

# **2023 Air Monitoring Network Plan for Minnesota**

## **Appendix B:**

### **Minimum Monitoring Requirements and 2022 Monitor Classifications in Air Quality System (AQS)**

#### **Summary**

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The U.S. Environmental Protection Agency (EPA) establishes the minimum number of monitoring sites required to meet national ambient monitoring objectives. The minimum monitoring requirements are codified in Appendix D of 40 CFR Part 58. Minimum monitoring requirements are specific to each individual pollutant (e.g. ozone, PM<sub>2.5</sub>) or objective-based monitoring network (e.g. NCore, PAMs). Minimum monitoring requirements typically rely on population and/or air pollution emissions data. Minnesota currently meets all minimum air monitoring requirements. This Appendix provides a detailed description of these requirements. It also provides tables that describe each monitor's scale, objective, method, and collocation, where required.

## **Federal Regulation**

*40 CFR § 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.*

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# PM<sub>2.5</sub>

## Fine particulate (PM<sub>2.5</sub>) monitoring requirements

The minimum monitoring requirements for PM<sub>2.5</sub> are established in Appendix D of 40 CFR Part 58, section 4.7.1(a) (Table B1). In addition to these population-based requirements, PM<sub>2.5</sub> monitoring is required at NCore and near-road air monitoring sites, as established in section 3(b) and section 4.7.1(b)(2) of Appendix D, respectively. NCore site also fulfills the continuous PM<sub>2.5</sub> and PM<sub>2.5</sub> chemical speciation network (CSN) site requirements, as established in section 4.7.2 and section 4.7.4 of the appendix, respectively. Each state is also required to operate at least one PM<sub>2.5</sub> site to monitor for regional background and at least one PM<sub>2.5</sub> site to monitor for regional transport, as established in section 4.7.3 of the appendix.

**Table B1. National minimum monitoring requirements for PM<sub>2.5</sub>**

MSA Population <sup>1,2</sup>	Most recent 3-year design value ≥85% of any PM <sub>2.5</sub> NAAQS <sup>3</sup>	Most recent 3-year design value <85% of any PM <sub>2.5</sub> NAAQS <sup>3,4</sup>
>1,000,000	3	2
500,000 – 1,000,000	2	1
50,000 - <500,000 <sup>5</sup>	1	0

<sup>1</sup> Minimum monitoring requirement applies to the Metropolitan statistical area (MSA).

<sup>2</sup> Population based on latest available census figures.

<sup>3</sup> The PM<sub>2.5</sub> National Ambient Air Quality Standard (NAAQS) levels and forms are defined in 40 CFR Part 50.

<sup>4</sup> These minimum monitoring requirements apply in the absence of a design value.

<sup>5</sup> Metropolitan statistical areas (MSA) must contain an urbanized area of 50,000 or more population

**Table B2. Minnesota monitoring requirements for PM<sub>2.5</sub> as compared to national standards**

Metropolitan Area	Counties included	2021 Population Estimate	Maximum 2021 Annual DV as % of NAAQS (12 µg/m <sup>3</sup> )	Maximum 2021 Daily DV as % of NAAQS (35 µg/m <sup>3</sup> )	Minimum	2022 Sites with FRM or FEM monitor
Minneapolis-St. Paul-Bloomington, MN-WI <sup>1</sup>	16 county area including the Twin Cities <sup>1</sup>	3,690,512	70%	77%	2	10
Duluth, MN-WI	Carlton (MN), St. Louis (MN), Douglas (WI)	290,780	43%	57%	0	3
Fargo, ND-MN	Clay (MN), Cass (ND)	252,136	66%	89%	1	1 (ND)
Rochester, MN	Dodge (MN), Olmsted (MN), Wabasha (MN)	227,151	53%	54%	0	1
St. Cloud, MN	Benton (MN), Stearns (MN)	200,406	57%	460%	0	1
La Crosse-Onalaska, WI-MN	Houston (MN), La Crosse (WI)	139,211	66%	63%	0	1 (WI)
Mankato-North Mankato, MN	Blue Earth (MN), Nicollet (MN)	103,612	Unmonitored		0	0
Grand Forks, ND-MN	Polk (MN), Grand Forks (ND)	103,462	Unmonitored		0	0
NCore (Blaine)		Not a population based requirement			1	1
Near-road Minneapolis		Not a population based requirement			1	1
Near-road Lakeville		Not a population based requirement			1	1
Regional background (Ely)		Not a population based requirement			1	1
Regional transport (Marshall)		Not a population based requirement			1	1

<sup>1</sup> Counties include: Anoka (MN), Carver (MN), Chisago (MN), Dakota (MN), Hennepin (MN), Isanti (MN), Le Sueur (MN), Mille Lacs (MN), Ramsey (MN), Scott (MN), Sherburne (MN), Sibley (MN), Washington (MN), Wright (MN), Pierce (WI), St. Croix (WI)

Minnesota currently meets all PM<sub>2.5</sub> monitoring requirements (Table B2), based on current monitoring objectives and methods (Tables B3-B6).

**Table B3. Scales and objectives of MPCA and Tribal PM<sub>2.5</sub> monitors**

MPCA Site ID	AQS Monitor ID	Monitor Type	Parameter Description	Measurement Scale	Monitor Objective Type
1002	27-003-1002-88101-1	SLAMS	PM <sub>2.5</sub> – Local Conditions	Urban Scale	Population Exposure
	27-003-1002-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Urban Scale	Population Exposure
2013	27-005-2013-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Urban Scale	Population Exposure
2304	27-007-2304-88101-3	TRIBAL	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
7417	27-017-7417-88101-3	TRIBAL	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
3410	27-021-3410-88101-3	TRIBAL	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
7810	27-031-7810-88101-3	TRIBAL	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
3204	27-035-3204-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Urban Scale	Population Exposure
0470	27-037-0470-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
0480	27-037-0480-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Middle Scale	Source Oriented
0962	27-053-0962-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Middle Scale	Source Oriented
0963	27-053-0963-88101-1	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
	27-053-0963-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
2006	27-053-2006-88101-1	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
	27-053-2006-88101-2	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
0005	27-075-0005-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Regional	General / Background
4210	27-083-4210-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Urban Scale	Population Exposure/ Regional Transport
5008	27-109-5008-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
0868	27-123-0868-88101-1	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
0871	27-123-0871-88101-1	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
	27-123-0871-88101-2	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
	27-123-0871-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
	27-123-0871-88101-4	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
7001	27-137-7001-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
7550	27-137-7550-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
7554	27-137-7554-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
0505	27-139-0505-88101-1	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
3052	27-145-3052-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure
3201	27-171-3201-88101-3	SLAMS	PM <sub>2.5</sub> – Local Conditions	Neighborhood	Population Exposure

