Draft 2010 Sulfur Dioxide Primary National Ambient Air Quality Standard
Wisconsin Designation Option - Technical Support Document

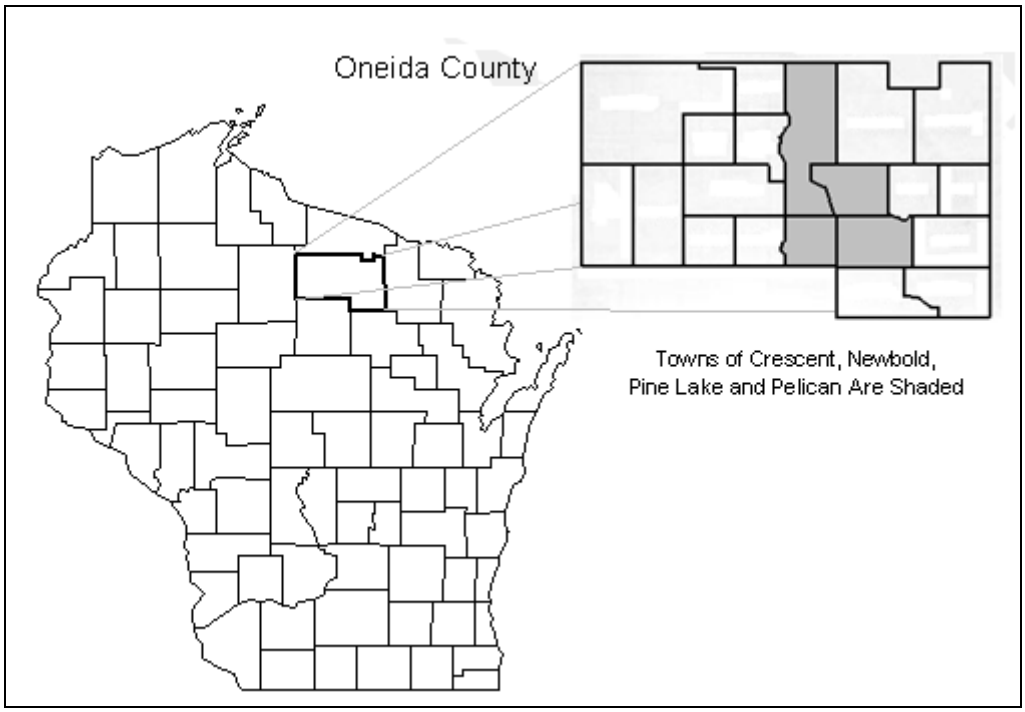
SUMMARY

The U.S. Environmental Protection Agency (EPA) strengthened the primary National Ambient Air Quality Standard (NAAQS) for sulfur dioxide (SO_2) on June 2, 2010 [*75 FR 35520*]. The U.S. EPA is replacing the current 24-hour and annual standard with a new 1-hour standard of 75 parts per billion (ppb). Section 107(d)(1)(A) of the Clean Air Act (CAA) requires Governors of each state to provide area designation recommendations (e.g., attainment, nonattainment or unclassifiable) based on the 2010 SO_2 NAAQS to the U.S. EPA no later than June 2, 2011.

The Wisconsin Department of Natural Resources (WDNR) has developed the following SO_2 area designation option for public comment and input prior to submitting the document for the Governor's consideration:

Option # 1:

- **Nonattainment** for a portion of Oneida County, including the City of Rhinelander and the Towns of Crescent, Newbold, Pine Lake and Pelican and **unclassifiable** for the remainder of Oneida County and all other Wisconsin counties.



BACKGROUND

The CAA requires the U.S. EPA to set the NAAQS for criteria pollutants. Currently, sulfur oxides (SO_x) and five other major pollutants are considered criteria pollutants. The others are ozone, lead, carbon monoxide, nitrogen oxides and particulate matter. The CAA also requires the U.S. EPA to review the criteria pollutant standards every five years and, if appropriate, revise the standards to ensure that they provide requisite health and environmental protection.

