TECHNICAL MEMORANDUM

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SUBJECT: Experimental Inter-comparison of Speciation Laboratories

Introduction

This study was conducted as part of the EPA's quality assurance oversight for the $PM_{2.5}$ chemical speciation air monitoring network (CSN) and the Interagency Monitoring of Protected Visual Environments (IMPROVE) Program. The purpose of this study was to evaluate specific laboratory performance at those laboratories that routinely analyze $PM_{2.5}$ speciation samples.

This study required each participating laboratory to analyze a set of blind Performance Evaluation (PE) filter samples. The PE samples were prepared at the National Air and Radiation Environmental Laboratory (NAREL) located in Montgomery, AL. NAREL was able to create replicate filter samples for this study by using co-located Met One speciation samplers. The co-located samplers were programmed to collect $PM_{2.5}$ from the Montgomery air and simultaneously load several filters during each collection event. A sufficient number of replicates were prepared so that each laboratory could receive the following set of PE samples.

- Gravimetric Mass Analysis – ten Teflon® filter samples and two metallic weights
- Ion Chromatography (IC) Analysis – six Nylon® filter samples or six Teflon® filter samples
- Carbon by Thermal Optical Analysis (TOA) – six quartz filter samples
- Elemental analysis by X-Ray Fluorescence (XRF) – six 47 mm Teflon® filter samples plus two additional samples created by Alion.

Detailed instructions for analyzing and reporting the PE samples were provided by NAREL. This report will compare and discuss the analytical results received from all of the laboratories. Some of the laboratories received a full set of PE samples, and some received a partial set due to limitations that will be explained later in the appropriate section of this report. Table 1 identifies all of the laboratories along with their level of participation.

Table 1. List of Participating Laboratories		
Laboratory	**Location**	**Analyses Reported**
California Air Resources Board (CARB)	Sacramento, CA	Gravimetric mass IC analysis, Nylon® filters TOA carbon, IMPROVE_A method Elements by XRF
Desert Research Institute (DRI)	Reno, NV	Gravimetric mass IC analysis, Teflon® filters IC analysis, Nylon® filters TOA carbon, STN method TOA carbon, IMPROVE_A method Elements by XRF
Oregon Dept. of Environmental Quality (ODEQ)	Portland, OR	Gravimetric mass IC analysis, Nylon® filters Elements by XRF
Research Triangle Institute (RTI)	Research Triangle Park, NC	Gravimetric mass IC analysis, Nylon® filters TOA carbon, STN method TOA carbon, IMPROVE_A method Elements by XRF
University of California / Davis (UCD)	Davis, CA	Gravimetric mass Elements by XRF*
EPA's National Exposure Research Laboratory (NERL)	Research Triangle Park, NC	Elements by XRF
EPA's National Air and Radiation Environmental Laboratory (NAREL)	Montgomery, AL	Gravimetric mass IC analysis, Teflon® filters IC analysis, Nylon® filters TOA carbon, STN method TOA carbon, IMPROVE_A method

**** A non-standard procedure must be used at UCD to analyze PE samples collected on 47 mm Teflon filters.***

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. Each speciation laboratory routinely provides clean PRE-weighed air filters to the supported field sites. At the field site, an approved sampling device must be used to deposit the $PM_{2.5}$ onto the collection filter. The loaded filter is returned to the originating laboratory where the gravimetric analysis is completed by POST-weighing the filter. After the gravimetric measurements are complete, the Teflon® filter is examined further using XRF to determine the elemental composition of the filter deposit. Usually XRF is the final analysis of the Teflon® filter after which the filter is placed into an archive for storage, but in some cases the filter is subjected to one more [final] analysis to determine the ions present in the filter deposit. If the Teflon® filter is examined for ions, it must be extracted, and the extract is subsequently analyzed using ion chromatography.

Most of the speciation laboratories provide clean Nylon® filters to the field sites. It is usually the Nylon® filter that 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.

The laboratories also provide clean quartz filters to the supported field sites. The quartz filter is used to capture $PM_{2.5}$ for subsequent carbon analysis. A thermal/optical analysis (TOA) is performed at the laboratory using a TOA analyzer to determine the carbon present on the quartz filter. The TOA technique requires heating a portion of the quartz filter to release captured $PM_{2.5}$. Carbon components released from the filter are catalytically converted to methane and measured by a flame ionization detector (FID). A laser and photo detector system is used by the TOA analyzer to correct for pyrolysis products that may form during the heating process. 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. Two slightly different TOA methods were used to analyze samples during this study. A more detailed description of each TOA method will be provided later in this report.

Gravimetric Analysis

A sample set of ten new filters and two metallic transfer weights were supplied by NAREL to each laboratory for this study. These samples were placed into individual Petri slides and shipped by overnight mail to the receiving lab with instructions to PRE-weigh each filter and metallic weight using the local standard procedures. After tare measurements were completed at the receiving lab, 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 filters from each set were loaded with $PM_{2.5}$ captured from the Montgomery air. Co-located Met One SuperSASS air samplers were used to load seven of the filters in each sample set according to the sampling schedule presented in Table 2.

Table 2. Sampling Schedule for Gravimetric PE Filters

Filter ID	Serial Number	Sample Start	Event Duration	Receiving Lab
T07-12164	T7039876	10/22/2007	48-hour	CARB
T07-12165	T7039877	10/22/2007	48-hour	CARB
T07-12166	T7039878	10/24/2007	20-hour	CARB
T07-12167	T7039879	10/24/2007	20-hour	CARB
T07-12168	T7039880	10/25/2007	24-hour	CARB
T07-12169	T7039881	10/25/2007	24-hour	CARB
T07-12170	T7039882	10/26/2007	36-hour	CARB
T07-12174	T7039886	10/22/2007	48-hour	DRI
T07-12175	T7039888	10/22/2007	48-hour	DRI
T07-12176	T7039889	10/24/2007	20-hour	DRI
T07-12177	T7039890	10/24/2007	20-hour	DRI
T07-12178	T7039891	10/25/2007	24-hour	DRI
T07-12179	T7039892	10/25/2007	24-hour	DRI
T07-12180	T7039893	10/26/2007	36-hour	DRI
T07-12184	T7039897	10/22/2007	48-hour	ODEQ
T07-12185	T7039898	10/22/2007	48-hour	ODEQ
T07-12186	T7039899	10/24/2007	20-hour	ODEQ
T07-12187	T7039900	10/24/2007	20-hour	ODEQ

Table 2. Sampling Schedule for Gravimetric PE Filters

Filter ID	Serial Number	Sample Start	Event Duration	Receiving Lab
T07-12188	T7039901	10/25/2007	24-hour	ODEQ
T07-12189	T7039902	10/25/2007	24-hour	ODEQ
T07-12190	T7039903	10/26/2007	36-hour	ODEQ
T07-12194	T7039907	10/22/2007	48-hour	RTI
T07-12195	T7039908	10/22/2007	48-hour	RTI
T07-12196	T7039909	10/24/2007	20-hour	RTI
T07-12197	T7039910	10/24/2007	20-hour	RTI
T07-12198	T7039911	10/25/2007	24-hour	RTI
T07-12199	T7039912	10/25/2007	24-hour	RTI
T07-12200	T7039913	10/26/2007	36-hour	RTI
T07-12204	none*	10/22/2007	48-hour	UCDavis
T07-12211	none*	10/22/2007	48-hour	UCDavis
T07-12206	none*	10/24/2007	20-hour	UCDavis
T07-12207	none*	10/24/2007	20-hour	UCDavis
T07-12208	none*	10/25/2007	24-hour	UCDavis
T07-12209	none*	10/25/2007	24-hour	UCDavis
T07-12210	none*	10/26/2007	36-hour	UCDavis

**** The 25-mm filters supplied to UCD did not have serial numbers.***

Table 2 shows thirty-five filters that were loaded during four separate collection events. A sufficient number of replicates were prepared during each event such that each lab could be provided with an almost identical set of loaded filters. For example, ten replicates were created during a 48-hour collection event that started on October 22, and two of these replicates were submitted to each lab for analysis. Only one filter from the last 36-hour event was available for distribution. Three of the ten filters that were PRE-weighed at each lab were not loaded and were used as filter blanks for this study.

Following sample collection, the filters and the metallic weights were returned to the weighing chamber at NAREL and POST-weighed multiple times over the course of several days to demonstrate a stable final mass. Finally, the filters and metallic weights were placed into small Igloo® coolers with ice substitute and shipped back to the participating labs for POST-weighing. The metallic weights were included in this study because they are usually less susceptible to weighing errors due to factors such as electrical static and volatility of filter constituents.

Gravimetric Results

The results from 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 2 presents the inter-laboratory differences along with advisory limits. Inter-laboratory differences were calculated by subtracting the $PM_{2.5}$ capture value determined at each speciation lab 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. The 3-sigma advisory limits were derived from all of the gravimetric PE studies administered by NAREL during the past few years.

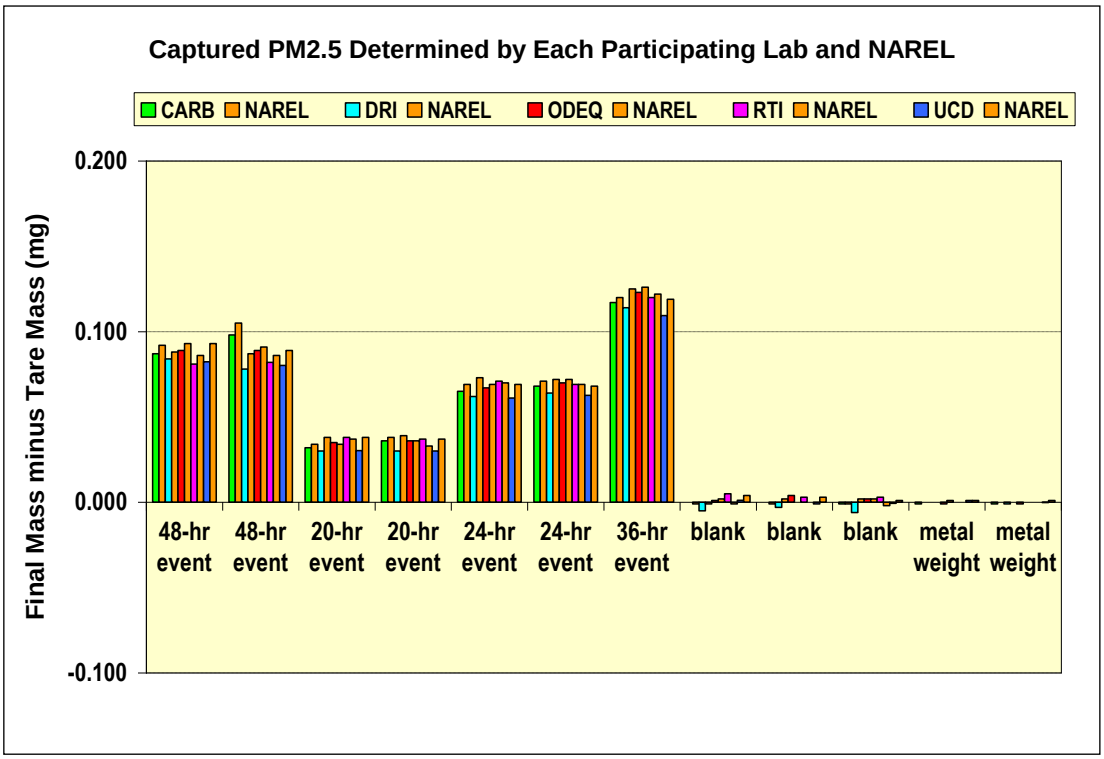


Figure 1

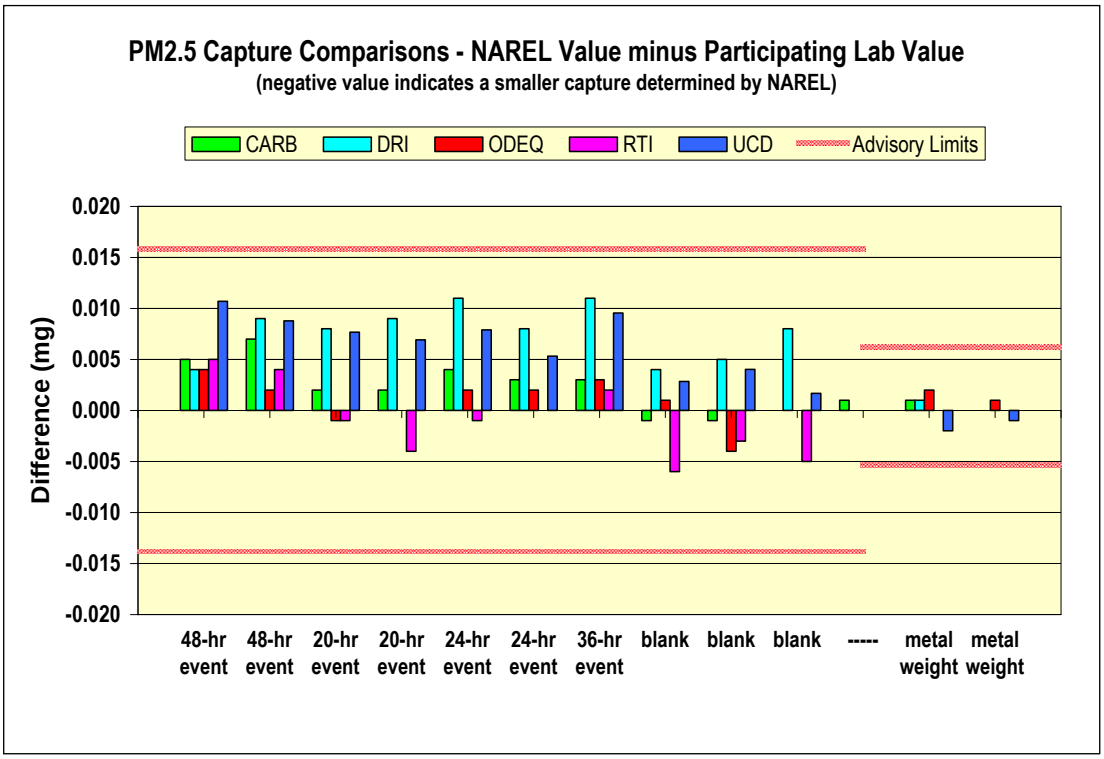


Figure 2

Figure 2 shows good agreement between the capture value determined at NAREL and the capture value reported by the test lab. All filter samples and metallic weights were well within the 3-sigma advisory limits.

