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SEP 25 2020

Mr. Peter Lopez
Regional Administrator
United States Environmental Protection Agency Region 2
290 Broadway, 26th Floor
New York, New York 10007-1866

Dear Mr. Lopez:

On behalf of the Governor of the State of New York, the New York State Department of Environmental Conservation (DEC or the Department) hereby submits the "Revised Designation Recommendation for Sulfur Dioxide: Cayuga, Seneca, St. Lawrence and Tompkins Counties: 2010 Primary National Ambient Air Quality Standard: September 2020" for consideration by the United States Environmental Protection Agency (EPA).

On September 5, 2019, EPA issued a memorandum with details on the schedule and process for area designations for the 2010 sulfur dioxide (SO₂) National Ambient Air Quality Standard (NAAQS) that must be completed by December 31, 2020 (Round 4). EPA will designate all areas in the country that have not yet been designated for the 2010 SO₂ NAAQS in Round 4. Cayuga, Seneca, St. Lawrence, and Tompkins Counties are the only areas in New York State that have yet to be designated. The designations for these four counties will be based primarily on ambient monitoring data from EPA-approved monitors that were installed and operated near Cayuga Operating Company in Tompkins County and Alcoa USA Corporation in St. Lawrence County pursuant to the federal Data Requirements Rule.

On June 1, 2011 DEC submitted an initial designation recommendation for the 2010 SO₂ NAAQS based on air quality information that was then available. On August 13, 2020, after considering New York's recommendation and all available information, particularly the most recent (2017-2019) air monitoring data, EPA informed Governor Cuomo that it intends to designate St. Lawrence County (excluding the northern portion of the Adirondack Park within St. Lawrence County) as "nonattainment." It intends to designate Cayuga, Seneca, Tompkins and the portion of St. Lawrence County containing the area of Adirondack Park located in the southern part of the County as "attainment/unclassifiable."

DEC disagrees with EPA's intended nonattainment boundary in St. Lawrence County and recommends that a small smaller portion of St. Lawrence County be designated "nonattainment." Specifically, DEC recommends that only the Village of Massena, a small portion of the Town of Massena, and a small portion of the Town of Louisville be



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designated "nonattainment" pursuant to the technical analysis included in the enclosed revised designation recommendation.

DEC agrees with EPA's August 13, 2020 intended designation of "attainment/unclassifiable" for Cayuga, Seneca, and Tompkins Counties, and continues to recommend that Cayuga, Seneca, and Tompkins Counties be designated "attainment" because ambient monitoring data from 2017, 2018 and 2019 in those counties is below the NAAQS.

Should you have any questions regarding this submission, please do not hesitate to contact Mr. Steven Flint, Director of the Department's Division of Air Resources at (518) 402-8452 with any questions you may have.

Sincerely,

A handwritten signature in dark ink, appearing to read "Basil Seggos", written in a cursive style.

Basil Seggos
Commissioner

Enclosures

c: S. Flint
R. Ruvo, EPA Region 2



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REVISED DESIGNATION RECOMMENDATION

Cayuga, Seneca, St. Lawrence, and Tompkins Counties

[2010 Primary Sulfur Dioxide
National Ambient Air Quality Standard]

September 2020

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Introduction

Sulfur dioxide (SO₂) is one of a group of highly reactive gasses known as “oxides of sulfur.” The largest sources of SO₂ emissions are from fossil fuel combustion at power plants and other industrial facilities. Smaller sources of SO₂ emissions include industrial processes and the burning of high sulfur containing fuels by locomotives, large ships, and non-road equipment. SO₂ is linked with several adverse health effects on the respiratory system. For example, exposure to sulfur dioxide can cause irritation and/or inflammation of the skin and mucous membranes of the eyes, nose, throat, and lungs. The respiratory system is particularly affected during heavy physical activity. High concentrations of SO₂ can also affect lung function, worsen asthma attacks, and aggravate existing heart disease in sensitive groups, such as children, the elderly, and those with chronic lung disease.

On June 2, 2010, the United States Environmental Protection Agency (EPA or Agency) strengthened the primary (health based) SO₂ National Ambient Air Quality Standard (NAAQS) by establishing a 1-hour NAAQS at a level of 75 parts per billion (ppb). EPA must designate all areas of the country as either “unclassifiable,” “attainment,” or “nonattainment” for this NAAQS pursuant to section 107(d) of the Clean Air Act (CAA) by December 31, 2020.

Cayuga, Seneca, St. Lawrence, and Tompkins Counties are the only areas in New York State that have not yet been designated for the 2010 SO₂ NAAQS. Since information regarding an appropriate designation for St. Lawrence County has changed since the original designation recommendation was submitted on June 1, 2011, the New York State Department of Environmental Conservation (DEC) has developed this revised designation recommendation using the September 5, 2019 EPA Memorandum entitled “Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standard – Round 4.”¹

¹ [September 5, 2019 EPA Memorandum](#)

Background

2010 1-hour SO₂ NAAQS and Designations

On June 2, 2010, EPA strengthened the primary (health based) SO₂ NAAQS by establishing a 1-hour standard at a level of 75 parts per billion (ppb) which is attained when the 3-year average of the 99th percentile of 1-hour daily maximum concentrations does not exceed 75 ppb. This NAAQS was published in the Federal Register (FR) on June 22, 2010 (75 FR 35520) and is codified at 40 CFR 50.17. The secondary (welfare based) standard for SO₂, set at 500 ppb evaluated over 3 hours was not revised, and EPA is not currently designating areas based on the secondary standard.

DEC submitted New York's designation request for the 2010 primary SO₂ NAAQS on June 1, 2011² and recommended that all areas of New York be designated as "attainment" based on certified monitoring data, except for the Poughkeepsie-Middletown-Newburgh Core-Based Statistical Area (CBSA). DEC recommended that this area be classified as "unclassifiable" since sufficient monitoring data was not available at the time to make an "attainment" designation recommendation.

On July 27, 2012, EPA extended the deadline for area designations for the 2010 primary SO₂ standard by approximately 1 year due to comments received on the approach for informing initial designations, and remaining uncertainties about the analytic approach states would use for designation determinations and for general implementation. With this extension, EPA intended to complete initial designations by June 3, 2013.

EPA responded to New York's June 1, 2011 designation request on February 6, 2013. At that time, EPA was only proceeding with designating as nonattainment areas in locations where existing monitoring data for 2009-2011 indicated violations of the 1-hour SO₂ standard (Round 1). Since EPA's review of the monitoring data for 2009-2011 showed no violations of the 2010 SO₂ NAAQS in any areas in New York State, EPA deferred action to designate any areas in New York.

² [NY 2011 SO₂ Designation Request](#)

Three lawsuits were filed against EPA alleging the Agency failed to designate areas by June 2013. On March 2, 2015 the U.S. District Court for the Northern District of California issued an enforceable order under which EPA must complete 1-hour SO₂ NAAQS designations for the remaining areas of the country in up to three additional rounds: the first additional round (Round 2) by July 2, 2016, the second additional round (Round 3) by December 31, 2017, and the final additional round (Round 4) by December 31, 2020.

