



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711
OFFICE OF AIR QUALITY PLANNING AND STANDARDS

Technical Note- Guidance on Statistics for Use of 1-Point QC Checks at Lower Concentrations as described in 40 CFR Part 58 Appendix A Section 3.1.1

05/05/2016

Summary

Similar to the annual performance evaluation audits, there will be “dual” acceptance criteria for one-point QC checks that are performed at lower concentration ranges.

- O₃: ± 1.5 ppb difference or ± 7 percent difference, whichever is greater
- SO₂: ± 1.5 ppb difference or $\pm 10\%$ percent difference
- NO₂: ± 1.5 ppb difference or $\pm 15\%$ percent difference
- CO- **NOTE:** since the low end of CO one-point QC checks is 0.500 ppm, the absolute difference acceptance criteria that was developed for the annual PE (± 0.03 ppm for concentrations <0.200 ppm) will not be in effect.

Background

On March 28, 2016¹ the one-point quality control check for 1-point QC ranges for SO₂, NO₂, O₃, and CO were revised as follows:

*3.1.1 One-Point Quality Control (QC) Check for SO₂, NO₂, O₃, and CO. (a) A one-point QC check must be performed at least once every 2 weeks on each automated monitor used to measure SO₂, NO₂, O₃ and CO. The QC check is made by challenging the monitor with a QC check gas of known concentration (effective concentration for open path monitors) between the prescribed range of **0.005 and 0.08 parts per million (ppm) for SO₂, NO₂, and O₃**, and between the prescribed range of **0.5 and 5 ppm for CO monitors**. The QC check gas concentration selected within the prescribed range should be related to the monitoring objectives for the monitor. If monitoring at an NCore site or for trace level monitoring, the QC check concentration should be selected to represent the mean or median concentrations at the site. If the mean or median concentrations at trace gas sites are below the MDL of the instrument the agency can select the lowest concentration in the prescribed range that can be practically achieved. If the mean or median concentrations at trace gas sites are above the prescribed range the agency can select the highest concentration in the prescribed range. An additional QC check point is encouraged for those organizations that may have occasional high values or would like to confirm the monitors' linearity at the higher end of the operational range or around NAAQS concentrations. If monitoring for NAAQS decisions, the*

¹ Federal Register/Vol. 81, No. 59/ Monday, March 28, 2016

QC concentration can be selected at a higher concentration within the prescribed range but should also consider precision points around mean or median monitor concentrations.

The March 28, 2016 final rule lowered the previous concentration ranges for these pollutants and as described in the preamble of the rule, EPA planned to evaluate the data in AQS to determine whether it could provide an absolute difference acceptance criteria (similar to the annual PE acceptance criteria) to monitoring organizations that challenged its monitors at the lower ranges.

Data Evaluation

EPA performed an evaluation of an aggregation of annual performance evaluation and one-point QC data for the years 2012-2014. Attachment A provides a graphical display of the data using notched box and whisker plots. Notch box-whisker plots show the interquartile range as the box, the median concentration as the center line, the 95% confidence level in the median as the notch, and 1.5*interquartile range as whiskers; points beyond the whiskers are shown as outlier dots. The data was aggregated by the 10 audit levels used for the annual performance evaluation data.

The left side of each figure presents the absolute difference of the audit data at each audit level while the right side of the figure displays the same data set as the percent difference. The red horizontal line on the left side of the figure represents the annual PE absolute difference acceptance criteria² whereas the horizontal red line on the right side of the figures represent the one-point QC acceptance criteria found in the validation templates of QA Handbook Guidance Document³.

Although there were limited data in the first audit levels for the four pollutants (around 100 data pairs) data pairs increased as one went to higher audits levels and then decreased again after about audit level 6. With respect to CO, the low concentration of the one-point QC (0.5 ppm) is imbedded in PE audit level 3 which had around 10,000 data pairs in 2012-2014 and demonstrates the ± 10 percent difference acceptance criteria is being achieved.

