

# Chemical Speciation Network (CSN) Summary of Precision from Six Collocated Sites



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## ABSTRACT

The Chemical Speciation Network (CSN) measurement quality objectives (MQOs) for precision are based on the coefficient of variation (CV) between collocated measurements of selected target species. The CSN MQOs are:

- 10% CV for ions
- 20% CV for elements; and
- 15% CV for total carbon.

The original MQOs were based on calcium, sulfate, nitrate, and total carbon. To assess CSN network precision, six sites have been collecting and reporting collocated measurements since 2001. The data from the collocated samplers provides information on the precision associated with the procedures for sample collection and laboratory analysis.

Contributors of the uncertainty between collocated sample measurements include sample collection, handling, shipping, storage, preparation, and analysis.

The objective of this poster is to provide summaries of the precision results of collocated sampler pairs at the six sites in order to assess whether the CSN precision MQOs have been met over the history of the network.

Precision MQO goals for CSN are achievable when both the primary and collocated samplers are well maintained and operating properly.

## BACKGROUND

The deployment of the PM<sub>2.5</sub> ambient air monitoring network is a critical component in the implementation of the PM National Ambient Air Quality Standard (NAAQS).

The data from this network drives an array of regulatory decisions, ranging from designating areas as attainment or nonattainment, to developing cost-effective control programs and tracking the progress of such programs.

Data derived from the PM monitoring network include both aerosol mass measurements and chemical speciation data. Chemical speciation data serve the implementation needs associated with developing mitigation approaches to reduce ambient PM levels and a variety of health, research, and modeling needs.

The PM<sub>2.5</sub> CSN currently consists of approximately 50 Speciation Trends Network (STN) sites for routine speciation monitoring and another 100 or so supplemental sites for State/Local driven monitoring needs.

## COLLOCATED SITES

The following six sites have collocated samplers whose data are used to estimate precision:

- Bakersfield, CA – AQS ID 06-029-0014
- Los Angeles, CA (Rubidoux West Riverside) – AQS ID 06-065-8001
- New Brunswick, NJ – AQS ID 34-023-0006
- Cleveland, OH (GT Craig) – AQS ID 39-035-0060
- Boston, MA (Dudley Square – Roxbury) – AQS ID 25-025-0042
- Deer Park, TX – AQS ID 48-201-1039

Each of these six sites have had collocated samplers since the network's initiation in 2001. Collocated data from years 2001 through 2012 were assessed and the results presented here.

## PRECISION CALCULATIONS

For a given primary/collocated sampler pair, Relative Percent Difference (RPD) is calculated using the following equation:

$$RPD_i = \frac{X_i - Y_i}{(X_i + Y_i)/2} * 100$$

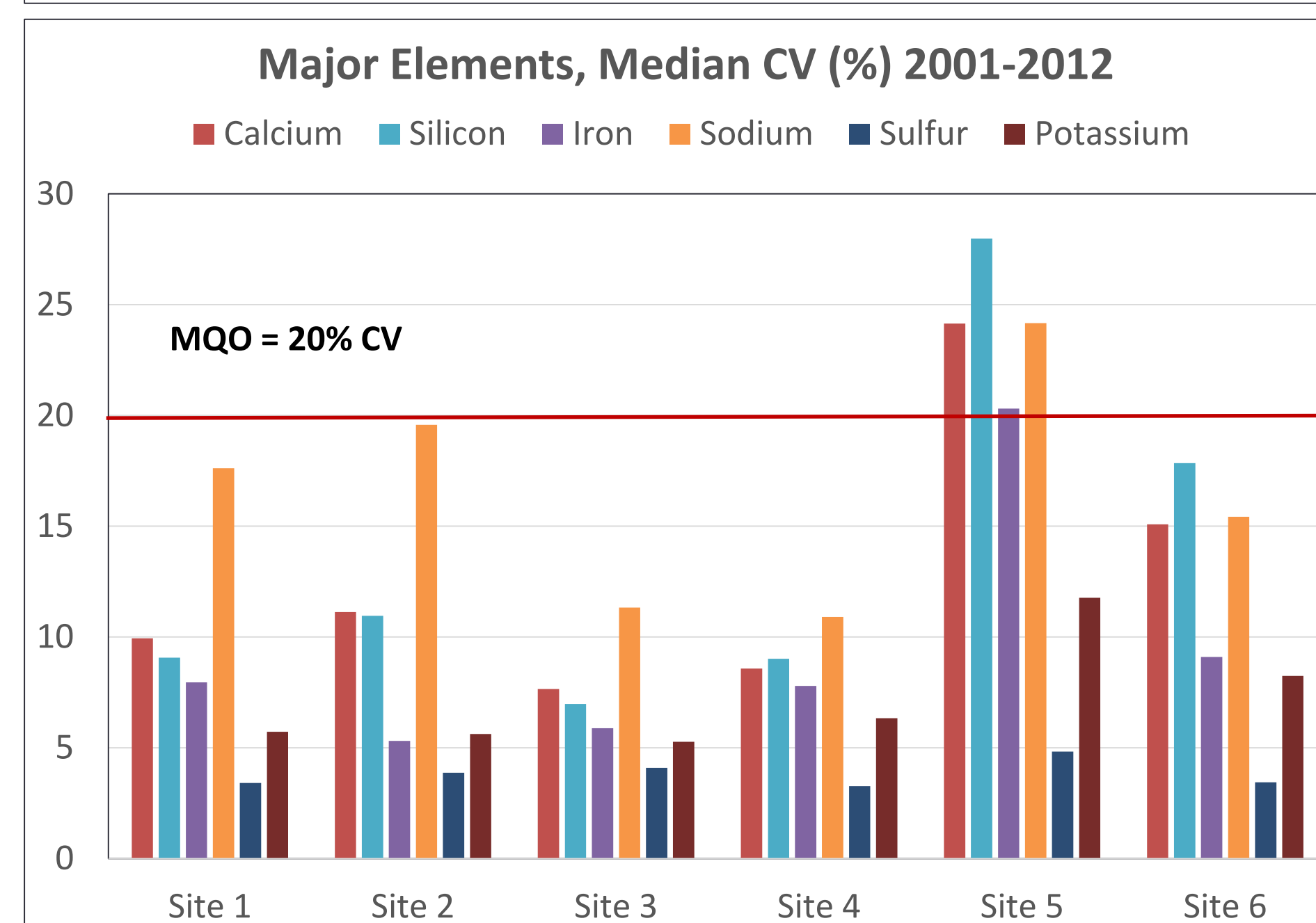
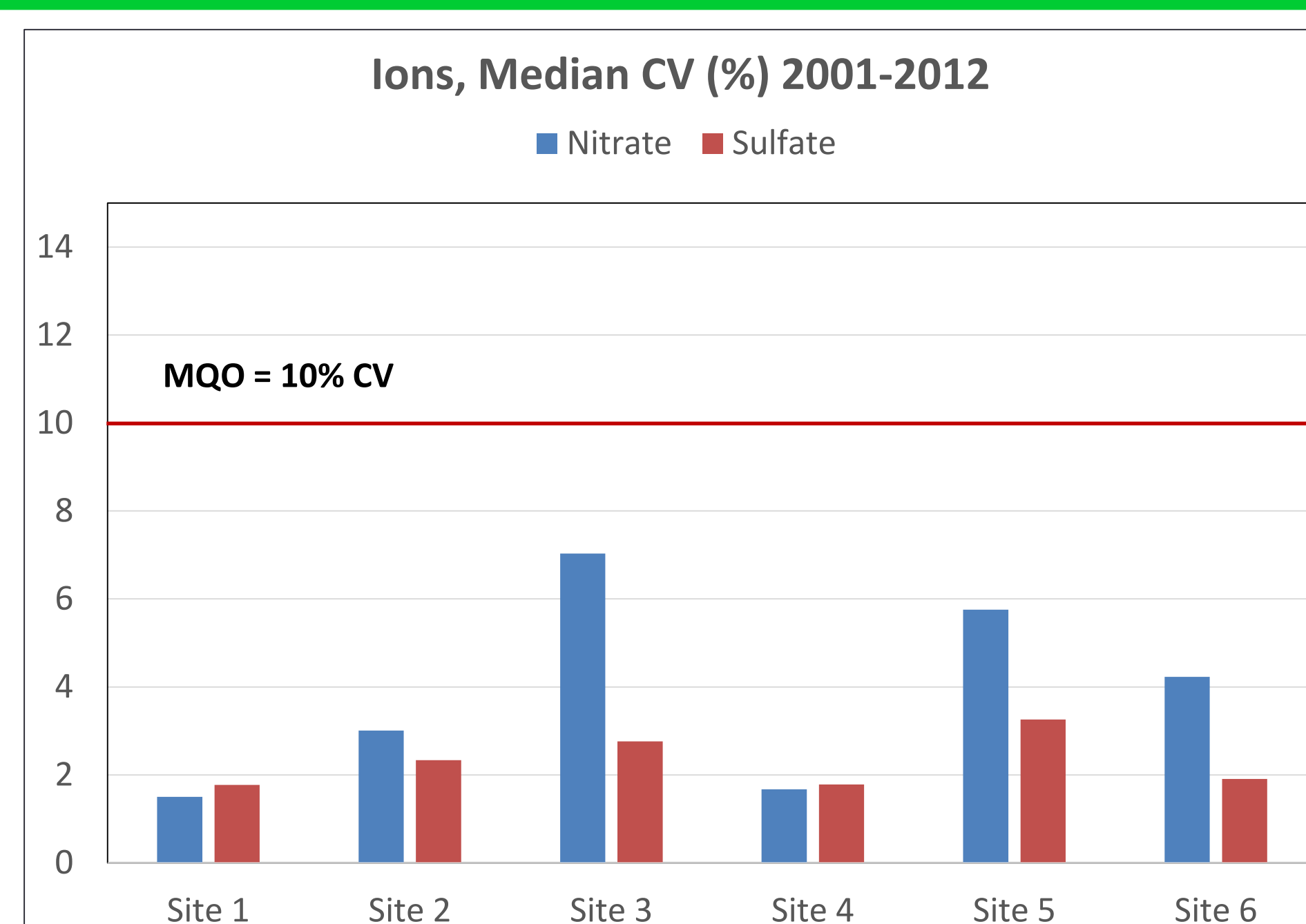
where  $X_i$  and  $Y_i$  are the primary and collocated sampler measurements, respectively, for the  $i^{th}$  pair of measurements. Both  $X_i$  and  $Y_i$  needed to be detected in order for the RPD to be calculated.