1. For the designations to be completed by July 2, 2016 (Round 2), EPA designated areas in two groups:
 1. Areas that monitored violations of the 2010 SO₂ standard based on 2013 – 2015 air quality data.
 - i. No areas in New York State monitored violations of the 2010 SO₂ NAAQS based on 2013 – 2015 air quality data.
 2. Areas that contained any stationary source not announced for retirement that according to EPA’s Air Markets Database emitted in 2012 either (a) more than 16,000 tons of SO₂, or (b) more than 2,600 tons of SO₂ and had an average emission rate of at least 0.45 lbs. SO₂/million British Thermal Units (mmBtu).
 - i. On March 20, 2015, EPA notified DEC that two electric power plants in New York State (Huntley Generating Station, Erie County and Somerset Station, Niagara County) met the criteria for emitting more than 2,600 tons of SO₂ and having an emission rate of at least 0.45 lbs. SO₂/mmBtu in 2012 and had not announced (as of March 2, 2015) that they will be retired. DEC submitted a revised designation recommendation on September 18, 2015 that provided the technical analysis supporting an “attainment” designation for Cattaraugus, Erie, and Niagara Counties.³ EPA designated Erie and Niagara Counties as “attainment”⁴ and deferred designating Cattaraugus County.
2. For the designations to be completed by December 31, 2017 (Round 3), EPA addressed areas where states did not install and operate new SO₂ monitoring to inform final designations. On December 21, 2017, EPA designated Monroe County as “Unclassifiable” and the remainder of New York State (with the exception of Cayuga, Seneca, St. Lawrence, and Tompkins Counties) as “Attainment/Unclassifiable” pursuant to Round 3.⁵
3. For the designations to be completed by December 31, 2020 (Round 4), EPA will address areas where states did install and operate new SO₂ monitors to inform final designations. This includes Cayuga, Seneca, St. Lawrence, and Tompkins Counties in New York State.

³ [New York September 18, 2016 Revised Designation Recommendation](#)

⁴ [Air Quality Designations for the 2010 SO₂ NAAQS - Round 2](#)

⁵ [Air Quality Designations for the 2010 SO₂ NAAQS - Round 3](#)

4. On August 13, 2020, EPA notified Governor Cuomo of its intended designations for Cayuga, Seneca, St. Lawrence and Tompkins Counties. DEC's revised designation recommendation concurs with EPA's intended designation of "attainment/unclassifiable" for Cayuga, Seneca and Tompkins Counties. DEC concurs with the intended designation of "nonattainment" for a portion of St. Lawrence County; however, this revised designation recommendation includes a technical justification for a smaller boundary than the one intended to be proposed by EPA.

Identifying Attainment/Unclassifiable Areas

EPA may designate an area as attainment/unclassifiable in Round 4 if information indicates it meets the SO₂ NAAQS and does not contribute to a violation of the NAAQS in a nearby area based on the most recent three years (2017-2019) of ambient air quality monitoring data.

Determining Attainment Area Boundaries

An attainment area cannot contain any area that violates the NAAQS or contributes to a violation of the NAAQS in a nearby area. Once it has determined the boundaries for nonattainment and unclassifiable areas in Round 4, EPA intends to designate the remainder of the undesignated areas as attainment/unclassifiable.

Identifying Nonattainment Areas

Section 107(d)(1)(A)(i) of the CAA defines an area as “nonattainment” if it is violating the NAAQS or if it is contributing to a violation of the NAAQS in a nearby area. EPA may consider, on a case-by-case basis, a designation other than nonattainment for areas where a source-oriented monitor has a design value above the NAAQS in two situations. The first situation is where the source in question has recently become subject to and is complying with a federally enforceable SO₂ emission limits and modeling with those limits shows attainment of the 2010 SO₂ NAAQS, but the monitored design value does not yet account for these recent emissions reductions. The second situation is where the source in question has permanently, and in a manner that is enforceable, ceased operations prior to the area designation.

Neither of the two situations described above apply to any sources included in this revised designation recommendation.

Determining Nonattainment Area Boundaries

Ambient SO₂ is a pollutant that arises from direct emissions, and SO₂ concentrations are generally expected to be highest relatively close to the source(s) and lower at further distances due to dispersion. Accordingly, EPA expects to consider county boundaries as the analytical starting point for determining SO₂ nonattainment areas.

EPA recommends that states base their updated boundary recommendations on an evaluation of five factors:

1. air quality data or dispersion modeling results;
2. emissions-related data;
3. meteorology;
4. geography and topography; and
5. jurisdictional boundaries

For defining partial county boundaries, EPA recommends the use of well-defined jurisdictional lines such as township borders or other well-established geopolitical boundaries, and immovable landmarks such as major roadways or other permanent and readily identifiable physical features.

Five-Factor Analysis for New York's Updated Boundary Recommendations

Factor 1a: Evaluation of Ambient Air Quality Data

All available information indicates that Cayuga, Seneca, and Tompkins Counties attain the 1-hour SO₂ NAAQS and do not contribute to a violation in a nearby area based on the most recent three years (2017-2019) of ambient air quality monitoring data. Cayuga Operating Company LLC, the reason for which these three counties are included in Round 4 designations, officially retired its two coal-fired electric generating units on June 4, 2020.

All available information indicates that a small portion of St. Lawrence County around Alcoa USA Corporation does not attain the 1-hour SO₂ NAAQS based on the most recent three years (2017-2019) of ambient air quality monitoring data. The 2019 design value of 86 parts per billion (ppb) exceeds the NAAQS level of 75 ppb.

Monitoring near Cayuga Operating Company LLC

DEC chose to characterize the air quality surrounding Cayuga Operating Company LLC by installing ambient air quality monitors at two sites near the facility. The federal SO₂ Data Requirements Rule (DRR) classifies these source-oriented sites as “State and Local Air Monitoring Stations” (SLAMS) and requires that the monitors be operated in a SLAMS-like manner subject to the requirements of 40 CFR part 58 regarding data reporting and certification; and also subject to the requirements of 40 CFR Appendices A, C, and E.

These two monitoring site locations were determined from an analysis of the spatial distribution of the maximum modeled 1-hour SO₂ concentrations in the area near the facility. The locations are specified by red crosses in Figure 1:

Figure 1: SO₂ Monitoring Sites for Cayuga Operating Company LLC



Monitoring near Alcoa USA Corporation

DEC chose to characterize the air quality surrounding Alcoa USA Corporation by installing ambient air quality monitors at two sites near the facility. As noted above, the federal SO₂ DRR classifies these source-oriented sites as SLAMS and requires that the monitors be operated in a SLAMS-like manner subject to the requirements of 40 CFR part 58 regarding data reporting and certification; and also subject to the requirements of 40 CFR Appendices A, C, and E.

These two monitoring site locations were determined from an analysis of the spatial distribution of the maximum modeled 1-hour SO₂ concentrations in the area near the facility. The locations are specified by X's on the map in Figure 2.

Figure 2: SO₂ Monitoring Sites for Alcoa USA Corporation



SO₂ Design Values

The 2010 primary SO₂ NAAQS is set at a level of 75 ppb. The Alcoa West monitor in St. Lawrence County is the only monitor evaluated in Round 4 that exceeds the 2010 primary SO₂ NAAQS.

Table 1: SO₂ Design Values for Monitors sited near Cayuga Operating Company LLC and Alcoa USA Corporation (NAAQS = 75 ppb)

County	Monitor	SO ₂ Design Value (ppb) 2019
Seneca	Cayuga West	2
Tompkins	Cayuga East	33
St. Lawrence	Alcoa West	86
St. Lawrence	Alcoa East	43

Source: EPA AQS Design Value Report generated July 1, 2019

Adjacent Areas

DEC evaluated ambient air quality monitoring data and SO₂ design value data for the areas near Cayuga Operating Company LLC and Alcoa USA Corporation. No nearby areas currently monitor nonattainment or have been officially designated nonattainment, including the St. Regis Mohawk Reservation near Alcoa. The St. Regis Mohawk Reservation is bordered by the New York towns of Fort Covington (east), Bombay (south), Brasher (southwest), and Massena (west), and by the Akwesasne Indian Reserve to the north in the Canadian provinces of Quebec and Ontario.

