Draft 2010 Nitrogen Dioxide Primary National Ambient Air Quality Standard
Wisconsin Designation Options
Technical Support Document

Summary

The U.S. Environmental Protection Agency (EPA) strengthened the primary National Ambient Air Quality Standard (NAAQS) for nitrogen dioxide (NO_2) on January 22, 2010 (75 FR 6474). A new 1-hour NO_2 standard was set at a level of 100 parts per billion (ppb). Section 107(d)(1)(A) of the Clean Air Act (CAA) requires states to provide area attainment / nonattainment designation recommendations based on the 2010 NO_2 NAAQS to the U.S. EPA no later than January 22, 2011.

The Wisconsin Department of Natural Resources (WDNR) has developed the following three NO_2 area designation options for public comment and input prior to submitting the document for the Governor's consideration:

Option # 1: Unclassifiable for all Wisconsin counties.

Option # 2: Unclassifiable for the Madison-Baraboo Combined Statistical Area (CSA) (Columbia, Dane, Iowa and Sauk Counties), the Milwaukee-Racine-Waukesha CSA (Milwaukee, Ozaukee, Racine, Washington and Waukesha Counties), the Chicago-Naperville-Michigan City CSA (Kenosha County), the Minneapolis-St. Paul-St. Cloud CSA (Pierce and St. Croix Counties) and attainment for the remaining Wisconsin counties.

Option # 3: Attainment for all Wisconsin counties.

Background

Current scientific evidence links short-term NO_2 exposures, ranging from 30 minutes to 24 hours, with an array of adverse respiratory effects including increased asthma symptoms, more difficulty controlling asthma and an increase in respiratory illnesses and symptoms. Studies have also shown a connection between short-term exposure and increased visits to emergency facilities and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly and asthmatics.

NO_2 concentrations recorded at ambient air monitors near major roads are appreciably higher than those measured at other monitors throughout the country. Concentrations in heavy traffic or on freeways can be twice as high as levels measured in residential areas or near smaller roads. NO_2 monitoring studies indicate that near-road (within about 50 meters) concentrations of NO_2 can be 30 to 100 percent higher than concentrations away from major roads. To address this concern, the U.S. EPA is requiring new NO_2 monitors in major urban areas, including Madison and Milwaukee.

The U.S. EPA first established standards for NO_2 in 1971, setting both a primary and secondary standard at 53 ppb, averaged annually. All areas of the country are currently meeting this standard. The U.S. EPA had decided to retain the current annual average NO_2 standard, in addition to adding the new 1-hour NO_2 standard of 100 ppb.

NAAQS Timeline

States are required to make recommendations to the U.S. EPA for areas to be designated as attainment, nonattainment or unclassifiable by January 22, 2011. Final designations by the U.S. EPA will be effective no later than January 22, 2012. However, states are required to install NO_2 near-roadway monitors in major urban areas and have them operational by January 1, 2013. States will need an additional 3 years thereafter to collect air quality data in order to determine compliance with the 2010 NO_2 NAAQS. The U.S. EPA plans to redesignate areas originally classified as unclassifiable as either attainment or nonattainment in 2016 or 2017. States are required to meet the 2010 NO_2 NAAQS 5 years after the date of the U.S. EPA's nonattainment designations.

Determining NAAQS Compliance

The U.S. EPA specified how attainment is determined as part of the new NO_2 NAAQS. An air quality monitor measures attainment when the 3-year average of the 98^{th} percentile of the annual distribution of daily maximum 1-hour average NO_2 concentrations does not exceed 100 ppb.

Current Wisconsin NO_2 Monitoring Network

There are currently five NO_2 monitors operating in the state. The names and locations of these monitors are shown in Figure 1. Three of these monitors, Ashland, Cassville and Potawatomi, have only been measuring NO_2 concentrations during the current year (2010). The Ashland and Cassville monitors are part of a special study by the WDNR and are expected to cease operations on or around June 30, 2011. The Manitowoc monitor is part of the national Photochemical Assessment Monitoring Stations (PAMS) network, as required by the U.S. EPA to better understand ozone and its precursors. As such, this monitor only operates from June 1 – August 31. The Milwaukee monitor has measured NO_2 concentrations for several years.