All of the participating labs have an SOP for measuring the gravimetric mass of $PM_{2.5}$ filter samples. Most of the SOP's are currently available on the web (see reference 1 through 5).

IC Analysis

This study included the analysis of selected ions using three slightly different IC methods. Five labs analyzed a set of Nylon® filters using the STN method, two labs analyzed a set of Teflon® filters using the STN method, and finally two labs analyzed a set of Nylon® filters using the IMPROVE method. NAREL provided each lab with a set of six filters for each method tested. Each sample set contained two blank filters and four filters that were loaded with $PM_{2.5}$ collected from the Montgomery air. Co-located Met One SuperSASS air samplers were used to load filters and create replicates in each sample set according the sampling schedule presented in Table 3

Table 3. Sampling Schedule for Ion Chromatography PE Filters

Filter ID	Filter Medium	Sample Start	Event Duration	Receiving Lab	Method
N06-11930	Nylon®	14-Nov-06	189-hour	CARB	STN
N06-11931	Nylon®	14-Nov-06	189-hour	CARB	STN
N07-12006	Nylon®	8-Feb-07	152-hour	CARB	STN
N07-12007	Nylon®	8-Feb-07	152-hour	CARB	STN
N06-11932	Nylon®	14-Nov-06	189-hour	DRI	STN
N06-11933	Nylon®	14-Nov-06	189-hour	DRI	STN
N07-12008	Nylon®	8-Feb-07	152-hour	DRI	STN
N07-12009	Nylon®	8-Feb-07	152-hour	DRI	STN
N06-11934	Nylon®	14-Nov-06	189-hour	ODEQ	STN
N06-11935	Nylon®	14-Nov-06	189-hour	ODEQ	STN
N07-12010	Nylon®	8-Feb-07	152-hour	ODEQ	STN
N07-12011	Nylon®	8-Feb-07	152-hour	ODEQ	STN
N06-11936	Nylon®	14-Nov-06	189-hour	RTI	STN
N06-11937	Nylon®	14-Nov-06	189-hour	RTI	STN
N07-12012	Nylon®	8-Feb-07	152-hour	RTI	STN
N07-12013	Nylon®	8-Feb-07	152-hour	RTI	STN
N06-11938	Nylon®	14-Nov-06	189-hour	NAREL	STN
N06-11939	Nylon®	14-Nov-06	189-hour	NAREL	STN
N07-12015	Nylon®	8-Feb-07	152-hour	NAREL	STN
N07-12016	Nylon®	8-Feb-07	152-hour	NAREL	STN
N06-11958	Nylon®	28-Nov-06	194-hour	RTI	IMPROVE
N06-11959	Nylon®	28-Nov-06	194-hour	RTI	IMPROVE
N07-12018	Nylon®	16-Feb-07	152-hour	RTI	IMPROVE
N07-12019	Nylon®	16-Feb-07	152-hour	RTI	IMPROVE
N06-11960	Nylon®	28-Nov-06	194-hour	NAREL	IMPROVE
N06-11961	Nylon®	28-Nov-06	194-hour	NAREL	IMPROVE
N07-12020	Nylon®	16-Feb-07	152-hour	NAREL	IMPROVE
N07-12021	Nylon®	16-Feb-07	152-hour	NAREL	IMPROVE
T06-11963	Teflon®	28-Nov-06	194-hour	DRI	STN
T06-11964	Teflon®	28-Nov-06	194-hour	DRI	STN
T07-12022	Teflon®	16-Feb-07	152-hour	DRI	STN
T07-12023	Teflon®	16-Feb-07	152-hour	DRI	STN
T06-11965	Teflon®	28-Nov-06	194-hour	NAREL	STN
T06-11966	Teflon®	28-Nov-06	194-hour	NAREL	STN
T07-12024	Teflon®	16-Feb-07	152-hour	NAREL	STN
T07-12025	Teflon®	16-Feb-07	152-hour	NAREL	STN

Table 3 shows thirty-six filters that were loaded during four separate collection events. A sufficient number of replicates were prepared during each event such that each participating lab was provided with an almost identical set of loaded filters. For example, ten replicates were created during a 189-hour collection event that started on November 14, and two of these replicates were submitted to each lab for analysis. Likewise, ten replicates were created during a 152-hour collection event that started on February 8, and two of these replicates were submitted to each lab for analysis. The collection times used for this study were significantly longer than the usual twenty-four hours to boost the amount of $PM_{2.5}$ collected and raise the level of most analytes to above the detection threshold. Table 3 does not list the filter blanks that were provided to each participating lab.

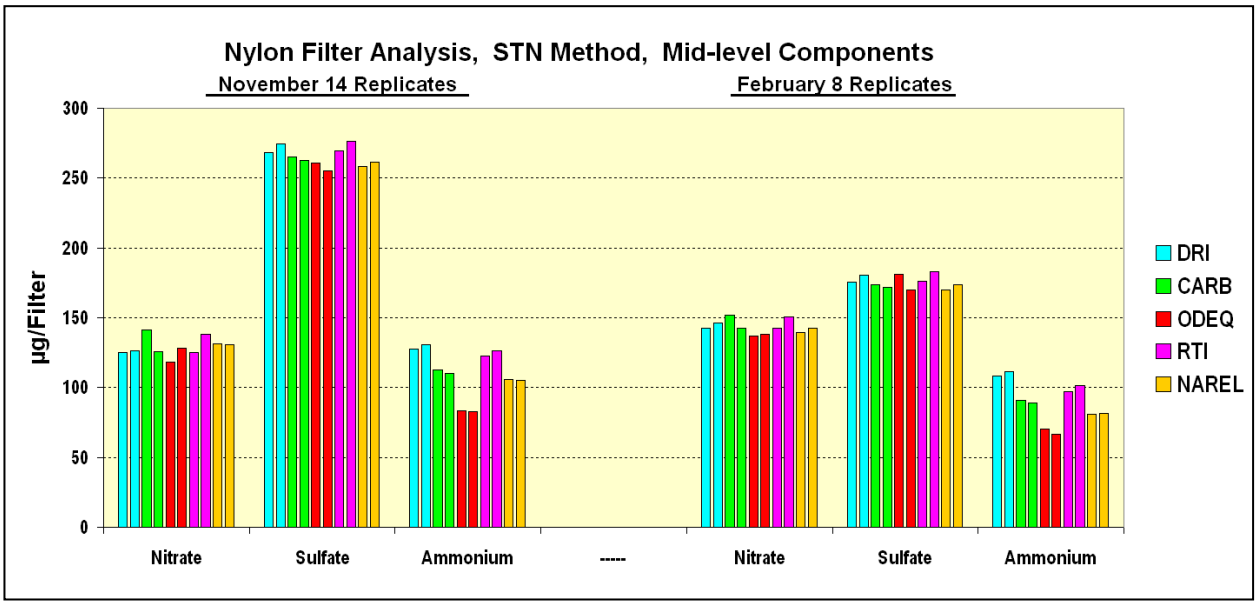
A filter set was provided to each participating lab with instructions to use the local standard procedures, as closely as possible, for the extraction and the IC analysis. No information was given to the labs about the history of the individual filters. The results were reported for each sample based upon the amount of analyte present on the filter (µg/filter). All of the participating labs have an SOP for analyzing $PM_{2.5}$ filter samples by IC. Most of the SOP's are currently available on the web (see reference 6 through 14). (Note: The ODEQ Lab was in the process of relocating their facility when this study began. The ion extractions were performed at the original facility, however, due to the disruption of normal operations, the cations were not analyzed until the IC was operational at the new lab, approximately two months later.

IC Results

Results from the analysis of twenty Nylon® filters using the STN method are presented as a bar graph in Figure 3 and Figure 4. The ten replicates from the November 14 event are shown on the left side of the graphs, and ten replicates from the February 8 event are shown on the right side of the graphs. The replicate samples within each cluster are arranged, from left to right, in the same order. Since each lab received two replicate filters from both sampling events, it is possible to examine the inter-laboratory precision as well as the precision within each lab. Nitrate, sulfate, and ammonium were the most abundant analytes captured from the Montgomery air, and these mid-level ions are plotted together in Figure 3.

Relatively good inter-laboratory and intra-laboratory agreement is seen for the nitrate and sulfate analytes shown in figure 3. Inter-lab agreement for ammonium is not quite as good although intra-lab precision is good.

Figure 3



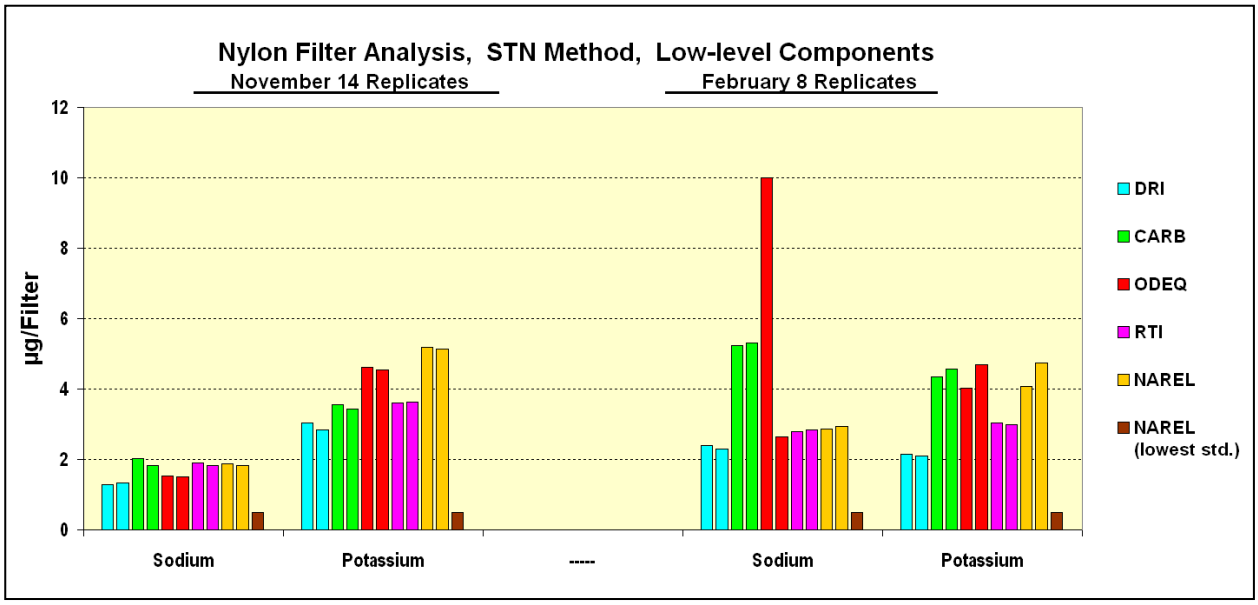


Figure 4

Sodium and potassium were present in the air at relatively low levels, and these ions are plotted in Figure 4. For those bar graphs that show the low-level components, an extra bar was added that represents the lowest calibration standard analyzed at NAREL. The lowest calibration standard is a good estimate of the practical quantitation limit for the analysis. The ODEQ reporting limit for sodium is 3.6 µg/filter, therefore, for illustration purposes, their uncensored values are shown in Figure 4. Each cluster of bars in the graph is labeled with the ion reported, but the individual samples within each cluster are not identified.

One sodium result (ten µg/filter) reported by ODEQ appears as an outlier in Figure 4. Low level sodium contamination of the sample is the most probable cause for the outlier; however, it is not possible to determine where this contamination may have occurred. Overall, reasonably good precision can be seen in Figure 4 for the low-level components.

According to Table 3, sixteen more filters were loaded during the November 28 and February 16 events, and these two sampling events were special because four Nylon® and four Teflon® filters were loaded during each event. The Teflon® filters were extracted and analyzed using the STN method and the Nylon® filters were extracted and analyzed by the IMPROVE method. Although Nylon® is the standard filter media used to collect ions for the STN and IMPROVE network, Teflon® filters are used by the Texas Commission on Environmental Quality (TCEQ) due to the type of air samplers used in their network. Since both filter types were used during the same sampling event, it may be possible to see differences in the analytical results that may be attributed to the filter matrix.

Results from the analysis of eight Teflon® filters using the STN method are presented as a bar graph in Figure 5 and Figure 6. The four replicates from the November 28 event are shown on the left side of the graphs, and four replicates from the February 16 event are shown on the right side of the graphs. The replicate samples within each cluster are consistently arranged, from left to right, in the same order.

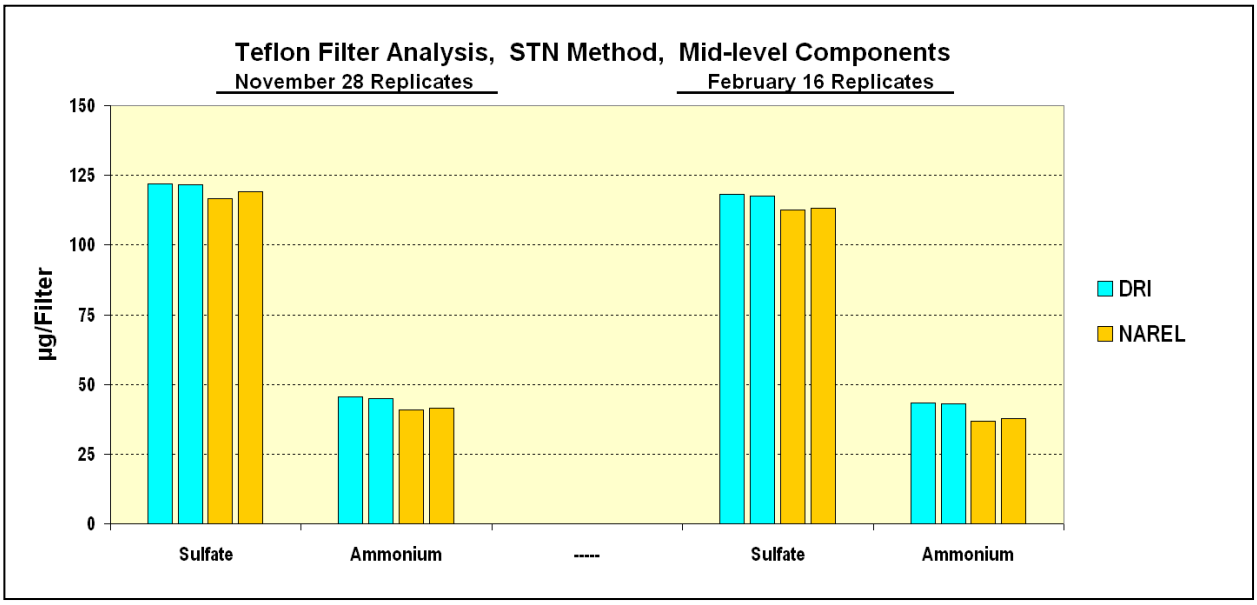


Figure 5

Again the mid-level and the low-level components are presented as separate graphs. Nitrate capture shown in Figure 6 is much lower than nitrate captured on Nylon® during the same sampling event. (See Figure 7) Low capture of nitrate on Teflon® filters has been observed in previous PE studies conducted in 2006 and 2005 (reference 26 and 27). The lower nitrate values from the Teflon® filters are probably due to a sampling artifact, and not due to low recovery from the filter extraction or artifacts of the analysis. Reasonably good precision was observed for all of the ions shown in Figure 5 and Figure 6.