Factor 1b: Evaluation of Dispersion Modeling Results

DEC did not conduct a modeling analysis for Cayuga, Seneca, and Tompkins Counties for this attainment recommendation because all available information indicates that the three counties attain the 1-hour SO₂ NAAQS and do not contribute to a violation in any nearby area based on the most recent three years (2017-2019) of ambient air quality monitoring data.

DEC recommends that a small portion of St. Lawrence County be designated non-attainment for the 1-hour SO₂ NAAQS because air quality monitoring around the Alcoa USA Corporation indicates nonattainment. DEC conducted air quality modeling around Alcoa USA Corporation to determine a recommended nonattainment boundary. The air dispersion modeling methodology that DEC used was based on policies and procedures contained in EPA's "Guideline on Air Quality Models" (40 CFR Part 51, Appendix W) and DEC's recommended dispersion modeling procedures for conducting ambient impact analyses as detailed in "DAR-10 / NYSDEC Guidelines on Dispersion Modeling Procedures for Air Quality Impact Analysis."

A detailed technical modeling analysis that supports a designation of nonattainment for a small portion of St. Lawrence County for the 2010 SO₂ NAAQS is included in this revised designation recommendation in Appendix A.

Factor 2: Evaluation of Emissions Data

All available information indicates that Cayuga, Seneca, and Tompkins Counties attain the 1-hour SO₂ NAAQS and no facilities within those counties contribute to a violation in a nearby area based on the most recent three years (2017-2019) of ambient air quality monitoring and emissions data from all facilities. Cayuga Operating Company LLC, the reason for which these three counties are included in Round 4 designations, ceased operations in 2019.

DEC considered emissions data for Alcoa USA Corporation and all other facilities in St. Lawrence County and included it in the modeling analysis used to recommend the nonattainment boundary.

Emissions Data

Emissions data for Cayuga Operating Company LLC and Alcoa USA Corporation are presented in Table 2a.

Table 2a: SO₂ Emissions from Cayuga Operating Company LLC and Alcoa USA Corporation (tons)

Facility	County	2017	2018	2019
Cayuga Operating Company LLC	Tompkins	506	769	345
Alcoa USA Corporation	St. Lawrence	2406	2406	2437

Source: NYSDEC AFS Emission Inventory

Emissions data from other sources in Cayuga, Seneca, St. Lawrence, and Tompkins Counties are presented in Table 2b.

Table 2b: SO₂ Emissions from Other Facilities in Cayuga, Seneca, St. Lawrence, and Tompkins Counties (tons)

Facility	County	2017	2018	2019
Owens-Brockway Glass	Cayuga	145	143	128
Nucor Steel Auburn Inc	Cayuga	23	28	35
Seneca Energy LFGTE	Seneca	48	44	42
Seneca Meadows SWMF	Seneca	22	33	40
Ogdensburg Energy Facility	St. Lawrence	0.04	0.05	0.05
Corning Incorporated	St. Lawrence	0.28	0.22	0.17
Arconic Massena Operations	St. Lawrence	0.06	0.10	0.05
Massena Energy Facility	St. Lawrence	0.02	0.01	0.01
Cornell University	Tompkins	8	9	9
Borger Station	Tompkins	0.37	0.49	0.45

Source: NYSDEC AFS Emission Inventory

Factors 3 and 4: Meteorology, Geography and Topography

DEC considered meteorological data, geography and topography in the modeling analysis (see Appendix A) for determining the nonattainment boundary in St. Lawrence County. DEC did not consider these factors for Cayuga, Seneca, and Tompkins Counties because all available information indicates those counties meet the 1-hour SO₂ NAAQS based on the most recent three years (2017-2019) of ambient air quality monitoring data.

Factor 5: Jurisdictional Boundaries

Pursuant to their September 5, 2019 guidance, EPA intends to consider existing jurisdictional boundaries (e.g. counties, townships, air districts, pre-existing nonattainment areas, reservations, metropolitan planning organizations) for the purposes of providing a clearly defined legal boundary in the final designations for the 1-hour SO₂ NAAQS.

DEC used existing jurisdictional boundaries to define the recommended nonattainment area in St. Lawrence County attainment area.

Designation Recommendation

In consideration of all available information and data, there are no changes to DEC’s 2011 designation recommendation of “attainment” for Cayuga, Seneca, and Tompkins Counties in this revised designation recommendation for 2020.

Table 3: 2020 Designation Recommendations for Cayuga, Seneca, St. Lawrence, and Tompkins Counties

County	2011 Designation Recommendation	2020 Designation Recommendation
Cayuga	Attainment	Attainment
Seneca	Attainment	Attainment
St. Lawrence (Entire)	Attainment	N/A
St. Lawrence (Partial*)	N/A	Nonattainment*
Tompkins	Attainment	Attainment

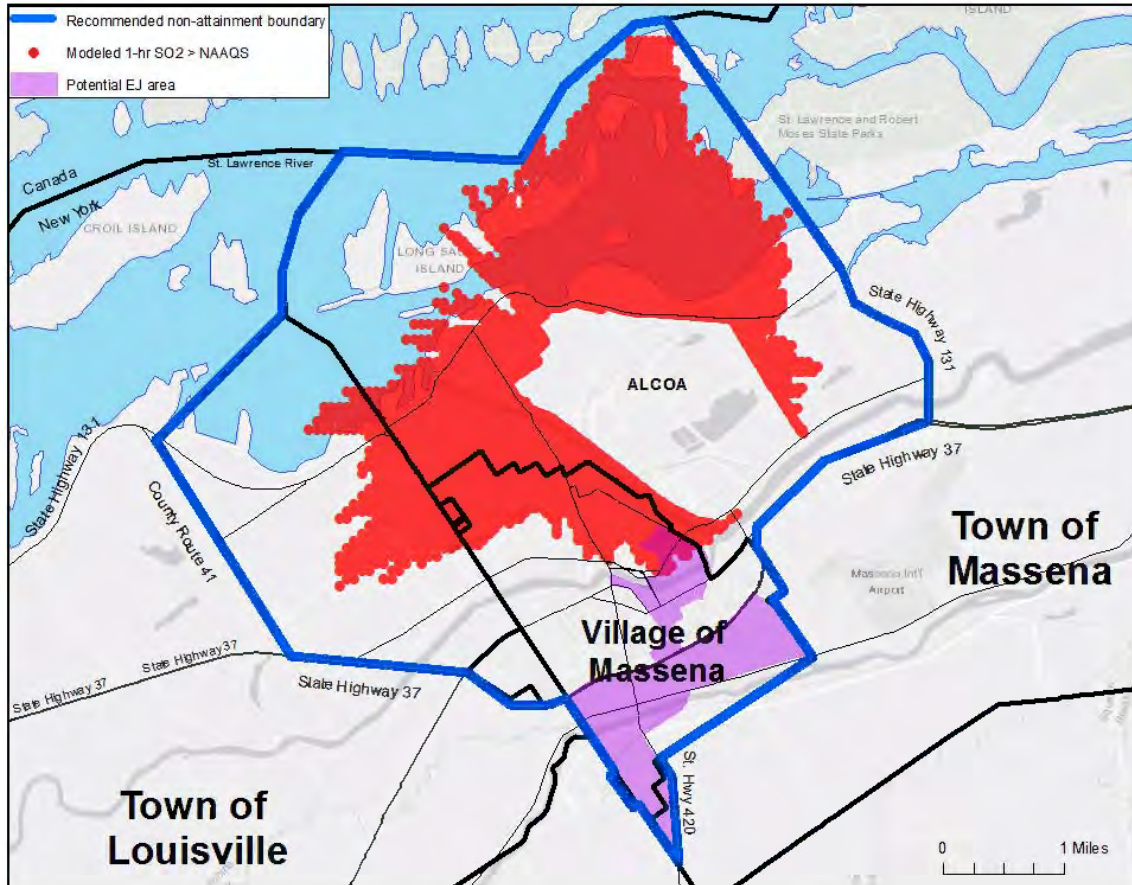
* See detailed partial nonattainment area designation recommendation below.