The percent CV was calculated as the absolute value of RPD divided by the square root of two:

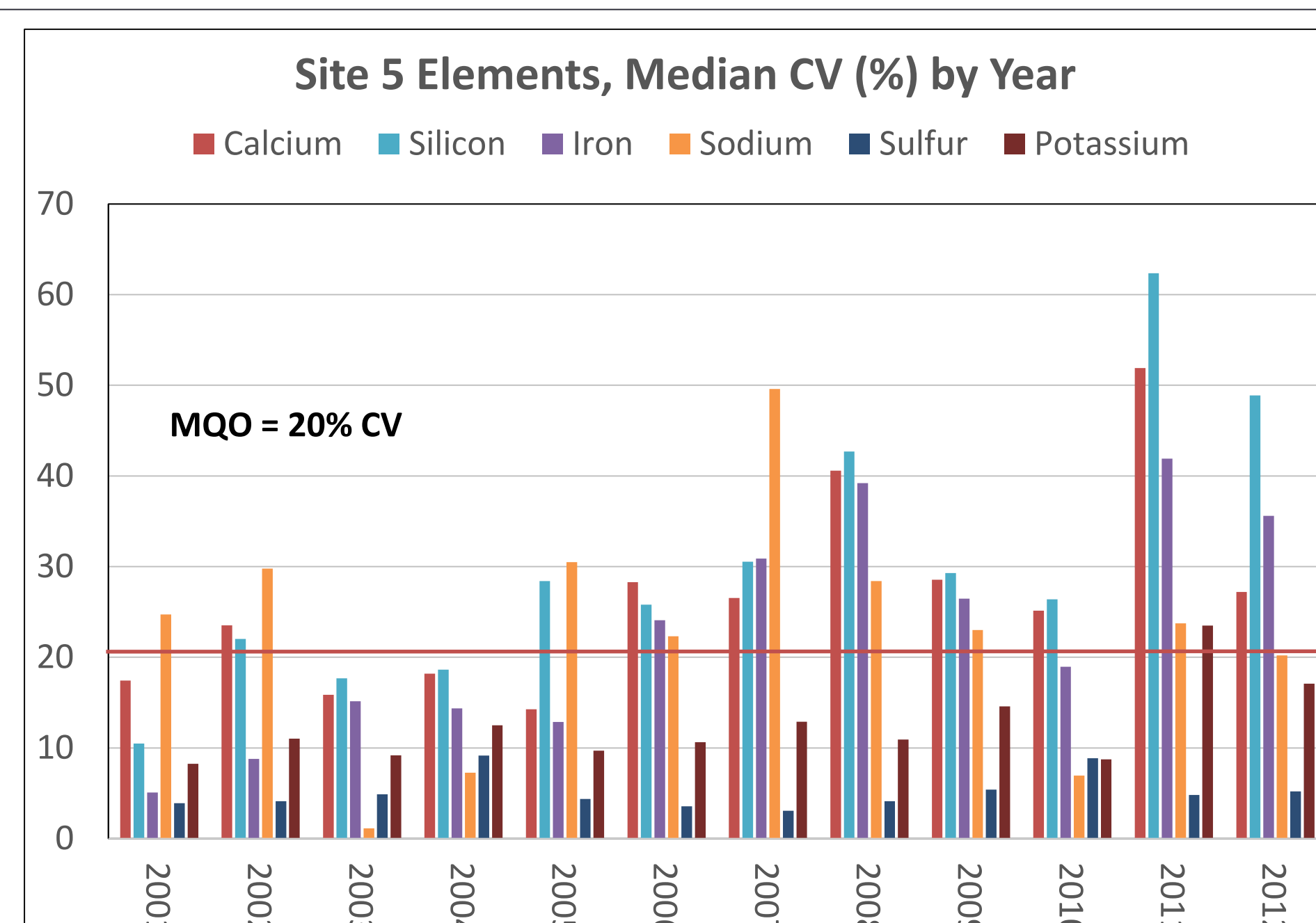
$$CV_i = \frac{|RPD_i|}{\sqrt{2}}$$

The square root of two in the denominator represents the two measurements entered into the calculation of RPD.