**Table B4. Scales and objectives of Industrial PM<sub>2.5</sub> monitors in AQS**

MPCA Site ID	AQS Monitor ID	Monitor Type	Parameter Description	Measurement Scale	Monitor Objective Type
0447	27-163-0447-88101-3	Industrial	PM <sub>2.5</sub> – Local Conditions	Middle Scale	Source Oriented
0448	27-163-0448-88101-1	Industrial	PM <sub>2.5</sub> – Local Conditions	Middle Scale	Source Oriented
	27-163-0448-88101-3	Industrial	PM <sub>2.5</sub> – Local Conditions	Middle Scale	Source Oriented

**Table B5. Methods, frequency, duration, and collocation of MPCA and Tribal PM<sub>2.5</sub> monitors prior to equipment replacement in 2022**

MPCA Site ID	AQS Monitor ID	Monitor Type	Method Code	Sample Analysis Description	Sample Duration	Collection Frequency	Collocation Primary Monitor Indicator	Distance from Primary Monitor (m)
1002	27-003-1002-88101-1	SLAMS	145	Gravimetric	24 hours	Every 3 <sup>rd</sup> Day	N	1
	27-003-1002-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	Y	0
2013	27-005-2013-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
2304	27-007-2304-88101-3	TRIBAL	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
7417	27-017-7417-88101-3	TRIBAL	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
3410	27-021-3410-88101-3	TRIBAL	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
7810	27-031-7810-88101-3	TRIBAL	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
3204	27-035-3204-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
0470	27-037-0470-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
0480	27-037-0480-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
0962	27-053-0962-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
0963	27-053-0963-88101-1	SLAMS	145	Gravimetric	24 hours	Every 3 <sup>rd</sup> Day	N	1
	27-053-0963-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	Y	0
2006	27-053-2006-88101-1	SLAMS	145	Gravimetric	24 hours	Every 3 <sup>rd</sup> Day	Y	0
	27-053-2006-88101-2	SLAMS	145	Gravimetric	24 hours	Every 12 <sup>th</sup> Day	N	1
0005	27-075-0005-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
4210	27-083-4210-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
5008	27-109-5008-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
0868	27-123-0868-88101-1	SLAMS	145	Gravimetric	24 hours	Every 3 <sup>rd</sup> Day	n/a	n/a
0871	27-123-0871-88101-1	SLAMS	145	Gravimetric	24 hours	Every 3 <sup>rd</sup> Day	N	1.5
	27-123-0871-88101-2	SLAMS	145	Gravimetric	24 hours	Every 12 <sup>th</sup> Day	N	1.5
	27-123-0871-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	Y	0
	27-123-0871-88101-4	SLAMS	170	Beta Attenuation	1 hour	Every Day	N	1.5
7001	27-137-7001-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
7550	27-137-7550-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
7554	27-137-7554-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
0505	27-139-0505-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
3052	27-145-3052-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
3201	27-171-3201-88101-3	SLAMS	170	Beta Attenuation	1 hour	Every Day	n/a	n/a

### Upcoming changes

In 2022, PM<sub>2.5</sub> BAM monitors will be replaced with Teledyne T640 and T640X monitors. T640 monitors are an FEM for PM<sub>2.5</sub> while T640X monitors are an FEM for PM<sub>2.5</sub>, PM<sub>10</sub>, and PM<sub>10-2.5</sub> simultaneously.

These monitors will be replaced gradually across the network starting in summer 2022. Special consideration will be taken regarding the order of replacement and collocation requirements. Details about methods and collocation after the transition can be found in Table B6.

**Table B6 . Methods, frequency, duration, and collocation of MPCA and Tribal PM<sub>2.5</sub> monitors after equipment replacement in 2022**

MPCA Site ID	AQS Monitor ID	Monitor Type	Method Code*	Sample Analysis Description	Sample Duration	Collection Frequency	Collocation Primary Monitor Indicator	Distance from Primary Monitor (m)
1002	27-003-1002-88101-1	SLAMS	145	Gravimetric	24 hours	Every 3 <sup>rd</sup> Day	N	1
	27-003-1002-88101-3	SLAMS	238	Broadband spectroscopy	1 hour	Every Day	Y	0
2013	27-005-2013-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
2304	27-007-2304-88101-3	TRIBAL	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
7417	27-017-7417-88101-3	TRIBAL	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
3410	27-021-3410-88101-3	TRIBAL	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
7810	27-031-7810-88101-3	TRIBAL	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
3204	27-035-3204-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
0470	27-037-0470-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
0480	27-037-0480-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
0910	27-053-0910-88101-3	SLAMS	238	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
0962	27-053-0962-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
0963	27-053-0963-88101-1	SLAMS	145	Gravimetric	24 hours	Every 3 <sup>rd</sup> Day	N	1
	27-053-0963-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	Y	0
2006	27-053-2006-88101-1	SLAMS	145	Gravimetric	24 hours	Every 3 <sup>rd</sup> Day	Y	0
	27-053-2006-88101-2	SLAMS	145	Gravimetric	24 hours	Every 12 <sup>th</sup> Day	N	1
0005	27-075-0005-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
4210	27-083-4210-88101-3	SLAMS	238	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
5008	27-109-5008-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
0868	27-123-0868-88101-1	SLAMS	145	Gravimetric	24 hours	Every 3 <sup>rd</sup> Day	n/a	n/a
0871	27-123-0871-88101-1	SLAMS	145	Gravimetric	24 hours	Every 3 <sup>rd</sup> Day	N	1.5
	27-123-0871-88101-2	SLAMS	145	Gravimetric	24 hours	Every 12 <sup>th</sup> Day	N	1.5
	27-123-0871-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	Y	0
	27-123-0871-88101-4	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	N	1.5
7001	27-137-7001-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
7550	27-137-7550-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
7554	27-137-7554-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
0505	27-139-0505-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
3052	27-145-3052-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
3201	27-171-3201-88101-3	SLAMS	236	Broadband spectroscopy	1 hour	Every Day	n/a	n/a

\* Method 236 uses Teledyne T640 at 5.0 LPM; method 238 uses Teledyne T640X at 16.67 LPM.