In consideration of all available information, data and modeling analyses, DEC recommends a revised designation recommendation of “nonattainment” for St. Lawrence County inside the following boundary surrounding Alcoa USA Corporation (See Figure 3):

1. The partial Town of Massena bordered by:
 - a. State Highway 37 to the south,
 - b. State Highway 131 to the east, extending north-northwest from the point where State Highway 131 turns west in a straight line (including the westernmost non-roadway portion of Robert Moses State Park) to the town border to the north (US/Canada border),
 - c. the town border to the north (US/Canada border), and
 - d. the town border to the west; and,
2. The partial Town of Massena bordered by:
 - a. the Village of Massena to the north,
 - b. State Highway 420 to the east and south, and
 - c. the town border to the west; and,
3. The entire Village of Massena; and,
4. The partial Town of Louisville bordered by:
 - a. State Highway 37 to the south,
 - b. County Route 41 to the west extending northeast in a straight line to the town border in the St. Lawrence River from the point where County Route 41 intersects with State Highway 131, and
 - c. the town border to the east.

DEC recommends a designation of “attainment” for the rest of St. Lawrence County.

Figure 3: Recommended Nonattainment Area Boundary



Appendix A: SO₂ NAAQS Designations Modeling Report

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AIR QUALITY MODELING REPORT FOR ALCOA USA CORPORATION

MASSENA, NEW YORK

Prepared by:
Impact Assessment and Meteorology Section

July 2020

DIVISION OF AIR RESOURCES
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Introduction

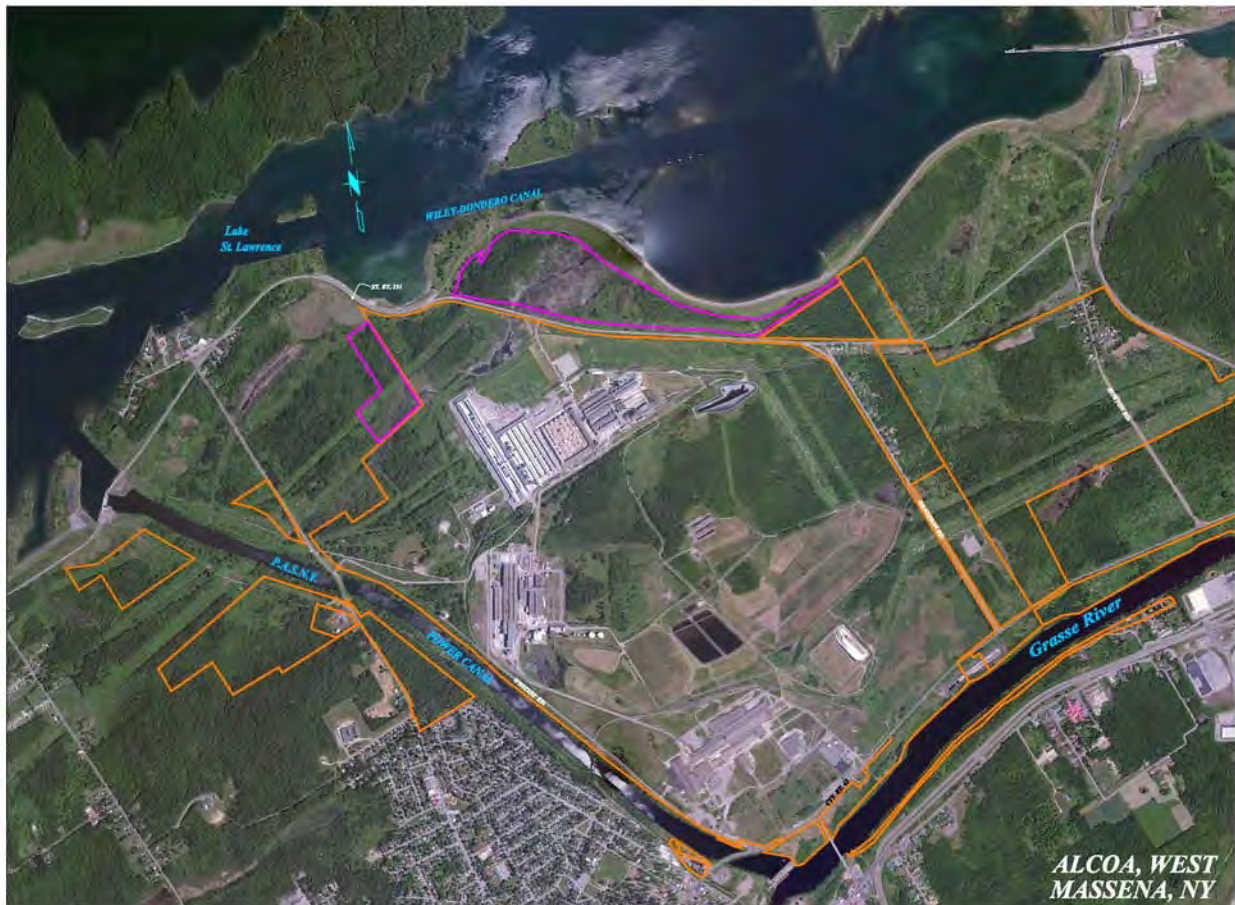
The purpose of this document is to present the results of an air quality dispersion modeling analysis of the area surrounding the Alcoa USA Corporation (Alcoa Massena Operations, or Alcoa) in Massena, New York. This Alcoa facility had been identified by the United States Environmental Protection Agency (EPA) as a large sulfur dioxide SO₂ emission source which emitted more than a threshold value of 2,000 tons of SO₂ per year. The Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide Primary National Ambient Air Quality Standard (NAAQS) (80 FR 51052) required that the New York State Department of Environmental Conservation (NYSDEC) provide data to characterize the 1-hour ambient air concentration of SO₂ in areas near known large SO₂ sources. NYSDEC chose to characterize the air quality surrounding the Alcoa facility by installing ambient air quality monitors at two sites near the facility. The locations of these two monitoring sites, Alcoa East and Alcoa West, were determined from an analysis of the spatial distribution of the maximum modeled 1-hour SO₂ concentrations in the area near the facility.

The air quality dispersion modeling methodology used in this analysis followed policies and procedures contained in the EPA Guideline on Air Quality Models (40 CFR Appendix W) and the NYSDEC's Air Quality Modeling Procedures outlined in DAR-10 / NYSDEC Guidelines on Dispersion Modeling Procedures for Air Quality Impact Analysis.

