lead Monitoring Network Analysis

EPA requires source-oriented SLAMS lead monitoring near industries that emit over 0.5 tons per year (tpy) of lead. The rule allows for a waiver of monitoring requirements if air dispersion modeling predicts ambient air concentrations less than half the NAAQS. These waivers must be renewed as an element of each State's five-year network assessment. Current federal lead monitoring rules are reproduced in Appendix U.

According to the Department's latest (2016 NEI) emissions estimates (Appendix V), there are no facilities in Iowa with lead emissions of 0.5 tpy or greater.

Historically the lead emissions from MidAmerican Energy Company - Walter Scott Jr Energy Center have been close to the 0.5 tpy threshold. Based on dispersion modeling results, EPA granted a waiver of monitoring requirements for this facility in Iowa's 2012 Network Plan and in

its 2015 5-Year Network Assessment[42]. The most recent 2016 emissions estimate for the facility is 0.295 tpy (Appendix V), so the waiver of monitoring requirements is no longer needed.

The Department sited a SLAMS lead monitoring site near Griffin Pipe in 2009. The site recorded levels over the National Ambient Air Quality Standard (NAAQS) for lead in 2010 and 2012. The area around Griffin Pipe was declared a non-attainment area by EPA late in 2011.[43] The Griffin Pipe Plant was closed indefinitely in May of 2014, after acquisition of Griffin Pipe by American Pipe.[44] The DNR submitted a State Implementation Plan (SIP) in January 2015 that provides for ongoing attainment of the lead NAAQS by establishing federally enforceable permit limits at Griffin Pipe (should it reopen[45]) and a nearby facility, Alter Metal Recycling. [46] The most recent lead data from the site indicates attainment with the NAAQS for the 2015-2017 period, with a monitored level for the period that is about 47% of the NAAQS. On 7/19/2017, the Department sent EPA a request to redesignate the area as attainment, which is under consideration by EPA.[47]

EPA's collocated monitoring requirements for lead are indicated in Appendix J. Iowa's monitoring network meets these requirements (Appendix K).

The location of Iowa's lead monitor is listed in Appendix D and displayed in Appendix L. There are no planned reductions to the SLAMS monitoring network for lead scheduled before submission of the next network plan. Iowa's current lead monitoring network meets federal requirements and will continue to meet the requirements after the changes described in Appendix M occur.

[42] Iowa DNR Air Monitoring
[43] Federal Register Lead Designations
[44] Foundry Magazine Article Griffin Pipe
[45] NonPareil Article 1/30/2016
[46] Iowa Lead SIP Download PDF
[47] EPA Iowa SIP Status

Appendix A: Federal Requirements for Annual Network Plans & Completion

40 CFR Part 58, § 58.10 Annual monitoring network plan and periodic network assessment.

(a)(1) Beginning July 1, 2007, the state, or where applicable local, agency shall submit to the Regional Administrator an annual monitoring network plan which shall provide for the documentation of the establishment and maintenance of an air quality surveillance system that consists of a network of SLAMS monitoring stations that can include FRM, FEM, and ARM monitors that are part of SLAMS, NCore, CSN, PAMS, and SPM stations. The plan shall include a statement of whether the operation of each monitor meets the requirements of appendices A, B, C, D, and E of this part, where applicable. The Regional Administrator may require additional information in support of this statement. The annual monitoring network plan must be made available for public inspection and comment for at least 30 days prior to submission to the EPA and the submitted plan shall include and address, as appropriate, any received comments.

(2) Any annual monitoring network plan that proposes network modifications (including new or discontinued monitoring sites, new determinations that data are not of sufficient quality to be compared to the NAAQS, and changes in identification of monitors as suitable or not suitable for comparison against the annual PM2.5 NAAQS) to SLAMS networks is subject to the approval of the EPA Regional Administrator, who shall approve or disapprove the plan within 120 days of submission of a complete plan to the EPA.

(3) The plan for establishing required NCore multipollutant stations shall be submitted to the Administrator not later than July 1, 2009. The plan shall provide for all required stations to be operational by January 1, 2011.

(4) A plan for establishing source-oriented Pb monitoring sites in accordance with the requirements of appendix D to this part for Pb sources emitting 1.0 tpy or greater shall be submitted to the EPA Regional Administrator no later than July 1, 2009, as part of the annual network plan required in paragraph (a)(1) of this section. The plan shall provide for the required source-oriented Pb monitoring sites for Pb sources emitting 1.0 tpy or greater to be operational by January 1, 2010. A plan for establishing source-oriented Pb monitoring sites in accordance with the requirements of appendix D to this part for Pb sources emitting equal to or greater than 0.50 tpy but less than 1.0 tpy shall be submitted to the EPA Regional Administrator no later than July 1, 2011. The plan shall provide for the required source-oriented Pb monitoring sites for Pb sources emitting equal to or greater than 0.50 tpy but less than 1.0 tpy to be operational by December 27, 2011.

(5)(i) A plan for establishing or identifying an area-wide NO2 monitor, in accordance with the requirements of Appendix D, section 4.3.3 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2012. The plan shall provide for these required monitors to be operational by January 1, 2013.

(ii) A plan for establishing or identifying any NO2 monitor intended to characterize vulnerable and susceptible populations, as required in Appendix D, section 4.3.4 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2012. The plan shall provide for these required monitors to be operational by January 1, 2013.

(iii) A plan for establishing a single near-road NO2 monitor in CBSAs having 1,000,000 or more persons, in accordance with the requirements of Appendix D, section 4.3.2 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2013. The plan shall provide for these required monitors to be operational by January 1, 2014.

(iv) A plan for establishing a second near-road NO2 monitor in any CBSA with a population of 2,500,000 persons or more, or a second monitor in any CBSA with a population of 1,000,000 or more persons that has one or more roadway segments with 250,000 or greater AADT counts, in accordance with the requirements of appendix D, section 4.3.2 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2014. The plan shall provide for these required monitors to be operational by January 1, 2015.

(6) A plan for establishing SO2 monitoring sites in accordance with the requirements of appendix D to this part shall be submitted to the EPA Regional Administrator by July 1, 2011 as part of the annual network plan required in paragraph (a) (1). The plan shall provide for all required SO2 monitoring sites to be operational by January 1, 2013.

(7) A plan for establishing CO monitoring sites in accordance with the requirements of appendix D to this part shall be submitted to the EPA Regional Administrator. Plans for required CO monitors shall be submitted at least six months prior to the date such monitors must be established as required by section 58.13.

(8)(i) A plan for establishing near-road PM2.5 monitoring sites in CBSAs having 2.5 million or more persons, in accordance with the requirements of appendix D to this part, shall be submitted as part of the annual monitoring network plan to the EPA Regional Administrator by July 1, 2014. The plan shall provide for these required monitoring stations to be operational by January 1, 2015.

(ii) A plan for establishing near-road PM2.5 monitoring sites in CBSAs having 1 million or more persons, but less than 2.5 million persons, in accordance with the requirements of appendix D to this part, shall be submitted as part of the annual monitoring network plan to the EPA Regional Administrator by July 1, 2016. The plan shall provide for these required monitoring stations to be operational by January 1, 2017.

(9) The annual monitoring network plan shall provide for the required O3 sites to be operating on the first day of the applicable required O3 monitoring season in effect on January 1, 2017 as listed in Table D-3 of appendix D of this part.

(10) A plan for making Photochemical Assessment Monitoring Stations (PAMS) measurements, if applicable, in accordance with the requirements of appendix D paragraph 5(a) of this part shall be submitted to the EPA Regional Administrator no later than July 1, 2018. The plan shall provide for the required PAMS measurements to begin by June 1, 2019.

(11) An Enhanced Monitoring Plan for O3, if applicable, in accordance with the requirements of appendix D paragraph 5(h) of this part shall be submitted to the EPA Regional Administrator no later than October 1, 2019 or two years following the effective date of a designation to a classification of Moderate or above O3 nonattainment, whichever is later.

(12) A detailed description of the PAMS network being operated in accordance with the requirements of appendix D to this part shall be submitted as part of the annual monitoring network plan for review by the EPA Administrator. The PAMS Network Description described in section 5 of appendix D may be used to meet this requirement.

(b) The annual monitoring network plan must contain the following information for each existing and proposed site:

(1) The AQS site identification number.

(2) The location, including street address and geographical coordinates.

(3) The sampling and analysis method(s) for each measured parameter.

(4) The operating schedules for each monitor.

(5) Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal.

(6) The monitoring objective and spatial scale of representativeness for each monitor as defined in appendix D to this part.

(7) The identification of any sites that are suitable and sites that are not suitable for comparison against the annual PM2.5 NAAQS as described in §58.30.

(8) The MSA, CBSA, CSA or other area represented by the monitor.

(9) The designation of any Pb monitors as either source-oriented or non-source-oriented according to Appendix D to 40 CFR part 58.

(10) Any source-oriented monitors for which a waiver has been requested or granted by the EPA Regional Administrator as allowed for under paragraph 4.5(a)(ii) of Appendix D to 40 CFR part 58.

(11) Any source-oriented or non-source-oriented site for which a waiver has been requested or granted by the EPA Regional Administrator for the use of Pb-PM10 monitoring in lieu of Pb-TSP monitoring as allowed for under paragraph 2.10 of Appendix C to 40 CFR part 58.

(12) The identification of required NO2 monitors as near-road, area-wide, or vulnerable and susceptible population monitors in accordance with Appendix D, section 4.3 of this part.

(13) The identification of any PM2.5 FEMs and/or ARMs used in the monitoring agency's network where the data are not of sufficient quality such that data are not to be compared to the NAAQS. For required SLAMS where the agency identifies that the PM2.5 Class III FEM or ARM does not produce data of sufficient quality for comparison to the NAAQS, the monitoring agency must

ensure that an operating FRM or filter-based FEM meeting the sample frequency requirements described in §58.12 or other Class III PM2.5 FEM or ARM with data of sufficient quality is operating and reporting data to meet the network design criteria described in appendix D to this part.

(c) The annual monitoring network plan must document how state and local agencies provide for the review of changes to a PM2.5 monitoring network that impact the location of a violating PM2.5 monitor. The affected state or local agency must document the process for obtaining public comment and include any comments received through the public notification process within their submitted plan.

(d) The state, or where applicable local, agency shall perform and submit to the EPA Regional Administrator an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in appendix D to this part, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and whether new technologies are appropriate for incorporation into the ambient air monitoring network. The network assessment must consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals (e.g., children with asthma), and, for any sites that are being proposed for discontinuance, the effect on data users other than the agency itself, such as nearby states and tribes or health effects studies. The state, or where applicable local, agency must submit a copy of this 5-year assessment, along with a revised annual network plan, to the Regional Administrator. The assessments are due every five years beginning July 1, 2010.

(e) All proposed additions and discontinuations of SLAMS monitors in annual monitoring network plans and periodic network assessments are subject to approval according to §58.14.

[71 FR 61298, Oct. 17, 2006, as amended at 72 FR 32210, June 12, 2007; 73 FR 67059, Nov. 12, 2008; 73 FR 77517, Dec. 19, 2008; 75 FR 6534, Feb. 9, 2010; 75 FR 35601, June 22, 2010; 75 FR 81137, Dec. 27, 2010; 76 FR 54341, Aug. 31, 2011; 78 FR 16188, Mar. 14, 2013; 78 FR 3282, Jan. 15, 2013; 80 FR 65466, Oct. 26, 2015; 81 FR 17279, Mar. 28, 2016; 81 FR 96388, Dec. 30, 2016]

…

40 CFR Part 58, § 58.13 Monitoring network completion.

(a) The network of NCore multipollutant sites must be physically established no later than January 1, 2011, and at that time, operating under all of the requirements of this part, including the requirements of appendices A, C, D, E, and G to this part. NCore sites required to conduct Pb monitoring as required under 40 CFR part 58 appendix D paragraph 3(b), or approved alternative non-source-oriented Pb monitoring sites, shall begin Pb monitoring in accordance with all of the requirements of this part, including the requirements of appendices A, C, D, E, and G to this part no later than December 27, 2011.

(b) Not withstanding specific dates included in this part, beginning January 1, 2008, when existing networks are not in conformance with the minimum number of required monitors specified in this part, additional required monitors must be identified in the next applicable annual monitoring network plan, with monitoring operation beginning by January 1 of the following year. To allow sufficient time to prepare and comment on Annual Monitoring Network Plans, only monitoring requirements effective 120 days prior to the required submission date of the plan (i.e., 120 days prior to July 1 of each year) shall be included in that year's annual monitoring network plan.

(c) The NO_2 monitors required under Appendix D, section 4.3 of this part must be physically established and operating under all of the requirements of this part, including the requirements of appendices A, C, D, and E to this part, no later than:

(1) January 1, 2013, for area-wide NO_2 monitors required in Appendix D, section 4.3.3;

(2) January 1, 2013, for NO_2 monitors intended to characterize vulnerable and susceptible populations that are required in Appendix D, section 4.3.4;

(3) January 1, 2014, for an initial near-road NO_2 monitor in CBSAs having 1,000,000 million or more persons that is required in Appendix D, section 4.3.2;

(4) January 1, 2015, for a second near-road NO_2 monitor in CBSAs that have a population of 2,500,000 or more persons or a second monitor in any CBSA with a population of 1,000,000 or more persons that has one or more roadway segments with 250,000 or greater AADT counts that is required in appendix D, section 4.3.2.

(d) The network of SO2 monitors must be physically established no later than January 1, 2013, and at that time, must be operating under all of the requirements of this part, including the requirements of appendices A, C, D, and E to this part.

(e) The CO monitors required under Appendix D, section 4.2 of this part must be physically established and operating under all of the requirements of this part, including the requirements of appendices A, C, D, and E to this part, no later than:

(1) January 1, 2015 for CO monitors in CBSAs having 2.5 million persons or more; or

(2) January 1, 2017 for other CO monitors.

(f) PM2.5 monitors required in near-road environments as described in appendix D to this part, must be physically established and operating under all of the requirements of this part, including the requirements of appendices A, C, D, and E to this part, no later than:

(1) January 1, 2015 for PM2.5 monitors in CBSAs having 2.5 million persons or more; or

(2) January 1, 2017 for PM2.5 monitors in CBSAs having 1 million or more, but less than 2.5 million persons.

(g) The O3 monitors required under appendix D, section 4.1 of this part must operate on the first day of the applicable required O3 monitoring season in effect January 1, 2017.

(h) The Photochemical Assessment Monitoring sites required under 40 CFR part 58 Appendix D, section 5(a) must be physically established and operating under all of the requirements of this part, including the requirements of appendix A, C, D, and E of this part, no later than June 1, 2019.

[71 FR 61298, Oct. 17, 2006, as amended at 73 FR 67059, Nov. 12, 2008; 75 FR 6534, Feb. 9, 2010; 75 FR 35601, June 22, 2010; 75 FR 81137, Dec. 27, 2010; 76 FR 54341, Aug. 31, 2011; 78 FR 16188, Mar. 14, 2013; 78 FR 3283, Jan. 15, 2013; 80 FR 65466, Oct. 26, 2015; 81 FR 96388, Dec. 30, 2016]

Appendix B: SLAMS Network Modification

40 CFR Part 58, § 58.14 System modification.

(a) The state, or where appropriate local, agency shall develop a network modification plan and schedule to modify the ambient air quality monitoring network that addresses the findings of the network assessment required every 5 years by §58.10(d). The network modification plan shall be submitted as part of the Annual Monitoring Network Plan that is due no later than the year after submittal of the network assessment.

(b) Nothing in this section shall preclude the State, or where appropriate local, agency from making modifications to the SLAMS network for reasons other than those resulting from the periodic network assessments. These modifications must be reviewed and approved by the Regional Administrator. Each monitoring network may make or be required to make changes between the 5-year assessment periods, including for example, site relocations or the addition of PAMS networks in bumped-up ozone nonattainment areas. These modifications must address changes invoked by a new census and changes due to changing air quality levels. The State, or where appropriate local, agency shall provide written communication describing the network changes to the Regional Administrator for review and approval as these changes are identified.

(c) State, or where appropriate, local agency requests for SLAMS monitor station discontinuation, subject to the review of the Regional Administrator, will be approved if any of the following criteria are met and if the requirements of appendix D to this part, if any, continue to be met. Other requests for discontinuation may also be approved on a case-by-case basis if discontinuance does not compromise data collection needed for implementation of a NAAQS and if the requirements of appendix D to this part, if any, continue to be met.

(1) Any PM2.5, O3, CO, PM10, SO2, Pb, or NO2 SLAMS monitor which has shown attainment during the previous five years, that has a probability of less than 10 percent of exceeding 80 percent of the applicable NAAQS during the next three years based on the levels, trends, and variability observed in the past, and which is not specifically required by an attainment plan or maintenance plan. In a nonattainment or maintenance area, if the most recent attainment or maintenance plan adopted by the State and approved by EPA contains a contingency measure to be triggered by an air quality concentration and the monitor to be discontinued is the only SLAMS monitor operating in the nonattainment or maintenance area, the monitor may not be discontinued.

(2) Any SLAMS monitor for CO, PM10, SO2, or NO2 which has consistently measured lower concentrations than another monitor for the same pollutant in the same county (or portion of a county within a distinct attainment area, nonattainment area, or maintenance area, as applicable) during the previous five years, and which is not specifically required by an attainment plan or maintenance plan, if control measures scheduled to be implemented or discontinued during the next five years would apply to the areas around both monitors and have similar effects on measured concentrations, such that the retained monitor would remain the higher reading of the two monitors being compared.

(3) For any pollutant, any SLAMS monitor in a county (or portion of a county within a distinct attainment, nonattainment, or maintenance area, as applicable) provided the monitor has not measured violations of the applicable NAAQS in the previous five years, and the approved SIP provides for a specific, reproducible approach to representing the air quality of the affected county in the absence of actual monitoring data.

(4) A PM2.5 SLAMS monitor which EPA has determined cannot be compared to the relevant NAAQS because of the siting of the monitor, in accordance with §58.30.

(5) A SLAMS monitor that is designed to measure concentrations upwind of an urban area for purposes of characterizing transport into the area and that has not recorded violations of the relevant NAAQS in the previous five years, if discontinuation of the monitor is tied to start-up of another station also characterizing transport.

(6) A SLAMS monitor not eligible for removal under any of the criteria in paragraphs (c)(1) through (c)(5) of this section may be moved to a nearby location with the same scale of representation if logistical problems beyond the State's control make it impossible to continue operation at its current site.

[71 FR 61298, Oct. 17, 2006, as amended at 81 FR 17280, Mar. 28, 2016]

Appendix C: 2017 Iowa Ambient Air Monitoring Sites

City	Site	Address	County	MSA	Latitude	Longitude	AQS Site ID	Responsible Agency
Buffalo	Linwood Mining	11100 110th Ave.	Scott	DMR	41.46724	-90.68845	191630017	DNR
Cedar Rapids	Public Health	500 11th St. NW	Linn	CDR	41.97677	-91.68766	191130040	Linn Local Prog.
Cedar Rapids	Tait Cummins Park (Prairie Creek)	3000 C Street SW	Linn	CDR	41.94867	-91.63954	191130041	Linn Local Prog.
Clinton	Chancy Park	23rd & Camanche	Clinton	-	41.82328	-90.21198	190450019	DNR
Clinton	Rainbow Park	Roosevelt St.	Clinton	-	41.875	-90.17757	190450021	DNR
Clive	Indian Hills Jr. High School	9401 Indian Hills	Polk	DSM	41.60352	-93.7479	191532510	Polk Local Prog.
Coggon	Coggon Elementary School	408 E Linn St.	Linn	CDR	42.28056	-91.52694	191130033	Linn Local Prog.
Council Bluffs	Franklin School	3130 C Ave.	Pottawattamie	OMC	41.26417	-95.89612	191550009	DNR
Council Bluffs	Griffin Pipe	8th Avenue and 27th St	Pottawattamie	OMC	41.25425	-95.88725	191550011	DNR
Davenport	Jefferson School	10th St. & Vine St.	Scott	DMR	41.53001	-90.58761	191630015	DNR
Davenport	Hayes School	622 South Concord St	Scott	DMR	41.51208	-90.62404	191630020	DNR
Des Moines	Health Dept.	1907 Carpenter	Polk	DSM	41.60318	-93.6433	191530030	Polk Local Prog.
Emmetsburg	Iowa Lakes College	Iowa Lakes Community College	Palo Alto	-	43.1237	-94.69352	191471002	DNR
Iowa City	Hoover School	2200 East Court	Johnson	IAC	41.65723	-91.50348	191032001	DNR
Keokuk	Fire Station	111S. 13th St.	Lee	-	40.40096	-91.39101	191110008	DNR
Mason City	Holcim Cement	17th St. & Washington St.	Cerro Gordo	-	43.16944	-93.20243	190330018	DNR
Muscatine	Greenwood Cemetery	Fletcher St. & Kimble St.	Muscatine	-	41.41943	-91.07098	191390016	DNR
Muscatine	Musser Park	Oregon St. & Earl Ave.	Muscatine	-	41.4069	-91.0616	191390020	DNR
Muscatine	Muscatine HS, East Campus Roof	1409 Wisconsin	Muscatine	-	41.40095	-91.06781	191390015	DNR
Muscatine	Muscatine HS, East Campus Trailer	1409 Wisconsin	Muscatine	-	41.40145	-91.06845	191390019	DNR
Pisgah	Forestry Office	206 Polk St.	Harrison	OMC	41.83226	-95.92819	190850007	DNR
Sheldahl	Southern Crossroads	15795 NW 58th St	Polk	DSM	41.84943	-93.69762	191531579	Polk Local Prog.
Sioux City	Irving School	901 Floyd Blvd.	Woodbury	SXC	42.499844	-96.394755	191930021	DNR
Waterloo	Water Tower	Vine St. & Steely	Black Hawk	WTL	42.50154	-92.31602	190130009	DNR
Waverly	Waverly Airport	Waverly Airport	Bremer	WTL	42.74117	-92.51285	190170011	DNR
-	Lake Sugema	24430 Lacey Trl, Keosauqua	Van Buren	-	40.69508	-92.00632	191770006	DNR
-	Scott County Park	Scott County Park	Scott	DMR	41.69917	-90.52194	191630014	DNR
-	Viking Lake State Park	2780 Viking Lake Road	Montgomery	-	40.96911	-95.04495	191370002	DNR

Site Table Definitions:

City – the city closest to the monitor location.

Site – the name of the monitoring site.

Address – an intersection or street address close to the monitoring site.

County – the county where the monitoring site resides.

MSA – Metropolitan Statistical Area. Iowa's Metropolitan Statistical Areas (MSAs) according to August 1, 2015 U.S. Census Bureau estimates:

U.S. Census Geographic area	Abbreviation
Omaha-Council Bluffs, NE-IA	OMC
Des Moines-West Des Moines, IA	DSM
Davenport-Moline-Rock Island, IA-IL	DMR
Cedar Rapids, IA	CDR
Waterloo-Cedar Falls, IA	WTL
Sioux City, IA-NE-SD	SXC
Iowa City, IA	IAC
Dubuque, IA	-
Ames, IA	-

From: US Census Reference Files*: August 1, 2017.*

Maximum ozone concentrations are typically measured 10-30 miles downwind of an MSA. The site intended to record the maximum ozone concentration resulting from a given MSA may be located outside the MSA boundaries. Sites intended to measure background levels of pollutants for an MSA may also be located upwind and outside of that particular MSA.

Latitude – the latitude of a monitoring site**,** given in decimal degrees using the WGS (World Geodetic System) 84 datum.

Longitude – the longitude of a monitoring site, given in decimal degrees using the WGS (World Geodetic System) 84 datum.

AQS Site ID – The identifier of a monitoring site used in the US EPA Air Quality System (AQS) database. It has the form XX-XXX-XXXX where the first two digits specify the state (19 for Iowa), the next set of three digits the county, and the last four digits the site.

Responsible Agency – The agency responsible for performing ambient air monitoring at a monitoring site. The Polk County Local Program operates sites in or near Polk County. The Linn County Local Program operates sites in or near Linn County. The Department of Natural Resources (DNR) contracts with the State Hygienic Laboratory at the University of Iowa (SHL) to operate monitoring sites not operated by the Polk or Linn County Local Programs.

Appendix D: 2017 Iowa Ambient Air Monitors

Site Name	Pollutant	POC	Monitor Type	Design Value 15-17	High Design Value?	Sampling Method	Analysis	Operating Schedule	Primary Monitoring Objective	Spatial Scale	NAAQS Comparable?	FRM / FEM	FRM/FEM Purpose
Buffalo, Linwood Mining	PM10	2	SLAMS			Low Volume FRM	Gravimetric	Daily	Source Oriented	Middle	Yes	Yes	NAAQS Compliance
Buffalo, Linwood Mining	PM10	3	SLAMS			Beta Attenuation	Met One BAM	Continuous	Source Oriented	Middle	No	Yes	QA NAAQS Compliance
Buffalo, Linwood Mining	PM10	5	SLAMS			Beta Attenuation	Met One BAM	Continuous	Source Oriented	Middle	No	Yes	Real-Time AQI Reporting*
Cedar Rapids, Public Health	CO	1	SPM			Non-Dispersive Infrared		Continuous	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Cedar Rapids, Public Health	Ozone	1	SPM	61	Yes	UV Absorption		Continuous	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Cedar Rapids, Public Health	Ozone	2	SPM			UV Absorption		Continuous	Population Exposure	Neighborhood	No	Yes	QA Real-Time AQI Reporting*
Cedar Rapids, Public Health	PM10	1	SLAMS			Low Volume FRM	Gravimetric	1 in 3	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Cedar Rapids, Public Health	PM10	2	SLAMS			Low Volume FRM	Gravimetric	1 in 6	Population Exposure	Neighborhood	No	Yes	QA NAAQS Compliance*
Cedar Rapids, Public Health	PM2.5	3	SLAMS			Beta Attenuation	Met One BAM	Continuous	Population Exposure	Neighborhood	Yes	Yes	QA Real-Time AQI Reporting*
Cedar Rapids, Public Health	PM2.5	4	SPM			Beta Attenuation	Met One BAM	Continuous	Population Exposure	Neighborhood	Yes	Yes	QA Real-Time AQI Reporting*
Cedar Rapids, Public Health	PM2.5	1	SLAMS	20 / 8.1	No	Low Volume FRM	Gravimetric	Daily	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Cedar Rapids, Public Health	PM2.5	2	SLAMS			Low Volume FRM	Gravimetric	1 in 6	Population Exposure	Neighborhood	No	Yes	QA NAAQS Compliance*
Cedar Rapids, Public Health	SO2	1	SPM			UV Fluorescent		Continuous	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Cedar Rapids, Public Health	Toxics	16	SPM			Cartridge	TO-11A	1 in 12	Population Exposure	Neighborhood	No	na	
Cedar Rapids, Tait Cummins Park	SO2	1	SLAMS			UV Fluorescent		Continuous	Source Oriented	Middle	Yes	Yes	NAAQS Compliance
Clinton, Chancy Park	PM2.5	3	SPM			Beta Attenuation	Met One BAM	Continuous	Source Oriented	Middle	No	No	
Clinton, Chancy Park	PM2.5	4	SPM			Beta Attenuation	Met One BAM	Continuous	Source Oriented	Middle	No	No	
Clinton, Chancy Park	PM2.5	1	SPM	21 / na	No	Low Volume FRM	Gravimetric	1 in 3	Source Oriented	Middle	24 Hour Only	Yes	NAAQS Compliance
Clinton, Chancy Park	SO2	1	SPM			UV Fluorescent		Continuous	Source Oriented	Middle	Yes	Yes	NAAQS Compliance
Clinton, Chancy Park	Toxics	16	SPM			Cartridge	TO-11A	1 in 12	Population Exposure	Middle	No	na	
Clinton, Rainbow Park	Ozone	1	SLAMS	62	Yes	UV Absorption		Continuous	Population Exposure	Urban	Yes	Yes	NAAQS Compliance
Clinton, Rainbow Park	Ozone	2	SLAMS			UV Absorption		Continuous	Population Exposure	Urban	No	Yes	QA Real-Time AQI Reporting*

Site Name	Pollutant	POC	Monitor Type	Design Value 15-17	High Design Value?	Sampling Method	Analysis	Operating Schedule	Primary Monitoring Objective	Spatial Scale	NAAQS Comparable?	FRM / FEM	FRM/FEM Purpose
Clinton, Rainbow Park	PM2.5	1	SPM	20 / 8.0	No	Low Volume FRM	Gravimetric	1 in 3	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Clive, Indian Hills Jr. High School	PM2.5	1	SLAMS	18 / 7.2	No	Low Volume FRM	Gravimetric	1 in 3	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Coggon Elementary School	Ozone	1	SLAMS	61	Yes	UV Absorption		Continuous	Max Ozone Concentration	Urban	Yes	Yes	NAAQS Compliance
Coggon Elementary School	Ozone	2	SLAMS			UV Absorption		Continuous	Max Ozone Concentration	Urban	No	Yes	QA Real-Time AQI Reporting*
Council Bluffs, Franklin School	PM10	1	SPM			Low Volume FRM	Gravimetric	1 in 3	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Council Bluffs, Franklin School	PM2.5	1	SPM	18 / 7.7	No	Low Volume FRM	Gravimetric	1 in 3	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Council Bluffs, Franklin School	PM2.5	2	SPM			Low Volume FRM	Gravimetric	1 in 6	Population Exposure	Neighborhood	No	Yes	QA NAAQS Compliance*
Council Bluffs, Griffin Pipe	Lead	1	SLAMS			High Volume FRM	GFAA or ICP-MS	1 in 6	Source Oriented	Middle	Yes	Yes	NAAQS Compliance
Council Bluffs, Griffin Pipe	Lead	3	SLAMS			High Volume FRM	GFAA or ICP-MS	1 in 6	Source Oriented	Middle	No	Yes	QA NAAQS Compliance*
Davenport, Hayes Sch.	PM2.5	1	SLAMS	23 / 8.7	No	Low Volume FRM	Gravimetric	Daily	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Davenport, Jefferson Sch.	CO	1	NCORE			Non-Dispersive Infrared		Continuous	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Davenport, Jefferson Sch.	NO2	1	SPM			Chemiluminescence		Continuous	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Davenport, Jefferson Sch.	NOy	2	NCORE			Chemiluminescence		Continuous	Population Exposure	Neighborhood	No	na	
Davenport, Jefferson Sch.	Ozone	1	NCORE	61	Yes	UV Absorption		Continuous	Population Exposure	Urban	Yes	Yes	NAAQS Compliance
Davenport, Jefferson Sch.	Ozone	2	NCORE			UV Absorption		Continuous	Population Exposure	Urban	No	Yes	QA Real-Time AQI Reporting*
Davenport, Jefferson Sch.	PM10	1	NCORE			Low Volume FRM	Gravimetric	1 in 3	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Davenport, Jefferson Sch.	PM10	2	NCORE			Low Volume FRM	Gravimetric	1 in 6	Population Exposure	Neighborhood	No	Yes	QA NAAQS Compliance*
Davenport, Jefferson Sch.	PM2.5	3	NCORE			Beta Attenuation	Met One BAM	Continuous	Population Exposure	Neighborhood	No	No	
Davenport, Jefferson Sch.	PM2.5	4	NCORE			Beta Attenuation	Met One BAM	Continuous	Population Exposure	Neighborhood	No	No	
Davenport, Jefferson Sch.	PM2.5	1	NCORE	20 / 8.2	No	Low Volume FRM	Gravimetric	Daily	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Davenport, Jefferson Sch.	PM2.5	2	NCORE			Low Volume FRM	Gravimetric	1 in 6	Population Exposure	Neighborhood	No	Yes	QA NAAQS Compliance*
Davenport, Jefferson Sch.	CSN Speciation	5	NCORE			CSN Sampler	CSN Protocol	1 in 3	Population Exposure	Neighborhood	No	No	
Davenport, Jefferson Sch.	SO2	1	NCORE			UV Fluorescent		Continuous	Population Exposure	Urban	Yes	Yes	NAAQS Compliance

Site Name	Pollutant	POC	Monitor Type	Design Value 15-17	High Design Value?	Sampling Method	Analysis	Operating Schedule	Primary Monitoring Objective	Spatial Scale	NAAQS Comparable?	FRM / FEM	FRM/FEM Purpose
Davenport, Jefferson Sch.	Toxics	16	SPM			Cartridge	TO-11A	1 in 12	Population Exposure	Neighborhood	No	na	
Des Moines, Health Dept.	CO	1	SPM			Non-Dispersive Infrared		Continuous	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Des Moines, Health Dept.	NO2	1	SPM			Chemiluminescence		Continuous	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Des Moines, Health Dept.	Ozone	1	SLAMS	59	No	UV Absorption		Continuous	Population Exposure	Urban	Yes	Yes	NAAQS Compliance
Des Moines, Health Dept.	Ozone	2	SLAMS			UV Absorption		Continuous	Population Exposure	Urban	No	Yes	QA Real-Time AQI Reporting*
Des Moines, Health Dept.	PM10	1	SLAMS			Low Volume FRM	Gravimetric	1 in 3	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Des Moines, Health Dept.	PM10	2	SLAMS			Low Volume FRM	Gravimetric	1 in 6	Population Exposure	Neighborhood	No	Yes	QA NAAQS Compliance*
Des Moines, Health Dept.	PM2.5	3	SLAMS			Beta Attenuation	Met One BAM	Continuous	Population Exposure	Neighborhood	Yes	Yes	QA Real-Time AQI Reporting*
Des Moines, Health Dept.	PM2.5	4	SPM			Beta Attenuation	Met One BAM	Continuous	Population Exposure	Neighborhood	No	Yes	QA Real-Time AQI Reporting
Des Moines, Health Dept.	PM2.5	1	SLAMS	18 / 7.4	No	Low Volume FRM	Gravimetric	Daily	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Des Moines, Health Dept.	PM2.5	2	SLAMS			Low Volume FRM	Gravimetric	1 in 6	Population Exposure	Neighborhood	No	Yes	QA NAAQS Compliance*
Des Moines, Health Dept.	SO2	1	SPM			UV Fluorescent		Continuous	Population Exposure	Urban	Yes	Yes	NAAQS Compliance
Des Moines, Health Dept.	Toxics	16	SPM			Cartridge	TO-11A	1 in 12	Population Exposure	Neighborhood	No	na	
Emmetsburg, Iowa Lakes Coll.	Ozone	1	SLAMS	61	Yes	UV Absorption		Continuous	Regional Transport	Regional	Yes	Yes	NAAQS Compliance
Emmetsburg, Iowa Lakes Coll.	Ozone	2	SLAMS			UV Absorption		Continuous	Regional Transport	Regional	No	Yes	QA Real-Time AQI Reporting*
Emmetsburg, Iowa Lakes Coll.	PM2.5	3	SPM			Beta Attenuation	Met One BAM	Continuous	General / Background	Regional	No	No	
Emmetsburg, Iowa Lakes Coll.	PM2.5	4	SPM			Beta Attenuation	Met One BAM	Continuous	General / Background	Regional	No	No	
Emmetsburg, Iowa Lakes Coll.	PM2.5	1	SLAMS	16 / 6.8	No	Low Volume FRM	Gravimetric	1 in 3	General / Background	Regional	Yes	Yes	NAAQS Compliance
Iowa City, Hoover Sch.	PM2.5	3	SLAMS			Beta Attenuation	Met One BAM	Continuous	Population Exposure	Neighborhood	No	No	
Iowa City, Hoover Sch.	PM2.5	4	SLAMS			Beta Attenuation	Met One BAM	Continuous	Population Exposure	Neighborhood	No	Yes	QA Real-Time AQI Reporting
Iowa City, Hoover Sch.	PM2.5	1	SLAMS	19 / 7.7	No	Low Volume FRM	Gravimetric	Daily	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Keokuk, Fire Station	PM2.5	1	SPM	19 / 8.4	No	Low Volume FRM	Gravimetric	1 in 3	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Keosauqua, Lake Sugema	IMPROVE Speciation	1	IMPROVE			IMPROVE Sampler	IMPROVE Protocol	1 in 3	General / Background	Regional	No	na	

