TECHNICAL MEMORANDUM

TO: Jim Homolya / OAQPS

FROM: Michael S. Clark / NAREL

COPY: Dr. R.K.M. Jayanty / RTI

AUTHOR: Jewell Smiley / NAREL

DATE: March 16, 2004

SUBJECT: Performance Evaluation - RTI Laboratories [amended report]

Introduction

This report is a modification of the original report dated December 30, 2003. This report contains extra information regarding the carbon analysis. The new information will be explained later within the carbon section of this report.

This study was conducted as part of the QA oversight for the $PM_{2.5}$ Speciation Trends Network (STN). The purpose of this study was to evaluate specific laboratory performance at the Research Triangle Institute (RTI). RTI is the prime contractor responsible for the analysis of air samples collected by the STN.

Performance Evaluation (PE) samples were prepared at the National Air and Radiation Environmental Laboratory (NAREL) and submitted to RTI for analysis. The PE samples consisted of the following components.

- Gravimetric Mass Analysis - ten Teflon® filter samples and two metallic weights
- Ion Chromatography (IC) Analysis - six Nylon® filter samples, three anion spike solutions, and three cation spike solutions
- Carbon by Thermal Optical Analysis (TOA) - five quartz filter samples and three spike solutions for analysis using the STN method and also five quartz filter samples for analysis at the Desert Research Institute (DRI) using the method approved by the Interagency Monitoring of Protected Visual Environments (IMPROVE) program
- Elemental analysis by X-Ray Fluorescence (XRF) - ten Teflon® filter samples for analysis using local instruments and also five Teflon® filter samples for analysis by the subcontracted laboratory

Detailed instructions for analyzing and reporting the PE samples were provided to RTI. The analytical facilities at NAREL are similar to those at RTI, and most of the PE samples, or replicates of the PE samples, were also analyzed at NAREL. This report will discuss the analytical results reported by RTI and will compare most of the results to an expected value.

Mass determination typically proceeds by weighing the Teflon® collection filter before and after the sampling event. The amount of Particulate Matter ($PM_{2.5}$) captured onto the surface of the filter can be calculated by a simple subtraction of the tare mass from the loaded filter mass. RTI routinely provides clean pre-weighed air filters to the various field sites within the network. At the field site, an approved sampling device must be used to deposit the $PM_{2.5}$ onto the collection filter. The filter is then returned to RTI where the gravimetric analysis is completed. After the gravimetric measurements are complete, the Teflon® filter is examined further using XRF to determine the elemental composition of the filter deposit.

RTI also provides clean Nylon® filters to the various field sites. The Nylon® filter is used to capture $PM_{2.5}$ for subsequent IC analysis. After the loaded filter is returned to the laboratory, the IC analysis typically proceeds by first extracting the filter using an appropriate solvent. The extract must be analyzed using an IC instrument that is optimized to determine the ions of interest. Target anions and target cations must be analyzed on separate IC instruments.

RTI routinely provides clean quartz filters to the various field sites. The quartz filter is used to capture $PM_{2.5}$ for subsequent carbon analysis. A thermal/optical technique is used at RTI to determine the carbon present on the quartz filter. A carefully measured portion of the quartz filter is placed into a special oven equipped to shine a laser at the sample. The technique requires heating the quartz filter material to release captured $PM_{2.5}$. Carbon components released from the filter are swept through the oven by a controlled purge gas. The carbon released from the filter is catalytically converted to methane and measured by a flame ionization detector (FID) positioned at the end of the sample train. A thermogram produced by the analysis contains signals from the FID and from the laser. Interpretation of the thermogram provides results for the organic carbon (OC) and the elemental carbon (EC) the sum of which represents the total carbon (TC) present in the sample. A new contract which became effective in July makes RTI responsible for two slightly different methods of carbon analysis: the STN method and the IMPROVE method. RTI currently performs the STN method using local instruments, but has subcontracted DRI to perform the IMPROVE analysis. A more detailed description of the two methods will be provided later in this report.

Gravimetric Analysis

Ten new filters and two metallic weights were supplied by NAREL for this study. These samples were placed into individual petri slides and shipped by overnight mail to RTI with instructions to determine the tare mass of each sample using standard procedures. After tare measurements were completed at RTI, the filters and metallic weights were returned to Montgomery and immediately placed into the weighing chamber at NAREL for equilibration and determination of a stable tare mass. Shortly after NAREL's tare measurements were complete, seven of the ten filters were loaded with $PM_{2.5}$ captured from the Montgomery air. A Met One SASS air sampler was used to load seven of the filters, and the remaining three filters were utilized as blanks. Following sample collection, the filters and the metallic weights were returned to the weighing chamber at NAREL and weighed multiple times over the course of several days to demonstrate a stable final mass. Finally, the ten filters and metallic weights were shipped back to RTI for their determination of the final mass. It is worth mentioning that the metallic weights were included in this study because they are generally less susceptible to weighing errors due factors such as electrical static and volatility of filter constituents.

Gravimetric Results

The results of this study are summarized in Figure 1. The critical information needed by the program is the mass of $PM_{2.5}$ deposited onto the surface of a collection filter, and therefore, $PM_{2.5}$ capture is plotted in Figure 1 for the seven loaded filters, three travel blanks, and two metallic weights.

Figure 1

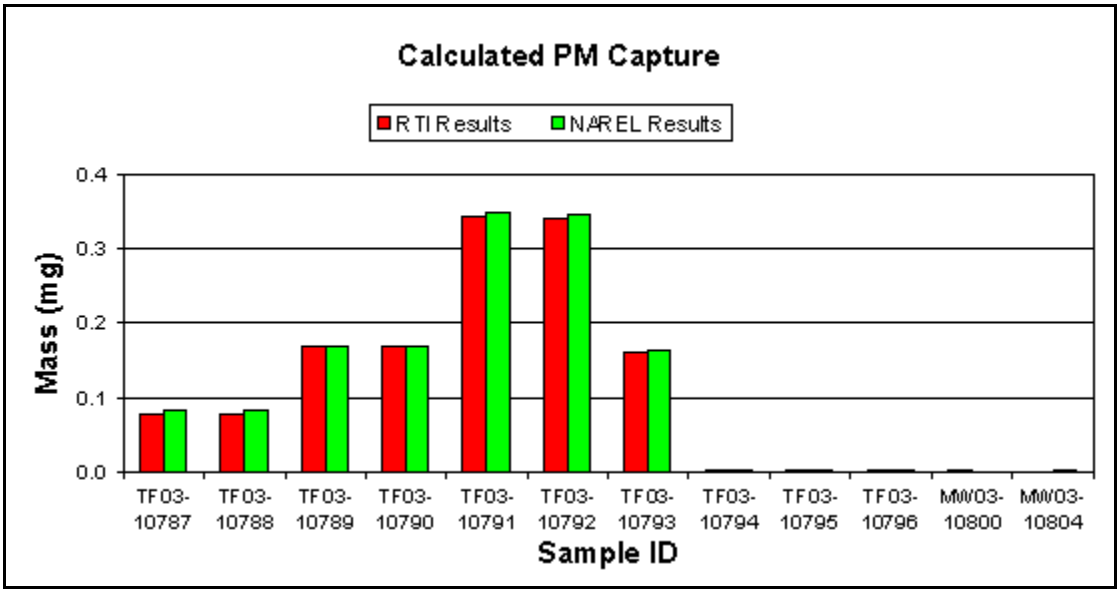
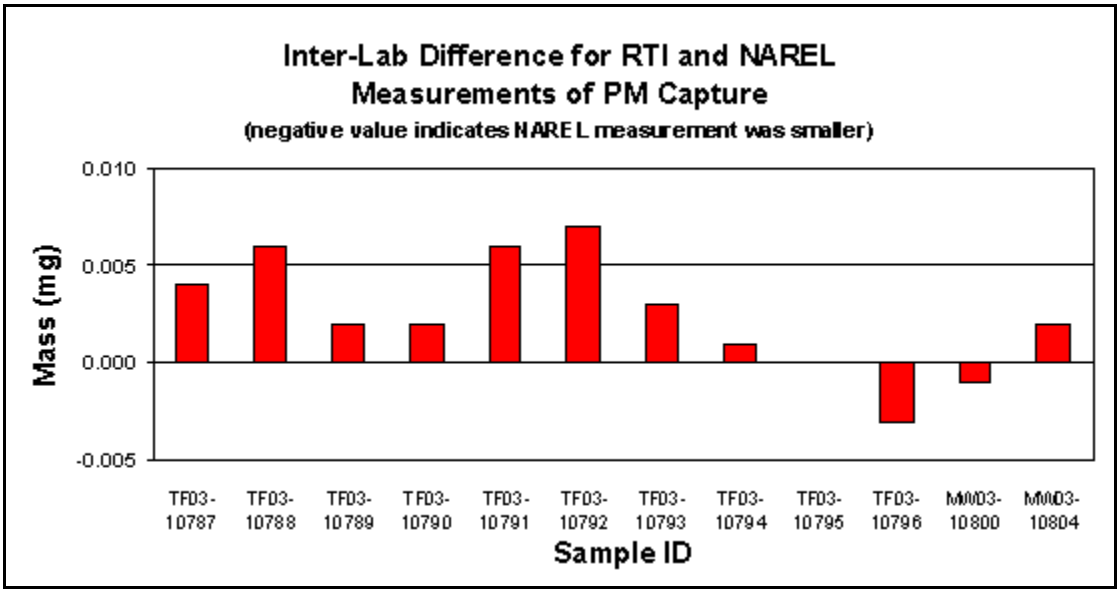


Figure 2 presents the inter-laboratory differences. Inter-laboratory differences were calculated by subtracting the $PM_{2.5}$ capture value determined at RTI from the capture value determined at NAREL. Notice that a negative bar on the Figure 2 graph represents a smaller $PM_{2.5}$ capture value determined at NAREL.

Figure 2



The raw data reported from both laboratories have been tabulated for easy viewing. At the end of this report, Table 1 includes the results of ten shared filters, two metallic weights, and one independent chamber blank weighed at each laboratory. Table 1 contains the tare weight, the final loaded weight, and the calculated $PM_{2.5}$ capture for each sample. Table 1 also contains the calculated inter-laboratory difference for measuring the $PM_{2.5}$ capture which is graphed in Figure 2.

RTI reported measurements made by several analysts, and since both laboratories weighed the samples several times, all of the mass measurements taken at RTI and NAREL are included in this report. The results presented in Figure 1 and Figure 2 are those reported for a single analyst at each lab. The only measurements presented in the graphs are those results in Table 1 that correspond to RTI Analyst #1. Only one set of measurements were selected for graphical presentation because usually only one set of measurements are available for a routine sample. By showing all of the measurements in the table, good precision can be seen among the different analysts at each lab. RTI's SOP for gravimetric mass measurements has been posted on the web for easy viewing (see reference 1).

IC Analysis

For this study, Nylon® filters and IC spike solutions were carefully prepared at NAREL and shipped to RTI for analysis. The SOP's used at RTI for the analysis of anions and cations are posted on the web for easy viewing (see reference 2 and reference 3).

A Met One SuperSASS sampler was used to load four replicate Nylon® filters with $PM_{2.5}$ captured from the Montgomery air during two separate collection events. Two replicate filters from each event were submitted to RTI for analysis along with two blank Nylon filters. Replicate filters were retained at NAREL for in-house analysis. Six IC spike solutions were also prepared at NAREL. Each solution was designed for dilution by a factor of ten using reagent water available at the receiving laboratory. After dilution to full volume, each spike solution was utilized as the solvent to extract a clean blank filter also provided by the receiving laboratory. The filter extracts were analyzed using appropriate IC instrumentation available at the receiving laboratory. The results reported for each sample were based upon the concentration of analyte present in the final extract.

The six Nylon® filters submitted to RTI consisted of two replicates from a 144-hour collection event started on July 18, two replicates from a 144-hour collection event started on August 13, and two filter blanks. No information was given to RTI regarding the history of these filters. Three of the six IC spike solutions were prepared for analysis of the anions, and three solutions were prepared for the analysis of cations. These solutions were designed to offer a mid-level concentration, a low-level concentration, and a blank for each analyte. Replicates of all samples were analyzed at NAREL following the same instructions provided to RTI.

IC Results

Results for the mid-level IC spikes are presented as a bar graph in Figure 3. For each analyte, the mid-level concentration of the fully diluted spike solution was between 1 and 4 µg/mL. Figure 3 presents the expected result, the RTI result, and the NAREL result for each analyte.

Results for the low-level spikes are presented as a bar graph in Figure 4. For each analyte, the low-level concentration of the fully diluted spike solution was between 0.1 and 0.4 µg/mL. Since the concentrations presented in Figure 4 are low, an extra bar was added to this graph showing the Method Detection Limit (MDL) reported by RTI. The results from the IC spike solutions are summarized in Table 2 at the end of this report.

Results of four replicate air samples are presented in Figure 5 and Figure 6. Two of these replicates were submitted to RTI for analysis, and the remaining two replicates were extracted and analyzed at NAREL. Sulfate and ammonium were the most abundant analytes captured from the Montgomery air during this [July 18] sampling event, and these ions are plotted in Figure 5. Notice that concentration units have changed from the previous figure, and the new units are micrograms of ion captured per cubic meter of air sampled.

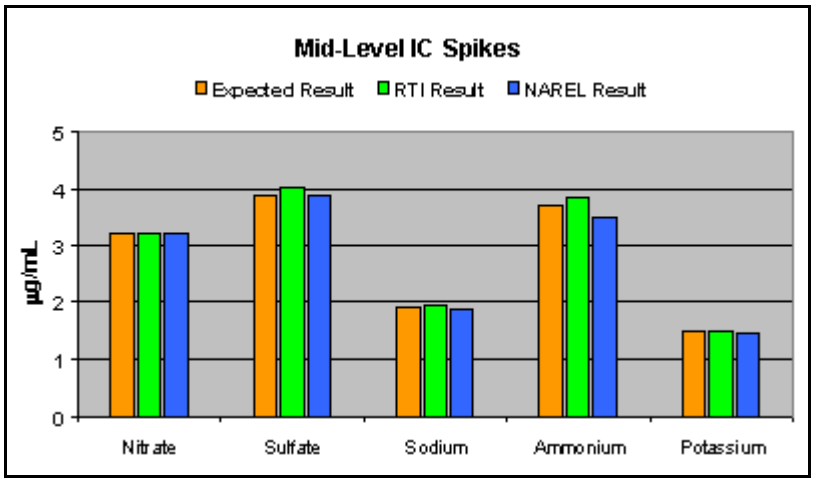


Figure 3

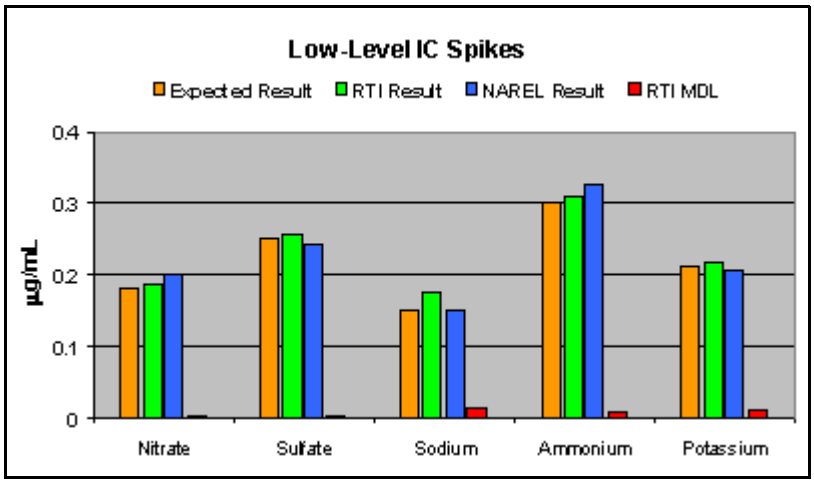


Figure 4

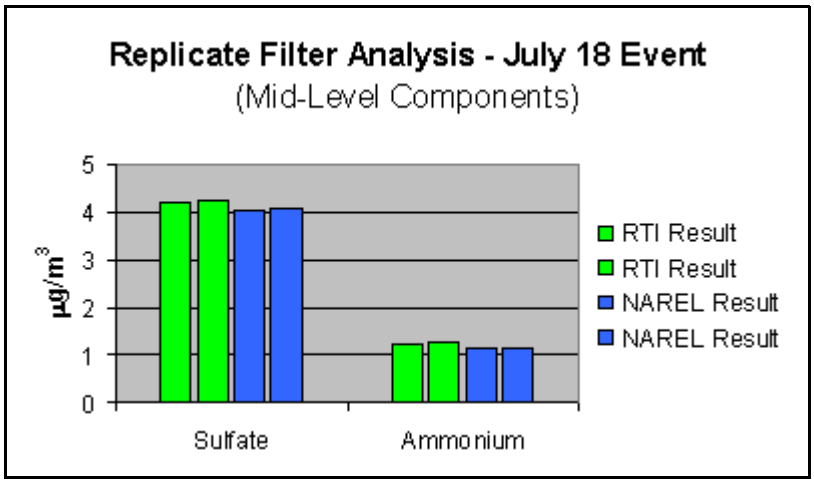


Figure 5

Nitrate, sodium, and potassium were present in the air at relatively low levels, and these three ions are plotted in Figure 6. Since the concentrations presented in Figure 6 are low, an extra bar was added to this graph to show the reported MDL.

Figure 7 and Figure 8 show the results from replicate samples that were collected on August 13. Two of the replicates were analyzed at RTI, and two were extracted and analyzed at NAREL. The sulfate and ammonium are plotted together again in Figure 7. The nitrate, sodium, and potassium were present in the air at relatively low levels again, and they are plotted together in Figure 8.

All of the results from the loaded Nylon® filters are presented in Table 3 and Table 4 at the end of this report.

Four blank Nylon® filters were also analyzed during this study. Both labs reported very low contamination of nitrate and sulfate for at least one of the blank filters, and very low sodium was also reported for one filter. But no serious contamination was reported by either laboratory for any of the blanks. The results from analysis of the blank Nylon® filters are presented in Table 5 at the end of this report. All of the Nylon® filters used for this study were pre-cleaned at NAREL, and the cleaning batch was tested before use.

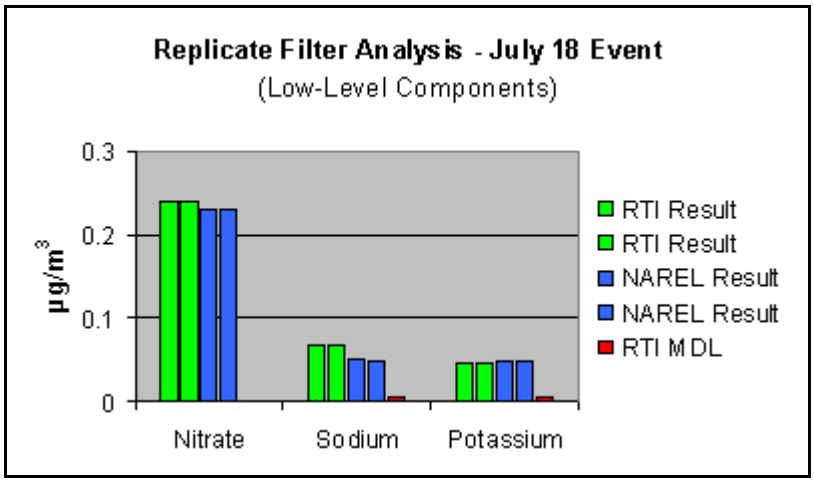


Figure 6

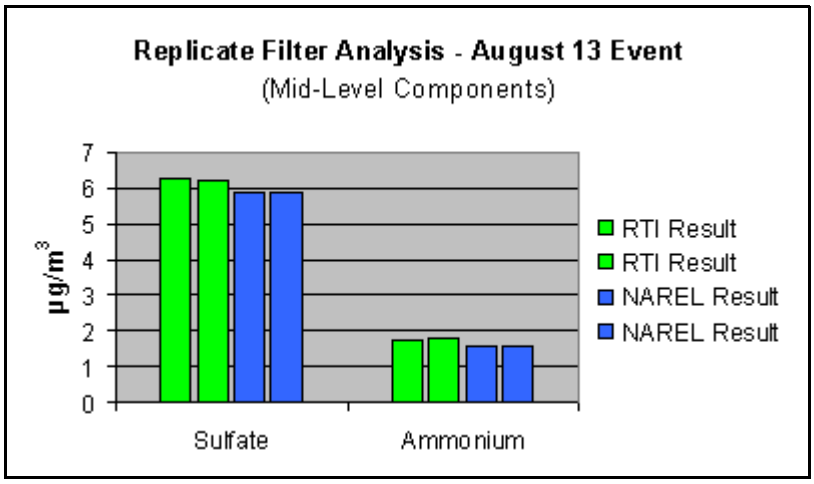


Figure 7

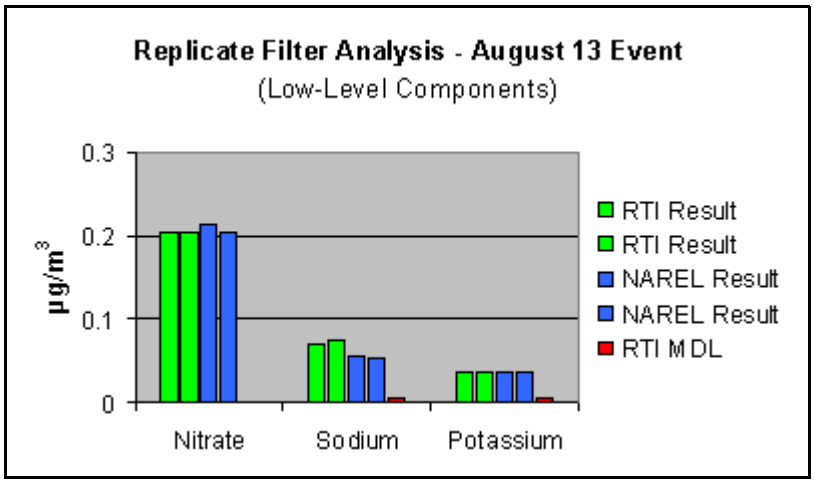


Figure 8

Carbon Analysis

For this study, quartz filters and spike solutions were carefully prepared at NAREL and shipped to RTI for analysis. Met One SuperSASS samplers were used to load several quartz filters with $PM_{2.5}$ captured from the Montgomery air. Two sets of five filters [ten filters] were submitted to RTI for analysis. A request was made to analyze the first set of filters using all three of the local Sunset instruments which were set up to perform the STN analytical method. Because multiple analyses were requested for each filter, the STN analysis was performed using a small 1-cm^2 punch size. The second set of filters were analyzed using the IMPROVE analytical method as it is performed by RTI's subcontractor, DRI. A request was made to analyze each filter in the second set using two different instruments at DRI. No information was given to RTI regarding the history of the quartz filters, and therefore RTI was not told that the two sets of five filters were identical and that each set of filters contained hidden replicates and a blank.

Three TOA spike solutions were also prepared at NAREL. One solution was blank water, one solution provided a mid-level concentration of sucrose, and one solution contained a mid-level concentration of potassium hydrogen phthalate (KHP). No information was given to RTI regarding the composition of the TOA spike solutions. The instructions for spiking and analyzing each solution are repeated here.

> *Pre-clean a standard-size punch from a blank quartz filter using the TOT instrument oven program. After the punch has cooled carefully spike 10.0 µL of the PE solution onto the clean quartz punch. Allow the solvent to evaporate from the punch, and then analyze the punch. This procedure should be similar to the daily and weekly calibration checks using a known concentration of sucrose.*

The final results from RTI were reported as mass of carbon per square centimeter of filter material ($\mu g/cm^2$). Raw data from all of the carbon PE samples were also supplied to NAREL.

Carbon Results

Results for the blind sucrose spike solution are presented as a stacked bar graph in Figure 9 on the next page. This spike solution was analyzed using four Sunset instruments: three at RTI and one at NAREL. All four instruments were set up to run the same [STN] method. Results calculated for the four thermal organic carbon fractions (OC1, OC2, OC3, OC4), pyrolytic carbon (PyrolC), and elemental carbon (EC) are shown as bar segments. The height of each bar represents the total carbon present in the sample. Figure 9 also shows a bar for the expected total carbon result. It can be seen that the between-instrument precision for total carbon is very good, but the agreement for some of the carbon fractions is poor. Sucrose spikes have been used at RTI historically to demonstrate instrument performance on a daily basis. Now that organic carbon fractions are being reported, sucrose spike analysis may no longer be a good standard for demonstrating the between-instrument precision. However, early evidence suggests that sucrose may offer worse between-instrument precision than routine field samples.

Results for the KHP spike solution are also presented in Figure 10 on the next page. Compared to sucrose, KHP shows better performance for the OC1 fraction, but OC4 shows more variability. Again there is good accuracy and good agreement among all instruments for the total carbon.