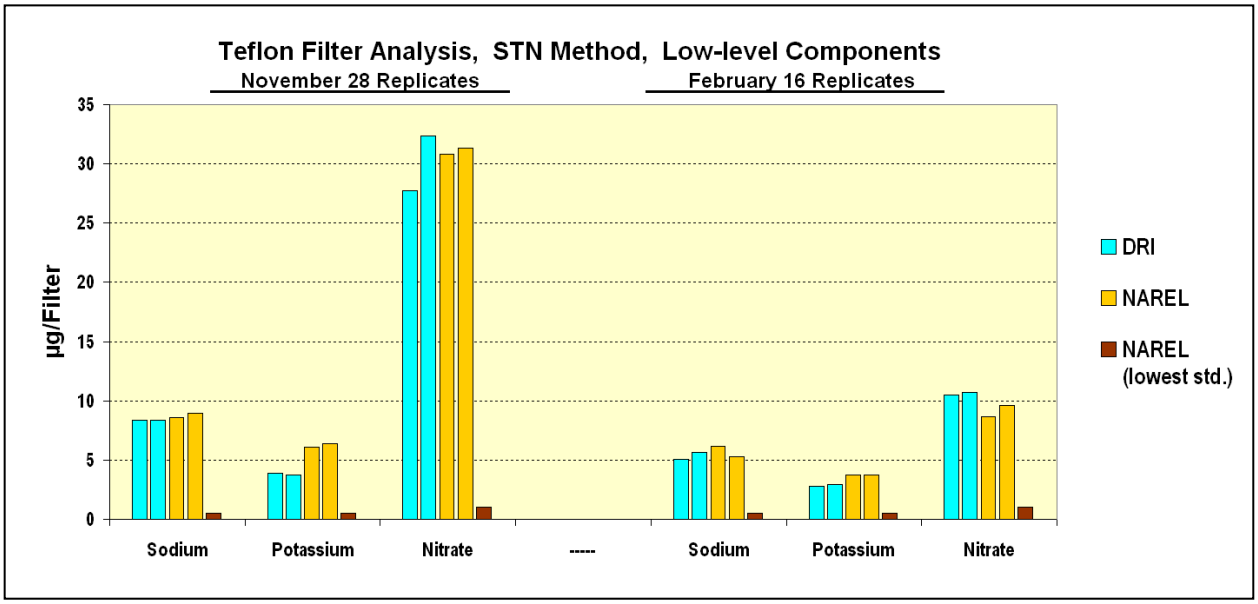


Figure 6

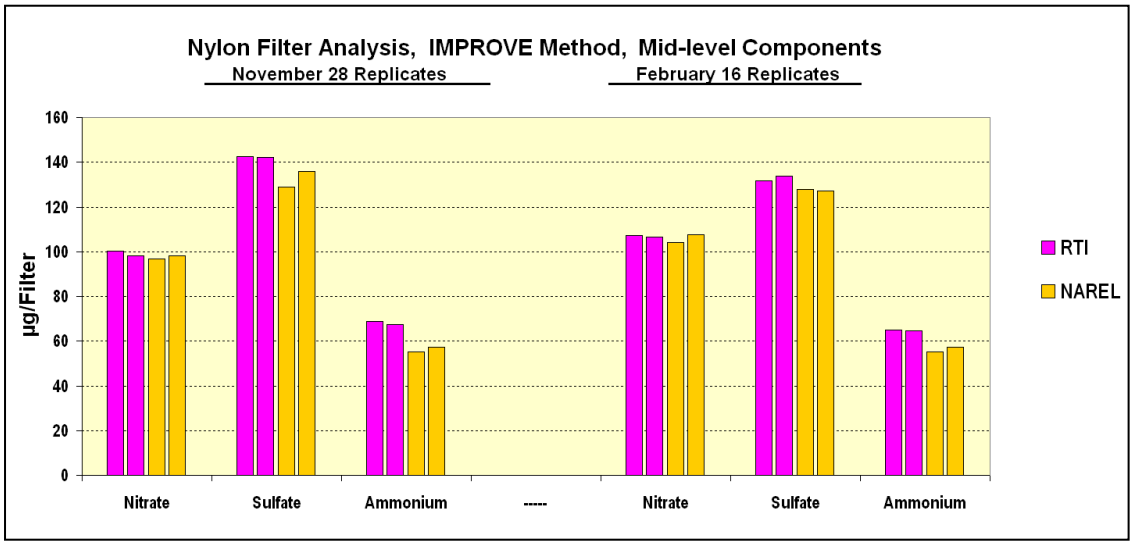
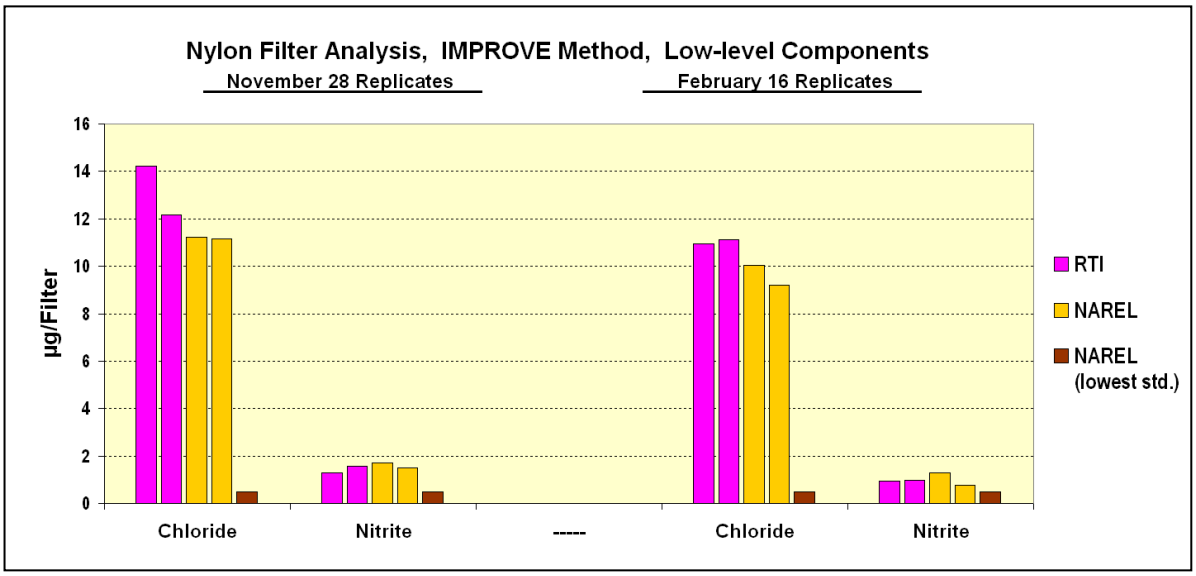


Figure 7

Figure 7 and Figure 8 show the results from the Nylon® filters using the IMPROVE method for filter extraction and analysis. Once again the mid-level components and the low-level components are presented in separate graphs. It is not surprising to see nitrate as a mid-level component again since Nylon® was the filter matrix. Nylon® filters are routinely analyzed at RTI using the IMPROVE method which is slightly different from the STN method with respect to the extraction procedure and the list of reported ions. Chloride and nitrite, shown in Figure 8, are components that are routinely determined using the IMPROVE method but not required for the STN program. Note also that potassium and sodium are not normally reported using the IMPROVE method.

Reasonably good precision is shown for all components in Figure 7 and Figure 8. Nitrite precision was unusually good considering the low levels observed. Blanks were provided to all of the labs for this study even though the blank results are not presented in graphical format. The numerical results for all of the blanks and for all of the loaded filters are available in Table 11 at the end of this report.

Figure 8



Carbon Analysis

This study included the Thermal-Optical Analysis (TOA) of quartz fiber filters to determine the amount of carbon present in captured $PM_{2.5}$. NAREL provided each participating laboratory with a set of six 47-mm filters. Each sample set contained two blank filters and four filters that were loaded with $PM_{2.5}$ collected from the Montgomery air. Co-located Met One SuperSASS air samplers were used to load filters and create replicates in each sample set according to the sampling schedule presented in Table 4.

Table 4. Sampling Schedule for TOA Carbon PE Filters

Filter ID	Filter Medium	Sample Start	Event Duration	Receiving Lab	Method(s)
Q06-11919	quartz	06-Oct-06	200-hour	CARB	IMPROVE_A
Q06-11920	quartz	06-Oct-06	200-hour	CARB	IMPROVE_A
Q07-12028	quartz	26-Feb-07	214-hour	CARB	IMPROVE_A
Q07-12029	quartz	26-Feb-07	214-hour	CARB	IMPROVE_A
Q06-11921	quartz	06-Oct-06	200-hour	DRI	STN+IMPROVE_A
Q06-11922	quartz	06-Oct-06	200-hour	DRI	STN+IMPROVE_A
Q07-12030	quartz	26-Feb-07	214-hour	DRI	STN+IMPROVE_A
Q07-12031	quartz	26-Feb-07	214-hour	DRI	STN+IMPROVE_A
Q06-11923	quartz	06-Oct-06	200-hour	RTI	STN+IMPROVE_A
Q06-11924	quartz	06-Oct-06	200-hour	RTI	STN+IMPROVE_A
Q07-12032	quartz	26-Feb-07	214-hour	RTI	STN+IMPROVE_A
Q07-12033	quartz	26-Feb-07	214-hour	RTI	STN+IMPROVE_A
Q06-11925	quartz	06-Oct-06	200-hour	NAREL	STN+IMPROVE_A
Q06-11926	quartz	06-Oct-06	200-hour	NAREL	STN+IMPROVE_A
Q07-12034	quartz	26-Feb-07	214-hour	NAREL	STN+IMPROVE_A
Q07-12035	quartz	26-Feb-07	214-hour	NAREL	STN+IMPROVE_A

Table 4 shows sixteen filters that were loaded during two separate collection events. A sufficient number of replicates were prepared during each event such that each participating lab was provided with an almost identical set of loaded filters. Eight replicates were created during the 200-hour autumn event that started on October 6, and two of these replicates were submitted to each lab for analysis. Likewise, eight replicates were created during the 214-hour winter event that started on February 7, and two of these replicates were submitted to each lab for analysis. The collection times used for this study were significantly longer than the normal 24-hours to boost the amount of elemental carbon deposited on the filter. Table 4 does not list the two filter blanks that were provided to each participating lab.

A filter set was provided to each lab with instructions to use local standard procedures, as closely as possible, for the analysis. No information was given to the participating labs about the history of the individual filters. ODEQ did not participate in this part of the study because their quartz filters are shipped to DRI for analysis. The DRI and RTI labs are set up to analyze a large volume of samples and routinely operate several TOA instruments. DRI uses the DRI Model 2001 analyzer for both the IMPROVE_A and STN methods of analysis. RTI operates Sunset Labs single mode TOT instruments for analyzing samples by the STN TOT method. For the IMPROVE_A method of analysis, RTI has available a Sunset Labs Dual Mode instrument and a DRI Model 2001 instrument. Both DRI and RTI were able to analyze each filter several times using more than one instrument and more than one TOA method. The CARB lab operates one instrument, a DRI Model 2001 analyzer, and provided results based on the IMPROVE_A method (See Table 5). The results were reported for each sample based upon the amount of carbon per square centimeter of the filter deposit ($\mu g\ C/cm^2$). Raw data were also supplied to NAREL so that some thermograms can be included in this report.

Table 5. TOR Instruments Used in Study				
Temperature Protocol	**Optical Analysis**	**Instrument Model**	**Specific Instrument Reporting**	**Parameters Reported**
STN	TOT	Sunset (single mode)	RTI Instr. R and Instr. T	OC, EC, TC, OCsub
			NAREL Instr. #1	OC, EC, TC, OCsub
		DRI Model 2001	DRI Instr. #9, #11, #12	OC, EC, TC, OCsub, ECsub
IMPROVE_A	TOR	DRI Model 2001	CARB Instr. #1	OC, EC, TC, OCsub, ECsub
			DRI Instr. #7, #9, #11 #12	OC, EC, TC, OCsub, ECsub
			RTI Instr. #1	OC, EC, TC, OCsub, ECsub
		Sunset (Dual Mode)	RTI Instr. F	OC, EC, TC, OCsub, ECsub
			NAREL Instr. #2	OC, EC, TC, OCsub, ECsub

Two different TOA methods based on temperature protocol and optical correction of pyrolysis products were used in this study. The following table provides a brief description of each method's temperature protocol. The STN method uses fixed time durations for each temperature ramp while the IMPROVE_A technique uses variable time durations for each temperature ramp.