Site Name	Pollutant	POC	Monitor Type	Design Value 15-17	High Design Value?	Sampling Method	Analysis	Operating Schedule	Primary Monitoring Objective	Spatial Scale	NAAQS Comparable?	FRM / FEM	FRM/FEM Purpose
Keosauqua, Lake Sugema	NO2	1	SPM			Chemiluminescence		Continuous	General / Background	Regional	Yes	Yes	NAAQS Compliance
Keosauqua, Lake Sugema	Ozone	1	SLAMS	59	No	UV Absorption		Continuous	Regional Transport	Regional	Yes	Yes	NAAQS Compliance
Keosauqua, Lake Sugema	Ozone	2	SLAMS			UV Absorption		Continuous	Regional Transport	Regional	No	Yes	QA Real-Time AQI Reporting*
Keosauqua, Lake Sugema	PM10	1	SPM			Low Volume FRM	Gravimetric	1 in 3	General / Background	Regional	Yes	Yes	NAAQS Compliance
Keosauqua, Lake Sugema	PM2.5	3	SPM			Beta Attenuation	Met One BAM	Continuous	Regional Transport	Regional	No	No	
Keosauqua, Lake Sugema	PM2.5	4	SPM			Beta Attenuation	Met One BAM	Continuous	Regional Transport	Regional	No	No	
Keosauqua, Lake Sugema	PM2.5	1	SLAMS	18 / 6.9	No	Low Volume FRM	Gravimetric	1 in 3	Regional Transport	Regional	Yes	Yes	NAAQS Compliance
Keosauqua, Lake Sugema	SO2	1	SPM			UV Fluorescent		Continuous	General / Background	Regional	Yes	Yes	NAAQS Compliance
Mason City, Holcim Cement	PM10	1	SLAMS			Low Volume FRM	Gravimetric	1 in 3	Source Oriented	Middle	Yes	Yes	NAAQS Compliance
Mason City, Holcim Cement	PM10	2	SLAMS			Low Volume FRM	Gravimetric	1 in 6	Source Oriented	Middle	No	Yes	QA NAAQS Compliance*
Muscatine HS, East Campus Roof	PM10	1	SPM			Low Volume FRM	Gravimetric	1 in 3	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Muscatine HS, East Campus Roof	PM2.5	1	SLAMS	21 / 8.3	No	Low Volume FRM	Gravimetric	Daily	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Muscatine HS, East Campus Roof	PM2.5	2	SLAMS			Low Volume FRM	Gravimetric	1 in 6	Population Exposure	Neighborhood	No	Yes	QA NAAQS Compliance*
Muscatine HS, East Campus Trailer	PM2.5	3	SPM			Beta Attenuation	Met One BAM	Continuous	Population Exposure	Neighborhood	No	No	
Muscatine HS, East Campus Trailer	PM2.5	4	SPM			Beta Attenuation	Met One BAM	Continuous	Population Exposure	Neighborhood	No	No	
Muscatine HS, East Campus Trailer	SO2	1	SPM			UV Fluorescent		Continuous	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Muscatine, Greenwood Cemetery	PM2.5	1	SPM	19 / 7.5	No	Low Volume FRM	Gravimetric	1 in 3	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Muscatine, Greenwood Cemetery	SO2	1	SPM			UV Fluorescent		Continuous	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Muscatine, Musser Park	PM2.5	1	SPM	21 / na	No	Low Volume FRM	Gravimetric	1 in 3	Source Oriented	Middle	24 Hour Only	Yes	NAAQS Compliance
Muscatine, Musser Park	SO2	1	SLAMS			UV Fluorescent		Continuous	Source Oriented	Middle	Yes	Yes	NAAQS Compliance

Site Name	Pollutant	POC	Monitor Type	Design Value 15-17	High Design Value?	Sampling Method	Analysis	Operating Schedule	Primary Monitoring Objective	Spatial Scale	NAAQS Comparable?	FRM / FEM	FRM/FEM Purpose
Muscatine, Musser Park	Toxics	16	SPM			Cartridge	TO-11A	1 in 12	Source Oriented	Middle	No	na	
Pisgah, Forestry Office	Ozone	1	SLAMS	62	Yes	UV Absorption		Continuous	Max Ozone Concentration	Urban	Yes	Yes	NAAQS Compliance
Pisgah, Forestry Office	Ozone	2	SLAMS			UV Absorption		Continuous	Max Ozone Concentration	Urban	No	Yes	QA Real-Time AQI Reporting*
Scott County Park	Ozone	1	SLAMS	62	Yes	UV Absorption		Continuous	Max Ozone Concentration	Urban	Yes	Yes	NAAQS Compliance
Scott County Park	Ozone	2	SLAMS			UV Absorption		Continuous	Max Ozone Concentration	Urban	No	Yes	QA Real-Time AQI Reporting*
Sheldahl, Southern Crossroads	Ozone	1	SLAMS	59	No	UV Absorption		Continuous	Max Ozone Concentration	Urban	Yes	Yes	NAAQS Compliance
Sheldahl, Southern Crossroads	Ozone	2	SLAMS			UV Absorption		Continuous	Max Ozone Concentration	Urban	No	Yes	QA Real-Time AQI Reporting*
Sioux City, Irving School	PM2.5	1	SPM			Low Volume FRM	Gravimetric	1 in 3	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Viking Lake State Park	IMPROVE Speciation	1	IMPROVE			IMPROVE Sampler	IMPROVE Protocol	1 in 3	General / Background	Regional	No	na	
Viking Lake State Park	Ozone	1	SLAMS	60	Yes	UV Absorption		Continuous	Regional Transport	Regional	Yes	Yes	NAAQS Compliance
Viking Lake State Park	Ozone	2	SLAMS			UV Absorption		Continuous	Regional Transport	Regional	No	Yes	QA Real-Time AQI Reporting*
Viking Lake State Park	PM2.5	3	SPM			Beta Attenuation	Met One BAM	Continuous	Regional Transport	Regional	No	No	
Viking Lake State Park	PM2.5	4	SPM			Beta Attenuation	Met One BAM	Continuous	Regional Transport	Regional	No	No	
Viking Lake State Park	PM2.5	1	SLAMS	16 / 6.5	No	Low Volume FRM	Gravimetric	1 in 3	Regional Transport	Regional	Yes	Yes	NAAQS Compliance
Waterloo, Water Tower	PM2.5	3	SLAMS			Beta Attenuation	Met One BAM	Continuous	Population Exposure	Neighborhood	No	No	
Waterloo, Water Tower	PM2.5	4	SLAMS			Beta Attenuation	Met One BAM	Continuous	Population Exposure	Neighborhood	No	No	
Waterloo, Water Tower	PM2.5	1	SLAMS	20 / 7.9	No	Low Volume FRM	Gravimetric	1 in 3	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance
Waverly Airport	Ozone	1	SLAMS	60	Yes	UV Absorption		Continuous	Population Exposure	Urban	Yes	Yes	NAAQS Compliance
Waverly Airport	Ozone	2	SLAMS			UV Absorption		Continuous	Population Exposure	Urban	No	Yes	QA Real-Time AQI Reporting*

Monitor Table Definitions:

Site Name – a combination of the city and site name from the previous table

Pollutant – indicates the pollutant, or set of pollutants, measured by each monitor

- CO – carbon monoxide
- CSN Speciation – a speciation monitor and suite of lab analysis procedures developed by the CSN program to identify and quantify the chemical components of $PM_{2.5}$
- IMPROVE Speciation – a speciation monitor and suite of lab analysis procedures developed by the IMPROVE program to identify and quantify the chemical components of $PM_{2.5}$ in order to establish changes in visibility
- Lead—lead (Pb)
- NO_2 – nitrogen dioxide
- NOy – reactive nitrogen; NO and its oxidation products; a common definition is: NOy = NO + NO_2 + HNO_3 + NO_3 (aerosol) + NO_3 (radical) + N_2O_5 + HNO_4 + PAN (peroxyacyl nitrates) + other organic nitrates
- Ozone – an unstable molecule consisting of three oxygen atoms
- PM_{10} – particles with a diameter of 10 micrometers or less
- $PM_{2.5}$ – particles with a diameter of 2.5 micrometers or less, also known as "fine particles".
- SO_2 – sulfur dioxide
- Toxics – monitoring for a pollutant identified on EPA's Urban Air Toxics list

POC – "Parameter Occurrence Code" an integer in the AQS database that labels monitors at a monitoring site. If there are multiple monitors for a given pollutant at a monitoring site, each monitor will have its own POC.

Monitor Type – This column indicates how the monitor is classified in the AQS database.

- IMPROVE – a speciation monitor developed by the IMPROVE program to identify and quantify the chemical components of $PM_{2.5}$. An IMPROVE monitor is a type of special purpose monitor (SPM) – see below.
- NCore – monitors operated at a site which has been accepted into EPA's national network of long term multi-pollutant sites.
- SLAMS – State and Local Air Monitoring Stations. SLAMS make up the ambient air quality monitoring sites that are primarily needed for NAAQS comparisons, but may serve other data purposes. SLAMS exclude special purpose monitor (SPM) stations and include NCore, and all other State or locally operated stations that have not been designated as SPM stations.
- SPM – means a monitor that is designated as a special purpose monitor in the monitoring network plan and in EPA's AQS database. SPM monitors do not count when showing compliance with minimum SLAMS requirements for monitor numbers and siting.

Design Value – A design value is a number computed from monitoring data (see 40 CFR Part 50, Appendix N) that is used for comparisons to the National Ambient Air Quality Standards (NAAQS). For $PM_{2.5}$ and ozone, the monitoring requirements depend on these design values. For $PM_{2.5}$, there are two design values—a 24 hour design value (in $\mu g/m^3$) and an annual design value (also in $\mu g/m^3$). For $PM_{2.5}$ monitors in the table, 24 hour design value is listed first and an annual design value is listed

second, i.e. 27/10.3. For ozone, there is a single design value; the 8-hour design value (in ppb) is indicated in the table.

High Design Value? – A "Yes" in this column indicates that the design value is within 85% of the NAAQS. For $PM_{2.5}$, 24 hour design values of 30 $\mu g/m^3$ or greater are considered greater than or equal to 85% of the 24-hour NAAQS (35 $\mu g/m^3$) and values of 10.2 $\mu g/m^3$ or greater are considered greater than or equal to the 85% of the annual NAAQS (12.0 $\mu g/m^3$). For ozone, 8-hour design values of 60 ppb or greater are considered greater than or equal to 85% of the 8-hour NAAQS (70 ppb).

Sampling Method – Indicates how the sample is collected. This column also shows how the sample is analyzed, if it is analyzed on site at the time of collection.

- Beta Attenuation—a type of continuous $PM_{2.5}$ monitor that reports data in real time. Continuous $PM_{2.5}$ monitors typically have three components: a size selective inlet (cyclone) that knocks out all but the fine particles, a conditioning system that rapidly dries the fine particles, and a mass measurement system that determines the mass of the conditioned sample. The type of continuous $PM_{2.5}$ monitor currently used in the Iowa Network is the BAM (BAM=Beta Attenuation Monitor). This monitor conditions particles using an inlet heater to reduce particle-bound water. Mass measurements are made by measuring the attenuation of beta particles caused by fine particles collected on a sampling tape during the sampling period.
- Cartridge – A 2,4-Dinitrophenylhydrazine (DNPH) cartridge is used to collect toxics that contain a carbonyl group.
- Chemiluminescence – When a nitric oxide (NO) molecule collides with an ozone molecule, a nitrogen dioxide (NO_2) molecule and an oxygen (O_2) molecule result. The NO_2 molecule is in an excited state, and subsequently emits infrared light that can be measured by a photomultiplier tube.
- High Volume FRM – a sampler that utilizes a flow of ~ 80 cubic meters per hour or about 80 times that of a low volume FRM.
- IMPROVE Sampler – See IMPROVE in the "Pollutant" section above.
- Low Volume – a sampler that uses a flow of 16.67 liters per minute.
- Low Volume FRM – a sampler that uses a flow of 16.67 liters per minute, which has been designated as a Federal Reference Method.
- Non-Dispersive Infrared – Carbon Monoxide absorbs infrared radiation; this property is the basis of the analytical method used by continuous CO monitors to quantify CO concentrations.
- CSN Sampler – a speciation monitor to identify and quantify the chemical components of $PM_{2.5}$ via CSN protocol.
- Absorption – Ozone absorbs ultraviolet light; this property is the basis of the analytical method used by continuous ozone monitors to quantify ozone concentrations.
- UV Fluorescent – When excited by ultraviolet light, SO_2 molecules emit light at a lower frequency that may be detected by a photomultiplier tube. This property is the basis for the analytical method used for continuous SO_2 gas analyzers.
- Met One BAM—See Beta Attenuation above. This category includes MetOne models 1020 and 1022. The 1020 measurement unit resides an air conditioned shelter, while the 1022 measurement unit is outdoors. The 1022 reduces the chances of condensation in the inlet line of the sampler in humid weather.

Analysis – indicates the method of post-collection analysis that is done in a lab environment.

- Gravimetric – A filter is weighed before and after collecting a particulate sample.
- ICP-MS – Inductively Coupled Plasma Mass Spectrometry is a highly sensitive analytical technique capable of determining a range of metals. The metal sample is atomized and ionized by argon plasma, and the ions are separated and quantified via a mass spectrometer.
- IMPROVE Protocol – This protocol uses a suite of analytical procedures (X-Ray Fluorescence, Ion Chromatography, and Thermal Optical Reflectance) to identify and quantify the components of $PM_{2.5}$. See IMPROVE for further details.
- CSN Protocol – refers to EPA's chemical speciation network protocol. This protocol utilizes X-Ray Fluorescence, Ion Chromatography, and Thermal Optical Reflectance to identify and quantify the components of $PM_{2.5}$.
- TO-11A – an EPA protocol in which carbonyl cartridge extracts are analyzed using High Performance Liquid Chromatography and an ultraviolet detector.

Operating Schedule – Continuous monitors run constantly and measure hourly average concentrations in real time. Manual samplers, such as PM filter samplers or toxics samplers, collect a single 24-hour sample from midnight to midnight on a particular day, which is quantified later in an analytical laboratory. A fractional (e.g. 1/2, 1/3, 1/6, and 1/12) schedule for a manual samplers refers to collecting a sample every second, third, sixth, and twelfth day, respectively. Ozone monitors in Iowa (except in Polk County and at the NCore site) are operated only during ozone season (April to October in 2016, March to October in 2017) when higher temperatures favor ozone formation. Cartridges for toxic carbonyl compounds are normally collected every twelfth day, but the schedule is accelerated to 1/6 days during ozone season.

Primary Monitoring Objective – the primary reason a monitor is operated at a particular location.

- General Background – The objective is to establish the background levels of a pollutant.
- Max. Ozone Conc. – The objective is to record the maximum ozone concentration. Because ozone is a secondary pollutant, ozone concentrations are typically highest 10-30 miles downwind of an urban area.
- Population Exposure – The objective is to monitor the exposure of individuals in the area represented by the monitor.
- Regional Transport – The objective is to assess the extent to which pollutants are transported between two regions that are separated by tens to hundreds of kilometers.
- Source Oriented – The objective is to determine the impact of a nearby source.
- Upwind Background – The objective is to establish the background levels of a pollutant, typically upwind of a source or urban area.

Spatial Scale – The scale of representativeness is described in terms of the physical dimensions of the air parcel nearest to a monitoring site throughout which actual pollutant concentrations are reasonably similar. Monitors are classified according to the largest applicable scale below:

- Microscale - defines the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.
- Middle scale - defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometer.

- Neighborhood scale - defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range. The neighborhood and urban scales listed below have the potential to overlap in applications that concern secondarily formed or homogeneously distributed air pollutants.
- Urban scale - defines concentrations within an area of city-like dimensions, on the order of 4 to 50 kilometers. Within a city, the geographic placement of sources may result in there being no single site that can be said to represent air quality on an urban scale.
- Regional scale – usually defines a rural area of reasonably homogeneous geography without large sources, and extends from tens to hundreds of kilometers.

NAAQS Comparable? – This column shows whether the data from the monitor can be compared to the National Ambient Air Quality Standards (NAAQS). Entries under this column are Yes, No, and 24 Hour Only. For a monitor's data to be eligible for comparison against the NAAQS, the type of monitor used must be defined as a federal reference method or federal equivalent method by EPA.

EPA has designated the Met One BAM as a Federal Equivalent Method (FEM) for $PM_{2.5}$ when configured and operated as prescribed in the federal equivalence designation. Iowa operates several Met One BAM analyzers, but most are not configured in accordance with the designation, and the data cannot be compared with the NAAQS.

For $PM_{2.5}$, there is both an annual and a 24-hour NAAQS. To be comparable to either $PM_{2.5}$ NAAQS a site must be population-oriented. In 40 CFR Part 58, EPA defines a population-oriented monitoring site as follows:

Population-oriented monitoring (or sites) means residential areas, commercial areas, recreational areas, industrial areas where workers from more than one company are located and other areas where a substantial number of people may spend a significant fraction of their day.

Following this definition, all $PM_{2.5}$ monitoring sites in Iowa are population-oriented.

In a populated area near an industrial source, monitoring data may only be comparable to the 24 hour $PM_{2.5}$ NAAQS. According to Subpart D of 40 CFR Part 58:

$PM_{2.5}$ measurement data from monitors that are not representative of area-wide air quality but rather of relatively unique micro-scale, or localized hot spot, or unique middle-scale impact sites are not eligible for comparison to the annual $PM_{2.5}$ NAAQS. $PM_{2.5}$ measurement data from these monitors are eligible for comparison to the 24-hour $PM_{2.5}$ NAAQS. For example, if a micro- or middle-scale $PM_{2.5}$ monitoring site is adjacent to a unique dominating local $PM_{2.5}$ source, then the $PM_{2.5}$ measurement data from such a site would only be eligible for comparison to the 24-hour $PM_{2.5}$ NAAQS.

FRM/FEM – "Federal Reference Method/Federal Equivalent Method" EPA specifies that only these types of monitors or monitoring methods may be used to establish attainment with the NAAQS. The first method that EPA declares to have sufficient accuracy and repeatability for ambient measurements is the reference method. Once the reference method is defined, other methods or equipment may be used for NAAQS comparisons, provided the candidate method passes tests that demonstrate comparability to the reference method. A criteria pollutant monitor that is not a

FRM/FEM may not be used for NAAQS comparisons, but may still be useful for other purposes, such as real time reporting.

FRM/FEM Purpose – When more than one FRM/FEM is operated at a monitoring site at the same time (i.e. multiple POCs for the same pollutant), there is the potential for ambiguity in the attainment status at a monitoring site. To avoid this ambiguity, we declare one of the monitors to be the NAAQS compliance (primary) monitor at the monitoring site and indicate the purpose for the other monitors at the site.

- NAAQS Compliance – denotes a monitor that is the primary monitor used to establish attainment with the NAAQS.
- QA NAAQS Compliance – denotes a monitor that is used to satisfy a federal requirement to provide quality assurance data for the primary NAAQS monitor. Addition of an asterisk, i.e. QA NAAQS Compliance* means that data from this monitor may be substituted for the primary monitor data when the primary monitor data is missing.[48, 49]
- Real-time AQI Reporting – Denotes a monitor used for real-time reporting. Addition of an asterisk, i.e. Real-time AQI Reporting* means that data from this monitor may be substituted for the primary monitor data when the primary monitor data is missing.
- QA Real-Time AQI Reporting – Denotes a monitor that is used to provide real-time QA of a continuous monitor used for real-time reporting. Addition of an asterisk, i.e. QA Real-time AQI Reporting* means that data from this monitor may be substituted for the primary monitor data when the primary monitor data is missing.

[48] For substitution rules for PM2.5, Lead, and PM10 see EPA POC Technical Note Download PDF

[49] For AQS Guidelines for Reporting Collocated PM2.5 and Lead Data see EPA Collocated Guidelines

Appendix E: Population-Based Minimum Monitoring Requirements

Ozone

40 CFR Part 58 Appendix D, Table D-2 specifies the minimum number of SLAMS (State and Local Air Monitoring Stations) ozone monitors required based on population and the most recent three years of monitoring data (design value).

MSA population[1] [2]	Most recent 3-year design value concentrations ≥85% of any O_3 NAAQS[3]	Most recent 3-year design value concentrations <85% of any O_3 NAAQS[3] [4]
>10 million	4	2
4-10 million	3	1
350,000-<4 million	2	1
50,000-<350,000[5]	1	0

[1]Minimum monitoring requirements apply to the Metropolitan statistical area (MSA).
[2]Population based on latest available census figures.
[3]The ozone (O_3) National Ambient Air Quality Standards (NAAQS) levels and forms are defined in 40 CFR part 50.
[4]These minimum monitoring requirements apply in the absence of a design value.
[5]Metropolitan statistical areas (MSA) must contain an urbanized area of 50,000 or more population.

$PM_{2.5}$

40 CFR Part 58 Appendix D, Table D-5 specifies the minimum number of SLAMS $PM_{2.5}$ monitors required based on population and 3-year design values.

TABLE D-5 OF APPENDIX D TO PART 58—$PM_{2.5}$ MINIMUM MONITORING REQUIREMENTS

MSA population[1] [2]	Most recent 3-year design value ≥85% of any $PM_{2.5}$ NAAQS[3]	Most recent 3-year design value <85% of any $PM_{2.5}$ NAAQS[3] [4]
>1,000,000	3	2
500,000-1,000,000	2	1
50,000-<500,000[5]	1	0

[1]Minimum monitoring requirements apply to the Metropolitan statistical area (MSA).
[2]Population based on latest available census figures.
[3]The $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS) levels and forms are defined in 40 CFR part 50.
[4]These minimum monitoring requirements apply in the absence of a design value.
[5]Metropolitan statistical areas (MSA) must contain an urbanized area of 50,000 or more population.

PM_{10}

40 CFR Part 58 Appendix D, Table D-4 lists the minimum requirements for the number of PM_{10} stations per MSA based on population and measured levels:

TABLE D-4 OF APPENDIX D TO PART 58—PM_{10} MINIMUM MONITORING REQUIREMENTS (APPROXIMATE NUMBER OF STATIONS PER MSA)[1]

Population category	High concentration[2]	Medium concentration[3]	Low concentration[4 5]
>1,000,000	6-10	4-8	2-4
500,000-1,000,000	4-8	2-4	1-2
250,000-500,000	3-4	1-2	0-1
100,000-250,000	1-2	0-1	0

[1]Selection of urban areas and actual numbers of stations per area will be jointly determined by EPA and the State agency.
[2]High concentration areas are those for which ambient PM10 data show ambient concentrations exceeding the PM_{10} NAAQS by 20 percent or more.
[3]Medium concentration areas are those for which ambient PM10 data show ambient concentrations exceeding 80 percent of the PM_{10} NAAQS.
[4]Low concentration areas are those for which ambient PM10 data show ambient concentrations less than 80 percent of the PM_{10} NAAQS.
[5]These minimum monitoring requirements apply in the absence of a design value.

Nitrogen Dioxide

40 CFR Part 58 Appendix D, section 4.3.2 and 4.3.3 contain the minimum requirement for population-based NO_2 Monitoring:

…

(a) Within the NO2 network, there must be one microscale near-road NO2 monitoring station in each CBSA with a population of 1,000,000 or more persons to monitor a location of expected maximum hourly concentrations sited near a major road with high AADT counts as specified in paragraph 4.3.2(a)(1) of this appendix. An additional near-road NO2 monitoring station is required for any CBSA with a population of 2,500,000 persons or more, or in any CBSA with a population of 1,000,000 or more persons that has one or more roadway segments with 250,000 or greater AADT counts to monitor a second location of expected maximum hourly concentrations. CBSA populations shall be based on the latest available census figures.

…

4.3.3 Requirement for Area-wide NO_2 Monitoring

(a) Within the NO2 network, there must be one monitoring station in each CBSA with a population of 1,000,000 or more persons to monitor a location of expected highest NO2 concentrations representing the neighborhood or larger spatial scales. PAMS sites collecting NO2 data that are situated in an area of expected high NO2 concentrations at the neighborhood or larger spatial scale may be used to satisfy this minimum monitoring requirement when the NO2 monitor is operated year round. Emission inventories and meteorological analysis should be used to identify the appropriate locations within a CBSA for locating required area-wide NO2 monitoring stations. CBSA populations shall be based on the latest available census figures.

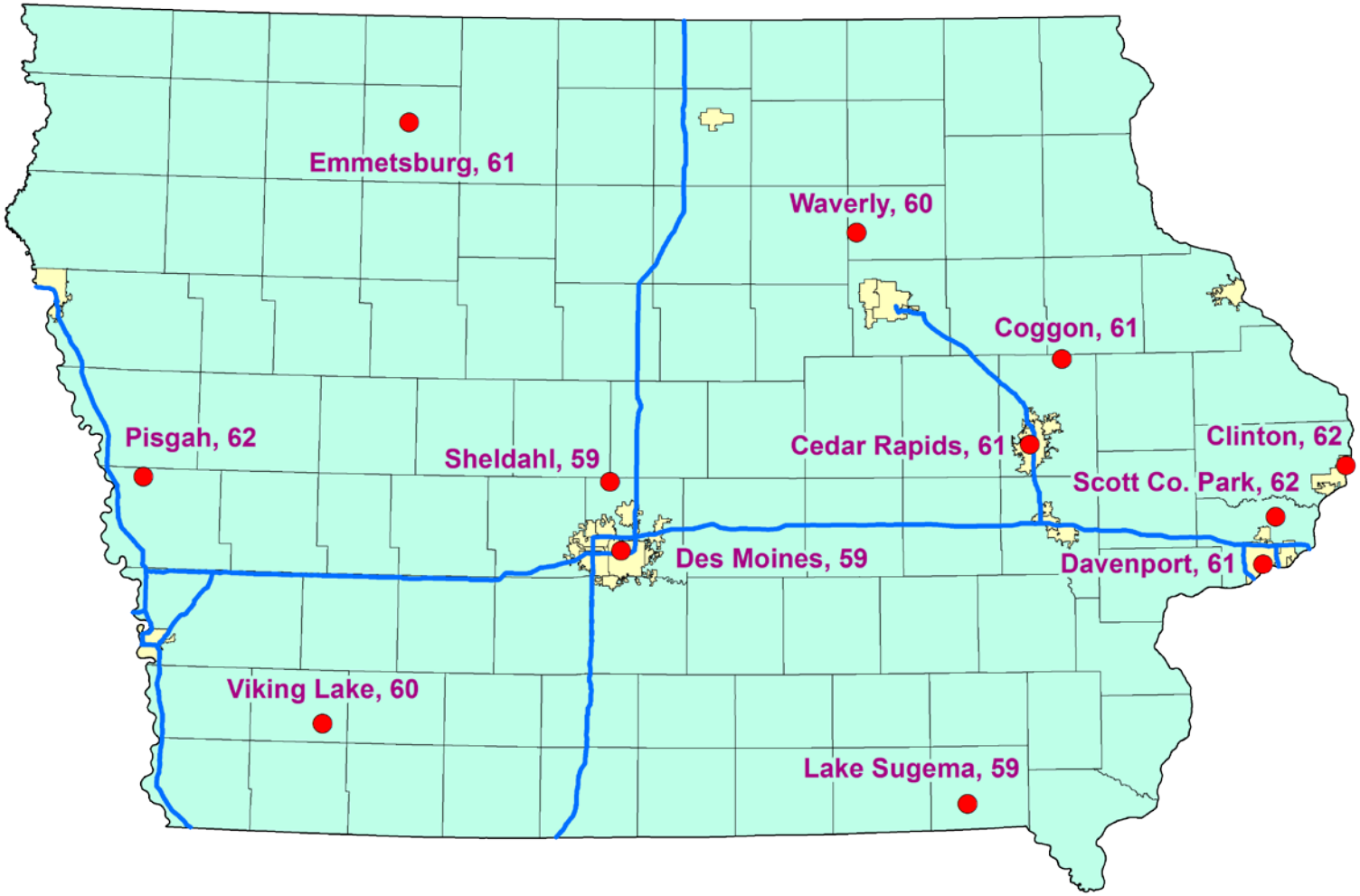
Appendix F: Census Bureau Estimates for Iowa MSAs

US Census Geographic Area	Counties in MSA	Population
Omaha-Council Bluffs, NE-IA	IA: Harrison, Mills, Pottawattamie NE: Cass, Douglas, Sarpy, Saunders, Washington	933,316
Des Moines-West Des Moines, IA	Dallas, Guthrie, Madison, Polk, Warren	645,911
Davenport-Moline-Rock Island, IA-IL	IA: Scott IL: Henry, Mercer, Rock Island	382,263
Cedar Rapids, IA	Benton, Jones, Linn	270,293
Waterloo-Cedar Falls, IA	Black Hawk, Bremer, Grundy	169,982
Sioux City, IA-NE-SD	IA: Plymouth, Woodbury NE: Dakota, Dixon SD: Union	168,618
Iowa City, IA	Johnson, Washington	171,491
Dubuque, IA	Dubuque	97,041
Ames, IA	Story	97,502

Source for Counties: US Census MSA Delineation

Source for 2017 Population Estimates: US Census Population Estimates

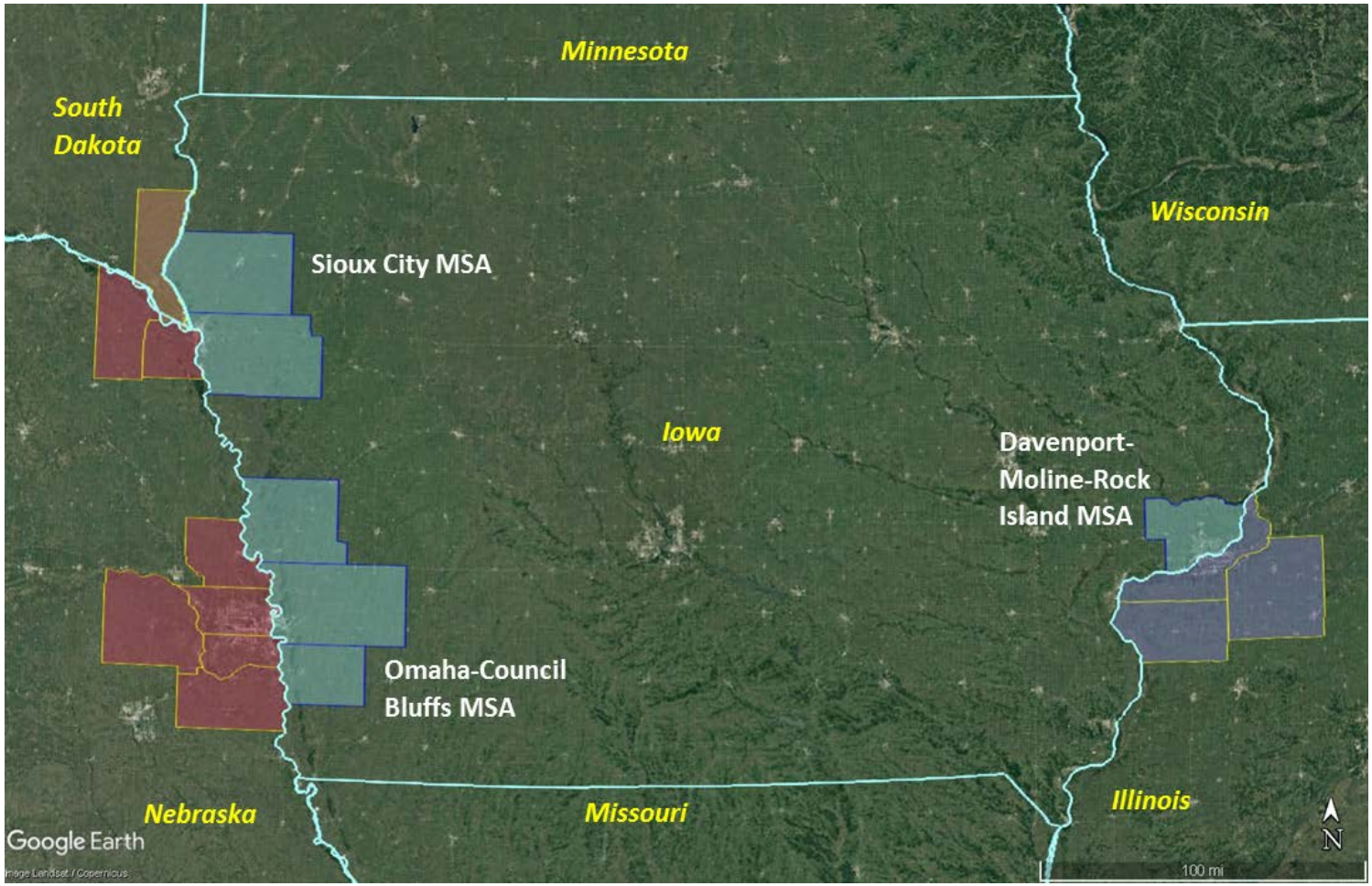
Appendix G: 2017 Design Value Map for Ozone

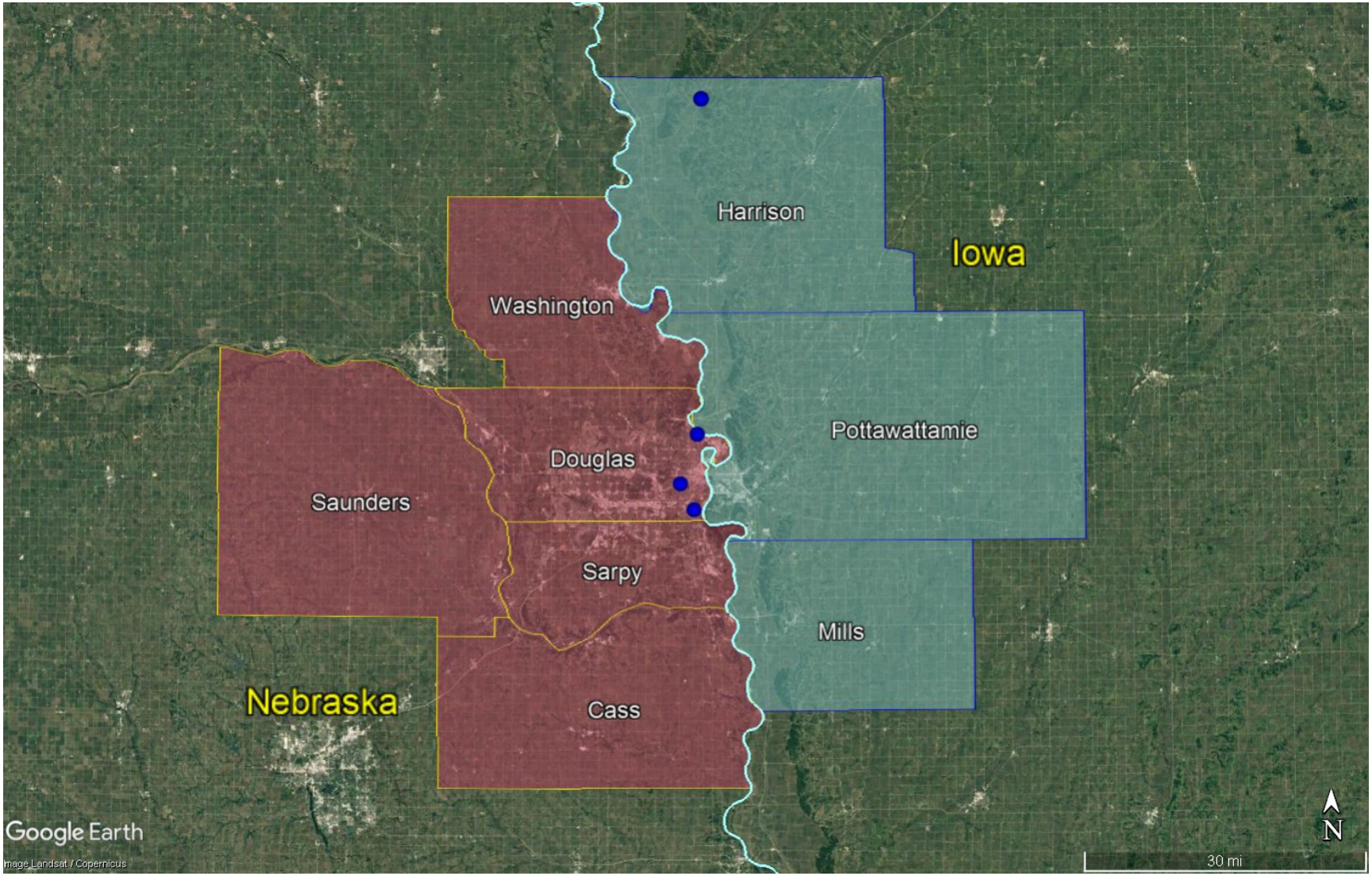


2015-2017 Ozone Design Values (ppb)

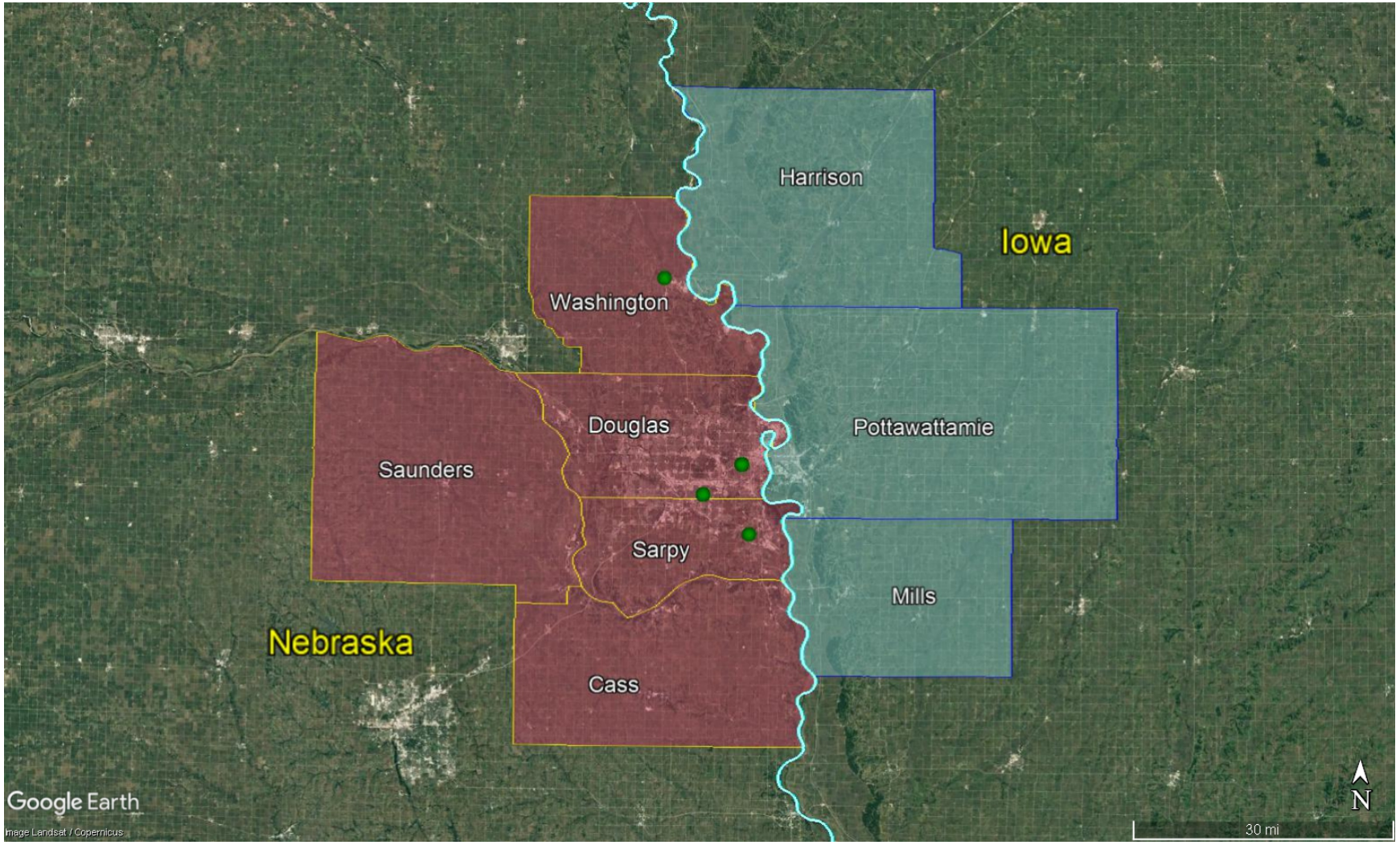
Appendix H: Maps of Monitoring Locations in MSAs on the State Border

Iowa includes portions of three MSAs that it shares with other states: Davenport-Moline-Rock Island, IA-IL; Omaha-Council Bluffs, NE-IA; and Sioux City, NE-IA-SD. To estimate the SLAMS monitors operating at the time of this review, Air Quality System (AQS) reports (AMP390 and AMP600) and Network Plans from adjacent states were examined. The following maps show the estimated number and locations for SLAMS monitors for ozone, $PM_{2.5}$, SO_2, and PM_{10} in these MSA's.