SO_2 is used by the U.S. EPA as the indicator pollutant for SO_x. The largest sources of SO_2 emissions nationally are from fossil fuel combustion at power plants (73%) and other industrial facilities (20%). Smaller sources of SO_2 emissions include industrial processes, such as extracting metal from ore, and the burning of high–sulfur fuels by locomotives, large ships and non-road equipment. SO_2 is linked with a number of adverse effects on the respiratory system.

The U.S. EPA first set the NAAQS for SO_2 in 1971. The U.S. EPA set a 24-hour primary standard at 140 ppb and an annual average standard at 30 ppb to protect health. The U.S. EPA also set a 3-hour average secondary standard at 500 ppb to protect public welfare.

The last review of the SO_2 NAAQS was completed in 1996 and the U.S. EPA chose not to revise the NAAQS at that time. The U.S. EPA also considered, but did not promulgate, a 5-minute SO_2 NAAQS to protect asthmatics at elevated ventilation rates from bronchoconstriction and other respiratory symptoms associated with 5-10 minute peak concentrations of SO_2.

The decision not to set a 5-minute standard in 1996 was challenged successfully by the American Lung Association (ALA) and remanded back to the U.S. EPA in 1998. No formal action with regard to the remand has been taken until this final rule. Under a judicial consent decree, the U.S. EPA completed this review of the primary SO_2 standard on June 2, 2010. The current review focuses only on the primary SO_2 standard. The U.S. EPA is addressing the secondary standard for SO_2 as part of a separate review.

SO_2 AND PUBLIC HEALTH

Current scientific evidence links health effects with short-term exposure to SO_2 ranging from 5-minutes to 24-hours. Adverse respiratory effects include narrowing of the airways which can cause difficulty breathing (bronchoconstriction) and increased asthma symptoms. These effects are particularly important for asthmatics during periods of faster or deeper breathing (e.g., while exercising or playing).

Studies also show an association between short-term SO_2 exposure and increased visits to emergency departments and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly and asthmatics.

Emissions that lead to high concentrations of SO_2 generally also lead to the formation of other SO_x. Control measures that reduce SO_2 can generally be expected to reduce people's exposure to all gaseous SO_x. Reducing SO_2 emissions is expected to have the important co-benefit of reducing the formation of fine sulfate particles that pose significant public health threats. Specifically, these small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death.

The revised primary standard for SO_2 is consistent with the advice and recommendations of the U.S. EPA's principal independent science advisors on the NAAQS: the Clean Air Scientific Advisory Committee (CASAC).

SO_2 NAAQS COMPLIANCE

The U.S. EPA plans to use a combination of monitoring and modeling to assess compliance with the 1-hour SO_2 standard. This is a different approach than has been used for other pollutants. For sources or groups of sources that have the potential to cause or contribute to a violation of the standard, the U.S. EPA anticipates using refined source-oriented dispersion modeling to identify violations and determine compliance. Since the U.S. EPA had not released SO_2 modeling guidance before the development of this document, the WDNR has only done limited SO_2 dispersion modeling. The U.S. EPA has stated that the county boundary would be the presumptive nonattainment boundary.

The following is a summary of the U.S. EPA stated designation approach for SO_2:

- Any county that has monitoring data or refined modeling results showing a violation will be designated as nonattainment.

- Any county that has refined modeling results, plus monitoring where required, showing no violations will be designated as attainment.

- All other counties will initially be designated unclassifiable until required monitors are operational and refined modeling is completed.

Without the U.S. EPA modeling guidance and requisite operational monitors in place, the WDNR has limited options to provide to the Governor for SO_2 NAAQS recommendations.