In reviewing the available data, it does appear that monitoring organizations attempting to challenge at these lower levels are achieving acceptable results. However, EPA is aware that these results may represent monitoring organizations that have the equipment and standards necessary to meet this acceptance criteria. Therefore, in an effort to encourage additional QC checks at these lower levels EPA is allowing the absolute percent difference acceptance criteria used for the annual PE audits levels 1 and 2 described above to be used for the one-point QC checks that are tested within those two ranges. Audit concentration values where the absolute difference will provide more “acceptance leeway” are as follows:

- O₃- < 0.022 ppm
- NO₂ - < 0.010 ppm
- SO₂ - < 0.014 ppm

Reports in AQS will be modified over the next few months to accommodate the difference acceptance criteria.

² See 2/17/2011 memo on AMTIC <https://www3.epa.gov/ttn/amtic/cpreldoc.html>

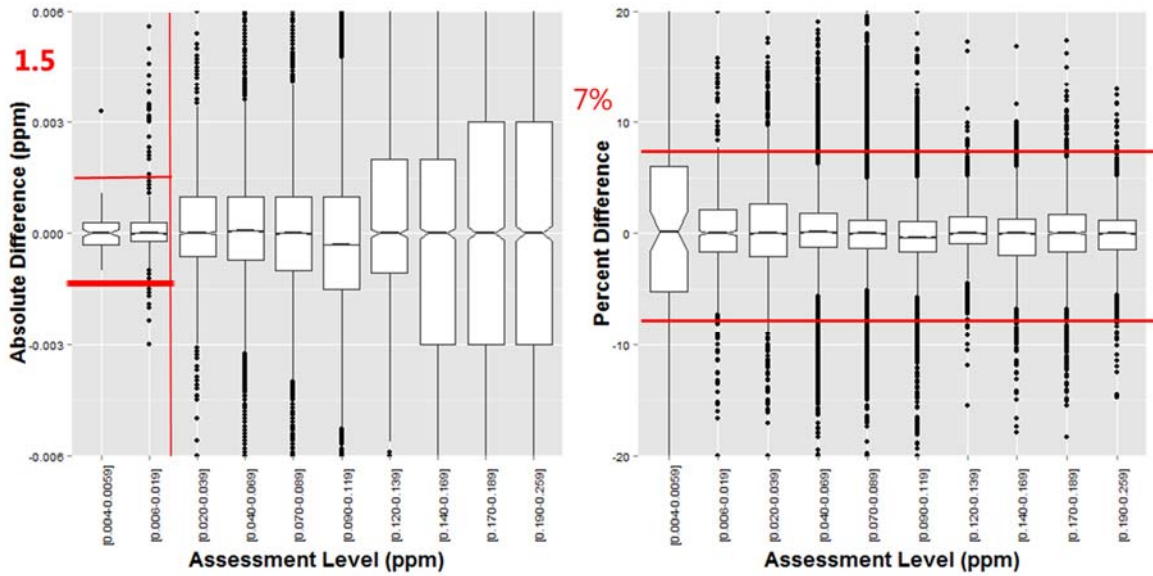
³ <https://www3.epa.gov/ttn/amtic/files/ambient/pm25/qa/QA-Handbook-Vol-II.pdf>

Attachment A

2012 -2104 1-Point QC and Annual PE Data Evaluations of Absolute and Percent Differences binned by Annual PE Audit Levels.