Table 6. Comparison of Temperature Protocols for TOA Methods

STN Method TOT Analysis	IMPROVE_A Method TOR Analysis	Carrier Gas	Carbon Fraction
heater off (90s)	heater off (90s)	He Purge	-----
310°C (60s)	140°C (150-580s)	He	OC1
480°C (60s)	280°C (150-580s)	He	OC2
615°C (60s)	480°C (150-580s)	He	OC3
900°C (90s)	580°C (150-580s)	He	OC4
heater off (40s)	-----	He	
600°C (35s)	580°C (150-580s)	He/O_2	EC1
675°C (45s)	740°C (150-580s)	He/O_2	EC2
750°C (45s)	840°C (150-580s)	He/O_2	EC3
825°C (45s)	-----	He/O_2	
920°C (120s)	-----	He/O_2	
heater off (110s)	heater off (200s)	He/O_2+ IS	

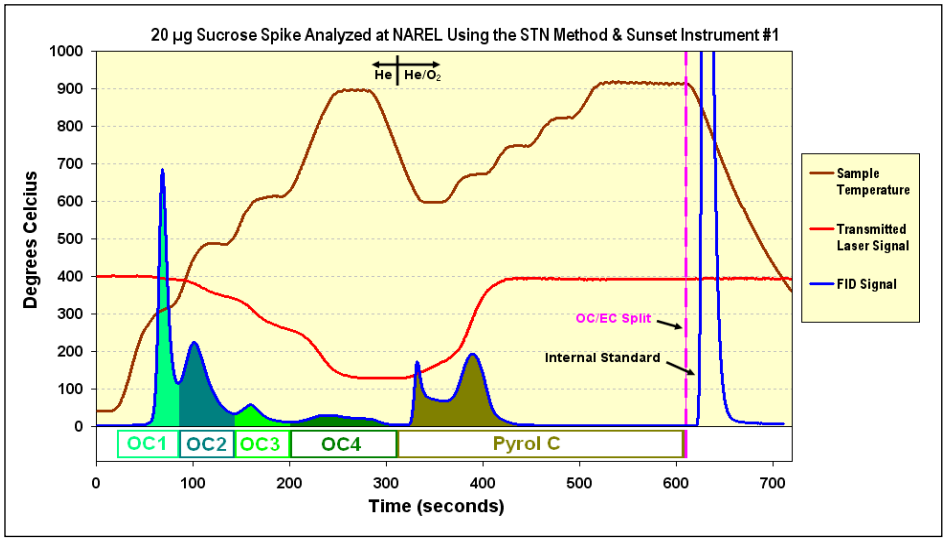
Beyond the thermal protocols listed in Table 6, each TOA method is further defined by the way optical measurements are made and utilized to calculate carbon fractions. For example, the optical measurements are used to distinguish the elemental carbon (EC) from the organic carbon (OC) present in the sample.

All of the instruments used for this study are equipped with a tubular quartz oven and a laser/diode system. The sample analysis begins by placing a carefully measured [punched] segment of the filter sample into the oven directly in the path of the laser. A purge gas removes air from the oven and surrounds the sample with a stream of pure helium before the heating and data acquisition begin. Light from the laser will interact with the sample during the analysis. A diode detector can be positioned to measure the light transmitted through the sample, and this configuration is needed for a TOT (thermal optical transmittance) analysis. A diode can also be positioned to measure the reflected light, and this configuration is needed for a TOR (thermal optical reflectance) analysis. As the sample segment is heated and the pure helium phase of the analysis proceeds, some of the organic carbon may char to form a darker pyrolized carbon (PyrolC).

Pyrolized carbon must be correctly assigned to the OC fraction and not counted as EC. All of the methods in this study use either TOT or TOR to evaluate the PyrolC. Three models of instruments were used for this study. The older Sunset [single mode] instruments are equipped with only one diode detector configured for the TOT analysis. The DRI Model 2001 instruments and the Sunset Dual Mode instruments are newer designs capable of measuring the transmitted and the reflected light simultaneously. These newer instruments provide more optical information since each instrument is equipped with two diode detectors giving the user a choice of TOT or the TOR analysis.

All of the instruments in this study operate by heating a punched segment of the sample in the presence of a controlled carrier gas. Any carbonaceous material released from the quartz filter segment is swept through a series of zones that rapidly convert the released carbon first to carbon dioxide then to methane which is measured by a Flame Ionization Detector (FID) positioned at the end of the sample train. During the first [non-oxidizing] stage of the analysis, the carrier gas is pure helium. Oxygen is added to the carrier during the second stage of the analysis which is designed to remove any remaining carbonaceous material from the quartz residue. Most of the OC is released during the first stage of the analysis, but the EC and any PyrolC that may have formed are more difficult to volatilize, and they are expected to release during the second stage of the analysis. A known mass of methane is injected through the oven at the end of the analysis to serve as an Internal Standard (IS). Signals from the FID and from the laser may be plotted along a time axis to construct a thermogram. An example thermogram is shown in Figure 9. This is a thermogram of a sucrose spike which was analyzed at NAREL as a routine calibration check sample. The sucrose spike contains no EC but has a strong tendency to char and form PyrolC.

Figure 9



After the raw data acquisition is complete, the thermogram must be evaluated to determine those carbon fractions that will be reported for the sample. All of the participating labs report the Total Carbon (TC) as the sum of the OC and the EC fractions: TC = OC + EC. Other carbon fractions may be calculated such as the OC subfractions: OC = OC1 + OC2 + OC3 + OC4 + PyrolC. Figure 9 shows an example of OC subfractions that were calculated by a Sunset instrument. The OC subfractions are based on the area of the FID signal determined at each of the helium phase temperature steps. EC subfractions may be calculated as well. For example, three EC subfractions have been reported for IMPROVE samples for many years. Table 6 shows that the IMPROVE_A method heats the sample at three different temperatures during the final [oxidizing] stage of the analysis. EC1 is defined by the method as that carbon released from the sample at 580 ºC after oxygen has been added to the carrier gas. And similarly, EC2 and EC3 represent the carbon released at 740 ºC and 840 ºC respectively (see Table 6). The heating requirements and their durations along with the precision of the method affect the amount of carbon assigned to each subfraction.

An article by Chow et al (see reference 15) describes the importance of accurate temperature measurement and offers a procedure to refine the temperature calibration of each instrument. The procedure uses a set of commercially available temperature-indicating materials (Tempil Inc., South Plainfield, NJ) which may be spiked onto a blank filter segment. Each temperature-indicating material has a certified characteristic temperature at which it will transition from optically opaque to relatively transparent. Once the spiked filter segment is placed into the oven and heating begins, the laser signal must be used to detect the transition point of the spiked material. By spiking several of these materials, a calibration curve can be constructed that relates a certified temperature of the sample fragment to the oven's thermocouple reading. This procedure for temperature calibration is the standard procedure used at DRI to calibrate their DRI Model 2001 instruments.

RTI has developed an alternate procedure to calibrate the sample oven temperature of their TOA analyzers using an external reference device. A temperature measuring device consisting of a thermocouple and data logger, calibrated as a unit to NIST traceable standards by an independent contractor, is used to record the oven temperature at different set points. Since it is important to have an accurate temperature measurement at the location of the sample, the tip of the external thermocouple is located to just touch the center of the sample punch. For the Sunset dual mode instrument, this is accomplished by inserting the thermocouple through the handle of a specially designed sample holder so that the thermocouple tip can be located properly at the sample. For the DRI Model 2001, the reference thermocouple is inserted through the top light pipe and sealed using appropriate tubing and fittings. By measuring a range of temperatures, a calibration curve can be constructed to relate the actual sample temperature to the temperature measured by the instrument's internal thermocouple. RTI has performed temperature calibrations for their DRI Model 2001 instrument using DRI's procedure as well as their own method and have found that both procedures demonstrate comparable results. Once the temperature calibration equation is established, each instrument's thermal profile can be programmed with corrected temperature set points allowing the sample oven to attain the actual temperatures required be the TOA methods.

NOTE: EPA is currently in the process of changing air monitors used in the CSN carbon monitoring network to a new model, the URG-3000N. The URG-3000N is similar to the air samplers used for the IMPROVE network which collects PM2.5 onto 25 mm quartz filters. The standard STN carbon analysis method that is currently used will also change to the IMPROVE_A TOR method for samples collected with the URG-3000N. Currently, DRI is contracted to analyze samples requiring the IMPROVE_A analysis. For information on the implementation, go to the web site http://www.epa.gov/ttn/amtic/specurg3000.html.

All of the results presented in this report have been identified with the instrument that performed the analysis as well as the thermal protocol and optical configuration that was used. All of the participating labs have an SOP for the TOA method(s) used at their laboratory. Most of the SOPs are currently available on the web (see reference 16 through 20).

Carbon Results

Results reported by three labs for the analysis of replicate quartz filters using the STN method are presented below as bar graphs. The CARB lab has moved to the IMPROVE_A method and no longer analyzes by the STN method. Notice that each bar in the graph is labeled with the instrument number, the lab, and the last three digits of the sample number. Figure 10 shows results from replicates that were created on October 6, and Figure 11 shows the results from replicates created on February 26. The bar segments show the OC and EC components of the total carbon but do not show the more detailed fractions.

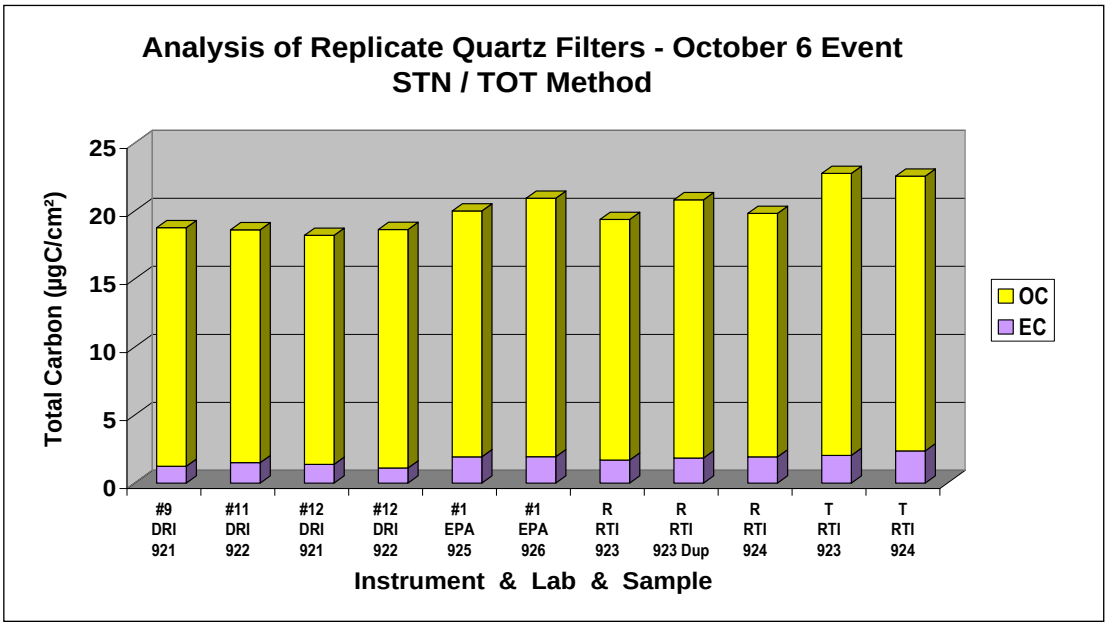


Figure 10

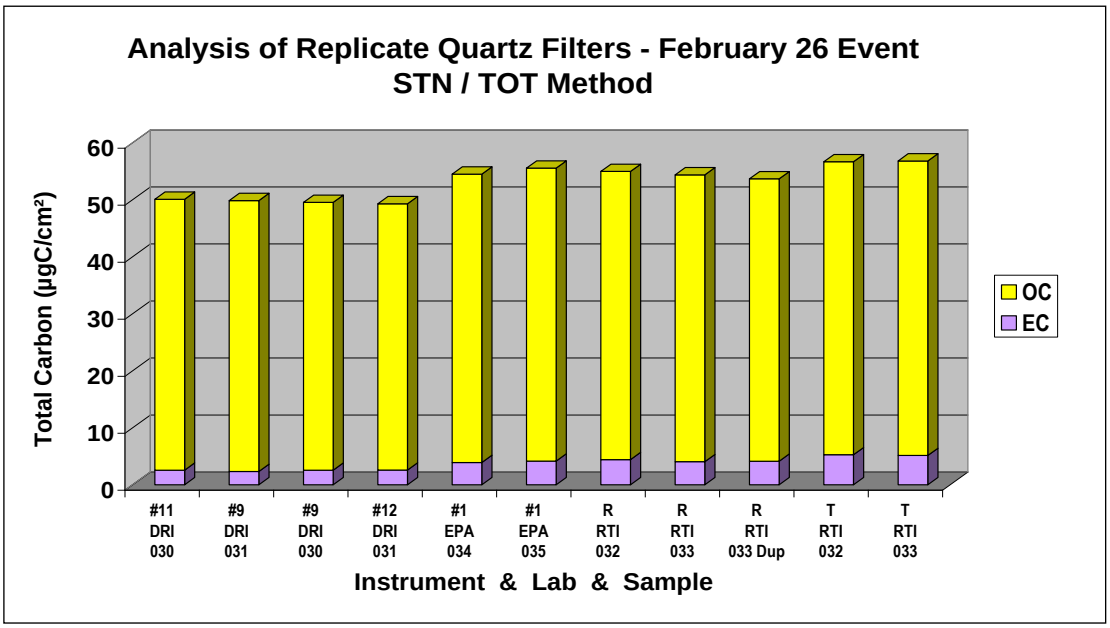


Figure 11

The results are presented again in Figures 12 and 13 with the OC subfractions revealed. Even though all of the instruments identified in the figures below are using the same temperature protocol, there is noticeable variability for some of the subfractions. The most noticeable bias seen in Figures 12 and 13 is observed for OC4 and PyrolC from the EPA instrument. The DRI 2001instruments show good intra-lab precision although they have a low bias for EC when compared to the EPA and RTI Sunset labs instruments. Thermograms for some of the samples reported in these figures will be presented later in this report so it will be possible to examine the raw data that produced these results.