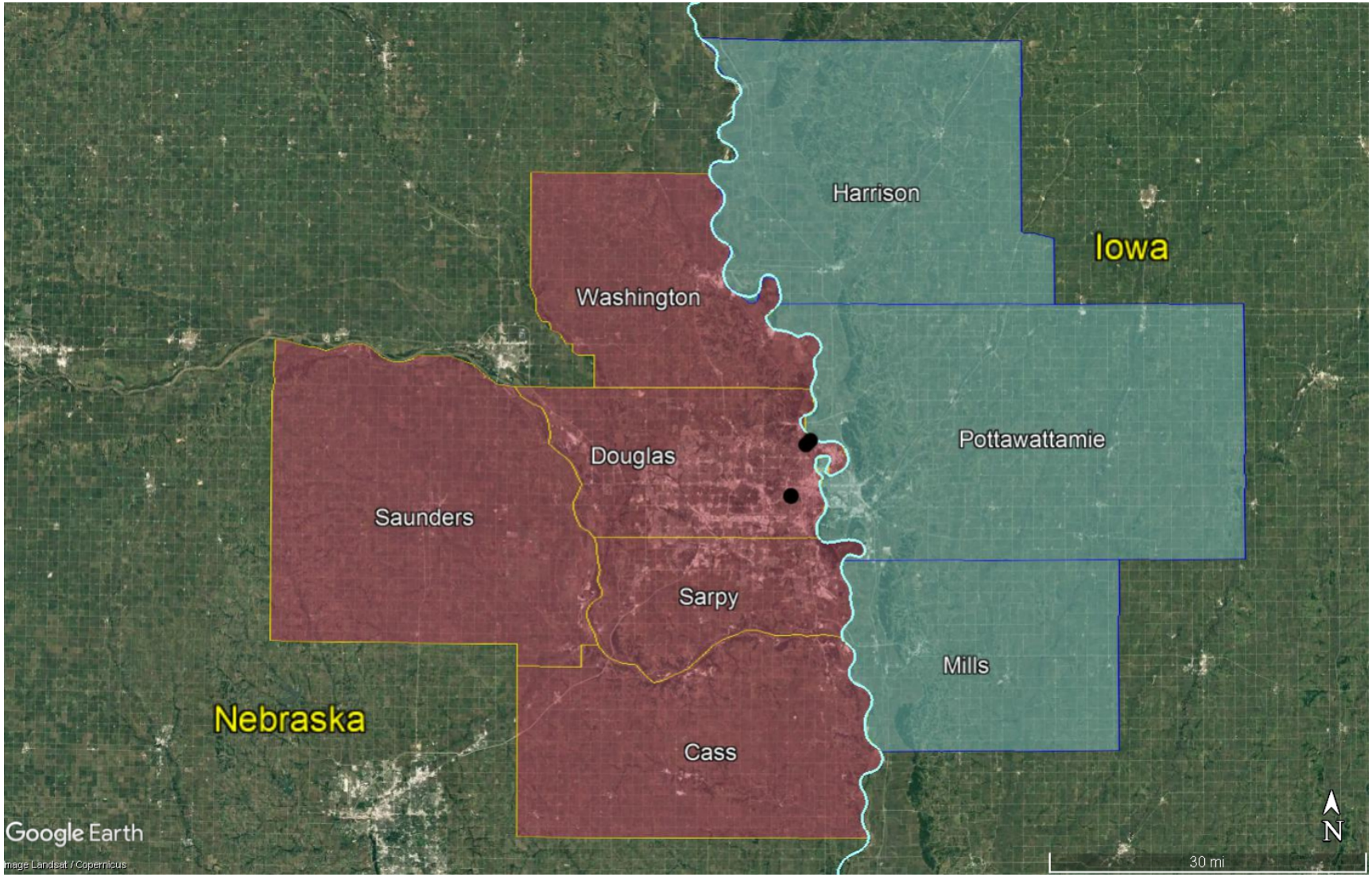




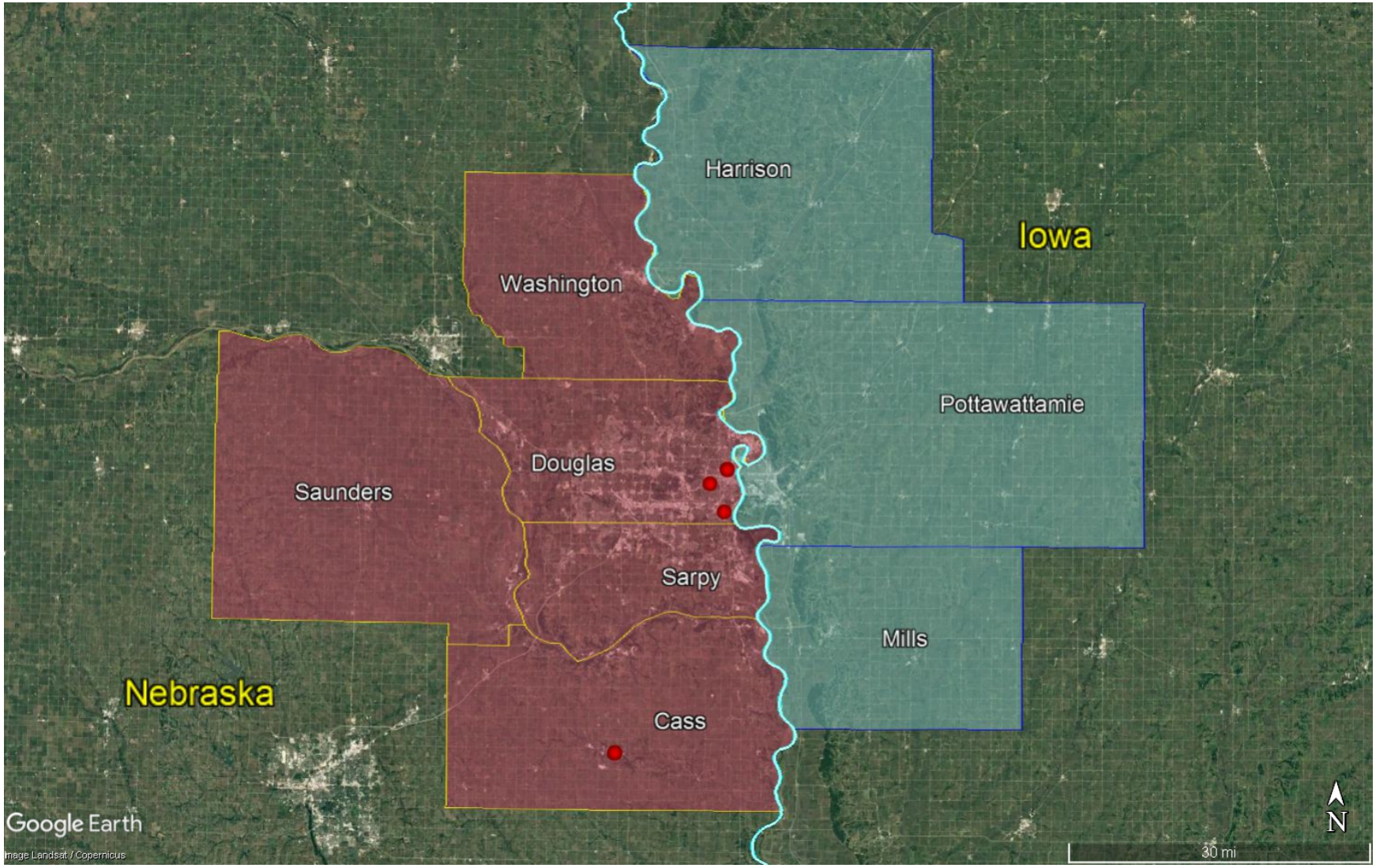
Omaha-Council Bluffs, NE-IA Ozone SLAMS Monitoring Sites



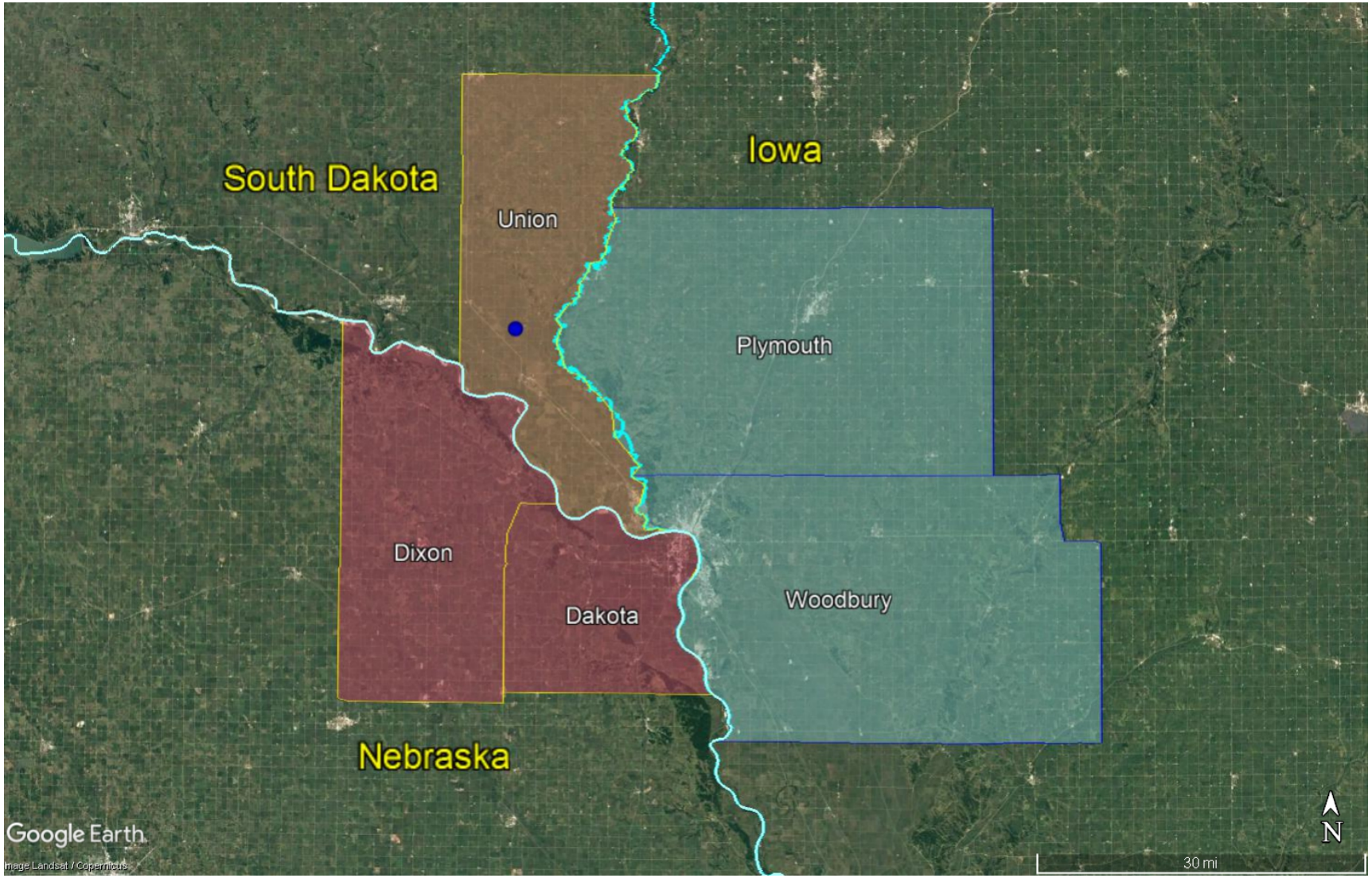
Omaha-Council Bluffs, NE-IA $PM_{2.5}$ SLAMS Monitoring Sites



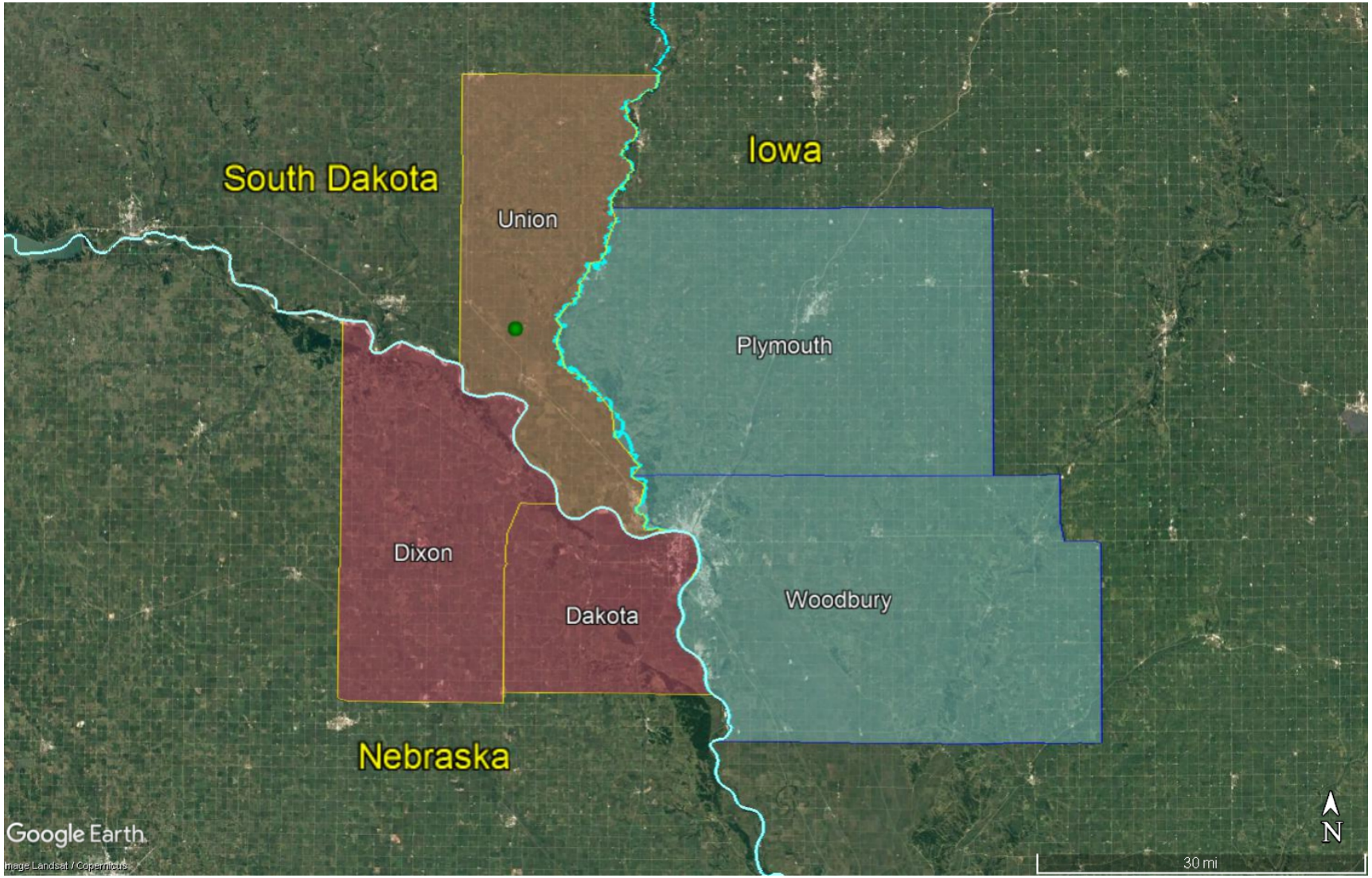
Omaha-Council Bluffs, NE-IA SO_2 SLAMS Monitoring Sites



Omaha-Council Bluffs, NE-IA PM_{10} SLAMS Monitors



Sioux City, IA-NE-SD Ozone SLAMS Monitors



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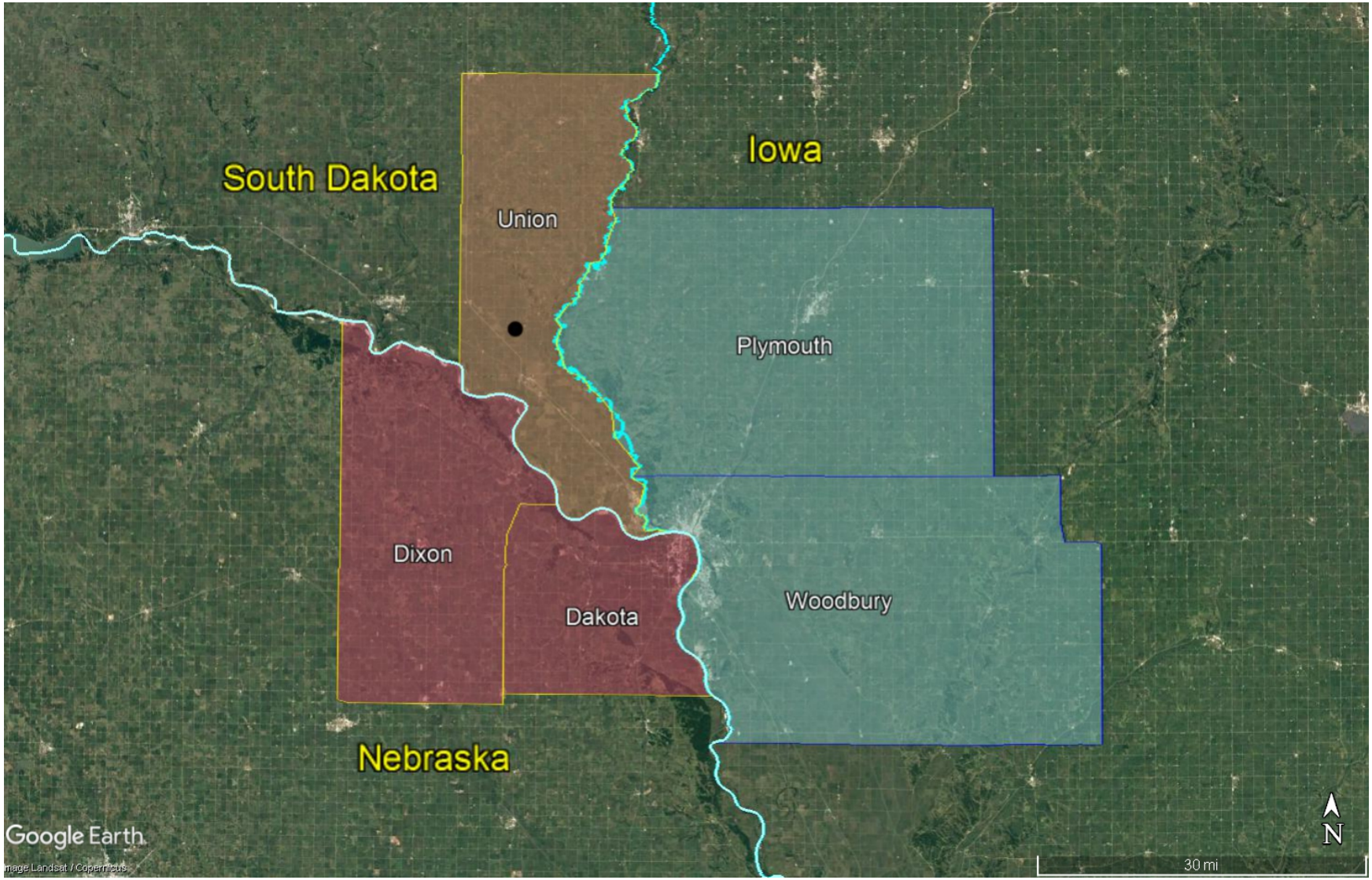

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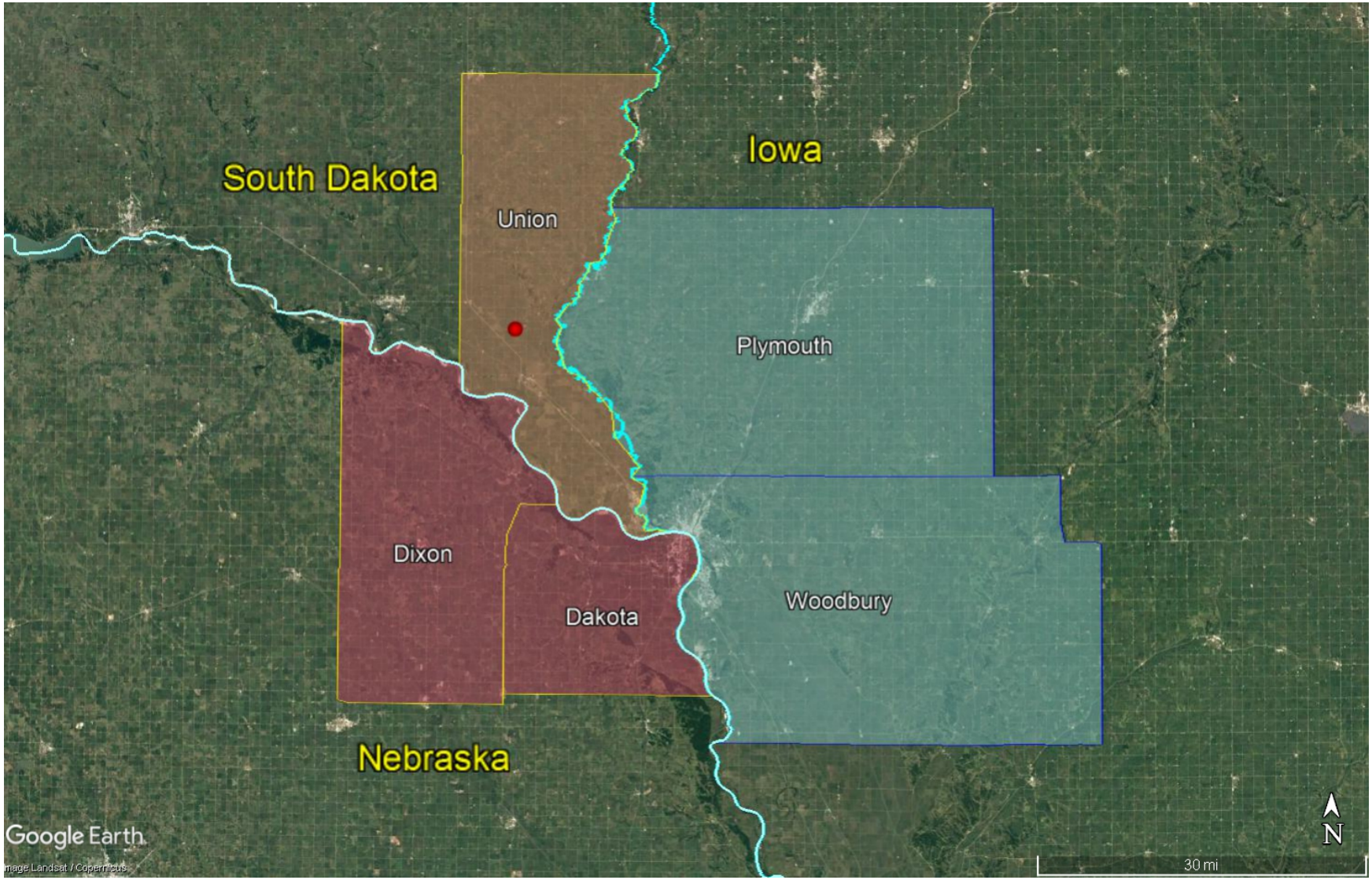
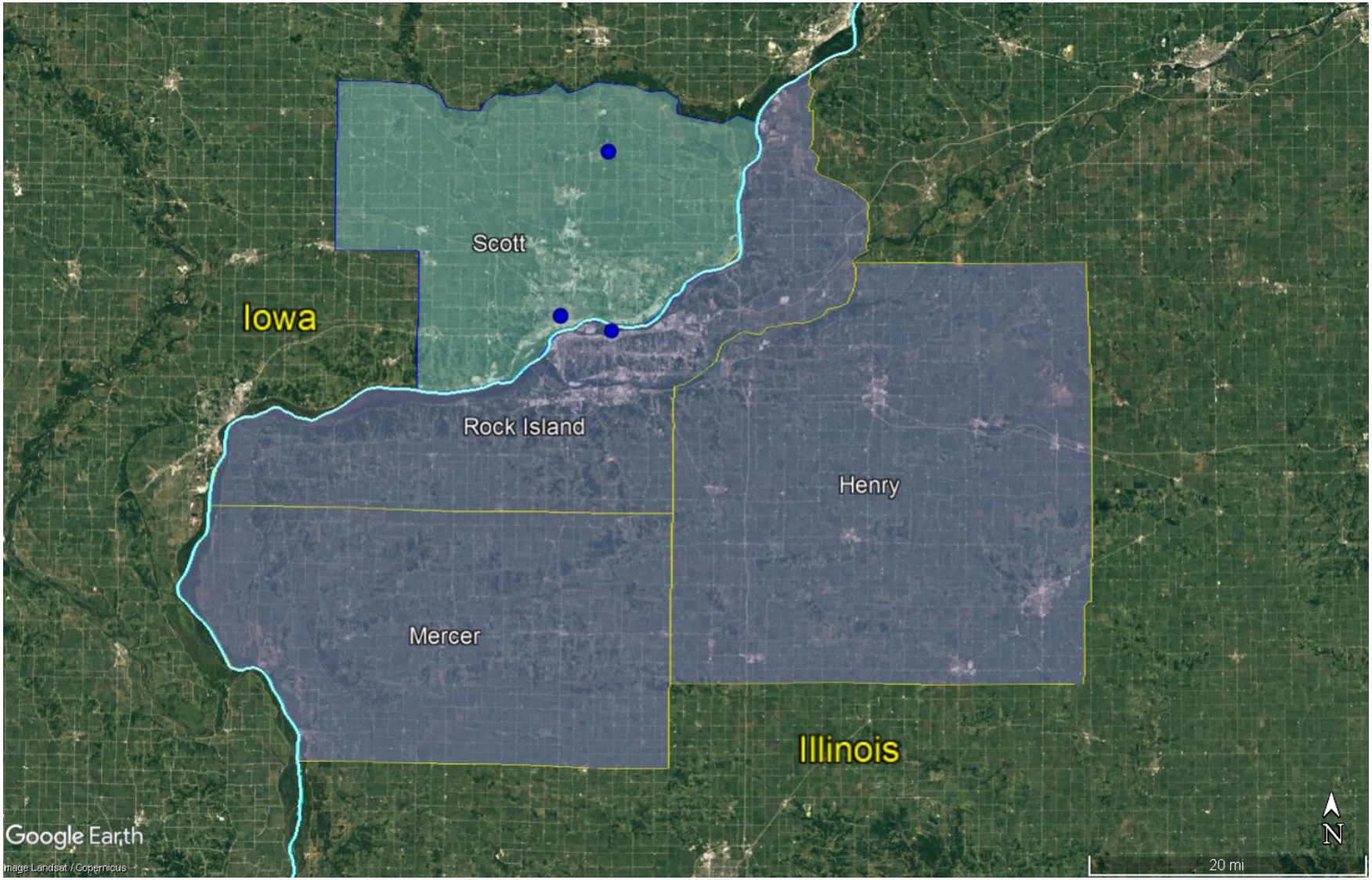
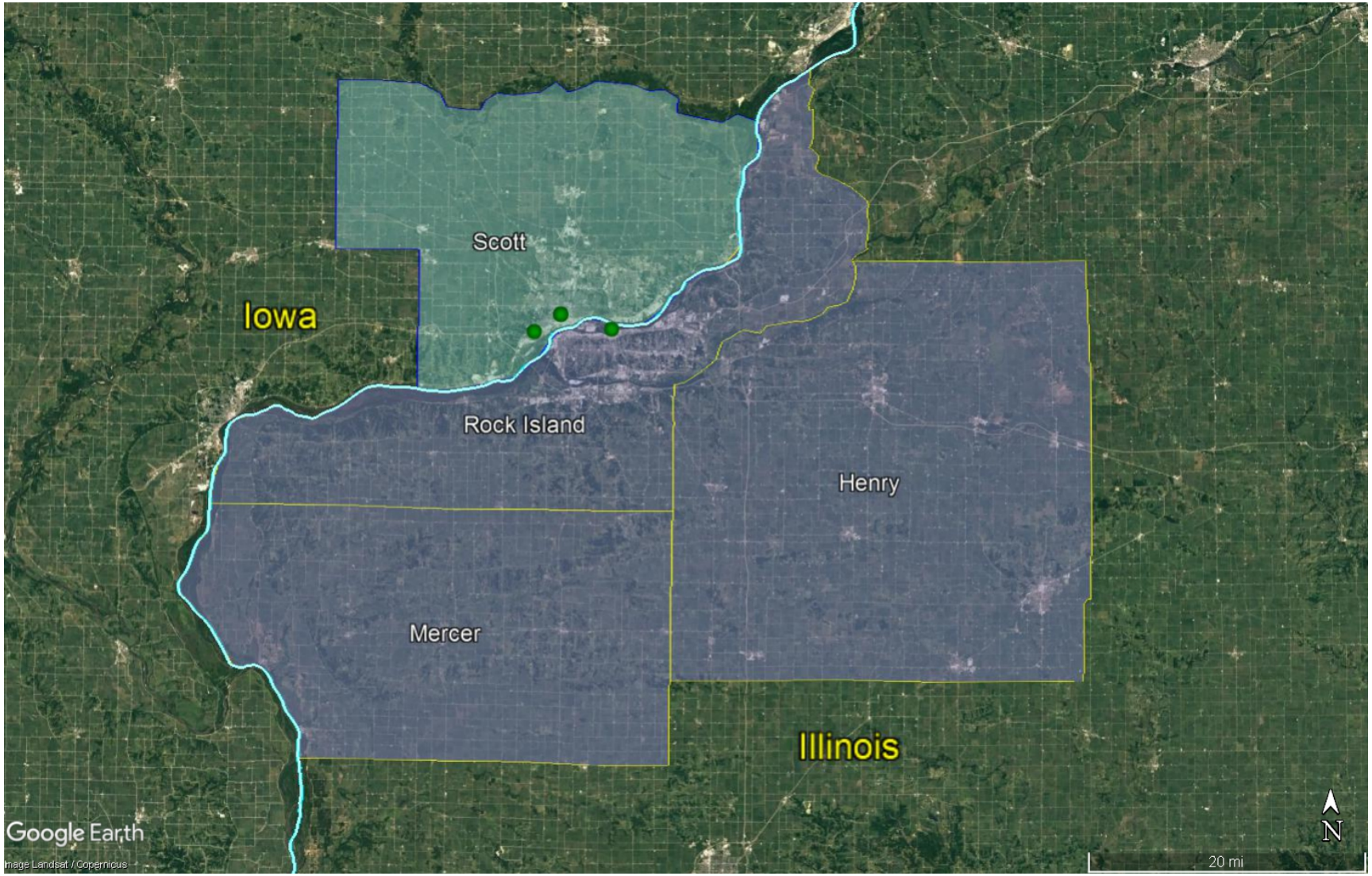


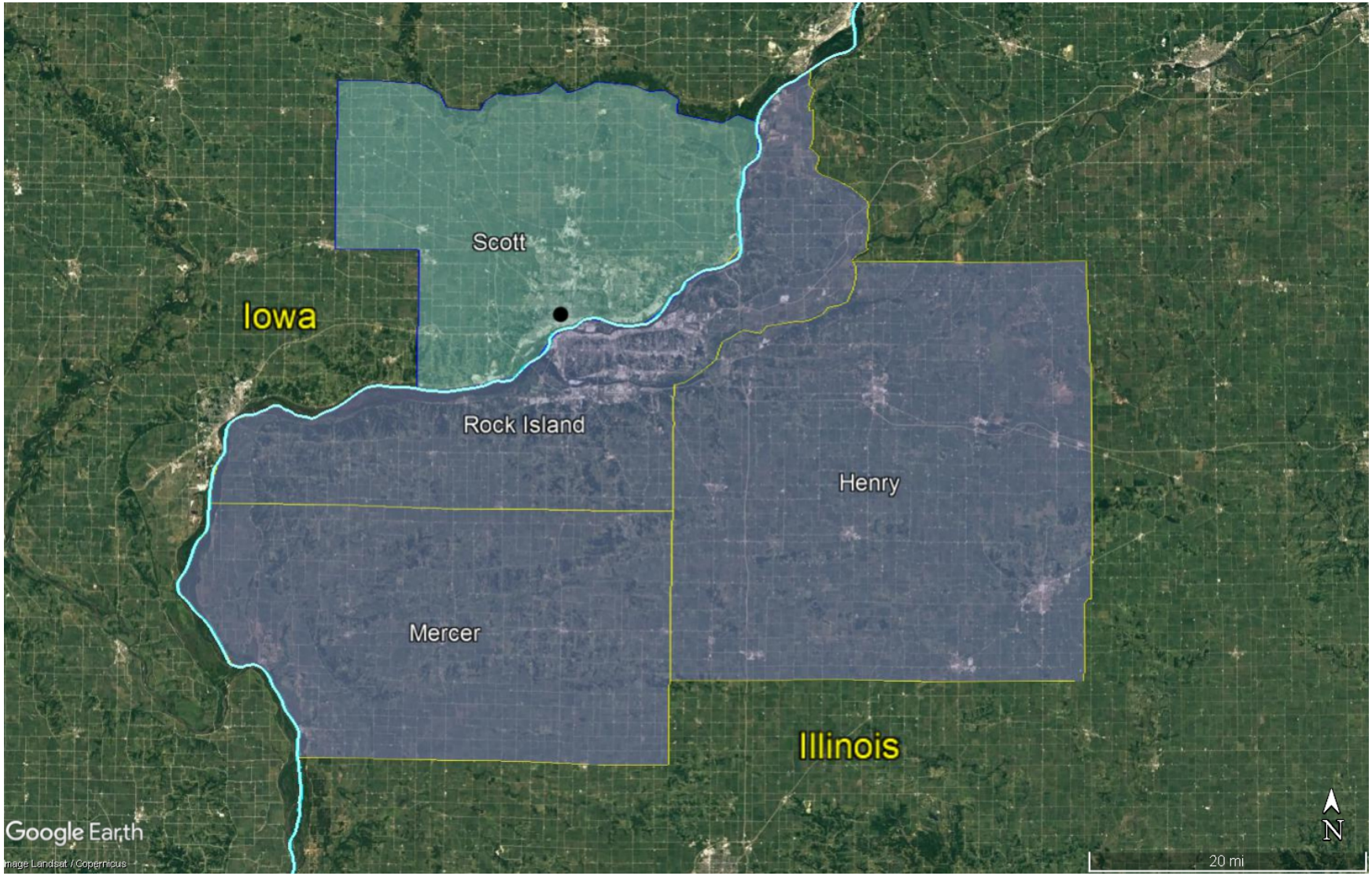
Sioux City, IA-NE-SD PM_{10} SLAMS Monitors



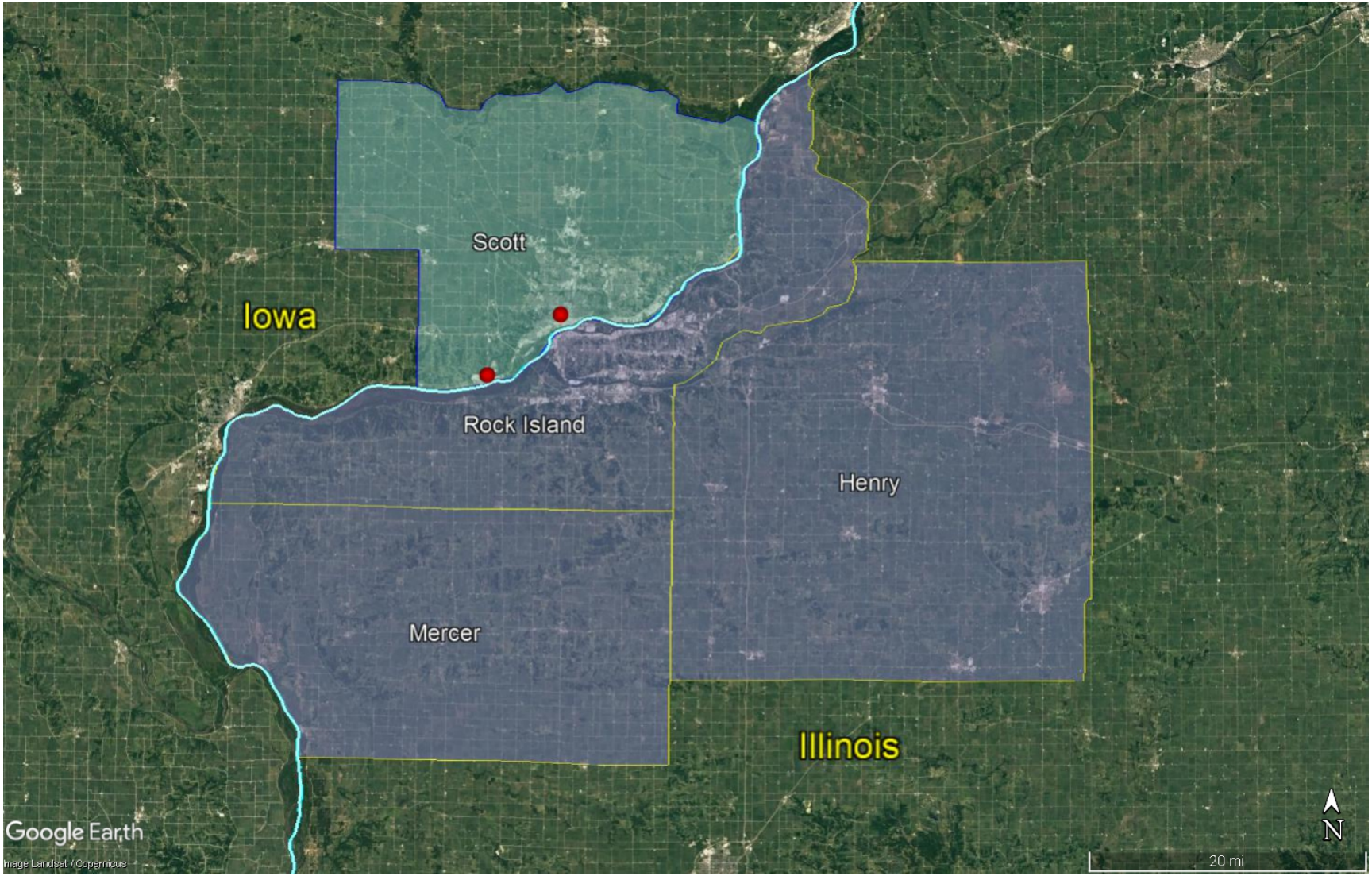
Davenport-Moline-Rock Island, IA-IL Ozone SLAMS Monitors



Davenport-Moline-Rock Island, IA-IL $PM_{2.5}$ SLAMS Monitors



Davenport-Moline-Rock Island, IA-IL SO_2 SLAMS Monitors



Davenport-Moline-Rock Island, IA-IL PM_{10} SLAMS Monitors

Appendix I: Uniform Air Quality Index (AQI) and Daily Reporting

Appendix G to Part 58—Uniform Air Quality Index (AQI) and Daily Reporting

General Requirements

1. What Is the AQI?

The AQI is a tool that simplifies reporting air quality to the general public. The AQI incorporates into a single index concentrations of 5 criteria pollutants: ozone (O3), particulate matter (PM), carbon monoxide (CO), sulfur dioxide (SO2), and nitrogen dioxide (NO2). The scale of the index is divided into general categories that are associated with health messages.