**Table B7. Methods and collocation of Industrial PM<sub>2.5</sub> monitors in AQS**

MPCA Site ID	AQS Monitor ID	Monitor Type	Method Code	Sample Analysis Description	Sample Duration	Collection Frequency	Collocation Primary Monitor Indicator	Distance from Primary Monitor (m)
0447	27-163-0447-88101-3	Industrial	170	Beta Attenuation	1 hour	Every Day	n/a	n/a
0448	27-163-0448-88101-1	Industrial	142	Gravimetric	24 hours	Every 12 <sup>th</sup> Day	Y	0
	27-163-0448-88101-3	Industrial	170	Beta Attenuation	1 hour	Every Day	N	2



# PM<sub>10</sub>

## PM<sub>10</sub> monitoring requirements

The minimum monitoring requirements for PM<sub>10</sub> are established in Appendix D of 40 CFR Part 58, section 4.6 (Table B8). In addition to these population-based requirements, PM<sub>10</sub> monitoring is required at NCore sites as established in section 3(b) of Appendix D.

Minnesota currently meets all PM<sub>10</sub> monitoring requirements (Table B9), based on current monitoring objectives and methods (Tables B10-B13).

**Table B8. National minimum monitoring requirements for PM<sub>10</sub>**

Population category	MSA <sup>1</sup>		
	High concentration <sup>2</sup>	Medium concentration <sup>3</sup>	Low concentration <sup>4,5</sup>
>1 million	6-10	4-8	2-4
500,000 – 1 million	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

<sup>1</sup>Selection of urban areas and actual numbers of stations per area within the ranges shown in this table will be jointly determined by EPA and the State Agency.

<sup>2</sup>High concentration areas are those for which ambient PM<sub>10</sub> data show ambient concentrations exceeding the PM<sub>10</sub> NAAQS by 20% or more.

<sup>3</sup>Medium concentration areas are those for which ambient PM<sub>10</sub> data show ambient concentrations exceeding 80% of the PM<sub>10</sub> NAAQS.

<sup>4</sup>Low concentration areas are those for which ambient PM<sub>10</sub> data show ambient concentrations less than 80% of the PM<sub>10</sub> NAAQS.

<sup>5</sup>These minimum monitoring requirements apply in the absence of a design value.

**Table B9. Minnesota monitoring requirements for PM<sub>10</sub> as compared to national standards**

Metropolitan Area	2021 Population Estimate	Expected days greater than 80% of the NAAQS (120 µg/m <sup>3</sup> ) based on 2021 data	Minimum Requirement	2022 Sites
Minneapolis-St. Paul-Bloomington, MN-WI	3,690,512	1 <sup>1</sup>	4-8	6
Duluth, MN-WI	290,780	0	0-1	2
Fargo, ND-MN	252,136	0	0	1 (ND)
Rochester, MN	227,151	Unmonitored	0	0
St. Cloud, MN	200,406	Unmonitored	0	0
La Crosse-Onalaska, WI-MN	139,211	Unmonitored	0	0
Grand Forks, ND-MN	103,462	Unmonitored	0	0
Mankato-North Mankato, MN	103,612	Unmonitored	0	0
NCore (Blaine)	Not a population based requirement		1	1

**Table B10. Scales and objectives of MPCA PM<sub>10</sub> monitors in AQS**

MPCA Site ID	Monitor Type	AQS Monitor ID	Parameter Description	Measurement Scale	Monitor Objective Type
1002	SLAMS	27-003-1002-81102-3	PM <sub>10</sub> Total 0-10 µm Stp	Urban Scale	Population Exposure
0909	SLAMS	27-053-0909-81102-3	PM <sub>10</sub> Total 0-10 µm Stp	Middle Scale	Source Oriented
0910	SLAMS	27-053-0910-81102-3	PM <sub>10</sub> Total 0-10 µm Stp	Middle Scale	Source Oriented
0966	SLAMS	27-053-0966-81102-1	PM <sub>10</sub> Total 0-10 µm Stp	Neighborhood	Population Exposure
0866	SLAMS	27-123-0866-81102-1	PM <sub>10</sub> Total 0-10 µm Stp	Middle Scale	Highest Concentration
	SLAMS	27-123-0866-81102-2	PM <sub>10</sub> Total 0-10 µm Stp	Middle Scale	Highest Concentration
0868	SLAMS	27-123-0868-81102-3	PM <sub>10</sub> Total 0-10 µm Stp	Neighborhood	Population Exposure
0032	SLAMS	27-137-0032-81102-1	PM <sub>10</sub> Total 0-10 µm Stp	Middle Scale	Source Oriented
	SLAMS	27-137-0032-81102-2	PM <sub>10</sub> Total 0-10 µm Stp	Middle Scale	Source Oriented
7001	SLAMS	27-137-7001-81102-1	PM <sub>10</sub> Total 0-10 µm Stp	Neighborhood	Population Exposure
1909	SPM	27-053-1909-88101-3	PM <sub>10</sub> Total 0-10 µm Stp	Neighborhood	Population Exposure

**Table B11. Scales and objectives of Industrial PM<sub>10</sub> monitors in AQS**

MPCA Site ID	Monitor Type	AQS Monitor ID	Parameter Description	Measurement Scale	Monitor Objective Type
1009	Industrial	27-075-1009-81102-1	PM <sub>10</sub> Total 0-10 µm Stp	Neighborhood	Source Oriented
7632	Industrial	27-075-7632-81102-1	PM <sub>10</sub> Total 0-10 µm Stp	Neighborhood	Source Oriented
7640	Industrial	27-075-7640-81102-1	PM <sub>10</sub> Total 0-10 µm Stp	Neighborhood	Source Oriented
		27-075-7640-81102-2	PM <sub>10</sub> Total 0-10 µm Stp	Neighborhood	Source Oriented
		27-075-7640-81102-3	PM <sub>10</sub> Total 0-10 µm Stp	Neighborhood	Source Oriented
0447	Industrial	27-163-0447-81102-3	PM <sub>10</sub> Total 0-10 µm Stp	Middle Scale	Source Oriented
0448	Industrial	27-163-0448-81102-3	PM <sub>10</sub> Total 0-10 µm Stp	Middle Scale	Source Oriented