Facility Description

Alcoa is located in the town of Massena along the St. Lawrence River, approximately 3 km north of the village of Massena, St. Lawrence County, New York. Figure 1 below shows an aerial image of the area surrounding Alcoa, with the facility owned property outlined in orange. Alcoa operates an integrated aluminum smelting and fabricating facility. The SO₂ emissions sources at Alcoa consist of 36 potline reactor stacks, two roof vents, and an anode bake furnace. The 36 potline reactor stacks are divided into three distinct groups, each composed of 12 stacks. They are designated as Reactor Stack Group A, Reactor Stack Group B and Reactor Stack Group C. For modeling purposes, the 12 stacks in each Reactor Stack Group were further defined as having 6 eastern and 6 western stacks.

Figure 1: Aerial Photograph of Alcoa Massena Operations



(image courtesy of J. Parent)

NYSDEC consulted with Alcoa and their consultants, AECOM, to determine the exact stack configuration for each hour in the 3-year SO₂ emissions dataset. All 36 stacks in the three Reactor Groups did not operate simultaneously between 2017-2019. The 6 western stacks in Reactor Group C were physically capped between June 5, 2018 and November 20, 2019. During this time period, all SO₂ emissions from the potlines in Group C were emitted from the 6 eastern stacks in Reactor Group C. For both Reactor Stack Group B and Reactor Stack Group C, the 6 western stacks in each Group were physically capped between September 18, 2018 and November 20, 2019. For this 14-month time period, the potline emissions from Reactor Stack Groups B and C were emitted from their 6 respective eastern stacks. The stack parameters for Alcoa's SO₂ emission sources for both the uncapped and capped stack time periods are listed in Table 1. Each of the 36 reactor stacks are denoted by the initials RS followed by their Reactor Stack group number, either A, B or C.

Table 1: Source Parameters

Point Source	Easting(m)	Northing(m)	BaseElev(m)	StackHt(m)	StackTemp(K)	ExitVel-Uncap	ExitVel-Capped	StackDiam(m)
RS_A1	508104.376	4978592.715	66.76	21.64	369.2	10.374	-	1.22
RS_A2	508107.198	4978588.866	66.75	21.64	369.2	10.374	-	1.22
RS_A3	508111.047	4978581.681	66.68	21.64	369.2	10.374	-	1.22
RS_A4	508113.357	4978577.319	66.65	21.64	369.2	10.374	-	1.22
RS_A5	508117.462	4978571.417	66.62	21.64	369.2	10.374	-	1.22
RS_A6	508120.542	4978567.055	66.61	21.64	369.2	10.374	-	1.22
RS_A7	508109.764	4978596.051	66.72	21.64	369.2	10.374	20.748	1.22
RS_A8	508113.357	4978591.175	66.71	21.64	369.2	10.374	20.748	1.22
RS_A9	508116.436	4978584.760	66.68	21.64	369.2	10.374	20.748	1.22
RS_A10	508119.515	4978579.628	66.65	21.64	369.2	10.374	20.748	1.22
RS_A11	508124.391	4978573.983	66.61	21.64	369.2	10.374	20.748	1.22
RS_A12	508126.443	4978570.134	66.58	21.64	369.2	10.374	20.748	1.22
RS_B1	508171.477	4978490.785	66.18	21.64	369.2	10.374	-	1.22
RS_B2	508186.616	4978477.698	65.90	21.64	369.2	10.374	20.748	1.22
RS_B3	508191.492	4978472.053	65.79	21.64	369.2	10.374	20.748	1.22
RS_B4	508193.545	4978468.204	65.75	21.64	369.2	10.374	20.748	1.22
RS_B5	508174.300	4978486.936	66.13	21.64	369.2	10.374	-	1.22
RS_B6	508178.149	4978479.751	66.03	21.64	369.2	10.374	-	1.22
RS_B7	508180.458	4978475.389	65.98	21.64	369.2	10.374	-	1.22
RS_B8	508184.564	4978469.487	65.86	21.64	369.2	10.374	-	1.22
RS_B9	508187.643	4978465.125	65.80	21.64	369.2	10.374	-	1.22
RS_B10	508176.866	4978494.120	66.12	21.64	369.2	10.374	20.748	1.22
RS_B11	508180.458	4978489.245	66.04	21.64	369.2	10.374	20.748	1.22
RS_B12	508183.537	4978482.830	65.97	21.64	369.2	10.374	20.748	1.22
RS_C1	508270.970	4978328.245	63.78	21.64	369.2	10.374	-	1.22
RS_C2	508276.359	4978331.581	63.98	21.64	369.2	10.374	20.748	1.22
RS_C3	508279.951	4978326.706	63.95	21.64	369.2	10.374	20.748	1.22
RS_C4	508283.030	4978320.291	63.94	21.64	369.2	10.374	20.748	1.22
RS_C5	508286.110	4978315.159	63.99	21.64	369.2	10.374	20.748	1.22
RS_C6	508290.985	4978309.513	64.05	21.64	369.2	10.374	20.748	1.22
RS_C7	508293.038	4978305.664	64.11	21.64	369.2	10.374	20.748	1.22
RS_C8	508273.793	4978324.396	63.71	21.64	369.2	10.374	-	1.22
RS_C9	508277.642	4978317.211	63.76	21.64	369.2	10.374	-	1.22
RS_C10	508279.951	4978312.849	63.79	21.64	369.2	10.374	-	1.22
RS_C11	508284.057	4978306.947	63.98	21.64	369.2	10.374	-	1.22
RS_C12	508287.136	4978302.585	64.09	21.64	369.2	10.374	-	1.22
Bake Furnace	508939.700	4978791.700	65.62	32.00	357.4	15.993	-	2.134

Source Emission Rates

The source parameters and actual 2017-2019 SO₂ emissions for the facility were obtained from AECOM. Emissions from aluminum smelters are typically very steady due to the need for stable operating conditions. The SO₂ emission rates for the 36 potline stacks were derived from the actual monthly averaged SO₂ emission rates for each of the three years. These modeled SO₂ emission rates vary by month and are shown in Table 2. For the time periods when the 6 western reactor stacks in each Group were capped (as indicated in Facility Description section of this report), the modeled emission rate for each of the 6 eastern stacks was two times the emission rate indicated in Table 2. The actual monthly averaged SO₂ emission data for the anode bake furnace was used to generate short-term emission rates for input into the AERMOD model. The monthly varying emission rates for the anode bake furnace are shown in Table 3.