Figure 9

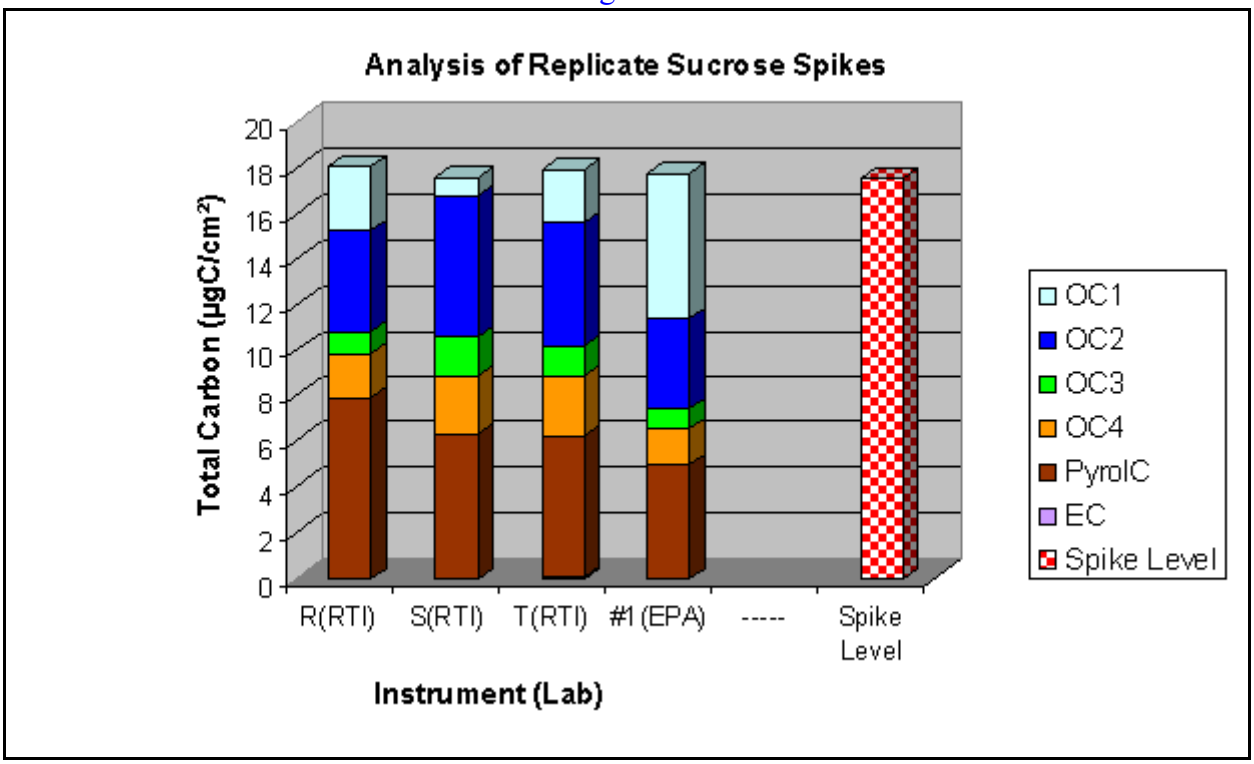
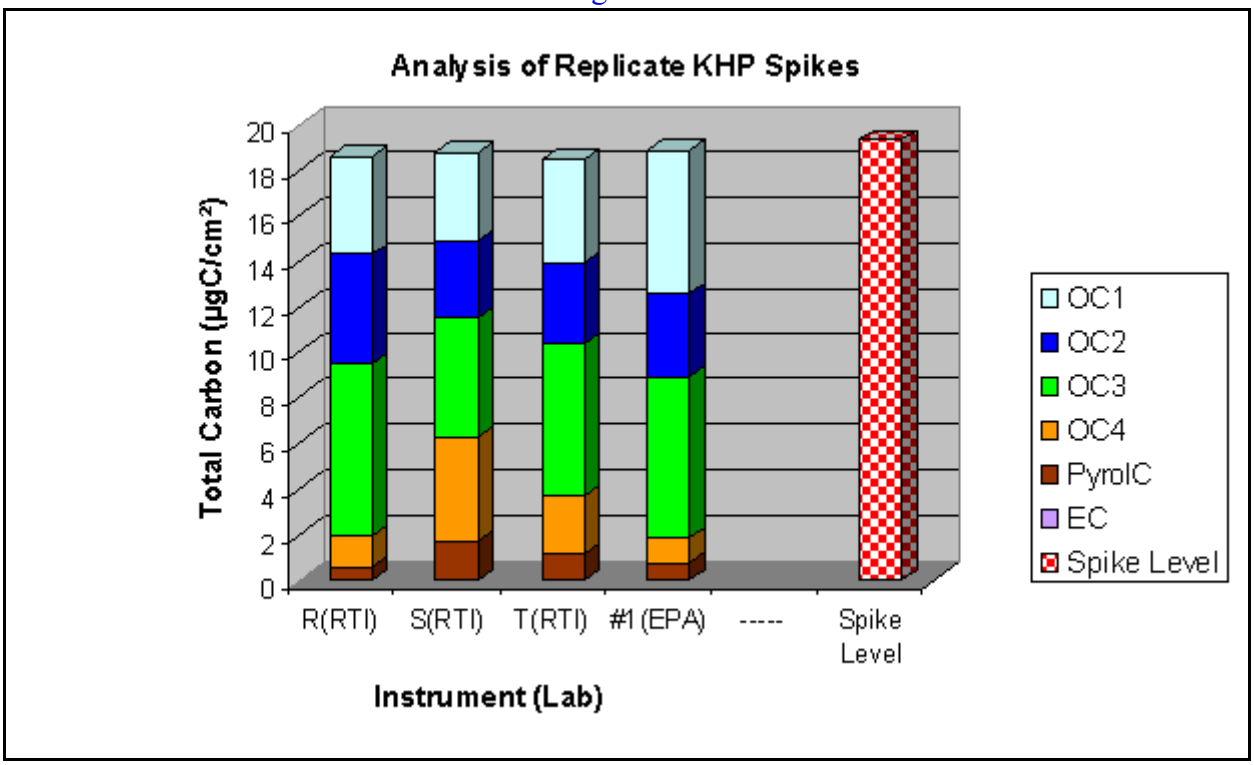


Figure 10



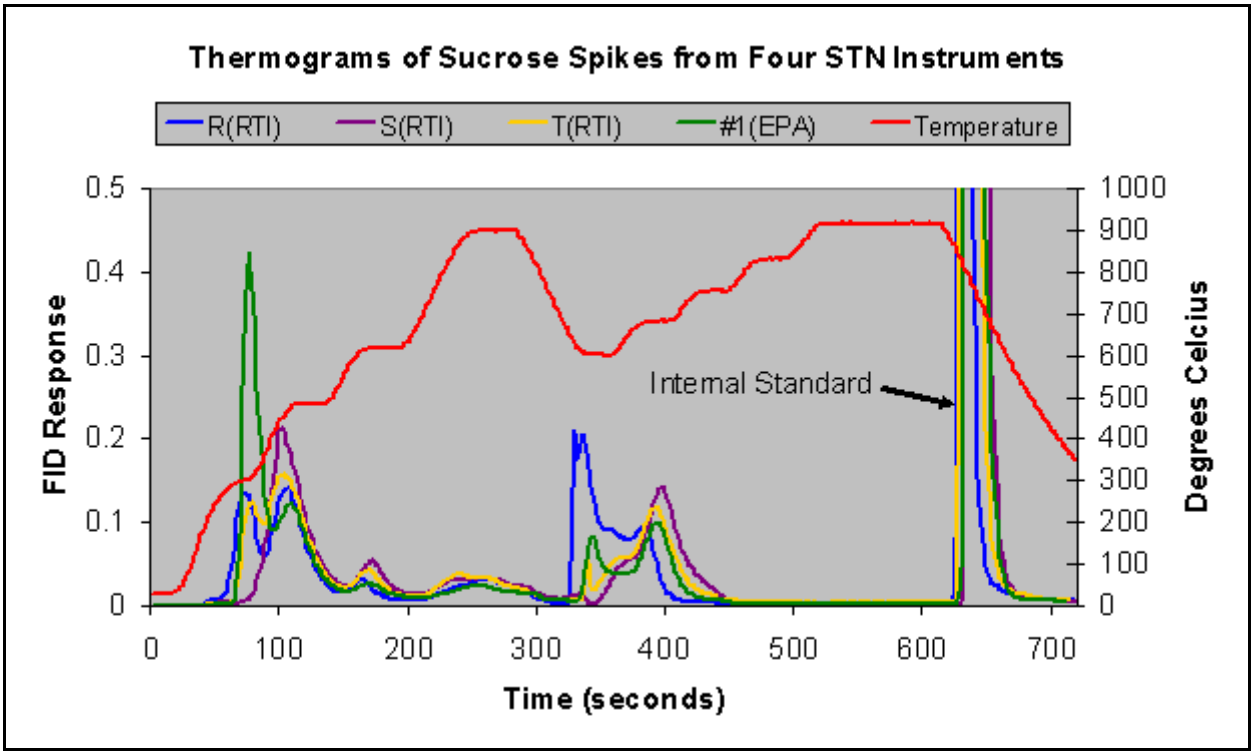


Figure 11

Thermograms of the sucrose spike solution are shown in Figure 11. The flame ionization detector (FID) signals have been positioned on the time axis after adjustments were made to account for the small differences in transit time among the four instruments. Furthermore, the FID intensities were normalized [using the internal standard response factor] to fit a single response scale. Only one temperature trace is shown, and it was produced by the EPA instrument. By plotting the raw data in this manner, some of the fundamental differences among the instruments can be seen.

Thermograms of the KHP spike solution are shown on the next page in Figure 12. KHP was included in this study because it is a source of carbon with chemical properties that are significantly different from sucrose, and it has been used to demonstrate instrument performance at NAREL for more than two years. KHP spikes do not create as much char as sucrose, and KHP is not as soluble in water. It should be stated that the KHP solution used for this study was prepared without adding strong acid to the aqueous solution. Experiments at NAREL have shown that adding even a small amount of hydrochloric acid to the KHP solution will alter the shape of the thermogram significantly as shown in Figure 13.

RTI's previous contract did not require reporting the OC fractions. Under the previous contract sucrose spikes fulfilled the need to demonstrate instrument performance for the parameters reported at that time. Now that OC fractions must be calculated, however, we may need a better standard to demonstrate that all instruments are producing comparable data.

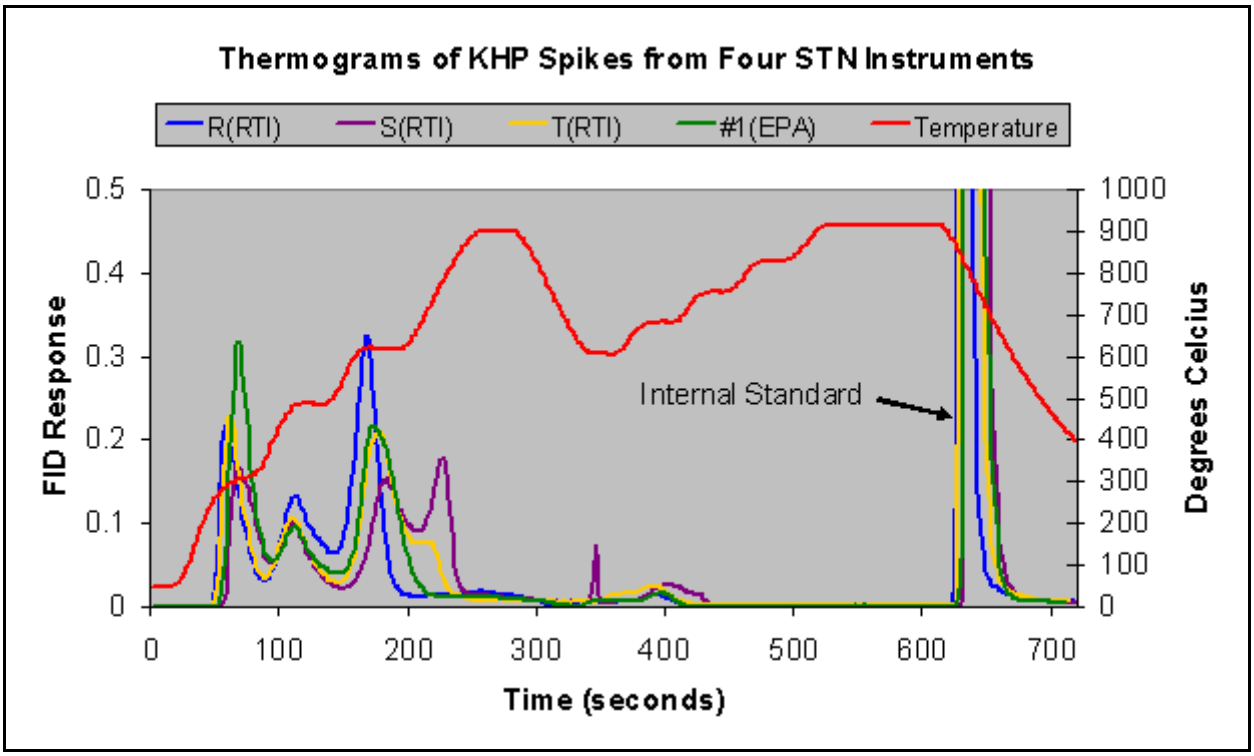
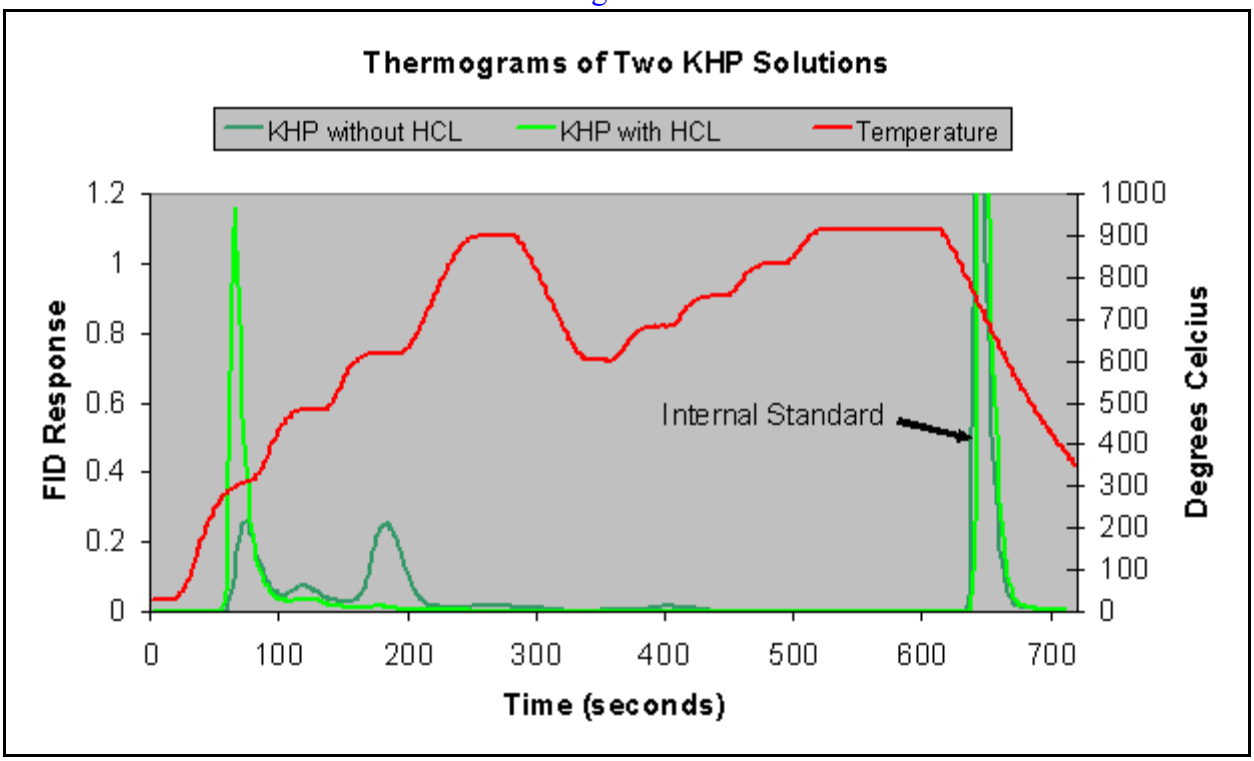


Figure 12

Figure 13

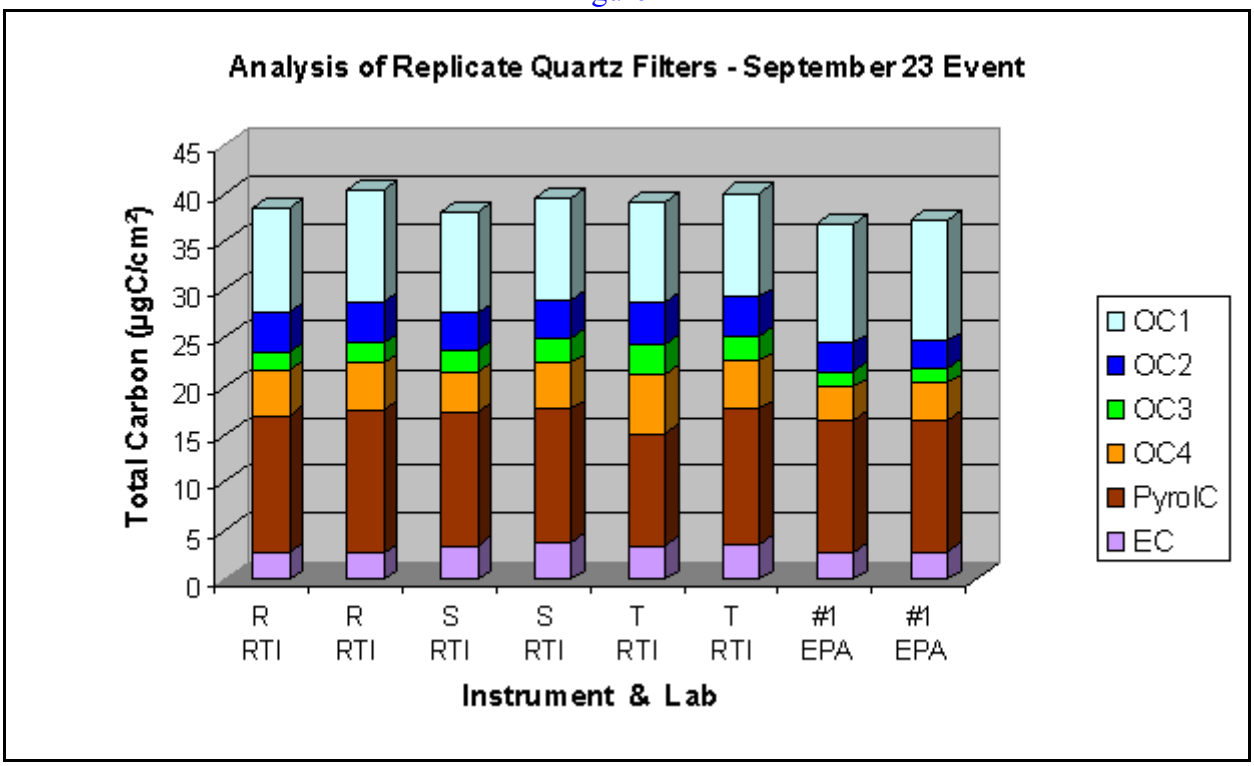


It may be useful to understand how the OC fractions are calculated. The fractions are not determined exclusively by the temperature program. Rather the placement of three division lines that separate the OC fractions [OC1 from OC2, OC2 from OC3, and OC3 from OC4] are determined by examination of actual thermograms for dips (or inflection points) in the FID signal during the non-oxidizing part of the analysis. What this means is that each instrument has a custom set of instructions for calculating the thermal fractions determined by experiment. Obviously the experiment should be repeated on a regular basis to validate the instrument performance. Currently the calibration checks are quantitatively evaluated only for the total carbon that is calculated from a sucrose spike or a KHP spike, and the uncertainty of measurement for each of the OC fractions has not been determined. The results from all of the PE spike solutions included in this study are available in Table 6 at the end of this report.

Several replicate quartz filters were loaded at NAREL during a 288-hour collection event which started on September 23. A longer-than-normal collection period was used to insure that the EC captured from the relatively clean Montgomery air was above the minimum detection level during the analysis. Results from four of the replicate filters are presented as a stacked bar graph in Figure 14. Two blind replicates (Q03-10870 and Q03-10871) were analyzed at RTI using all three of the instruments set up to perform the STN method. Two other replicates (Q03-10874 and Q03-10875) were analyzed at NAREL using the instrument identified as #1 (EPA). It can be seen that the between-instrument precision is much better for these filter samples than for the sucrose spikes and the KHP spikes.

Several more replicate quartz filters were loaded at NAREL during a 271-hour collection event which started on October 7. Results from four of these replicate filters are presented in Figure 15. Two blind replicates (Q03-10890 and Q03-10891) were analyzed at RTI, again using all three of the instruments set up to perform the STN method. Two other replicates (Q03-10894 and Q03-10895) were analyzed

Figure 14



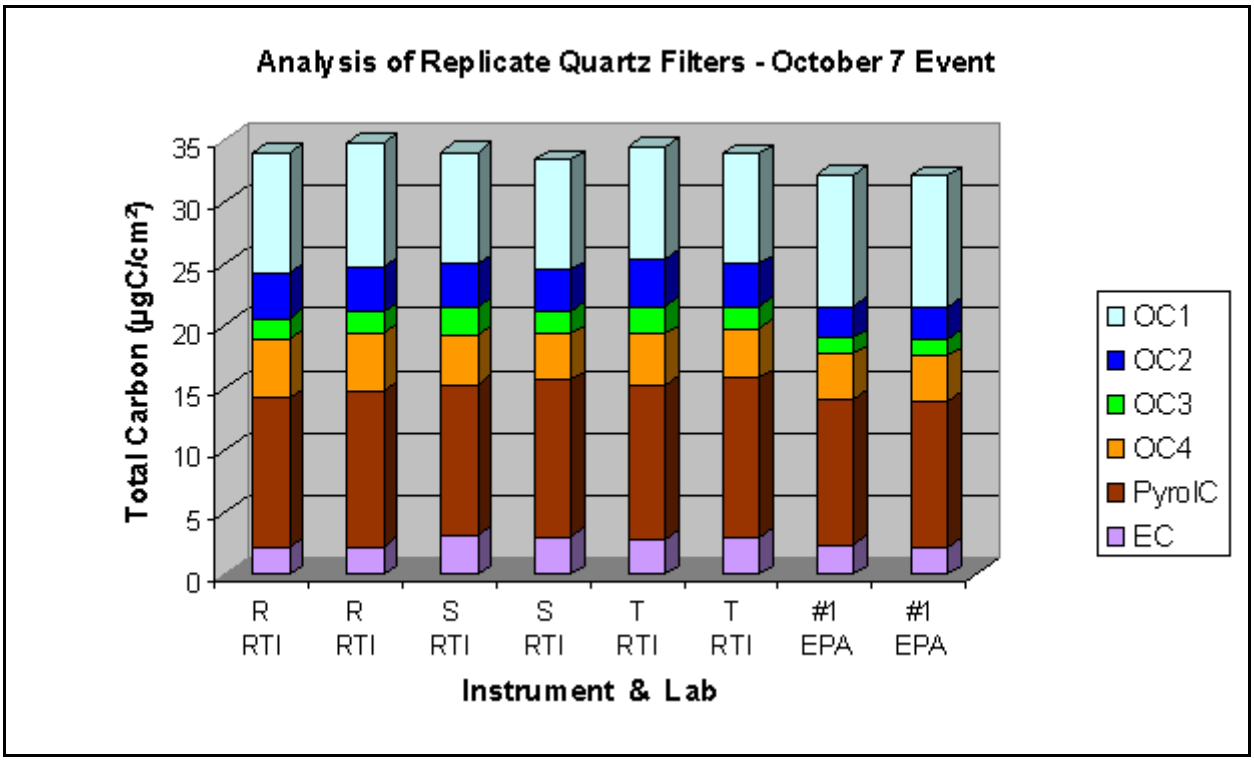


Figure 15

at NAREL using the instrument identified as #1 (EPA). Reasonably good precision was observed again for the October 7 filter replicates.

Some of the filter replicates from September 23 and from October 7 were analyzed at DRI using instruments set up to perform the IMPROVE method. DRI first reported results from two of their new Model 2001 instruments, and these early results were included in the original [December 30th] report of this PE study. After the original report had been posted, however, EPA decided to request additional analyses of the PE filters at DRI using the older instrumentation. This request was made because the Model 2001 instrument has not yet been fully approved for the analysis of IMPROVE samples. This amended report not only includes the PE results reported earlier from two of the Model 2001 instruments (DRI #6 and DRI #8) but also includes more recent results produced by two of DRI's older instrument (DRI #1 and DRI #2).

The Model 2001 instrument is designed to shine a laser at the sample and simultaneously monitor the transmitted as well as the reflected light. The older instruments could not monitor the transmitted light, and the analysis was based upon Thermal Optical Reflection (TOR). The Model 2001 instrument can calculate an OC/EC split point based upon the reflected light – the TOR analysis – or based upon the transmitted light – the TOT analysis.

Results from DRI are shown as stacked bar graphs in Figure 16 through Figure 19. The bar segments show the OC and EC components of the total carbon but do not show the more detailed fractions. Figure 16 shows the IMPROVE / TOR results from two of the September 23 replicates (Q03-10872 and Q03-10873) analyzed at DRI. Figure 16 also contains the STN results presented earlier in Figure 14. It is important to realize that all of the results in Figure 16 are from September 23 replicate filters.

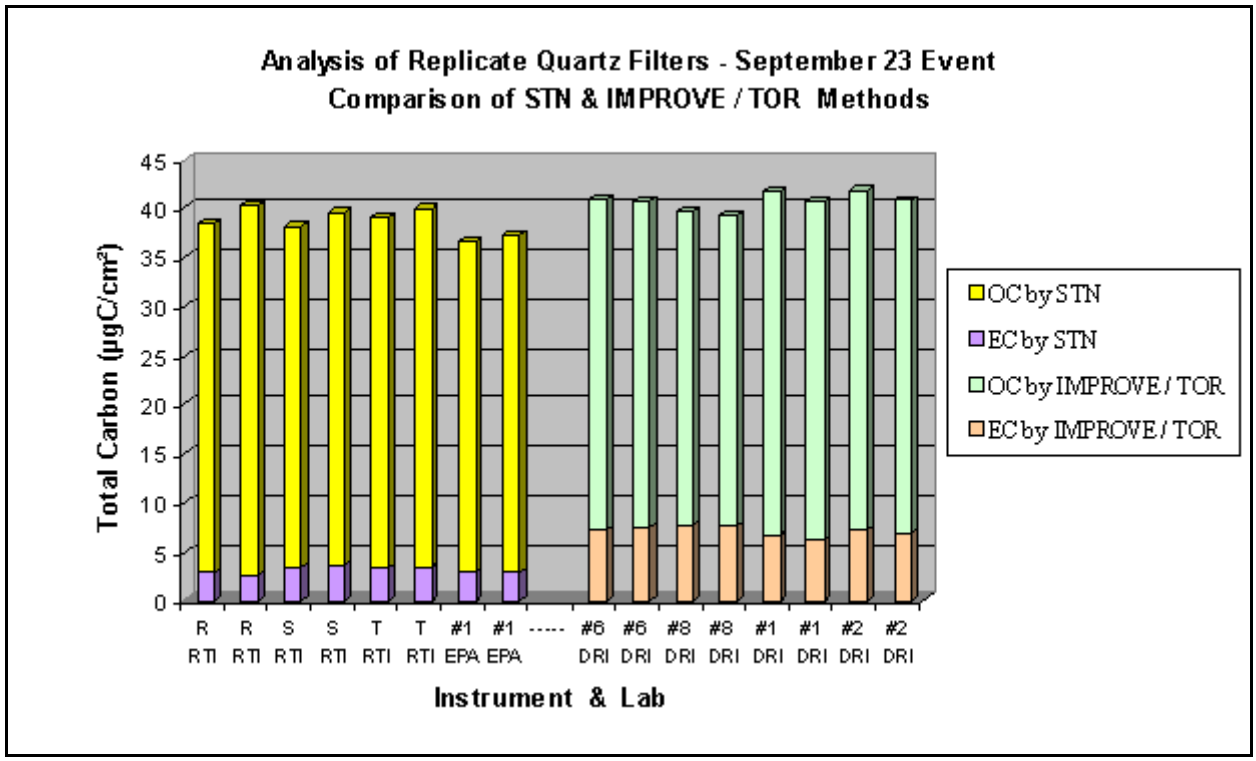


Figure 16

Figure 17

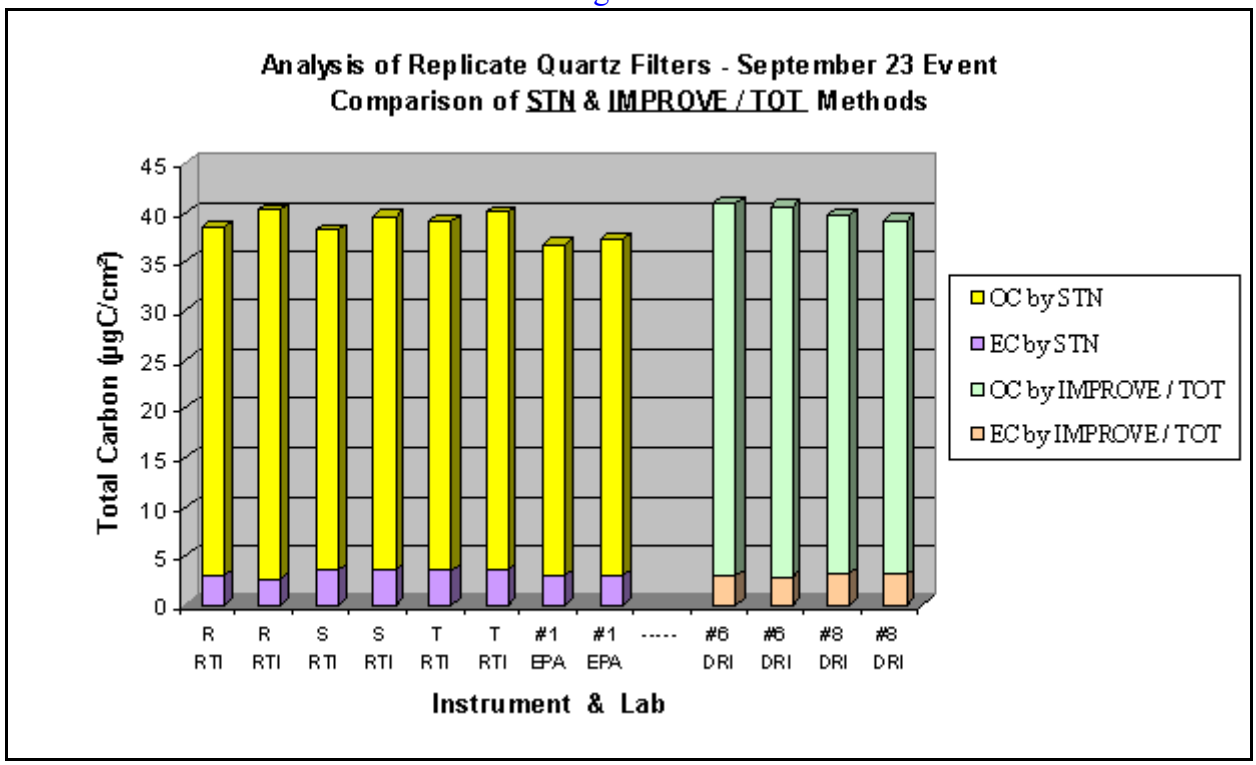


Figure 17 shows the IMPROVE / TOT results for the same samples. Results from DRI #1 and DRI #2 instruments are not shown in Figure 17 because the older model of instrument does not have TOT capability. It is very interesting to see that IMPROVE results based upon a TOT split point agree very well with the STN results, but the IMPROVE / TOR results [shown in Figure 16] contain EC values that are twice as large as the STN results. This observation should not be overlooked! For years the OC/EC community has been aware of comparability issues related to the STN and the IMPROVE programs. Results from this study may provide valuable insight.