## RESULTS

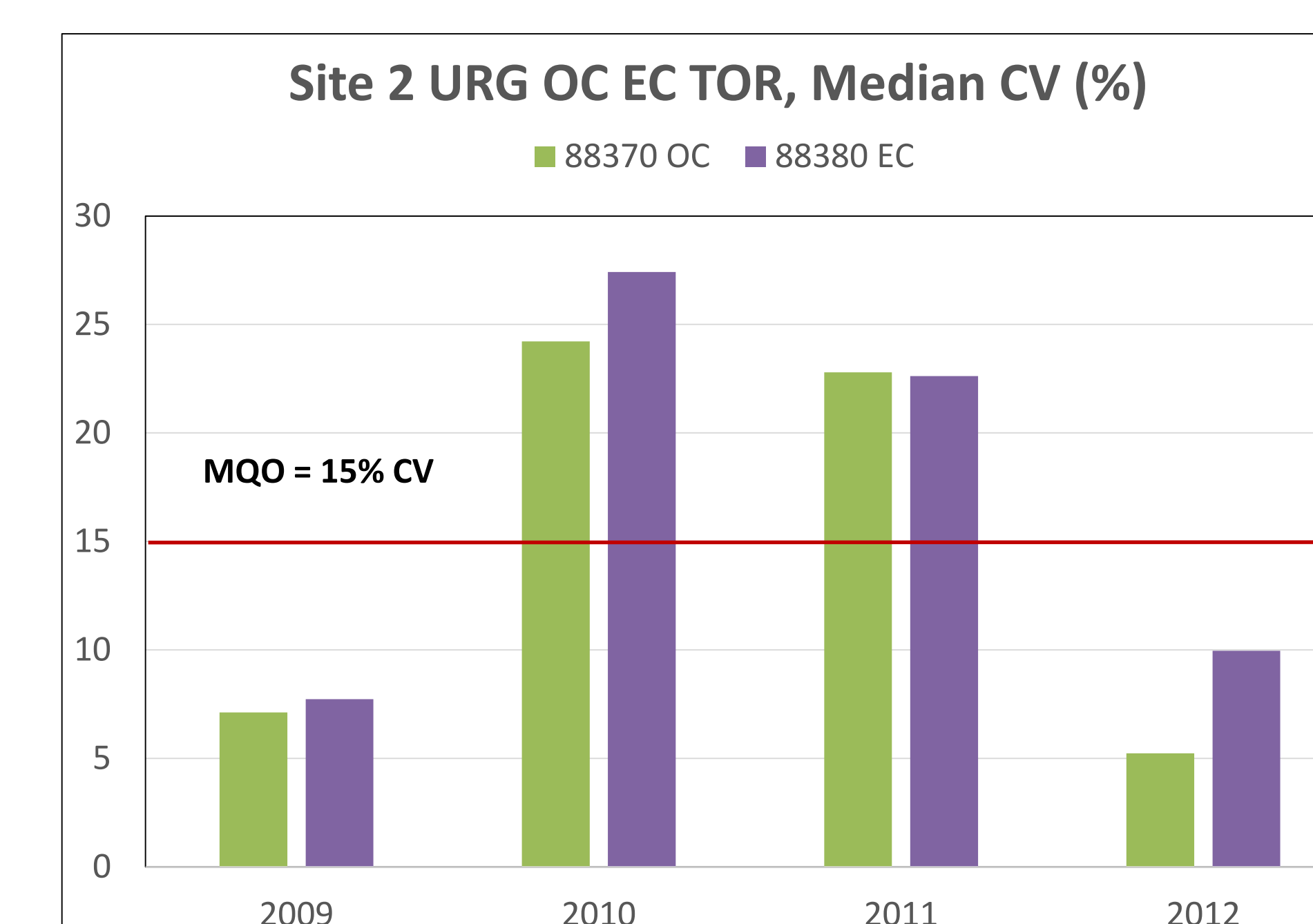
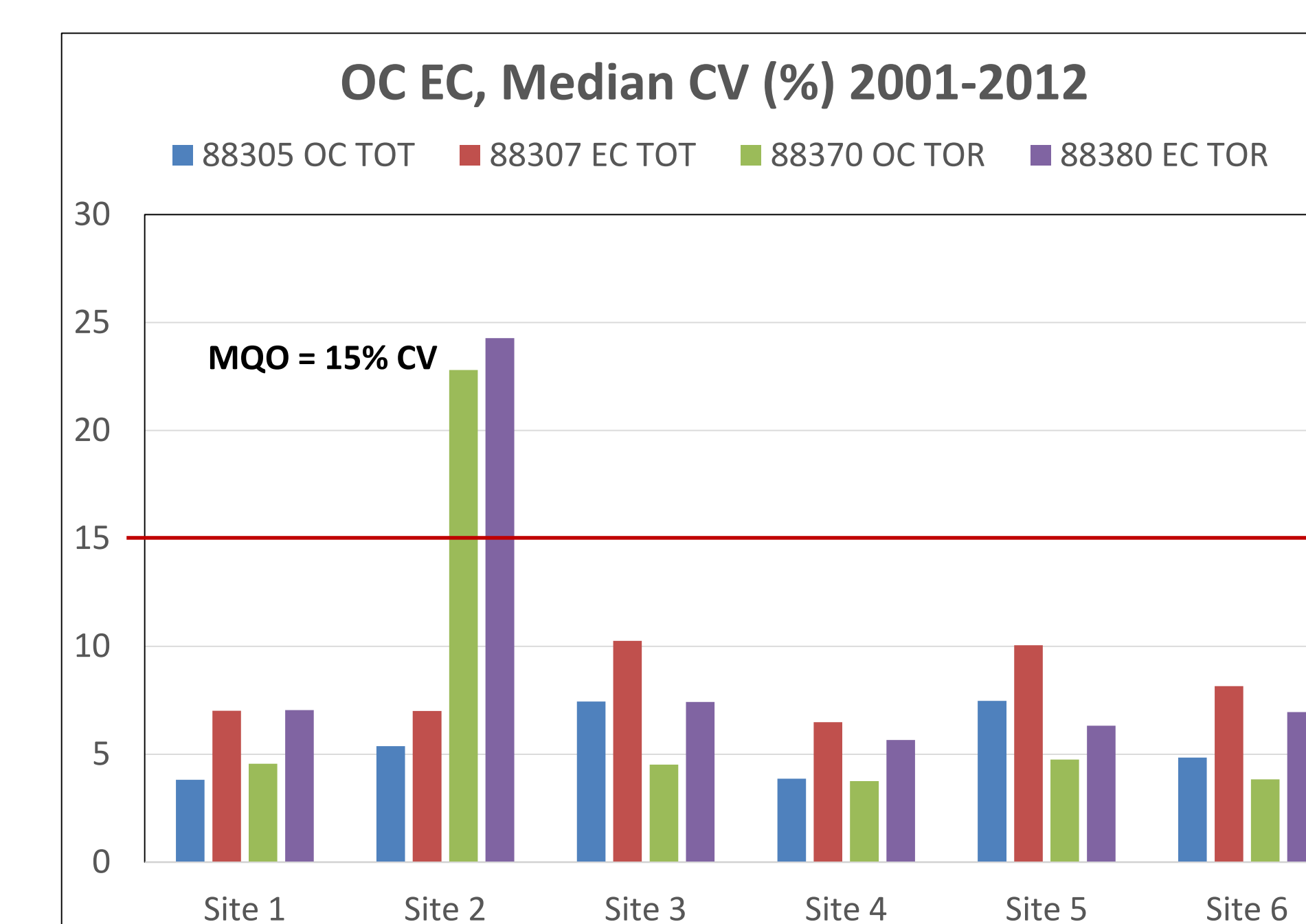