2. Why Report the AQI?

The AQI offers various advantages:

a. It is simple to create and understand.
b. It conveys the health implications of air quality.
c. It promotes uniform use throughout the country.

3. Must I Report the AQI?

You must report the AQI daily if yours is a metropolitan statistical area (MSA) with a population over 350,000.

4. What Goes Into My AQI Report?

i. Your AQI report must contain the following:
a. The reporting area(s) (the MSA or subdivision of the MSA).
b. The reporting period (the day for which the AQI is reported).
c. The critical pollutant (the pollutant with the highest index value).
d. The AQI (the highest index value).
e. The category descriptor and index value associated with the AQI and, if you choose to report in a color format, the associated color. Use only the following descriptors and colors for the six AQI categories:

Table 1—AQI Categories

For this AQI	Use this descriptor	And this color[1]
0 to 50	"Good"	Green.
51 to 100	"Moderate"	Yellow.
101 to 150	"Unhealthy for Sensitive Groups"	Orange.
151 to 200	"Unhealthy"	Red.
201 to 300	"Very Unhealthy"	Purple.
301 and above	"Hazardous"	Maroon.[1]

[1]Specific colors can be found in the most recent reporting guidance (Guideline for Public Reporting of Daily Air Quality—Air Quality Index (AQI)).

f. The pollutant specific sensitive groups for any reported index value greater than 100. Use the following sensitive groups for each pollutant:

When this pollutant has an index value above 100 * * *	Report these sensitive groups * * *
Ozone	Children and people with asthma are the groups most at risk.
$PM_{2.5}$	People with respiratory or heart disease, the elderly and children are the groups most at risk.
PM_{10}	People with respiratory disease are the group most at risk.
CO	People with heart disease are the group most at risk.
SO_2	People with asthma are the group most at risk.
NO_2	Children and people with respiratory disease are the groups most at risk.

ii. When appropriate, your AQI report may also contain the following:
a. Appropriate health and cautionary statements.
b. The name and index value for other pollutants, particularly those with an index value greater than 100.
c. The index values for sub-areas of your MSA.
d. Causes for unusual AQI values.
e. Actual pollutant concentrations.

5. Is My AQI Report for My MSA Only?

Generally, your AQI report applies to your MSA only. However, if a significant air quality problem exists (AQI greater than 100) in areas significantly impacted by your MSA but not in it (for example, O_3 concentrations are often highest downwind and outside an urban area), you should identify these areas and report the AQI for these areas as well.

6. How Do I Get My AQI Report to the Public?

You must furnish the daily report to the appropriate news media (radio, television, and newspapers). You must make the daily report publicly available at one or more places of public access, or by any other means, including a

recorded phone message, a public Internet site, or facsimile transmission. When the AQI value is greater than 100, it is particularly critical that the reporting to the various news media be as extensive as possible. At a minimum, it should include notification to the media with the largest market coverages for the area in question.

7. How Often Must I Report the AQI?

You must report the AQI at least 5 days per week. Exceptions to this requirement are in section 8 of this appendix.

8. May I Make Exceptions to These Reporting Requirements?

i. If the index value for a particular pollutant remains below 50 for a season or year, then you may exclude the pollutant from your calculation of the AQI in section 12.

ii. If all index values remain below 50 for a year, then you may report the AQI at your discretion. In subsequent years, if pollutant levels rise to where the AQI would be above 50, then the AQI must be reported as required in sections 3, 4, 6, and 7 of this appendix.

Calculation

9. How does the AQI relate to air pollution levels?

For each pollutant, the AQI transforms ambient concentrations to a scale from 0 to 500. The AQI is keyed as appropriate to the national ambient air quality standards (NAAQS) for each pollutant. In most cases, the index value of 100 is associated with the numerical level of the short-term standard (i.e., averaging time of 24-hours or less) for each pollutant. The index value of 50 is associated with the numerical level of the annual standard for a pollutant, if there is one, at one-half the level of the short-term standard for the pollutant, or at the level at which it is appropriate to begin to provide guidance on cautionary language. Higher categories of the index are based on increasingly serious health effects and increasing proportions of the population that are likely to be affected. The index is related to other air pollution concentrations through linear interpolation based on these levels. The AQI is equal to the highest of the numbers corresponding to each pollutant. For the purposes of reporting the AQI, the sub-indexes for PM10 and PM2.5 are to be considered separately. The pollutant responsible for the highest index value (the reported AQI) is called the “critical” pollutant.

10. What monitors should I use to get the pollutant concentrations for calculating the AQI?

You must use concentration data from State/Local Air Monitoring Station (SLAMS) or parts of the SLAMS required by 40 CFR 58.10 for each pollutant except PM. For PM, calculate and report the AQI on days for which you have measured air quality data (e.g., from continuous PM2.5 monitors required in Appendix D to this part). You may use PM measurements from monitors that are not reference or equivalent methods (for example, continuous PM10 or PM2.5 monitors). Detailed guidance for relating non-approved measurements to approved methods by statistical linear regression is referenced in section 13 below.

11. Do I Have to Forecast the AQI?

You should forecast the AQI to provide timely air quality information to the public, but this is not required. If you choose to forecast the AQI, then you may consider both long-term and short-term forecasts. You can forecast the AQI at least 24-hours in advance using the most accurate and reasonable procedures considering meteorology, topography, availability of data, and forecasting expertise. The document “Guideline for Developing an Ozone Forecasting Program” (the Forecasting Guidance) will help you start a forecasting program. You can also issue short-term forecasts by predicting 8-hour ozone values from 1-hour ozone values using methods suggested in the Reporting Guidance, “Guideline for Public Reporting of Daily Air Quality.”

12. How do I calculate the AQI?

i. The AQI is the highest value calculated for each pollutant as follows:

a. Identify the highest concentration among all of the monitors within each reporting area and truncate as follows:

(1) Ozone—truncate to 3 decimal places
$PM_{2.5}$—truncate to 1 decimal place
PM_{10}—truncate to integer
CO—truncate to 1 decimal place
SO_2—truncate to integer
NO_2—truncate to integer

(2) [Reserved]

b. Using Table 2, find the two breakpoints that contain the concentration.
c. Using Equation 1, calculate the index.
d. Round the index to the nearest integer.

Table 2—Breakpoints for the AQI

These breakpoints							**Equal these AQI's**	
O_3 (ppm) 8-hour	**O_3 (ppm) 1-hour[1]**	**$PM_{2.5}$ (µg/m^3) 24-hour**	**PM_{10} (µg/m^3) 24-hour**	**CO (ppm) 8-hour**	**SO_2 (ppb) 1-hour**	**NO_2 (ppb) 1-hour**	**AQI**	**Category**
0.000-0.054		0.0-12.0	0-54	0.0-4.4	0-35	0-53	0-50	Good.
0.055-0.070		12.1-35.4	55-154	4.5-9.4	36-75	54-100	51-100	Moderate.
0.071-0.085	0.125-0.164	35.5-55.4	155-254	9.5-12.4	76-185	101-360	101-150	Unhealthy for Sensitive Groups.
0.086-0.105	0.165-0.204	[3]55.5-150.4	255-354	12.5-15.4	[4]186-304	361-649	151-200	Unhealthy.
0.106-0.200	0.205-0.404	[3]150.5-250.4	355-424	15.5-30.4	[4]305-604	650-1249	201-300	Very Unhealthy.
201-([2])	0.405-0.504	[3]250.5-350.4	425-504	30.5-40.4	[4]605-804	1250-1649	301-400	Hazardous.
([2])	0.505-0.604	[3]350.5-500.4	505-604	40.5-50.4	[4]805-1004	1650-2049	401-500	

[1]Areas are generally required to report the AQI based on 8-hour ozone values. However, there are a small number of areas where an AQI based on 1-hour ozone values would be more precautionary. In these cases, in addition to calculating the 8-hour ozone index value, the 1-hour ozone index value may be calculated, and the maximum of the two values reported.

[2]8-hour O^3 values do not define higher AQI values (≥301). AQI values of 301 or greater are calculated with 1-hour O_3 concentrations.

[3]If a different SHL for $PM_{2.5}$ is promulgated, these numbers will change accordingly.

[4]1-hr SO_2 values do not define higher AQI values (≥200). AQI values of 200 or greater are calculated with 24-hour SO_2 concentrations.

ii. If the concentration is equal to a breakpoint, then the index is equal to the corresponding index value in Table 2. However, Equation 1 can still be used. The results will be equal. If the concentration is between two breakpoints, then calculate the index of that pollutant with Equation 1. You must also note that in some areas, the AQI based on 1-hour O3 will be more precautionary than using 8-hour values (see footnote 1 to Table 2). In these cases, you may use 1-hour values as well as 8-hour values to calculate index values and then use the maximum index value as the AQI for O3.

$$I_p = \frac{I_{Hi} - I_{Lo}}{BP_{Hi} - BP_{Lo}}\left(C_p - BP_{Lo}\right) + I_{Lo} \qquad \text{(Equation 1)}$$

Where:
I_p = the index value for pollutant$_p$
C_p = the truncated concentration of pollutant$_p$
BP_{Hi} = the breakpoint that is greater than or equal to C_p
BP_{Lo} = the breakpoint that is less than or equal to C_p
I_{Hi} = the AQI value corresponding to BP_{Hi}
I_{lo} = the AQI value corresponding to BP_{Lo}.

iii. If the concentration is larger than the highest breakpoint in Table 2 then you may use the last two breakpoints in Table 2 when you apply Equation 1.

Example

iv. Using Table 2 and Equation 1, calculate the index value for each of the pollutants measured and select the one that produces the highest index value for the AQI. For example, if you observe a PM_{10} value of 210 µg/m^3, a 1-hour O_3 value of 0.156 ppm, and an 8-hour O_3 value of 0.130 ppm, then do this:

a. Find the breakpoints for PM_{10} at 210 µg/m^3 as 155 µg/m^3 and 254 µg/m^3, corresponding to index values 101 and 150;

b. Find the breakpoints for 1-hour O_3 at 0.156 ppm as 0.125 ppm and 0.164 ppm, corresponding to index values 101 and 150;

c. Find the breakpoints for 8-hour O_3 at 0.130 ppm as 0.116 ppm and 0.374 ppm, corresponding to index values 201 and 300;

d. Apply Equation 1 for 210 µg/m^3, PM_{10}:

$$\frac{150 - 101}{254 - 155}\left(210 - 155\right) + 101 = 128$$

e. Apply Equation 1 for 0.156 ppm, 1-hour O_3:

$$\frac{150 - 101}{0.164 - 0.125}\left(0.156 - 0.125\right) + 101 = 140$$

f. Apply Equation 1 for 0.130 ppm, 8-hour O_3:

$$\frac{300 - 201}{0.374 - 0.116}\left(0.130 - 0.116\right) + 201 = 206$$

g. Find the maximum, 206. This is the AQI. The minimal AQI report would read:

v. Today, the AQI for my city is 206 which is Very Unhealthy, due to ozone. Children and people with asthma are the groups most at risk.

13. What additional information should I know?

The EPA has developed a computer program to calculate the AQI for you. The program prompts for inputs, and it displays all the pertinent information for the AQI (the index value, color, category, sensitive group, health effects, and cautionary language). The EPA has also prepared a brochure on the AQI that explains the index in detail (The Air Quality Index), Reporting Guidance (Technical Assistance Document for the Reporting of Daily Air Quality—the Air Quality Index (AQI)) that provides associated health effects and cautionary statements, and Forecasting Guidance (Guideline for Developing an Ozone Forecasting Program) that explains the steps necessary to start an air pollution forecasting program. You can download the program and the guidance documents at www.airnow.gov. Reference for relating non-approved PM measurements to approved methods (Eberly, S., T. Fitz-Simons, T. Hanley, L. Weinstock., T. Tamanini, G. Denniston, B. Lambeth, E. Michel, S. Bortnick. Data Quality Objectives (DQOs) For Relating Federal Reference Method (FRM) and Continuous PM2.5 Measurements to Report an Air Quality Index (AQI). U.S. Environmental Protection Agency, Research Triangle Park, NC. EPA-454/B-02-002, November 2002) can be found on the Ambient Monitoring Technology Information Center (AMTIC) Web site, http://www.epa.gov/ttnamti1/.

[64 FR 42547, Aug. 4, 1999, as amended at 73 FR 16513, Mar. 27, 2008; 75 FR 6537, Feb. 9, 2010; 75 FR 35602, June 22, 2010; 78 FR 3286, Jan. 15, 2013; 80 FR 65468, Oct. 26, 2015]

Appendix J: Federal Collocation Requirements & Operating Schedules

Unless otherwise indicated, all the following is quoted from Appendix A to 40 CFR Part 58.

Collocation Requirements for $PM_{2.5}$:

3.2.3 Collocated Quality Control Sampling Procedures for PM2.5. For each pair of collocated monitors, designate one sampler as the primary monitor whose concentrations will be used to report air quality for the site, and designate the other as the quality control monitor. There can be only one primary monitor at a monitoring site for a given time period.

3.2.3.1 For each distinct monitoring method designation (FRM or FEM) that a PQAO is using for a primary monitor, the PQAO must have 15 percent of the primary monitors of each method designation collocated (values of 0.5 and greater round up); and have at least one collocated quality control monitor (if the total number of monitors is less than three). The first collocated monitor must be a designated FRM monitor.

3.2.3.2 In addition, monitors selected for collocation must also meet the following requirements:

(a) A primary monitor designated as an EPA FRM shall be collocated with a quality control monitor having the same EPA FRM method designation.

(b) For each primary monitor designated as an EPA FEM used by the PQAO, 50 percent of the monitors designated for collocation, or the first if only one collocation is necessary, shall be collocated with a FRM quality control monitor and 50 percent of the monitors shall be collocated with a monitor having the same method designation as the FEM primary monitor. If an odd number of collocated monitors is required, the additional monitor shall be a FRM quality control monitor. An example of the distribution of collocated monitors for each unique FEM is provided below. Table A-2 of this appendix demonstrates the collocation procedure with a PQAO having one type of primary FRM and multiple primary FEMs.

3.2.3.3 Since the collocation requirements are used to assess precision of the primary monitors and there can only be one primary monitor at a monitoring site, a site can only count for the collocation of the method designation of the primary monitor at that site.

3.2.3.4 The collocated monitors should be deployed according to the following protocol:

(a) Fifty percent of the collocated quality control monitors should be deployed at sites with annual average or daily concentrations estimated to be within plus or minus 20 percent of either the annual or 24-hour NAAQS and the remainder at the PQAOs discretion;

(b) If an organization has no sites with annual average or daily concentrations within ±20 percent of the annual NAAQS or 24-hour NAAQS, 50 percent of the collocated quality control monitors should be deployed at those sites with the annual mean concentrations or 24-hour concentrations among the highest for all sites in the network and the remainder at the PQAOs discretion.

(c) The two collocated monitors must be within 4 meters (inlet to inlet) of each other and at least 2 meters apart for flow rates greater than 200 liters/min or at least 1 meter apart for samplers having flow rates less than 200 liters/min to preclude airflow interference. A waiver allowing up to 10 meters horizontal distance and up to 3 meters vertical distance (inlet to inlet) between a primary and collocated sampler may be approved by the Regional Administrator for sites at a neighborhood or larger scale of representation during the annual network plan approval process. Sampling and analytical methodologies must be the consistently implemented for both primary and collocated quality control samplers and for all other samplers in the network.

(d) Sample the collocated quality control monitor on a 1-in-12 day schedule. Report the measurements from both primary and collocated quality control monitors at each collocated sampling site to AQS. The calculations for evaluating precision between the two collocated monitors are described in section 4.2.1 of this appendix.
…

4.7.2 Requirement for Continuous PM2.5 Monitoring. The State, or where appropriate, local agencies must operate continuous PM2.5 analyzers equal to at least one-half (round up) the minimum required sites listed in Table D-5 of this appendix. At least one required continuous analyzer in each MSA must be collocated with one of the required FRM/FEM/ARM monitors, unless at least one of the required FRM/FEM/ARM monitors is itself a continuous FEM or ARM monitor in which case no collocation requirement applies. State and local air monitoring agencies must use methodologies and quality assurance/quality control (QA/QC) procedures approved by the EPA Regional Administrator for these required continuous analyzers. [This paragraph is from Appendix D to 40 CFR Part 58.]

Collocation Requirements for Manual PM_{10}:

3.3.4 Collocated Quality Control Sampling Procedures for Manual PM10. Collocated sampling for PM10 is only required for manual samplers. For each pair of collocated monitors, designate one sampler as the primary monitor whose concentrations will be used to report air quality for the site and designate the other as the quality control monitor.

3.3.4.1 For manual PM10 samplers, a PQAO must:

(a) Have 15 percent of the primary monitors collocated (values of 0.5 and greater round up); and

(b) Have at least one collocated quality control monitor (if the total number of monitors is less than three).

3.3.4.2 The collocated quality control monitors should be deployed according to the following protocol:

(a) Fifty percent of the collocated quality control monitors should be deployed at sites with daily concentrations estimated to be within plus or minus 20 percent of the applicable NAAQS and the remainder at the PQAOs discretion;

(b) If an organization has no sites with daily concentrations within plus or minus 20 percent of the NAAQS, 50 percent of the collocated quality control monitors should be deployed at those sites with the daily mean concentrations among the highest for all sites in the network and the remainder at the PQAOs discretion.

(c) The two collocated monitors must be within 4 meters (inlet to inlet) of each other and at least 2 meters apart for flow rates greater than 200 liters/min or at least 1 meter apart for samplers having flow rates less than 200 liters/min to preclude airflow interference. A waiver allowing up to 10 meters horizontal distance and up to 3 meters vertical distance (inlet to inlet) between a primary and collocated sampler may be approved by the Regional Administrator for sites at a neighborhood or larger scale of representation. This waiver may be approved during the annual network plan approval process. Sampling and analytical methodologies must be the consistently implemented for both collocated samplers and for all other samplers in the network.

(d) Sample the collocated quality control monitor on a 1-in-12 day schedule. Report the measurements from both primary and collocated quality control monitors at each collocated sampling site to AQS. The calculations for evaluating precision between the two collocated monitors are described in section 4.2.1 of this appendix.

Collocated Quality Control Sampling for TSP Pb:

3.4.4 Collocated Quality Control Sampling for TSP Pb for monitoring sites other than non-source oriented NCore. For each pair of collocated monitors for manual TSP Pb samplers, designate one sampler as the primary monitor whose concentrations will be used to report air quality for the site, and designate the other as the quality control monitor.

3.4.4.1 A PQAO must:

(a) Have 15 percent of the primary monitors (not counting non-source oriented NCore sites in PQAO) collocated. Values of 0.5 and greater round up; and

(b) Have at least one collocated quality control monitor (if the total number of monitors is less than three).

3.4.4.2 The collocated quality control monitors should be deployed according to the following protocol:

(a) The first collocated Pb site selected must be the site measuring the highest Pb concentrations in the network. If the site is impractical, alternative sites, approved by the EPA Regional Administrator, may be selected. If additional collocated sites are necessary, collocated sites may be chosen that reflect average ambient air Pb concentrations in the network.

(b) The two collocated monitors must be within 4 meters (inlet to inlet) of each other and at least 2 meters apart for flow rates greater than 200 liters/min or at least 1 meter apart for samplers having flow rates less than 200 liters/min to preclude airflow interference.

(c) Sample the collocated quality control monitor on a 1-in-12 day schedule. Report the measurements from both primary and collocated quality control monitors at each collocated sampling site to AQS. The calculations for evaluating precision between the two collocated monitors are described in section 4.2.1 of this appendix.

40 CFR Part 58, § 58.12 Operating schedules.

State and local governments shall collect ambient air quality data at any SLAMS station on the following operational schedules:

(a) For continuous analyzers, consecutive hourly averages must be collected except during:

(1) Periods of routine maintenance,

(2) Periods of instrument calibration, or

(3) Periods or monitoring seasons exempted by the Regional Administrator.

(b) For Pb manual methods, at least one 24-hour sample must be collected every 6 days except during periods or seasons exempted by the Regional Administrator.

(c) For PAMS VOC samplers, samples must be collected as specified in section 5 of appendix D to this part. Area-specific PAMS operating schedules must be included as part of the PAMS network description and must be approved by the Regional Administrator.

(d) For manual PM2.5 samplers:

(1)(i) Manual PM2.5 samplers at required SLAMS stations without a collocated continuously operating PM2.5 monitor must operate on at least a 1-in-3 day schedule unless a waiver for an alternative schedule has been approved per paragraph (d)(1)(ii) of this section.

(ii) For SLAMS PM2.5 sites with both manual and continuous PM2.5 monitors operating, the monitoring agency may request approval for a reduction to 1-in-6 day PM2.5 sampling or for seasonal sampling from the EPA Regional Administrator. Other requests for a reduction to 1-in-6 day PM2.5 sampling or for seasonal sampling may be approved on a case-by-case basis. The EPA Regional Administrator may grant sampling frequency reductions after consideration of factors (including but not limited to the historical PM2.5 data quality assessments, the location of current PM2.5 design value sites, and their regulatory data needs) if the Regional Administrator determines that the reduction in sampling frequency will not compromise data needed for implementation of the NAAQS. Required SLAMS stations whose measurements determine the design value for their area and that are within ±10 percent of the annual NAAQS, and all required sites where one or more 24-hour values have exceeded the 24-hour NAAQS each year for a consecutive period of at least 3 years are required to maintain at least a 1-in-3 day sampling frequency until the design value no longer meets these criteria for 3 consecutive years. A continuously operating FEM or ARM PM2.5 monitor satisfies this requirement unless it is identified in the monitoring agency's annual monitoring network plan as not appropriate for comparison to the NAAQS and the EPA Regional Administrator has approved that the data from that monitor may be excluded from comparison to the NAAQS.

(iii) Required SLAMS stations whose measurements determine the 24-hour design value for their area and whose data are within ±5 percent of the level of the 24-hour PM2.5 NAAQS must have an FRM or FEM operate on a daily schedule if that area's design value for the annual NAAQS is less than the level of the annual PM2.5 standard. A continuously operating FEM or ARM PM2.5 monitor satisfies this requirement unless it is identified in the monitoring agency's annual monitoring network plan as not appropriate for comparison to the NAAQS and the EPA Regional Administrator has approved that the data from that monitor may be excluded from comparison to the NAAQS. The daily schedule must be maintained until the referenced design value no longer meets these criteria for 3 consecutive years.

(iv) Changes in sampling frequency attributable to changes in design values shall be implemented no later than January 1 of the calendar year following the certification of such data as described in §58.15.

(2) Manual PM2.5 samplers at NCore stations and required regional background and regional transport sites must operate on at least a 1-in-3 day sampling frequency.

(3) Manual PM2.5 speciation samplers at STN stations must operate on at least a 1-in-3 day sampling frequency unless a reduction in sampling frequency has been approved by the EPA Administrator based on factors such as area's design value, the role of the particular site in national health studies, the correlation of the site's species data with nearby sites, and presence of other leveraged measurements.

(e) For PM10 samplers, a 24-hour sample must be taken from midnight to midnight (local standard time) to ensure national consistency. The minimum monitoring schedule for the site in the area of expected maximum concentration shall be based on the relative level of that monitoring site concentration with respect to the 24-hour standard as illustrated in Figure 1. If the operating agency demonstrates by monitoring data that during certain periods of the year conditions preclude violation of the PM10 24-hour standard, the increased sampling frequency for those periods or seasons may be exempted by the Regional Administrator and permitted to revert back to once in six days. The minimum sampling schedule for all other sites in the area remains once every six days. No less frequently than as part of each 5-year network assessment, the most recent year of data must be considered to estimate the air quality status at the site near the area of maximum concentration. Statistical models such as analysis of concentration frequency distributions as described in “Guideline for the Interpretation of Ozone Air Quality Standards,” EPA-450/479-003, U.S. Environmental Protection Agency, Research Triangle Park, NC, January 1979, should be used. Adjustments to the monitoring schedule must be made on the basis of the 5-year network assessment. The site having the highest concentration in the most current year must be given first consideration when selecting the site for the more frequent sampling schedule. Other factors such as major change in sources of

PM10 emissions or in sampling site characteristics could influence the location of the expected maximum concentration site. Also, the use of the most recent 3 years of data might, in some cases, be justified in order to provide a more representative database from which to estimate current air quality status and to provide stability to the network. This multiyear consideration reduces the possibility of an anomalous year biasing a site selected for accelerated sampling. If the maximum concentration site based on the most current year is not selected for the more frequent operating schedule, documentation of the justification for selection of an alternative site must be submitted to the Regional Office for approval during the 5-year network assessment process. Minimum data completeness criteria, number of years of data and sampling frequency for judging attainment of the NAAQS are discussed in appendix K of part 50 of this chapter.

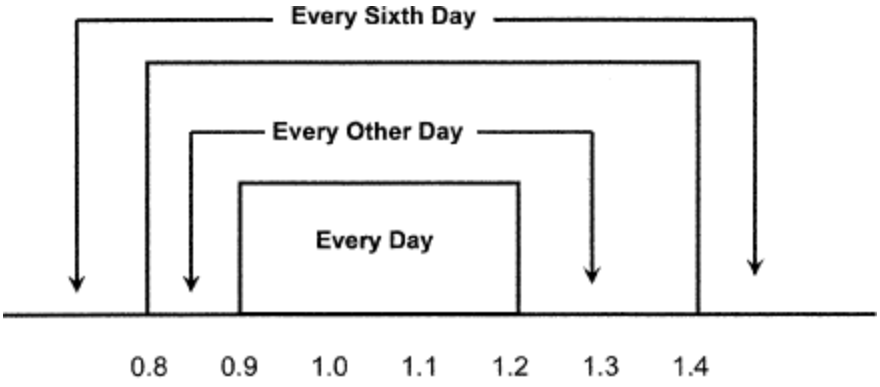


Figure 1 – Ratio to Standard

(f) For manual PM10-2.5 samplers:

(1) Manual PM10-2.5 samplers at NCore stations must operate on at least a 1-in-3 day schedule at sites without a collocated continuously operating federal equivalent PM10-2.5 method that has been designated in accordance with part 53 of this chapter.

(2) [Reserved]

(g) For continuous SO2 analyzers, the maximum 5-minute block average concentration of the twelve 5-minute blocks in each hour must be collected except as noted in §58.12 (a).

[71 FR 61298, Oct. 17, 2006, as amended at 72 FR 32210, June 12, 2007; 75 FR 35601, June 22, 2010; 78 FR 3282, Jan. 15, 2013; 81 FR 17279, Mar. 28, 2016]

Appendix K: Collocated Monitoring Network Analysis

For some criteria pollutants, EPA regulations require that multiple monitors are operated at the same site for the purpose of quality assurance Appendix J or public reporting Appendix I. This Appendix compares the Iowa network to these requirements.

Ozone Network Analysis

There are no federal requirements for collocated ozone monitoring. In the Iowa network, continuous ozone data is generated at twelve sites. The data is used for real-time and AQI reporting and uploaded to the EPA's AirNow Real-Time Reporting System, where it is consolidated to produce the national ozone and AQI maps. At each of the twelve sites, pairs of ozone monitors are operated to allow for a real-time check on the quality of the data. These are FEM monitors, and the data they produce is acceptable for NAAQS compliance and AQI reporting. When two FEM monitors are operated simultaneously at a monitoring site, data from the secondary ozone monitor is substituted for missing values from the primary monitor. The combined dataset is then used to calculate a design value for the site.

$PM_{2.5}$ Network Analysis

To meet EPA QA requirements, the Iowa network contains pairs of $PM_{2.5}$ monitors (collocated monitors) at some sites. EPA regulations (Appendix J) require that 15 percent of the sites be collocated (values of 0.5 and greater round up), and a minimum of one collocated monitor within each monitoring group or primary quality assurance organization (PQAO). The Iowa network contains three PQAO's, corresponding to the Polk, Linn and SHL networks. Since the SHL network contains 15 FRM sites, 2.25 (rounding to 2) collocated sites are required. The Polk network (2 FRM sites) and Linn network (1 FRM site), each meet minimum collocation requirements by operation of a single collocated FRM site.

Linn County operates a collocated monitor at its Public Health site. Polk County operates its collocated monitor at its Health Department site. SHL uses two groups of field operators to run its $PM_{2.5}$ samplers. Members of the SHL staff collect filters in the eastern part of the state where levels are typically higher. Contract operators collect filters in the western half of the state where levels are typically lower. SHL operates a collocated pair of filter samplers at its NCORE site. SHL also operates a collocated pair of filter samplers at Muscatine High School (with highest annual and 24-Hour design values in the state). A contract operator collects filters at a collocated site at Franklin School in Council Bluffs.

EPA regulations indicate that "50 percent of the collocated quality control monitors should be deployed at sites with annual average or daily concentrations estimated to be within ±20 percent of either the annual or 24-hour NAAQS and the remainder at the PQAOs discretion".

EPA also indicates that "If an organization has no sites with annual average or daily concentrations within ±20 percent of the annual NAAQS or 24-hour NAAQS, 50 percent of the collocated quality control monitors should be deployed at those sites with the annual mean concentrations or 24-hour concentrations among the highest for all sites in the network and the remainder at the PQAOs discretion". This requirement is met automatically in the Linn PQAO since they have only one $PM_{2.5}$ site. It is also met in the Polk PQAO.

Iowa has no sites within 20% of either $PM_{2.5}$ NAAQS. SHL currently operates three sites in Iowa that have collocated $PM_{2.5}$ monitors; Muscatine High School, Davenport, Jefferson School, and Council Bluffs, Franklin School. (See Figure K.1.) The Muscatine High School site is among the highest sites in the SHL network. The Department feels that the value of having a collocated $PM_{10\text{-}2.5}$ pair at Davenport, Jefferson School argues against relocating the collocated $PM_{2.5}$ pair. The Department also feels that there is value in having a collocated $PM_{2.5}$ monitor at the Council Bluffs site in order to provide additional quality assurance data for a monitor that could impact the attainment status of the large Omaha-Council Bluffs MSA.

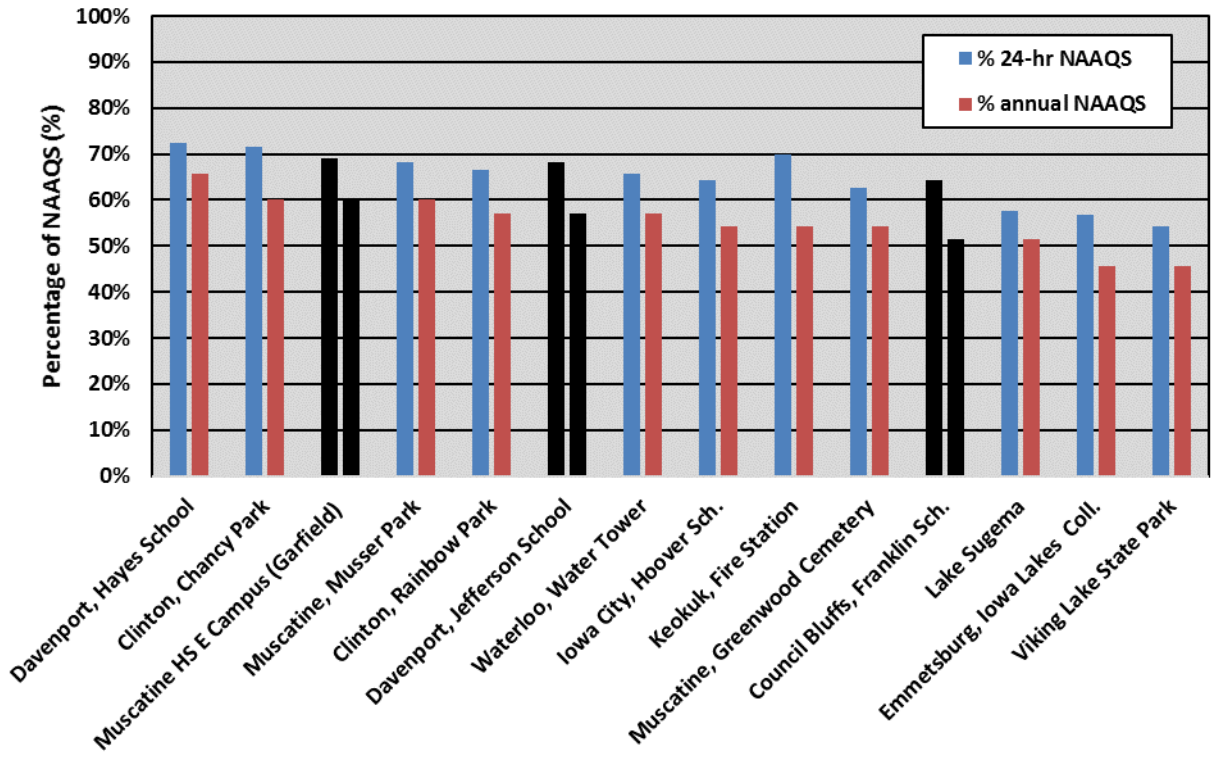


Figure K.1 SHL $PM_{2.5}$ Design Values as a percentage of the NAAQS. Collocated Monitors are shown in black.