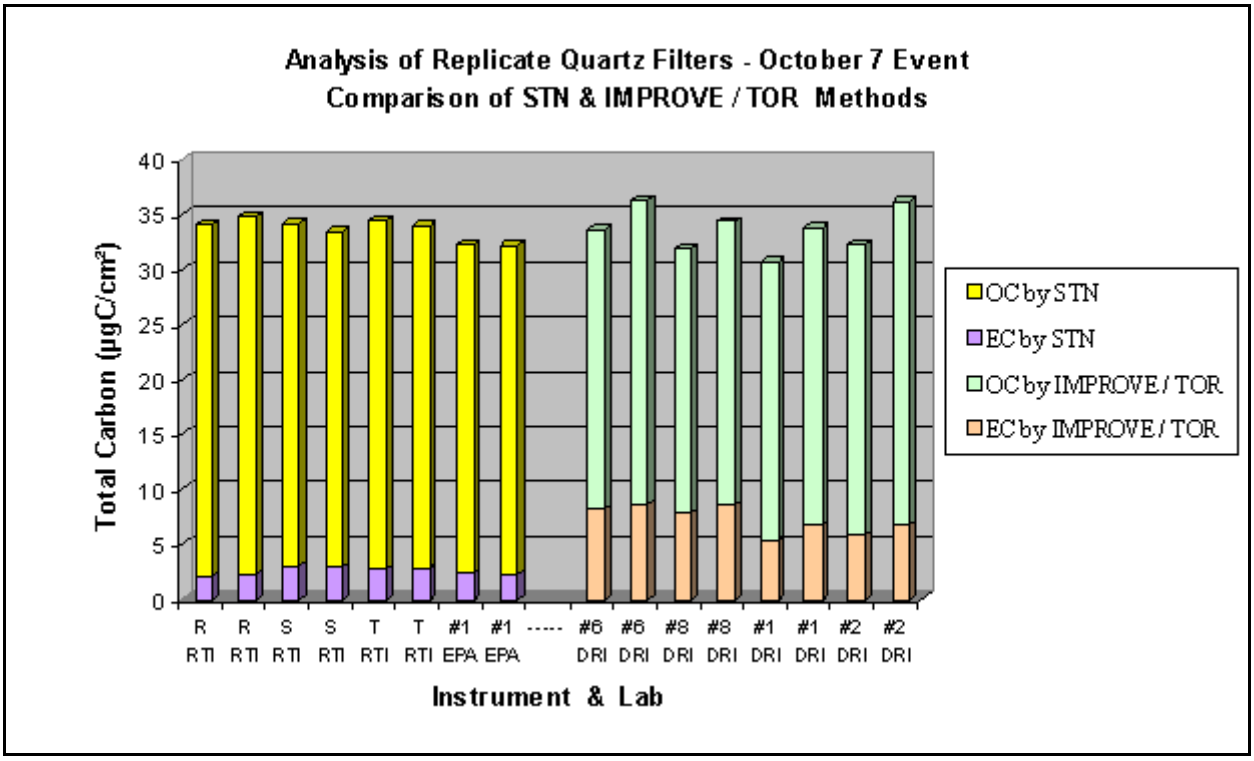


Figure 18

Figure 18 shows more IMPROVE / TOR results from two replicates (Q03-10892 and Q03-10893) analyzed at DRI. Figure 18 also contains the STN results from October 7 samples presented earlier in Figure 15. Again, it is important to realize that all of the results in Figure 18 are from October 7 replicates: two replicates were analyzed at RTI, two replicates were analyzed at EPA, and two replicates were analyzed at DRI.

Figure 19 on the next page shows the IMPROVE / TOT results for the same samples. As one might expect, the results in Figure 19 for the October 7 event, are very similar to those shown in Figure 17 for the September 23 event.

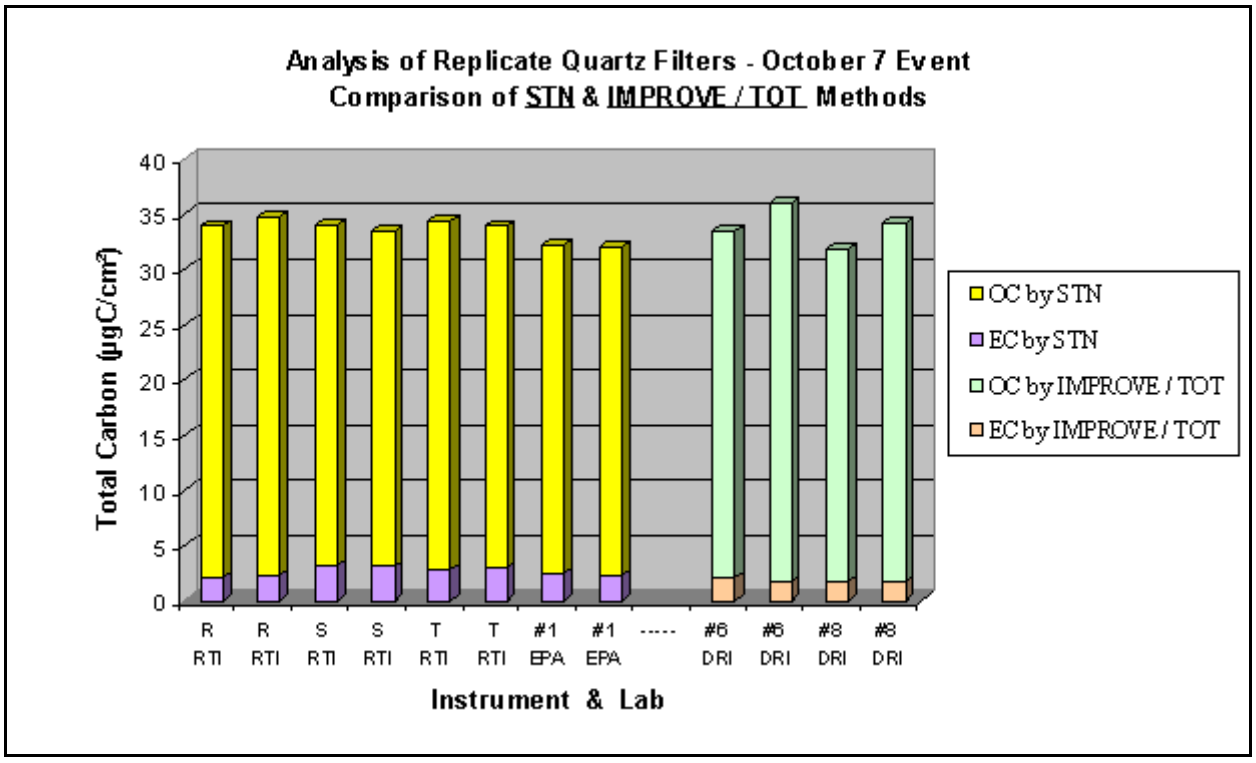


Figure 19

Figure 20

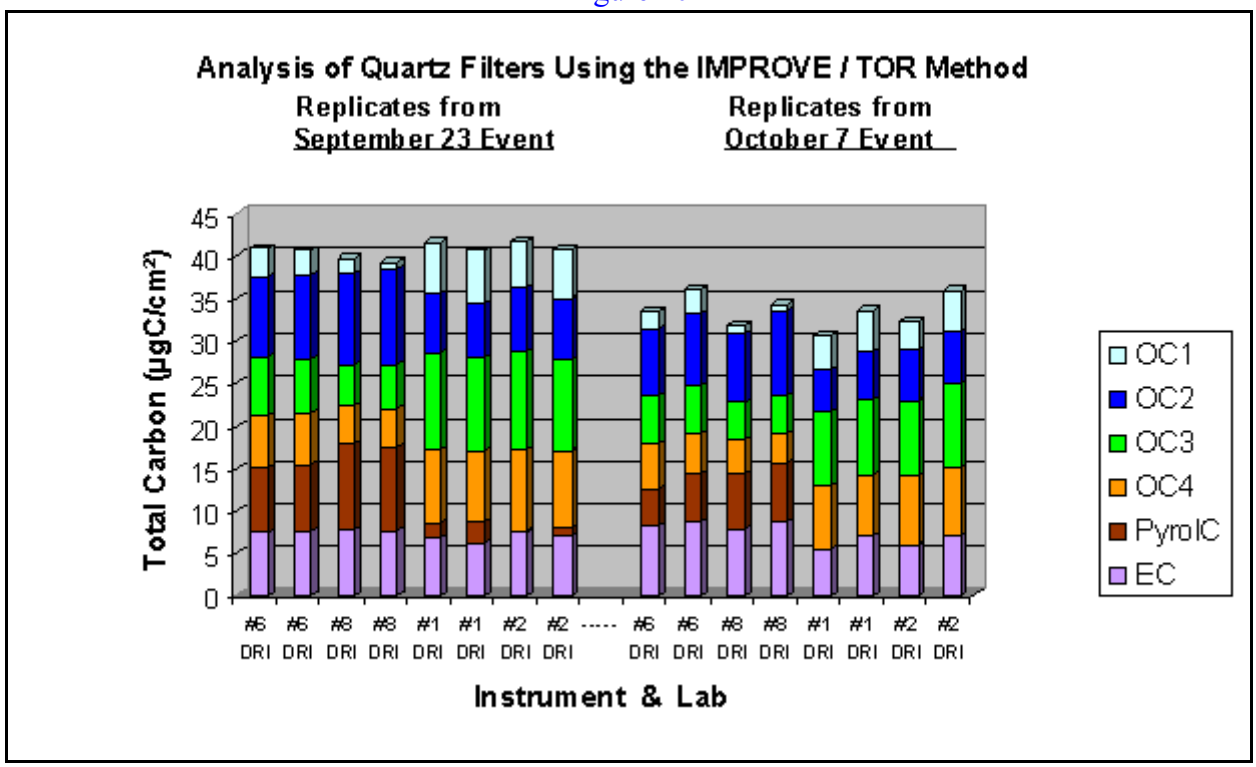


Figure 20 shows IMPROVE / TOR results for all of the loaded filters analyzed at DRI. This stacked bar graph shows results for all of the OC fractions. It would be inappropriate to compare IMPROVE OC fractions to the STN OC fractions since the two methods use different temperature profiles to create the fractions. Neither NAREL nor RTI are able to perform the IMPROVE method at this time although both laboratories are currently working to acquire this capability soon. The purpose of Figure 20 is simply to show graphically the precision of the IMPROVE method. Keep in mind that only two replicate filters from the September 23 event were supplied to DRI for analysis, and similarly, only two replicate filters from the October 5 event were supplied to DRI for this study. Each filter was analyzed by four different instruments, and this was accomplished by removing a separate [punched] segment from the filter for each analysis. Consider just the left portion of Figure 20. Four identified instruments were used to analyze two filters from the September 23 event to produce eight bars in the graph, and every other bar represents a different punch from the same filter.

Results from all of the loaded quartz filters and results from two blank filters are presented in Table 7 through Table 9 at the end of this report. These tables include the uncertainty of measurement when it was available. The SOP's for carbon analysis at RTI, DRI, and NAREL are available on the web for easy viewing (see reference 4, 5, and 6).

XRF Analysis

Three sets of five Teflon® filters [fifteen filters] were submitted to RTI for elemental analysis using XRF. The first set of samples were 37-mm filters, and a request was made to analyze these samples using both of the approved instruments located on RTI's campus. This first set of filters contained one filter blank and four loaded filters. An IMPROVE sampler located at NAREL was used to load the 37-mm filters with $PM_{2.5}$ captured from the air. The first sample set did not contain filter replicates.

The second and third set of samples contained only 47-mm filters, and each of these sets contained a blank filter and four loaded filters. The 47-mm filters were loaded at NAREL using Met One Super SASS samplers. Hidden replicate filters were present within both of these sample sets, and two of the loaded filters in each set were replicates of the same collection event. A request was made to analyze the second set of filters using one of RTI's instruments, and send the third set of filters to RTI's subcontractor in Oregon, Chester LabNet. Chester submitted results from three instruments at their laboratory which were used to analyze all of the filters in the third set.

All of the 37-mm filters in the first sample set were previously analyzed at EPA's laboratory in Research Triangle Park, NC. Replicates of all of the 47-mm filters were also analyzed at EPA's laboratory. The final results from all instruments were reported as mass of the element per square centimeter of filter material ($\mu g/cm^2$).

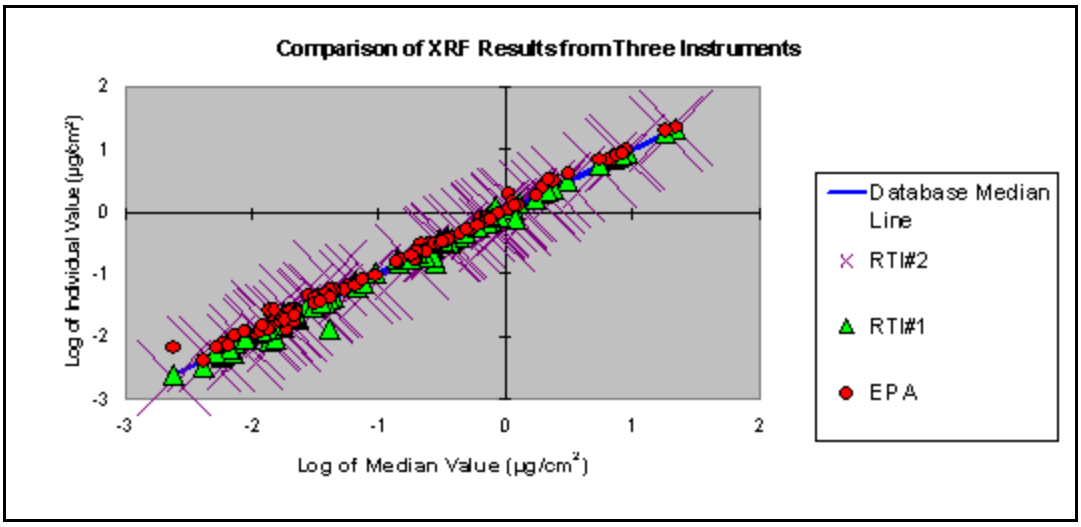
XRF Results

A very large number of XRF results were reported for this study. Forty-eight elements are routinely reported for each analysis, and forty-five analyses were reported.

(48 elements/analysis) x (45 analyses) = 2160 results

The results from all reporting laboratories are included in Table 10 and Table 11 at the end of this report. Table 10 contains results from the loaded filters, and Table 11 contains results from the filter

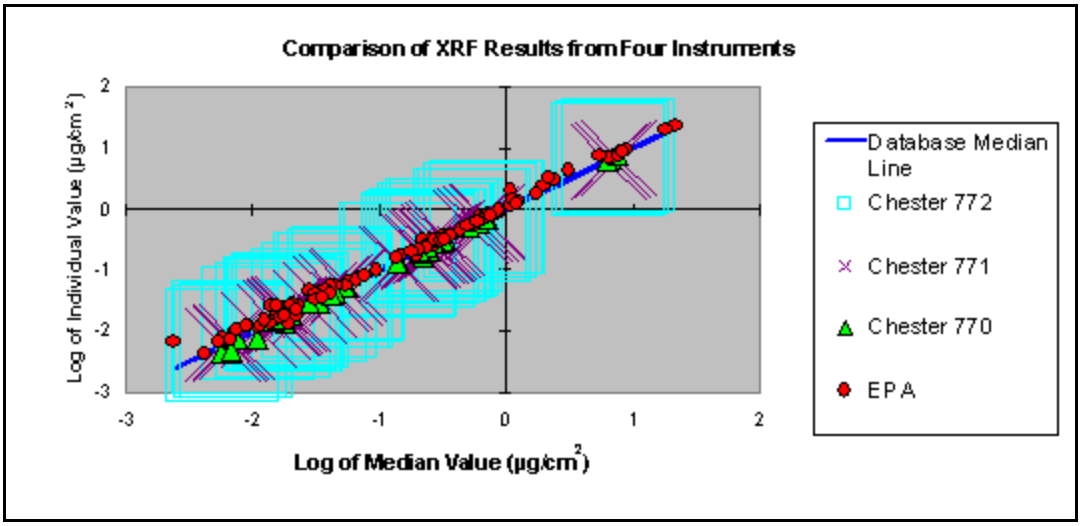
Figure 21



blanks. Table 10 also contains a median value calculated for some of the elements. A median value was calculated only when all of the reporting instruments determined a concentration greater than three times the expressed uncertainty. Seven of the heavy elements (In, Sm, Eu, Tb, Hf, Ta, and Ir) were not included in EPA's analysis, and therefore these EPA results are missing from the tables.

All of the results reported from the EPA, RTI#1, and RTI#2 instruments have been compared to the median values by constructing a scatter plot shown in Figure 21. A log-log plot was constructed with the median values forming a straight line with unity slope. The corresponding results from EPA, RTI#1, and RTI#2 instruments were superimposed on the median line. Some EPA values were on the median line [because the EPA value was the median result], and some EPA values were above or below the median line. Most of the results from these three instruments were very near the median indicating good agreement among the instruments. Even though Figure 21 gives a quick visual impression of many results that cover a wide range of concentrations, this scatter plot does not identify the element plotted nor the sample. A similar plot was constructed in Figure 22 which compares the median values to results from the three Chester instruments. The EPA results are also shown again in Figure 22.

Figure 22



The more significant XRF results are presented again as stacked bar graphs in Figures 23 through 27. Each bar segment represents an individual value reported by one of the instruments. Elements are identified along the horizontal axis, and the elements are arranged from left to right in order of decreasing concentration. The vertical axis of each bar graph is a linear scale, and each bar is normalized to the sum of results reported by all instruments identified in the legend. Each bar segment is color coded to identify the instrument and labeled to show the reported concentration value. Again, the only results shown in the graphs are those that are significantly above the reported uncertainty. Those significant results can be identified in Table 10 by looking for a calculated median.

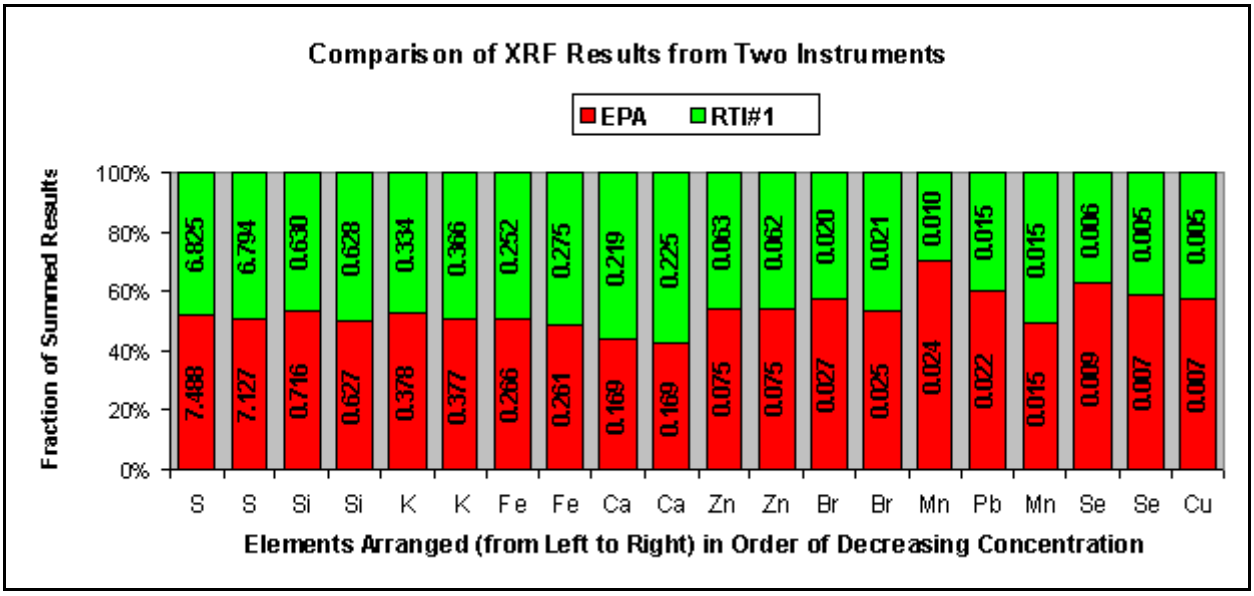


Figure 23

Figure 23 shows results from two 47-mm filter replicates identified as sample 603 and sample 604 in Table 10. These two replicates were analyzed by EPA and by RTI#1. The most inconsistent result in Figure 23 was for Mn with EPA reporting 0.024 µg/cm^2 and RTI#1 reporting 0.010 µg/cm^2. It is interesting to note that both labs reported Mn at 0.015 µg/cm^2 for the replicate filter.

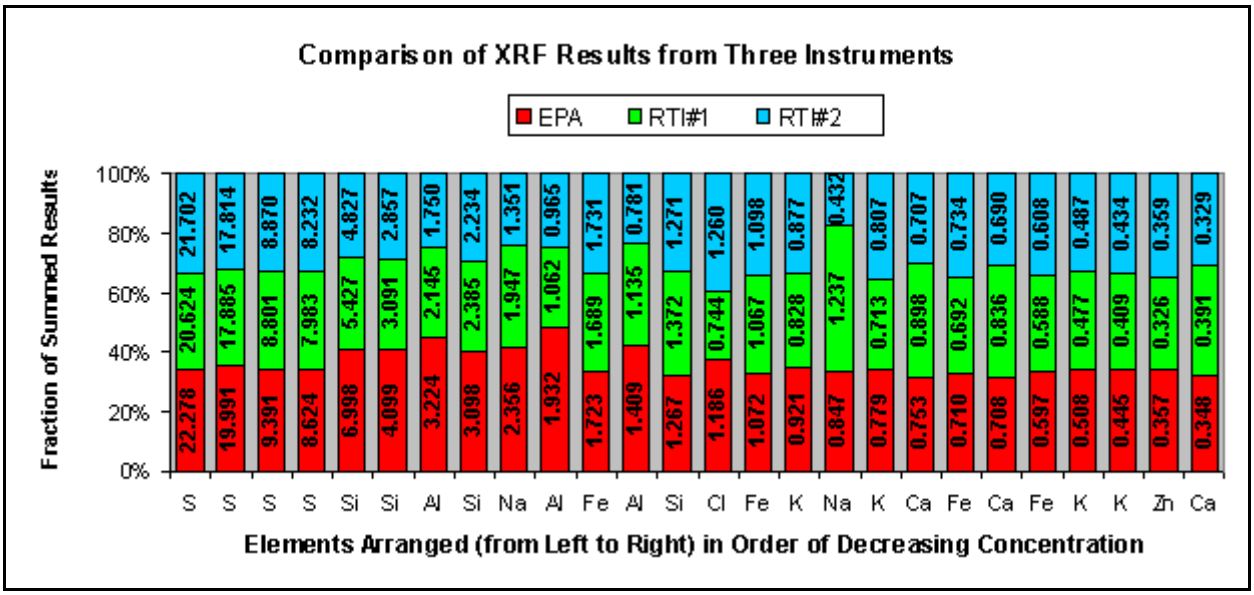
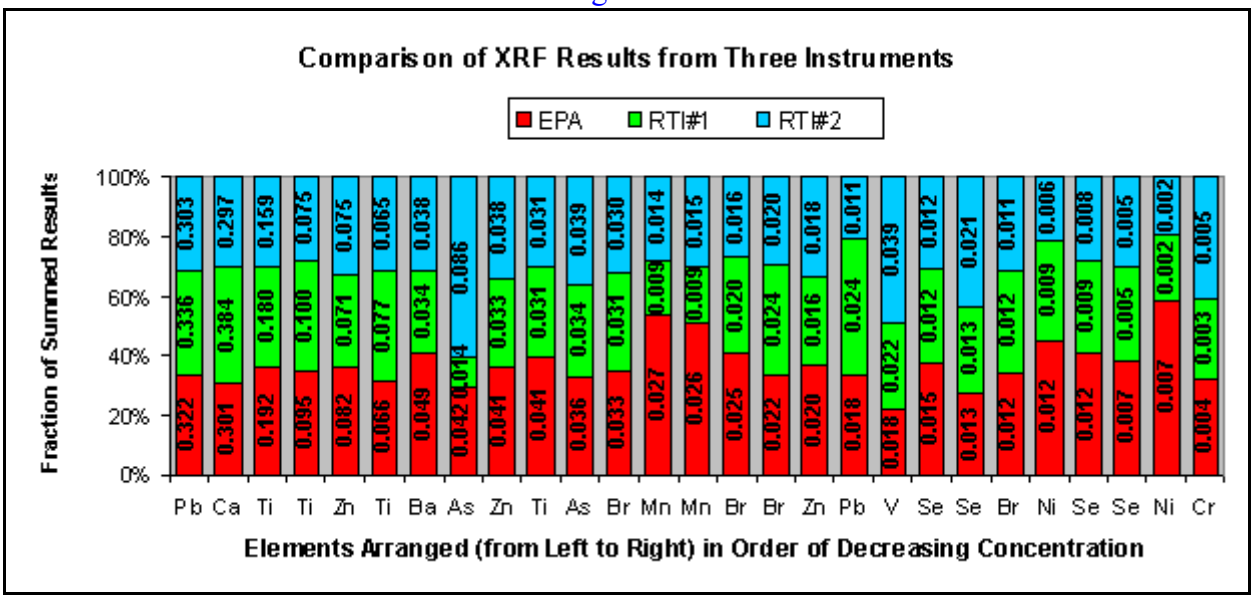


Figure 24

Four 37-mm filters identified as samples 805, 807, 811, and 812 were analyzed by EPA, RTI#1, and RTI#2. Results from these four samples are shown in Figure 24 and Figure 25. The most inconsistent result in Figure 24 was for Na reported at 0.847, 1.237, and 0.432 for the EPA, RTI#1 and RTI#2 instruments respectively.

One set of As values shown in Figure 25 was noticeably inconsistent possibly because Pb was also present in that sample at about 0.3 µg/cm^2. The analytical line for As is not resolved from one of the prominent Pb lines, and therefore As is more difficult to determine in the presence of Pb.

