UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

October 6, 2008

MEMORANDUM

SUBJECT: Lead NAAQS Review: Comparison of Numbers/Percents of Sites/Counties/Populations That are Not Likely to Meet Various Potential NAAQS Levels Using Various Averaging Times and Forms.

FROM: Mark Schmidt, OAQPS/AQAD/AQAG (C304-04)

TO: Lead NAAQS Review Docket (EPA-HQ-OAR-2006-0735)

General

This document describes analyses conducted by EPA-OAQPS to estimate the number of Pb-TSP monitoring sites, counties, and county populations that are not likely to meet potential NAAQS levels using various potential NAAQS metrics (i.e., averaging times and forms). Current Pb-TSP concentration information, representing the years 2005 through 2007, are the basis for the estimates. The EPA recognizes that the current Pb-TSP monitoring network is deficient in relation to a possible strengthened standard, most notably, large emissions sources are presently under-monitored. Should the Pb NAAQS be tightened, and the associated required monitoring be more focused on sources, the total number of Pb monitoring sites would be expected to increase, such that EPA anticipates the numbers of sites/counties not meeting the revised metric-level combinations would likely be greater than that shown here (for the same metric-level). The current network results provided here, however, are nonetheless useful when viewed as likely minima, or when viewed in the relative sense.

Four different metrics, all using a 3-year evaluation period, were considered in this comparison: 1) the current maximum calendar quarter average, 2) the maximum "rolling" 3-month average, 3) the second maximum monthly average, and 4) the maximum monthly average. The next section describes these four metrics in more detail. The metric calculations and data completeness determinations in these analyses were based on the same raw data (representing the years 2005 through 2007). Also, the imposed data completeness criteria were conceptually consistent across the metrics. The basic data completeness logic is the same as specified in the proposed rule published May 20, 2008 (73 FR 29184); see next section for details on the completeness checks imposed in this analysis. Due to differences in the four averaging periods

and forms evaluated, there are some substantial differences in the numbers of sites deemed "complete" for each averaging time, form, and level. A total of 225 monitoring sites, those with at least some reported Pb-TSP data in the 3-year period, were considered for each metric-level specific evaluation. These 225 sites are located in 22 States and 111 counties. The total population in these 111 counties is approximately 66 million. Because of the variable distribution of monitoring sites across regions of the U.S. and the substantial number of monitoring sites that did not meet data completeness criteria for the different averaging time, form, and level options, analyses were focused on the total data set in the U.S., across all regions.

Input Data, Completeness Checks, and Metric Calculations

Data for Pb-TSP (parameter code 12128, durations "7" and "C") were obtained from the Air Quality System (AQS), EPA's repository of ambient air quality data, on September 9, 2008. Data were used "as reported" to AQS; also, no data were censored from the analyses for any reason (e.g., data flagged with quality assurance informational flags and/or exceptional event flags were included). Raw data from collocated monitors (i.e., two or more monitors operating at the same site at the same time) were aggregated into a combined site record basis before calculations. Specifically, data records present for the monitor with the lowest occurring Pollutant Occurrence Code (POC), as determined on a daily basis, constituted the combined site data record. Daily values in the combined site record were truncated to three decimal places if reported with more. Where Pb-TSP data were reported in "composite" form (i.e., multiple filters for a month of sampling that are analyzed together), the composite concentration was used as the site-based monthly mean concentration if there were no valid daily Pb-TSP data reported for that month with a lower POC; in such a case, the reported composite concentration (monthly mean) was not truncated (but rounded to two decimals for the two monthly metrics, and used at face value for the quarterly and 3-month metrics; see below).

All data in the combined site record were used in the mean computations, but only those reported for scheduled sampling days, and those that could be counted as make-ups for missed scheduled days, were counted towards completeness. Completeness was evaluated with the assumption that every site operated on a 1-6 (every sixth day) sampling schedule as denoted per official EPA sampling calendars. A non-scheduled sample that was taken within 5 days of a missed scheduled sample, or exactly 7 days after the miss, was counted as a valid make-up for the miss. A maximum of two scheduled sample make-ups were allowed each month. Make-ups were allowed to span months and quarters but not years. Make-up samples taken in a different month than the miss being made up (i.e., the subsequent month) will be credited for data capture in the month of the miss but will be included in the month actually taken when computing monthly means. The minimum data capture requirement for each averaging time was 75 percent; if an averaging period did not have 75 percent then one of two diagnostic data substitution tests was attempted to see if the deficient period could be deemed complete and hence, utilized in this analysis. Both diagnostic tests utilize site-specific, period-specific (across the 3 years) actual reported low or high values as proxies for the missing data, temporarily recalculate the period mean, and then make a pass/fail decision for the original (deficient) mean.