NAAQS TIMELINE

- June 2, 2011: States submit designation recommendations
- June 1, 2012: U.S. EPA issues attainment/nonattainment/unclassifiable designations
- January 1, 2013: States have new SO_2 monitoring operational
- June 2, 2013: States submit CAA Section 110(a) State Implementation Plans
- February, 2014: States submit CAA Section 172(c) State Implementation Plans
- August, 2017: All areas are required to attain the SO_2 standard

SO_2 MONITORING

Wisconsin currently has five operational SO_2 monitors – Green Bay East High School, Horicon, Potawatomi, Milwaukee WDNR Southeast Regional Headquarters (SERHQ) and Rhinelander. The locations of these monitors are shown in Figure 1. Attainment is measured when the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour average SO_2 concentrations is below 75 ppb.

The following is a summary of 2007 – 2009 SO_2 design values:

- Rhinelander: 196.0 ppb
- Green Bay East High School: 74.0 ppb
- Horicon: 11.7 ppb
- Potawatomi: 8.3 ppb
- Milwaukee WDNR SERHQ: Not enough data available to calculate.

The U.S. EPA has also revised the ambient air monitoring requirements for SO_2. Monitors are required to be operational in the following Core Based Statistical Areas (CBSAs) by January 1, 2013:

- Chicago-Naperville-Joliet, IL, IN, WI: 3
- Green Bay, WI: 1
- Madison, WI: 1
- Milwaukee-Waukesha-West Allis, WI: 1
- Minneapolis-St. Paul-Bloomington, MN, WI: 2

SO_2 MODELING

As previously discussed, the WDNR has done very limited SO_2 modeling. However, a dispersion modeling analysis was completed to assess the impact of SO_2 emissions from Wausau Paper Mills, LLC., in Rhinelander (Oneida County). Detailed information from this modeling analysis is presented in Appendix 1. Wausau Paper Mills, LLC., is primarily the only major source of SO_2 in the county. Based on 2009 stationary source reported emissions, Wausau Paper Mills, LLC., accounted for 99.7% (2796.19 tons) of the reported SO_2 in Oneida County (2804.17 tons). The WDNR has record of four other stationary sources in Oneida County with documented SO_2 emissions in 2009 accounting for only 7.98 tons. Only one stationary source, the smallest (0.012 tons, 0.0004% of the county total emissions), is located outside of the recommended nonattainment area.

Wausau Paper Mills, LLC., is in close proximity to the air quality monitor which has measured very high concentrations of SO_2. The modeling results show that SO_2 concentrations are below the SO_2 standard within a 5 mile radius from Wausau Paper Mills, LLC., and support a nonattainment boundary smaller than the presumed county boundary.

DESIGNATION OPTION SUMMARY

Based on the information presented in this technical support document, the WDNR has developed the following SO_2 area designation option for the Governor's consideration:

Option # 1:

- **Nonattainment** for a portion of Oneida County, including the City of Rhinelander and the Towns of Crescent, Newbold, Pine Lake and Pelican and **unclassifiable** for the remainder of Oneida County and all other Wisconsin counties.

This option acknowledges the fact that SO_2 nonattainment is localized and modeling supports a smaller nonattainment boundary than the Oneida County boundary. All other counties are unclassifiable because no refined modeling has been completed to date.

Figure 1 – Current Wisconsin SO_2 Monitoring Network

Appendix 1: Air Dispersion Analysis for Wausau Paper – Rhinelander, WI (Oneida Co.)

A. INTRODUCTION

A dispersion modeling analysis was completed on February 5, 2011 to assess the impact to ambient air of sulfur dioxide (SO_2) emissions from Wausau Paper Mills, LLC., in Rhinelander (Oneida County). This analysis was performed in support of the technical support document for SO_2 attainment / nonattainment recommendations.

B. MODELING ANALYSIS

- Stack parameters used in this analysis were derived from historical dispersion modeling analyses combined with permit allowable emission rates. Building dimensions were determined using BPIP-PRIME with measurements taken on plot plans provided by Wausau Paper Mills – Rhinelander (WPMR). Please refer to the source parameter table for modeled values.