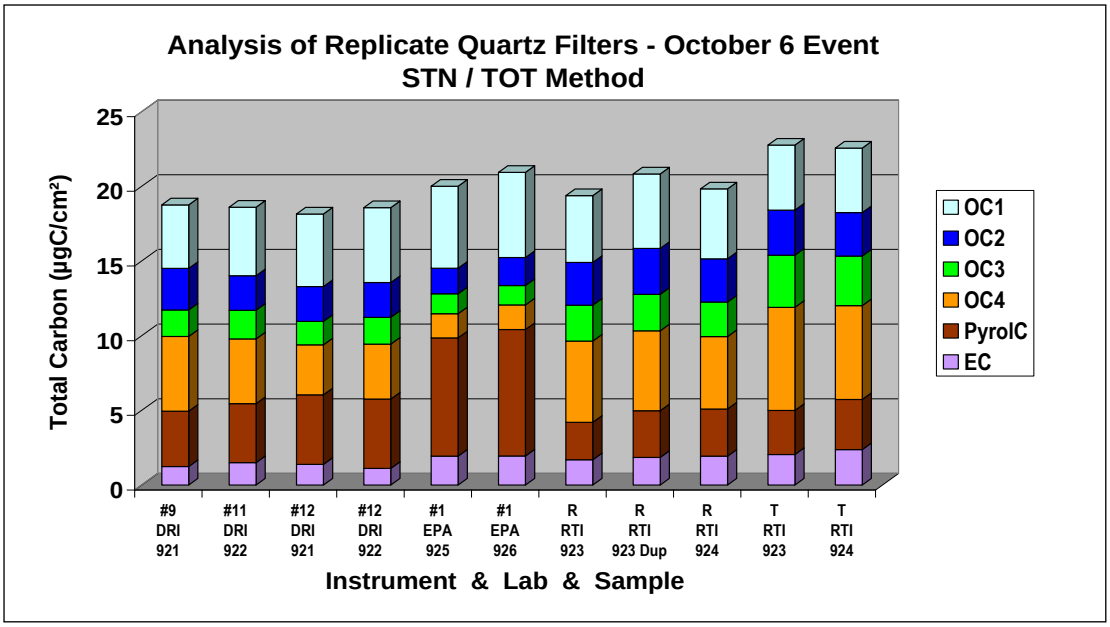


Figure 12

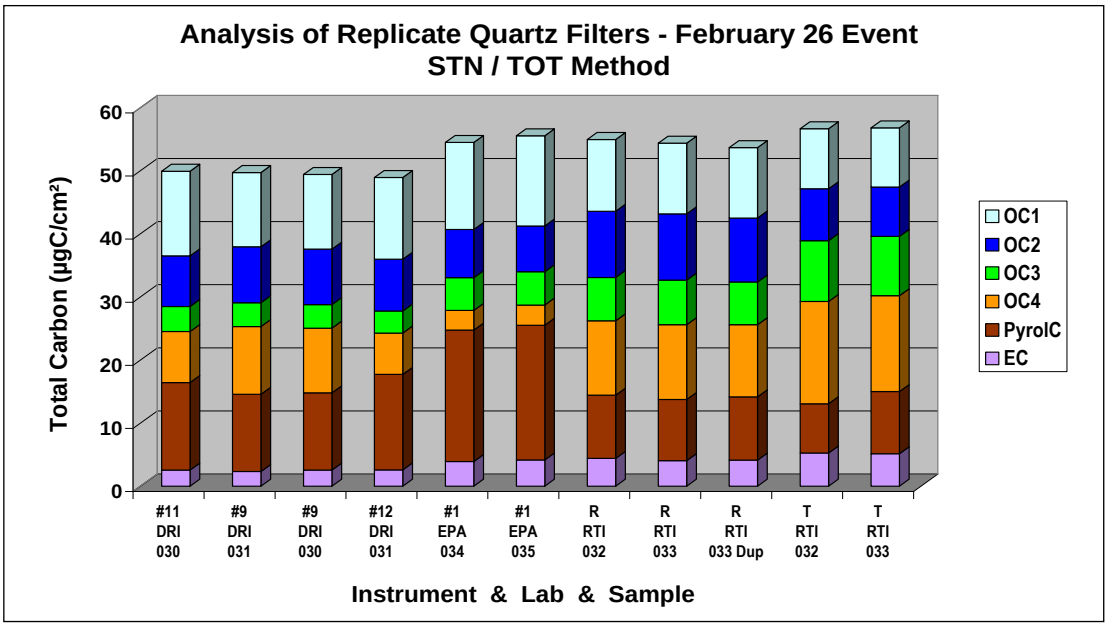


Figure 13

Four labs reported results from the IMPROVE_A method. Reasonably good precision is observed in the TC as well as the OC and EC fractions shown in Figures 14 and 15. Since all of these samples were analyzed by two different methods, it is appropriate to compare the IMPROVE_A results with the STN results presented earlier. It is not surprising that the EC results presented here in Figures 14 and 15 are significantly larger than the EC results reported from the STN method (compare with Figures 10 and 11). The OC/EC split point is usually earlier in the thermogram for the TOR analysis compared to the TOT analysis. Also, the STN method has two more high temperature steps (maximum of 900°C) in pure helium than the IMPROVE_A method which may allow more OC to evolve.

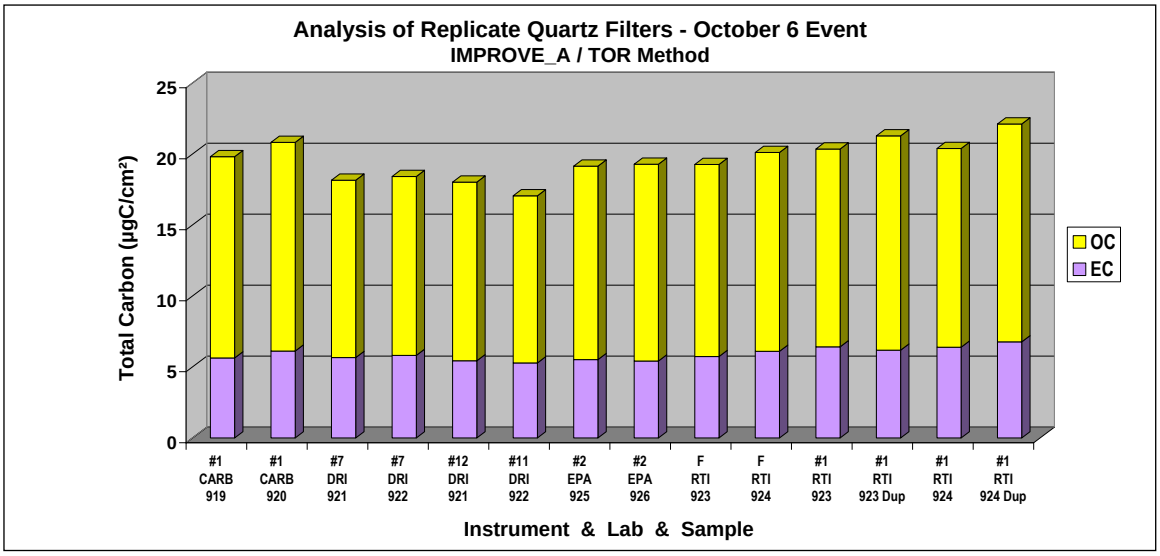


Figure 14

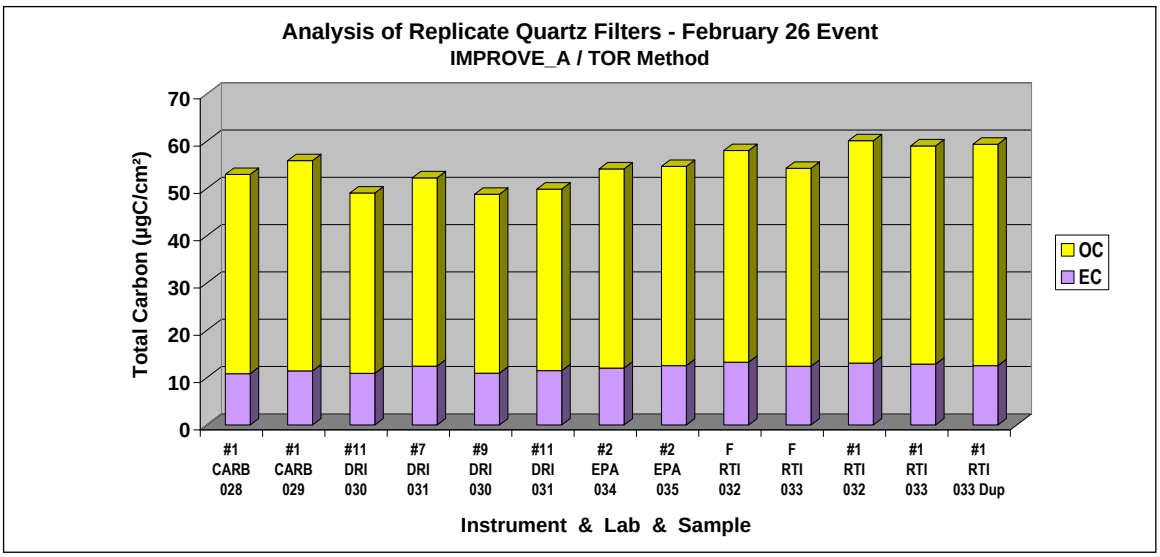


Figure 15

Figures 16 and 17 show the IMPROVE_A results again with more detail. Reasonably good intra-lab and inter-lab precision is observed. The IMPROVE_A method appears to allow for better EC agreement between the Sunset and DRI 2001 instruments. The thermograms for samples from the October 6 event reported in Figure 16 will be presented later in this report so it will be possible to examine the raw data that produced these results.

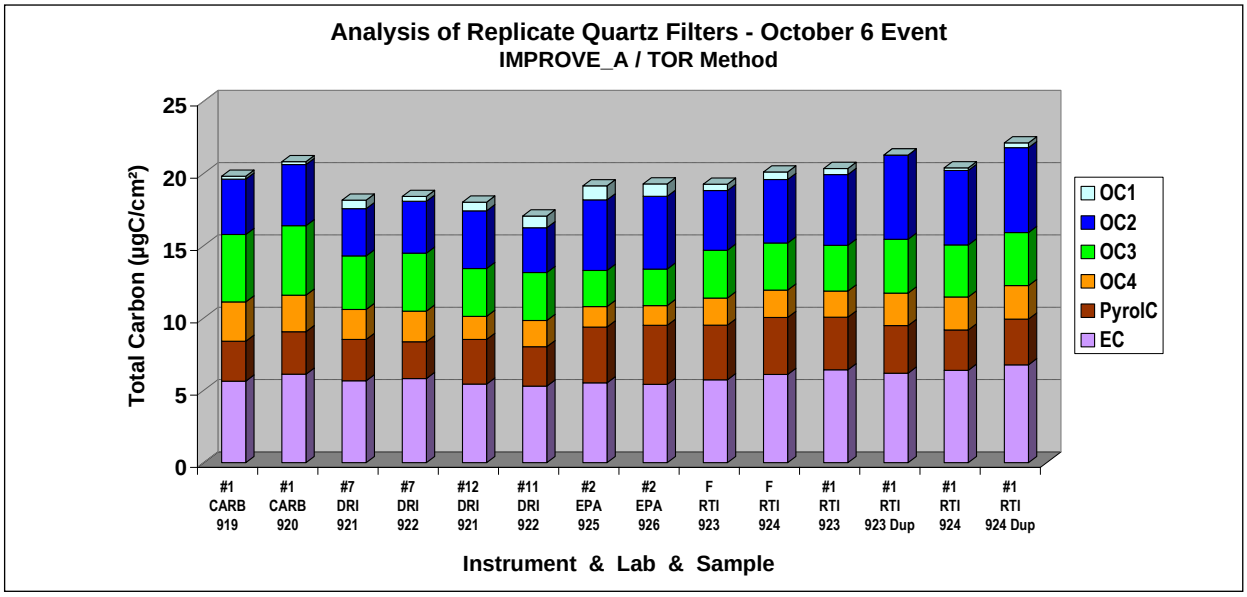


Figure 16

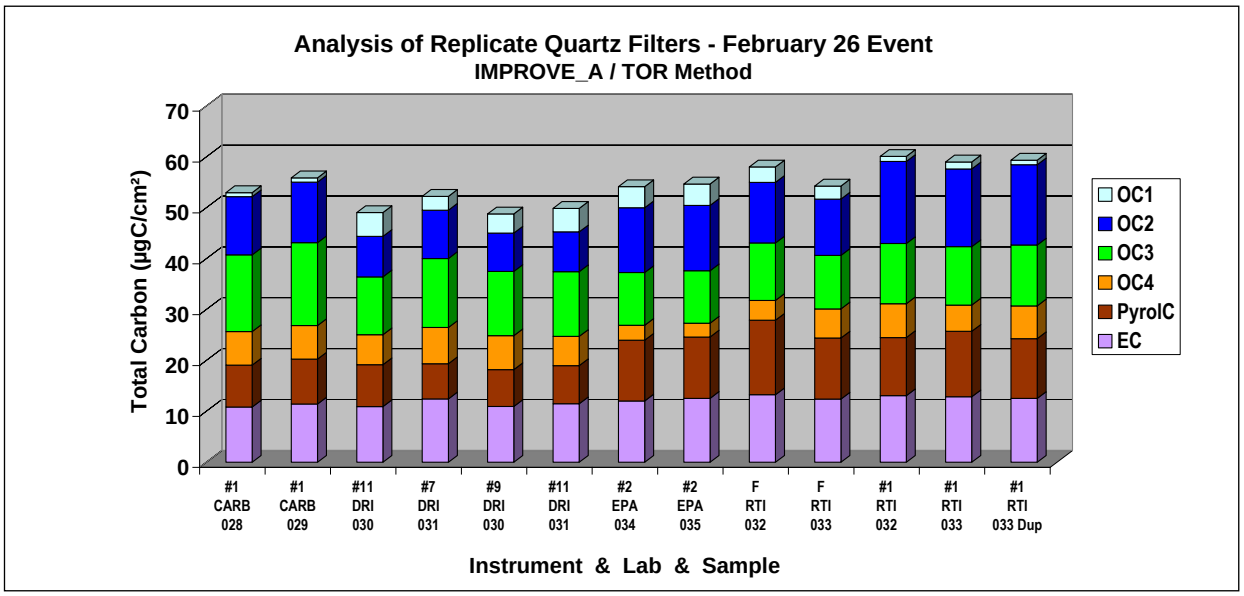


Figure 17

Figures 18 and 19 present additional results available from dual mode instruments that were included in the data delivered by the participating labs. The results presented below are different from the results presented previously in Figures 16 and 17, because the transmitted laser signal was used to establish the OC/EC split point. The only significant change observed in the new results is a smaller EC and a larger PyrolC. These changes were predicted, but now we can observe the size of the difference using experimental data.