**Table B12. Methods and collocation of MPCA PM<sub>10</sub> monitors in AQS**

MPCA Site ID	Monitor Type	AQS Monitor ID	Method Code	Sample Analysis Description	Sample Duration	Collection Frequency	Collocation Primary Monitor Indicator	Distance from Primary Monitor (m)
1002*	SLAMS	27-003-1002-81102-3	122	Beta Attenuation	1 hour	Every Day	n/a	n/a
0909	SLAMS	27-053-0909-81102-3	122	Beta Attenuation	1 hour	Every Day	n/a	n/a
0910*	SLAMS	27-053-0910-81102-3	122	Beta Attenuation	1 hour	Every Day	n/a	n/a
0966	SLAMS	27-053-0966-81102-1	063	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
4210	SLAMS	27-083-4210-81102-3	239	Broadband spectroscopy	1 hour	Every Day	n/a	n/a
0866	SLAMS	27-123-0866-81102-1	063	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	Y	0
		27-123-0866-81102-2	063	Gravimetric	24 hours	Every 12 <sup>th</sup> Day	N	1.5
0868	SLAMS	27-123-0868-81102-3	122	Beta Attenuation	1 hour	Every Day	n/a	n/a
0032	SLAMS	27-137-0032-81102-1	063	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	Y	0
		27-137-0032-81102-2	063	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	N	1.5
7001	SLAMS	27-137-7001-81102-1	063	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
1909	SPM	27-053-1909-88101-3	122	Beta Attenuation	1 hour	Every Day	n/a	n/a

\* These sites will change to method 239 (Teledyne T640X at 16.67 LPM) in 2022

**Table B13. Methods and collocation of Industrial PM<sub>10</sub> monitors in AQS**

MPCA Site ID	Monitor Type	AQS Monitor ID	Method Code	Sample Analysis Description	Sample Duration	Collection Frequency	Collocation Primary Monitor Indicator	Distance from Primary Monitor (m)
1009	Industrial	27-075-1009-81102-1	063	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
7632	Industrial	27-075-7632-81102-1	063	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	Y	1
7640	Industrial	27-075-7640-81102-1	063	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	Y	0
		27-075-7640-81102-2	063	Gravimetric	24 hours	Every 12 <sup>th</sup> Day	N	1
		27-075-7640-81102-3	122	Beta Attenuation	1 hour	Every Day	N	1
0447	Industrial	27-163-0447-81102-3	122	Beta Attenuation	1 hour	Every Day	n/a	n/a
0448	Industrial	27-163-0448-81102-3	122	Beta Attenuation	1 hour	Every Day	n/a	n/a

## Total suspended particulate matter (TSP)

### TSP monitoring requirements

The TSP NAAQS was replaced in 1987 by the PM<sub>10</sub> standard. There are currently no federal requirements to monitor TSP. Minnesota rule administered by the Minnesota Pollution Control Agency requires the monitoring of TSP and the enforcement of state TSP standards. The TSP standards are detailed in [Minn.R.7009.0080](#).

Minnesota monitors at several locations (Tables B14 and B15).

**Table B14. Scales and objectives of MPCA TSP monitors**

MPCA Site ID	Monitor Type	AQS Monitor ID	Parameter Description	Measurement Scale	Monitor Objective Type
1002	SLAMS	27-003-1002-11101-1	Suspended particulate (TSP)	Neighborhood	Population Exposure
0020	SLAMS	27-037-0020-11101-1	Suspended particulate (TSP)	Middle Scale	Source Oriented
		27-037-0020-11101-2	Suspended particulate (TSP)	Middle Scale	Source Oriented
0423	SLAMS	27-037-0423-11101-2	Suspended particulate (TSP)	Middle Scale	Source Oriented
0465	SLAMS	27-037-0465-11101-1	Suspended particulate (TSP)	Middle Scale	Source Oriented
		27-037-0465-11101-2	Suspended particulate (TSP)	Middle Scale	Source Oriented
0470	SLAMS	27-037-0470-11101-1	Suspended particulate (TSP)	Neighborhood	Population Exposure
0909	SLAMS	27-053-0909-11101-1	Suspended particulate (TSP)	Middle Scale	Source Oriented
0910	SLAMS	27-053-0910-11101-1	Suspended particulate (TSP)	Middle Scale	Source Oriented
0962	SLAMS	27-053-0962-11101-1	Suspended particulate (TSP)	Middle Scale	Source Oriented
0963	SLAMS	27-053-0963-11101-1	Suspended particulate (TSP)	Neighborhood	Population Exposure
0966	SLAMS	27-053-0966-11101-1	Suspended particulate (TSP)	Neighborhood	Population Exposure
1007	SLAMS	27-053-1007-11101-1	Suspended particulate (TSP)	Neighborhood	Population Exposure
1909	SPM	27-053-1909-11101-1	Suspended particulate (TSP)	Neighborhood	Population Exposure
0871	SLAMS	27-123-0871-11101-1	Suspended particulate (TSP)	Neighborhood	Population Exposure
0875	SLAMS	27-123-0875-11101-1	Suspended particulate (TSP)	Neighborhood	Population Exposure
7001	SLAMS	27-137-7001-11101-1	Suspended particulate (TSP)	Neighborhood	Population Exposure
7549	SLAMS	27-137-7549-11101-1	Suspended particulate (TSP)	Middle Scale	Source Oriented
7555	SLAMS	27-137-7555-11101-1	Suspended particulate (TSP)	Neighborhood	Population Exposure
		27-137-7555-11101-2	Suspended particulate (TSP)	Neighborhood	Population Exposure
0438	SLAMS	27-163-0438-11101-1	Suspended particulate (TSP)	Middle Scale	Source Oriented
0446	SLAMS	27-163-0446-11101-1	Suspended particulate (TSP)	Middle Scale	Source Oriented

**Table B15. Methods and collocation of MPCA TSP monitors**

MPCA Site ID	AQS Monitor ID	Method Code	Sample Analysis Description	Sample Duration	Collection Frequency	Collocation Primary Monitor Indicator	Distance from Primary Monitor (m)
1002	27-003-1002-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0020	27-037-0020-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	Y	0
	27-037-0020-11101-2	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	N	2.5
0423	27-037-0423-11101-2	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0465	27-037-0465-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	Y	0
	27-037-0465-11101-2	091	Gravimetric	24 hours	Every 12 <sup>th</sup> Day	N	2.5
0470	27-037-0470-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0909	27-053-0909-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0910	27-053-0910-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0962	27-053-0962-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0963	27-053-0963-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0966	27-053-0966-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
1007	27-053-1007-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
1909	27-053-1909-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0871	27-123-0871-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0875	27-123-0875-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
7001	27-137-7001-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
7549	27-137-7549-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
7555	27-137-7555-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	Y	0
	27-137-7555-11101-2	091	Gravimetric	24 hours	Every 12 <sup>th</sup> Day	N	3
0438	27-163-0438-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0446	27-163-0446-11101-1	091	Gravimetric	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a

# Lead

## Lead monitoring requirements

The minimum monitoring requirements for lead are established in Appendix D of 40 CFR Part 58, section 4.5. Lead monitoring requirements are based on annual emissions. This source-oriented network requires lead monitoring for non-airport sources which emit 0.50 tons or more lead per year (TPY) (Table B16) and from each airport which emits 1.0 or more TPY, based on either the most recent National Emission Inventory (NEI) or other scientifically justifiable methods and data. The EPA Regional Administrator may waive the lead monitoring requirement near lead sources if the State or, where appropriate, the local agency can demonstrate the lead source will not contribute to a maximum lead concentration in ambient air in excess of 50% of the NAAQS (based on historical monitoring data, modeling, or other means). The waiver must be re-evaluated once every five years as part of the network assessment.