Figure 25



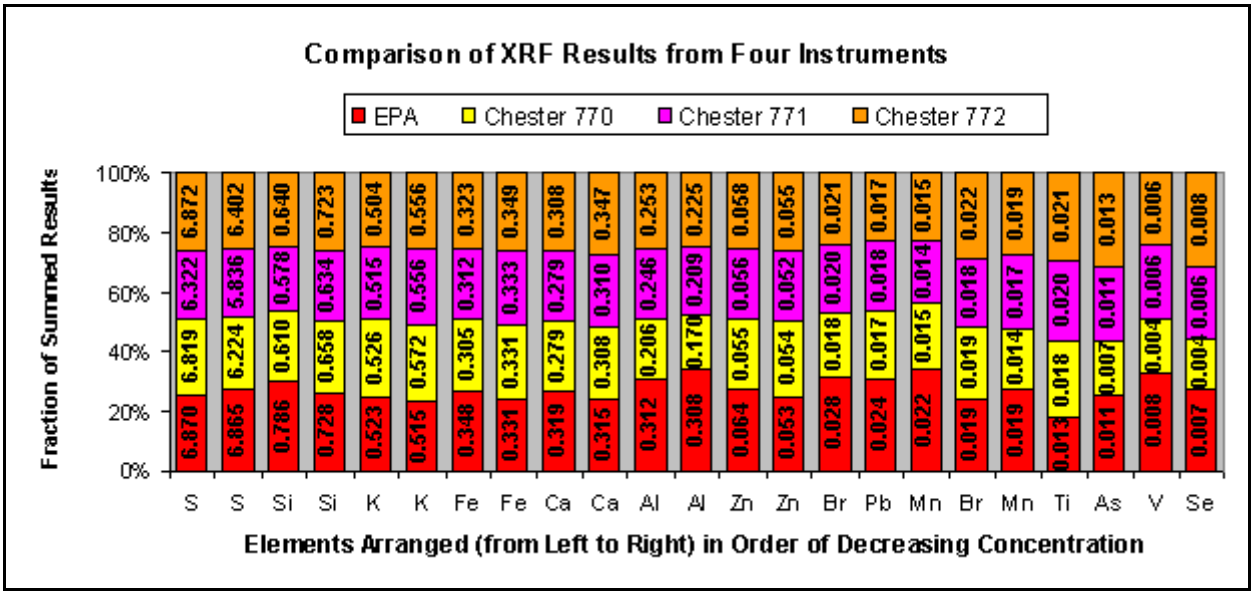
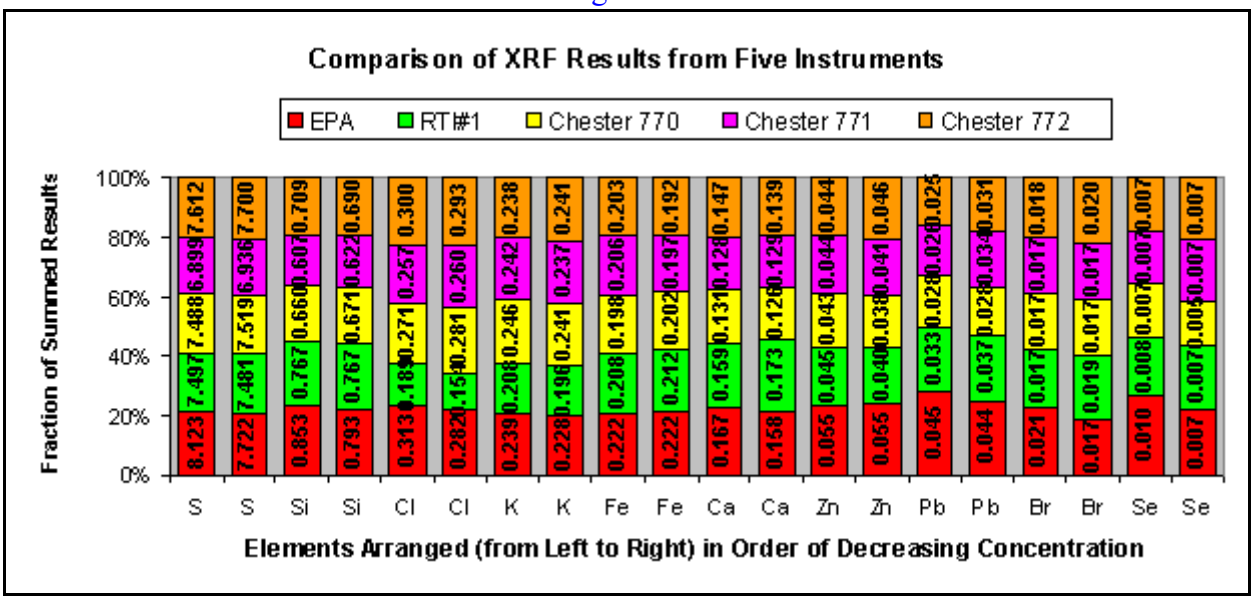


Figure 26

Two filter replicates identified as sample 611 and 612 were analyzed by EPA and three instruments at Chester LabNet as shown in Figure 26. Very good agreement among the four instruments can be seen in this data set.

Six replicate filters were used to produce the data shown in Figure 27. Two replicates were analyzed by EPA. Two more replicates identified as sample 667 and sample 668 were analyzed by RTI#1. And the last two replicates identified as sample 669 and 670 were analyzed by all three instruments at Chester LabNet. Again we can see very good between-instrument precision demonstrated with this data set. Chlorine results reported for the RTI#1 instrument are the most noticeable outlier, and those results are not bad. SOP's for the XRF analysis at RTI and Chester LabNet are available on the web (see reference 7 and reference 8).

Figure 27



Conclusions

Good agreement was observed for all gravimetric mass measurements performed at RTI and at NAREL. RTI submitted results from five analysts, and all of the measurements showed good agreement with measurements performed at NAREL. A decision was made to graphically present only those measurements which were performed by one analyst because multiple determinations are not usually performed for the routine samples. This study indicates very good performance by the gravimetric laboratory at RTI.

Excellent recoveries (95-104%) were obtained at RTI and at NAREL for the mid-level IC spikes. Good recoveries (97-116%) were also observed for the low-level spikes. Sample spike solutions identified as A-3 and C-3 were actually blank water. These blanks provided a mechanism to measure laboratory contamination from a variety of sources such as (1) the reagent water used to dilute every sample, (2) the "clean" filter extracted by the test solution which is normally provided to the field for $PM_{2.5}$ capture, and (3) containers used to hold and transfer the sample during the extraction and analysis process. No contamination was reported for the cation blank (C-3), but a very low level of nitrate was reported for the anion blank (A-3). The nitrate was reported at 0.025 µg/mL which is above RTI's MDL which was reported at 0.003 µg/mL.

Replicate Nylon® filters from two collection events were available for this study. The longer-than-normal collection period was necessary to provide a sample with all ions sufficiently above the detection threshold. The results reported by RTI show excellent agreement with the results produced at NAREL. A difference from the mean value was calculated for each analyte, and this Relative Percent Difference (RPD) is included in Table 3 and Table 4. All RPD's were below 20 percent, and this was true even for those ions present in the sample at a low level! Blank Nylon® filters were also prepared for this study, and very low levels of nitrate, sulfate, and sodium were reported by both labs, but no serious contamination was reported. This study indicates good performance by the IC laboratory at RTI.

The carbon portion of this study was larger than normal for two reasons: (1) EPA needs to better understand the quality of the OC fractions that are required for the new contract, and (2) the PE study was expanded to include samples analyzed by the IMPROVE method. A possible quality problem with the OC fractions was discussed in a recent audit report (see reference 9), and a very informative response to that concern was prepared by RTI. It should be clearly stated that the potential problem is not with RTI's performance, but the potential problem is with the analytical method. EPA has required RTI to report the OC fractions, but has not allowed changes to the temperature program. Consequently, the OC fractions may have poor precision over time and between instruments.

Not having a good set of standard reference materials for the OC/EC analysis continues to be a problem. This study has shown that sucrose and KHP spikes may not provide sufficient QC information to validate the OC fractions. In fact, sucrose spike data have raised doubt regarding the value of OC fractions. This study submitted PE samples for analysis using multiple instruments to obtain more precision data. Based upon the small data set created by this study, ambient air filters produce better precision than sucrose and KHP spikes. Do we need to express the uncertainty of measurement associated with OC fractions? Uncertainties were reported by DRI for the IMPROVE fractions, but it is unclear how the uncertainties were calculated.

Excellent agreement was observed for the EC, OC, and TC results produced at NAREL and RTI by sharing replicate filters. Excellent recoveries (96-102%) were also observed for the sucrose and KHP spikes from both labs. This study shows excellent performance by the OC/EC laboratory at RTI.

Replicate filters were also shared with DRI for analysis using the IMPROVE method. DRI reported TC results that were in good agreement with NAREL and RTI. This report includes results from DRI's old version of TOR instruments and also from the new Model 2001 instruments. The new instruments were able to report two sets of OC/EC results. The EC results based upon TOR were approximately twice the values determined at NAREL and RTI using the STN method. But the EC results based upon TOT were in excellent agreement with the STN method. When they are operated in the TOR mode, the Model 2001 instruments can produce OC, EC, and TC values that agree very well with the older TOR instruments. But less agreement was observed, however, for some of the OC fractions. This last point has become an issue for the IMPROVE steering committee to consider.

Fifteen filters were analyzed by at least two XRF instruments and some of the filters were analyzed by five different instruments. The filter sets contained blind replicates and blank filters. No significant contamination was reported for the blanks, and very good precision was generally observed for the loaded filters. Special thanks go to EPA's National Exposure Research Laboratory (NERL) in Research Triangle Park, NC, for their contributions to this study. NERL reported XRF results for fifteen filters that were used in this study.

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Table 1. Gravimetric Mass Data

Filter ID	Analyst	Tare Mass RTI (mg)	Tare Mass NAREL (mg)	Final Mass RTI (mg)	Final Mass NAREL (mg)	Captured $PM_{2.5}$ RTI (mg)	Captured $PM_{2.5}$ NAREL (mg)	Inter-Lab Difference* of Captured $PM_{2.5}$ (mg)
TF03-10787	1	149.301	149.304	149.380	149.387	0.079	0.083	0.004
	2	-----	149.304	149.381	149.387	-----	0.083	-----
	3	149.304	149.303	149.383	149.386	0.079	0.083	0.004
	4	149.303	149.304	149.382	149.386	0.079	0.082	0.003
	5	149.303	-----	149.382	-----	0.079	-----	-----
TF03-10788	1	146.263	146.263	146.341	146.347	0.078	0.084	0.006
	2	-----	146.264	146.340	146.347	-----	0.083	-----
	3	146.263	146.263	146.344	146.346	0.081	0.083	0.002
	4	146.263	146.264	146.342	146.347	0.079	0.083	0.004
	5	146.262	-----	146.343	-----	0.081	-----	-----
TF03-10789	1	144.922	144.925	145.090	145.095	0.168	0.170	0.002
	2	-----	144.925	145.089	145.095	-----	0.170	-----
	3	144.924	144.925	145.093	145.095	0.169	0.170	0.001
	4	144.925	144.925	145.091	145.094	0.166	0.169	0.003
	5	144.924	-----	145.090	-----	0.166	-----	-----
TF03-10790	1	146.803	146.807	146.972	146.978	0.169	0.171	0.002
	2	-----	146.807	146.974	146.978	-----	0.171	-----
	3	146.807	146.807	146.975	146.977	0.168	0.170	0.002
	4	146.805	146.807	146.975	146.978	0.170	0.171	0.001
	5	146.804	-----	146.975	-----	0.171	-----	-----
TF03-10791	1	142.033	142.033	142.376	142.382	0.343	0.349	0.006
	2	-----	142.034	142.375	142.382	-----	0.348	-----
	3	142.033	142.033	142.376	142.382	0.343	0.349	0.006
	4	142.033	142.034	142.375	142.382	0.342	0.348	0.006
	5	142.034	-----	142.375	-----	0.341	-----	-----
TF03-10792	1	143.221	143.222	143.561	143.569	0.340	0.347	0.007
	2	-----	143.222	143.563	143.570	-----	0.348	-----
	3	143.222	143.221	143.562	143.570	0.340	0.349	0.009
	4	143.222	143.222	143.564	143.571	0.342	0.349	0.007
	5	143.222	-----	143.564	-----	0.342	-----	-----
TF03-10793	1	143.145	143.150	143.306	143.314	0.161	0.164	0.003
	2	-----	143.151	143.307	143.314	-----	0.163	-----
	3	143.147	143.150	143.307	143.313	0.160	0.163	0.003
	4	143.146	143.151	143.309	143.313	0.163	0.162	-0.001
	5	143.145	-----	143.308	-----	0.163	-----	-----

Table 1. Gravimetric Mass Data

Filter ID	Analyst	Tare Mass RTI (mg)	Tare Mass NAREL (mg)	Final Mass RTI (mg)	Final Mass NAREL (mg)	Captured $PM_{2.5}$ RTI (mg)	Captured $PM_{2.5}$ NAREL (mg)	Inter-Lab Difference* of Captured $PM_{2.5}$ (mg)
TF03-10794	1	143.204	143.207	143.205	143.209	0.001	0.002	0.001
	2	-----	143.208	143.206	143.210	-----	0.002	-----
	3	143.206	143.206	143.208	143.208	0.002	0.002	0.000
	4	143.206	143.206	143.205	143.209	-0.001	0.003	0.004
	5	143.208	-----	143.207	-----	-0.001	-----	-----
TF03-10795	1	145.832	145.833	145.833	145.834	0.001	0.001	0.000
	2	-----	145.834	145.834	145.836	-----	0.002	-----
	3	145.835	145.833	145.838	145.835	0.003	0.002	-0.001
	4	145.835	145.833	145.834	145.835	-0.001	0.002	0.003
	5	145.834	-----	145.835	-----	0.001	-----	-----
TF03-10796	1	145.594	145.599	145.598	145.600	0.004	0.001	-0.003
	2	-----	145.599	145.598	145.601	-----	0.002	-----
	3	145.596	145.599	145.599	145.601	0.003	0.002	-0.001
	4	145.596	145.598	145.599	145.601	0.003	0.003	0.000
	5	145.595	-----	145.598	-----	0.003	-----	-----
MW03-10800	1	197.311	197.313	197.312	197.313	0.001	0.000	-0.001
	2	-----	197.314	197.313	197.313	-----	-0.001	-----
	3	197.312	197.313	197.312	197.313	0.000	0.000	0.000
	4	197.312	197.313	197.312	197.314	0.000	0.001	0.001
	5	197.312	-----	197.312	-----	0.000	-----	-----
MW03-10804	1	95.658	95.658	95.657	95.659	-0.001	0.001	0.002
	2	-----	95.659	95.657	95.658	-----	-0.001	-----
	3	95.658	95.658	95.657	95.658	-0.001	0.000	0.001
	4	95.657	95.659	95.657	95.658	0.000	-0.001	-0.001
	5	95.657	-----	95.658	-----	0.001	-----	-----
Chamber Blank	1	149.276	143.945	149.277	143.948	0.001	0.003	0.002
	2	-----	143.945	-----	143.949	-----	0.004	-----
	3	-----	143.944	-----	143.947	-----	0.003	-----
	4	-----	143.945	-----	143.948	-----	0.003	-----
	5	-----	-----	-----	-----	-----	-----	-----

**** Negative values indicate a larger capture determined by RTI.***

Table 2. IC Spike Solutions

Sample ID	Analyte	Expected Result (µg/mL)	RTI Result (µg/mL)	NAREL Result (µg/mL)	RTI Recovery	NAREL Recovery	RTI MDL (µg/mL)
A-1	Nitrate	3.200	3.229	3.228	101%	101%	0.003
	Sulfate	0.250	0.258	0.244	103%	97%	0.003
A-2	Nitrate	0.180	0.187	0.201	104%	112%	0.003
	Sulfate	3.900	4.019	3.885	103%	100%	0.003
A-3	Nitrate	0.000	0.025	0.000	-----	-----	0.003
	Sulfate	0.000	0.000	0.000	-----	-----	0.003
C-1	Sodium	0.150	0.174	0.149	116%	99%	0.014
	Ammonium	3.700	3.843	3.505	104%	95%	0.006
	Potassium	1.500	1.502	1.477	100%	98%	0.011
C-2	Sodium	1.900	1.953	1.866	103%	98%	0.014
	Ammonium	0.300	0.310	0.324	103%	108%	0.006
	Potassium	0.210	0.216	0.207	103%	98%	0.011
C-3	Sodium	0.000	0.000	0.000	-----	-----	0.014
	Ammonium	0.000	0.000	0.000	-----	-----	0.006
	Potassium	0.000	0.000	0.000	-----	-----	0.011

Table 3. IC Analysis of Filter Replicates - July 14 Event

Analyte	Sample ID	RTI Result (µg/mL)	NAREL Result (µg/mL)	Air Volume (m^3)	Air Conc. (µg/m^3)	RTI MDL (µg/m^3)	Air Conc. RPD	Mean Air Conc. (µg/m^3)
Nitrate	N03-10827	0.559	-----	58.1	0.240	0.001	2%	0.235
	N03-10828	0.555	-----	58.1	0.239	-----	2%	0.235
	N03-10829	-----	0.535	58.1	0.230	-----	-2%	0.235
	N03-10830	-----	0.534	58.1	0.230	-----	-2%	0.235
Sulfate	N03-10827	9.776	-----	58.1	4.206	0.001	2%	4.132
	N03-10828	9.886	-----	58.1	4.254	-----	3%	4.132
	N03-10829	-----	9.321	58.1	4.011	-----	-3%	4.132
	N03-10830	-----	9.431	58.1	4.058	-----	-2%	4.132
Sodium	N03-10827	0.156	-----	58.1	0.067	0.006	15%	0.059
	N03-10828	0.154	-----	58.1	0.066	-----	13%	0.059
	N03-10829	-----	0.120	58.1	0.052	-----	-12%	0.059
	N03-10830	-----	0.114	58.1	0.049	-----	-16%	0.059
Ammonium	N03-10827	2.913	-----	58.1	1.253	0.003	4%	1.208
	N03-10828	3.004	-----	58.1	1.293	-----	7%	1.208
	N03-10829	-----	2.643	58.1	1.137	-----	-6%	1.208
	N03-10830	-----	2.670	58.1	1.149	-----	-5%	1.208
Potassium	N03-10827	0.105	-----	58.1	0.045	0.005	-5%	0.048
	N03-10828	0.107	-----	58.1	0.046	-----	-3%	0.048
	N03-10829	-----	0.115	58.1	0.050	-----	4%	0.048
	N03-10830	-----	0.115	58.1	0.049	-----	4%	0.048

Table 4. IC Analysis of Filter Replicates - August 13 Event

Analyte	Sample ID	RTI Result (µg/mL)	NAREL Result (µg/mL)	Air Volume (m^3)	Air Conc. (µg/m^3)	RTI MDL (µg/m^3)	Air Conc. RPD	Mean Air Conc. (µg/m^3)
Nitrate	NO3-10831	0.478	-----	58.1	0.206	0.001	-1%	0.207
	NO3-10832	0.476	-----	58.1	0.205	-----	-1%	0.207
	NO3-10833	-----	0.499	58.1	0.215	-----	3%	0.207
	NO3-10834	-----	0.475	58.1	0.205	-----	-1%	0.207
Sulfate	NO3-10831	14.568	-----	58.1	6.268	0.001	4%	6.050
	NO3-10832	14.428	-----	58.1	6.208	-----	3%	6.050
	NO3-10833	-----	13.579	58.1	5.843	-----	-3%	6.050
	NO3-10834	-----	13.669	58.1	5.882	-----	-3%	6.050
Sodium	NO3-10831	0.164	-----	58.1	0.070	0.006	11%	0.063
	NO3-10832	0.173	-----	58.1	0.075	-----	18%	0.063
	NO3-10833	-----	0.127	58.1	0.055	-----	-13%	0.063
	NO3-10834	-----	0.124	58.1	0.053	-----	-16%	0.063
Ammonium	NO3-10831	4.086	-----	58.1	1.758	0.003	6%	1.665
	NO3-10832	4.106	-----	58.1	1.767	-----	6%	1.665
	NO3-10833	-----	3.601	58.1	1.549	-----	-7%	1.665
	NO3-10834	-----	3.685	58.1	1.586	-----	-5%	1.665
Potassium	NO3-10831	0.088	-----	58.1	0.038	0.005	3%	0.037
	NO3-10832	0.087	-----	58.1	0.038	-----	2%	0.037
	NO3-10833	-----	0.083	58.1	0.036	-----	-3%	0.037
	NO3-10834	-----	0.084	58.1	0.036	-----	-2%	0.037

Table 5. IC Analysis of Nylon® Filter Blanks

Analyte	Sample ID	RTI Result (µg/mL)	NAREL Result (µg/mL)	RTI MDL (µg/mL)
Nitrate	NO3-10835	0.022	-----	0.001
	NO3-10836	0.023	-----	-----
	NO3-10837	-----	0.017	-----
	NO3-10838	-----	0.018	-----
Sulfate	NO3-10835	0.013	-----	0.001
	NO3-10836	0.000	-----	-----
	NO3-10837	-----	0.024	-----
	NO3-10838	-----	0.000	-----
Sodium	NO3-10835	0.000	-----	0.006
	NO3-10836	0.011	-----	-----
	NO3-10837	-----	0.000	-----
	NO3-10838	-----	0.000	-----
Ammonium	NO3-10835	0.000	-----	0.003
	NO3-10836	0.000	-----	-----
	NO3-10837	-----	0.000	-----
	NO3-10838	-----	0.000	-----
Potassium	NO3-10835	0.000	-----	0.005
	NO3-10836	0.000	-----	-----
	NO3-10837	-----	0.000	-----
	NO3-10838	-----	0.000	-----

Table 6. TOA Carbon Spike Solutions

Sample ID	Spiked Compound	Analyte	Expected Result (µg/cm²)	RTI Result Analyzer R (µg/cm²)	RTI Result Analyzer S (µg/cm²)	RTI Result Analyzer T (µg/cm²)	NAREL Result (µg/cm²)	RTI Average Recovery	NAREL Recovery
TOA-1	Sucrose	OC	17.49	18.03 ± 1.10	17.56 ± 1.08	17.87 ± 1.09	17.69 ± 1.08	102%	101%
		EC	0.00	0.00 ± 0.20	0.00 ± 0.20	0.01 ± 0.20	0.00 ± 0.20	-----	-----
		TC	17.49	18.03 ± 1.20	17.56 ± 1.18	17.88 ± 1.19	17.69 ± 1.18	102%	101%
		OC1	-----	2.79	0.81	2.37	6.32	-----	-----
		OC2	-----	4.45	6.20	5.33	3.92	-----	-----
		OC3	-----	0.92	1.66	1.32	0.94	-----	-----
		OC4	-----	1.97	2.58	2.59	1.60	-----	-----
		Pyrol C	-----	7.90	6.32	6.25	4.91	-----	-----
TOA-2	KHP	OC	19.31	18.60 ± 1.13	18.76 ± 1.14	18.50 ± 1.12	18.89 ± 1.14	96%	98%
		EC	0.00	0.01 ± 0.20	0.00 ± 0.20	0.00 ± 0.20	0.00 ± 0.20	-----	-----
		TC	19.31	18.61 ± 1.23	18.76 ± 1.24	18.50 ± 1.22	18.89 ± 1.24	96%	98%
		OC1	-----	4.30	3.86	4.52	6.34	-----	-----
		OC2	-----	4.83	3.38	3.61	3.56	-----	-----
		OC3	-----	7.54	5.21	6.67	7.14	-----	-----
		OC4	-----	1.37	4.63	2.60	1.13	-----	-----
		Pyrol C	-----	0.56	1.68	1.10	0.73	-----	-----
TOA-3	None	OC	0.00	0.16 ± 0.21	0.20 ± 0.21	0.25 ± 0.21	0.12 ± 0.21	-----	-----
		EC	0.00	0.01 ± 0.20	0.00 ± 0.20	0.00 ± 0.20	0.00 ± 0.20	-----	-----
		TC	0.00	0.17 ± 0.31	0.20 ± 0.31	0.25 ± 0.31	0.12 ± 0.31	-----	-----
		OC1	-----	0.04	0.03	0.06	0.02	-----	-----
		OC2	-----	0.06	0.07	0.08	0.03	-----	-----
		OC3	-----	0.03	0.04	0.05	0.02	-----	-----
		OC4	-----	0.04	0.03	0.07	0.02	-----	-----
		Pyrol C	-----	0.00	0.03	0.00	0.03	-----	-----

Table 7. Analysis of Quartz Filter Replicates - September 23 Event

Analyte	Sample ID	STN Result Analyzer R RTI (µg/cm²)	STN Result Analyzer S RTI (µg/cm²)	STN Result Analyzer T RTI (µg/cm²)	STN Result Analyzer #1 NAREL (µg/cm²)	IMPROVE TOT Result DRI * Analyzer 6 (µg/cm²)	IMPROVE TOT Result DRI * Analyzer 8 (µg/cm²)	IMPROVE TOR Result DRI * Analyzer 6 (µg/cm²)	IMPROVE TOR Result DRI * Analyzer 8 (µg/cm²)	IMPROVE TOR Result DRI ** Analyzer 1 (µg/cm²)	IMPROVE TOR Result DRI ** Analyzer 2 (µg/cm²)
OC	Q03-10870	35.61 ± 1.98	34.62 ± 1.93	35.65 ± 1.98	-----	-----	-----	-----	-----	-----	-----
	Q03-10871	37.65 ± 2.08	35.83 ± 1.99	36.42 ± 2.02	-----	-----	-----	-----	-----	-----	-----
	Q03-10872	-----	-----	-----	-----	37.9 ± 1.7	36.5 ± 1.7	33.6 ± 3.4	31.9 ± 3.3	35.0 ± 3.9	34.5 ± 3.8
	Q03-10873	-----	-----	-----	-----	37.9 ± 1.7	36.1 ± 1.7	33.1 ± 3.4	31.6 ± 3.2	34.4 ± 3.8	33.9 ± 3.8
	Q03-10874	-----	-----	-----	33.87 ± 1.89	-----	-----	-----	-----	-----	-----
	Q03-10875	-----	-----	-----	34.30 ± 1.92	-----	-----	-----	-----	-----	-----
EC	Q03-10870	2.87 ± 0.34	3.48 ± 0.37	3.49 ± 0.37	-----	-----	-----	-----	-----	-----	-----
	Q03-10871	2.64 ± 0.33	3.73 ± 0.39	3.58 ± 0.38	-----	-----	-----	-----	-----	-----	-----
	Q03-10872	-----	-----	-----	-----	3.0 ± 0.4	3.2 ± 0.4	7.3 ± 0.2	7.8 ± 0.3	6.7 ± 0.4	7.3 ± 0.5
	Q03-10873	-----	-----	-----	-----	2.8 ± 0.3	3.1 ± 0.4	7.5 ± 0.3	7.7 ± 0.3	6.2 ± 0.4	6.9 ± 0.5
	Q03-10874	-----	-----	-----	2.87 ± 0.34	-----	-----	-----	-----	-----	-----
	Q03-10875	-----	-----	-----	2.91 ± 0.35	-----	-----	-----	-----	-----	-----
TC	Q03-10870	38.48 ± 2.22	38.10 ± 2.21	39.14 ± 2.26	-----	-----	-----	-----	-----	-----	-----
	Q03-10871	40.29 ± 2.31	39.57 ± 2.28	40.00 ± 2.30	-----	-----	-----	-----	-----	-----	-----
	Q03-10872	-----	-----	-----	-----	40.9 ± 1.8	39.7 ± 1.7	40.9 ± 1.8	39.7 ± 1.7	41.7 ± 4.3	41.8 ± 4.3
	Q03-10873	-----	-----	-----	-----	40.7 ± 1.8	39.3 ± 1.7	40.7 ± 1.8	39.3 ± 1.7	40.7 ± 4.2	40.8 ± 4.2
	Q03-10874	-----	-----	-----	36.74 ± 2.14	-----	-----	-----	-----	-----	-----
	Q03-10875	-----	-----	-----	37.21 ± 2.16	-----	-----	-----	-----	-----	-----
OC1	Q03-10870	10.82	10.56	10.48	-----	-----	-----	-----	-----	-----	-----
	Q03-10871	11.56	10.65	10.80	-----	-----	-----	-----	-----	-----	-----
	Q03-10872	-----	-----	-----	-----	3.4 ± 3.3	1.8 ± 1.7	3.4 ± 3.3	1.8 ± 1.7	6.11 ± 0.67	5.47 ± 0.60
	Q03-10873	-----	-----	-----	-----	3.0 ± 3.0	0.7 ± 0.7	3.0 ± 3.0	0.7 ± 0.7	6.21 ± 0.68	5.83 ± 0.64
	Q03-10874	-----	-----	-----	12.19	-----	-----	-----	-----	-----	-----
	Q03-10875	-----	-----	-----	12.46	-----	-----	-----	-----	-----	-----