The proposed Appendix R (in 72 FR 71488) details the data substitution logic for a second maximum monthly metric; that same logic was used in this analysis for the two monthly-based metrics. For processing the maximum quarterly mean statistic, a quarterly data capture rate (and concentration mean) was computed across the quarter irrespective of month, and the completeness data substitution logic utilized was identical to that proposed for the monthly metric except it was applied by quarter instead of by month. For the rolling 3-month average metric, data capture (and concentration means) were first computed by month and then those monthly means were then averaged (three at a time) to obtain the 3-month metrics. The 75 percent data capture requirement was applied to the 3-month data capture average; if the 3-month capture average was less than 75 percent, then each individual month deficient of 75 percent had data substitution applied (as stipulated for the monthly metrics); the actual diagnosis of pass/fail, however, was not based on the individual deficient months but rather on recalculated 3-month means (derived from recalculated monthly means).

The four calculated statistical metrics are described below.

- Three-year maximum calendar quarter mean: This metric represents the highest calendar quarter mean concentration of those with complete data (up to 12 possible). An arithmetic mean was calculated for each of the 12 calendar quarters of the 3-year period, 2005-2007. Quarterly means were rounded to two decimal places. The identified 3-year maximum quarterly mean concentration was deemed valid if it either: 1) exceeded the tested potential NAAQS level, regardless of the number of valid quarters (thus, the exceeding quarter could possibly be the only complete quarter), or 2) met the tested potential NAAQS level (i.e., less than or equal to it) and all other 11 quarters (i.e., all 12) were also complete.
- Three-year maximum rolling 3-month mean: This metric represents the highest 3-month mean concentration of those with complete data (up to 36 possible). Arithmetic monthly means were first calculated by site for each month of the 3-year period (i.e., 1 to 36 monthly means). Then, three consecutive monthly averages were averaged together to obtain a 3-month mean using the end (third) month as the month of report. Note that the first two 3-month periods of the 3-year period theoretically should encompass November and/or December of the previous year (2004), but that 2004 data were purposely not included in this evaluation so as not to interject a metric comparison bias. Thus, the first of the calculated 36 3-month periods is actually a one-month average (January 2005) and the second 3-month period is actually a 2-month average (January and February 2005). Only in a few situations was data substitution able to resurrect one or both of those data capture (i.e., less than 75 percent) deficient periods. Monthly means were not rounded and 3-month means were rounded to two decimal places. The identified 3-year maximum 3-month mean concentration was deemed valid if it either: 1) exceeded the tested potential NAAQS level, regardless of the number of valid 3-month periods (thus, the exceeding period could possibly be the only complete one), or 2) met the tested potential NAAQS level (i.e., less than or equal to it) and there were at least 34 valid 3-

month periods; due to the issue discussed above with the first two periods, those two periods were not required to meet data completeness requirements.

- Second maximum monthly mean: This metric represents the second highest monthly mean concentration of those with complete data (up to 36 possible). An arithmetic mean was calculated for each of the 36 months of the 3-year period, 2005-2007. Monthly means were rounded to two decimal places. In a situation where there were two or more months with identical means and that mean was the highest (i.e., a tie for first highest), then the identified second highest mean was also that same value. The identified 3-year second maximum monthly mean concentration was deemed valid if it: 1) exceeded the tested potential NAAQS level, and there was at least one additional valid month (i.e., the maximum), 2) met the tested potential NAAQS level (i.e., less than or equal to it) and all other 35 months (i.e., all 36) were also complete, or 3) met the tested potential NAAQS level, had only 35 total valid (complete) months and the maximum monthly mean of those 35 months also met the tested NAAQS level..
- Maximum monthly mean: This metric represents the highest monthly mean concentration of those with complete data (up to 36 possible). An arithmetic mean was calculated for each of the 36 months of the 3-year period, 2005-2007. Monthly means were rounded to two decimal places. The identified 3-year maximum monthly mean concentration was deemed valid if it either: 1) exceeded the tested potential NAAQS level, regardless the number of valid months (thus, the exceeding month could possibly be the only complete month), or 2) met the tested potential NAAQS level (i.e., less than or equal to it) and all other 35 months (i.e., all 36) were also complete.

Analysis Results

Site-level metric validity status (i.e., data completeness) and estimated compliance status ("likely to meet" or "not likely to meet" a potential level) were assessed at five concentration levels, 0.10 $\mu g/m^3$, 0.15 $\mu g/m^3$, 0.20 $\mu g/m^3$, 0.25 $\mu g/m^3$, and 0.30 $\mu g/m^3$. A county was deemed valid for a particular metric-level combination if it contained at least one site with a valid metric at that level. A county was deemed "not likely meet" a particular metric-level combination if it contained at least one site that was "not likely to meet" that metric-level combination. For each metric-level combination, the number of sites/counties with valid metrics and the number of sites/counties with "not likely to meet" metrics were summarized. Table 1 shows summary counts by county, and Table 2 shows summary counts by site. In Table 1, the first data column shows the number of counties with a valid metric at the specified level, and parenthetically, that count as a percent of 111, which is the total number of counties with any Pb-TSP data in 2005-2007. The second data column shows the number of counties that are not likely to meet each metric-level combination, and parenthetically, that count as a percent of the number of complete counties (for that metric-level). The third (last) data column shows the summed population of the counties not likely to meet that metric-level, and parenthetically, that population as a percent of the total population in all valid counties for that metric-level. For the second and third data columns, note that the denominators used to calculate the parenthetical percentages are typically different for each metric-level combination. In Table 2, the first data column shows the number