**Table B16. 2017 to 2020 comparison of sources with annual lead emissions greater than 0.5 TPY**

Facility Name	City	County	2016 Lead Emissions (TPY)	2017 Lead Emissions (TPY)	2018 Lead Emissions (TPY)	2019 Lead Emissions (TPY)	2020 Lead Emissions (TPY)
Federal Cartridge Co.	Anoka, MN	Anoka	0.114	0.073	0.141	2.02	2.07
Gopher Resource LLC	Eagan, MN	Dakota	0.155**	0.157	0.325	0.170	0.135
Grede LLC – St. Cloud	St. Cloud, MN	Stearns	0.001*	0.001	0.001	0.001	0.001
US Steel Corp – Minntac	Mountain Iron, MN	St. Louis	0.481	0.564	0.552	0.501	0.486

\*Facility was updated and now uses negative pressure, resulting in 100% capture for the largest lead-emitting units and significantly reduced lead emissions.

\*\*2016 stack test emission factors were updated and resulted in reduced lead emissions.

## Federal Cartridge

Federal Cartridge was identified above the 0.5 tons Lead on their annually emission inventory for 2019 and 2020. The MCPA will be placing a lead monitoring site at Federal Cartridge, Anoka MN, to meet the requirement of Appendix D of 40 CFR Part 58, section 4.5. This requirement identifies 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. A new site will be placed near this facility in 2022.

## Gopher Resource LLC

In addition to the emissions-based lead monitoring requirements, the EPA Regional Administrator can require additional monitoring beyond the minimum monitoring requirements where the “likelihood of lead air quality violations is significant”, or where the emissions density, topography, or population locations are complex and varied. The Minnesota Pollution Control Agency (MPCA) interprets the “likelihood of lead air quality violations is significant” to include locations where ambient monitoring or modeling indicate that ambient lead concentrations may be greater than 50% of the lead NAAQS. Based on monitoring conducted from 2019-2021, one ambient lead monitoring site measured maximum 3-month rolling average lead concentrations greater than 50% of the lead NAAQS (Table B17). At a minimum, the MPCA intends to continue monitoring for lead at

this site for as long as the maximum 3-month rolling average lead concentration is greater than 50% of the lead NAAQS.

**Table B17. Minnesota lead monitoring sites with maximum 3-month rolling average lead concentrations greater than 50% of the NAAQS**

Site Name	AQS Monitor ID	Maximum 3-month Rolling Average (2019-2021)	Percent of NAAQS
Eagan – Gopher Resources	27-037-0465-14129-1	0.08 µg/m <sup>3</sup>	53%

## Grede LLC

The MPCA conducted ambient lead monitoring at Grede LLC – St. Cloud (27-145-3053) from January 2010 – June 2013. The maximum 3-month rolling average lead concentration measured near the facility was 0.01 µg/m<sup>3</sup>, which is less than 50% of the lead standard. The MPCA submitted a monitor closure request to the the EPA Region 5 Administrator in April 2013. The Regional Administrator approved the closure request in June 2013. As required by regulation the MPCA, with EPA, re-evaluated the need for ambient lead monitoring at Grede LLC in 2017, using current emissions, updated facility characteristics, and regulatory air dispersion models approved by the EPA. The EPA confirmed with the MPCA on March 12, 2018, that, since Grede LLC had 0.001 TPY emissions of lead in 2016, no waiver was necessary.

## US Steel Corp – Minntac

In 2009, the MPCA conducted modeling to assess ambient lead concentrations near U.S. Steel Corp – Minntac. The results of this modeling predicted that maximum ambient lead concentrations near the facility were less than 50% of the lead NAAQS. See the 2011 Source-oriented Lead Monitoring Plan for Minnesota for a summary of these results, at <https://www.pca.state.mn.us/sites/default/files/aq10-04.pdf>. The MPCA received a lead monitoring waiver for U.S. Steel Corp-Minntac in December 2011.

The 2011 monitoring waiver was re-evaluated and results were published in the January 2017 Lead Monitoring Waiver Renewal for U.S. Steel Corp – Minntac. Results of the 2017 modeling reassessment are similar to those conducted in 2009 and 2011. Modeled ambient lead concentrations are well below the monitoring threshold of 50% of the lead NAAQS. Using a background ambient lead concentration of 0.01 µg/m<sup>3</sup>, the total facility impact is estimated at 0.010244 µg/m<sup>3</sup>, which is approximately 14% of the threshold to require ambient fence-line monitoring. Based on these results, the EPA has approved MPCA’s lead monitoring waiver for the Minntac facility.