In MSAs where a single $PM_{2.5}$ monitor is required, 40 CFR Part 58 requires that an additional continuous $PM_{2.5}$ monitor is operated at the same monitoring location (Appendix E). A

continuous $PM_{2.5}$ monitor for the Omaha-Council Bluffs MSA is operated by a Nebraska agency. Continuous $PM_{2.5}$ monitors are currently operated in Des Moines, Davenport, Cedar Rapids, Waterloo, and Iowa City.

In the Iowa $PM_{2.5}$ network, continuous $PM_{2.5}$ data is generated at ten sites. This data is used for real-time AQI reporting and uploaded to the EPA's AirNow system where it is consolidated along with data from other states to produce the national $PM_{2.5}$ and AQI maps. At all ten sites, pairs of beta-attenuation monitors (BAMs) are operated to allow for a real-time check on the quality of the data. Owing to historical issues with comparability of $PM_{2.5}$ continuous data produced by BAMs and FRM filter sampler data, the continuous monitors are not currently operated in a FEM configuration except for the pair of BAM 1020s at Cedar Rapids, Public Health; and the pair of BAM 1022s at the Des Moines Health Dept. The data from the eight remaining sites not in FEM configuration is used for real-time AQI reporting, but not for establishing NAAQS compliance.

Beginning in July of 2017 at the Des Moines Health Department site, the POC 4 BAM read less than both the POC 3 BAM and the FRM. In the following months the disparity increased, and from November 2017 to February of 2018 the difference between the POC 4 BAM and the other two analyzers was more than 2 $\mu g/m^3$. (See Figure K.2 below). To avoid low bias in the site data caused by the admixture of data from the POC 4 BAM, the monitor was designated as an SPM, and its data was blocked from contributing to the combined data set for the site.

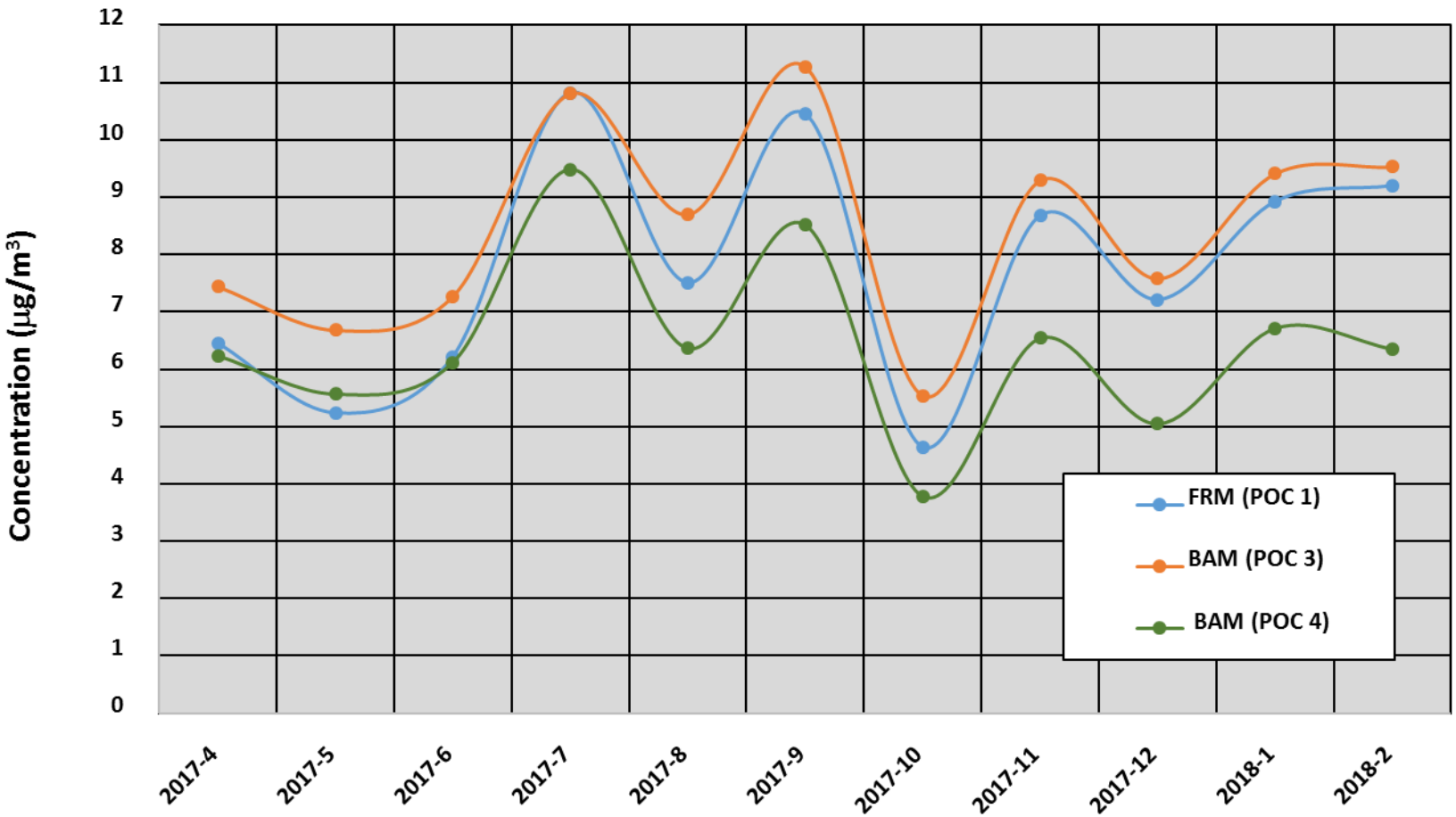


Figure K.2 Polk County Public Health $PM_{2.5}$ (POC Averages by Month)

Acceptable	Site #	Site Name	Monitor ID	Slope (S)	Intercept (I)	R	Count
S, I, R	1	Cedar Rapids, Public Health	191130040-3	0.93	0.3	0.95	348
S, I, R	2	Cedar Rapids, Public Health	191130040-4	0.97	-0.1	0.95	346
S, I, R	3	Des Moines, Health Dept.	191530030-3	1.05	0.6	0.97	254
S, I, R	4	Des Moines, Health Dept.	191530030-4	0.98	-0.3	0.95	235
S, I	5	Clinton, Rainbow Park	190450021-3	0.97	1.6	0.84	148
S, I	6	Iowa City, Hoover Sch.	191032001-4	0.90	0.4	0.87	248
S, I	7	Keosauqua, Lake Sugema	191770006-3	0.99	1.8	0.92	107
S, I	8	Muscatine HS, East Campus Trailer	191390019-3	0.97	1.3	0.94	316
S, I	9	Viking Lake State Park	191370002-3	0.94	0.3	0.93	110
-	10	Clinton, Chancy Park	190450019-3	0.88	6.6	0.91	217
-	11	Clinton, Chancy Park	190450019-4	1.04	3.0	0.85	213
-	12	Clinton, Rainbow Park	190450021-4	1.00	4.8	0.91	152
-	13	Davenport, Jefferson Sch.	191630015-3	0.90	4.1	0.88	333
-	14	Davenport, Jefferson Sch.	191630015-4	0.98	2.7	0.83	315
-	15	Emmetsburg, Iowa Lakes Coll.	191471002-3	0.98	2.2	0.90	106
-	16	Emmetsburg, Iowa Lakes Coll.	191471002-4	0.97	3.1	0.94	110
-	17	Iowa City, Hoover Sch.	191032001-3	0.89	1.5	0.79	334
-	18	Keosauqua, Lake Sugema	191770006-4	0.84	2.1	0.78	102
-	19	Muscatine HS, East Campus Trailer	191390019-4	0.92	2.2	0.93	328
-	20	Viking Lake State Park	191370002-4	0.76	2.2	0.66	104
-	21	Waterloo, Water Tower	190130009-3	0.86	3.7	0.86	113
-	22	Waterloo, Water Tower	190130009-4	0.94	4.1	0.92	115

Table K.1 BAM Performance Relative to the $PM_{2.5}$ Class III Acceptance Criteria.

According to the $PM_{2.5}$ Class III Acceptance Criteria contained in Table C-4 of Part 53[50,51,52] when CCV ≥ 0.5, R (the coefficient of correlation) is required to be ≥ 0.95. In 2017, all CCV's were greater than 0.5, and only 4 monitors (see green highlighted section of table K.1) had R ≥ 0.95.

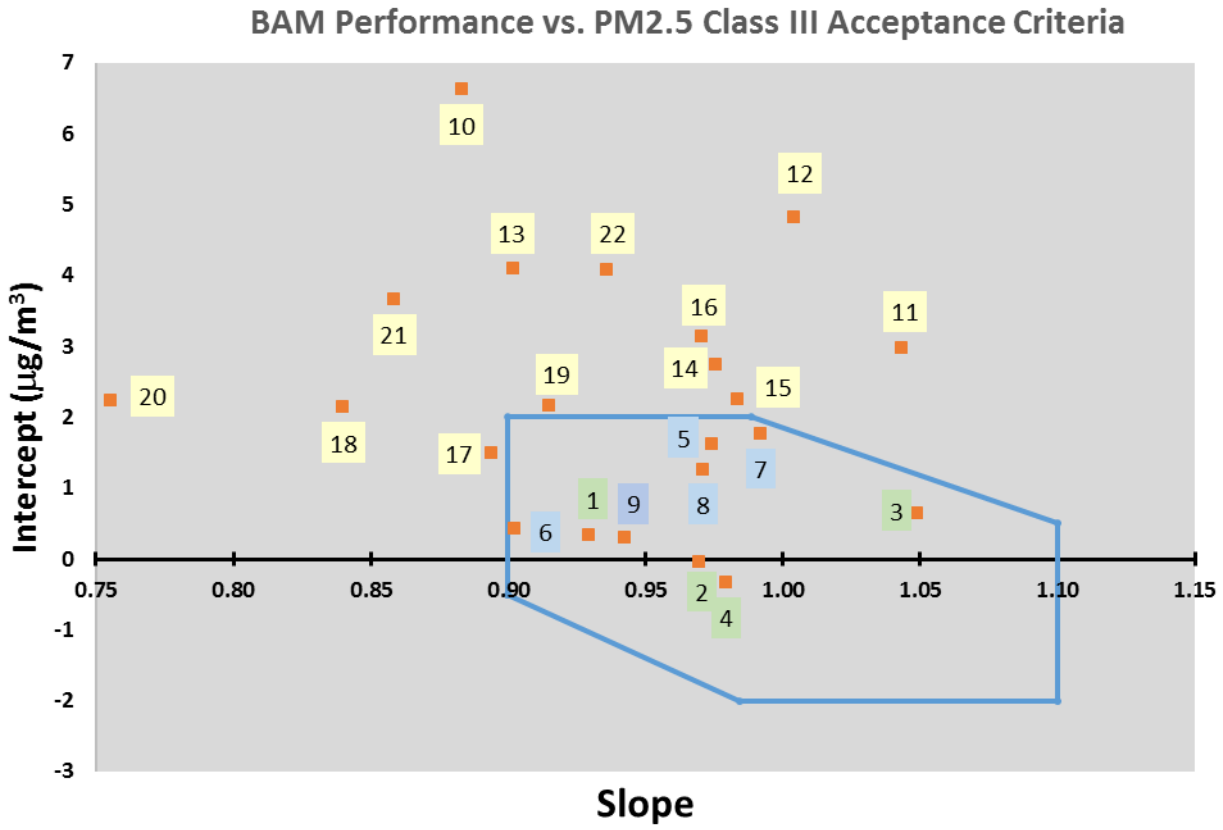


Figure K.3 BAM Performance Relative to the Slope and Intercept Acceptance Criteria in Part 53.

Also according to the $PM_{2.5}$ Class III Acceptance Criteria, The Slope (S) and Intercept (I) must be inside the Blue Box (the boundaries of the box are indicated blue lines in Figure K.3). Nine monitors noted in blue and green in the chart (Figure K.3) and table (Table K.1) above met this criteria. Four monitors (indicated in blue in the chart and table above) met all criteria for S, R, and I.

[50] 40 CFR Part 53

[51] EPA Air Data. In the lower right corner of the webpage (under "Generate Technical Reports") see "PM2.5 Continuous Monitor Comparability Assessments".

[52] EPA AMTIC Site. See bullet item "Spreadsheet with example data included (xls file) (410K)".

$PM_{10-2.5}$ Network Analysis

There are currently no PQAO collocation requirements for $PM_{10-2.5}$. The Iowa network contains three PQAO's, corresponding to the Polk, Linn, and SHL networks and the networks operate 1, 1, and 4 sites respectively. Each of the PQAO's operates one collocated $PM_{10-2.5}$ site.

PM_{10} Network Analysis

EPA regulations require collocation at 15 percent (or at least one) of the monitoring sites within a PQAO. The Iowa network contains three PQAO's, corresponding to the Polk, Linn and SHL networks. Since the SHL network contains 6 FRM sites, 0.9 (rounding to 1) collocated site is required. For the Polk network (1 FRM site) and Linn network (1 FRM site), one collocated site meets the requirement.

Linn County operates a collocated monitor at its Public Health site. Polk County operates its collocated monitor at its Health Department site. SHL operates a collocated pair of filter samplers at its NCORE site as well as the Holcim Cement site in Mason City.

According to EPA regulations "Fifty percent of the collocated quality control monitors should be deployed at sites with daily concentrations estimated to be within plus or minus 20 percent of the applicable NAAQS and the remainder at the PQAOs discretion". Based on data from the most recent 5 years, the only site in Iowa measuring levels within 20 percent of the NAAQS (120 $\mu g/m^3$or more) is the Linwood Mining site in Buffalo, Iowa (see Table K.2) and it is currently collocated.

PQAO	AQS ID	Site Name	2013	2014	2015	2016	2017
SHL	191630017	Buffalo, Linwood Mining	141	145	153	120	110
SHL	190330018	Mason City, Holcim Cement	73	57	70	72	84
Polk	191530030	Des Moines, Health Dept.	46	52	40	43	65
Linn	191130040	Cedar Rapids, Public Health	57	53	69	53	64
SHL	191550009	Council Bluffs, Franklin School	65	53	50	53	64
SHL	191630015	Davenport, Jefferson Sch.	50	49	63	40	49
SHL	191390015	Muscatine HS, East Campus Roof	57	50	65	41	45
SHL	191770006	Keosauqua, Lake Sugema	42	46	38	41	44

Table K.2 Annual Daily Maximum Values for Iowa PM_{10} Sites. All units are $\mu g/m^3$. Shaded rows indicate that the site has collocated monitors.

EPA also indicates that "If an organization has no sites with daily concentrations within plus or minus 20 percent of the NAAQS, 50 percent of the collocated quality control monitors should be deployed at those sites with the daily mean concentrations among the highest for all sites in the network and the remainder at the PQAOs discretion."

The Polk and Linn County PQAOs each operate one PM_{10} and each of these sites are collocated to meet these EPA requirements.

When multiple FRM/FEM monitors are operated simultaneously at a monitoring site, in the absence of EPA rules describing the how the monitor data is to be aggregated to establish the site data, there is potential ambiguity in establishing the data capture and NAAQS attainment status at the site (Figure K.4). Owing to comparability issues between filter-based and continuous methods, the Department considers the FRM method (filter data) to be more suitable for making PM_{10} attainment decisions than continuous methods. At Linwood Mining near Buffalo, SHL collects filters from the primary filter sampler (POC 2) to establish NAAQS attainment, and operates a collocated BAM (POC 3) for quality assurance purposes and an additional BAM (POC 5) for real-time AQI reporting. A comparison of each BAM relative to the FRM is displayed in Figure K.4.

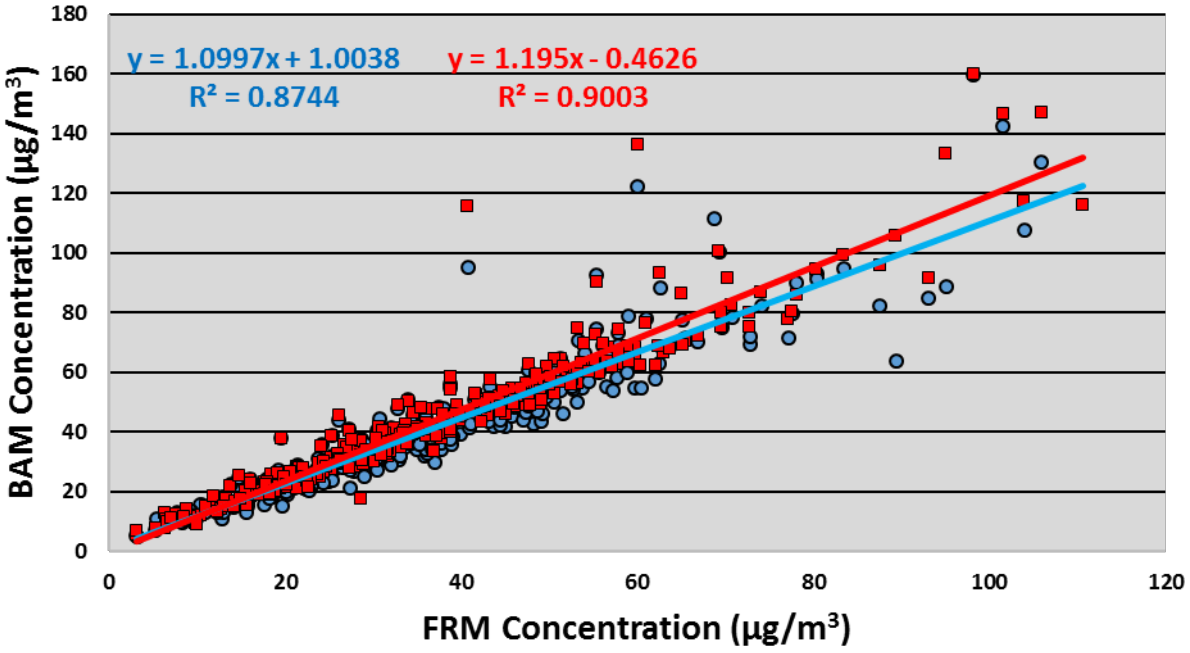


Figure K.4 Buffalo, Linwood Mining PM_{10} BAM vs FRM in 2017.

SO_2, NO_2, CO Network Analysis

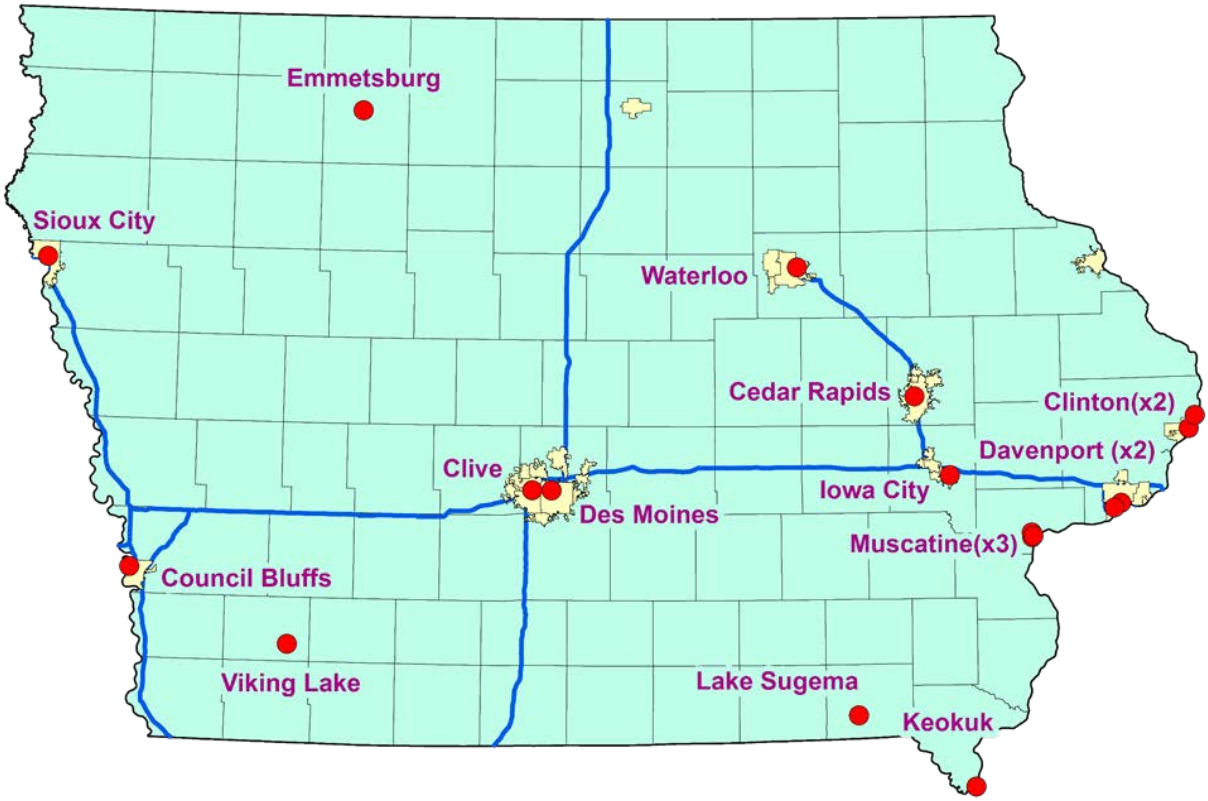
There are no federal requirements for collocated SO_2, NO_2 or CO monitoring, and there are no collocated monitors in the Iowa network for these criteria pollutants.

Lead Network Analysis

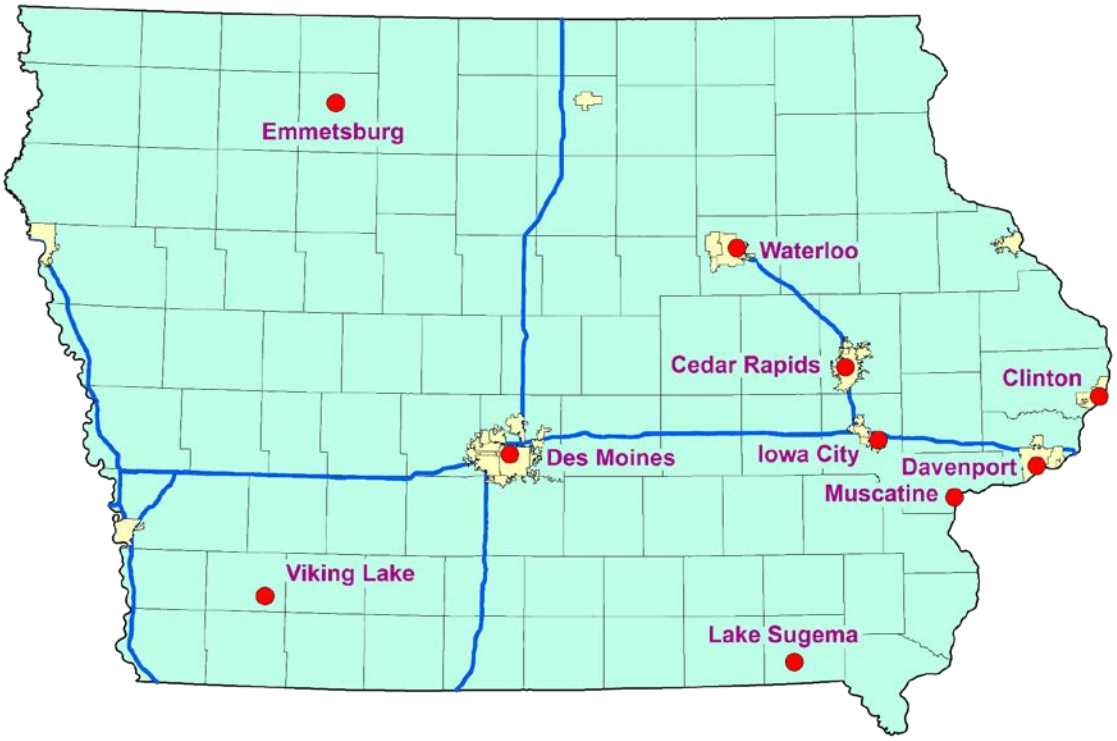
Iowa has only one Lead site and meets CFR requirements by having a one collocated monitor at this site.

Appendix L: Iowa Ambient Air Monitoring Network Maps

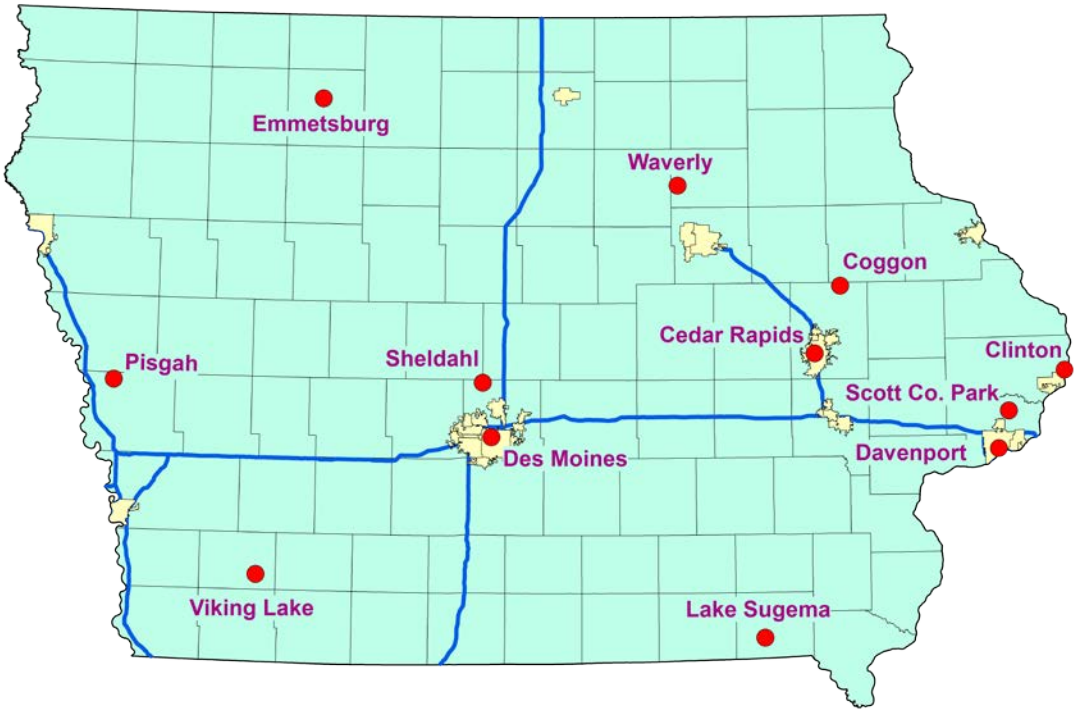
The following maps show the locations for the criteria pollutant monitors in the state of Iowa, which are current as of January 1, 2018. Non-criteria pollutant maps are also included for the continuous $PM_{2.5}$ monitoring network and the Toxics and Speciation monitoring networks.



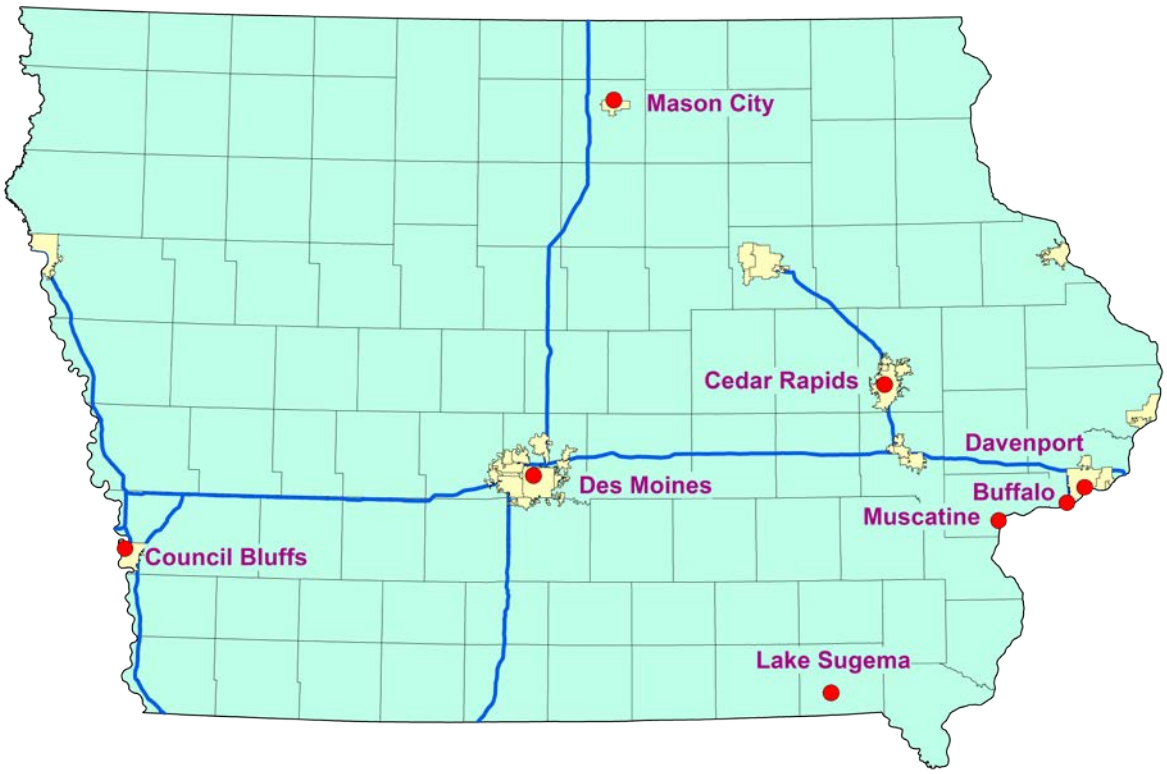
Manual $PM_{2.5}$ (FRM) Monitoring Sites



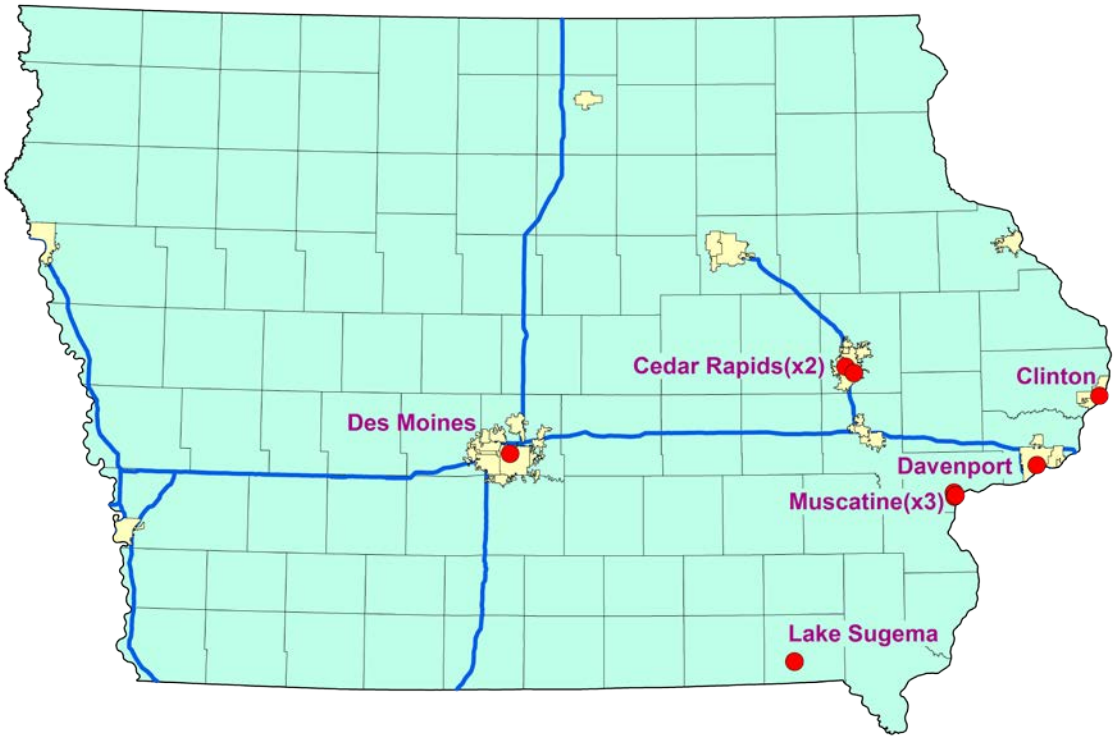
Continuous $PM_{2.5}$ (non-FRM) Monitoring Sites