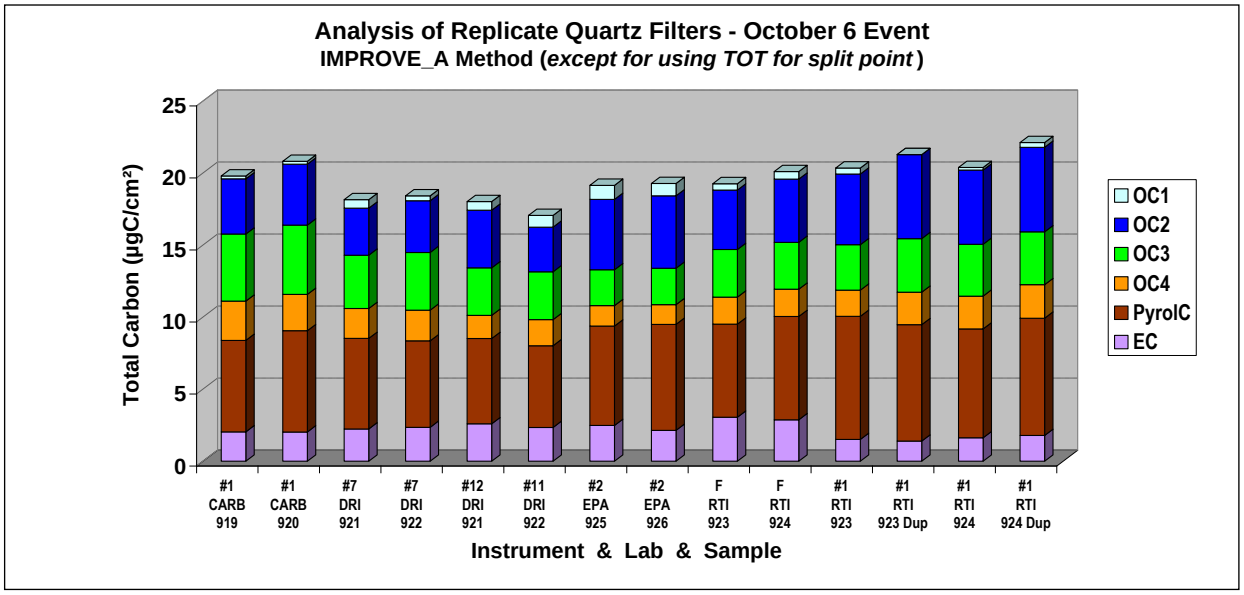


Figure 18

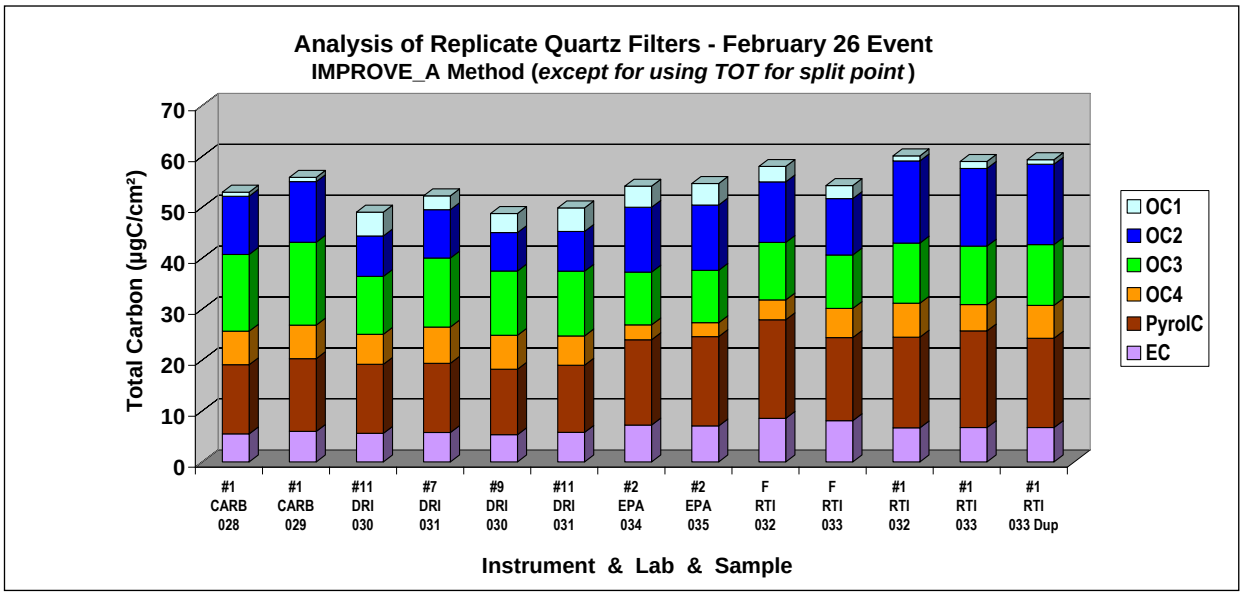


Figure 19

This report includes several thermograms from the instruments that were used for this study. Each thermogram was derived from the analysis of a replicate PE sample that was loaded during the collection event that started on October 6, 2006. The thermograms were produced at NAREL from the information inside the raw data files submitted by each lab. Some processing normally done by the manufacturer's software was not performed for the thermograms produced for this report. For example, the laser signal(s) presented here were not processed using the software to correct for temperature dependence of the laser/diode system.

Figure 20 is from NAREL's Sunset Labs TOT instrument #1. This is an older model Sunset [single mode] instrument, as indicated by a single laser signal, configured to perform the TOT analysis.

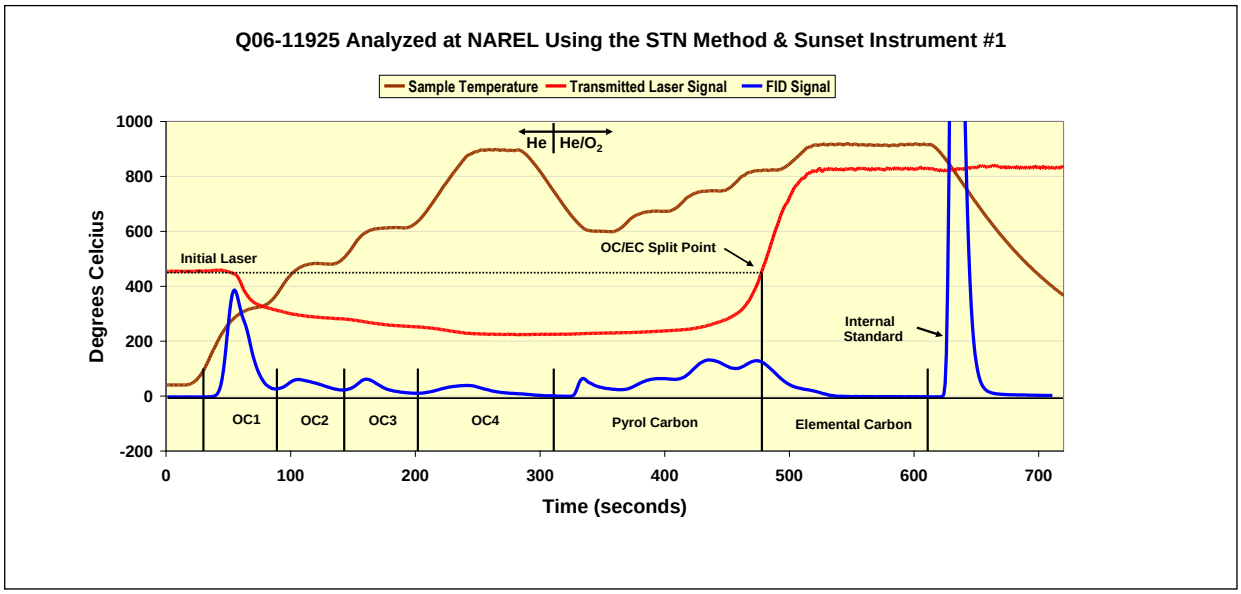


Figure 20

Figure 20 shows that an OC sub-fraction occurs with each of the four thermal ramps during the He stage. The STN method does not require reporting EC sub-fractions. PyrolC, formed during the He stage and indicated by the declining laser signal, begins to evolve from the sample along with any original EC when He/O_2 stage begins as indicated by the increasing laser and FID signals. The laser signal illustrated in Figure 20 begins to increase only after the He/O_2 stage begins. If a significant concentration of O_2 contamination is present during the He stage or if the sample contains oxidizing compounds that cause EC to oxidize prematurely, the laser signal would indicate this by increasing before the He/O_2 stage begins which could result in less calculated EC. The split point shown in Figure 20 occurs in the thermogram at the point at which the laser increases to its initial value determined at the beginning of the analysis. EC is defined as any carbon evolving from the time of the split point up to the introduction of the internal standard. The length of the analysis using the Sunset analyzer with STN method is fixed at 720 seconds.

Figures 21 and 22 are thermograms produced from RTI's Sunset Labs TOT instruments R and T.

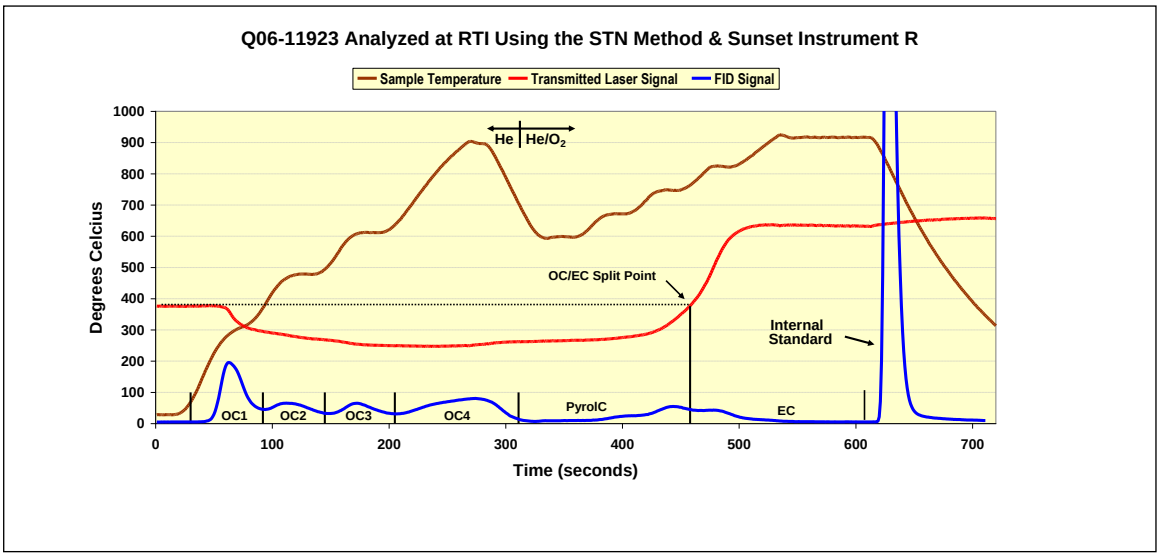


Figure 21

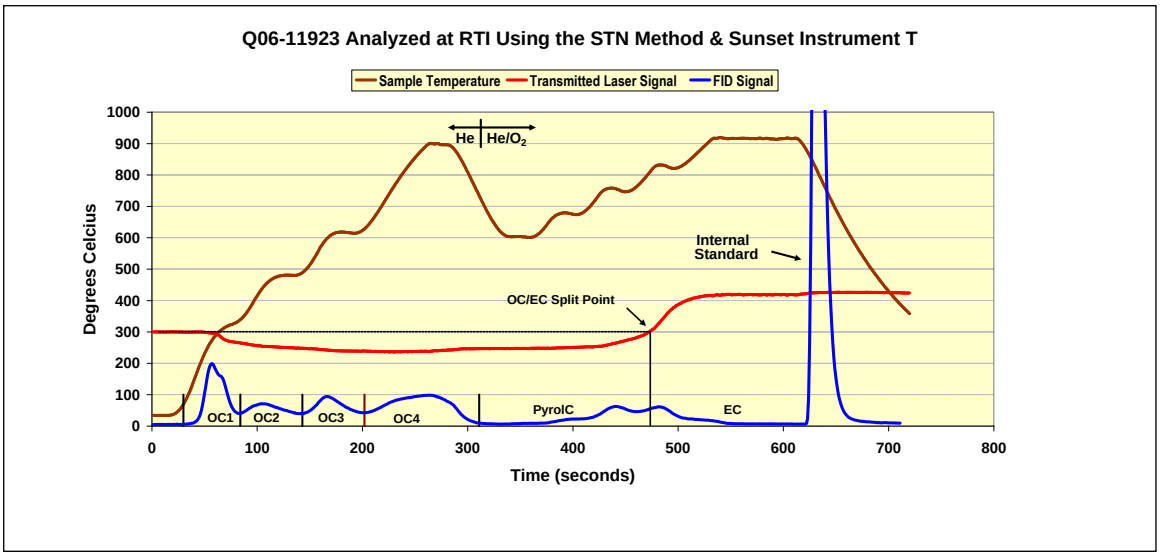


Figure 22

The laser signals shown in the RTI thermograms appear to increase very slightly before the He/O_2 is introduced. As stated earlier, a rising laser signal at this point could indicate possible oxygen contamination. If the rising laser signal is the result of oxygen, the EC comparisons presented in the Figures 10 and 11 suggest the effects of the oxygen are insignificant. RTI has developed a procedure to measure trace oxygen contamination in the instrument's sample oven using a commercially available oxygen analyzer that is capable of detecting O_2 concentrations at less than 1.0 part per million (ppm). RTI has reported measurements of less than 2 ppm from their Sunset instruments and less than 7 ppm from their DRI model 2001.

Figures 23 and 24 are thermograms produced from data submitted by DRI for their duplicate analyses of sample Q06-11921 by the STN method using two different instruments.