**Table B18. Scales and objectives of MPCA lead monitors in AQ5**

MPCA Site ID	Monitor Type	AQS Monitor ID	Parameter Description	Measurement Scale	Monitor Objective Type
1002	SLAMS	27-003-1002-14129-1	Lead (Tsp) LC	Neighborhood	Population Exposure
0020	SLAMS	27-037-0020-14129-1	Lead (Tsp) LC	Middle Scale	Source Oriented
	SLAMS	27-037-0020-14129-2	Lead (Tsp) LC	Middle Scale	Source Oriented
0423	SLAMS	27-037-0423-14129-2	Lead (Tsp) LC	Middle Scale	Source Oriented
0465	SLAMS	27-037-0465-14129-1	Lead (Tsp) LC	Middle Scale	Source Oriented
	SLAMS	27-037-0465-14129-2	Lead (Tsp) LC	Middle Scale	Source Oriented
0470	SLAMS	27-037-0470-14129-1	Lead (Tsp) LC	Neighborhood	Population Exposure
0909	SLAMS	27-053-0909-14129-1	Lead (Tsp) LC	Middle Scale	Source Oriented
0910	SLAMS	27-053-0910-14129-1	Lead (Tsp) LC	Middle Scale	Source Oriented
0962	SLAMS	27-053-0962-14129-1	Lead (Tsp) LC	Middle Scale	Source Oriented
0963	SLAMS	27-053-0963-14129-1	Lead (Tsp) LC	Neighborhood	Population Exposure
0966	SLAMS	27-053-0966-14129-1	Lead (Tsp) LC	Neighborhood	Population Exposure
1007	SLAMS	27-053-1007-14129-1	Lead (Tsp) LC	Neighborhood	Population Exposure
1909	SPM	27-053-1909-14129-1	Lead (Tsp) LC	Neighborhood	Population Exposure
0871	SLAMS	27-123-0871-14129-1	Lead (Tsp) LC	Neighborhood	Population Exposure
0875	SLAMS	27-123-0875-14129-1	Lead (Tsp) LC	Neighborhood	Population Exposure
7001	SLAMS	27-137-7001-14129-1	Lead (Tsp) LC	Neighborhood	Population Exposure
7549	SLAMS	27-137-7549-14129-1	Lead (Tsp) LC	Neighborhood	Population Exposure
7555	SLAMS	27-137-7555-14129-1	Lead (Tsp) LC	Neighborhood	Population Exposure
	SLAMS	27-137-7555-14129-2	Lead (Tsp) LC	Neighborhood	Population Exposure
0438	SLAMS	27-163-0438-14129-1	Lead (Tsp) LC	Middle Scale	Source Oriented
0446	SLAMS	27-163-0446-14129-1	Lead (Tsp) LC	Middle Scale	Source Oriented

**Table B19. Methods and collocation of MPCA lead monitors**

MPCA Site ID	AQS Monitor ID	Monitor Type	Method Code*	Sample Duration	Collection Frequency	Collocation Primary Monitor Indicator	Distance from Primary Monitor (m)
1002	27-003-1002-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0020	27-037-0020-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	Y	0
	27-037-0020-14129-2	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	N	2.5
0423	27-037-0423-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0465	27-037-0465-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	Y	0
	27-037-0465-14129-2	SLAMS	192	24 hours	Every 12 <sup>th</sup> Day	N	2.5
0470	27-037-0470-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0909	27-053-0909-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0910	27-053-0910-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0962	27-053-0962-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0963	27-053-0963-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0966	27-053-0966-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
1007	27-053-1007-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
1909	27-053-1909-14129-1	SPM	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0871	27-123-0871-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
7001	27-137-7001-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
7549	27-137-7549-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
7555	27-137-7555-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	Y	0
	27-137-7555-14129-2	SLAMS	192	24 hours	Every 12 <sup>th</sup> Day	N	3
0438	27-163-0438-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a
0446	27-163-0446-14129-1	SLAMS	192	24 hours	Every 6 <sup>th</sup> Day	n/a	n/a

\*Method 192 is Inductively Coupled Plasma-Mass Spectrometry Acid filter extract with hot nitric acid

# Ozone

## Ozone (O<sub>3</sub>) monitoring requirements

The minimum monitoring requirements for ozone are established in Section 4.1 of Appendix D of 40 CFR Part 58, section 4.1 (Table B19). In addition to these population-based requirements, ozone monitoring is required at NCore sites as established in section 3(b) of Appendix D.

Minnesota currently meets all ozone monitoring requirements (Table B20), based on current monitoring objectives and methods (Tables B21 and B22).

**Table B20. National minimum monitoring requirements for ozone**

MSA Population <sup>1,2</sup>	Most recent 3-year design value concentrations $\geq$ 85% of any O <sub>3</sub> NAAQS <sup>3</sup>	Most recent 3-year design value concentration <85% of any O <sub>3</sub> NAAQS <sup>3,4</sup>
>10 million	4	2
4-10 million	3	1
350,000 - <4 million	2	1
50,000 - <350,000 <sup>5</sup>	1	0

<sup>1</sup>Minimum monitoring requirements apply to the Metropolitan statistical area (MSA).

<sup>2</sup>Population based on latest available census figures.

<sup>3</sup>The ozone (O<sub>3</sub>) National Ambient Air Quality Standards (NAAQS) levels and forms are defined in 40 CFR part 50.

<sup>4</sup>These minimum monitoring requirements apply in the absence of a design value.

<sup>5</sup>Metropolitan statistical areas (MSA) must contain an urbanized area of 50,000 or more population.

**Table B21. Minnesota monitoring requirements for ozone as compared to national standards**

Metropolitan Area	2021 Population Estimate	Maximum 2021 8-Hour DV as % of NAAQS (70 ppb)	Minimum Requirement	2021 Sites
Minneapolis-St. Paul-Bloomington, MN-WI	3,690,512	91%	2	6
Duluth, MN-WI	290,780	81%	0	2
Fargo, ND-MN	252,136	86%	1	1 (ND)
Rochester, MN	227,151	89%	1	1
St. Cloud, MN*	200,406	Unmonitored	0	0
La Crosse-Onalaska, WI-MN	139,211	86%	1	1 (WI)
Grand Forks, ND-MN	103,462	Unmonitored	0	0
Mankato-North Mankato, MN	103,612	Unmonitored	0	0
NCore (Blaine)	Not a population based requirement		1	1

\*AQS Site 27-145-3052 may represent the St. Cloud air mass, and is within St. Cloud city limits, but its actual location in Sherburne County means that it is outside the boundary of the St. Cloud MSA. Thus, Site 3052 does not meet the monitoring requirements for the St. Cloud MSA. Sherburne County is part of the Minneapolis-St. Paul-Bloomington, MN-WI MSA.



**Table B22. Scales and objectives of MPCA and Tribal ozone monitors**

MPCA Site ID	Monitor Type	AQS Monitor ID	Parameter Description	Measurement Scale	Monitor Objective Type
1001	SLAMS	27-003-1001-44201-1	Ozone	Neighborhood	Highest Concentration
1002	SLAMS	27-003-1002-44201-1	Ozone	Neighborhood	Highest Concentration
2013	SLAMS	27-005-2013-44201-1	Ozone	Urban Scale	Regional Transport
7417	TRIBAL	27-017-7417-44201-1	Ozone	Neighborhood	Population Exposure
3204	SLAMS	27-035-3204-44201-1	Ozone	Urban Scale	Population Exposure
5302	SLAMS	27-049-5302-44201-1	Ozone	Neighborhood	Population Exposure
0962	SLAMS	27-053-0962-44201-1	Ozone	Middle Scale	Source Oriented
0005	SLAMS	27-075-0005-44201-1	Ozone	Regional	General / Background
4210	SLAMS	27-083-4210-44201-1	Ozone	Urban Scale	Regional Transport
3051	TRIBAL	27-095-3051-44201-1	Ozone	Urban Scale	Population Exposure
5008	SLAMS	27-109-5008-44201-1	Ozone	Neighborhood	Population Exposure
7550	SLAMS	27-137-7550-44201-1	Ozone	Neighborhood	Population Exposure
0505	SLAMS	27-139-0505-44201-1	Ozone	Neighborhood	Population Exposure
3052	SLAMS	27-145-3052-44201-1	Ozone	Neighborhood	Population Exposure
6016	SLAMS	27-163-6016-44201-1	Ozone	Neighborhood	Highest Concentration
3201	SLAMS	27-171-3201-44201-1	Ozone	Neighborhood	Highest Concentration