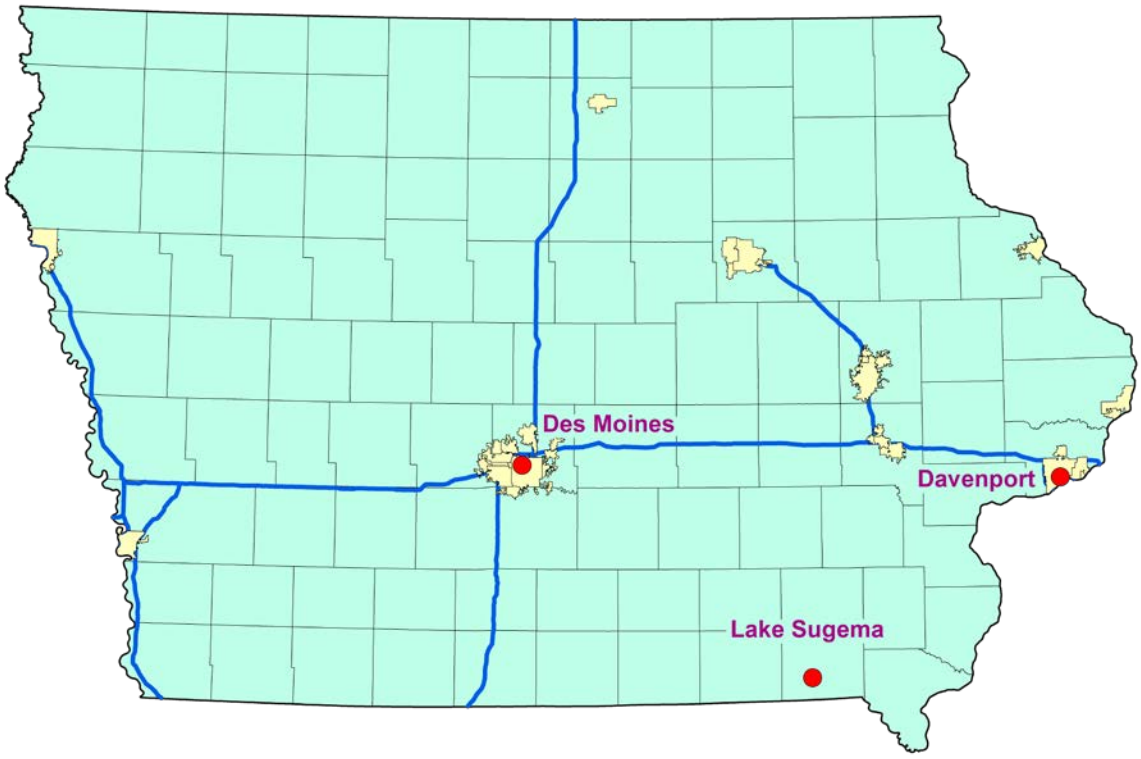
Ozone Monitoring Sites



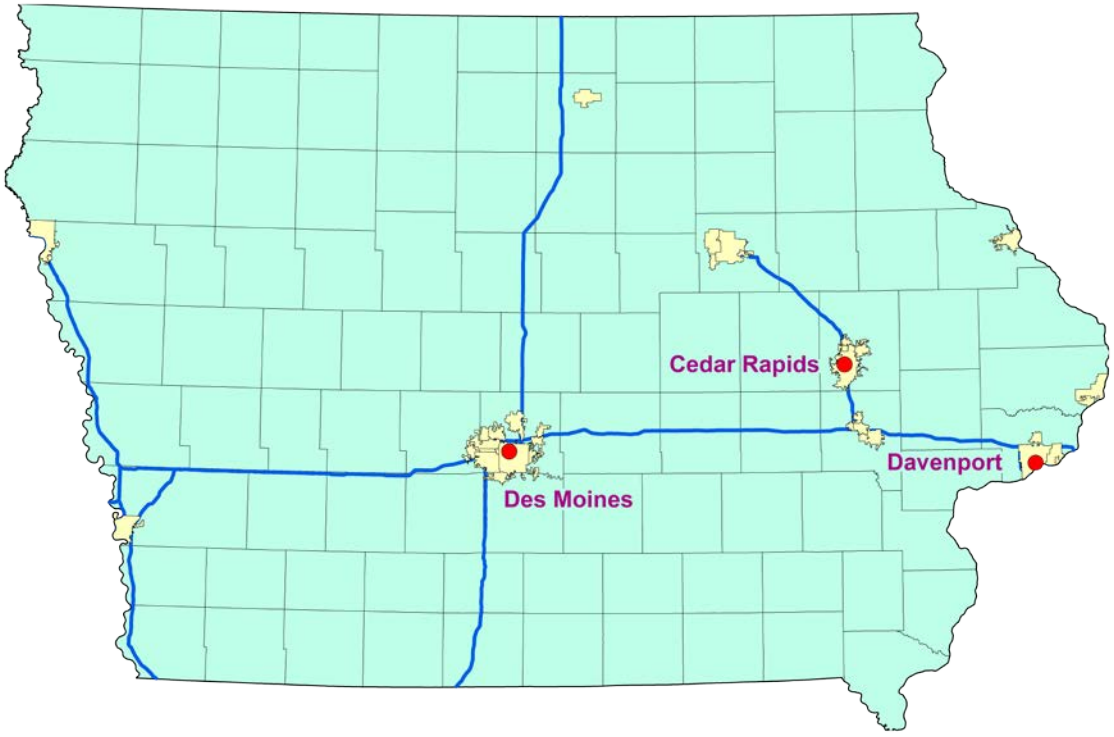
PM_{10} Monitoring Sites



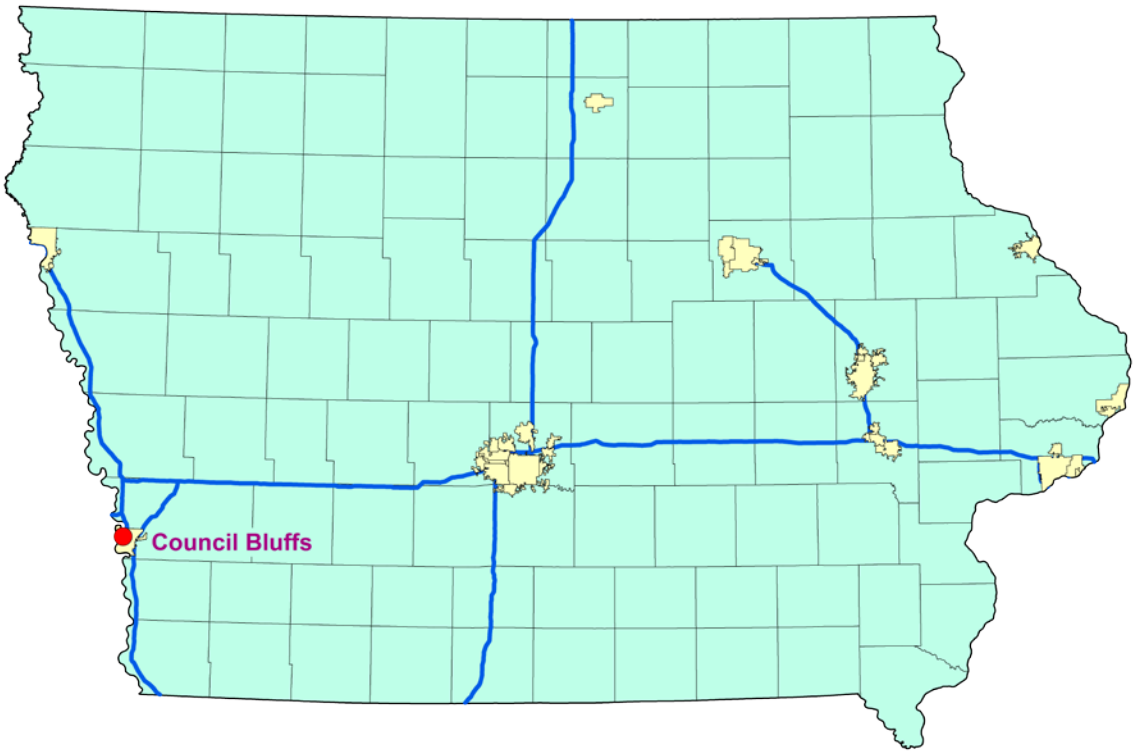
SO_2 Monitoring Sites



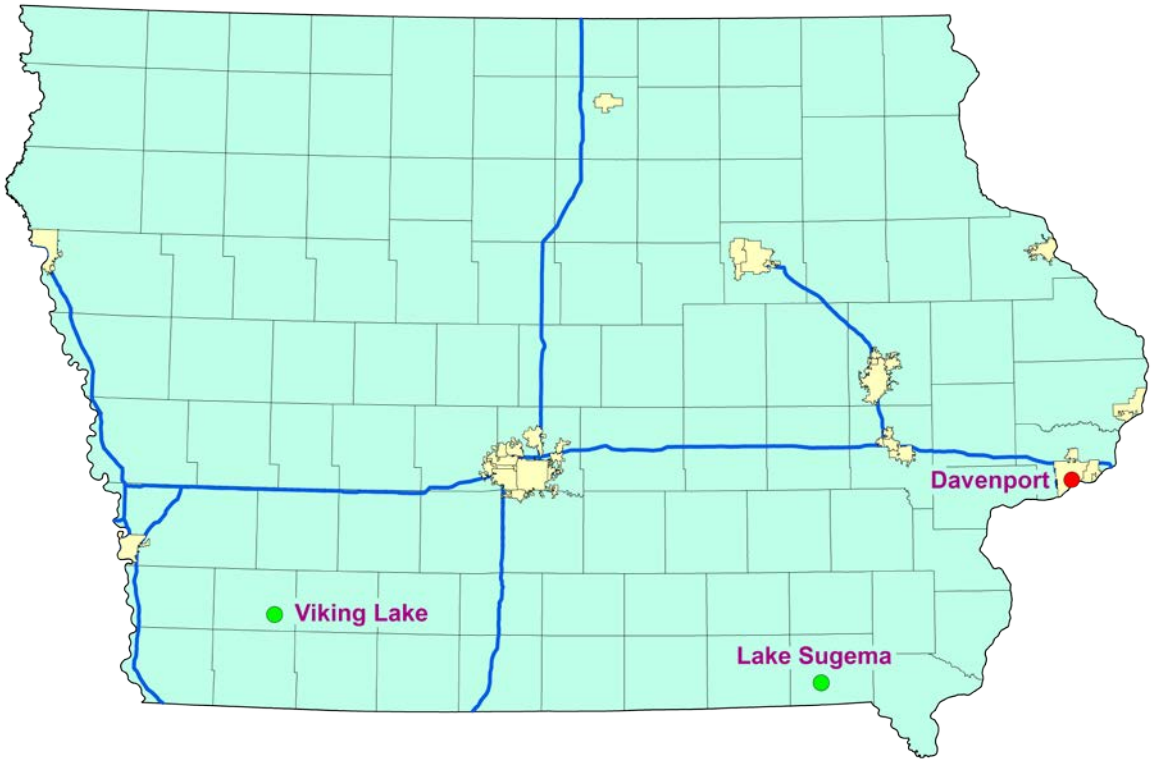
NO_2 Monitoring Sites



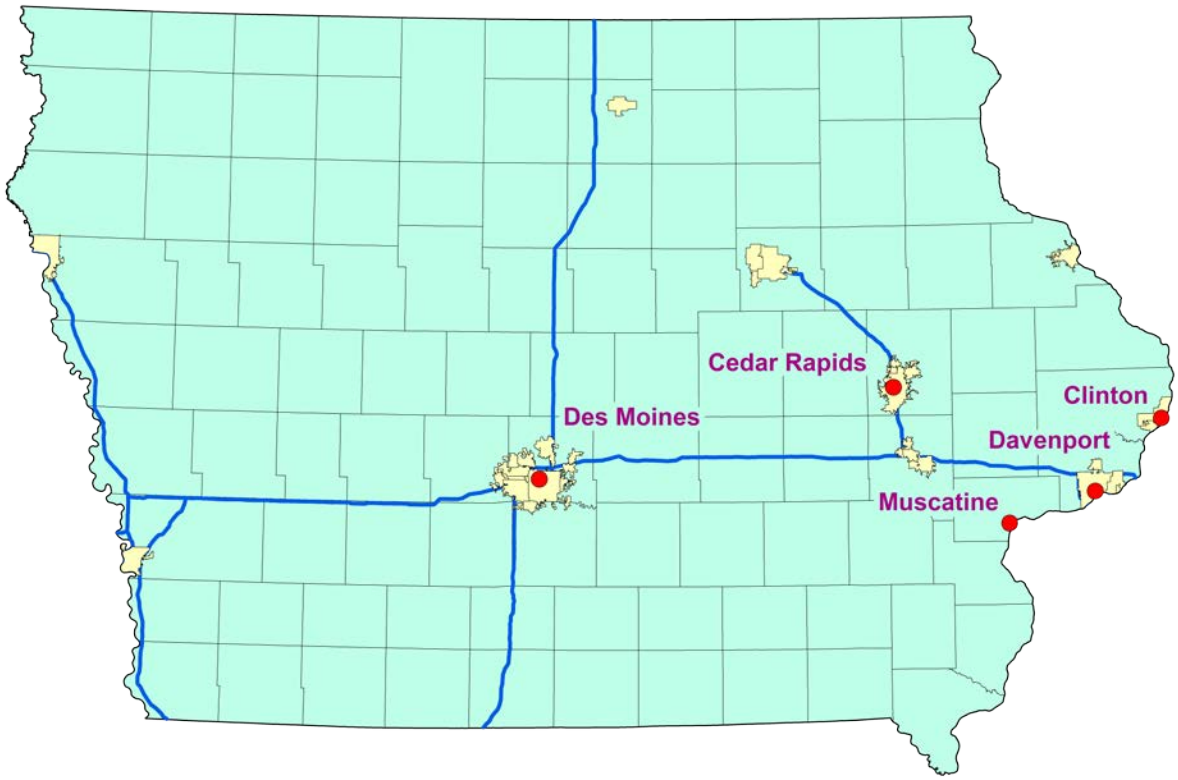
CO Monitoring Sites



Lead (Pb) Monitoring Site



Speciation Monitoring Sites; CSN Speciation site is located at the red dot, IMPROVE speciation sites are located at the green dots.



Toxics Monitoring Sites

Appendix M: Network Changes

SLAMs Network Changes

Based on the discussion in the Introduction, Appendix W and Appendix X, there are no federal requirements for SLAMS monitors at the sites below, and the DNR proposes to reclassify the following monitors from SLAMs to SPMs.

Site Name	AQS Site ID	Pollutant	POC	Analysis	Operating Schedule	Primary Monitoring Objective	Spatial Scale	NAAQS Comparable?	FRM / FEM	FRM/FEM Purpose	Action
Clive, Indian Hills Jr. High School	191532510	PM2.5	1	Gravimetric	1 in 3	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance	Convert SLAMs to SPM
Iowa City, Hoover Sch.	191032001	PM2.5	3	Met One BAM	Continuous	Population Exposure	Neighborhood	No	No		Convert SLAMs to SPM
Iowa City, Hoover Sch.	191032001	PM2.5	4	Met One BAM	Continuous	Population Exposure	Neighborhood	No	Yes	QA Real-Time AQI Reporting	Convert SLAMs to SPM
Iowa City, Hoover Sch.	191032001	PM2.5	1	Gravimetric	Daily	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance	Convert SLAMs to SPM

Table M.1 SLAMs monitors proposed for conversion to SPM monitors

Termination of SPM monitors

The reductions in the Iowa SPM network that are scheduled for January 1, 2019 are indicated in the table below:

Site Name	AQS Site ID	Pollutant	POC	Sampling Method	Operating Schedule	Primary Monitoring Objective	Spatial Scale	NAAQS Comparable?	FRM / FEM	FRM / FEM Purpose	Action
Cedar Rapids, Public Health	191130040	CO	1	Non-Dispersive Infrared	Continuous	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance	Deletion
Davenport, Jefferson Sch.	191630015	NO2	1	Chemiluminescence	Continuous	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance	Deletion
Des Moines, Health Dept.	191530030	SO2	1	UV Fluorescent	Continuous	Population Exposure	Neighborhood	Yes	Yes	NAAQS Compliance	Deletion

Table M.2 SPM monitors proposed for termination

As indicated in the graphs below, each of these three monitors have recorded excellent data capture (see Figures M.2, M.5, and M.8). They have also recorded ambient levels that are considerably less than the NAAQS (see Figures M.1, M.3, and M.6). Figure M.4 indicates that all the design values in the course of the Davenport NO_2 monitors operation are less than 50% of the NAAQS. Figure M.7 indicates that all the design values in the course of the Des Moines SO_2 monitors operation are less than 7% of the NAAQS. Termination of these monitors has been discussed with the Department's dispersion modeling staff and it was decided that they are not required for computation of background levels for dispersion modeling.

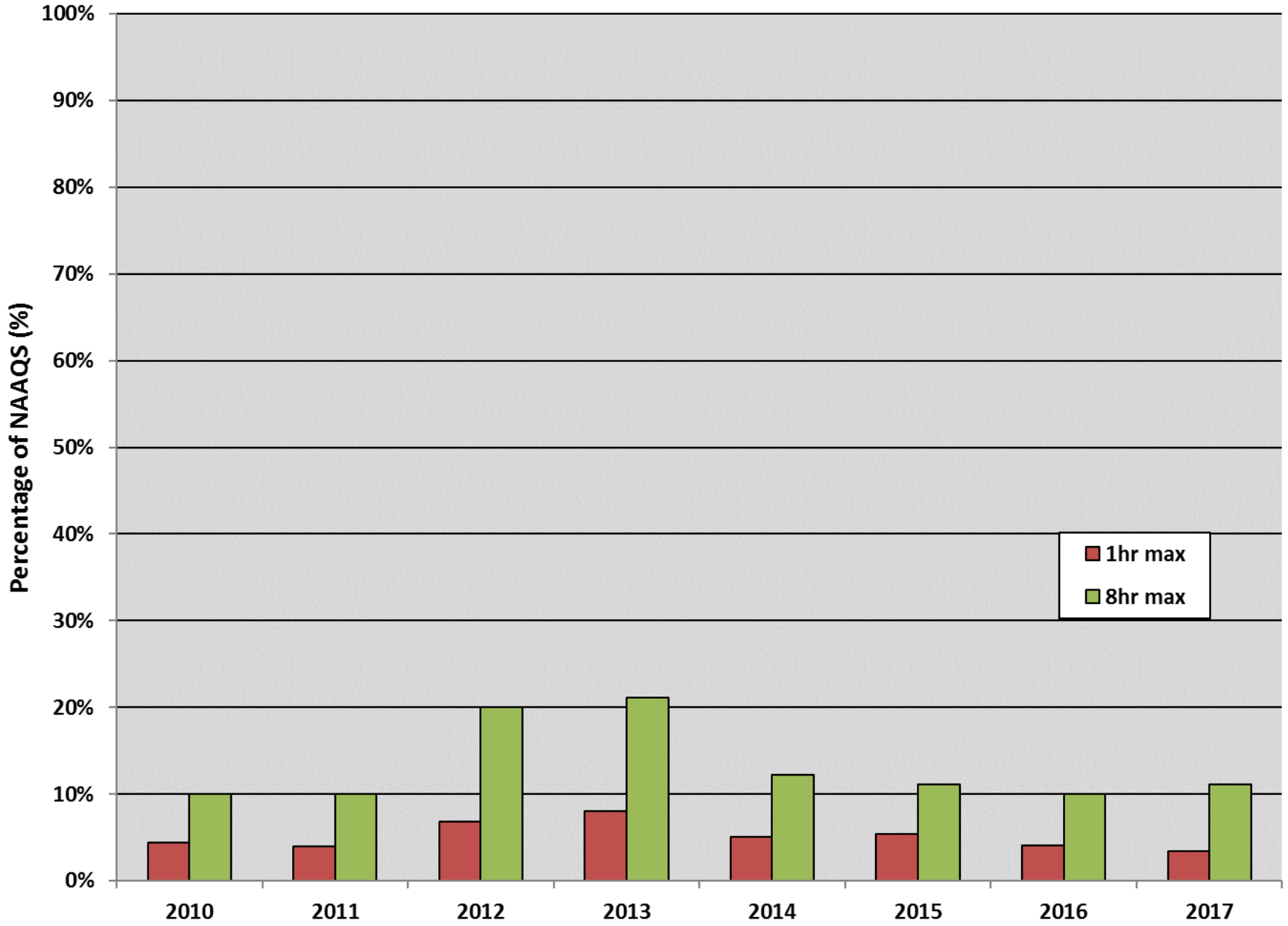


Figure M.1. Cedar Rapids, Public Health Site CO monitor, Daily Maximum 1-hr and 8-hr Values as a Percentage of the NAAQS. The 1-hr NAAQS is 35 ppm and the 8-hr NAAQS is 9 ppm.

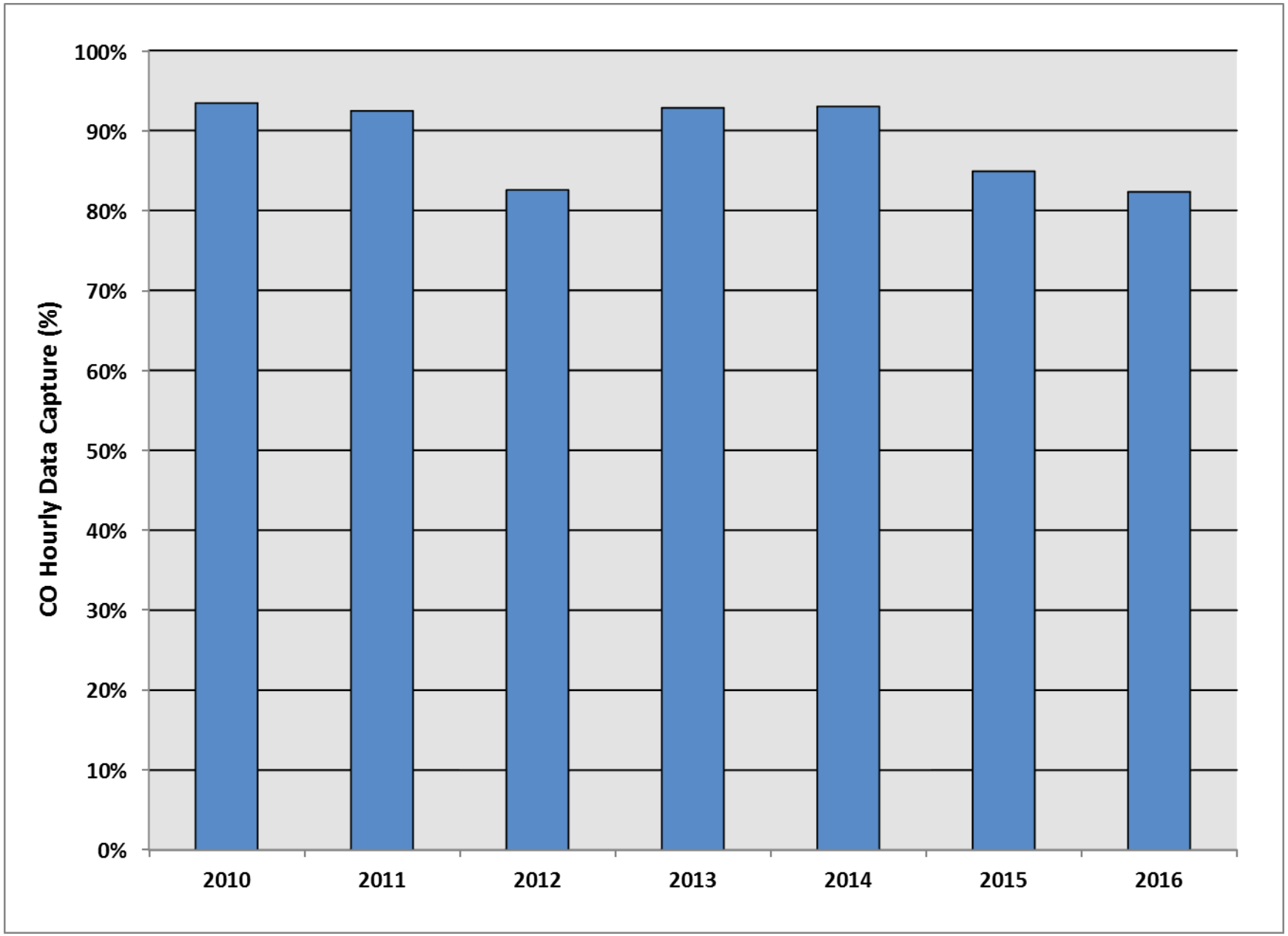


Figure M.2 Cedar Rapids, Public Health Site CO monitor, Percentage Hourly Data Capture by Year

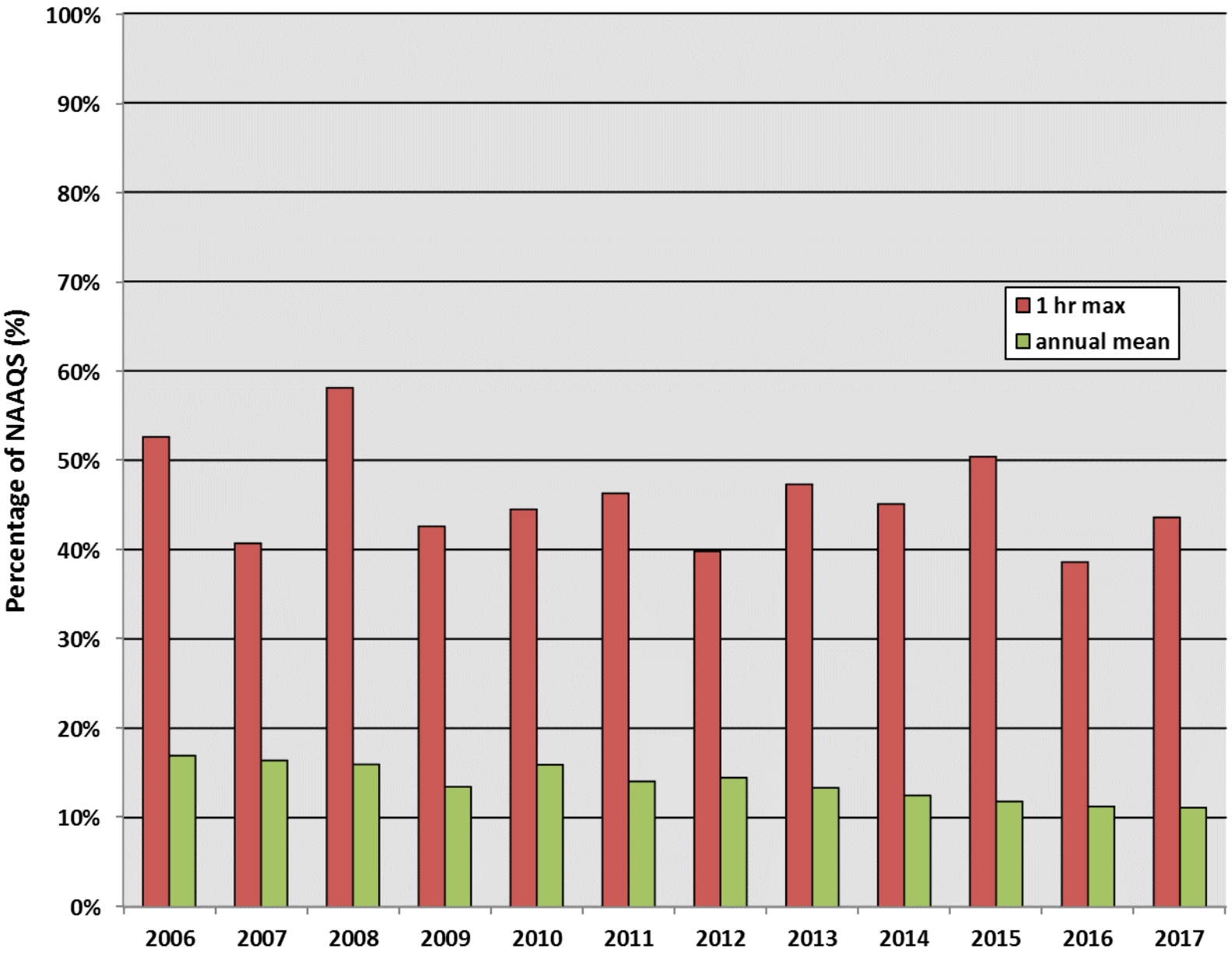


Figure M.3. Davenport, Jefferson School Site NO_2 monitor, Maximum Hourly and Annual Mean Values as a Percentage of the NAAQS. The 1-hr NAAQS is 100 ppb and the annual NAAQS is 53 ppb.

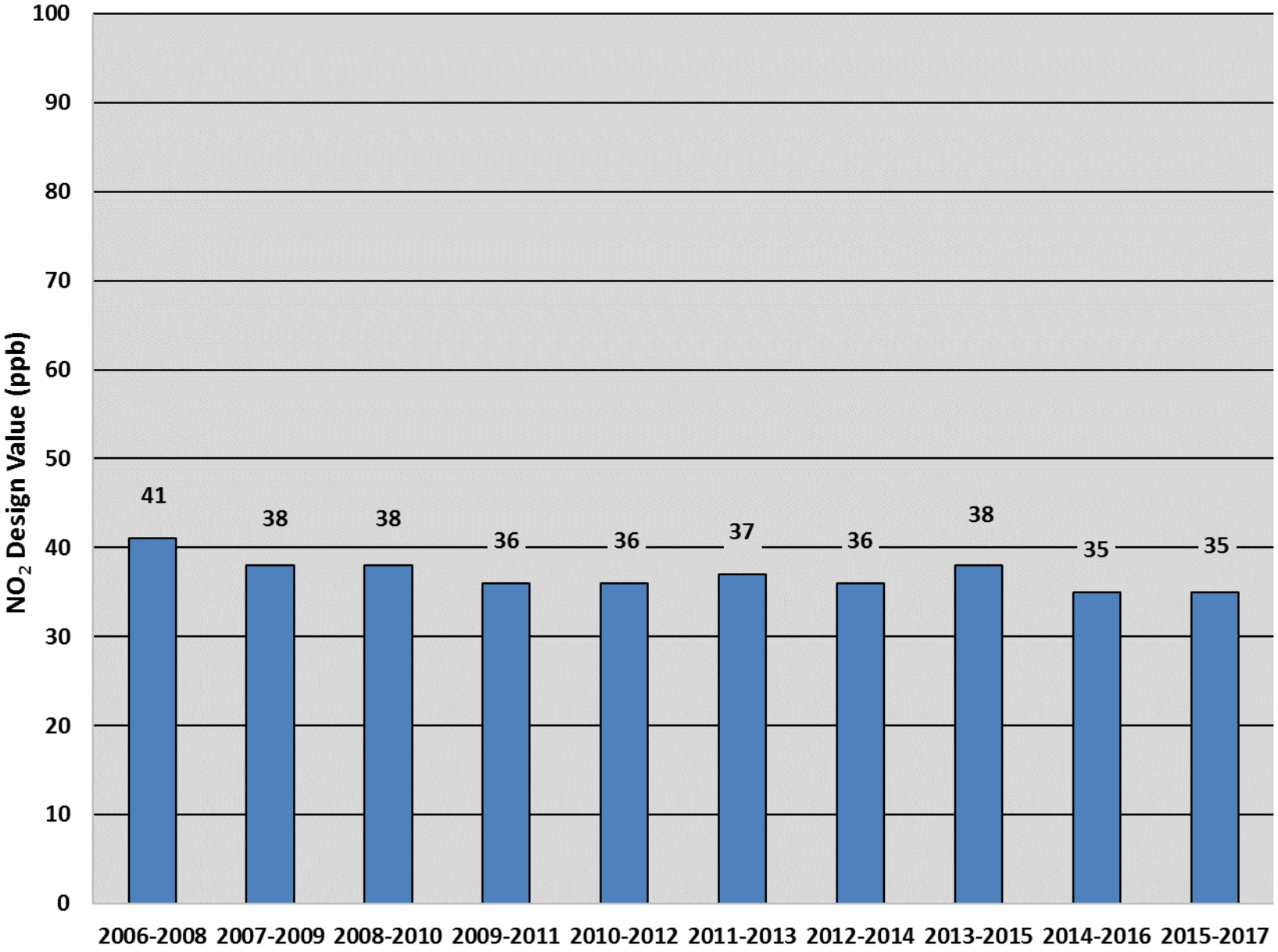


Figure M.4 Davenport, Jefferson School Site NO_2 monitor, Design Value Compared to the NAAQS (100 ppb)

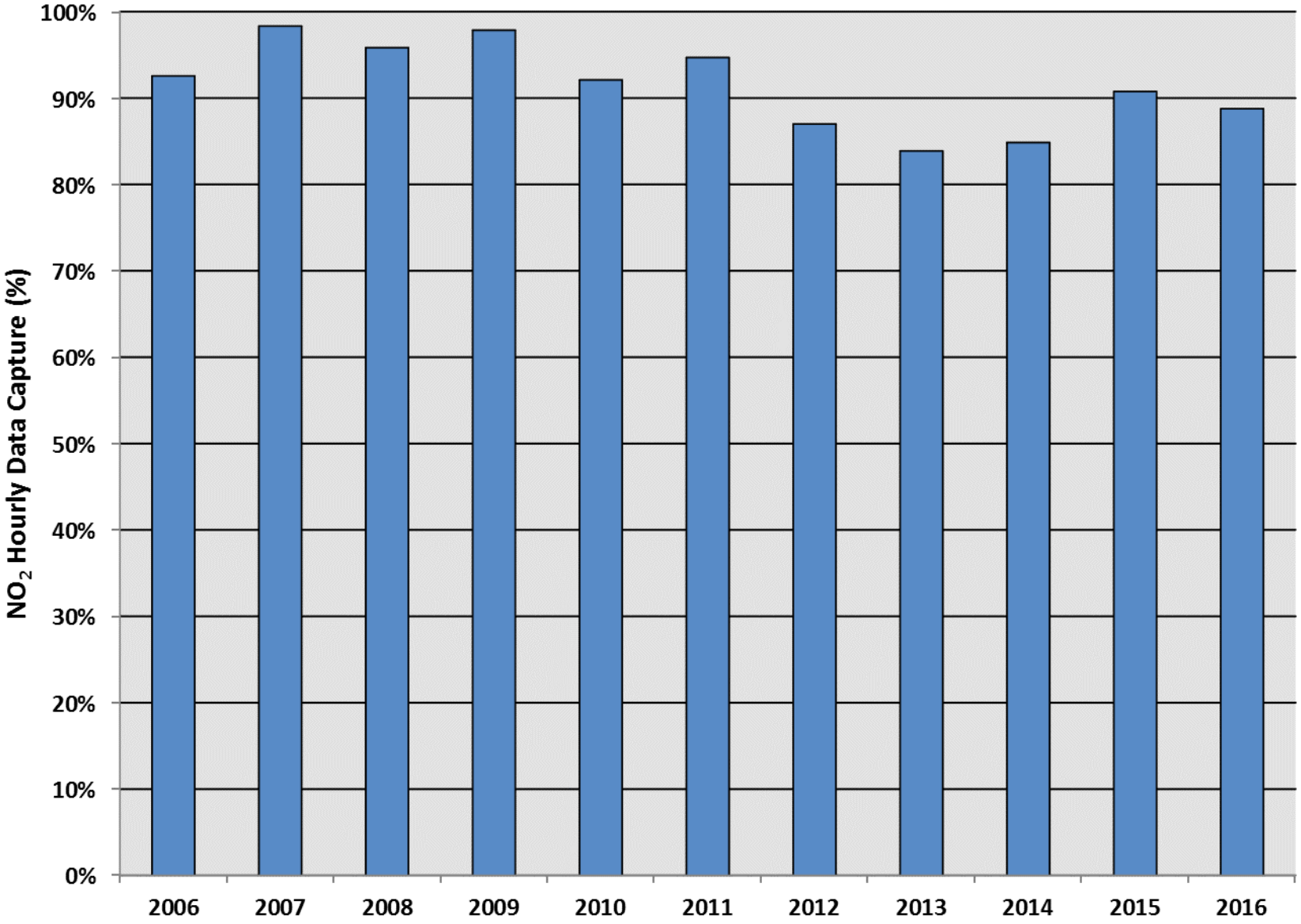


Figure M.5 Davenport, Jefferson School Site NO2 monitor, Percentage Hourly Data Capture by Year

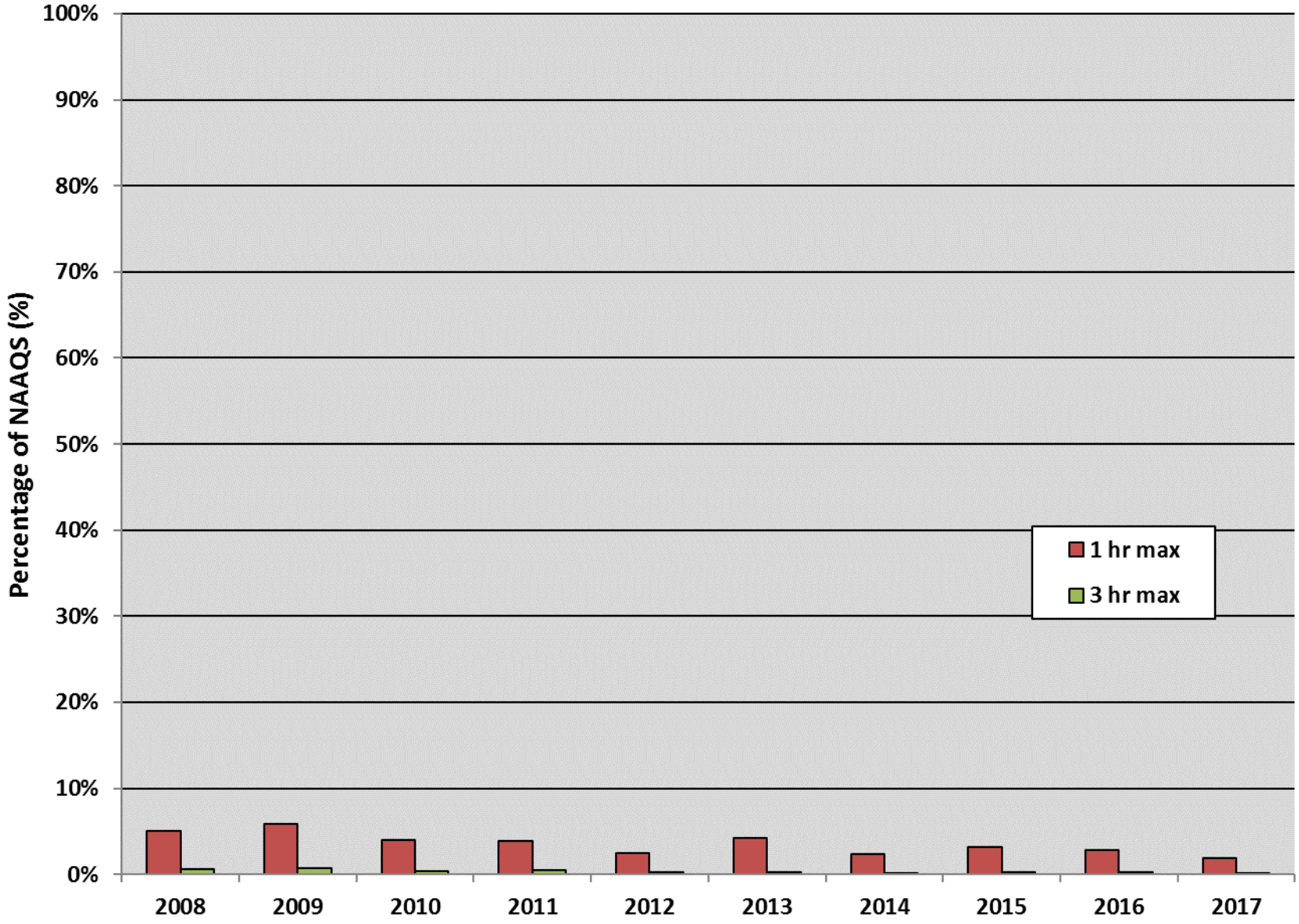


Figure M.6 Des Moines, Public Health Department Site SO2 monitor, Maximum 1-hr. and 3-hr. Values as a Percentage of the NAAQS. The 1-hr NAAQS is 75 ppb and the 3-hr NAAQS is 50 ppb.