**Table 2: Monthly-Varying Modeled SO₂ Emission Rates (g/s)
Per Dry Potline Scrubber Stack**

Month	2017	2018	2019
January	1.841	1.850	1.882
February	1.938	1.915	1.918
March	1.841	1.882	1.858
April	1.924	1.808	1.934
May	1.932	1.845	1.746
June	1.861	1.767	1.887
July	1.881	1.871	1.969
August	1.787	1.740	1.962
September	1.819	1.929	1.972
October	1.849	1.900	1.852
November	1.759	1.850	1.799
December	1.793	1.904	1.857

**Table 3: Monthly-Varying Modeled SO₂ Emission Rates (g/s)
for the Anode Bake Furnace Stack**

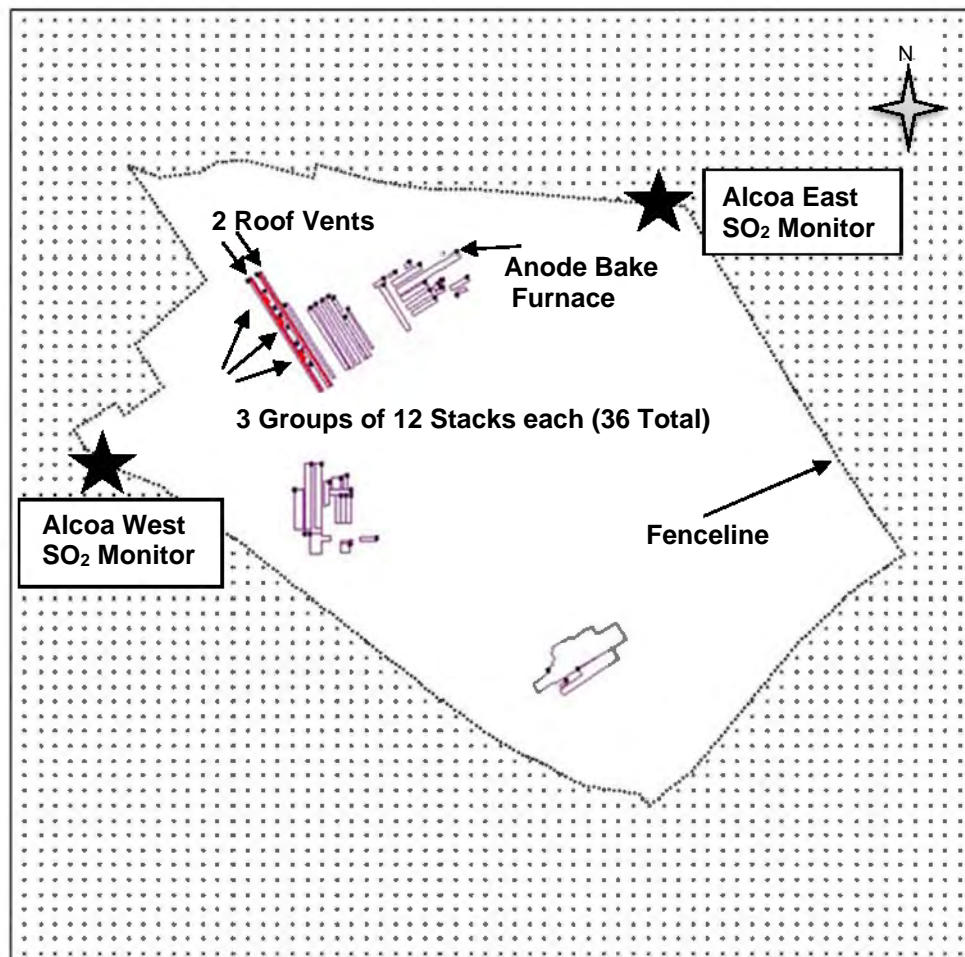
Month	2017	2018	2019
January	2.503	2.275	2.674
February	2.363	2.607	2.544
March	2.121	2.628	2.554
April	2.382	2.124	2.516
May	2.598	2.273	2.485
June	2.391	2.581	2.604
July	2.497	2.507	2.429
August	2.311	2.597	2.422
September	2.327	2.588	2.434
October	2.536	2.375	2.575
November	2.627	2.331	2.301
December	2.273	2.378	2.430

Emissions from the two roof vents were calculated by the facility as 1.6% of the total SO₂ potline emissions. In the 2016 NYSDEC modeling analysis performed to determine the locations of the two SO₂ monitors, Alcoa East and Alcoa West, NYSDEC used the Buoyant Line and Point source (BLP) option to model the two roof vents. After evaluating 3 years of actual hourly SO₂ data from these two monitors, it was apparent that the BLP option had overpredicted the SO₂ impacts from the facility. Therefore, for current modeling purposes, the estimated SO₂ roof vent emissions were added to the emissions for the dry scrubber stacks.

Buildings and Fenceline

The locations of buildings on the Alcoa property are shown in blue in Figure 2. The fenceline used in the modeling analysis was confirmed on a site visit by NYSDEC personnel, as well as by visually analyzing a Google Earth satellite image of the facility. The locations of the Alcoa East (ID:36-0890005) and Alcoa West (ID:36-0890004) SO₂ monitors are denoted by a star in Figure 2.

Figure 2: Locations of Emission Sources, Buildings, Fenceline and Ambient Air Quality Monitors



Regional Background SO₂ Data

There are two SO₂ monitors adjacent to the facility. The Alcoa West monitor is located southwest of the facility and the Alcoa East monitor is located to the northeast of the facility. The predominant wind directions in the Massena area are from the southwest and the northeast, as indicated on the wind rose in Figure 3. Since there are no other major SO₂ sources in this region, these two monitors accurately represent the SO₂ concentrations in the area surrounding the facility. The hourly SO₂ data from both monitors were examined and it was apparent that the SO₂ plume emitted from Alcoa impacted only one monitor at a time depending on the wind direction. To avoid double-counting of Alcoa's SO₂ impact and to determine a representative regional background SO₂ value, hourly concentrations at the Alcoa West and Alcoa East monitors were compared. It was determined that, for each hour, the lower of the two monitor's concentrations would be used to represent the regional hourly background SO₂. After determining the representative regional SO₂ dataset, the Seasonal Hour-of-Day background design value was calculated, following guidance found in the March 1, 2011 EPA Memo "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO₂ National Ambient Air Quality Standard" and in the August 2016 EPA document "SO₂ NAAQS Designations Modeling Technical Assistance Document". Table 4 shows the Seasonal Hour-of-Day design values used in the modeling analysis.

Table 4: SO₂ Design Values (µg/m³) by Season and Hour-of-Day

Hour	Winter	Spring	Summer	Fall
1	7.432	2.611	1.904	2.655
2	7.091	3.354	2.332	2.952
3	6.498	2.777	2.899	2.716
4	5.703	3.554	5.380	3.083
5	5.616	2.742	2.891	2.672
6	6.375	4.602	4.105	2.803
7	9.484	3.991	4.664	2.838
8	6.506	6.305	7.074	3.039
9	7.048	8.070	5.886	3.362
10	6.760	7.921	10.48	5.118
11	7.109	6.253	7.397	9.511
12	9.249	6.209	8.908	6.157
13	10.139	5.144	9.790	7.022
14	11.170	4.166	9.511	9.100
15	8.559	4.393	11.519	6.585
16	8.340	4.987	7.493	4.515
17	6.917	4.934	8.594	3.834
18	7.633	4.725	6.358	4.236
19	6.105	3.563	7.450	4.288
20	8.183	2.821	3.266	3.458
21	5.345	2.830	2.175	2.349
22	6.209	3.624	4.576	2.402
23	7.135	2.943	6.524	2.672
24	7.100	3.450	2.253	2.768