of sites with a valid metric at the specified level, and parenthetically, that count as a percent of 225 (which is the total number of sites with any Pb-TSP data in 2005-2007). The second (last) data column shows the number of sites that are not likely to meet each metric-level combination, and parenthetically, that count as a percent of the number of complete sites for that metric-level. Here again, note that the denominators used to calculate the parenthetical percentages are typically different for each metric-level combination.

Attachments

Table 1. County Summary

Averaging Time and Form	Number of counties with at least one monitor *meeting data completeness criteria* (as a percent of counties with any reported data)	Number of counties with at least one monitor *not likely to meet stated standard* (as a percent of counties with at least one monitor meeting data completeness criteria)	Population (in thousands) in counties with at least one monitor *not likely to meet stated standard* (as a percent of population in counties with at least one monitor meeting data completeness criteria)
Number of counties with any reported data (population in those counties) = 111 counties (65,916 thousand)			
Level of 0.10 $\mu g/m^3$			
max quarterly	60 (54%)	20 (33%)	8,926 (19%)
max rolling 3-month	45 (41%)	20 (44%)	8,926 (24%)
2nd max monthly	58 (52%)	21 (36%)	7,415 (16%)
max monthly	48 (43%)	26 (54%)	12,065 (32%)
Level of 0.15 $\mu g/m^3$			
max quarterly	59 (53%)	17 (29%)	5,630 (12%)
max rolling 3-month	45 (41%)	18 (40%)	6,380 (17%)
2nd max monthly	55 (50%)	17 (31%)	5,630 (13%)
max monthly	44 (40%)	20 (45%)	8,926 (25%)
Level of 0.20 $\mu g/m^3$			
max quarterly	56 (50%)	12 (21%)	3,088 (7%)
max rolling 3-month	41 (37%)	13 (32%)	3,241 (9%)
2nd max monthly	55 (50%)	17 (31%)	5,630 (13%)
max monthly	44 (40%)	20 (45%)	8,926 (25%)
Level of 0.25 $\mu g/m^3$			
max quarterly	56 (50%)	10 (18%)	2,983 (7%)
max rolling 3-month	40 (36%)	12 (30%)	3,182 (9%)
2nd max monthly	53 (48%)	13 (25%)	3,347 (8%)
max monthly	43 (39%)	19 (44%)	8,176 (23%)
Level of 0.30 $\mu g/m^3$			
max quarterly	56 (50%)	10 (18%)	2,983 (7%)
max rolling 3-month	40 (36%)	10 (25%)	2,983 (8%)
2nd max monthly	52 (47%)	11 (21%)	3,242 (8%)
max monthly	42 (38%)	15 (36%)	3,681 (11%)

Table 2. Site Summary

Averaging Time and Form	Number of sites *meeting data completeness criteria* (as a percent of sites with any reported data)	Number of sites *not likely to meet stated standard* (as a percent of sites meeting data completeness criteria)
Number of sites with any reported data = 225		
Level of 0.10 µg/m^3		
max quarterly	117 (52%)	41 (35%)
max rolling 3-month	89 (40%)	42 (47%)
2nd max monthly	110 (49%)	44 (40%)
max monthly	98 (44%)	54 (55%)
Level of 0.15 µg/m^3		
max quarterly	112 (50%)	33 (29%)
max rolling 3-month	86 (38%)	35 (41%)
2nd max monthly	103 (46%)	36 (35%)
max monthly	92 (41%)	46 (50%)
Level of 0.20 µg/m^3		
max quarterly	106 (47%)	26 (25%)
max rolling 3-month	78 (35%)	26 (33%)
2nd max monthly	102 (45%)	33 (32%)
max monthly	89 (40%)	41 (46%)
Level of 0.25 µg/m^3		
max quarterly	103 (46%)	20 (19%)
max rolling 3-month	75 (33%)	22 (29%)
2nd max monthly	97 (43%)	27 (28%)
max monthly	86 (38%)	38 (44%)
Level of 0.30 µg/m^3		
max quarterly	103 (46%)	19 (18%)
max rolling 3-month	72 (32%)	19 (26%)
2nd max monthly	97 (43%)	23 (24%)
max monthly	79 (35%)	29 (37%)