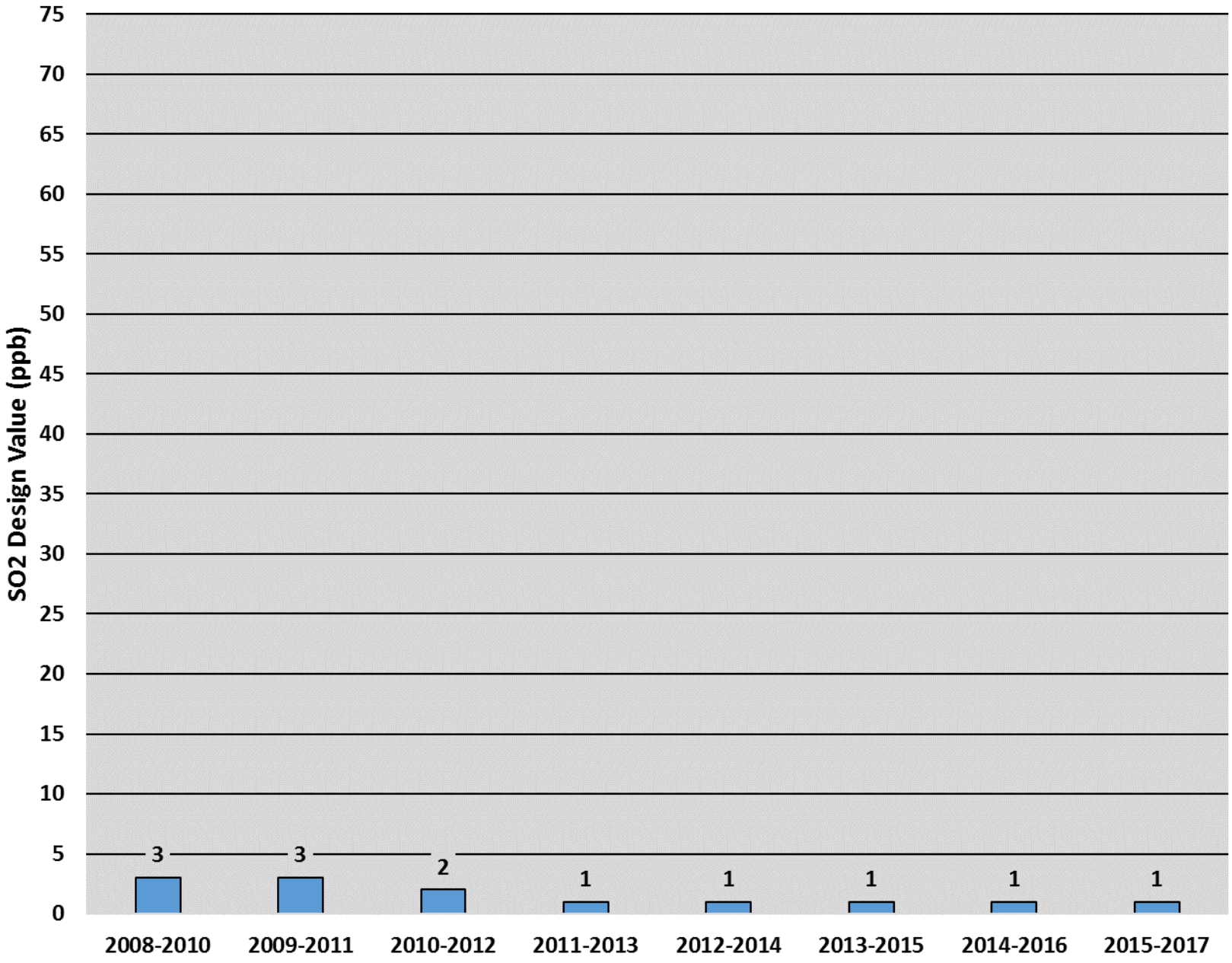


Figure M.7 Des Moines, Public Health Department Site SO_2 Monitor Design Value Compared to the NAAQS (75 ppb)

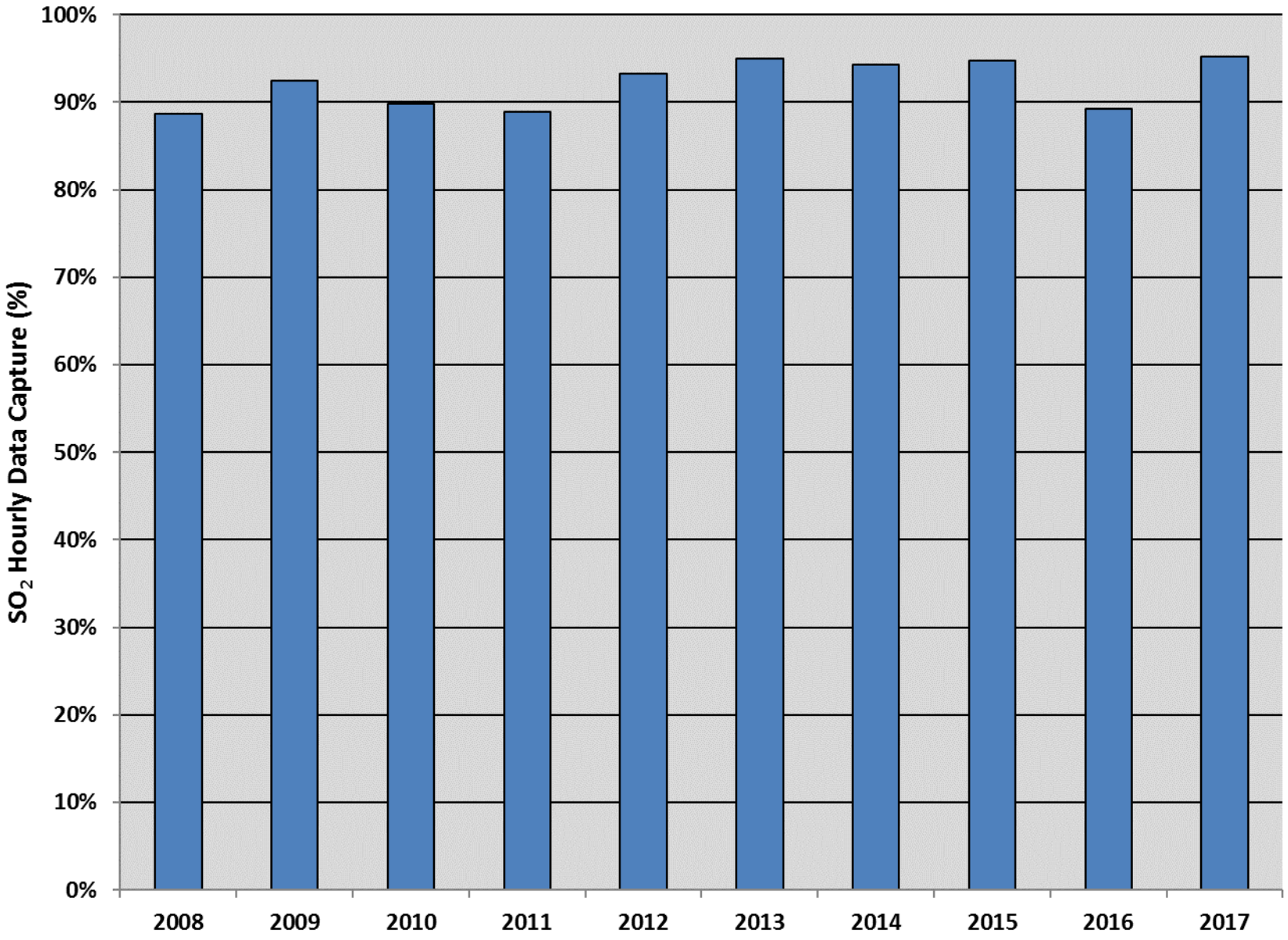
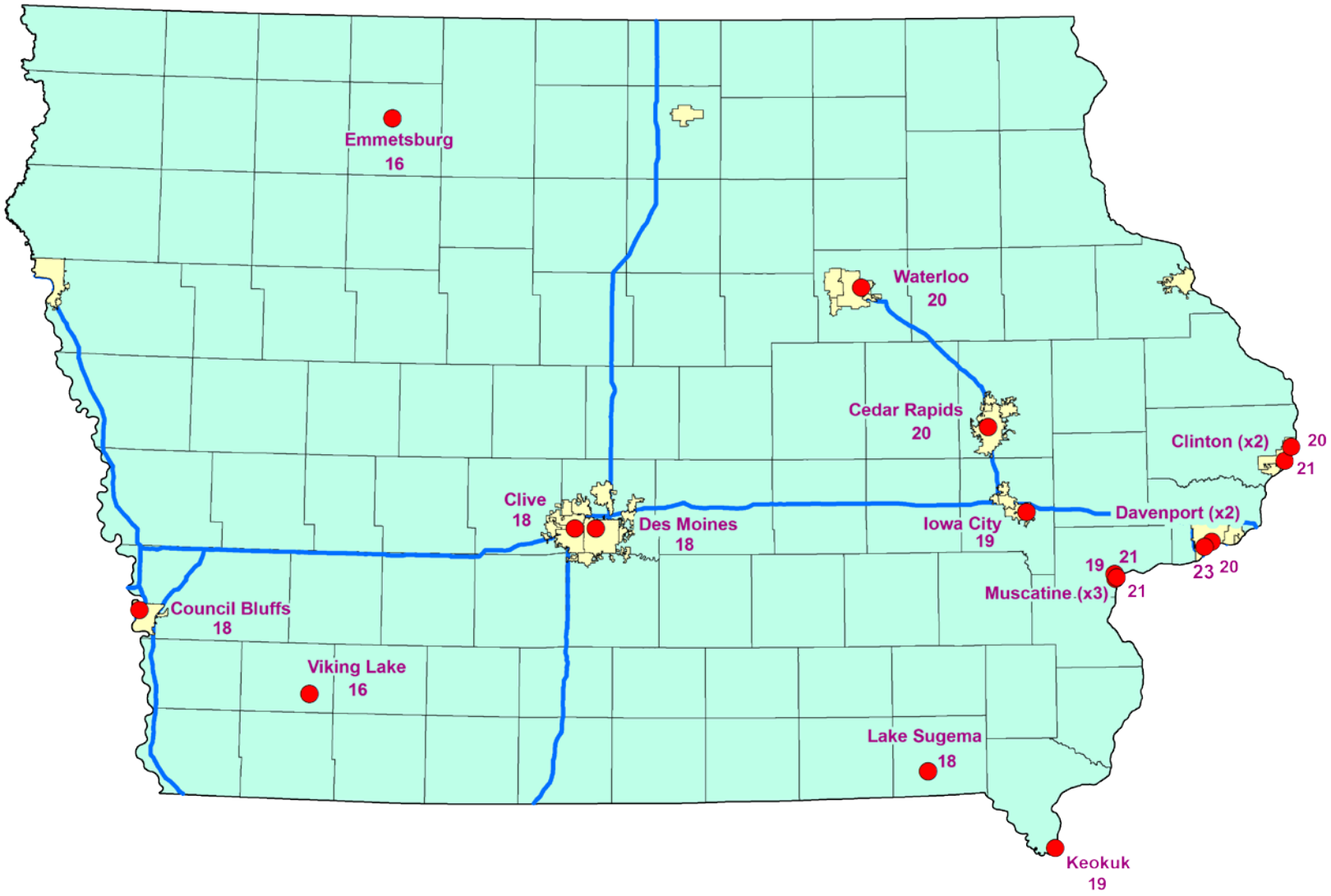
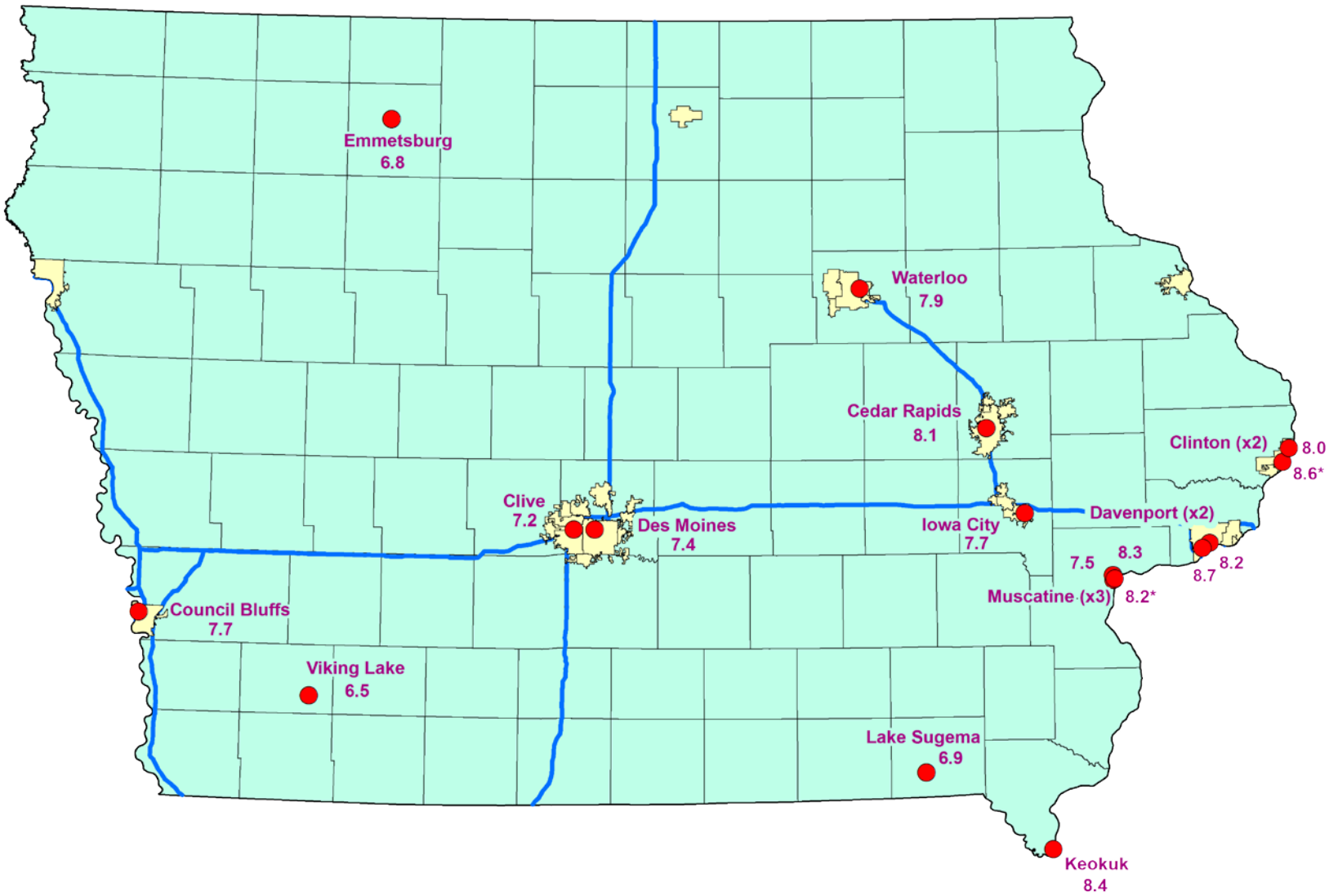


Figure M.8 Des Moines, Public Health Department Site SO_2 Monitor, Percentage Hourly Data Capture by Year

Appendix N: Design Value Maps for $PM_{2.5}$



2015-2017 $PM_{2.5}$ 24-hr Design Values ($\mu g/m^3$)



2015-2017 $PM_{2.5}$ Annual Design Values (µg/m³)

Note: The asterisk indicates that this is a source-oriented site where the annual NAAQS does not apply

Appendix O: Federal Requirements for NCore Sites

40 CFR Part 58 Appendix D, Section 3: Design Criteria for NCore Sites.

(a) Each State (i.e. the fifty States, District of Columbia, Puerto Rico, and the Virgin Islands) is required to operate at least one NCore site. States may delegate this requirement to a local agency. States with many MSAs often also have multiple air sheds with unique characteristics and, often, elevated air pollution. These States include, at a minimum, California, Florida, Illinois, Michigan, New York, North Carolina, Ohio, Pennsylvania, and Texas. These States are required to identify one to two additional NCore sites in order to account for their unique situations. These additional sites shall be located to avoid proximity to large emission sources. Any State or local agency can propose additional candidate NCore sites or modifications to these requirements for approval by the Administrator. The NCore locations should be leveraged with other multipollutant air monitoring sites including PAMS sites, National Air Toxics Trends Stations (NATTS) sites, CASTNET sites, and STN sites. Site leveraging includes using the same monitoring platform and equipment to meet the objectives of the variety of programs where possible and advantageous.

(b) The NCore sites must measure, at a minimum, PM2.5 particle mass using continuous and integrated/filter-based samplers, speciated PM2.5, PM10-2.5 particle mass, O3, SO2, CO, NO/NOY, wind speed, wind direction, relative humidity, and ambient temperature.

(1) Although the measurement of NOy is required in support of a number of monitoring objectives, available commercial instruments may indicate little difference in their measurement of NOy compared to the conventional measurement of NOX, particularly in areas with relatively fresh sources of nitrogen emissions. Therefore, in areas with negligible expected difference between NOy and NOX measured concentrations, the Administrator may allow for waivers that permit NOX monitoring to be substituted for the required NOy monitoring at applicable NCore sites.

(2) The EPA recognizes that, in some cases, the physical location of the NCore site may not be suitable for representative meteorological measurements due to the site's physical surroundings. It is also possible that nearby meteorological measurements may be able to fulfill this data need. In these cases, the requirement for meteorological monitoring can be waived by the Administrator.

(c) [Reserved]

(d) Siting criteria are provided for urban and rural locations. Sites with significant historical records that do not meet siting criteria may be approved as NCore by the Administrator. Sites with the suite of NCore measurements that are explicitly designed for other monitoring objectives are exempt from these siting criteria (e.g., a near-roadway site).

(1) Urban NCore stations are to be generally located at urban or neighborhood scale to provide representative concentrations of exposure expected throughout the metropolitan area; however, a middle-scale site may be acceptable in cases where the site can represent many such locations throughout a metropolitan area.

(2) Rural NCore stations are to be located to the maximum extent practicable at a regional or larger scale away from any large local emission source, so that they represent ambient concentrations over an extensive area.

Appendix P: Federal Requirements for Near-Road Sites

40 CFR Part 58 Appendix D—Network Design Criteria for Ambient Air Quality Monitoring

4.2 Carbon Monoxide (CO) Design Criteria

4.2.1 General Requirements. (a) Except as provided in subsection (b), one CO monitor is required to operate collocated with one required near-road NO2 monitor, as required in Section 4.3.2 of this part, in CBSAs having a population of 1,000,000 or more persons. If a CBSA has more than one required near-road NO2 monitor, only one CO monitor is required to be collocated with a near-road NO2 monitor within that CBSA.

(b) If a state provides quantitative evidence demonstrating that peak ambient CO concentrations would occur in a near-road location which meets microscale siting criteria in Appendix E of this part but is not a near-road NO2 monitoring site, then the EPA Regional Administrator may approve a request by a state to use such an alternate near-road location for a CO monitor in place of collocating a monitor at near-road NO2 monitoring site.

…

Appendix D to Part 58—Network Design Criteria for Ambient Air Quality Monitoring

4.3 Nitrogen Dioxide (NO_2) Design Criteria

4.3.1 General Requirements

(a) State and, where appropriate, local agencies must operate a minimum number of required NO2 monitoring sites as described below.

4.3.2 Requirement for Near-road NO2 Monitors

(a) Within the NO2 network, there must be one microscale near-road NO2 monitoring station in each CBSA with a population of 1,000,000 or more persons to monitor a location of expected maximum hourly concentrations sited near a major road with high AADT counts as specified in paragraph 4.3.2(a)(1) of this appendix. An additional near-road NO2 monitoring station is required for any CBSA with a population of 2,500,000 persons or more, or in any CBSA with a population of 1,000,000 or more persons that has one or more roadway segments with 250,000 or greater AADT counts to monitor a second location of expected maximum hourly concentrations. CBSA populations shall be based on the latest available census figures.

(1) The near-road NO2 monitoring sites shall be selected by ranking all road segments within a CBSA by AADT and then identifying a location or locations adjacent to those highest ranked road segments, considering fleet mix, roadway design, congestion patterns, terrain, and meteorology, where maximum hourly NO2 concentrations are expected to occur and siting criteria can be met in accordance with appendix E of this part. Where a state or local air monitoring agency identifies multiple acceptable candidate sites where maximum hourly NO2 concentrations are expected to occur, the monitoring agency shall consider the potential for population exposure in the criteria utilized to select the final site location. Where one CBSA is required to have two near-road NO2 monitoring stations, the sites shall be differentiated from each other by one or more of the following factors: fleet mix; congestion patterns; terrain; geographic area within the CBSA; or different route, interstate, or freeway designation.

(b) Measurements at required near-road NO2 monitor sites utilizing chemiluminescence FRMs must include at a minimum: NO, NO2, and NOX.

4.3.3 Requirement for Area-wide NO2 Monitoring

(a) Within the NO2 network, there must be one monitoring station in each CBSA with a population of 1,000,000 or more persons to monitor a location of expected highest NO2 concentrations representing the neighborhood or larger spatial scales. PAMS sites collecting NO2 data that are situated in an area of expected high NO2

concentrations at the neighborhood or larger spatial scale may be used to satisfy this minimum monitoring requirement when the NO2 monitor is operated year round. Emission inventories and meteorological analysis should be used to identify the appropriate locations within a CBSA for locating required area-wide NO2 monitoring stations. CBSA populations shall be based on the latest available census figures.

4.3.4 Regional Administrator Required Monitoring

(a) The Regional Administrators, in collaboration with States, must require a minimum of forty additional NO2 monitoring stations nationwide in any area, inside or outside of CBSAs, above the minimum monitoring requirements, with a primary focus on siting these monitors in locations to protect susceptible and vulnerable populations. The Regional Administrators, working with States, may also consider additional factors described in paragraph (b) below to require monitors beyond the minimum network requirement.

(b) The Regional Administrators may require monitors to be sited inside or outside of CBSAs in which:

(i) The required near-road monitors do not represent all locations of expected maximum hourly NO2 concentrations in an area and NO2 concentrations may be approaching or exceeding the NAAQS in that area;

(ii) Areas that are not required to have a monitor in accordance with the monitoring requirements and NO2 concentrations may be approaching or exceeding the NAAQS; or

(iii) The minimum monitoring requirements for area-wide monitors are not sufficient to meet monitoring objectives.

(c) The Regional Administrator and the responsible State or local air monitoring agency should work together to design and/or maintain the most appropriate NO2 network to address the data needs for an area, and include all monitors under this provision in the annual monitoring network plan.

4.3.5 NO2 Monitoring Spatial Scales

(a) The most important spatial scale for near-road NO2 monitoring stations to effectively characterize the maximum expected hourly NO2 concentration due to mobile source emissions on major roadways is the microscale. The most important spatial scales for other monitoring stations characterizing maximum expected hourly NO2 concentrations are the microscale and middle scale. The most important spatial scale for area-wide monitoring of high NO2 concentrations is the neighborhood scale.

(1) Microscale—This scale represents areas in close proximity to major roadways or point and area sources. Emissions from roadways result in high ground level NO2 concentrations at the microscale, where concentration gradients generally exhibit a marked decrease with increasing downwind distance from major roads. As noted in appendix E of this part, near-road NO2 monitoring stations are required to be within 50 meters of target road segments in order to measure expected peak concentrations. Emissions from stationary point and area sources, and non-road sources may, under certain plume conditions, result in high ground level concentrations at the microscale. The microscale typically represents an area impacted by the plume with dimensions extending up to approximately 100 meters.

(2) Middle scale—This scale generally represents air quality levels in areas up to several city blocks in size with dimensions on the order of approximately 100 meters to 500 meters. The middle scale may include locations of expected maximum hourly concentrations due to proximity to major NO2 point, area, and/or non-road sources.

(3) Neighborhood scale—The neighborhood scale represents air quality conditions throughout some relatively uniform land use areas with dimensions in the 0.5 to 4.0 kilometer range. Emissions from stationary point and area sources may, under certain plume conditions, result in high NO2 concentrations at the neighborhood scale. Where

a neighborhood site is located away from immediate NO2 sources, the site may be useful in representing typical air quality values for a larger residential area, and therefore suitable for population exposure and trends analyses.

(4) Urban scale—Measurements in this scale would be used to estimate concentrations over large portions of an urban area with dimensions from 4 to 50 kilometers. Such measurements would be useful for assessing trends in area-wide air quality, and hence, the effectiveness of large scale air pollution control strategies. Urban scale sites may also support other monitoring objectives of the NO2 monitoring network identified in paragraph 4.3.4 above.

4.3.6 NOy Monitoring

(a) NO/NOy measurements are included within the NCore multi-pollutant site requirements and the PAMS program. These NO/NOy measurements will produce conservative estimates for NO2 that can be used to ensure tracking continued compliance with the NO2 NAAQS. NO/NOy monitors are used at these sites because it is important to collect data on total reactive nitrogen species for understanding O3 photochemistry.

40 CFR Part 58 Appendix D—Network Design Criteria for Ambient Air Quality Monitoring

4.7 Fine Particulate Matter ($PM_{2.5}$) Design Criteria.

4.7.1 General Requirements.

…

(b)(2) For CBSAs with a population of 1,000,000 or more persons, at least one PM2.5 monitor is to be collocated at a near-road NO_2 station required in section 4.3.2(a) of this appendix.

Appendix Q: Highest PM_{10} Values in Iowa MSAs 2015-2017

The following table shows the highest values recorded by PM_{10} monitors in Iowa Metropolitan Statistical Areas, including those shared with Illinois, South Dakota and Nebraska.

Table D-4 of Appendix D to Part 58 of the Code of Federal Regulations, specifies different minimum monitoring requirements for PM_{10}, depending on whether the concentrations are high, medium, or low. High concentrations are defined as exceeding the PM_{10} NAAQS by 20% or more (186 $\mu g/m^3$ or greater). Medium levels are defined as concentrations exceeding 80% of the NAAQS (between 124 and 186 $\mu g/m^3$). If ambient concentrations are less than 80% of the PM_{10} NAAQS, the levels are characterized as low. These categories are reflected in the last column of the following table.

MSA	2015 Max ($\mu g/m^3$)	2016 Max ($\mu g/m^3$)	2017 Max ($\mu g/m^3$)	3 Year Max ($\mu g/m^3$)	Classification
Omaha-Council Bluffs, NE-IA	166	151	120	166	Medium
Des Moines-West Des Moines, IA	48	43	65	65	Low
Davenport-Moline-Rock Island, IA-IL	153	120	110	153	Medium
Cedar Rapids, IA	69	53	64	69	Low
Sioux City, IA-NE-SD	91	84	52	91	Low
Waterloo-Cedar Falls, IA	57	46	40*	57	Low
Iowa City, IA	53	43	47*	53	Low

PM_{10} Values in MSAs (3 year maximum)

Source: *EPA Monitor Values Report*

***** In these MSA's, Iowa operated the only PM_{10} monitor, and it was discontinued on 7/1/2017.

Appendix R: Federal Requirements for SO_2 Sites

40 CFR Part 58 Appendix D —Network Design Criteria for Ambient Air Quality Monitoring

4.4 Sulfur Dioxide (SO_2) Design Criteria.
4.4.1 General Requirements. (a) State and, where appropriate, local agencies must operate a minimum number of required SO2 monitoring sites as described below.

4.4.2 Requirement for Monitoring by the Population Weighted Emissions Index. (a) The population weighted emissions index (PWEI) shall be calculated by States for each core based statistical area (CBSA) they contain or share with another State or States for use in the implementation of or adjustment to the SO2 monitoring network. The PWEI shall be calculated by multiplying the population of each CBSA, using the most current census data or estimates, and the total amount of SO2 in tons per year emitted within the CBSA area, using an aggregate of the most recent county level emissions data available in the National Emissions Inventory for each county in each CBSA. The resulting product shall be divided by one million, providing a PWEI value, the units of which are million persons-tons per year. For any CBSA with a calculated PWEI value equal to or greater than 1,000,000, a minimum of three SO2 monitors are required within that CBSA. For any CBSA with a calculated PWEI value equal to or greater than 100,000, but less than 1,000,000, a minimum of two SO2 monitors are required within that CBSA. For any CBSA with a calculated PWEI value equal to or greater than 5,000, but less than 100,000, a minimum of one SO2 monitor is required within that CBSA.

(1) The SO2 monitoring site(s) required as a result of the calculated PWEI in each CBSA shall satisfy minimum monitoring requirements if the monitor is sited within the boundaries of the parent CBSA and is one of the following site types (as defined in section 1.1.1 of this appendix): population exposure, highest concentration, source impacts, general background, or regional transport. SO2 monitors at NCore stations may satisfy minimum monitoring requirements if that monitor is located within a CBSA with minimally required monitors under this part. Any monitor that is sited outside of a CBSA with minimum monitoring requirements to assess the highest concentration resulting from the impact of significant sources or source categories existing within that CBSA shall be allowed to count towards minimum monitoring requirements for that CBSA.

4.4.3 Regional Administrator Required Monitoring. (a) The Regional Administrator may require additional SO2 monitoring stations above the minimum number of monitors required in 4.4.2 of this part, where the minimum monitoring requirements are not sufficient to meet monitoring objectives. The Regional Administrator may require, at his/her discretion, additional monitors in situations where an area has the potential to have concentrations that may violate or contribute to the violation of the NAAQS, in areas impacted by sources which are not conducive to modeling, or in locations with susceptible and vulnerable populations, which are not monitored under the minimum monitoring provisions described above. The Regional Administrator and the responsible State or local air monitoring agency shall work together to design and/or maintain the most appropriate SO2 network to provide sufficient data to meet monitoring objectives.

4.4.4 SO2 Monitoring Spatial Scales. (a) The appropriate spatial scales for SO2 SLAMS monitors are the microscale, middle, neighborhood, and urban scales. Monitors sited at the microscale, middle, and neighborhood scales are suitable for determining maximum hourly concentrations for SO2. Monitors sited at urban scales are useful for identifying SO2 transport, trends, and, if sited upwind of local sources, background concentrations.

(1) Microscale—This scale would typify areas in close proximity to SO2 point and area sources. Emissions from stationary point and area sources, and non-road sources may, under certain plume conditions, result in high ground level concentrations at the microscale. The microscale typically represents an area impacted by the plume with dimensions extending up to approximately 100 meters.

(2) Middle scale—This scale generally represents air quality levels in areas up to several city blocks in size with dimensions on the order of approximately 100 meters to 500 meters. The middle scale may include locations of

expected maximum short-term concentrations due to proximity to major SO2 point, area, and/or non-road sources.

(3) Neighborhood scale—The neighborhood scale would characterize air quality conditions throughout some relatively uniform land use areas with dimensions in the 0.5 to 4.0 kilometer range. Emissions from stationary point and area sources may, under certain plume conditions, result in high SO2 concentrations at the neighborhood scale. Where a neighborhood site is located away from immediate SO2 sources, the site may be useful in representing typical air quality values for a larger residential area, and therefore suitable for population exposure and trends analyses.

(4) Urban scale—Measurements in this scale would be used to estimate concentrations over large portions of an urban area with dimensions from 4 to 50 kilometers. Such measurements would be useful for assessing trends in area-wide air quality, and hence, the effectiveness of large scale air pollution control strategies. Urban scale sites may also support other monitoring objectives of the SO2 monitoring network such as identifying trends, and when monitors are sited upwind of local sources, background concentrations.

4.4.5 NCore Monitoring. (a) SO2 measurements are included within the NCore multipollutant site requirements as described in paragraph (3)(b) of this appendix. NCore-based SO2 measurements are primarily used to characterize SO2 trends and assist in understanding SO2 transport across representative areas in urban or rural locations and are also used for comparison with the SO2 NAAQS. SO2 monitors at NCore sites that exist in CBSAs with minimum monitoring requirements per section 4.4.2 above shall be allowed to count towards those minimum monitoring requirements.
* * * * *

Appendix S: SO_2 Data Requirements Rule

Section I. 40 CFR Part 51, Subpart BB

Subpart BB—Data Requirements for Characterizing Air Quality for the Primary SO2 NAAQS

Source: 80 FR 51087, Aug. 21, 2015, unless otherwise noted.

§51.1200 Definitions.

The following definitions apply for the purposes of this subpart. All terms not defined herein will have the meaning given them in §51.100 or in the Clean Air Act (CAA). Air agency means the agency or organization responsible for air quality management within a state, local governmental jurisdiction, territory or area subject to tribal government. Annual SO2 emissions data means the quality-assured annual SO2 emissions data for a stationary source. Such data may have been required to be reported to the EPA in accordance with an existing regulatory requirement (such as the Air Emissions Reporting Rule or the Acid Rain Program); however, annual SO2 emissions data may be obtained or determined through other reliable means as well.

Applicable source means a stationary source that is:

(1) Not located in a designated nonattainment area, and

(2) Has actual annual SO2 emissions data of 2,000 tons or more, or has been identified by an air agency or by the EPA Regional Administrator as requiring further air quality characterization. 2010 SO2 NAAQS means the primary National Ambient Air Quality Standard for sulfur oxides (sulfur dioxide) as codified at 40 CFR 50.17, as effective August 23, 2010.

§51.1201 Purpose.

The purpose of this subpart is to require air agencies to develop and submit air quality data characterizing maximum 1-hour ambient concentrations of SO2 across the United States through either ambient air quality monitoring or air quality modeling analysis at the air agency's election. These monitoring and modeling data may be used in future determinations by the EPA regarding areas' SO2 NAAQS attainment status, or for other actions designed to ensure attainment of the 2010 SO2 NAAQS and provide protection to the public from the short-term health effects associated with exposure to SO2 concentrations that exceed the NAAQS.

§51.1202 Applicability.

This subpart applies to any air agency in whose jurisdiction is located one or more applicable sources of SO2 emissions that have annual actual SO2 emissions of 2,000 tons or more; or in whose jurisdiction is located one or more sources of SO2 emissions that have been identified by the air agency or by the EPA Regional Administrator as requiring further air quality characterization. For the purposes of this subpart, the subject air agency shall identify applicable sources of SO2 based on the most recently available annual SO2 emissions data for such sources.

§51.1203 Air agency requirements.

(a) The air agency shall submit a list of applicable SO2 sources identified pursuant to §51.1202 located in its jurisdiction to the EPA by January 15, 2016. This list may be revised by the Regional Administrator after review based on available SO2 emissions data.

(b) For each source area subject to requirements for air quality characterization, the air agency shall notify the EPA by July 1, 2016, whether it has chosen to characterize peak 1-hour SO2 concentrations in such area through

ambient air quality monitoring; characterize peak 1-hour SO2 concentrations in such area through air quality modeling techniques; or provide federally enforceable emission limitations by January 13, 2017 that limit emissions of applicable sources to less than 2,000 tpy, in accordance with paragraph (e) of this section, or provide documentation that the applicable source has permanently shut down. Emission limits in accordance with paragraph (e) of this section may be established in lieu of conducting monitoring or modeling unless, in the judgment of the air agency or the EPA Regional Administrator, the area warrants further air quality characterization even with the establishment of any new emission limit(s). If the air agency has chosen to establish requirements to limit emissions for applicable sources in an area, the notification from the air agency shall describe the requirements and emission limits the air agency intends to apply. For any area with multiple applicable sources, the air agency (or air agencies if a multi-state area) shall use the same technique (monitoring, modeling, or emissions limitation) for all applicable sources in the area. If multiple air agencies have applicable sources in an area, the air agencies must consult with each other to employ a common technique for the area.

(c) Monitoring. For each area identified in the notification submitted pursuant to paragraph (b) of this section as an area for which SO2 concentrations will be characterized through ambient monitoring, the required monitors shall be sited and operated either as SLAMS or in a manner equivalent to SLAMS. In either case, monitors shall meet applicable criteria in 40 CFR part 58, appendices A, C, and E and their data shall be subject to data certification and reporting requirements as prescribed in 40 CFR 58.15 and 58.16. These requirements include quarterly reporting of monitoring data to the Air Quality System, and the annual certification of data by May 1 of the following year.

(1) The air agency shall include relevant information about monitors used to meet the requirements of this paragraph (c) in the air agency's Annual Monitoring Network Plan required by 40 CFR 58.10 due July 1, 2016. The air agency shall consult with the appropriate EPA Regional Office in the development of plans to install, supplement, or maintain an appropriate ambient SO2 monitoring network pursuant to the requirements of 40 CFR part 58 and of this subpart.

(2) All existing, new, or relocated ambient monitors intended to meet the requirements of this paragraph (c) must be operational by January 1, 2017 and must be operated continually until approved for shut down by EPA.

(3) Any SO2 monitor identified by an air agency in its approved Annual Monitoring Network Plan as having the purpose of meeting the requirements of this paragraph (c) that: Is not located in an area designated as nonattainment as the 2010 SO2 NAAQS is not also being used to satisfy other ambient SO2 minimum monitoring requirements listed in 40 CFR part 58, appendix D, section 4.4; and is not otherwise required as part of a SIP, permit, attainment plan or maintenance plan, may be eligible for shut down upon EPA approval if it produces a design value no greater than 50 percent of the 2010 SO2 NAAQS from data collected in either its first or second 3-year period of operation. The air agency must receive EPA Regional Administrator approval of a request to cease operation of the monitor as part of the EPA's action on the Annual Monitoring Network Plan under 40 CFR 58.10 prior to shutting down any qualifying monitor under this paragraph (c).

(d) Modeling. For each area identified in the notification submitted pursuant to paragraph (b) of this section as an area for which SO2 concentrations will be characterized through air quality modeling, the air agency shall submit by July 1, 2016, a technical protocol for conducting such modeling to the Regional Administrator for review. The air agency shall consult with the appropriate EPA Regional Office in developing these modeling protocols.

(1) The modeling protocol shall include information about the modeling approach to be followed, including but not limited to the model to be used, modeling domain, receptor grid, emissions dataset, meteorological dataset and how the air agency will account for background SO2 concentrations.

(2) Modeling analyses shall characterize air quality based on either actual SO2 emissions from the most recent 3 years, or on any federally enforceable allowable emission limit or limits established by the air agency or the EPA and that are effective and require compliance by January 13, 2017.

(3) Except as provided by §51.1204, the air agency shall conduct the modeling analysis for any applicable source identified by the air agency pursuant to paragraph (a) of this section, and for its associated area and any nearby area, as applicable, and submit the modeling analysis to the EPA Regional Office by January 13, 2017.