A summary of the annual 98^{th} percentile daily maximum 1-hour average NO_2 concentrations for the five statewide NO_2 monitors is provided in Table 1. Despite the limited amount of data, the rural monitors have a range of 98^{th} percentile NO_2 concentrations from 5 – 31 ppb and the urban monitor in Milwaukee has a range of 98^{th} percentile NO_2 concentrations from 44 – 70 ppb. These annual values are well below the 100 ppb NO_2 standard, which is based on a three-year average of 98^{th} percentile concentrations. A sufficient amount of data is available from the Manitowoc and Milwaukee monitors to calculate three-year averages, which range from 11 – 18 ppb and 47 – 54 ppb, respectively.

Future NO_2 Monitoring in Wisconsin

To determine compliance with the 2010 NO_2 NAAQS, the U.S. EPA has established the following ambient air monitoring requirements for NO_2:

1. In urban areas, monitors are required within 50 meters of major roads, as well as in other locations where maximum concentrations are expected.

2. Additional monitors are required in large urban areas to measure the highest concentrations of NO_2 that occur more broadly across communities.

3. Working with states, the U.S. EPA will also site a subset of monitors in locations to help protect communities that are susceptible and vulnerable to NO_2-related health effects.

The WDNR plans to install NO_2 near-roadway monitors in Madison and Milwaukee. Final locations of the monitors are still being determined. These monitors may be operational by January 1, 2013 to meet the NO_2 monitoring requirements.

Summary of the Designation Options

Option # 1: All Wisconsin Counties: Unclassifiable

The U.S. EPA stated in the final NO_2 NAAQS rule that they intend to designate areas with monitored NO_2 concentrations above the 1-hour standard as nonattainment and the remainder of the country as unclassifiable until sufficient air quality data is collected from near-roadway monitors. This option most closely matches the U.S. EPA's stated intentions.

Option # 2: Columbia, Dane, Iowa, Kenosha, Milwaukee, Ozaukee, Pierce, Racine, Sauk, St. Croix, Washington and Waukesha Counties: Unclassifiable
Remaining Wisconsin Counties: Attainment

This option takes into consideration that near-roadway NO_2 monitoring is only planned in major urban areas. Counties not located in these areas should be designated as attainment based on past NO_2 monitoring in Wisconsin. An unclassifiable designation is not justified in the majority of Wisconsin counties since no additional monitoring is planned.

Option # 3: All Wisconsin Counties: Attainment

Wisconsin's urban areas may attain the new NO_2 standard based on past NO_2 monitoring in Wisconsin and results from a recent near-roadway NO_2 monitoring study in Las Vegas, Nevada[1]. The 98th percentile NO_2 concentration at Fyfe Elementary School in Las Vegas, NV from September 15, 2007 – September 14, 2008 was only 59 ppb. The population of Las Vegas in 2008 was 1,865,746 compared to 1,549,308 and 561,505 in Milwaukee and Madison, respectively.

[1] Roberts et al. (2010). Characterization of a Year of Near-Road NO2 Measurements in Las Vegas, Nevada. U.S. EPA's 2010 National Air Quality Conference, March 15 – 18, 2010. http://www.epa.gov/airnow/2010conference/naqc/forecasting/roberts_nearroadwayno2.ppt

Figure 1 – Wisconsin NO_2 Monitoring Network

Table 1 – Wisconsin NO_2 Monitoring Data

Year	2006	2007	2008	2009	2010 [1]
Ashland					
98th Percentile Concentration	-	-	-	-	16 ppb
Design Value	-	-	-	-	-
Cassville					
98th Percentile Concentration	-	-	-	-	29 ppb
Design Value	-	-	-	-	-
Manitowoc [2]					
98th Percentile Concentration	15 ppb	11 ppb	15 ppb	9 ppb	31 ppb
Design Value	-	-	13 ppb	11 ppb	18 ppb
Milwaukee					
98th Percentile Concentration	48 ppb	50 ppb	44 ppb	49 ppb	70 ppb
Design Value	-	-	47 ppb	47 ppb	54 ppb
Potowatomi					
98th Percentile Concentration	-	-	-	-	5 ppb
Design Value	-	-	-	-	-

[1] 2010 data is from January 1 – October 28, 2010.
[2] The Manitowoc monitor only operates from June 1 – August 31.