- The results from the preliminary modeling analysis were lower than the measured design value from the Rhinelander monitor. Since no other sources of SO_2 exist in the immediate area, the result from the modeling of WPMR should match the measured design value. Further sensitivity tests with other, distant sources, and with other meteorological data sets also had modeled impacts less than those monitored. Without having in-stack emission parameter monitoring, it is uncertain what stack conditions led to the high monitor values. Therefore, for this analysis the exit gas temperature and exit gas velocity were adjusted downward until the modeled concentration at the receptor nearest the Rhinelander monitor matched the measured design value.

- Five years (1998-2002) of preprocessed meteorological data was used in this analysis. The surface data was collected in Rhinelander (RHI), and the upper air meteorological data originated in Green Bay.

- The AERMIC (AMS/EPA Regulatory Model Improvement Committee) Model (AERMOD) was also used in the analysis. The model used rural dispersion coefficients with the regulatory default options. These allow for calm wind and missing data correction, buoyancy induced dispersion, and building downwash including recirculation cavity effects.

- U.S. EPA guidance specifies that the highest hourly measured SO_2 value be used for regional background. The monitoring data in Wisconsin from 1998-2009 was collected and examined to determine if any sites could serve as regional background for Rhinelander. SO_2 has generally been monitored near industrial facilities and most of the maximum hourly values are very high. Therefore, in this analysis all nearby sources of SO_2 will be explicitly modeled and a background value from a non-industrial monitoring location will be used. The Forest County Potawatomi Community operates a monitor that is ~45km from any major source of SO_2, and the maximum hourly value from 2007-2009 (39.2 $\mu g/m^3$) will serve as the hourly regional background concentration. Additional emissions of SO_2 will then be input to the model from Red Arrow Foods in Rhinelander and Packaging Corporation of America in Tomahawk.

