

Memorandum

To: Supersite Principal Investigators, Data Managers and Research Scientist
From: Dr. Paul Solomon, ORD, Dennis Mikel, OAQPS; Mike Jones, OAQPS
Date: 07/25/01
Subject: Submittal of Uncertainty Estimates for the Supersite Program

The Supersites program is generating large amounts of data that will set a precedent in the air monitoring community. This summer, the Eastern Supersite Intensive will begin June 30, 2001, and will generate numerous data sets that will be utilized by government, research institutions and other scientists whom will begin to draw many conclusions about the health of our atmosphere. To support these users, it is important that the uncertainty of the data be estimated.

Three working groups have been formed to focus on specific aspects of the Supersites program: these are Quality Assurance, Data Management, and Carbon Analysis groups. Recently, the Quality Assurance and Data Management groups discussed the submittal of uncertainty information with all data that will be stored in the NARSTO permanent archive. Both of the groups strongly recommend that the uncertainty information be submitted along with all of the research data. EPA strongly agrees and recommends this course of action.

The uncertainty of the data collected is of paramount importance. The data users will need to understand the uncertainty of the data, which will provide them confidence in their assumptions and predictions. Therefore, the EPA is strongly recommending that each Supersite Cooperative work closely with the research investigators and data managers of each Supersite to estimate and report the uncertainties.

As you know, each of the Supersite Cooperatives was required to submit a Quality Assurance Project Plan (QAPP). Each QAPP was submitted to the EPA for review and approval. Now that all of the Supersites' QAPPs have been reviewed and approved, the EPA must reaffirm that the uncertainty estimates defined in the QAPPs, or in a referenced standard operating procedure for a given method, are calculated and reported for all data to be submitted to the final archive¹. The uncertainty data that are expected with the measurement data per the QAPPs are: Detection Limits (DL), Precision, and Accuracy/Bias. Other data quality indicators, such as Completeness, Representativeness, and Comparability, will be dealt with in the Quality Assurance Final Report that each Supersite Cooperative will submit at the completion of data collection and analysis activities. It is imperative that the Supersite data collected have estimates of the uncertainty. We will assist you in any way to create a database of unparalleled quality and significance. To that end, please see the attached guidance on the uncertainty flags

¹Supersite Cooperative Agreement, Terms and Conditions, addresses data archiving :

(2) Data Management and Results Availability.

(d) "Level two" validated data will be forwarded to NARSTO for archiving in a publicly accessible NARSTO Data Archive within twelve (12) months of the end of each quarter of data collection during the duration of this cooperative agreement.

that should be used when the data are submitted to the NARSTO data archive. In addition, an example will be developed and placed on the NARSTO-QSSC Web-site (<http://cdiac.esd.ornl.gov/programs/NARSTO/>) showing how estimates of uncertainty would be reported and represented in the NARSTO Data Exchange Standard.

To avoid confusion, the Supersite Quality Assurance decided to review the definitions of the major Quality Assurance indicators. The following terms have been defined: Detection Limit, Precision, Accuracy, Representativeness, Comparability, Completeness and Bias. These terms and definitions are from the EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5 EPA/600/R-98/018.

Accuracy — The measure of the closeness of an individual measurement or the average of a number of measurements to the true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; the EPA recommends using the terms “*precision*” and “*bias*”, rather than “accuracy,” to convey the information usually associated with accuracy.

Bias — The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample’s true value).

Detection Limit (DL) — A measure of the capability of an analytical method to distinguish samples that do not contain a specific analyte from samples that contain low concentrations of the analyte; the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability. DLs are analyte- and matrix-specific and may be laboratory-dependent.

Precision — A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions expressed generally in terms of the standard deviation.

Representativeness --Representativeness is a measure of the degree to which data accurately and precisely represent a characteristic of a population parameter at a sampling point or for a process condition or environmental condition. Representativeness is a qualitative term that should be evaluated to determine whether in-situ and other measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the media and phenomenon measured or studied.

Comparability--Comparability is the qualitative term that expresses the confidence that two data sets can contribute to a common analysis and interpolation. Comparability must be carefully evaluated to establish whether two data sets can be considered equivalent in regard to the measurement of a specific variable or groups of variables.

Completeness--Completeness is a measure of the amount of valid data obtained from a measurement system, expressed as a percentage of the number of valid measurements that should have been collected (i.e., measurements that were planned).