(e) Federally enforceable requirement to limit SO2 emissions to under 2,000 tons per year. For each area identified in the notification submitted pursuant to paragraph (b) of this sectionas an area for which the air agency will adopt federally enforceable requirements in lieu of characterizing air quality through monitoring or modeling, the air agency shall submit documentation to the EPA by January 13, 2017, showing that such requirements have been adopted, are in effect, and been made federally enforceable by January 13, 2017, through an appropriate legal mechanism, and the provisions either:

(1) Require the applicable sources in the area to emit less than 2,000 tons of SO2 per year for calendar year 2017 and thereafter; or

(2) Document that the applicable sources in the area have permanently shut down by January 13, 2017.

Appendix T: Sulfur Dioxide Population Weighted Emissions Index

This SO_2 rule requires monitoring in or near Core Based Statistical Areas (CBSA's) based on the population weighted emissions index (PWEI). The PWEI is calculated using the most recent census data or estimates, and the most recent county level emissions data available in the National Emissions Inventory.

The PWEI is calculated by multiplying the population of the CBSA by the total tons of SO_2 emissions inventories from counties that make up the CBSA and dividing by one million. The PWEI is expressed in units of million person-tons per year.

The final monitoring regulations require monitors to be placed in Core Based Statistical Areas (CBSA's) based on the PWEI for the area. The final rule requires:

- 3 monitors in CBSAs with index values of 1,000,000 or more;
- 2 monitors in CBSAs with index values less than 1,000,000 but greater than 100,000; and
- 1 monitor in CBSAs with index values greater than 5,000 but less than 100,000.

Iowa has chosen the 2014 National Emissions Inventory (NEI) data[53] as the most complete and accessible data to use for SO_2 emissions information available for Iowa and neighboring States. U.S. Census Bureau population estimates from Appendix F have been used for population data. The PWEI for Iowa MSAs are listed in the table below.

US Census Geographic Area	US Census Population Estimate, July, 2017	SO_2 Emissions, tons per year	SO_2 Population Weighted Emissions Index	SO_2 Monitors Required
Omaha-Council Bluffs, NE-IA	933,316	26,750	24,966	1
Sioux City, IA-NE-SD	168,618	13,545	2,284	0
Davenport-Moline-Rock Island, IA-IL	382,263	5,393	2,062	0
Cedar Rapids, IA	270,293	7,362	1,990	0
Des Moines-West Des Moines, IA	645,911	451	291	0
Iowa City, IA	171,491	846	145	0
Ames, IA	97,502	1,233	120	0
Waterloo-Cedar Falls, IA	169,982	573	97	0
Dubuque, IA	97,041	40	4	0

[53] EPA National Emissions Inventory

Appendix U: Federal Requirements for Lead Sites

40 CFR Part 58 Appendix D —Network Design Criteria for Ambient Air Quality Monitoring

***

4.5 Lead (Pb) Design Criteria.

(a) State and, where appropriate, local agencies are required to conduct ambient air Pb monitoring near Pb sources which are expected to or have been shown to contribute to a maximum Pb concentration in ambient air in excess of the NAAQS, taking into account the logistics and potential for population exposure. At a minimum, there must be one source-oriented SLAMS site located to measure the maximum Pb concentration in ambient air resulting from each non-airport Pb source which emits 0.50 or more tons per year and from each airport which emits 1.0 or more tons per year based on either the most recent National Emission Inventory (http://www.epa.gov/ttn/chief/eiinformation.html) or other scientifically justifiable methods and data (such as improved emissions factors or site-specific data) taking into account logistics and the potential for population exposure.

(i) One monitor may be used to meet the requirement in paragraph 4.5(a) for all sources involved when the location of the maximum Pb concentration due to one Pb source is expected to also be impacted by Pb emissions from a nearby source (or multiple sources). This monitor must be sited, taking into account logistics and the potential for population exposure, where the Pb concentration from all sources combined is expected to be at its maximum.

(ii) The Regional Administrator may waive the requirement in paragraph 4.5(a) for monitoring near Pb sources if the State or, where appropriate, local agency can demonstrate the Pb source will not contribute to a maximum Pb concentration in ambient air in excess of 50 percent of the NAAQS (based on historical monitoring data, modeling, or other means). The waiver must be renewed once every 5 years as part of the network assessment required under §58.10(d).

(iii) State and, where appropriate, local agencies are required to conduct ambient air Pb monitoring near each of the airports listed in Table D-3A for a period of 12 consecutive months commencing no later than December 27, 2011. Monitors shall be sited to measure the maximum Pb concentration in ambient air, taking into account logistics and the potential for population exposure, and shall use an approved Pb-TSP Federal Reference Method or Federal Equivalent Method. Any monitor that exceeds 50 percent of the Pb NAAQS on a rolling 3-month average (as determined according to 40 CFR part 50, Appendix R) shall become a required monitor under paragraph 4.5(c) of this Appendix, and shall continue to monitor for Pb unless a waiver is granted allowing it to stop operating as allowed by the provisions in paragraph 4.5(a)(ii) of this appendix. Data collected shall be submitted to the Air Quality System database according to the requirements of 40 CFR part 58.16.

Table D-3A Airports to be Monitored for Lead

Airport	County	State
Merrill Field	Anchorage	AK
Pryor Field Regional	Limestone	AL
Palo Alto Airport of Santa Clara County	Santa Clara	CA
McClellan-Palomar	San Diego	CA
Reid-Hillview	Santa Clara	CA

Airport	County	State
Gillespie Field	San Diego	CA
San Carlos	San Mateo	CA
Nantucket Memorial	Nantucket	MA
Oakland County International	Oakland	MI
Republic	Suffolk	NY
Brookhaven	Suffolk	NY
Stinson Municipal	Bexar	TX
Northwest Regional	Denton	TX
Harvey Field	Snohomish	WA
Auburn Municipal	King	WA

(b) [Reserved]

(c) The EPA Regional Administrator may require additional monitoring beyond the minimum monitoring requirements contained in paragraph 4.5(a) of this appendix where the likelihood of Pb air quality violations is significant or where the emissions density, topography, or population locations are complex and varied. The EPA Regional Administrators may require additional monitoring at locations including, but not limited to, those near existing additional industrial sources of Pb, recently closed industrial sources of Pb, airports where piston-engine aircraft emit Pb, and other sources of re-entrained Pb dust.

* * * * *

Appendix V: Lead (Pb) Emissions Inventory and Modeling Memos

DEPARTMENT OF NATURAL RESOURCES

GOVERNOR KIM REYNOLDS
LT. GOVERNOR ADAM GREGG
DIRECTOR CHUCK GIPP

Air Quality Bureau

Memo

To: Sean Fitzsimmons

From: Nick Page

CC: Pete Zayudis, Brad Ashton, Lori Hanson, Brian Hutchins, Jim McGraw

Date: 4/20/2018

Re: Lead Emissions Inventory Narrative for 2018 Ambient Monitoring Network Plan

Purpose of this Document

To identify facilities that reported actual lead emissions of greater than or equal to 0.25 tons of lead (Pb) per year for calendar year 2016. The actual lead emissions estimates, as estimated by DNR, are estimated using the most recent and best available set of facility-specific data that includes, but is not limited to, actual throughput, valid stack test data, dust analyses, engineering estimates, operating schedules, and control efficiencies.

Introduction

The Environmental Protection Agency (EPA) finalized a revised standard for Pb on November 12, 2008. The standard was revised from 1.5 micrograms per cubic meter ($\mu g/m^3$) of air, to 0.15 $\mu g/m^3$. In conjunction with strengthening the lead NAAQS, EPA identified the need for states to improve existing lead monitoring networks by requiring monitors to be placed in areas with sources that have actual Pb emissions of 1.0 ton or more per year (tpy) and in urban areas with more than 500,000 people. States will base their specific siting decisions regarding Pb monitoring on dispersion modeling results and reviews of the existing emission inventories for Pb. On December 14, 2010, EPA signed an amendment to the lead ambient air monitoring requirement to expand the lead monitoring network. This amendment reduces the actual lead emissions threshold for the site specific monitoring requirement to 0.5 tons or more per year.

Table 1: Facilities included in the 2016 NEI submittal with actual emissions estimates of 0.25 tpy or greater.

Facility Name	Facility ID	2016 Actual Emissions (Tons)
Walter Scott Jr. Energy Center - Council Bluffs	78-01-026	0.295

IOWA DEPARTMENT OF NATURAL RESOURCES
Environmental Services Division
Air Quality Bureau
Modeling Group

M E M O R A N D U M

DATE: 3-MAY-2018
TO: SEAN FITZSIMMONS
FROM: BRAD ASHTON, PETER ZAYUDIS
RE: LEAD MODELING FOR 2016 EMISSIONS
CC: BRIAN HUTCHINS, JIM MCGRAW, LORI HANSON, NICK PAGE

INTRODUCTION

On January 12, 2009, the EPA's new and more stringent NAAQS standard for airborne lead (Pb) became effective. The primary standard for lead is 0.15 µg/m^3 based on the maximum (not to be exceeded) 3-month rolling average. On December 23, 2009 EPA proposed to decrease the emissions threshold for ambient monitoring to 0.5 tons/yr. Each year the DNR will evaluate sources of lead emissions in the state to determine if any facilities meet or exceed this value.

In 2016, no facility's actual lead emissions were greater than or close to the site specific monitoring threshold of 0.5 tons/yr for lead. In 2016, MidAmerican Energy Company-Water Scott Jr Energy Center reported the highest actual emissions at approximately 0.295 tons.

MidAmerican Energy Company-Water Scott Jr Energy Center (Plant No. 78-01-026)

In 2016, the lead emissions MidAmerican Energy Company - Walter Scott Jr Energy Center remained constant at 0.295 tons as compared to 2015 actual emissions. However, since 2014, actual lead emissions from Walter Scott Jr Energy Center have decreased by approximately 35 percent due to a decrease in the amount of coal combusted at the site.

Based on the predicted concentrations for lead (0.027 g/m^3) as evaluated in December 30, 2015 (see attached memo) and the decrease in actual lead emissions since 2014, a revision to the lead ambient air analysis at MidAmerican Energy Company - Walter Scott Jr Energy Center is not warranted at this time.

IOWA DEPARTMENT OF NATURAL RESOURCES
Environmental Services Division
Air Quality Bureau
Modeling Group

M E M O R A N D U M

DATE: 30-DEC-2015
TO: SEAN FITZSIMMONS
FROM: DON PETERSON, PETER ZAYUDIS
RE: LEAD MODELING FOR 2014 EMISSIONS
CC: BRIAN HUTCHINS, JIM MCGRAW, JASON MARCEL, BRAD ASHTON, NICK PAGE

INTRODUCTION

On January 12, 2009, the EPA's new and more stringent NAAQS standard for airborne lead (Pb) became effective. The primary standard for lead is 0.15 $\mu g/m^3$ based on the maximum (not to be exceeded) 3-month rolling average. On December 23, 2009 EPA proposed to decrease the emissions threshold for ambient monitoring to 0.5 tons/yr. Each year the DNR will evaluate sources of lead emissions in the state to determine if any facilities meet or exceed this value.

In 2014, two facilities actual lead emissions were greater than or close to the site specific monitoring threshold of 0.5 tons/yr for lead. The two facilities are Grain Processing Corporation at 3.0 tons and MidAmerican Walter Scott Jr Energy Center at 0.45 tons.

Grain Processing Corporation (Plant No. 70-01-004)

In 2014, the lead emissions from Grain Processing Corporation (GPC) increased from 2.7 tons in 2013 to 3.0 tons due to an increase in the amount of coal combusted. For emissions year 2014 no other changes have occurred that would affect lead emissions or dispersion characteristics at GPC.

As of July 15, 2015, GPC only combusts natural gas in Boilers 1, 2, 3, 4, 6 and 7, and coal combustion ceased within these boilers. Potential lead emissions from these boilers will be reduced to approximately 0.002 tons per year based on natural gas combustion only. After 2015, the estimated actual annual lead emissions from GPC will fall below the site specific monitoring threshold of 0.5 tons.

MidAmerican Energy Company - Walter Scott Jr Energy Center (Plant No. 78-01-026)

In 2014, the lead emissions from MidAmerican Energy Company - Walter Scott Jr Energy Center increased from 0.448 tons in 2013 to 0.452 tons due to a slight increase in the amount of coal combusted. For emissions year 2014 no other changes at MidAmerican Energy Company - Walter Scott Jr Energy Center have occurred that would affect lead emissions or dispersion characteristics.

Therefore the DNR has decided to model the impacts from lead emissions from these facilities. Monitoring may, at the EPA Regional Administrator's discretion, be waived if modeled concentrations do not exceed 50% of the standard. The purposes of the current modeling are to evaluate ambient concentrations around these facilities for aid in determining if a monitoring waiver can be issued and, if necessary, where to site monitors.

ANALYSIS SUMMARY

Previous lead modeling for each facility was used as a base on which to build the current analysis. The analysis was evaluated using the newest version of AERMOD (version 15181). The sources at each facility were modeled using the stack parameters and emission rates listed in Table 1. Sources were modeled using the most recent actual emission rates approved by the construction permit engineering staff. No stack parameters or emission rates were changed from the previously modeled values.

Table 1: Modeled Emission Rates and Stack Parameters

Emission Point	Pb (lb/hr)	Stack Height (ft)	Stack Gas Exit Temperature (°F)	Stack Tip Diameter (in)	Stack Gas Flow Rate (acfm)
MidAmerican Energy – Walter Scott Energy Center					
1 (Boiler 1)	1.17	250	287	144	220,270
2 (Boiler 2)	1.65	250	316	144	446,200
3 (Boiler 3)	0.14	550	180	300	2,619,890
4 (Boiler 4)	0.025	551	207	296	2,447,050
Grain Processing Corporation					
EP001 (GEP Boilers)	0.97	219	379	180	402,340

MODEL RESULTS

Since the dispersion model AERMOD does not provide the ability to directly compute the 3-month rolling averages, results must go through a post-processing procedure. EPA's "leadpost" tool was used to determine the highest 3-month rolling average lead concentration, the receptor location, and the period of time.

According to the results from the AMS/EPA Regulatory Model (AERMOD, dated 15181), as post-processed by leadpost (dated 13262), the Pb emissions from these facilities will cause predicted concentrations that are less than 50% of the Pb NAAQS. All sources were assumed to operate 24 hours/day, 8760 hours/year.

The Pb modeling results for the worst case calendar quarter and year are listed in Tables 2 and 3. Visual displays of concentration isopleths are provided in Figures 1 and 2. The isopleths are based on the highest 3-month rolling average concentrations at each receptor. The coordinates for both facilities are based on UTM zone 15, NAD27. The location of the maximum concentration is marked with either a red dot or red contour line. This will facilitate a determination of where the highest predicted impacts are and where monitors may best be located, if monitoring will be required.

Table 2: Worst Case Modeling Results for Pb – MidAmerican – WSEC

Averaging Period	Year in which event occurred	Predicted Concentration* ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
Rolling 3-month	2011 (July – September)	0.027	0	0.027	0.15

* The rolling 3-month concentration is the highest predicted value.

Figure 1: Concentration Profile – MidAmerican – WSEC

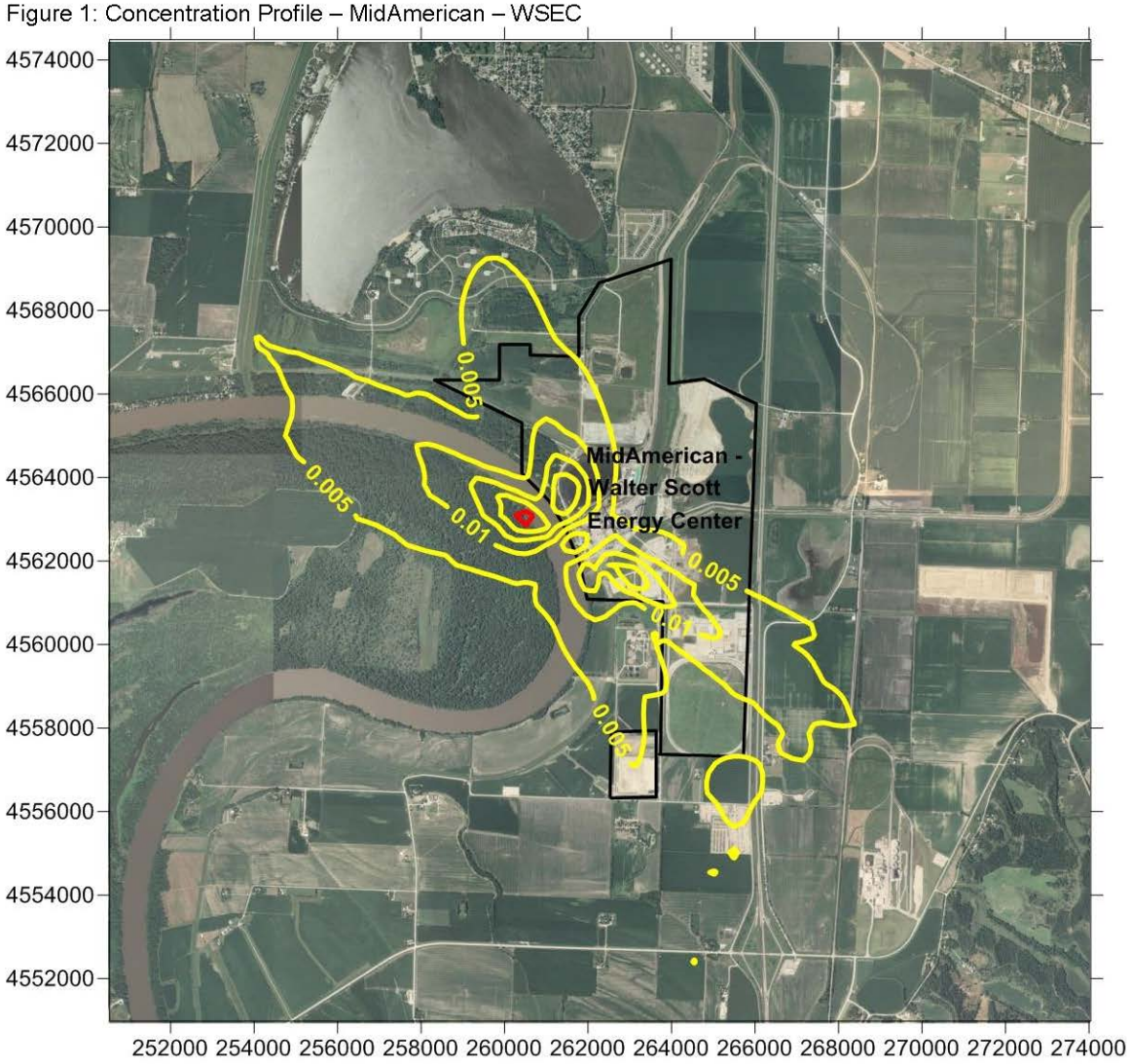
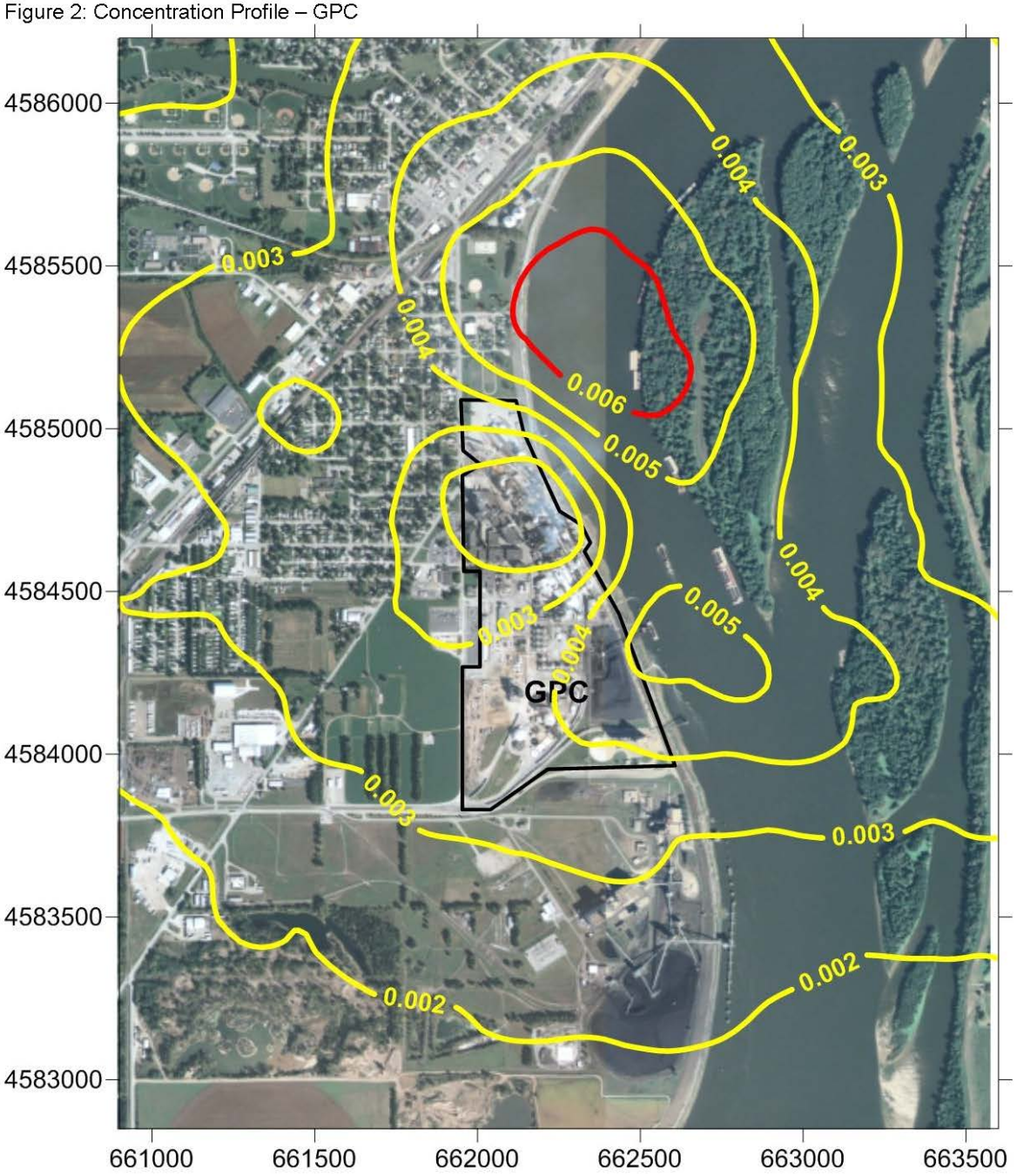


Table 3: Worst Case Modeling Results for Pb – GPC

Averaging Period	Year in which event occurred	Predicted Concentration* ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
Rolling 3-month	2012 (June – August)	0.0068	0	0.0068	0.15

* The rolling 3-month concentration is the highest predicted value.

Figure 2: Concentration Profile – GPC



Appendix W: Calculation of 90th Percentile Upper Confidence Limit

In order to calculate the 90th Percentile upper confidence limit concentration (90% UCL), an average concentration ($\bar{C}$) is calculated. A standard deviation (s) is then obtained using the formula below in which C_i is each individual concentration and n is the number of samples.

$$s = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(C_i - \bar{C})^2}$$

A table of Students t-Values ($t_{0.90,n-1}$) are appended below. (In Excel, the expression TINV(0.10, n-1) is used to generate these values.)

Degrees of Freedom	$t_{(0.90,n-1)}$
1	6.314
2	2.920
3	2.353
4	2.132

The standard error (SE) is then calculated by using

$$SE = \frac{s}{\sqrt{n}}$$

The 90th percentile upper confidence limit (UCL 90%) concentration was then found by multiplying the Student's t-Value by the standard error and adding the product to the mean concentration.

$$\text{UCL}\ (90\%) = \bar{C} + SE * t_{(0.90,n-1)}$$

Appendix X: Tests for Discontinuation of Iowa $PM_{2.5}$ SLAMs Monitors 2013-2017

Using the method discussed in Appendix W, the 24-hr and annual 90% UCLs for Iowa $PM_{2.5}$ sites for the period 2013-2017 have been computed in the tables below. To comply with EPA guidance for discontinuance of SLAMS sites [54] 5 years of data are required. The Sioux City $PM_{2.5}$ monitor at Irving School has not operated for five years and has therefore been excluded from this analysis. To pass the test for discontinuation of a SLAMs PM2.5 monitor, design values for each year of operation must show attainment, that is they must be less than both NAAQS (24-hr: 35 $\mu g/m^3$, annual: 12.0 $\mu g/m^3$) and the 90% UCL for the five-year period must be less than 80% of the NAAQS (24-hr: 28 $\mu g/m^3$, annual: 9.6 $\mu g/m^3$).

As indicated in figures X.1 and X.2, all monitors indicate attainment with both the 24-hr NAAQS and the Annual NAAQS.

Tables X.2 and X.3 indicate that there are six $PM_{2.5}$ sites that pass both UCL tests:

AQS ID	Site
191032001	Iowa City, Hoover Sch.
191532510	Clive, Indian Hills Jr. High School
191530030	Des Moines, Health Dept.
191770006	Keosauqua, Lake Sugema
191370002	Viking Lake State Park
191471002	Emmetsburg, Iowa Lakes Coll.

Table X.1. $PM_{2.5}$ Sites that Pass the Part 58 SLAMs Monitor Discontinuation Tests

[54] See page 59 of PDF Download: EPA Network Assessment Guidance

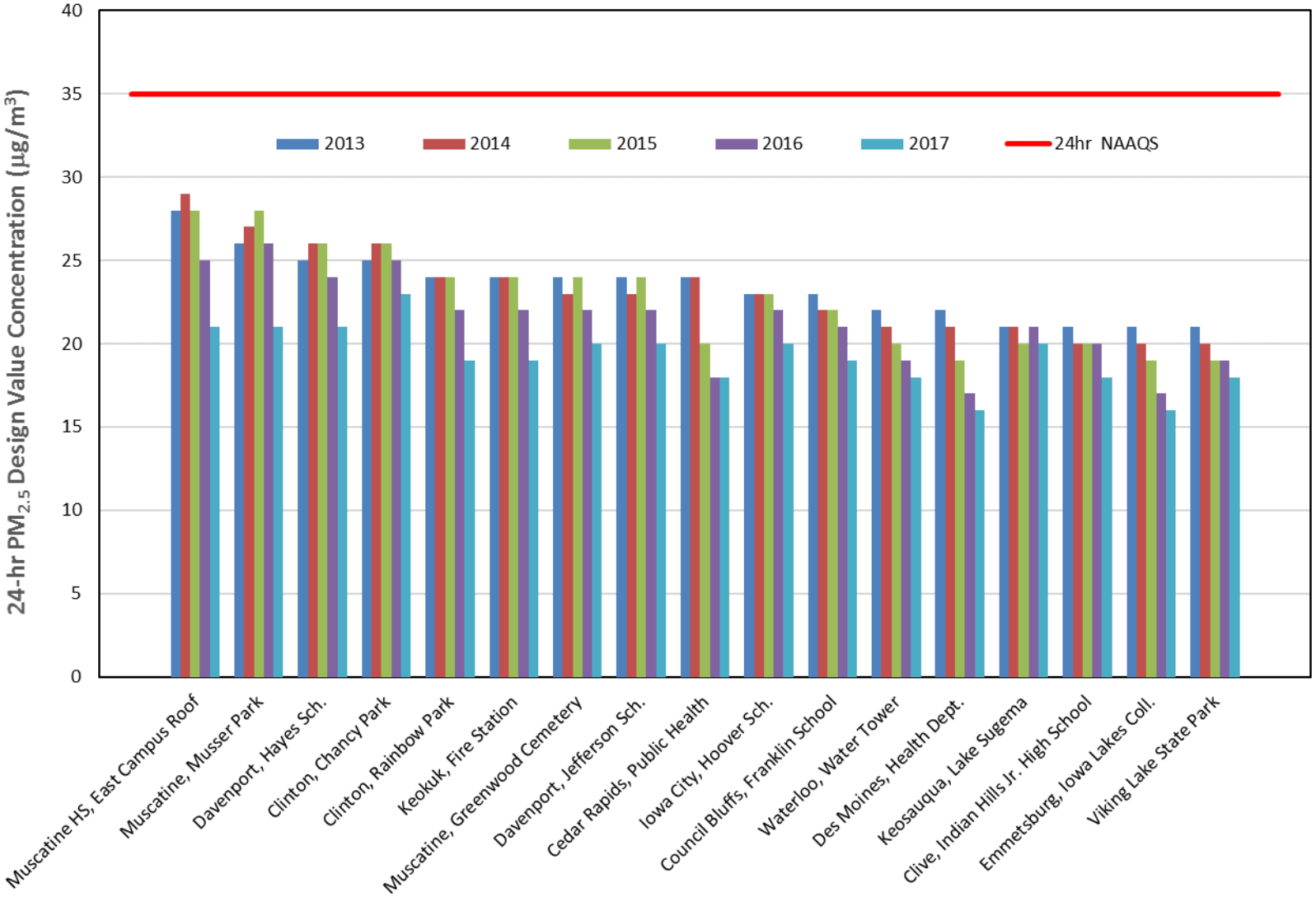


Figure X.1. $PM_{2.5}$ 24-hr Design Values 2013-2017. All Design Values are less than the 24-hr NAAQS of 35 µg/m³.

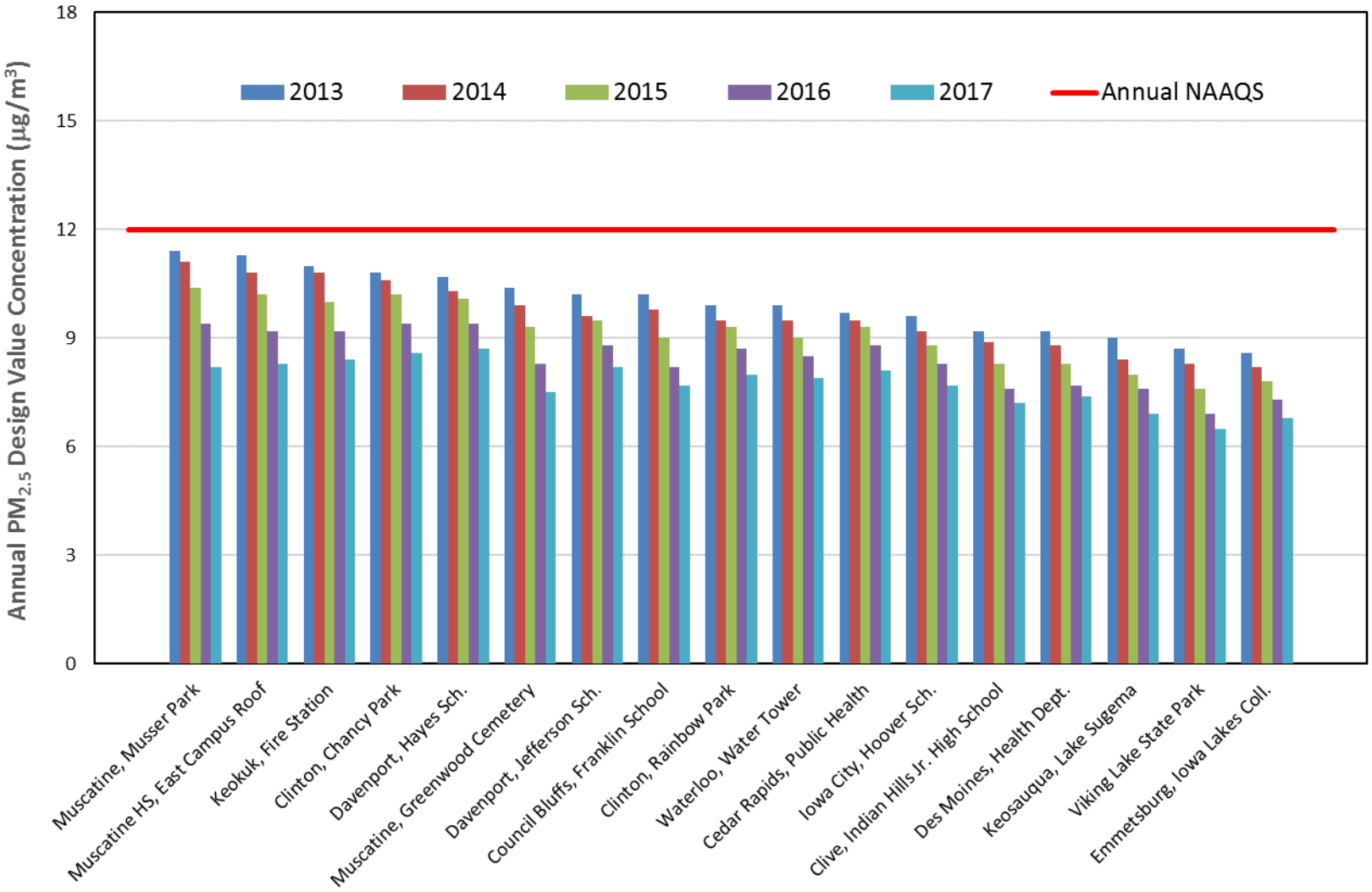


Figure X.2. $PM_{2.5}$ Annual Design Values 2013-2017. All Design Values are less than the Annual NAAQS of 12.0 µg/m³.

AQS ID	Site Name	2013	2014	2015	2016	2017	$PM_{2.5}$ 24-hr DV UCL	80% of $PM_{2.5}$ 24-hr NAAQS
191390015	Muscatine HS, E. Campus Roof	28	29	28	25	21	30	28
191390020	Muscatine, Musser Park	26	27	28	26	21	29	28
191630020	Davenport, Hayes Sch.	25	26	26	24	21	27	28
190450019	Clinton, Chancy Park	25	26	26	25	23	27	28
190450021	Clinton, Rainbow Park	24	24	24	22	19	25	28
191110008	Keokuk, Fire Station	24	24	24	22	19	25	28
191390016	Muscatine, Greenwood Cem.	24	23	24	22	20	24	28
191630015	Davenport, Jefferson Sch.	24	23	24	22	20	24	28
191130040	Cedar Rapids, Public Health	24	24	20	18	18	24	28
191032001	Iowa City, Hoover Sch.	23	23	23	22	20	24	28
191550009	Council Bluffs, Franklin School	23	22	22	21	19	23	28
190130009	Waterloo, Water Tower	22	21	20	19	18	21	28
191530030	Des Moines, Health Dept.	22	21	19	17	16	21	28
191770006	Keosauqua, Lake Sugema	21	21	20	21	20	21	28
191532510	Clive, Indian Hills Jr. High School	21	20	20	20	18	21	28
191471002	Emmetsburg, Iowa Lakes Coll.	21	20	19	17	16	21	28
191370002	Viking Lake State Park	21	20	19	19	18	20	28

Table X.2. UCL test for $PM_{2.5}$ 24-hr Design Values. All units are $\mu g/m^3$. Rows shaded in blue indicate sites that pass the 24-hr UCL test for removing the SLAMs monitor. Rows shaded in green indicate sites that fail the 24-hr UCL test for removing the SLAMs monitor.

AQS ID	Site Name	2013	2014	2015	2016	2017	$PM_{2.5}$ Annual DV UCL	80% of $PM_{2.5}$ Annual NAAQS
191390015	Muscatine HS, E. Campus Roof	11.3	10.8	10.2	9.2	8.3	11.1	9.6
191110008	Keokuk, Fire Station	11.0	10.8	10.0	9.2	8.4	10.9	9.6
190450019	Clinton, Chancy Park	10.8	10.6	10.2	9.4	8.6	10.8	9.6
191630020	Davenport, Hayes Sch.	10.7	10.3	10.1	9.4	8.7	10.6	9.6
191390016	Muscatine, Greenwood Cem.	10.4	9.9	9.3	8.3	7.5	10.2	9.6
191630015	Davenport, Jefferson Sch.	10.2	9.6	9.5	8.8	8.2	10.0	9.6
191550009	Council Bluffs, Franklin School	10.2	9.8	9.0	8.2	7.7	10.0	9.6
190450021	Clinton, Rainbow Park	9.9	9.5	9.3	8.7	8.0	9.8	9.6
190130009	Waterloo, Water Tower	9.9	9.5	9.0	8.5	7.9	9.7	9.6
191130040	Cedar Rapids, Public Health	9.7	9.5	9.3	8.8	8.1	9.7	9.6
191032001	Iowa City, Hoover Sch.	9.6	9.2	8.8	8.3	7.7	9.4	9.6
191532510	Clive, Indian Hills Jr. High School	9.2	8.9	8.3	7.6	7.2	9.0	9.6
191530030	Des Moines, Health Dept.	9.2	8.8	8.3	7.7	7.4	9.0	9.6
191770006	Keosauqua, Lake Sugema	9.0	8.4	8.0	7.6	6.9	8.7	9.6
191370002	Viking Lake State Park	8.7	8.3	7.6	6.9	6.5	8.5	9.6
191471002	Emmetsburg, Iowa Lakes Coll.	8.6	8.2	7.8	7.3	6.8	8.4	9.6

Table X.3. UCL test for $PM_{2.5}$ Annual Design Values. All units are $\mu g/m^3$. Rows shaded in blue indicate sites that pass the Annual UCL test for removing the SLAMs monitor. Rows shaded in green indicate sites that fail the 24-hr UCL test for removing the SLAMs monitor.