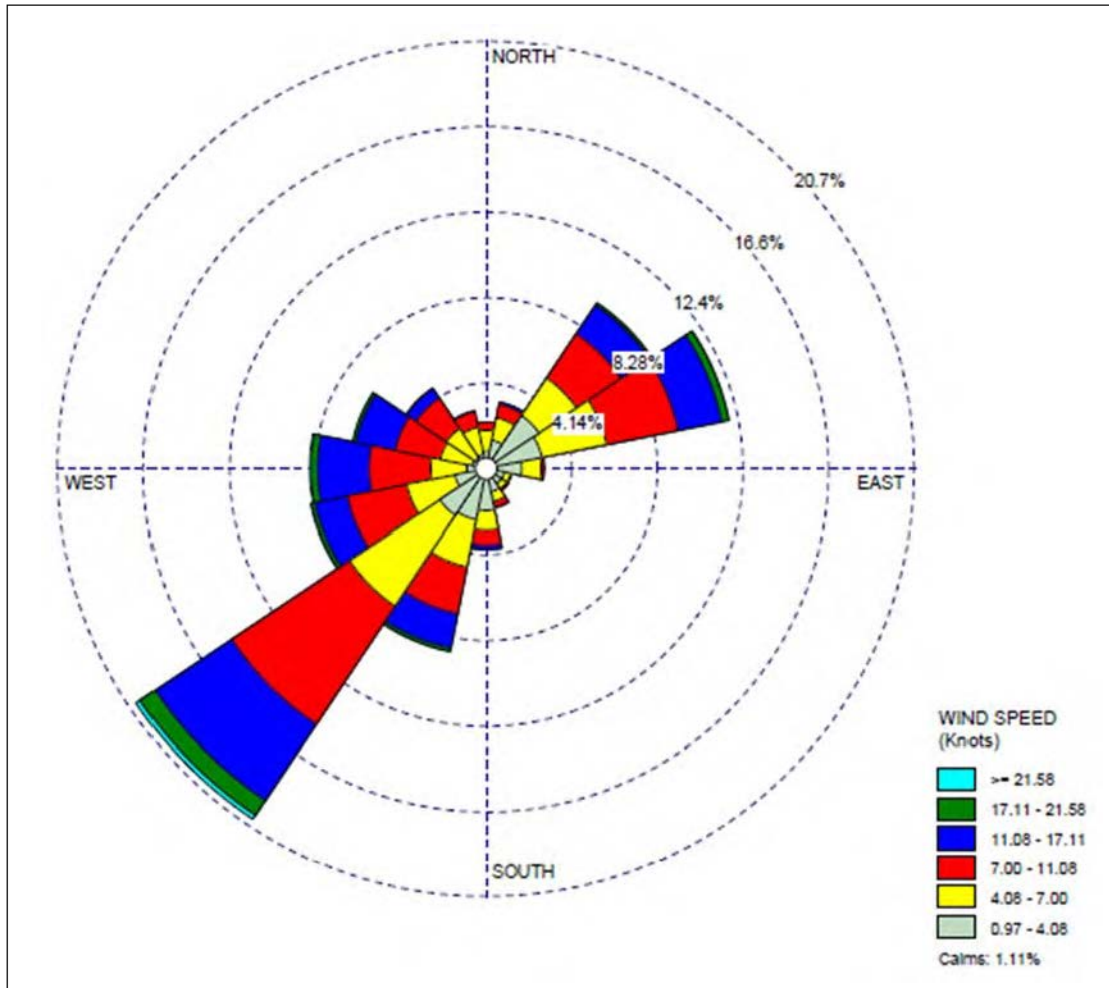
Air Dispersion Modeling Analysis

For this modeling analysis, hourly emissions data obtained from the facility were matched with 3 years of concurrent surface and upper-air meteorological data to run AERMOD version 19191.

Meteorological Data

The Massena Airport (KMSS) was chosen as the most representative surface meteorological site and is located approximately 2 miles to the south of the SO₂ emission sources at Alcoa. Using AERMET version 19191, the 2017-2019 surface meteorological data from Massena was paired with the upper-air meteorological data from the Albany International Airport (KALB). One-minute wind data, recorded by the ASOS instrument at the Massena Airport, was processed using the AERMINUTE (version 15272) pre-processor. For the Massena area, the ADJ_U* option was selected in AERMET which adjusts the surface friction velocity under low wind and stable atmospheric conditions. Figure 3 shows a wind rose for the 3 years of meteorological data processed at the Massena Airport.

Figure 3: Wind Rose for the Massena Airport, 2017-2019



Land use within a 1 km radius of the meteorological tower at the Massena Airport was evaluated using the AERSURFACE pre-processor (version 20060). The 2016 land cover data from the National Land Cover Data set (NLCD) was supplemented with the 2016 Tree Canopy and 2016 Impervious Surface data to determine three key surface parameters needed for modeling: surface roughness, albedo, and the Bowen ratio. For this modeling analysis, the 1-km circular area centered at the meteorological station site was divided into 12 equal 30-degree sectors. The sector located between 240-270 degrees relative to due north was identified as a non-airport sector for the purpose of calculating the appropriate sector-averaged surface roughness length. For the Bowen ratio calculations, the land use values can be linked to three categories of surface moisture corresponding to average, wet, and dry conditions – depending on the site and meteorological data period. For this site and data period, the “average” surface moisture option was applied. The AERSURFACE results were used as input into the AERMET meteorological data processor.

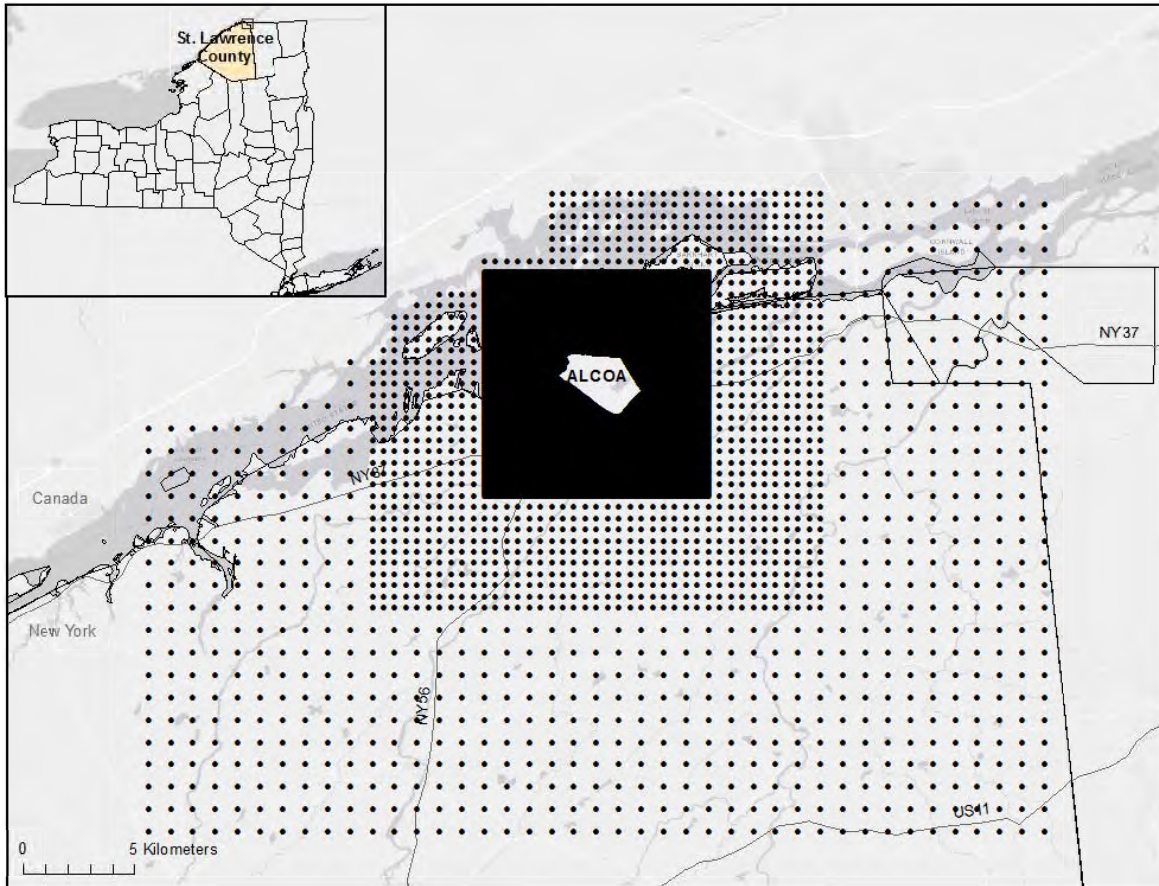
Receptor Grid

A Cartesian receptor grid, extending out 20 km from the center of the Alcoa facility, was used in the dispersion modeling to determine the location of the maximum 1-hour SO₂ impacts. Most receptors located beyond the border of the United States were eliminated from this modeling analysis. The receptor grid consisted of the following receptor spacing:

