

EPA Background Files (Processing Notes)

On March 1, 2011, EPA provided additional clarification on the implementation of the 1-Hour NO₂ NAAQS; one area in which they provided guidance was on acceptable NO₂ background data. The following discussion describes the options provided in the referenced memo:

Please Note: The following is only a summary of the referenced memo which provided an explanation of each the following items. The memorandum can be found at [http://www.epa.gov/ttn/scram/Additional Clarifications AppendixW Hourly-NO2-NAAQS FINAL 03-01-2011.pdf](http://www.epa.gov/ttn/scram/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf).

1. A uniform monitored background contribution based on the monitored design value from a representative monitor should be acceptable in most cases. The monitored NO₂ design value, i.e., the 98th-percentile of the annual distribution of daily maximum 1-hour values averaged across the most recent three years of monitored data
2. The following three refined background data sets can be used and will be supported in AERMOD (11059).
 - a. Hour-Of-Day 98th-percentile (8th Highest) value
 - b. Monthly Hour-Of-Day
 - c. Seasonal Hour-Of-Day

Each of the above background datasets are described below.

District Procedures

Hour-Of-Day 98th-percentile (8th Highest) value

Hour-Of-Day is determined by organizing all of the NO₂ concentrations by hour of day (1AM, 2AM, 3AM, etc) in descending order and selecting the 8th highest NO₂ concentrations for each hour of the day. This process is repeated for each of the three years under review. The procedure is similar to that used to determine a monitor's design value (instead of daily values you use each hour of the day).

For example, (1AM)

1. First take all the 1AM NO₂ concentrations (maximum of 365-366 numbers)
2. Organizing the NO₂ concentrations in descending order (highest to lowest)
3. Take the 8th highest NO₂ concentrations
4. This value will be used to represent the 1AM 98th- percentile of available data
5. The above process is repeated for each hour of the day
6. Repeat steps 1 thru 5 for each of the three years under review
7. Average the three 1AM NO₂ concentrations
8. This value will be used in AERMOD as the NO₂ background concentrations (3yr average of the 98th percentile) for the 1AM hour.
9. Repeat step 7 and 8 for each of the hours in the day

Please Note: The files generated by the District will also contain the 1st through the 8th highest values for each hour of the day, for completeness. See Appendix A for a discussion of the file structure.

Monthly Hour-Of-Day

Monthly Hour-Of-Day is determined by organizing all of the NO₂ concentrations by hour of day (1AM, 2AM, 3AM, etc) for each month in descending order and selecting the 1st highest NO₂ concentrations (Maximum Hourly) for each hour of the day.

For example, (1AM)

1. First take all the 1AM NO₂ concentrations (maximum of 28-31 numbers) for each month
2. Organizing the NO₂ concentrations in descending order (highest to lowest)
3. Take the 1st highest NO₂ concentrations
4. This value will be used to represent the 1AM maximum hour or 98th-percentile of available data
5. The above process is repeated for each hour of the day and month
6. Repeat steps 1 thru 5 for each of the three years under review
7. Average the three 1AM NO₂ concentrations
8. This value will be used in AERMOD as the NO₂ background concentrations (3yr average of the 98th percentile) for the 1AM hour and month
9. Repeat step 7 and 8 for each of the hours in the day and month

Seasonal Hour-Of-Day

Seasonal Hour-Of-Day is determined by organizing all of the NO₂ concentrations by hour of day (1AM, 2AM, 3AM, etc) for each season of the year in descending order and selecting the 3rd highest NO₂ concentrations for each hour of the day and season.

For example, (1AM)

1. First take all the 1AM values (maximum of 90-92 numbers) for each Season
 - a. Winter = December Of Previous Year, January, February
 - b. Spring = March, April, May
 - c. Summer = June, July, August
 - d. Autumn = September, October, November
2. Organizing the NO₂ concentrations in descending order (highest to lowest)
3. Take the 3rd highest NO₂ concentrations
4. This value will be used to represent the 1AM 3rd highest or 98th- percentile of available data
5. The above process is repeated for each hour of the day and season
6. Repeat steps 1 thru 5 for each of the three years under review
7. Average the three 1AM NO₂ concentrations
8. This value will be used in AERMOD as the NO₂ background concentrations (3yr average of the 98th percentile) for the 1AM hour and season
9. Repeat step 7 and 8 for each of the hours in the day and season

Please Note: The files generated by the District will also contain the 1st through the 3rd highest values for each hour of the day, this is done for completeness. See Appendix A for a discussion of the file structure.

Gap Filling

The District has implemented the following gap filling technique to ensure that all Hour-Of-Day values have been included. First, missing Hour-Of-Day values, for the most part, are attributed to the required QA/QC and calibration requirements established by EPA and are typically scheduled during an hour(s) of low concentration.

The District uses the same gap filling technique established by EPA for filling a single hour of missing meteorological data; the missing NO₂ concentration is filled using a linear interpolation using the NO₂ concentration from the hour before and the hour after to replace the missing NO₂ concentration.

Seasonal Hour-Of-Day “Winter”

To ensure consistency between the Modeled definition and the background NO₂ data, the seasonal winter Hour-Of-Day values represents data from January and February of the year under review and December of the previous year. This is the definition of winter provided in the AERMOD guidance document for Seasonal Hour-Of-Day where winter is identified as including December, January, and February. The District does not believe that it would be appropriate to add the last month of the year, under review, to the first two months of the year.

Appendix A

File Structure

Hour-Of-Day File Structure

Where:

NthHigh = The Nth Highest value
Hr_Of_Day = A given hour of the day (1-24)

Please Note: The next two fields are repeated for each of the three years being evaluated.

Year = The NO₂ concentration in ppb for the Nth Highest value
YearMO-DY* = The month and day that was determine to be the Nth highest value

3yrAve = The average of the NO₂ concentration in ppb over the three years

Month Hour-Of-Day File Structure

Where:

Month = The calendar month (1-12) evaluated
NthHigh = The Nth Highest value
Hr_Of_Day = A given hour of the day (1-24)

Please Note: The next two fields are repeated for each of the three years being evaluated.

Year = The NO₂ concentration in ppb for the Nth Highest value
YearDY* = The day that was determine to be the Nth highest value

3yrAve = The average of the NO₂ concentration in ppb over the three years

Seasonal Hour-Of-Day File Structure (One file for each Season)

Where:

Season = The season evaluated

- Winter = December Of Previous Year, January, February
- Spring = March, April, May
- Summer = June, July, August
- Autumn = September, October, November

NthHigh = The Nth Highest value
Hr_Of_Day = A given hour of the day (1-24)

Please Note: The next two fields are repeated for each of the three years being evaluated.

Year = The NO₂ concentration in ppb for the Nth Highest value
YearMO-DY* = The month and day that was determine to be the Nth highest value

3yrAve = The average of the NO₂ concentration in ppb over the three years

***Please Note: The word “Filled” means that the District’s Gap Filling procedure was utilizes to ensure completeness of the data. The word “No-Fill” means that more than one consecutive hour of missing data was identified and not filled.**