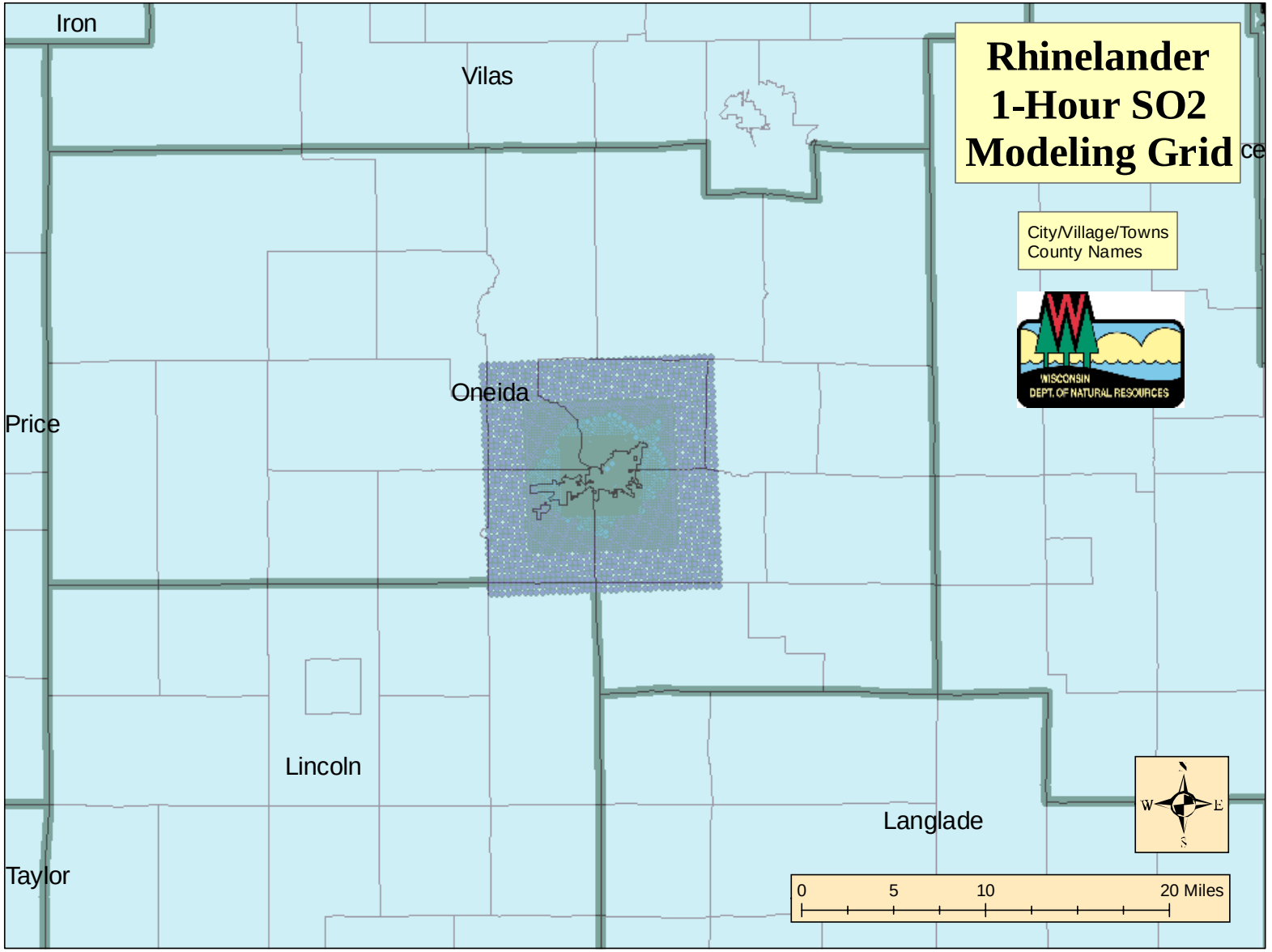
C. MODEL RESULTS

The overall goal of this analysis is to examine the geographic extent of the high SO_2 concentrations. While there may be some long-distance (greater than 100 km) transport of SO_2, it is expected that individual facilities are the primary culpable sources. Because of this, the area that experiences concentrations above the standard may be much less than the presumed county-wide nonattainment. The results from this dispersion modeling analysis were post-processed to produce the five-year average of the 99th percentile of the daily maximum concentration. This data was entered into a geographic information service (GIS) program to produce the images on the following pages. The results shown include the modeled impact plus the estimate of regional background concentration.

Note that the areal extent shown is defined by the maximum modeled design value concentration at each receptor. For any particular hour only a small subset of points is affected, and the locations of the affected points vary throughout the day and throughout the year.

WAUSAU PAPER MILLS - RHINELANDER
Emission Rates & Stack Parameters

Stack ID	LOCATION (UTM83)	HEIGHT (M)	DIAM (M)	VELOCITY (M/S)	TEMP (K)	SO_2 #/HR
S08	311338, 5056922	35.66	1.68	20.08	439.0	15.23
S09	311349, 5056895	63.09	2.13	5.00	345.0	1050.0
S11	311384, 5056829	60.96	3.35	3.00	400.0	471.5
Red Arrow Foods Rhinelander Sources						
S07	307577, 5055183	12.56	1.01	14.40	444.3	3.23
S10	307604, 5055176	15.54	1.07	13.20	366.5	3.23
PCA Tomahawk Sources						
S14	285952, 5036176	46.60	1.37	4.64	470.4	140.3
S15	285952, 5036203	60.70	3.23	16.50	468.0	2563.0