Table 7. Analysis of Quartz Filter Replicates - September 23 Event

Analyte	Sample ID	STN Result Analyzer R RTI (µg/cm²)	STN Result Analyzer S RTI (µg/cm²)	STN Result Analyzer T RTI (µg/cm²)	STN Result Analyzer #1 NAREL (µg/cm²)	IMPROVE TOT Result DRI * Analyzer 6 (µg/cm²)	IMPROVE TOT Result DRI * Analyzer 8 (µg/cm²)	IMPROVE TOR Result DRI * Analyzer 6 (µg/cm²)	IMPROVE TOR Result DRI * Analyzer 8 (µg/cm²)	IMPROVE TOR Result DRI ** Analyzer 1 (µg/cm²)	IMPROVE TOR Result DRI ** Analyzer 2 (µg/cm²)
OC2	Q03-10870	4.17	3.74	4.36	-----	-----	-----	-----	-----	-----	-----
	Q03-10871	4.30	3.96	4.02	-----	-----	-----	-----	-----	-----	-----
	Q03-10872	-----	-----	-----	-----	9.3 ± 1.2	10.8 ± 1.3	9.3 ± 1.2	10.8 ± 1.3	6.91 ± 0.86	7.57 ± 0.94
	Q03-10873	-----	-----	-----	-----	9.8 ± 1.2	11.4 ± 1.4	9.8 ± 1.2	11.4 ± 1.4	6.38 ± 0.79	7.15 ± 0.89
	Q03-10874	-----	-----	-----	2.99	-----	-----	-----	-----	-----	-----
	Q03-10875	-----	-----	-----	2.97	-----	-----	-----	-----	-----	-----
OC3	Q03-10870	1.82	2.37	2.98	-----	-----	-----	-----	-----	-----	-----
	Q03-10871	2.06	2.51	2.53	-----	-----	-----	-----	-----	-----	-----
	Q03-10872	-----	-----	-----	-----	7.0 ± 1.6	4.9 ± 1.1	7.0 ± 1.6	4.9 ± 1.1	11.50 ± 1.10	11.65 ± 1.12
	Q03-10873	-----	-----	-----	-----	6.4 ± 1.5	5.2 ± 1.2	6.4 ± 1.5	5.2 ± 1.2	11.10 ± 1.06	10.84 ± 1.04
	Q03-10874	-----	-----	-----	1.61	-----	-----	-----	-----	-----	-----
	Q03-10875	-----	-----	-----	1.48	-----	-----	-----	-----	-----	-----
OC4	Q03-10870	4.69	4.12	6.24	-----	-----	-----	-----	-----	-----	-----
	Q03-10871	4.95	4.85	4.97	-----	-----	-----	-----	-----	-----	-----
	Q03-10872	-----	-----	-----	-----	6.2 ± 1.9	4.4 ± 1.3	6.2 ± 1.9	4.4 ± 1.3	8.65 ± 0.82	9.37 ± 0.88
	Q03-10873	-----	-----	-----	-----	6.0 ± 1.8	4.5 ± 1.4	6.0 ± 1.8	4.5 ± 1.4	8.32 ± 0.79	9.02 ± 0.85
	Q03-10874	-----	-----	-----	3.44	-----	-----	-----	-----	-----	-----
	Q03-10875	-----	-----	-----	3.76	-----	-----	-----	-----	-----	-----
PyrolC	Q03-10870	14.12	13.82	11.59	-----	-----	-----	-----	-----	-----	-----
	Q03-10871	14.78	13.87	14.11	-----	-----	-----	-----	-----	-----	-----
	Q03-10872	-----	-----	-----	-----	12.1 ± 1.8	14.7 ± 2.2	7.8 ± 2.1	10.1 ± 2.7	1.80 ± 0.47	0.41 ± 0.12
	Q03-10873	-----	-----	-----	-----	12.7 ± 1.9	14.3 ± 2.2	8.0 ± 2.1	9.7 ± 2.6	2.42 ± 0.63	1.06 ± 0.28
	Q03-10874	-----	-----	-----	13.65	-----	-----	-----	-----	-----	-----
	Q03-10875	-----	-----	-----	13.62	-----	-----	-----	-----	-----	-----

* DRI Analyzer #6 and DRI Analyzer #8 were Model 2001 instruments.

** DRI Analyzer #1 and DRI Analyzer #2 were older TOR instruments.

Table 8. Analysis of Quartz Filter Replicates - October 7 Event

Analyte	Sample ID	STN Result Analyzer R RTI (µg/cm²)	STN Result Analyzer S RTI (µg/cm²)	STN Result Analyzer T RTI (µg/cm²)	STN Result Analyzer #1 NAREL (µg/cm²)	IMPROVE TOT Result DRI * Analyzer 6 (µg/cm²)	IMPROVE TOT Result DRI * Analyzer 8 (µg/cm²)	IMPROVE TOR Result DRI * Analyzer 6 (µg/cm²)	IMPROVE TOR Result DRI * Analyzer 8 (µg/cm²)	IMPROVE TOR Result DRI ** Analyzer 1 (µg/cm²)	IMPROVE TOR Result DRI ** Analyzer 2 (µg/cm²)
OC	Q03-10890	31.84 ± 1.79	30.86 ± 1.74	31.55 ± 1.78	-----	-----	-----	-----	-----	-----	-----
	Q03-10891	32.46 ± 1.82	30.35 ± 1.72	30.89 ± 1.74	-----	-----	-----	-----	-----	-----	-----
	Q03-10892	-----	-----	-----	-----	31.4 ± 1.4	30.1 ± 1.4	25.3 ± 2.6	23.9 ± 2.4	25.2 ± 2.8	26.3 ± 2.9
	Q03-10893	-----	-----	-----	-----	34.3 ± 1.6	32.6 ± 1.5	27.5 ± 2.8	25.7 ± 2.6	26.8 ± 3.0	29.1 ± 3.2
	Q03-10894	-----	-----	-----	2.41 ± 0.32	-----	-----	-----	-----	-----	-----
	Q03-10895	-----	-----	-----	2.24 ± 0.31	-----	-----	-----	-----	-----	-----
EC	Q03-10890	2.12 ± 0.31	3.18 ± 0.36	2.84 ± 0.34	-----	-----	-----	-----	-----	-----	-----
	Q03-10891	2.29 ± 0.31	3.03 ± 0.35	2.99 ± 0.35	-----	-----	-----	-----	-----	-----	-----
	Q03-10892	-----	-----	-----	-----	2.1 ± 0.3	1.8 ± 0.2	8.2 ± 0.3	7.9 ± 0.3	5.5 ± 0.4	5.9 ± 0.4
	Q03-10893	-----	-----	-----	-----	1.8 ± 0.2	1.7 ± 0.2	8.6 ± 0.3	8.6 ± 0.3	6.9 ± 0.5	6.9 ± 0.5
	Q03-10894	-----	-----	-----	2.41 ± 0.32	-----	-----	-----	-----	-----	-----
	Q03-10895	-----	-----	-----	2.24 ± 0.31	-----	-----	-----	-----	-----	-----
TC	Q03-10890	33.96 ± 2.00	34.05 ± 2.00	34.38 ± 2.02	-----	-----	-----	-----	-----	-----	-----
	Q03-10891	34.75 ± 2.04	33.38 ± 1.97	33.89 ± 1.99	-----	-----	-----	-----	-----	-----	-----
	Q03-10892	-----	-----	-----	-----	33.5 ± 1.5	31.8 ± 1.4	33.5 ± 1.5	31.8 ± 1.4	30.7 ± 0.32	32.2 ± 0.34
	Q03-10893	-----	-----	-----	-----	36.2 ± 1.6	34.2 ± 1.5	36.2 ± 1.6	34.3 ± 1.5	33.7 ± 0.35	36.0 ± 0.37
	Q03-10894	-----	-----	-----	32.19 ± 1.91	-----	-----	-----	-----	-----	-----
	Q03-10895	-----	-----	-----	32.05 ± 1.90	-----	-----	-----	-----	-----	-----
OC1	Q03-10890	9.65	9.08	9.01	-----	-----	-----	-----	-----	-----	-----
	Q03-10891	10.02	8.87	8.88	-----	-----	-----	-----	-----	-----	-----
	Q03-10892	-----	-----	-----	-----	2.0 ± 2.0	0.8 ± 0.8	2.0 ± 2.0	0.8 ± 0.8	4.05 ± 0.44	3.20 ± 0.35
	Q03-10893	-----	-----	-----	-----	2.9 ± 2.9	0.7 ± 0.7	2.9 ± 2.9	0.7 ± 0.7	4.93 ± 0.54	4.79 ± 0.52
	Q03-10894	-----	-----	-----	10.56	-----	-----	-----	-----	-----	-----
	Q03-10895	-----	-----	-----	10.56	-----	-----	-----	-----	-----	-----

Table 8. Analysis of Quartz Filter Replicates - October 7 Event

Analyte	Sample ID	STN Result Analyzer R RTI (µg/cm²)	STN Result Analyzer S RTI (µg/cm²)	STN Result Analyzer T RTI (µg/cm²)	STN Result Analyzer #1 NAREL (µg/cm²)	IMPROVE TOT Result DRI * Analyzer 6 (µg/cm²)	IMPROVE TOT Result DRI * Analyzer 8 (µg/cm²)	IMPROVE TOR Result DRI * Analyzer 6 (µg/cm²)	IMPROVE TOR Result DRI * Analyzer 8 (µg/cm²)	IMPROVE TOR Result DRI ** Analyzer 1 (µg/cm²)	IMPROVE TOR Result DRI ** Analyzer 2 (µg/cm²)
OC2	Q03-10890	3.71	3.48	3.72	-----	-----	-----	-----	-----	-----	-----
	Q03-10891	3.62	3.29	3.37	-----	-----	-----	-----	-----	-----	-----
	Q03-10892	-----	-----	-----	-----	8.0 ± 1.0	8.3 ± 1.0	8.0 ± 1.0	8.3 ± 1.0	5.04 ± 0.63	5.99 ± 0.74
	Q03-10893	-----	-----	-----	-----	8.6 ± 1.1	10.0 ± 1.3	8.6 ± 1.1	10.0 ± 1.3	5.63 ± 0.70	6.33 ± 0.78
	Q03-10894	-----	-----	-----	2.55	-----	-----	-----	-----	-----	-----
	Q03-10895	-----	-----	-----	2.57	-----	-----	-----	-----	-----	-----
OC3	Q03-10890	1.65	2.19	2.34	-----	-----	-----	-----	-----	-----	-----
	Q03-10891	1.71	1.85	1.76	-----	-----	-----	-----	-----	-----	-----
	Q03-10892	-----	-----	-----	-----	5.6 ± 1.3	4.3 ± 1.0	5.6 ± 1.3	4.3 ± 1.0	8.70 ± 0.84	9.00 ± 0.87
	Q03-10893	-----	-----	-----	-----	5.6 ± 1.3	4.5 ± 1.1	5.6 ± 1.3	4.5 ± 1.1	8.98 ± 0.87	9.74 ± 0.94
	Q03-10894	-----	-----	-----	1.32	-----	-----	-----	-----	-----	-----
	Q03-10895	-----	-----	-----	1.30	-----	-----	-----	-----	-----	-----
OC4	Q03-10890	4.80	4.00	4.15	-----	-----	-----	-----	-----	-----	-----
	Q03-10891	4.66	3.69	4.12	-----	-----	-----	-----	-----	-----	-----
	Q03-10892	-----	-----	-----	-----	5.3 ± 1.6	4.1 ± 1.2	5.3 ± 1.6	4.1 ± 1.2	7.42 ± 0.70	8.10 ± 0.77
	Q03-10893	-----	-----	-----	-----	4.8 ± 1.5	3.4 ± 1.0	4.8 ± 1.5	3.4 ± 1.0	7.24 ± 0.68	8.23 ± 0.78
	Q03-10894	-----	-----	-----	3.65	-----	-----	-----	-----	-----	-----
	Q03-10895	-----	-----	-----	3.66	-----	-----	-----	-----	-----	-----
PyrolC	Q03-10890	12.02	12.11	12.33	-----	-----	-----	-----	-----	-----	-----
	Q03-10891	12.46	12.64	12.77	-----	-----	-----	-----	-----	-----	-----
	Q03-10892	-----	-----	-----	-----	10.5 ± 1.6	12.6 ± 1.9	4.4 ± 1.2	6.4 ± 1.7	0.01 ± 0.05	0.01 ± 0.05
	Q03-10893	-----	-----	-----	-----	12.5 ± 1.9	14.0 ± 2.1	5.7 ± 1.5	7.1 ± 1.9	0.01 ± 0.05	0.01 ± 0.05
	Q03-10894	-----	-----	-----	11.71	-----	-----	-----	-----	-----	-----
	Q03-10895	-----	-----	-----	11.71	-----	-----	-----	-----	-----	-----

* DRI Analyzer #6 and DRI Analyzer #8 were Model 2001 instruments.

** DRI Analyzer #1 and DRI Analyzer #2 were older TOR instruments.

Table 9. Analysis of Blank Quartz Filters

Analyte	Sample ID	STN Result Analyzer R RTI (µg/cm²)	STN Result Analyzer S RTI (µg/cm²)	STN Result Analyzer T RTI (µg/cm²)	STN Result Analyzer #1 NAREL (µg/cm²)	IMPROVE TOT Result DRI * Analyzer 6 (µg/cm²)	IMPROVE TOT Result DRI * Analyzer 8 (µg/cm²)	IMPROVE TOR Result DRI * Analyzer 6 (µg/cm²)	IMPROVE TOR Result DRI * Analyzer 8 (µg/cm²)	IMPROVE TOR Result DRI ** Analyzer 1 (µg/cm²)	IMPROVE TOR Result DRI ** Analyzer 2 (µg/cm²)
OC	Q03-10910	0.04 ± 0.20	0.15 ± 0.21	0.13 ± 0.21	-----	-----	-----	-----	-----	-----	-----
	Q03-10911	-----	-----	-----	-----	0.3 ± 0.3	0.4 ± 0.4	0.3 ± 0.3	0.4 ± 0.3	0.2 ± 0.3	0.3 ± 0.3
	Q03-10912	-----	-----	-----	0.10 ± 0.20	-----	-----	-----	-----	-----	-----
EC	Q03-10910	0.00 ± 0.20	0.01 ± 0.20	0.00 ± 0.20	-----	-----	-----	-----	-----	-----	-----
	Q03-10911	-----	-----	-----	-----	0.0 ± 0.1	0.0 ± 0.1	0.0 ± 0.1	0.0 ± 0.1	0.0 ± 0.1	0.0 ± 0.1
	Q03-10912	-----	-----	-----	0.00 ± 0.20	-----	-----	-----	-----	-----	-----
TC	Q03-10910	0.04 ± 0.30	0.16 ± 0.31	0.13 ± 0.31	-----	-----	-----	-----	-----	-----	-----
	Q03-10911	-----	-----	-----	-----	0.3 ± 0.3	0.4 ± 0.3	0.3 ± 0.3	0.4 ± 0.3	0.2 ± 0.3	0.3 ± 0.3
	Q03-10912	-----	-----	-----	0.10 ± 0.30	-----	-----	-----	-----	-----	-----
OC1	Q03-10910	0.02	0.02	0.03	-----	-----	-----	-----	-----	-----	-----
	Q03-10911	-----	-----	-----	-----	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.00 ± 0.03	0.00 ± 0.03
	Q03-10912	-----	-----	-----	0.02	-----	-----	-----	-----	-----	-----
OC2	Q03-10910	0.01	0.06	0.03	-----	-----	-----	-----	-----	-----	-----
	Q03-10911	-----	-----	-----	-----	0.0 ± 0.1	0.0 ± 0.1	0.0 ± 0.1	0.0 ± 0.1	0.00 ± 0.06	0.00 ± 0.06
	Q03-10912	-----	-----	-----	0.05	-----	-----	-----	-----	-----	-----
OC3	Q03-10910	0.01	0.04	0.02	-----	-----	-----	-----	-----	-----	-----
	Q03-10911	-----	-----	-----	-----	0.3 ± 0.2	0.3 ± 0.2	0.3 ± 0.2	0.3 ± 0.2	0.21 ± 0.19	0.29 ± 0.19
	Q03-10912	-----	-----	-----	0.02	-----	-----	-----	-----	-----	-----

Table 9. Analysis of Blank Quartz Filters

Analyte	Sample ID	STN Result Analyzer R RTI (µg/cm²)	STN Result Analyzer S RTI (µg/cm²)	STN Result Analyzer T RTI (µg/cm²)	STN Result Analyzer #1 NAREL (µg/cm²)	IMPROVE TOT Result DRI * Analyzer 6 (µg/cm²)	IMPROVE TOT Result DRI * Analyzer 8 (µg/cm²)	IMPROVE TOR Result DRI * Analyzer 6 (µg/cm²)	IMPROVE TOR Result DRI * Analyzer 8 (µg/cm²)	IMPROVE TOR Result DRI ** Analyzer 1 (µg/cm²)	IMPROVE TOR Result DRI ** Analyzer 2 (µg/cm²)
OC4	Q03-10910	0.00	0.03	0.04	-----	-----	-----	-----	-----	-----	-----
	Q03-10911	-----	-----	-----	-----	0.0 ± 0.1	0.0 ± 0.1	0.0 ± 0.1	0.0 ± 0.1	0.00 ± 0.07	0.00 ± 0.07
	Q03-10912	-----	-----	-----	0.02	-----	-----	-----	-----	-----	-----
PyrolC	Q03-10910	0.00	0.00	0.00	-----	-----	-----	-----	-----	-----	-----
	Q03-10911	-----	-----	-----	-----	0.0 ± 0.1	0.0 ± 0.1	0.0 ± 0.1	0.0 ± 0.1	0.00 ± 0.05	0.00 ± 0.05
	Q03-10912	-----	-----	-----	0.00	-----	-----	-----	-----	-----	-----

* DRI Analyzer #6 and DRI Analyzer #8 were Model 2001 instruments.

** DRI Analyzer #1 and DRI Analyzer #2 were older TOR instruments.

Table 10. XRF Data - Loaded Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)	Median** (µg/cm²)
603	11	Na	0.2050 ± 0.0333	0.0093 ± 0.0214	not reported	not reported	not reported	not reported	-----
603	12	Mg	0.0553 ± 0.0147	0.0000 ± 0.0076	not reported	not reported	not reported	not reported	-----
603	13	Al	0.1454 ± 0.0337	0.0000 ± 0.0064	not reported	not reported	not reported	not reported	-----
603	14	Si	0.7158 ± 0.0628	0.6296 ± 0.0161	not reported	not reported	not reported	not reported	0.6727
603	15	P	0.0378 ± 0.0291	0.0000 ± 0.0015	not reported	not reported	not reported	not reported	-----
603	16	S	7.1270 ± 0.5111	6.7942 ± 0.0264	not reported	not reported	not reported	not reported	6.9606
603	17	Cl	0.0814 ± 0.0110	0.0000 ± 0.0053	not reported	not reported	not reported	not reported	-----
603	19	K	0.3775 ± 0.0198	0.3337 ± 0.0099	not reported	not reported	not reported	not reported	0.3556
603	20	Ca	0.1690 ± 0.0096	0.2253 ± 0.0057	not reported	not reported	not reported	not reported	0.1972
603	21	Sc	0.0033 ± 0.0019	0.0000 ± 0.0021	not reported	not reported	not reported	not reported	-----
603	22	Ti	0.0028 ± 0.0037	0.0102 ± 0.0019	not reported	not reported	not reported	not reported	-----
603	23	V	0.0083 ± 0.0016	0.0000 ± 0.0012	not reported	not reported	not reported	not reported	-----
603	24	Cr	0.0027 ± 0.0012	0.0003 ± 0.0006	not reported	not reported	not reported	not reported	-----
603	25	Mn	0.0145 ± 0.0028	0.0147 ± 0.0009	not reported	not reported	not reported	not reported	0.0146
603	26	Fe	0.2613 ± 0.0195	0.2748 ± 0.0031	not reported	not reported	not reported	not reported	0.2680
603	27	Co	0.0060 ± 0.0025	0.0000 ± 0.0008	not reported	not reported	not reported	not reported	-----
603	28	Ni	0.0004 ± 0.0016	0.0012 ± 0.0005	not reported	not reported	not reported	not reported	-----
603	29	Cu	0.0068 ± 0.0017	0.0049 ± 0.0008	not reported	not reported	not reported	not reported	0.0059
603	30	Zn	0.0749 ± 0.0071	0.0624 ± 0.0013	not reported	not reported	not reported	not reported	0.0686
603	31	Ga	0.0045 ± 0.0025	0.0000 ± 0.0007	not reported	not reported	not reported	not reported	-----
603	33	As	0.0085 ± 0.0033	0.0051 ± 0.0008	not reported	not reported	not reported	not reported	-----
603	34	Se	0.0073 ± 0.0021	0.0051 ± 0.0005	not reported	not reported	not reported	not reported	0.0062
603	35	Br	0.0267 ± 0.0034	0.0196 ± 0.0008	not reported	not reported	not reported	not reported	0.0231
603	37	Rb	0.0041 ± 0.0021	0.0008 ± 0.0007	not reported	not reported	not reported	not reported	-----
603	38	Sr	0.0005 ± 0.0056	0.0023 ± 0.0005	not reported	not reported	not reported	not reported	-----
603	39	Y	-0.0003 ± 0.0057	0.0000 ± 0.0006	not reported	not reported	not reported	not reported	-----
603	40	Zr	0.0062 ± 0.0049	0.0000 ± 0.0013	not reported	not reported	not reported	not reported	-----
603	41	Nb	-0.0015 ± 0.0051	0.0000 ± 0.0010	not reported	not reported	not reported	not reported	-----
603	42	Mo	0.0008 ± 0.0053	0.0000 ± 0.0028	not reported	not reported	not reported	not reported	-----
603	47	Ag	0.0132 ± 0.0170	0.0020 ± 0.0022	not reported	not reported	not reported	not reported	-----
603	48	Cd	0.0169 ± 0.0074	0.0040 ± 0.0027	not reported	not reported	not reported	not reported	-----
603	49	In	not reported	0.0068 ± 0.0068	not reported	not reported	not reported	not reported	-----
603	50	Sn	0.0278 ± 0.0065	0.0142 ± 0.0153	not reported	not reported	not reported	not reported	-----
603	51	Sb	0.0202 ± 0.0073	0.0000 ± 0.0077	not reported	not reported	not reported	not reported	-----
603	55	Cs	0.0147 ± 0.0046	0.0058 ± 0.0053	not reported	not reported	not reported	not reported	-----

Table 10. XRF Data - Loaded Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)	Median** (µg/cm²)
603	56	Ba	0.0188 ± 0.0074	0.0135 ± 0.0042	not reported	not reported	not reported	not reported	-----
603	57	La	0.0006 ± 0.0054	0.0033 ± 0.0034	not reported	not reported	not reported	not reported	-----
603	58	Ce	0.0082 ± 0.0042	0.0022 ± 0.0032	not reported	not reported	not reported	not reported	-----
603	62	Sm	not reported	0.0000 ± 0.0018	not reported	not reported	not reported	not reported	-----
603	63	Eu	not reported	0.0000 ± 0.0020	not reported	not reported	not reported	not reported	-----
603	65	Tb	not reported	0.0000 ± 0.0057	not reported	not reported	not reported	not reported	-----
603	72	Hf	not reported	0.0000 ± 0.0021	not reported	not reported	not reported	not reported	-----
603	73	Ta	not reported	0.0000 ± 0.0029	not reported	not reported	not reported	not reported	-----
603	74	W	0.0016 ± 0.0069	0.0042 ± 0.0022	not reported	not reported	not reported	not reported	-----
603	77	Ir	not reported	0.0011 ± 0.0012	not reported	not reported	not reported	not reported	-----
603	79	Au	0.0052 ± 0.0040	0.0028 ± 0.0013	not reported	not reported	not reported	not reported	-----
603	80	Hg	0.0069 ± 0.0042	0.0023 ± 0.0083	not reported	not reported	not reported	not reported	-----
603	82	Pb	0.0136 ± 0.0059	0.0134 ± 0.0014	not reported	not reported	not reported	not reported	-----
604	11	Na	0.2466 ± 0.0365	0.0158 ± 0.0210	not reported	not reported	not reported	not reported	-----
604	12	Mg	0.0636 ± 0.0143	0.0000 ± 0.0076	not reported	not reported	not reported	not reported	-----
604	13	Al	0.0988 ± 0.0312	0.0000 ± 0.0063	not reported	not reported	not reported	not reported	-----
604	14	Si	0.6272 ± 0.0571	0.6283 ± 0.0161	not reported	not reported	not reported	not reported	0.6277
604	15	P	0.0336 ± 0.0290	0.0000 ± 0.0015	not reported	not reported	not reported	not reported	-----
604	16	S	7.4875 ± 0.5371	6.8251 ± 0.0264	not reported	not reported	not reported	not reported	7.1563
604	17	Cl	0.0705 ± 0.0106	0.0000 ± 0.0052	not reported	not reported	not reported	not reported	-----
604	19	K	0.3771 ± 0.0198	0.3661 ± 0.0109	not reported	not reported	not reported	not reported	0.3716
604	20	Ca	0.1692 ± 0.0096	0.2191 ± 0.0061	not reported	not reported	not reported	not reported	0.1942
604	21	Sc	0.0024 ± 0.0019	0.0000 ± 0.0021	not reported	not reported	not reported	not reported	-----
604	22	Ti	0.0056 ± 0.0038	0.0171 ± 0.0018	not reported	not reported	not reported	not reported	-----
604	23	V	0.0064 ± 0.0016	0.0016 ± 0.0012	not reported	not reported	not reported	not reported	-----
604	24	Cr	0.0035 ± 0.0013	0.0000 ± 0.0007	not reported	not reported	not reported	not reported	-----
604	25	Mn	0.0237 ± 0.0033	0.0098 ± 0.0009	not reported	not reported	not reported	not reported	0.0167
604	26	Fe	0.2655 ± 0.0198	0.2523 ± 0.0029	not reported	not reported	not reported	not reported	0.2589
604	27	Co	0.0061 ± 0.0025	0.0000 ± 0.0008	not reported	not reported	not reported	not reported	-----
604	28	Ni	0.0029 ± 0.0016	0.0017 ± 0.0005	not reported	not reported	not reported	not reported	-----
604	29	Cu	0.0026 ± 0.0016	0.0051 ± 0.0008	not reported	not reported	not reported	not reported	-----
604	30	Zn	0.0750 ± 0.0071	0.0633 ± 0.0013	not reported	not reported	not reported	not reported	0.0691
604	31	Ga	0.0048 ± 0.0025	0.0008 ± 0.0006	not reported	not reported	not reported	not reported	-----
604	33	As	0.0100 ± 0.0035	0.0066 ± 0.0008	not reported	not reported	not reported	not reported	-----
604	34	Se	0.0094 ± 0.0023	0.0056 ± 0.0005	not reported	not reported	not reported	not reported	0.0075