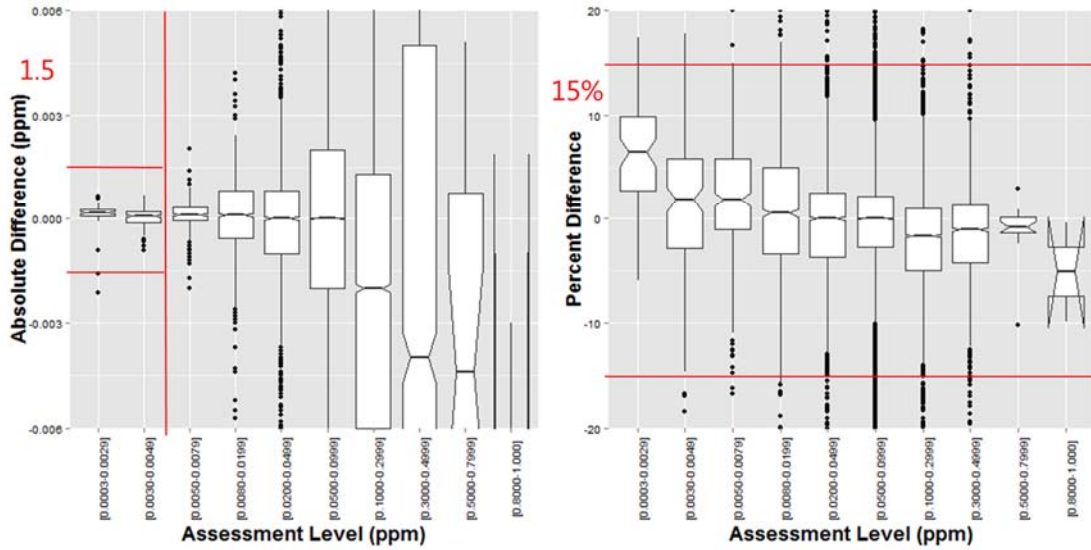
Annual PE Level 1 and 2; 1.5 ppb difference
or Percent Difference 7%

Ozone



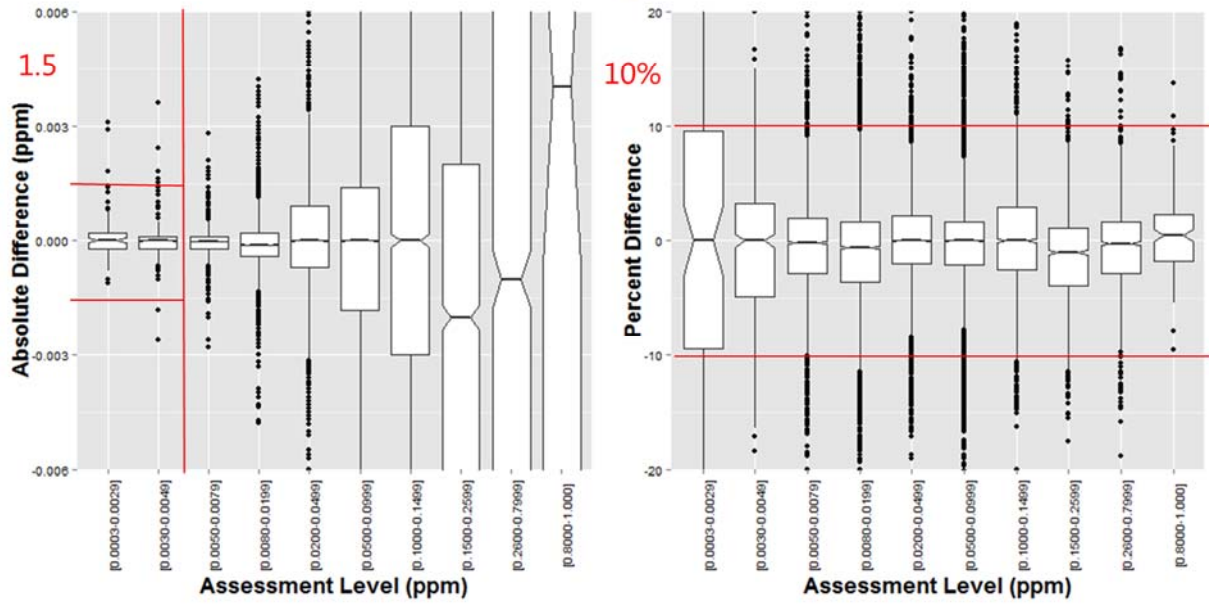
Annual PE Level 1 and 2; 1.5 ppb difference
or Percent Difference 15%

NO₂



Annual PE Level 1 and 2; 1.5 ppb difference
or Percent Difference 10%

SO₂



Annual PE Level 1 and 2; 0.03 ppm difference
or Percent Difference 10%

CO