**Table B23. Methods of MPCA and Tribal ozone monitors**

MPCA Site ID	Monitor Type	AQS Monitor ID	Parameter Description	Method Code	Sample Analysis Description
1001	SLAMS	27-003-1001-44201-1	Ozone	087	Ultraviolet Absorption
1002	SLAMS	27-003-1002-44201-1	Ozone	087	Ultraviolet Absorption
2013	SLAMS	27-005-2013-44201-1	Ozone	087	Ultraviolet Absorption
7417	TRIBAL	27-017-7417-44201-1	Ozone	087	Ultraviolet Absorption
3204	SLAMS	27-035-3204-44201-1	Ozone	087	Ultraviolet Absorption
5302	SLAMS	27-049-5302-44201-1	Ozone	087	Ultraviolet Absorption
0962	SLAMS	27-053-0962-44201-1	Ozone	087	Ultraviolet Absorption
0005	SLAMS	27-075-0005-44201-1	Ozone	087	Ultraviolet Absorption
4210	SLAMS	27-083-4210-44201-1	Ozone	087	Ultraviolet Absorption
3051	TRIBAL	27-095-3051-44201-1	Ozone	087	Ultraviolet Absorption
5008	SLAMS	27-109-5008-44201-1	Ozone	087	Ultraviolet Absorption
7550	SLAMS	27-137-7550-44201-1	Ozone	087	Ultraviolet Absorption
0505	SLAMS	27-139-0505-44201-1	Ozone	087	Ultraviolet Absorption
3052	SLAMS	27-145-3052-44201-1	Ozone	087	Ultraviolet Absorption
6016	SLAMS	27-163-6016-44201-1	Ozone	087	Ultraviolet Absorption
3201	SLAMS	27-171-3201-44201-1	Ozone	087	Ultraviolet Absorption

# Carbon monoxide

## Carbon monoxide (CO) monitoring requirements

The minimum monitoring requirements for CO are established in Appendix D of 40 CFR Part 58, section 4.2. These requirements include monitoring CO at NCore sites and at two near-road air monitoring site in Core Base Statistical Areas (CBSAs) having a population of 1,000,000 or more persons, as established in section 3(b) and section 4.2.1(a) of Appendix D, respectively. (Table B23). In addition to these minimum requirements, the Regional Administrator may require additional monitors in situations where data or other information suggests that CO concentrations may be approaching or exceeding the NAAQS. Minnesota currently meets the minimum CO monitoring requirements, according to monitoring objectives and methods (Tables B24 and B25).

**Table B24. Minnesota carbon monoxide monitoring requirements**

Location Requirement	Required Sites	2021 Sites
Near-road CO for CBSAs > 1 million (Minneapolis – St. Paul-Bloomington, MN-WI)	1	2
NCore (Blaine)	1	1

**Table B25. Scales and objectives of MPCA carbon monoxide monitors in AQ5**

MPCA Site ID	Monitor Type	AQS Monitor ID	Parameter Description	Measurement Scale	Monitor Objective Type
1002	SLAMS	27-003-1002-42101-1	Carbon Monoxide	Urban Scale	Population Exposure
0020	SLAMS	27-037-0020-42101-1	Carbon Monoxide	Middle Scale	Source Oriented
0423	SLAMS	27-037-0423-42101-1	Carbon Monoxide	Middle Scale	Source Oriented
0480	SLAMS	27-037-0480-42101-1	Carbon Monoxide	Middle Scale	Source Oriented
0954	SLAMS	27-053-0954-42101-1	Carbon Monoxide	Microscale	Highest Concentration
0962	SLAMS	27-053-0962-42101-1	Carbon Monoxide	Middle Scale	Source Oriented

**Table B26. Methods of MPCA carbon monoxide monitors in AQ5**

MPCA Site ID	Monitor Type	AQS Monitor ID	Method Code	Sample Analysis Description
1002	SLAMS	27-003-1002-42101-1	593	Gas Filter Correlation Teledyne API 300 EU
0020	SLAMS	27-037-0020-42101-1	093	Gas Filter Correlation CO Analyzer
0423	SLAMS	27-037-0423-42101-1	093	Gas Filter Correlation CO Analyzer
0480	SLAMS	27-037-0480-42101-1	093	Gas Filter Correlation CO Analyzer
0954	SLAMS	27-053-0954-42101-1	093	Gas Filter Correlation CO Analyzer
0962	SLAMS	27-053-0962-42101-1	093	Gas Filter Correlation CO Analyzer

# Nitrogen dioxide

## Nitrogen dioxide (NO<sub>2</sub>) monitoring requirements

The minimum monitoring requirements for NO<sub>2</sub> are established in Appendix D of 40 CFR Part 58, section 4.3. There are two primary monitoring objectives for NO<sub>2</sub>, including monitoring near roads and in neighborhoods (area-wide), as established in section 3(b) and section 4.2.1(a) of Appendix D, respectively (Table B26). In addition to these minimum requirements, the Regional Administrator may require additional monitoring in areas where NO<sub>2</sub> is expected to be near the level of the NAAQS. To date, the Regional Administrator has not required any additional NO<sub>2</sub> monitors in Minnesota.

Minnesota currently meets all NO<sub>2</sub> monitoring requirements (Table B27), based on current monitoring objectives (Table B28) and methods (Table B29).

**Table B27. National minimum monitoring requirements for nitrogen dioxide**

MSA Population	Near-Road Monitors	Area-wide Monitors
500,000	1-2 <sup>1</sup>	0
1,000,000	1	1
2,500,000	2	1

<sup>1</sup>A second near-road site is required for any CBSA with a population of 500,000 or more persons that has one or more roadway segments with Annual Average Daily Traffic (AADT) greater than 250,000.