Table 10. XRF Data - Loaded Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)	Median** (µg/cm²)
604	35	Br	0.0246 ± 0.0033	0.0213 ± 0.0008	not reported	not reported	not reported	not reported	0.0230
604	37	Rb	0.0015 ± 0.0020	0.0002 ± 0.0005	not reported	not reported	not reported	not reported	-----
604	38	Sr	0.0049 ± 0.0061	0.0024 ± 0.0005	not reported	not reported	not reported	not reported	-----
604	39	Y	-0.0027 ± 0.0059	0.0002 ± 0.0006	not reported	not reported	not reported	not reported	-----
604	40	Zr	-0.0001 ± 0.0043	0.0000 ± 0.0013	not reported	not reported	not reported	not reported	-----
604	41	Nb	0.0064 ± 0.0057	0.0000 ± 0.0010	not reported	not reported	not reported	not reported	-----
604	42	Mo	0.0059 ± 0.0056	0.0000 ± 0.0028	not reported	not reported	not reported	not reported	-----
604	47	Ag	0.0062 ± 0.0188	0.0064 ± 0.0025	not reported	not reported	not reported	not reported	-----
604	48	Cd	0.0372 ± 0.0083	0.0000 ± 0.0032	not reported	not reported	not reported	not reported	-----
604	49	In	not reported	0.0000 ± 0.0040	not reported	not reported	not reported	not reported	-----
604	50	Sn	0.0438 ± 0.0070	0.0000 ± 0.0058	not reported	not reported	not reported	not reported	-----
604	51	Sb	0.0150 ± 0.0073	0.0149 ± 0.0078	not reported	not reported	not reported	not reported	-----
604	55	Cs	0.0107 ± 0.0046	0.0000 ± 0.0031	not reported	not reported	not reported	not reported	-----
604	56	Ba	0.0247 ± 0.0076	0.0101 ± 0.0042	not reported	not reported	not reported	not reported	-----
604	57	La	0.0109 ± 0.0056	0.0000 ± 0.0038	not reported	not reported	not reported	not reported	-----
604	58	Ce	0.0070 ± 0.0042	0.0000 ± 0.0034	not reported	not reported	not reported	not reported	-----
604	62	Sm	not reported	0.0000 ± 0.0017	not reported	not reported	not reported	not reported	-----
604	63	Eu	not reported	0.0000 ± 0.0015	not reported	not reported	not reported	not reported	-----
604	65	Tb	not reported	0.0000 ± 0.0056	not reported	not reported	not reported	not reported	-----
604	72	Hf	not reported	0.0000 ± 0.0021	not reported	not reported	not reported	not reported	-----
604	73	Ta	not reported	0.0000 ± 0.0035	not reported	not reported	not reported	not reported	-----
604	74	W	0.0032 ± 0.0068	0.0058 ± 0.0023	not reported	not reported	not reported	not reported	-----
604	77	Ir	not reported	0.0022 ± 0.0012	not reported	not reported	not reported	not reported	-----
604	79	Au	0.0034 ± 0.0040	0.0014 ± 0.0013	not reported	not reported	not reported	not reported	-----
604	80	Hg	0.0025 ± 0.0045	0.0006 ± 0.0009	not reported	not reported	not reported	not reported	-----
604	82	Pb	0.0223 ± 0.0061	0.0147 ± 0.0014	not reported	not reported	not reported	not reported	0.0185
611	11	Na	0.4306 ± 0.0525	not reported	not reported	0.3681 ± 0.0577	0.1189 ± 0.1947	0.5569 ± 0.0879	-----
611	12	Mg	0.0687 ± 0.0162	not reported	not reported	0.0580 ± 0.0145	0.0537 ± 0.0460	0.0030 ± 0.0181	-----
611	13	Al	0.3115 ± 0.0438	not reported	not reported	0.2055 ± 0.0258	0.2457 ± 0.0326	0.2529 ± 0.0312	0.2493
611	14	Si	0.7277 ± 0.0641	not reported	not reported	0.6583 ± 0.0771	0.6344 ± 0.0737	0.7226 ± 0.0852	0.6905
611	15	P	-0.0154 ± 0.0280	not reported	not reported	0.0000 ± 0.0040	0.0000 ± 0.0053	0.0000 ± 0.0043	-----
611	16	S	6.8703 ± 0.4928	not reported	not reported	6.8190 ± 0.7718	6.3220 ± 0.7140	6.8720 ± 0.7784	6.8447
611	17	Cl	0.0214 ± 0.0079	not reported	not reported	0.0000 ± 0.0072	0.0000 ± 0.0080	0.0076 ± 0.0043	-----
611	19	K	0.5152 ± 0.0267	not reported	not reported	0.5718 ± 0.0647	0.5556 ± 0.0628	0.5560 ± 0.0630	0.5558
611	20	Ca	0.3151 ± 0.0168	not reported	not reported	0.3075 ± 0.0349	0.3096 ± 0.0352	0.3469 ± 0.0395	0.3124

Table 10. XRF Data - Loaded Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)	Median** (µg/cm²)
611	21	Sc	-0.0038 ± 0.0022	not reported	not reported	0.0000 ± 0.0025	0.0000 ± 0.0024	0.0000 ± 0.0033	-----
611	22	Ti	0.0067 ± 0.0042	not reported	not reported	0.0224 ± 0.0017	0.0206 ± 0.0016	0.0226 ± 0.0018	-----
611	23	V	0.0084 ± 0.0017	not reported	not reported	0.0021 ± 0.0008	0.0060 ± 0.0008	0.0058 ± 0.0009	-----
611	24	Cr	0.0040 ± 0.0013	not reported	not reported	0.0008 ± 0.0006	0.0007 ± 0.0007	0.0011 ± 0.0007	-----
611	25	Mn	0.0189 ± 0.0031	not reported	not reported	0.0135 ± 0.0014	0.0173 ± 0.0014	0.0185 ± 0.0016	0.0179
611	26	Fe	0.3307 ± 0.0244	not reported	not reported	0.3309 ± 0.0169	0.3334 ± 0.0170	0.3493 ± 0.0181	0.3322
611	27	Co	0.0015 ± 0.0024	not reported	not reported	0.0000 ± 0.0021	0.0002 ± 0.0018	0.0000 ± 0.0016	-----
611	28	Ni	-0.0010 ± 0.0016	not reported	not reported	0.0006 ± 0.0006	0.0025 ± 0.0006	0.0021 ± 0.0008	-----
611	29	Cu	0.0052 ± 0.0018	not reported	not reported	0.0078 ± 0.0008	0.0062 ± 0.0008	0.0083 ± 0.0010	-----
611	30	Zn	0.0639 ± 0.0064	not reported	not reported	0.0550 ± 0.0046	0.0557 ± 0.0029	0.0582 ± 0.0032	0.0570
611	31	Ga	0.0023 ± 0.0025	not reported	not reported	0.0000 ± 0.0016	0.0016 ± 0.0026	0.0000 ± 0.0020	-----
611	33	As	0.0110 ± 0.0036	not reported	not reported	0.0074 ± 0.0021	0.0108 ± 0.0027	0.0132 ± 0.0021	0.0109
611	34	Se	0.0070 ± 0.0023	not reported	not reported	0.0042 ± 0.0009	0.0062 ± 0.0013	0.0079 ± 0.0010	0.0066
611	35	Br	0.0190 ± 0.0031	not reported	not reported	0.0193 ± 0.0014	0.0179 ± 0.0017	0.0223 ± 0.0016	0.0192
611	37	Rb	0.0049 ± 0.0023	not reported	not reported	0.0022 ± 0.0009	0.0000 ± 0.0012	0.0016 ± 0.0010	-----
611	38	Sr	-0.0021 ± 0.0055	not reported	not reported	0.0025 ± 0.0010	0.0010 ± 0.0012	0.0053 ± 0.0011	-----
611	39	Y	-0.0065 ± 0.0055	not reported	not reported	0.0000 ± 0.0012	0.0000 ± 0.0015	0.0000 ± 0.0013	-----
611	40	Zr	-0.0002 ± 0.0047	not reported	not reported	0.0000 ± 0.0014	0.0004 ± 0.0018	0.0000 ± 0.0015	-----
611	41	Nb	0.0041 ± 0.0056	not reported	not reported	0.0000 ± 0.0017	0.0024 ± 0.0022	0.0041 ± 0.0018	-----
611	42	Mo	0.0081 ± 0.0063	not reported	not reported	0.0011 ± 0.0021	0.0013 ± 0.0028	0.0013 ± 0.0021	-----
611	47	Ag	-0.0654 ± 0.0203	not reported	not reported	0.0009 ± 0.0041	0.0039 ± 0.0028	0.0000 ± 0.0047	-----
611	48	Cd	0.0504 ± 0.0088	not reported	not reported	0.0000 ± 0.0044	0.0025 ± 0.0029	0.0023 ± 0.0046	-----
611	49	In	not reported	not reported	not reported	0.0060 ± 0.0047	0.0000 ± 0.0034	0.0000 ± 0.0049	-----
611	50	Sn	0.0346 ± 0.0078	not reported	not reported	0.0062 ± 0.0056	0.0041 ± 0.0042	0.0069 ± 0.0057	-----
611	51	Sb	0.0292 ± 0.0088	not reported	not reported	0.0000 ± 0.0063	0.0000 ± 0.0050	0.0114 ± 0.0065	-----
611	55	Cs	0.0094 ± 0.0048	not reported	not reported	0.0000 ± 0.0149	0.0023 ± 0.0136	0.0209 ± 0.0157	-----
611	56	Ba	0.0433 ± 0.0087	not reported	not reported	0.0333 ± 0.0187	0.0134 ± 0.0185	0.0273 ± 0.0207	-----
611	57	La	0.0064 ± 0.0059	not reported	not reported	0.0000 ± 0.0243	0.0000 ± 0.0242	0.0196 ± 0.0263	-----
611	58	Ce	0.0013 ± 0.0046	not reported	not reported	0.0000 ± 0.0314	0.0000 ± 0.0330	0.0000 ± 0.0337	-----
611	62	Sm	not reported	not reported	not reported	0.0000 ± 0.0025	0.0000 ± 0.0024	0.0000 ± 0.0025	-----
611	63	Eu	not reported	not reported	not reported	0.0000 ± 0.0045	0.0000 ± 0.0051	0.0000 ± 0.0065	-----
611	65	Tb	not reported	not reported	not reported	0.0000 ± 0.0113	0.0000 ± 0.0128	0.0000 ± 0.0186	-----
611	72	Hf	not reported	not reported	not reported	0.0000 ± 0.0028	0.0000 ± 0.0054	0.0035 ± 0.0023	-----
611	73	Ta	not reported	not reported	not reported	0.0000 ± 0.0030	0.0083 ± 0.0062	0.0038 ± 0.0034	-----
611	74	W	0.0118 ± 0.0072	not reported	not reported	0.0000 ± 0.0032	0.0118 ± 0.0055	0.0000 ± 0.0030	-----

Table 10. XRF Data - Loaded Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)	Median** (µg/cm²)
611	77	Ir	not reported	not reported	not reported	0.0000 ± 0.0021	0.0046 ± 0.0033	0.0000 ± 0.0018	-----
611	79	Au	0.0025 ± 0.0042	not reported	not reported	0.0000 ± 0.0024	0.0070 ± 0.0032	0.0000 ± 0.0021	-----
611	80	Hg	0.0031 ± 0.0050	not reported	not reported	0.0000 ± 0.0019	0.0003 ± 0.0021	0.0009 ± 0.0015	-----
611	82	Pb	0.0173 ± 0.0063	not reported	not reported	0.0180 ± 0.0025	0.0193 ± 0.0035	0.0159 ± 0.0024	-----
612	11	Na	0.3917 ± 0.0483	not reported	not reported	0.3804 ± 0.0579	0.1080 ± 0.1866	0.5226 ± 0.0821	-----
612	12	Mg	0.1030 ± 0.0177	not reported	not reported	0.0592 ± 0.0155	0.0000 ± 0.0439	0.0720 ± 0.0191	-----
612	13	Al	0.3084 ± 0.0438	not reported	not reported	0.1700 ± 0.0218	0.2092 ± 0.0287	0.2248 ± 0.0278	0.2170
612	14	Si	0.7860 ± 0.0679	not reported	not reported	0.6100 ± 0.0713	0.5782 ± 0.0671	0.6402 ± 0.0752	0.6251
612	15	P	0.0141 ± 0.0286	not reported	not reported	0.0000 ± 0.0039	0.0000 ± 0.0050	0.0000 ± 0.0040	-----
612	16	S	6.8653 ± 0.4924	not reported	not reported	6.2240 ± 0.7038	5.8360 ± 0.6588	6.4020 ± 0.7244	6.3130
612	17	Cl	0.0196 ± 0.0080	not reported	not reported	0.0000 ± 0.0067	0.0000 ± 0.0076	0.0067 ± 0.0040	-----
612	19	K	0.5228 ± 0.0271	not reported	not reported	0.5256 ± 0.0594	0.5145 ± 0.0581	0.5040 ± 0.0571	0.5187
612	20	Ca	0.3187 ± 0.0170	not reported	not reported	0.2788 ± 0.0317	0.2788 ± 0.0317	0.3077 ± 0.0350	0.2933
612	21	Sc	0.0037 ± 0.0022	not reported	not reported	0.0000 ± 0.0023	0.0000 ± 0.0022	0.0000 ± 0.0030	-----
612	22	Ti	0.0130 ± 0.0042	not reported	not reported	0.0183 ± 0.0015	0.0198 ± 0.0015	0.0207 ± 0.0017	0.0191
612	23	V	0.0077 ± 0.0018	not reported	not reported	0.0042 ± 0.0008	0.0060 ± 0.0008	0.0056 ± 0.0009	0.0058
612	24	Cr	0.0020 ± 0.0013	not reported	not reported	0.0007 ± 0.0006	0.0006 ± 0.0007	0.0010 ± 0.0007	-----
612	25	Mn	0.0220 ± 0.0033	not reported	not reported	0.0146 ± 0.0014	0.0137 ± 0.0013	0.0145 ± 0.0014	0.0146
612	26	Fe	0.3478 ± 0.0256	not reported	not reported	0.3049 ± 0.0156	0.3117 ± 0.0159	0.3230 ± 0.0168	0.3174
612	27	Co	-0.0003 ± 0.0023	not reported	not reported	0.0000 ± 0.0020	0.0006 ± 0.0017	0.0000 ± 0.0015	-----
612	28	Ni	0.0011 ± 0.0017	not reported	not reported	0.0007 ± 0.0007	0.0007 ± 0.0005	0.0017 ± 0.0008	-----
612	29	Cu	0.0048 ± 0.0018	not reported	not reported	0.0055 ± 0.0007	0.0056 ± 0.0007	0.0069 ± 0.0009	-----
612	30	Zn	0.0533 ± 0.0058	not reported	not reported	0.0535 ± 0.0044	0.0519 ± 0.0027	0.0545 ± 0.0045	0.0534
612	31	Ga	0.0056 ± 0.0028	not reported	not reported	0.0000 ± 0.0015	0.0000 ± 0.0025	0.0000 ± 0.0018	-----
612	33	As	0.0094 ± 0.0037	not reported	not reported	0.0060 ± 0.0020	0.0092 ± 0.0025	0.0051 ± 0.0020	-----
612	34	Se	0.0015 ± 0.0020	not reported	not reported	0.0059 ± 0.0009	0.0068 ± 0.0012	0.0043 ± 0.0009	-----
612	35	Br	0.0278 ± 0.0035	not reported	not reported	0.0180 ± 0.0014	0.0198 ± 0.0017	0.0210 ± 0.0015	0.0204
612	37	Rb	0.0016 ± 0.0022	not reported	not reported	0.0000 ± 0.0008	0.0008 ± 0.0011	0.0000 ± 0.0009	-----
612	38	Sr	0.0110 ± 0.0073	not reported	not reported	0.0023 ± 0.0009	0.0007 ± 0.0012	0.0032 ± 0.0010	-----
612	39	Y	0.0110 ± 0.0068	not reported	not reported	0.0000 ± 0.0011	0.0000 ± 0.0014	0.0007 ± 0.0012	-----
612	40	Zr	-0.0042 ± 0.0049	not reported	not reported	0.0000 ± 0.0013	0.0000 ± 0.0017	0.0000 ± 0.0014	-----
612	41	Nb	0.0112 ± 0.0061	not reported	not reported	0.0000 ± 0.0016	0.0026 ± 0.0020	0.0000 ± 0.0016	-----
612	42	Mo	0.0053 ± 0.0059	not reported	not reported	0.0010 ± 0.0020	0.0000 ± 0.0026	0.0009 ± 0.0020	-----
612	47	Ag	-0.0217 ± 0.0187	not reported	not reported	0.0000 ± 0.0040	0.0008 ± 0.0027	0.0000 ± 0.0045	-----
612	48	Cd	0.0322 ± 0.0083	not reported	not reported	0.0019 ± 0.0043	0.0000 ± 0.0028	0.0000 ± 0.0046	-----

Table 10. XRF Data - Loaded Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)	Median** (µg/cm²)
612	49	In	not reported	not reported	not reported	0.0000 ± 0.0045	0.0001 ± 0.0033	0.0000 ± 0.0048	-----
612	50	Sn	0.0572 ± 0.0083	not reported	not reported	0.0117 ± 0.0054	0.0038 ± 0.0040	0.0149 ± 0.0056	-----
612	51	Sb	0.0283 ± 0.0088	not reported	not reported	0.0000 ± 0.0062	0.0018 ± 0.0048	0.0088 ± 0.0062	-----
612	55	Cs	0.0095 ± 0.0048	not reported	not reported	0.0000 ± 0.0144	0.0000 ± 0.0130	0.0000 ± 0.0151	-----
612	56	Ba	0.0308 ± 0.0083	not reported	not reported	0.0339 ± 0.0181	0.0124 ± 0.0178	0.0194 ± 0.0197	-----
612	57	La	0.0167 ± 0.0058	not reported	not reported	0.0000 ± 0.0235	0.0000 ± 0.0231	0.0092 ± 0.0253	-----
612	58	Ce	0.0078 ± 0.0045	not reported	not reported	0.0000 ± 0.0303	0.0000 ± 0.0322	0.0000 ± 0.0318	-----
612	62	Sm	not reported	not reported	not reported	0.0000 ± 0.0026	0.0000 ± 0.0023	0.0000 ± 0.0025	-----
612	63	Eu	not reported	not reported	not reported	0.0000 ± 0.0047	0.0000 ± 0.0045	0.0000 ± 0.0057	-----
612	65	Tb	not reported	not reported	not reported	0.0000 ± 0.0105	0.0000 ± 0.0121	0.0000 ± 0.0174	-----
612	72	Hf	not reported	not reported	not reported	0.0000 ± 0.0026	0.0000 ± 0.0051	0.0000 ± 0.0022	-----
612	73	Ta	not reported	not reported	not reported	0.0011 ± 0.0028	0.0066 ± 0.0060	0.0000 ± 0.0030	-----
612	74	W	0.0265 ± 0.0079	not reported	not reported	0.0000 ± 0.0030	0.0004 ± 0.0050	0.0000 ± 0.0029	-----
612	77	Ir	not reported	not reported	not reported	0.0021 ± 0.0020	0.0023 ± 0.0031	0.0000 ± 0.0017	-----
612	79	Au	0.0002 ± 0.0041	not reported	not reported	0.0000 ± 0.0023	0.0017 ± 0.0030	0.0000 ± 0.0021	-----
612	80	Hg	0.0046 ± 0.0046	not reported	not reported	0.0000 ± 0.0017	0.0002 ± 0.0021	0.0000 ± 0.0013	-----
612	82	Pb	0.0236 ± 0.0066	not reported	not reported	0.0171 ± 0.0024	0.0180 ± 0.0032	0.0174 ± 0.0022	0.0177
667 & 669	11	Na	0.0799 ± 0.0217	0.0000 ± 0.0213	not reported	0.0354 ± 0.0329	0.0000 ± 0.2006	0.0629 ± 0.0490	-----
667 & 669	12	Mg	0.0407 ± 0.0136	0.0000 ± 0.0078	not reported	0.0000 ± 0.0132	0.0000 ± 0.0467	0.0078 ± 0.0165	-----
667 & 669	13	Al	0.1363 ± 0.0341	0.0000 ± 0.0064	not reported	0.0853 ± 0.0126	0.0749 ± 0.0179	0.1032 ± 0.0142	-----
667 & 669	14	Si	0.8534 ± 0.0724	0.7669 ± 0.0169	not reported	0.6596 ± 0.0773	0.6072 ± 0.0706	0.7085 ± 0.0835	0.7085
667 & 669	15	P	-0.0163 ± 0.0292	0.0000 ± 0.0015	not reported	0.0000 ± 0.0042	0.0000 ± 0.0055	0.0000 ± 0.0044	-----
667 & 669	16	S	8.1227 ± 0.5814	7.4970 ± 0.0277	not reported	7.4880 ± 0.8473	6.8990 ± 0.7790	7.6120 ± 0.8617	7.4970
667 & 669	17	Cl	0.2821 ± 0.0242	0.1541 ± 0.0066	not reported	0.2806 ± 0.0330	0.2597 ± 0.0310	0.2929 ± 0.0339	0.2806
667 & 669	19	K	0.2393 ± 0.0130	0.2082 ± 0.0079	not reported	0.2455 ± 0.0279	0.2419 ± 0.0275	0.2379 ± 0.0271	0.2393
667 & 669	20	Ca	0.1669 ± 0.0094	0.1586 ± 0.0050	not reported	0.1307 ± 0.0150	0.1282 ± 0.0147	0.1465 ± 0.0169	0.1465
667 & 669	21	Sc	0.0067 ± 0.0020	0.0000 ± 0.0020	not reported	0.0000 ± 0.0014	0.0000 ± 0.0014	0.0000 ± 0.0017	-----
667 & 669	22	Ti	0.0045 ± 0.0039	0.0188 ± 0.0019	not reported	0.0138 ± 0.0013	0.0121 ± 0.0013	0.0147 ± 0.0015	-----
667 & 669	23	V	0.0043 ± 0.0015	0.0017 ± 0.0011	not reported	0.0000 ± 0.0007	0.0008 ± 0.0007	0.0020 ± 0.0007	-----
667 & 669	24	Cr	0.0027 ± 0.0013	0.0027 ± 0.0007	not reported	0.0003 ± 0.0006	0.0023 ± 0.0007	0.0016 ± 0.0007	-----
667 & 669	25	Mn	0.0147 ± 0.0028	0.0000 ± 0.0006	not reported	0.0071 ± 0.0011	0.0077 ± 0.0011	0.0083 ± 0.0012	-----
667 & 669	26	Fe	0.2224 ± 0.0167	0.2083 ± 0.0027	not reported	0.1981 ± 0.0103	0.2055 ± 0.0106	0.2030 ± 0.0157	0.2055
667 & 669	27	Co	0.0072 ± 0.0024	0.0000 ± 0.0007	not reported	0.0000 ± 0.0014	0.0005 ± 0.0012	0.0000 ± 0.0012	-----
667 & 669	28	Ni	0.0522 ± 0.0046	0.0093 ± 0.0006	not reported	0.0007 ± 0.0006	0.0000 ± 0.0005	0.0003 ± 0.0008	-----
667 & 669	29	Cu	0.0016 ± 0.0017	0.0050 ± 0.0008	not reported	0.0045 ± 0.0007	0.0059 ± 0.0008	0.0064 ± 0.0009	-----

Table 10. XRF Data - Loaded Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)	Median** (µg/cm²)
667 & 669	30	Zn	0.0547 ± 0.0058	0.0447 ± 0.0011	not reported	0.0426 ± 0.0037	0.0442 ± 0.0024	0.0444 ± 0.0038	0.0444
667 & 669	31	Ga	0.0051 ± 0.0027	0.0000 ± 0.0007	not reported	0.0000 ± 0.0016	0.0000 ± 0.0027	0.0000 ± 0.0019	-----
667 & 669	33	As	0.0062 ± 0.0039	0.0051 ± 0.0010	not reported	0.0060 ± 0.0025	0.0093 ± 0.0032	0.0035 ± 0.0027	-----
667 & 669	34	Se	0.0104 ± 0.0025	0.0077 ± 0.0006	not reported	0.0074 ± 0.0010	0.0067 ± 0.0013	0.0070 ± 0.0010	0.0074
667 & 669	35	Br	0.0208 ± 0.0031	0.0174 ± 0.0008	not reported	0.0173 ± 0.0013	0.0165 ± 0.0016	0.0181 ± 0.0014	0.0174
667 & 669	37	Rb	0.0024 ± 0.0022	0.0000 ± 0.0004	not reported	0.0000 ± 0.0009	0.0004 ± 0.0011	0.0000 ± 0.0010	-----
667 & 669	38	Sr	-0.0033 ± 0.0057	0.0022 ± 0.0005	not reported	0.0000 ± 0.0010	0.0004 ± 0.0013	0.0020 ± 0.0011	-----
667 & 669	39	Y	0.0003 ± 0.0061	0.0000 ± 0.0006	not reported	0.0000 ± 0.0012	0.0000 ± 0.0015	0.0000 ± 0.0013	-----
667 & 669	40	Zr	0.0008 ± 0.0047	0.0000 ± 0.0013	not reported	0.0000 ± 0.0015	0.0030 ± 0.0018	0.0019 ± 0.0015	-----
667 & 669	41	Nb	0.0009 ± 0.0055	0.0000 ± 0.0010	not reported	0.0000 ± 0.0017	0.0000 ± 0.0022	0.0000 ± 0.0018	-----
667 & 669	42	Mo	-0.0029 ± 0.0053	0.0000 ± 0.0029	not reported	0.0000 ± 0.0022	0.0000 ± 0.0028	0.0034 ± 0.0022	-----
667 & 669	47	Ag	-0.0140 ± 0.0186	0.0000 ± 0.0027	not reported	0.0000 ± 0.0041	0.0000 ± 0.0028	0.0081 ± 0.0046	-----
667 & 669	48	Cd	0.0315 ± 0.0077	0.0106 ± 0.0028	not reported	0.0012 ± 0.0043	0.0016 ± 0.0031	0.0021 ± 0.0045	-----
667 & 669	49	In	not reported	0.0000 ± 0.0041	not reported	0.0020 ± 0.0047	0.0000 ± 0.0035	0.0050 ± 0.0050	-----
667 & 669	50	Sn	0.0246 ± 0.0061	0.0000 ± 0.0053	not reported	0.0177 ± 0.0057	0.0000 ± 0.0042	0.0023 ± 0.0057	-----
667 & 669	51	Sb	0.0170 ± 0.0071	0.0403 ± 0.0073	not reported	0.0004 ± 0.0064	0.0039 ± 0.0051	0.0002 ± 0.0063	-----
667 & 669	55	Cs	0.0056 ± 0.0043	0.0000 ± 0.0034	not reported	0.0000 ± 0.0150	0.0000 ± 0.0138	0.0165 ± 0.0159	-----
667 & 669	56	Ba	0.0193 ± 0.0077	0.0000 ± 0.0248	not reported	0.0109 ± 0.0190	0.0000 ± 0.0187	0.0036 ± 0.0208	-----
667 & 669	57	La	0.0021 ± 0.0055	0.0000 ± 0.0033	not reported	0.0000 ± 0.0249	0.0000 ± 0.0246	0.0000 ± 0.0266	-----
667 & 669	58	Ce	0.0051 ± 0.0043	0.0000 ± 0.0032	not reported	0.0219 ± 0.0319	0.0376 ± 0.0341	0.0000 ± 0.0337	-----
667 & 669	62	Sm	not reported	0.0000 ± 0.0016	not reported	0.0000 ± 0.0026	0.0000 ± 0.0023	0.0000 ± 0.0026	-----
667 & 669	63	Eu	not reported	0.0000 ± 0.0017	not reported	0.0000 ± 0.0035	0.0000 ± 0.0035	0.0000 ± 0.0047	-----
667 & 669	65	Tb	not reported	0.0000 ± 0.0050	not reported	0.0000 ± 0.0073	0.0000 ± 0.0083	0.0000 ± 0.0123	-----
667 & 669	72	Hf	not reported	0.0000 ± 0.0021	not reported	0.0000 ± 0.0028	0.0000 ± 0.0057	0.0014 ± 0.0023	-----
667 & 669	73	Ta	not reported	0.0000 ± 0.0034	not reported	0.0000 ± 0.0030	0.0108 ± 0.0065	0.0000 ± 0.0032	-----
667 & 669	74	W	0.0144 ± 0.0076	0.0000 ± 0.0023	not reported	0.0000 ± 0.0031	0.0104 ± 0.0055	0.0000 ± 0.0028	-----
667 & 669	77	Ir	not reported	0.0000 ± 0.0021	not reported	0.0000 ± 0.0022	0.0000 ± 0.0035	0.0000 ± 0.0018	-----
667 & 669	79	Au	0.0024 ± 0.0042	0.0027 ± 0.0013	not reported	0.0000 ± 0.0024	0.0080 ± 0.0032	0.0000 ± 0.0020	-----
667 & 669	80	Hg	0.0077 ± 0.0046	0.0000 ± 0.0014	not reported	0.0000 ± 0.0019	0.0072 ± 0.0023	0.0002 ± 0.0014	-----
667 & 669	82	Pb	0.0443 ± 0.0076	0.0375 ± 0.0018	not reported	0.0280 ± 0.0029	0.0336 ± 0.0040	0.0312 ± 0.0029	0.0336
668 & 670	11	Na	0.0950 ± 0.0234	0.0000 ± 0.0214	not reported	0.0000 ± 0.0326	0.0916 ± 0.1993	0.0130 ± 0.0481	-----
668 & 670	12	Mg	0.0200 ± 0.0139	0.0000 ± 0.0077	not reported	0.0075 ± 0.0136	0.0000 ± 0.0463	0.0000 ± 0.0164	-----
668 & 670	13	Al	0.2159 ± 0.0382	0.0000 ± 0.0065	not reported	0.0776 ± 0.0119	0.0913 ± 0.0189	0.0875 ± 0.0125	-----
668 & 670	14	Si	0.7933 ± 0.0686	0.7674 ± 0.0169	not reported	0.6706 ± 0.0786	0.6219 ± 0.0723	0.6899 ± 0.0813	0.6899
668 & 670	15	P	0.0780 ± 0.0303	0.0000 ± 0.0016	not reported	0.0000 ± 0.0041	0.0000 ± 0.0055	0.0000 ± 0.0043	-----