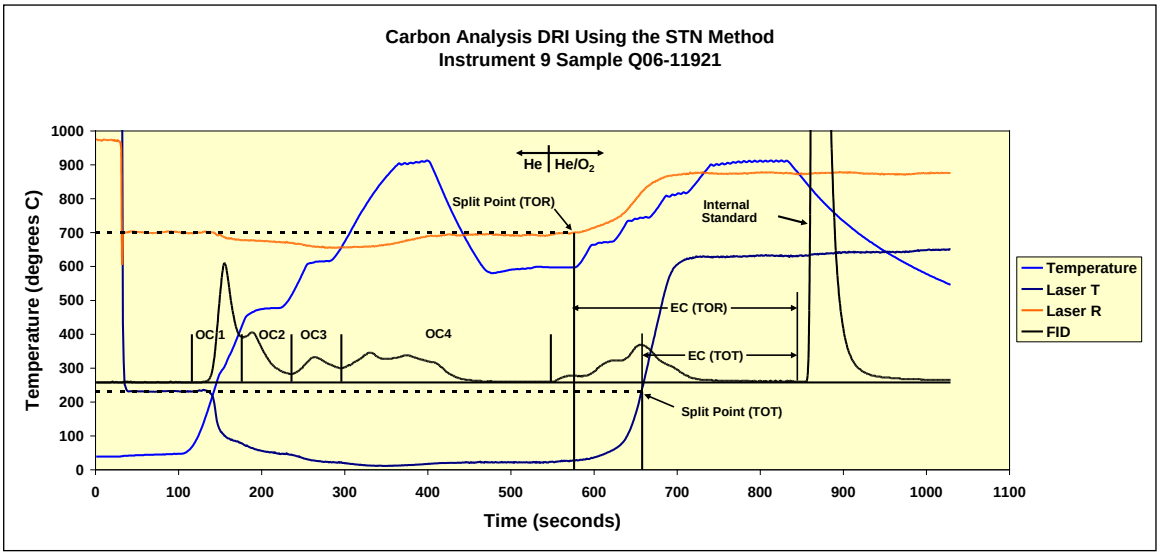


Figure 23

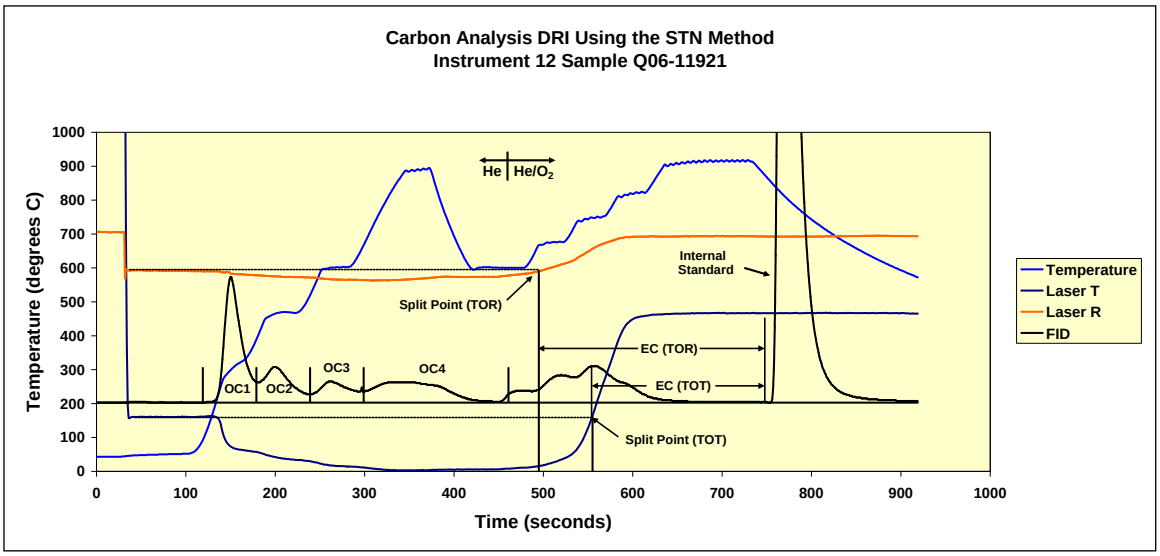


Figure 24

The instruments are DRI model 2001 analyzers which have both reflected and transmitted laser signals available to correct for pyrolysis. The STN method results reported by DRI, and illustrated in the previous bar graphs, were calculated based on the transmitted laser signal. The figures illustrate how the split point by transmitted laser comes later in the analysis than the split point determined by reflectance, resulting in lower calculated EC concentrations.

The DRI thermograms also reveal possible traces of oxygen in the helium phase indicated by the rising laser signals ahead of the introduction of He/O_2. DRI also has procedures to check their carbon analyzers for trace oxygen contamination. A sample of the He carrier gas is taken from the carbon analyzer's front oven and injected into a gas chromatograph with a mass spectrometer detector (GC/MS). Typically, the O_2 concentration in the DRI Model 2001 oven is less than 25 ppm. RTI measured less than 8 ppm in their DRI Model 2001 analyzer.

Figures 25 and 26 are thermograms produced from data submitted by DRI for their duplicate analyses of sample Q06-11921 by the IMPROVE_A method using two different instruments.

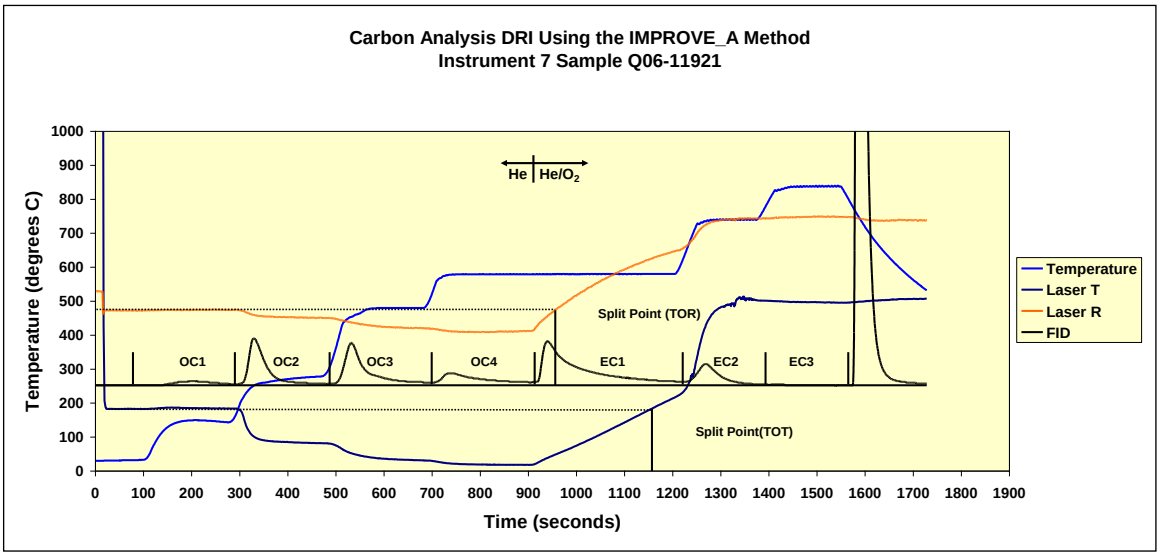


Figure 25

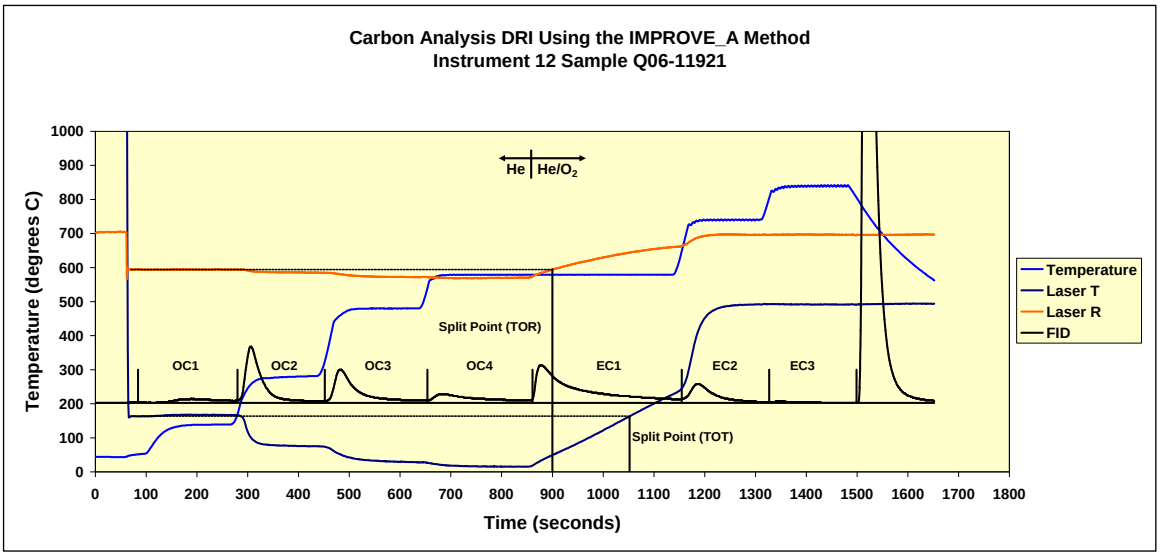


Figure 26

The IMPROVE_A method requires reporting three EC sub-fractions as well as the OC and PyrolC sub-fractions. The laser signals indicate no visible effects of trace O_2 contamination in the IMPROVE_A thermograms. The effect of trace oxygen in the pure helium stage is greater at higher temperatures such as those produced using the STN method.

Figure 27 is a thermogram produced from data submitted by CARB for their analysis of sample Q06-11919 by the IMPROVE_A method using their DRI Model 2001 #1 instrument.

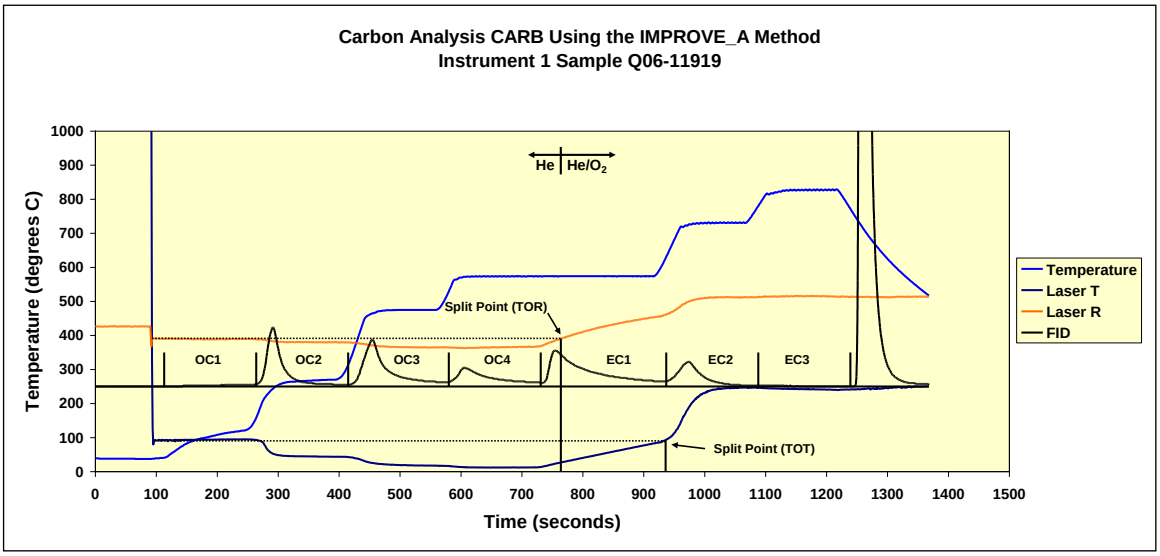


Figure 27

Previously, CARB used a modified version of the STN method in which the maximum temperature of the pure helium, non-oxidizing, stage was reduced to 700 °C. This was done to reduce the effects of trace oxygen contamination that was occurring at the higher temperatures used by the STN method. The IMPROVE_A method reduces the non-oxidizing temperature to 580°C, further lessening the effect of any oxygen contamination.

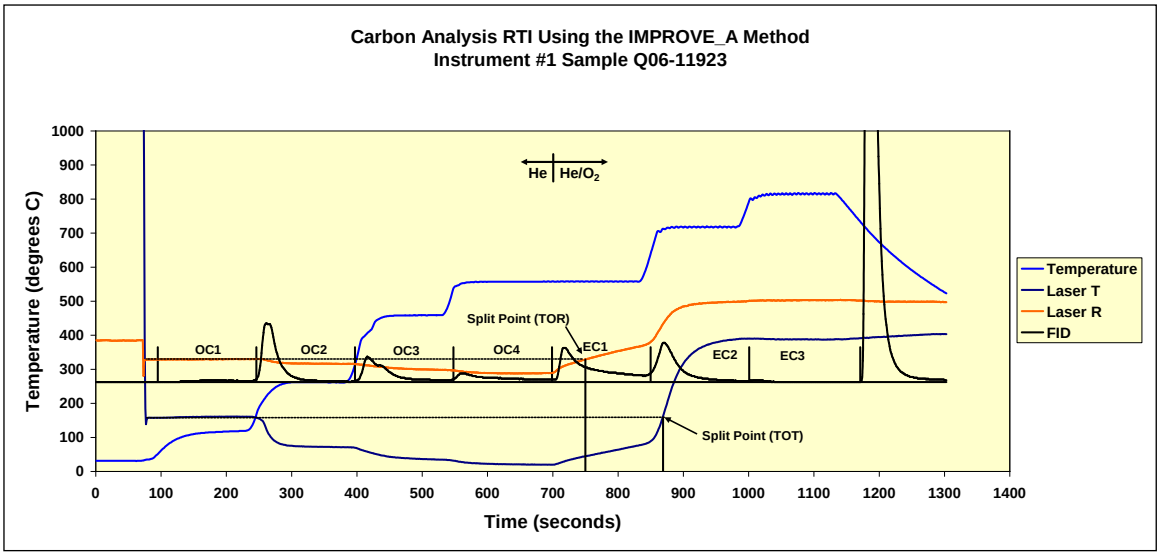


Figure 28

Figure 28 is from RTI's analysis of sample Q06-11923 by the IMPROVE_A method using their DRI model 2001 analyzer.

Figures 29 and 30 are thermograms produced from RTI and EPA Sunset Dual Mode instruments performing the IMPROVE_A method for replicate filters of the October 6 event.