Rhinelander
1-Hour SO2
Modeling Grid
City/Village/Towns
County Names
WISCONSIN
DEPT. OF NATURAL RESOURCES
Iron
Vilas
Oneida
Price
Lincoln
Langlade
Taylor
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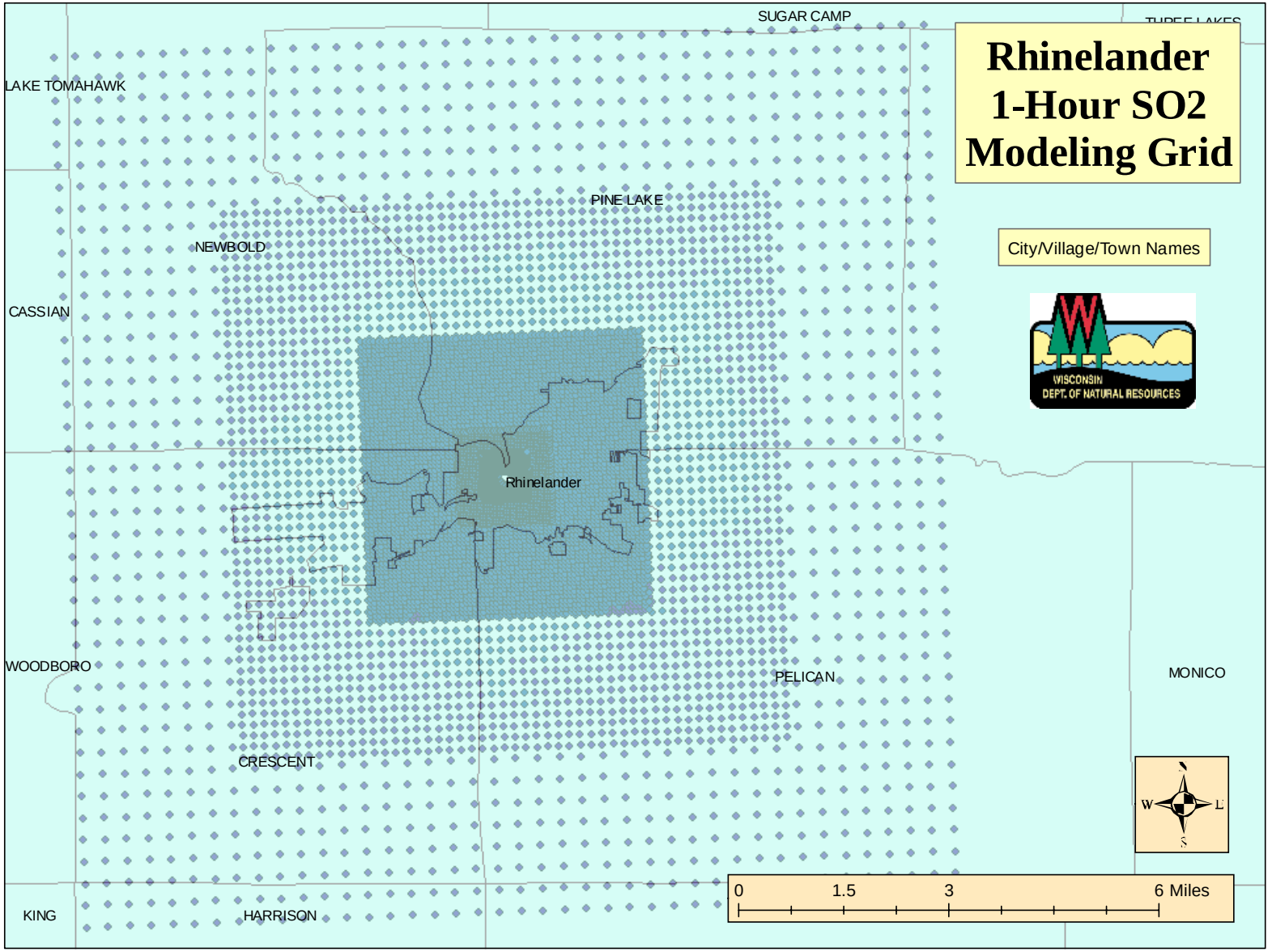
Wisconsin Department of Natural Resources