Table 10. XRF Data - Loaded Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)	Median** (µg/cm²)
668 & 670	16	S	7.7217 ± 0.5530	7.4810 ± 0.0275	not reported	7.5190 ± 0.8508	6.9360 ± 0.7832	7.7000 ± 0.8718	7.5190
668 & 670	17	Cl	0.3131 ± 0.0261	0.1885 ± 0.0069	not reported	0.2710 ± 0.0319	0.2567 ± 0.0307	0.2998 ± 0.0346	0.2710
668 & 670	19	K	0.2275 ± 0.0124	0.1964 ± 0.0078	not reported	0.2412 ± 0.0274	0.2365 ± 0.0269	0.2414 ± 0.0275	0.2365
668 & 670	20	Ca	0.1584 ± 0.0090	0.1732 ± 0.0053	not reported	0.1261 ± 0.0145	0.1286 ± 0.0147	0.1388 ± 0.0160	0.1388
668 & 670	21	Sc	0.0019 ± 0.0019	0.0000 ± 0.0021	not reported	0.0000 ± 0.0013	0.0003 ± 0.0014	0.0000 ± 0.0017	-----
668 & 670	22	Ti	-0.0002 ± 0.0038	0.0162 ± 0.0020	not reported	0.0116 ± 0.0012	0.0110 ± 0.0012	0.0124 ± 0.0014	-----
668 & 670	23	V	0.0023 ± 0.0014	0.0000 ± 0.0011	not reported	0.0000 ± 0.0006	0.0030 ± 0.0007	0.0011 ± 0.0007	-----
668 & 670	24	Cr	0.0013 ± 0.0012	0.0036 ± 0.0007	not reported	0.0006 ± 0.0006	0.0000 ± 0.0006	0.0002 ± 0.0007	-----
668 & 670	25	Mn	0.0138 ± 0.0027	0.0000 ± 0.0006	not reported	0.0062 ± 0.0011	0.0076 ± 0.0010	0.0069 ± 0.0011	-----
668 & 670	26	Fe	0.2215 ± 0.0167	0.2117 ± 0.0028	not reported	0.2016 ± 0.0105	0.1969 ± 0.0101	0.1923 ± 0.0150	0.2016
668 & 670	27	Co	0.0068 ± 0.0024	0.0000 ± 0.0008	not reported	0.0000 ± 0.0014	0.0009 ± 0.0012	0.0002 ± 0.0011	-----
668 & 670	28	Ni	0.0303 ± 0.0032	0.0014 ± 0.0005	not reported	0.0005 ± 0.0006	0.0002 ± 0.0005	0.0009 ± 0.0007	-----
668 & 670	29	Cu	-0.0002 ± 0.0017	0.0055 ± 0.0008	not reported	0.0047 ± 0.0007	0.0063 ± 0.0007	0.0062 ± 0.0009	-----
668 & 670	30	Zn	0.0546 ± 0.0058	0.0399 ± 0.0011	not reported	0.0384 ± 0.0021	0.0414 ± 0.0022	0.0459 ± 0.0026	0.0414
668 & 670	31	Ga	0.0005 ± 0.0023	0.0000 ± 0.0007	not reported	0.0000 ± 0.0016	0.0000 ± 0.0025	0.0000 ± 0.0018	-----
668 & 670	33	As	0.0086 ± 0.0039	0.0083 ± 0.0010	not reported	0.0040 ± 0.0024	0.0092 ± 0.0029	0.0075 ± 0.0024	-----
668 & 670	34	Se	0.0072 ± 0.0023	0.0067 ± 0.0005	not reported	0.0048 ± 0.0009	0.0066 ± 0.0013	0.0067 ± 0.0009	0.0067
668 & 670	35	Br	0.0167 ± 0.0029	0.0193 ± 0.0008	not reported	0.0166 ± 0.0013	0.0168 ± 0.0016	0.0195 ± 0.0014	0.0168
668 & 670	37	Rb	0.0023 ± 0.0021	0.0000 ± 0.0005	not reported	0.0000 ± 0.0009	0.0000 ± 0.0011	0.0000 ± 0.0009	-----
668 & 670	38	Sr	-0.0040 ± 0.0051	0.0024 ± 0.0005	not reported	0.0000 ± 0.0010	0.0014 ± 0.0012	0.0000 ± 0.0010	-----
668 & 670	39	Y	-0.0012 ± 0.0054	0.0000 ± 0.0006	not reported	0.0000 ± 0.0012	0.0000 ± 0.0015	0.0000 ± 0.0012	-----
668 & 670	40	Zr	0.0062 ± 0.0050	0.0000 ± 0.0013	not reported	0.0000 ± 0.0014	0.0000 ± 0.0017	0.0016 ± 0.0015	-----
668 & 670	41	Nb	0.0071 ± 0.0057	0.0000 ± 0.0010	not reported	0.0000 ± 0.0017	0.0000 ± 0.0021	0.0000 ± 0.0017	-----
668 & 670	42	Mo	-0.0061 ± 0.0053	0.0007 ± 0.0022	not reported	0.0001 ± 0.0021	0.0000 ± 0.0028	0.0000 ± 0.0021	-----
668 & 670	47	Ag	-0.0092 ± 0.0177	0.0000 ± 0.0024	not reported	0.0000 ± 0.0041	0.0023 ± 0.0028	0.0029 ± 0.0045	-----
668 & 670	48	Cd	0.0380 ± 0.0078	0.0086 ± 0.0029	not reported	0.0024 ± 0.0043	0.0000 ± 0.0030	0.0090 ± 0.0046	-----
668 & 670	49	In	not reported	0.0000 ± 0.0038	not reported	0.0008 ± 0.0046	0.0000 ± 0.0033	0.0000 ± 0.0049	-----
668 & 670	50	Sn	0.0226 ± 0.0060	0.0000 ± 0.0052	not reported	0.0097 ± 0.0055	0.0000 ± 0.0041	0.0000 ± 0.0055	-----
668 & 670	51	Sb	0.0273 ± 0.0072	0.0445 ± 0.0077	not reported	0.0073 ± 0.0063	0.0000 ± 0.0049	0.0018 ± 0.0061	-----
668 & 670	55	Cs	0.0037 ± 0.0043	0.0000 ± 0.0032	not reported	0.0100 ± 0.0149	0.0059 ± 0.0132	0.0000 ± 0.0151	-----
668 & 670	56	Ba	0.0374 ± 0.0081	0.0000 ± 0.0254	not reported	0.0079 ± 0.0186	0.0353 ± 0.0182	0.0446 ± 0.0205	-----
668 & 670	57	La	0.0089 ± 0.0056	0.0000 ± 0.0032	not reported	0.0022 ± 0.0245	0.0152 ± 0.0240	0.0344 ± 0.0261	-----
668 & 670	58	Ce	0.0043 ± 0.0043	0.0000 ± 0.0030	not reported	0.0000 ± 0.0315	0.0000 ± 0.0329	0.0139 ± 0.0331	-----
668 & 670	62	Sm	not reported	0.0000 ± 0.0016	not reported	0.0000 ± 0.0026	0.0000 ± 0.0023	0.0000 ± 0.0025	-----
668 & 670	63	Eu	not reported	0.0000 ± 0.0016	not reported	0.0000 ± 0.0035	0.0000 ± 0.0034	0.0000 ± 0.0044	-----

Table 10. XRF Data - Loaded Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)	Median** (µg/cm²)
668 & 670	65	Tb	not reported	0.0000 ± 0.0051	not reported	0.0000 ± 0.0074	0.0006 ± 0.0080	0.0000 ± 0.0120	-----
668 & 670	72	Hf	not reported	0.0000 ± 0.0022	not reported	0.0005 ± 0.0028	0.0000 ± 0.0055	0.0021 ± 0.0022	-----
668 & 670	73	Ta	not reported	0.0000 ± 0.0034	not reported	0.0000 ± 0.0030	0.0000 ± 0.0061	0.0000 ± 0.0030	-----
668 & 670	74	W	0.0023 ± 0.0066	0.0000 ± 0.0022	not reported	0.0000 ± 0.0030	0.0000 ± 0.0053	0.0000 ± 0.0027	-----
668 & 670	77	Ir	not reported	0.0000 ± 0.0020	not reported	0.0000 ± 0.0023	0.0000 ± 0.0034	0.0000 ± 0.0017	-----
668 & 670	79	Au	0.0081 ± 0.0041	0.0029 ± 0.0012	not reported	0.0000 ± 0.0023	0.0000 ± 0.0031	0.0000 ± 0.0020	-----
668 & 670	80	Hg	-0.0009 ± 0.0046	0.0000 ± 0.0014	not reported	0.0000 ± 0.0020	0.0000 ± 0.0022	0.0000 ± 0.0014	-----
668 & 670	82	Pb	0.0445 ± 0.0075	0.0326 ± 0.0018	not reported	0.0278 ± 0.0028	0.0256 ± 0.0037	0.0249 ± 0.0026	0.0278
805	11	Na	2.3555 ± 0.3929	1.9467 ± 0.0272	1.3513 ± 0.0185	not reported	not reported	not reported	1.9467
805	12	Mg	0.7515 ± 0.1468	0.0000 ± 0.0101	0.0000 ± 0.0056	not reported	not reported	not reported	-----
805	13	Al	1.9324 ± 0.2613	1.0618 ± 0.0082	0.9653 ± 0.0063	not reported	not reported	not reported	1.0618
805	14	Si	4.0992 ± 0.4002	3.0910 ± 0.0291	2.8565 ± 0.0049	not reported	not reported	not reported	3.0910
805	15	P	0.0042 ± 0.0343	0.0000 ± 0.0018	0.0000 ± 0.0128	not reported	not reported	not reported	-----
805	16	S	9.3908 ± 0.6733	8.8005 ± 0.0302	8.8703 ± 0.0330	not reported	not reported	not reported	8.8703
805	17	Cl	0.0242 ± 0.0071	0.0000 ± 0.0051	0.0000 ± 0.0038	not reported	not reported	not reported	-----
805	19	K	0.7792 ± 0.0413	0.7132 ± 0.0141	0.8073 ± 0.0059	not reported	not reported	not reported	0.7792
805	20	Ca	0.7081 ± 0.0364	0.8362 ± 0.0112	0.6896 ± 0.0046	not reported	not reported	not reported	0.7081
805	21	Sc	-0.0006 ± 0.0021	0.0000 ± 0.0018	0.0000 ± 0.0047	not reported	not reported	not reported	-----
805	22	Ti	0.0954 ± 0.0084	0.1000 ± 0.0035	0.0747 ± 0.0029	not reported	not reported	not reported	0.0954
805	23	V	0.0097 ± 0.0019	0.0049 ± 0.0016	0.0037 ± 0.0013	not reported	not reported	not reported	-----
805	24	Cr	0.0021 ± 0.0011	0.0080 ± 0.0008	0.0041 ± 0.0007	not reported	not reported	not reported	-----
805	25	Mn	0.0267 ± 0.0037	0.0088 ± 0.0011	0.0138 ± 0.0009	not reported	not reported	not reported	0.0138
805	26	Fe	1.0717 ± 0.0767	1.0669 ± 0.0060	1.0984 ± 0.0048	not reported	not reported	not reported	1.0717
805	27	Co	-0.0009 ± 0.0026	0.0000 ± 0.0015	0.0000 ± 0.0011	not reported	not reported	not reported	-----
805	28	Ni	0.0019 ± 0.0014	0.0029 ± 0.0004	0.0027 ± 0.0003	not reported	not reported	not reported	-----
805	29	Cu	0.0099 ± 0.0015	0.0006 ± 0.0006	0.0000 ± 0.0004	not reported	not reported	not reported	-----
805	30	Zn	0.0407 ± 0.0045	0.0333 ± 0.0009	0.0379 ± 0.0007	not reported	not reported	not reported	0.0379
805	31	Ga	0.0048 ± 0.0020	0.0000 ± 0.0005	0.0004 ± 0.0003	not reported	not reported	not reported	-----
805	33	As	0.0061 ± 0.0021	0.0098 ± 0.0007	0.0099 ± 0.0005	not reported	not reported	not reported	-----
805	34	Se	0.0120 ± 0.0020	0.0091 ± 0.0006	0.0083 ± 0.0004	not reported	not reported	not reported	0.0091
805	35	Br	0.0251 ± 0.0028	0.0200 ± 0.0008	0.0165 ± 0.0005	not reported	not reported	not reported	0.0200
805	37	Rb	0.0028 ± 0.0014	0.0015 ± 0.0004	0.0015 ± 0.0003	not reported	not reported	not reported	-----
805	38	Sr	0.0116 ± 0.0050	0.0124 ± 0.0006	0.0085 ± 0.0005	not reported	not reported	not reported	-----
805	39	Y	0.0074 ± 0.0045	0.0006 ± 0.0004	0.0000 ± 0.0004	not reported	not reported	not reported	-----
805	40	Zr	0.0105 ± 0.0044	0.0040 ± 0.0005	0.0079 ± 0.0008	not reported	not reported	not reported	-----

Table 10. XRF Data - Loaded Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)	Median** (µg/cm²)
805	41	Nb	0.0028 ± 0.0038	0.0000 ± 0.0006	0.0000 ± 0.0006	not reported	not reported	not reported	-----
805	42	Mo	0.0013 ± 0.0036	0.0000 ± 0.0021	0.0000 ± 0.0008	not reported	not reported	not reported	-----
805	47	Ag	0.0262 ± 0.0210	0.0000 ± 0.0017	0.0020 ± 0.0026	not reported	not reported	not reported	-----
805	48	Cd	-0.0378 ± 0.0233	0.0012 ± 0.0021	0.0000 ± 0.0043	not reported	not reported	not reported	-----
805	49	In	0.0840 ± 0.0280	0.0000 ± 0.0033	0.0000 ± 0.0038	not reported	not reported	not reported	-----
805	50	Sn	-0.0758 ± 0.0288	0.0000 ± 0.0043	0.0000 ± 0.0053	not reported	not reported	not reported	-----
805	51	Sb	0.0305 ± 0.0205	0.0000 ± 0.0063	0.0000 ± 0.0074	not reported	not reported	not reported	-----
805	55	Cs	0.0097 ± 0.0066	0.0000 ± 0.0042	0.0000 ± 0.0064	not reported	not reported	not reported	-----
805	56	Ba	0.0489 ± 0.0141	0.0341 ± 0.0081	0.0376 ± 0.0059	not reported	not reported	not reported	0.0376
805	57	La	-0.0075 ± 0.0058	0.0000 ± 0.0064	0.0000 ± 0.0012	not reported	not reported	not reported	-----
805	58	Ce	-0.0003 ± 0.0050	0.0000 ± 0.0045	0.0000 ± 0.0030	not reported	not reported	not reported	-----
805	62	Sm	not reported	0.0000 ± 0.0019	0.0000 ± 0.0011	not reported	not reported	not reported	-----
805	63	Eu	not reported	0.0400 ± 0.0017	0.0366 ± 0.0018	not reported	not reported	not reported	0.0383
805	65	Tb	not reported	0.0000 ± 0.0112	0.0000 ± 0.0078	not reported	not reported	not reported	-----
805	72	Hf	not reported	0.0000 ± 0.0015	0.0000 ± 0.0012	not reported	not reported	not reported	-----
805	73	Ta	not reported	0.0000 ± 0.0029	0.0000 ± 0.0019	not reported	not reported	not reported	-----
805	74	W	-0.0067 ± 0.0043	0.0097 ± 0.0017	0.0000 ± 0.0012	not reported	not reported	not reported	-----
805	77	Ir	not reported	0.0000 ± 0.0015	0.0000 ± 0.0008	not reported	not reported	not reported	-----
805	79	Au	-0.0059 ± 0.0024	0.0000 ± 0.0010	0.0000 ± 0.0007	not reported	not reported	not reported	-----
805	80	Hg	-0.0046 ± 0.0025	0.0000 ± 0.0010	0.0000 ± 0.0007	not reported	not reported	not reported	-----
805	82	Pb	0.0023 ± 0.0036	0.0084 ± 0.0013	0.0054 ± 0.0013	not reported	not reported	not reported	-----
807	11	Na	0.8467 ± 0.1501	1.2366 ± 0.0225	0.4321 ± 0.0144	not reported	not reported	not reported	0.8467
807	12	Mg	0.3163 ± 0.0700	0.0000 ± 0.0089	0.0000 ± 0.0047	not reported	not reported	not reported	-----
807	13	Al	1.4092 ± 0.1942	1.1353 ± 0.0077	0.7806 ± 0.0058	not reported	not reported	not reported	1.1353
807	14	Si	3.0978 ± 0.3053	2.3849 ± 0.0261	2.2337 ± 0.0044	not reported	not reported	not reported	2.3849
807	15	P	0.0130 ± 0.0332	0.0000 ± 0.0016	0.0000 ± 0.0121	not reported	not reported	not reported	-----
807	16	S	8.6237 ± 0.6176	7.9833 ± 0.0288	8.2319 ± 0.0318	not reported	not reported	not reported	8.2319
807	17	Cl	0.0538 ± 0.0088	0.0000 ± 0.0051	0.0000 ± 0.0036	not reported	not reported	not reported	-----
807	19	K	0.4447 ± 0.0247	0.4088 ± 0.0106	0.4341 ± 0.0044	not reported	not reported	not reported	0.4341
807	20	Ca	0.3475 ± 0.0184	0.3909 ± 0.0076	0.3285 ± 0.0033	not reported	not reported	not reported	0.3475
807	21	Sc	0.0008 ± 0.0018	0.0000 ± 0.0016	0.0000 ± 0.0035	not reported	not reported	not reported	-----
807	22	Ti	0.0663 ± 0.0065	0.0767 ± 0.0029	0.0648 ± 0.0025	not reported	not reported	not reported	0.0663
807	23	V	0.0081 ± 0.0018	0.0079 ± 0.0014	0.0025 ± 0.0012	not reported	not reported	not reported	-----
807	24	Cr	0.0003 ± 0.0011	0.0048 ± 0.0007	0.0018 ± 0.0006	not reported	not reported	not reported	-----
807	25	Mn	0.0133 ± 0.0027	0.0000 ± 0.0009	0.0000 ± 0.0006	not reported	not reported	not reported	-----

Table 10. XRF Data - Loaded Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)	Median** (µg/cm²)
807	26	Fe	0.7095 ± 0.0511	0.6921 ± 0.0048	0.7337 ± 0.0039	not reported	not reported	not reported	0.7095
807	27	Co	-0.0013 ± 0.0022	0.0000 ± 0.0012	0.0000 ± 0.0009	not reported	not reported	not reported	-----
807	28	Ni	0.0065 ± 0.0015	0.0024 ± 0.0004	0.0022 ± 0.0003	not reported	not reported	not reported	0.0024
807	29	Cu	0.0062 ± 0.0013	0.0002 ± 0.0005	0.0000 ± 0.0003	not reported	not reported	not reported	-----
807	30	Zn	0.0195 ± 0.0031	0.0157 ± 0.0007	0.0176 ± 0.0005	not reported	not reported	not reported	0.0176
807	31	Ga	-0.0032 ± 0.0017	0.0000 ± 0.0005	0.0006 ± 0.0003	not reported	not reported	not reported	-----
807	33	As	0.0028 ± 0.0022	0.0058 ± 0.0006	0.0089 ± 0.0004	not reported	not reported	not reported	-----
807	34	Se	0.0067 ± 0.0017	0.0053 ± 0.0004	0.0053 ± 0.0003	not reported	not reported	not reported	0.0053
807	35	Br	0.0121 ± 0.0020	0.0117 ± 0.0006	0.0109 ± 0.0004	not reported	not reported	not reported	0.0117
807	37	Rb	0.0039 ± 0.0015	0.0012 ± 0.0003	0.0007 ± 0.0003	not reported	not reported	not reported	-----
807	38	Sr	0.0000 ± 0.0042	0.0061 ± 0.0005	0.0054 ± 0.0004	not reported	not reported	not reported	-----
807	39	Y	0.0037 ± 0.0047	0.0000 ± 0.0004	0.0000 ± 0.0004	not reported	not reported	not reported	-----
807	40	Zr	0.0029 ± 0.0036	0.0020 ± 0.0005	0.0042 ± 0.0008	not reported	not reported	not reported	-----
807	41	Nb	-0.0045 ± 0.0033	0.0000 ± 0.0006	0.0000 ± 0.0006	not reported	not reported	not reported	-----
807	42	Mo	-0.0009 ± 0.0035	0.0000 ± 0.0025	0.0000 ± 0.0008	not reported	not reported	not reported	-----
807	47	Ag	0.0069 ± 0.0161	0.0000 ± 0.0021	0.0000 ± 0.0029	not reported	not reported	not reported	-----
807	48	Cd	-0.0166 ± 0.0178	0.0000 ± 0.0025	0.0000 ± 0.0045	not reported	not reported	not reported	-----
807	49	In	0.0072 ± 0.0215	0.0000 ± 0.0028	0.0000 ± 0.0042	not reported	not reported	not reported	-----
807	50	Sn	-0.0208 ± 0.0197	0.0000 ± 0.0043	0.0000 ± 0.0055	not reported	not reported	not reported	-----
807	51	Sb	0.0317 ± 0.0166	0.0000 ± 0.0066	0.0000 ± 0.0078	not reported	not reported	not reported	-----
807	55	Cs	-0.0074 ± 0.0058	0.0000 ± 0.0040	0.0000 ± 0.0044	not reported	not reported	not reported	-----
807	56	Ba	0.0296 ± 0.0129	0.0000 ± 0.0180	0.0000 ± 0.0018	not reported	not reported	not reported	-----
807	57	La	-0.0036 ± 0.0055	0.0000 ± 0.0056	0.0000 ± 0.0033	not reported	not reported	not reported	-----
807	58	Ce	-0.0038 ± 0.0047	0.0000 ± 0.0039	0.0008 ± 0.0027	not reported	not reported	not reported	-----
807	62	Sm	not reported	0.0000 ± 0.0017	0.0000 ± 0.0010	not reported	not reported	not reported	-----
807	63	Eu	not reported	0.0382 ± 0.0013	0.0191 ± 0.0015	not reported	not reported	not reported	0.0287
807	65	Tb	not reported	0.0000 ± 0.0091	0.0000 ± 0.0064	not reported	not reported	not reported	-----
807	72	Hf	not reported	0.0000 ± 0.0014	0.0000 ± 0.0010	not reported	not reported	not reported	-----
807	73	Ta	not reported	0.0000 ± 0.0028	0.0000 ± 0.0017	not reported	not reported	not reported	-----
807	74	W	-0.0078 ± 0.0043	0.0008 ± 0.0014	0.0000 ± 0.0010	not reported	not reported	not reported	-----
807	77	Ir	not reported	0.0000 ± 0.0015	0.0000 ± 0.0008	not reported	not reported	not reported	-----
807	79	Au	-0.0034 ± 0.0025	0.0000 ± 0.0008	0.0000 ± 0.0006	not reported	not reported	not reported	-----
807	80	Hg	-0.0045 ± 0.0026	0.0000 ± 0.0010	0.0000 ± 0.0008	not reported	not reported	not reported	-----
807	82	Pb	0.0082 ± 0.0040	0.0055 ± 0.0011	0.0005 ± 0.0012	not reported	not reported	not reported	-----
811	11	Na	0.1434 ± 0.0799	0.2271 ± 0.0293	0.2058 ± 0.0174	not reported	not reported	not reported	-----

Table 10. XRF Data - Loaded Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)	Median** (µg/cm²)
811	12	Mg	0.0855 ± 0.0352	0.0000 ± 0.0110	0.0000 ± 0.0053	not reported	not reported	not reported	-----
811	13	Al	0.6343 ± 0.1083	0.0000 ± 0.0075	0.5425 ± 0.0055	not reported	not reported	not reported	-----
811	14	Si	1.2666 ± 0.1392	1.3718 ± 0.0249	1.2714 ± 0.0039	not reported	not reported	not reported	1.2714
811	15	P	0.1154 ± 0.0496	0.0000 ± 0.0022	0.0000 ± 0.0189	not reported	not reported	not reported	-----
811	16	S	22.2783 ± 1.6269	20.6240 ± 0.0463	21.7020 ± 0.0518	not reported	not reported	not reported	21.7020
811	17	Cl	1.1860 ± 0.0890	0.7438 ± 0.0119	1.2597 ± 0.0120	not reported	not reported	not reported	1.1860
811	19	K	0.5079 ± 0.0282	0.4768 ± 0.0118	0.4873 ± 0.0047	not reported	not reported	not reported	0.4873
811	20	Ca	0.3005 ± 0.0162	0.3838 ± 0.0077	0.2965 ± 0.0032	not reported	not reported	not reported	0.3005
811	21	Sc	-0.0024 ± 0.0019	0.0000 ± 0.0018	0.0000 ± 0.0038	not reported	not reported	not reported	-----
811	22	Ti	0.0407 ± 0.0050	0.0312 ± 0.0024	0.0314 ± 0.0021	not reported	not reported	not reported	0.0314
811	23	V	0.0031 ± 0.0015	0.0063 ± 0.0013	0.0017 ± 0.0010	not reported	not reported	not reported	-----
811	24	Cr	0.0042 ± 0.0012	0.0034 ± 0.0007	0.0053 ± 0.0006	not reported	not reported	not reported	0.0042
811	25	Mn	0.0262 ± 0.0036	0.0093 ± 0.0010	0.0155 ± 0.0009	not reported	not reported	not reported	0.0155
811	26	Fe	0.5966 ± 0.0431	0.5884 ± 0.0044	0.6085 ± 0.0036	not reported	not reported	not reported	0.5966
811	27	Co	-0.0012 ± 0.0024	0.0000 ± 0.0011	0.0000 ± 0.0009	not reported	not reported	not reported	-----
811	28	Ni	0.0121 ± 0.0019	0.0089 ± 0.0005	0.0057 ± 0.0004	not reported	not reported	not reported	0.0089
811	29	Cu	0.0165 ± 0.0018	0.0001 ± 0.0007	0.0000 ± 0.0005	not reported	not reported	not reported	-----
811	30	Zn	0.3573 ± 0.0268	0.3257 ± 0.0024	0.3589 ± 0.0019	not reported	not reported	not reported	0.3573
811	31	Ga	0.0025 ± 0.0026	0.0000 ± 0.0010	0.0000 ± 0.0006	not reported	not reported	not reported	-----
811	33	As	0.0416 ± 0.0073	0.0140 ± 0.0027	0.0855 ± 0.0018	not reported	not reported	not reported	0.0416
811	34	Se	0.0134 ± 0.0023	0.0135 ± 0.0007	0.0207 ± 0.0005	not reported	not reported	not reported	0.0135
811	35	Br	0.0334 ± 0.0036	0.0308 ± 0.0010	0.0301 ± 0.0006	not reported	not reported	not reported	0.0308
811	37	Rb	0.0006 ± 0.0015	0.0005 ± 0.0005	0.0000 ± 0.0004	not reported	not reported	not reported	-----
811	38	Sr	-0.0014 ± 0.0044	0.0040 ± 0.0004	0.0029 ± 0.0004	not reported	not reported	not reported	-----
811	39	Y	-0.0015 ± 0.0044	0.0000 ± 0.0006	0.0000 ± 0.0005	not reported	not reported	not reported	-----
811	40	Zr	0.0060 ± 0.0040	0.0018 ± 0.0006	0.0025 ± 0.0009	not reported	not reported	not reported	-----
811	41	Nb	0.0009 ± 0.0035	0.0000 ± 0.0007	0.0000 ± 0.0007	not reported	not reported	not reported	-----
811	42	Mo	0.0035 ± 0.0039	0.0000 ± 0.0024	0.0000 ± 0.0009	not reported	not reported	not reported	-----
811	47	Ag	-0.0254 ± 0.0223	0.0028 ± 0.0021	0.0011 ± 0.0027	not reported	not reported	not reported	-----
811	48	Cd	0.0353 ± 0.0231	0.0000 ± 0.0025	0.0000 ± 0.0048	not reported	not reported	not reported	-----
811	49	In	0.0179 ± 0.0235	0.0000 ± 0.0032	0.0000 ± 0.0046	not reported	not reported	not reported	-----
811	50	Sn	0.0456 ± 0.0231	0.0600 ± 0.0060	0.0610 ± 0.0073	not reported	not reported	not reported	-----
811	51	Sb	0.0390 ± 0.0172	0.0000 ± 0.0055	0.0000 ± 0.0080	not reported	not reported	not reported	-----
811	55	Cs	0.0165 ± 0.0060	0.0000 ± 0.0037	0.0000 ± 0.0051	not reported	not reported	not reported	-----
811	56	Ba	0.0284 ± 0.0119	0.0147 ± 0.0055	0.0199 ± 0.0043	not reported	not reported	not reported	-----