All sites, except Site 5 meet the MQO for elements. The monitoring agency for Site 5 has been contacted. Precision for Site 5 by year is provided in the chart below.



## RESULTS

All sites met the MQO for OC/EC except Site 2. The State/Local monitoring agency for Site 2 was contacted. The reason for Site 2 precision data outside the target MQO for OC/EC was due to flow control issues with the collocated sampler. The sampler was replaced in 2012.



## CONCLUSIONS

CSN precision MQO goals for elements, ions, and carbon are achievable when both the primary and collocated samplers are well maintained and operating properly. Assessments of precision can help identify potential sampler issues.

All sites met the MQO for ions.

Site 2 did not meet the MQO for OC/EC (2010-2011) and the issue identified by the State/Local monitoring agency was related to flow control issues with the collocated sampler. The sampler was replaced and subsequent results met the MQO.

All but one site met the MQO for elements. Precision for Ca, Si, Fe, and Na at collocated CSN site 5 do not meet the 20% CV MQO for elements.

Recommendations include:

- Evaluating precision MQOs annually at all of the CSN collocated sites.
- Reporting quarterly flow audit data for both the primary and collocated sampler to the EPA's Air Quality System (AQS) using the QA Transaction Generator (see EPA poster by Jenia Tufts).
- Moving the collocated sites to other locations within the network to assess precision at other locations in the network.