- 25 m spacing along the fenceline
- 70 m spacing extending from the facility center to 2.5 km
- 100 m spacing extending from 2.5 km to 5 km
- 500 m spacing extending from 5 km to 10 km
- 1000 m spacing extending from 10 km to 20 km

The receptor grid consisted of 13593 receptors. The base elevation and hill scale parameters for all receptors were assigned using AERMAP (version 18081) based on 1-arcsecond elevation data obtained from EPA. The receptor grid used in the modeling analysis is shown in Figure 4 below.

Figure 4: Receptor Grid Used in the Modeling Analysis



Modeling Methodology

The air quality modeling analysis was performed using regulatory default AERMOD options. This was done to ensure that all pertinent local meteorological conditions and operational scenarios were accounted for in determining the spatial distribution of the maximum 1-hour SO₂ concentrations surrounding the Alcoa facility.

Since aluminum smelters operate at a very high temperature, the area surrounding these types of facilities is often considered an urban heat island for modeling purposes. For this particular Alcoa facility in Massena, it was determined that the facility's power consumption, as well as the temperature differential between the facility and the surrounding area, were not sufficiently large enough for NYSDEC to reasonably classify this area as urban. Therefore, to be conservative, this facility was modeled as rural.

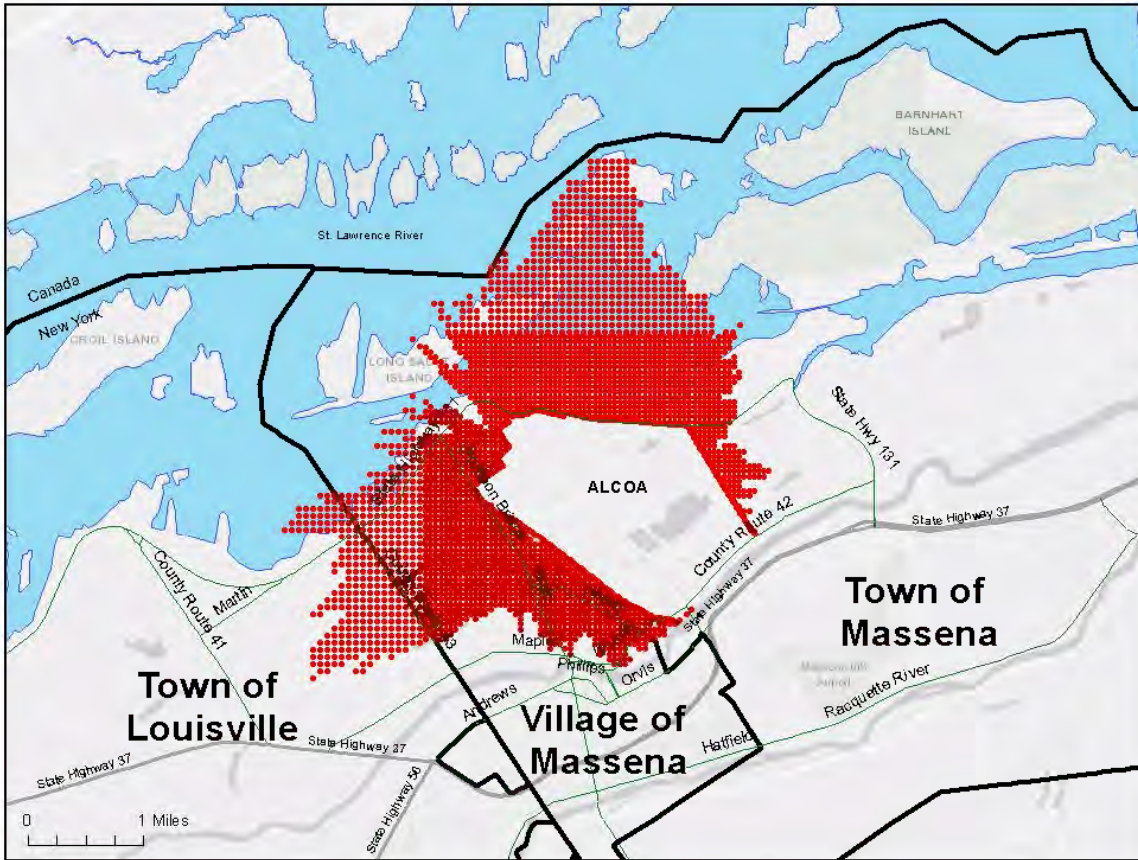
After discussions with the facility and AECOM, NYSDEC acknowledges that fugitive heat releases from aluminum smelters can be large and do contribute to plume merging from the potline stacks. These fugitive heat losses oftentimes offset the building downwash effects. AECOM provided an analysis comparing the 2017-2019 hourly SO₂ data measured at the Alcoa East and Alcoa West monitors to the modeled Alcoa impacts with and without downwash. Results showed that incorporating downwash using the rural classification resulted in modeled design values that were 7 to 12 times higher than the actual monitored design values. After a review of this analysis, it was determined that downwash would not be considered due to the enhanced plume liftoff generated by the high temperature of the effluent.

Modeling Results

The maximum 1-hour SO₂ impacts were calculated using the 3-year average of the 99th percentile of daily 1-hour maximum SO₂ concentrations and the regional background SO₂ concentrations. The areas showing the highest 1-hour SO₂ concentrations were located along the northern and northwestern portions of Alcoa's property.

Figure 5 shows the spatial distribution of the modeled 1-hour SO₂ impacts which exceeded the NAAQS of 196 µg/m³. The maximum modeled 1-hour SO₂ impact of 326.6 µg/m³ occurred just north of the Alcoa facility. The 1-hour SO₂ concentrations decrease rapidly with distance from the fenceline, which is consistent with the modeling results for other aluminum smelters in the United States. For comparison, the highest 1-hour SO₂ concentration measured between 2017-2019 at the Alcoa East monitor was 202.1 µg/m³ and 265.4 µg/m³ at the Alcoa West monitor. Based on the relative agreement between the monitor data and modeled maximum 1-hour SO₂ impacts, NYSDEC determined that the selected modeling approach appropriately represents the area where potential 1-hour SO₂ exceedances may occur.

Figure 5: Spatial Distribution of the Modeled 1-hour SO₂ Impacts Exceeding the NAAQS



The input and output modeling files, meteorological data, terrain data, regional background SO₂ data and hourly emission rate file used in this modeling analysis can be found on the USB drive attached to this report.