Table 10. XRF Data - Loaded Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)	Median** (µg/cm²)
811	57	La	0.0076 ± 0.0055	0.0000 ± 0.0047	0.0000 ± 0.0028	not reported	not reported	not reported	-----
811	58	Ce	-0.0032 ± 0.0044	0.0000 ± 0.0036	0.0000 ± 0.0026	not reported	not reported	not reported	-----
811	62	Sm	not reported	0.0000 ± 0.0016	0.0000 ± 0.0011	not reported	not reported	not reported	-----
811	63	Eu	not reported	0.0231 ± 0.0016	0.0260 ± 0.0018	not reported	not reported	not reported	0.0245
811	65	Tb	not reported	0.0000 ± 0.0082	0.0000 ± 0.0059	not reported	not reported	not reported	-----
811	72	Hf	not reported	0.0000 ± 0.0018	0.0000 ± 0.0009	not reported	not reported	not reported	-----
811	73	Ta	not reported	0.0000 ± 0.0034	0.0000 ± 0.0025	not reported	not reported	not reported	-----
811	74	W	0.0039 ± 0.0071	0.0019 ± 0.0039	0.0000 ± 0.0029	not reported	not reported	not reported	-----
811	77	Ir	not reported	0.0000 ± 0.0029	0.0000 ± 0.0016	not reported	not reported	not reported	-----
811	79	Au	-0.0044 ± 0.0037	0.0000 ± 0.0022	0.0000 ± 0.0015	not reported	not reported	not reported	-----
811	80	Hg	0.0012 ± 0.0034	0.0000 ± 0.0011	0.0000 ± 0.0010	not reported	not reported	not reported	-----
811	82	Pb	0.3217 ± 0.0254	0.3361 ± 0.0047	0.3031 ± 0.0051	not reported	not reported	not reported	0.3217
812	11	Na	0.7610 ± 0.1431	0.0000 ± 0.0290	0.0000 ± 0.0176	not reported	not reported	not reported	-----
812	12	Mg	0.4564 ± 0.0957	0.0000 ± 0.0120	0.0000 ± 0.0062	not reported	not reported	not reported	-----
812	13	Al	3.2243 ± 0.4269	2.1448 ± 0.0103	1.7499 ± 0.0079	not reported	not reported	not reported	2.1448
812	14	Si	6.9979 ± 0.6771	5.4271 ± 0.0391	4.8272 ± 0.0063	not reported	not reported	not reported	5.4271
812	15	P	0.0333 ± 0.0499	0.0000 ± 0.0025	0.0000 ± 0.0174	not reported	not reported	not reported	-----
812	16	S	19.9914 ± 1.4601	17.8850 ± 0.0430	17.8140 ± 0.0467	not reported	not reported	not reported	17.8850
812	17	Cl	0.0148 ± 0.0089	0.0000 ± 0.0069	0.0000 ± 0.0050	not reported	not reported	not reported	-----
812	19	K	0.9208 ± 0.0488	0.8277 ± 0.0153	0.8767 ± 0.0062	not reported	not reported	not reported	0.8767
812	20	Ca	0.7533 ± 0.0389	0.8983 ± 0.0116	0.7066 ± 0.0047	not reported	not reported	not reported	0.7533
812	21	Sc	-0.0005 ± 0.0023	0.0000 ± 0.0019	0.0000 ± 0.0050	not reported	not reported	not reported	-----
812	22	Ti	0.1921 ± 0.0150	0.1799 ± 0.0045	0.1592 ± 0.0037	not reported	not reported	not reported	0.1799
812	23	V	0.0175 ± 0.0025	0.0220 ± 0.0020	0.0385 ± 0.0016	not reported	not reported	not reported	0.0220
812	24	Cr	0.0044 ± 0.0013	0.0045 ± 0.0010	0.0012 ± 0.0008	not reported	not reported	not reported	-----
812	25	Mn	0.0390 ± 0.0046	0.0000 ± 0.0013	0.0000 ± 0.0010	not reported	not reported	not reported	-----
812	26	Fe	1.7225 ± 0.1227	1.6889 ± 0.0075	1.7307 ± 0.0060	not reported	not reported	not reported	1.7225
812	27	Co	-0.0027 ± 0.0032	0.0000 ± 0.0018	0.0000 ± 0.0014	not reported	not reported	not reported	-----
812	28	Ni	0.0039 ± 0.0016	0.0043 ± 0.0005	0.0010 ± 0.0003	not reported	not reported	not reported	-----
812	29	Cu	0.0107 ± 0.0017	0.0009 ± 0.0007	0.0000 ± 0.0005	not reported	not reported	not reported	-----
812	30	Zn	0.0824 ± 0.0075	0.0713 ± 0.0012	0.0748 ± 0.0009	not reported	not reported	not reported	0.0748
812	31	Ga	0.0021 ± 0.0021	0.0000 ± 0.0006	0.0000 ± 0.0004	not reported	not reported	not reported	-----
812	33	As	0.0356 ± 0.0043	0.0343 ± 0.0013	0.0390 ± 0.0009	not reported	not reported	not reported	0.0356
812	34	Se	0.0146 ± 0.0023	0.0122 ± 0.0006	0.0119 ± 0.0005	not reported	not reported	not reported	0.0122
812	35	Br	0.0223 ± 0.0028	0.0244 ± 0.0009	0.0198 ± 0.0005	not reported	not reported	not reported	0.0223

Table 10. XRF Data - Loaded Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)	Median** (µg/cm²)
812	37	Rb	0.0048 ± 0.0016	0.0044 ± 0.0005	0.0023 ± 0.0004	not reported	not reported	not reported	-----
812	38	Sr	0.0021 ± 0.0043	0.0121 ± 0.0006	0.0104 ± 0.0005	not reported	not reported	not reported	-----
812	39	Y	0.0017 ± 0.0044	0.0000 ± 0.0005	0.0000 ± 0.0005	not reported	not reported	not reported	-----
812	40	Zr	0.0052 ± 0.0039	0.0050 ± 0.0006	0.0110 ± 0.0009	not reported	not reported	not reported	-----
812	41	Nb	-0.0024 ± 0.0034	0.0000 ± 0.0007	0.0000 ± 0.0007	not reported	not reported	not reported	-----
812	42	Mo	0.0036 ± 0.0039	0.0000 ± 0.0025	0.0000 ± 0.0009	not reported	not reported	not reported	-----
812	47	Ag	0.0287 ± 0.0233	0.0020 ± 0.0019	0.0000 ± 0.0031	not reported	not reported	not reported	-----
812	48	Cd	-0.0003 ± 0.0251	0.0000 ± 0.0026	0.0000 ± 0.0046	not reported	not reported	not reported	-----
812	49	In	0.0737 ± 0.0305	0.0000 ± 0.0034	0.0000 ± 0.0045	not reported	not reported	not reported	-----
812	50	Sn	-0.0372 ± 0.0281	0.0000 ± 0.0046	0.0000 ± 0.0059	not reported	not reported	not reported	-----
812	51	Sb	0.0520 ± 0.0232	0.0054 ± 0.0061	0.0184 ± 0.0076	not reported	not reported	not reported	-----
812	55	Cs	0.0147 ± 0.0073	0.0000 ± 0.0058	0.0000 ± 0.0065	not reported	not reported	not reported	-----
812	56	Ba	0.0569 ± 0.0158	0.0113 ± 0.0104	0.0410 ± 0.0077	not reported	not reported	not reported	-----
812	57	La	0.0153 ± 0.0068	0.0000 ± 0.0085	0.0000 ± 0.0030	not reported	not reported	not reported	-----
812	58	Ce	0.0016 ± 0.0055	0.0000 ± 0.0055	0.0000 ± 0.0039	not reported	not reported	not reported	-----
812	62	Sm	not reported	0.0000 ± 0.0023	0.0000 ± 0.0009	not reported	not reported	not reported	-----
812	63	Eu	not reported	0.0748 ± 0.0020	0.0872 ± 0.0022	not reported	not reported	not reported	0.0810
812	65	Tb	not reported	0.0000 ± 0.0141	0.0000 ± 0.0098	not reported	not reported	not reported	-----
812	72	Hf	not reported	0.0000 ± 0.0018	0.0000 ± 0.0012	not reported	not reported	not reported	-----
812	73	Ta	not reported	0.0000 ± 0.0033	0.0000 ± 0.0022	not reported	not reported	not reported	-----
812	74	W	0.0136 ± 0.0060	0.0026 ± 0.0021	0.0000 ± 0.0015	not reported	not reported	not reported	-----
812	77	Ir	not reported	0.0000 ± 0.0016	0.0000 ± 0.0009	not reported	not reported	not reported	-----
812	79	Au	0.0011 ± 0.0034	0.0000 ± 0.0011	0.0000 ± 0.0009	not reported	not reported	not reported	-----
812	80	Hg	0.0002 ± 0.0035	0.0000 ± 0.0011	0.0000 ± 0.0009	not reported	not reported	not reported	-----
812	82	Pb	0.0179 ± 0.0051	0.0242 ± 0.0024	0.0110 ± 0.0025	not reported	not reported	not reported	0.0179

*** Two sample ID's are listed when replicate filters were analyzed.**

**** Median was calculated only when the result from all reporting labs was greater than three times the uncertainty.**

Table 11. XRF Data - Blank Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)
619 & 620	11	Na	0.0029 ± 0.0123	0.0000 ± 0.0105	not reported	0.0054 ± 0.0098	0.0060 ± 0.0538	0.0000 ± 0.0146
619 & 620	12	Mg	0.0011 ± 0.0102	0.0000 ± 0.0031	not reported	0.0026 ± 0.0047	0.0000 ± 0.0146	0.0000 ± 0.0055
619 & 620	13	Al	0.0209 ± 0.0157	0.0000 ± 0.0055	not reported	0.0000 ± 0.0027	0.0012 ± 0.0056	0.0000 ± 0.0023
619 & 620	14	Si	0.0608 ± 0.0171	0.0008 ± 0.0053	not reported	0.0000 ± 0.0022	0.0020 ± 0.0033	0.0012 ± 0.0018
619 & 620	15	P	0.0056 ± 0.0099	0.0000 ± 0.0006	not reported	0.0029 ± 0.0018	0.0007 ± 0.0018	0.0000 ± 0.0011
619 & 620	16	S	0.0073 ± 0.0073	0.0000 ± 0.0026	not reported	0.0000 ± 0.0023	0.0000 ± 0.0057	0.0000 ± 0.0018
619 & 620	17	Cl	0.0031 ± 0.0047	0.0000 ± 0.0021	not reported	0.0000 ± 0.0037	0.0000 ± 0.0044	0.0000 ± 0.0031
619 & 620	19	K	-0.0014 ± 0.0019	0.0000 ± 0.0029	not reported	0.0007 ± 0.0010	0.0000 ± 0.0019	0.0000 ± 0.0009
619 & 620	20	Ca	0.0022 ± 0.0018	0.0035 ± 0.0018	not reported	0.0012 ± 0.0011	0.0024 ± 0.0013	0.0019 ± 0.0014
619 & 620	21	Sc	0.0024 ± 0.0016	0.0000 ± 0.0021	not reported	0.0000 ± 0.0008	0.0005 ± 0.0010	0.0000 ± 0.0009
619 & 620	22	Ti	-0.0028 ± 0.0034	0.0000 ± 0.0014	not reported	0.0001 ± 0.0010	0.0018 ± 0.0010	0.0009 ± 0.0011
619 & 620	23	V	0.0020 ± 0.0014	0.0000 ± 0.0011	not reported	0.0000 ± 0.0006	0.0000 ± 0.0006	0.0000 ± 0.0006
619 & 620	24	Cr	0.0017 ± 0.0012	0.0009 ± 0.0005	not reported	0.0000 ± 0.0005	0.0003 ± 0.0006	0.0000 ± 0.0006
619 & 620	25	Mn	0.0068 ± 0.0023	0.0000 ± 0.0005	not reported	0.0000 ± 0.0009	0.0000 ± 0.0009	0.0000 ± 0.0009
619 & 620	26	Fe	-0.0007 ± 0.0018	0.0004 ± 0.0006	not reported	0.0000 ± 0.0008	0.0000 ± 0.0007	0.0000 ± 0.0010
619 & 620	27	Co	0.0038 ± 0.0019	0.0007 ± 0.0004	not reported	0.0000 ± 0.0006	0.0004 ± 0.0006	0.0000 ± 0.0006
619 & 620	28	Ni	0.0006 ± 0.0016	0.0000 ± 0.0004	not reported	0.0000 ± 0.0006	0.0000 ± 0.0005	0.0003 ± 0.0007
619 & 620	29	Cu	-0.0057 ± 0.0015	0.0004 ± 0.0007	not reported	0.0000 ± 0.0006	0.0000 ± 0.0006	0.0004 ± 0.0007
619 & 620	30	Zn	-0.0034 ± 0.0022	0.0000 ± 0.0008	not reported	0.0000 ± 0.0005	0.0000 ± 0.0005	0.0007 ± 0.0007
619 & 620	31	Ga	0.0006 ± 0.0024	0.0000 ± 0.0006	not reported	0.0006 ± 0.0015	0.0000 ± 0.0024	0.0000 ± 0.0017
619 & 620	33	As	-0.0021 ± 0.0029	0.0000 ± 0.0004	not reported	0.0000 ± 0.0008	0.0035 ± 0.0012	0.0000 ± 0.0008
619 & 620	34	Se	0.0031 ± 0.0019	0.0004 ± 0.0004	not reported	0.0000 ± 0.0007	0.0023 ± 0.0011	0.0000 ± 0.0008
619 & 620	35	Br	-0.0023 ± 0.0019	0.0004 ± 0.0003	not reported	0.0002 ± 0.0007	0.0017 ± 0.0010	0.0000 ± 0.0007
619 & 620	37	Rb	-0.0053 ± 0.0019	0.0006 ± 0.0004	not reported	0.0000 ± 0.0007	0.0000 ± 0.0010	0.0001 ± 0.0008
619 & 620	38	Sr	0.0073 ± 0.0066	0.0005 ± 0.0005	not reported	0.0000 ± 0.0009	0.0000 ± 0.0011	0.0010 ± 0.0010
619 & 620	39	Y	0.0105 ± 0.0069	0.0008 ± 0.0006	not reported	0.0000 ± 0.0011	0.0000 ± 0.0014	0.0013 ± 0.0011
619 & 620	40	Zr	0.0121 ± 0.0056	0.0001 ± 0.0008	not reported	0.0000 ± 0.0013	0.0025 ± 0.0017	0.0000 ± 0.0014
619 & 620	41	Nb	-0.0007 ± 0.0052	0.0000 ± 0.0010	not reported	0.0006 ± 0.0017	0.0000 ± 0.0020	0.0015 ± 0.0017
619 & 620	42	Mo	0.0012 ± 0.0056	0.0000 ± 0.0026	not reported	0.0000 ± 0.0020	0.0000 ± 0.0026	0.0000 ± 0.0020
619 & 620	47	Ag	-0.0173 ± 0.0150	0.0000 ± 0.0026	not reported	0.0000 ± 0.0039	0.0048 ± 0.0028	0.0052 ± 0.0044
619 & 620	48	Cd	0.0282 ± 0.0065	0.0007 ± 0.0029	not reported	0.0000 ± 0.0041	0.0018 ± 0.0029	0.0000 ± 0.0043
619 & 620	49	In	not reported	0.0000 ± 0.0037	not reported	0.0000 ± 0.0045	0.0000 ± 0.0032	0.0000 ± 0.0047
619 & 620	50	Sn	0.0138 ± 0.0039	0.0024 ± 0.0053	not reported	0.0041 ± 0.0052	0.0000 ± 0.0039	0.0045 ± 0.0053
619 & 620	51	Sb	0.0108 ± 0.0042	0.0000 ± 0.0079	not reported	0.0000 ± 0.0060	0.0000 ± 0.0048	0.0000 ± 0.0060
619 & 620	55	Cs	0.0017 ± 0.0041	0.0000 ± 0.0033	not reported	0.0000 ± 0.0143	0.0052 ± 0.0131	0.0032 ± 0.0150

Table 11. XRF Data - Blank Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)
619 & 620	56	Ba	0.0141 ± 0.0069	0.0000 ± 0.0027	not reported	0.0276 ± 0.0181	0.0195 ± 0.0179	0.0000 ± 0.0196
619 & 620	57	La	0.0114 ± 0.0054	0.0000 ± 0.0029	not reported	0.0000 ± 0.0238	0.0000 ± 0.0236	0.0000 ± 0.0252
619 & 620	58	Ce	0.0109 ± 0.0040	0.0000 ± 0.0029	not reported	0.0000 ± 0.0305	0.0167 ± 0.0323	0.0034 ± 0.0321
619 & 620	62	Sm	not reported	0.0000 ± 0.0013	not reported	0.0000 ± 0.0024	0.0000 ± 0.0022	0.0004 ± 0.0026
619 & 620	63	Eu	not reported	0.0000 ± 0.0011	not reported	0.0000 ± 0.0028	0.0000 ± 0.0027	0.0006 ± 0.0036
619 & 620	65	Tb	not reported	0.0000 ± 0.0013	not reported	0.0000 ± 0.0026	0.0000 ± 0.0024	0.0000 ± 0.0042
619 & 620	72	Hf	not reported	0.0000 ± 0.0019	not reported	0.0000 ± 0.0026	0.0037 ± 0.0051	0.0005 ± 0.0021
619 & 620	73	Ta	not reported	0.0000 ± 0.0033	not reported	0.0000 ± 0.0027	0.0000 ± 0.0060	0.0000 ± 0.0030
619 & 620	74	W	-0.0055 ± 0.0056	0.0000 ± 0.0018	not reported	0.0024 ± 0.0026	0.0000 ± 0.0047	0.0014 ± 0.0023
619 & 620	77	Ir	not reported	0.0000 ± 0.0020	not reported	0.0000 ± 0.0019	0.0000 ± 0.0033	0.0000 ± 0.0016
619 & 620	79	Au	-0.0006 ± 0.0037	0.0002 ± 0.0010	not reported	0.0027 ± 0.0020	0.0000 ± 0.0028	0.0000 ± 0.0017
619 & 620	80	Hg	-0.0001 ± 0.0041	0.0002 ± 0.0008	not reported	0.0000 ± 0.0018	0.0017 ± 0.0020	0.0019 ± 0.0014
619 & 620	82	Pb	0.0071 ± 0.0059	0.0000 ± 0.0009	not reported	0.0017 ± 0.0019	0.0000 ± 0.0027	0.0000 ± 0.0017
814	11	Na	0.0285 ± 0.0200	0.2581 ± 0.0073	0.0162 ± 0.0051	not reported	not reported	not reported
814	12	Mg	0.0063 ± 0.0152	0.1666 ± 0.0029	0.0042 ± 0.0016	not reported	not reported	not reported
814	13	Al	-0.0044 ± 0.0115	0.1280 ± 0.0043	0.0000 ± 0.0030	not reported	not reported	not reported
814	14	Si	-0.0051 ± 0.0147	0.0035 ± 0.0028	0.0021 ± 0.0014	not reported	not reported	not reported
814	15	P	-0.0027 ± 0.0057	0.0000 ± 0.0003	0.0000 ± 0.0020	not reported	not reported	not reported
814	16	S	-0.0012 ± 0.0042	0.0023 ± 0.0013	0.0000 ± 0.0014	not reported	not reported	not reported
814	17	Cl	0.0003 ± 0.0024	0.0001 ± 0.0010	0.0006 ± 0.0010	not reported	not reported	not reported
814	19	K	-0.0006 ± 0.0020	0.0014 ± 0.0015	0.0009 ± 0.0006	not reported	not reported	not reported
814	20	Ca	-0.0029 ± 0.0011	0.0001 ± 0.0009	0.0010 ± 0.0007	not reported	not reported	not reported
814	21	Sc	-0.0007 ± 0.0009	0.0000 ± 0.0010	0.0000 ± 0.0007	not reported	not reported	not reported
814	22	Ti	0.0011 ± 0.0022	0.0000 ± 0.0008	0.0000 ± 0.0007	not reported	not reported	not reported
814	23	V	0.0004 ± 0.0009	0.0005 ± 0.0006	0.0001 ± 0.0005	not reported	not reported	not reported
814	24	Cr	0.0011 ± 0.0008	0.0000 ± 0.0003	0.0000 ± 0.0004	not reported	not reported	not reported
814	25	Mn	0.0002 ± 0.0017	0.0000 ± 0.0002	0.0000 ± 0.0003	not reported	not reported	not reported
814	26	Fe	-0.0038 ± 0.0015	0.0000 ± 0.0004	0.0000 ± 0.0003	not reported	not reported	not reported
814	27	Co	-0.0003 ± 0.0013	0.0003 ± 0.0002	0.0000 ± 0.0002	not reported	not reported	not reported
814	28	Ni	-0.0009 ± 0.0010	0.0000 ± 0.0002	0.0002 ± 0.0001	not reported	not reported	not reported
814	29	Cu	0.0001 ± 0.0009	0.0000 ± 0.0004	0.0000 ± 0.0002	not reported	not reported	not reported
814	30	Zn	0.0013 ± 0.0013	0.0000 ± 0.0004	0.0004 ± 0.0002	not reported	not reported	not reported
814	31	Ga	0.0009 ± 0.0014	0.0000 ± 0.0004	0.0001 ± 0.0002	not reported	not reported	not reported
814	33	As	-0.0008 ± 0.0013	0.0000 ± 0.0002	0.0006 ± 0.0002	not reported	not reported	not reported
814	34	Se	-0.0006 ± 0.0010	0.0002 ± 0.0002	0.0002 ± 0.0002	not reported	not reported	not reported

Table 11. XRF Data - Blank Filters

Sample ID*	Z	Element	EPA (µg/cm²)	RTI#1 (µg/cm²)	RTI#2 (µg/cm²)	Chester770 (µg/cm²)	Chester771 (µg/cm²)	Chester772 (µg/cm²)
814	35	Br	-0.0002 ± 0.0011	0.0000 ± 0.0002	0.0000 ± 0.0002	not reported	not reported	not reported
814	37	Rb	0.0001 ± 0.0009	0.0000 ± 0.0002	0.0000 ± 0.0002	not reported	not reported	not reported
814	38	Sr	0.0059 ± 0.0044	0.0005 ± 0.0003	0.0000 ± 0.0003	not reported	not reported	not reported
814	39	Y	0.0012 ± 0.0040	0.0007 ± 0.0003	0.0006 ± 0.0003	not reported	not reported	not reported
814	40	Zr	-0.0011 ± 0.0030	0.0000 ± 0.0007	0.0017 ± 0.0006	not reported	not reported	not reported
814	41	Nb	0.0009 ± 0.0034	0.0000 ± 0.0005	0.0000 ± 0.0005	not reported	not reported	not reported
814	42	Mo	-0.0017 ± 0.0031	0.0000 ± 0.0019	0.0000 ± 0.0007	not reported	not reported	not reported
814	47	Ag	0.0039 ± 0.0077	0.0014 ± 0.0015	0.0015 ± 0.0025	not reported	not reported	not reported
814	48	Cd	-0.0022 ± 0.0044	0.0000 ± 0.0021	0.0000 ± 0.0041	not reported	not reported	not reported
814	49	In	-0.0009 ± 0.0047	0.0000 ± 0.0031	0.0000 ± 0.0040	not reported	not reported	not reported
814	50	Sn	0.0038 ± 0.0027	0.0000 ± 0.0042	0.0000 ± 0.0049	not reported	not reported	not reported
814	51	Sb	0.0011 ± 0.0024	0.0000 ± 0.0058	0.0000 ± 0.0074	not reported	not reported	not reported
814	55	Cs	0.0019 ± 0.0033	0.0000 ± 0.0019	0.0000 ± 0.0015	not reported	not reported	not reported
814	56	Ba	0.0055 ± 0.0052	0.0000 ± 0.0019	0.0000 ± 0.0014	not reported	not reported	not reported
814	57	La	0.0041 ± 0.0037	0.0000 ± 0.0016	0.0000 ± 0.0011	not reported	not reported	not reported
814	58	Ce	0.0016 ± 0.0027	0.0000 ± 0.0016	0.0000 ± 0.0011	not reported	not reported	not reported
814	62	Sm	not reported	0.0000 ± 0.0004	0.0000 ± 0.0007	not reported	not reported	not reported
814	63	Eu	not reported	0.0000 ± 0.0006	0.0000 ± 0.0005	not reported	not reported	not reported
814	65	Tb	not reported	0.0000 ± 0.0009	0.0000 ± 0.0006	not reported	not reported	not reported
814	72	Hf	not reported	0.0000 ± 0.0011	0.0000 ± 0.0008	not reported	not reported	not reported
814	73	Ta	not reported	0.0000 ± 0.0025	0.0000 ± 0.0012	not reported	not reported	not reported
814	74	W	0.0001 ± 0.0032	0.0000 ± 0.0011	0.0000 ± 0.0007	not reported	not reported	not reported
814	77	Ir	not reported	0.0000 ± 0.0013	0.0000 ± 0.0006	not reported	not reported	not reported
814	79	Au	0.0042 ± 0.0023	0.0001 ± 0.0006	0.0000 ± 0.0005	not reported	not reported	not reported
814	80	Hg	0.0026 ± 0.0023	0.0000 ± 0.0009	0.0000 ± 0.0007	not reported	not reported	not reported
814	82	Pb	0.0014 ± 0.0028	0.0000 ± 0.0005	0.0000 ± 0.0005	not reported	not reported	not reported

*** Two sample ID's are listed when replicate filters were analyzed.**