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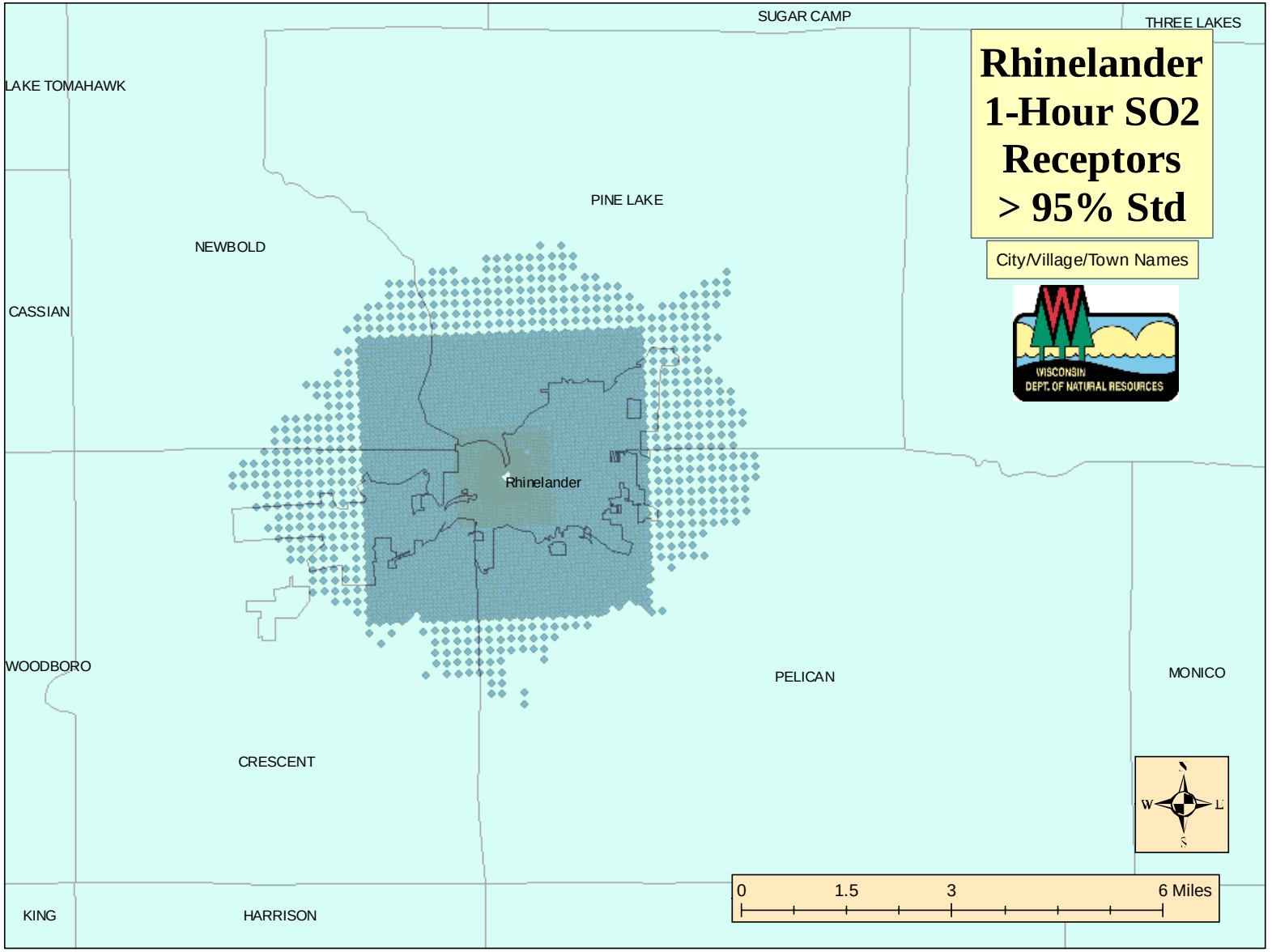

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