**Table B28. Minnesota monitoring requirements for nitrogen dioxide**

Metropolitan Area	2021 Population Estimate	Required Near-Road	2021 Near-Road	Required Area-Wide	2021 Area-Wide
Minneapolis-St. Paul-Bloomington, MN-WI	3,690,512	2	2	1	1
Duluth, MN-WI	290,780	0	0	0	0
Fargo, ND-MN	252,136	0	0	0	1 (ND)
Rochester, MN	227,151	0	0	0	0
St. Cloud, MN	200,406	0	0	0	0
La Crosse-Onalaska, WI-MN	139,211	0	0	0	0
Grand Forks, ND-MN	103,462	0	0	0	0
Mankato-North Mankato, MN	103,612	0	0	0	0

**Table B29. Scales and objectives of MPCA nitrogen dioxide monitors in AQS**

MPCA Site ID	Monitor Type	AQS Monitor ID	Parameter Description	Measurement Scale	Monitor Objective Type
1002*	SLAMS	27-003-1002-42602-1	Nitrogen Dioxide	Urban Scale	General / Background
0020	SLAMS	27-037-0020-42602-1	Nitrogen Dioxide	Middle Scale	Source Oriented
0423	SLAMS	27-037-0423-42602-1	Nitrogen Dioxide	Middle Scale	Source Oriented
0480	SLAMS	27-037-0480-42602-1	Nitrogen Dioxide	Middle Scale	Source Oriented
0962	SLAMS	27-053-0962-42602-1	Nitrogen Dioxide	Middle Scale	Source Oriented / Highest Concentration
7001	SPM	27-137-7001-42602-1	Nitrogen Dioxide	Regional Scale	General / Background

\*The NO<sub>2</sub> monitor at NCore (1002) satisfies the area-wide requirement for the Minneapolis-St. Paul-Bloomington, MN-WI CBSA.

**Table B30. Methods of MPCA NO<sub>2</sub> monitors in AQS**

MPCA Site ID	Monitor Type	AQS Monitor ID	Parameter Description	Method Code	Sample Analysis Description
1002	SLAMS	27-003-1002-42602-1	Nitrogen Dioxide	099	Gas Phase Chemiluminescence
0020	SLAMS	27-037-0020-42602-1	Nitrogen Dioxide	099	Gas Phase Chemiluminescence
0423	SLAMS	27-037-0423-42602-1	Nitrogen Dioxide	099	Gas Phase Chemiluminescence
0480	SLAMS	27-037-0480-42602-1	Nitrogen Dioxide	099	Gas Phase Chemiluminescence
0962	SLAMS	27-053-0962-42602-1	Nitrogen Dioxide	099	Gas Phase Chemiluminescence
7001	SPM	27-137-7001-42602-1	Nitrogen Dioxide	099	Gas Phase Chemiluminescence

## Sulfur dioxide

### Sulfur dioxide (SO<sub>2</sub>) monitoring requirements

The minimum monitoring requirements for SO<sub>2</sub> are established in Appendix D of 40 CFR Part 58, section 4.4. The SO<sub>2</sub> monitoring requirement is based on the Population Weighted Emissions Index (PWEI) for all CBSAs (Table B30). The PWEI is calculated by multiplying the population of each CBSA, using the most recent census data or estimates, and the total amount of SO<sub>2</sub> in TPY 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 value is divided by one million, providing a PWEI value, the units of which are million person-tons per year (Table B31). In addition to these population-based requirements, SO<sub>2</sub> monitoring is required at NCore sites as established in section 3(b) of Appendix D.

The MPCA currently monitors SO<sub>2</sub> at seven locations in the state (Tables B32 and B33).

**Table B31. National minimum monitoring requirements for sulfur dioxide**

PWEI for CBSA	Required Sites
≥1 million	3
100,000 to < 1 million	2
5,000 to < 100,000	1

**Table B32. Minnesota monitoring requirements for sulfur dioxide as compared to national standards**

Metropolitan Area	2021 Population Estimate	2017 NEI SO <sub>2</sub> (tons/year)	PWEI	Minimum requirement	2022 Sites
Minneapolis-St. Paul-Bloomington, MN-WI	3,690,512	15,435	56,964	1	6
Duluth, MN-WI	290,780	5,242	1,524	0	0
Fargo, ND-MN	252,136	15,371	3,846	0	1 (ND)
Rochester, MN	227,151	318	72	0	0
St. Cloud, MN	200,406	452	91	0	0
La Crosse-Onalaska, WI-MN	139,211	173	24	0	0
Grand Forks, ND-MN	103,462	7,231	748	0	0
Mankato-North Mankato, MN	103,612	351	36	0	0
NCore (Blaine)	Not a population-based requirement			1	1

**Table B33. Scales and objectives of MPCA sulfur dioxide monitors in AQS**

MPCA Site ID	Monitor Type	AQS Monitor ID	Parameter Description	Measurement Scale	Monitor Objective Type
1002	SLAMS	27-003-1002-42401-1	Sulfur Dioxide	Urban Scale	Population Exposure
	SLAMS	27-003-1002-42401-2	Sulfur Dioxide	Urban Scale	Population Exposure
0020	SLAMS	27-037-0020-42401-1	Sulfur Dioxide	Middle Scale	Source Oriented
0423	SLAMS	27-037-0423-42401-1	Sulfur Dioxide	Middle Scale	Source Oriented
0443	SLAMS	27-037-0443-42401-1	Sulfur Dioxide	Middle Scale	Source Oriented
0954	SLAMS	27-053-0954-42401-1	Sulfur Dioxide	Microscale	Population Exposure
7001	SPM	27-137-7001-42401-1	Sulfur Dioxide	Regional Scale	General / Background
0436	SLAMS	27-163-0436-42401-1	Sulfur Dioxide	Middle Scale	Source Oriented

**Table B34. Methods of MPCA sulfur dioxide monitors in AQS**

MPCA Site ID	Monitor Type	AQS Monitor ID	Method Code	Sample Analysis Description
1002	SLAMS	27-003-1002-42401-1	600	Ultraviolet Fluorescence API 100 EU
	SLAMS	27-003-1002-42401-2	600	Ultraviolet Fluorescence API 100 EU
0020	SLAMS	27-037-0020-42401-1	100	Ultraviolet Fluorescence
0423	SLAMS	27-037-0423-42401-1	100	Ultraviolet Fluorescence
0443	SLAMS	27-037-0443-42401-1	100	Ultraviolet Fluorescence
0954	SLAMS	27-053-0954-42401-1	100	Ultraviolet Fluorescence
7001	SPM	27-137-7001-42401-1	100	Ultraviolet Fluorescence
0436	SLAMS	27-163-0436-42401-1	100	Ultraviolet Fluorescence