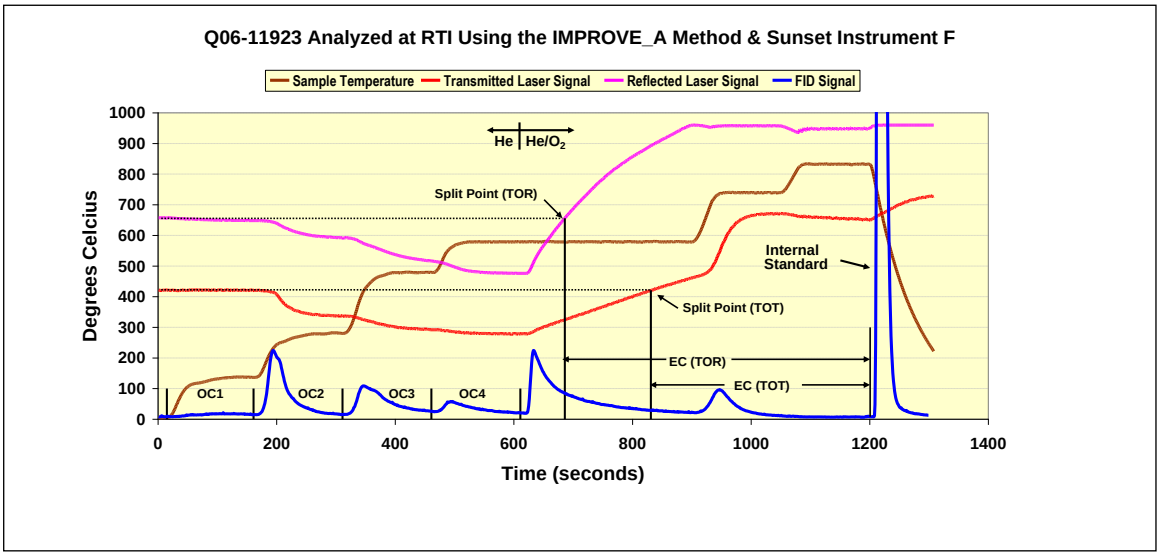


Figure 29

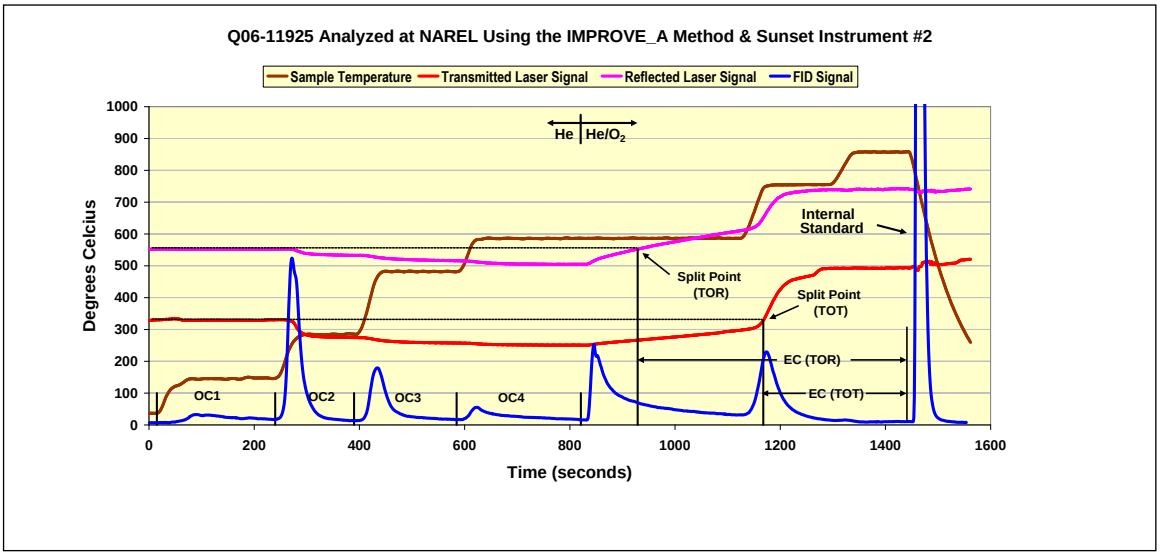


Figure 30

Both the RTI and EPA Sunset instruments have been set up and optimized to run the IMPROVE_A method. Both instruments show good comparability with the DRI Model 2001 instruments when replicate samples are analyzed by the IMPROVE_A method.

Each of the thermograms presented represents the analysis of a replicate $PM_{2.5}$ sample collected during the October 6 event. Results from all of the quartz filters are presented in Table 12 at the end of this report. This table includes the uncertainty of measurement when it was available. Table 12 also contains results from the blank filters that were part of each set of PE samples.

XRF analysis

NAREL provided each participating laboratory with a set of eight 47-mm Teflon® filters for elemental analysis using energy dispersive XRF. Each sample set contained two blank filters, four filters that were loaded with $PM_{2.5}$ collected from the Montgomery air, and two spiked filters that were provided by the Alion Corporation. Co-located Met One SuperSASS air samplers were used to load filters to create replicates according to the sampling schedule presented in Table 7. Again, collection times used for this study were significantly longer than the usual twenty-four hours to raise the level of the analytes.

Table 7. Sample Sets for XRF PE Filters

Filter ID	Serial Number	Sample Start	Event Duration	Receiving Lab
T06-11968	T6056385	08-Dec-06	231-hour	CARB
T06-11969	T6056386	08-Dec-06	231-hour	CARB
T07-11985	T7039779	25-Jan-07	232-hour	CARB
T07-11986	T7039780	25-Jan-07	232-hour	CARB
T07-12099	T7039751	-----	Alion	CARB
T07-12100	T7039752	-----	Alion	CARB
T07-12116	T7039851	-----	Blank	CARB
T07-12117	T7039852	-----	Blank	CARB
T06-11970	T6056387	08-Dec-06	231-hour	DRI
T06-11971	T6056388	08-Dec-06	231-hour	DRI
T07-11987	T7039781	25-Jan-07	232-hour	DRI
T07-11988	T7039782	25-Jan-07	232-hour	DRI
T07-12101	T7039753	-----	Alion	DRI
T07-12102	T7039754	-----	Alion	DRI
T07-12118	T7039853	-----	Blank	DRI
T07-12119	T7039854	-----	Blank	DRI
T06-11972	T6056389	08-Dec-06	231-hour	ODEQ
T06-11973	T6056390	08-Dec-06	231-hour	ODEQ
T07-11989	T7039783	25-Jan-07	232-hour	ODEQ
T07-11990	T7039784	25-Jan-07	232-hour	ODEQ
T07-12103	T7039755	-----	Alion	ODEQ
T07-12104	T7039756	-----	Alion	ODEQ
T07-12120	T7039855	-----	Blank	ODEQ
T07-12121	T7039856	-----	Blank	ODEQ
T06-11974	T6056391	08-Dec-06	231-hour	RTI
T06-11975	T6056392	08-Dec-06	231-hour	RTI
T07-11991	T7039785	25-Jan-07	232-hour	RTI
T07-11992	T7039786	25-Jan-07	232-hour	RTI
T07-12105	T7039757	-----	Alion	RTI
T07-12106	T7039758	-----	Alion	RTI
T07-12122	T7039857	-----	Blank	RTI
T07-12123	T7039858	-----	Blank	RTI
T06-11976	T6056393	08-Dec-06	231-hour	UCD
T06-11977	T6056394	08-Dec-06	231-hour	UCD
T07-11993	T7039767	25-Jan-07	232-hour	UCD

Table 7. Sample Sets for XRF PE Filters

Filter ID	Serial Number	Sample Start	Event Duration	Receiving Lab
T07-11994	T7039768	25-Jan-07	232-hour	UCD
T07-12107	T7039759	-----	Alion	UCD
T07-12108	T7039760	-----	Alion	UCD
T07-12124	T7039859	-----	Blank	UCD
T07-12125	T7039860	-----	Blank	UCD

The Alion Science and Technology Corporation, located in RTP, created a set of XRF samples made with clean Teflon® filters supplied by NAREL. Alion supplies PT filter samples to OAQPS for QA support of the National Air Toxics Trends Sites (NATTS) Program. Alion has developed a method of simultaneously creating replicate spiked filter samples by pulling an aerosol containing the selected elements through a manifold attached to several filter holders. The aerosol is generated from a solution containing the dissolved elements. The element concentration deposited on each filter is a calculated amount based on flow rates and element concentrations in the solution. The elements deposited on each filter included Chromium, Manganese, Nickel, Arsenic, Cadmium, Antimony, Mercury, and Lead. A few representative samples from a batch of replicates are sent to a reference lab for analysis by ICPMS to ensure the quality of the replicates. Results from the reference lab become the "true value" used by OAQPS to evaluate the NATTS laboratories. There is no particle sizing of the deposited material such as the size selective inlets used to capture $PM_{2.5}$ with the SASS samplers. PT filters supplied to the NATTS laboratories are normally quartz filters for analysis by ICPMS. XRF results provided through this study will allow OAQPS to compare PT sample results from two different methods of analysis.

The quality of the NAREL created replicates described in Table 7 was first tested at NAREL by measuring the gravimetric mass of $PM_{2.5}$ captured onto each filter. Furthermore it was decided that all of the filters should be analyzed at a single laboratory before they were redistributed to the other labs participating in the study. Consequently all of the samples for the study were submitted to EPA's National Exposure Research Laboratory (NERL) for the first XRF analysis. NERL analyzed all filters using their LBL XRF instrument with helium purge. All filters were analyzed two times in two separate runs. Resulting data was processed by NERL using two different versions of their least squares algorithm. The older version used in previous years is being replaced with a new optimization algorithm which incorporates additional elements and interference corrections. NAREL requested that NERL provide results with and without attenuation corrections. In all, the various processing combinations resulted in eight results files. For this study, NAREL used the optimized results without attenuation corrections.

All of the filters were returned to NAREL for redistribution to the other XRF labs. Each lab received a set of eight samples as described in Table 7. Results were reported to NAREL as mass of the element per square centimeter ($\mu g/cm^2$), and a one-sigma uncertainty was provided for each analytical result. Those results were multiplied by the total area of the filter deposit, 11.3 cm^2, to produce final results in units of micrograms of the element per filter (µg/filter).

Figure 31 compares NERL results from two runs with the median result of the two analyses. Only results that are greater than three sigma are plotted in Figure 31. The plot gives a quick visual impression of the agreement of the two runs.

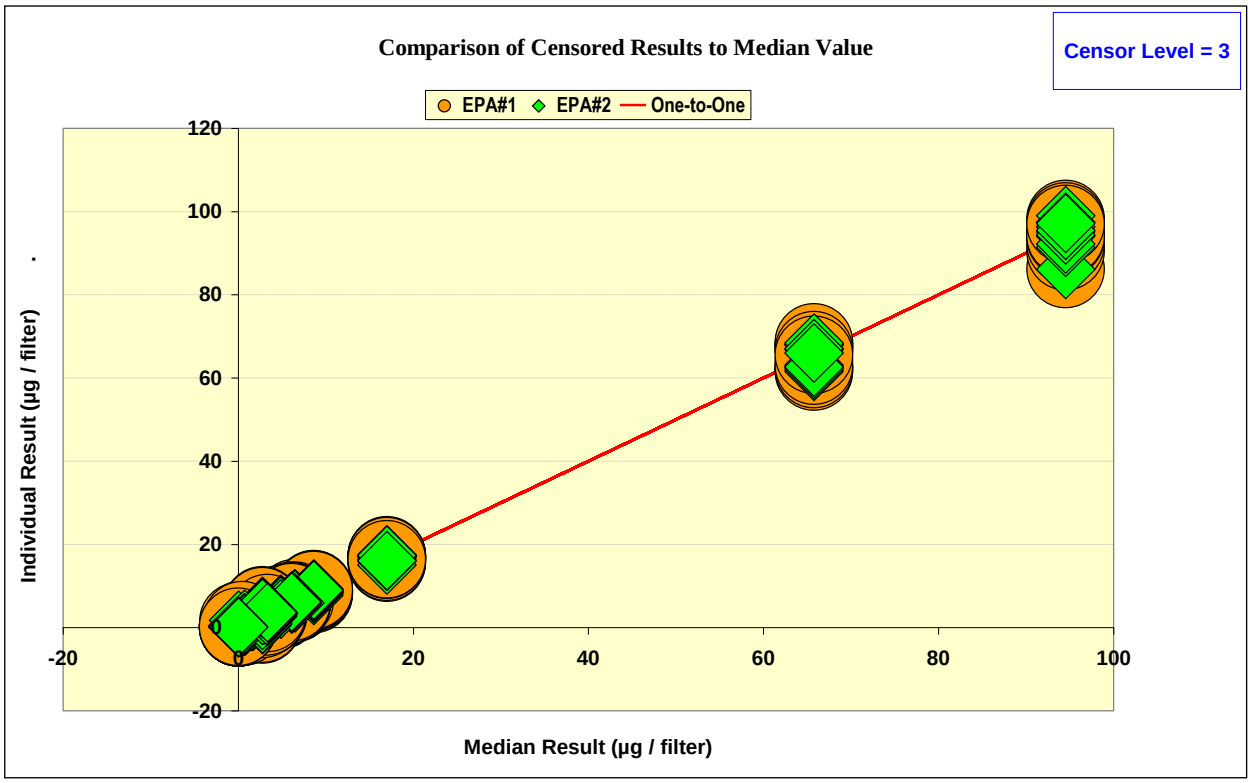


Figure 31

All of the participating labs have an SOP for their XRF analysis. Most of the SOP's are currently available on the web (see reference 21 through 25).

XRF Results

A large number of XRF results were reported for this study. Forty-eight STN elements are routinely reported for each sample, forty samples were reported, and each sample was reported from two labs (NERL included).

(48 results/sample/lab) x (40 samples) x (2 labs) = 3840 results

Not all labs report all forty-eight elements, however. Table 8 lists the 48 STN elements with an X representing a lab's reported elements. Only two labs, DRI and RTI, reported all forty-eight elements described in this report.

Table 8 Elements Reported by Lab

Element	Z	CARB	DRI	ODEQ	RTI	UCD	EPA
Na	11		X		X	X	
Mg	12		X		X	X	
Al	13	X	X	X	X	X	X
Si	14	X	X	X	X	X	X
P	15	X	X	X	X	X	X
S	16	X	X	X	X	X	X
Cl	17	X	X	X	X	X	X

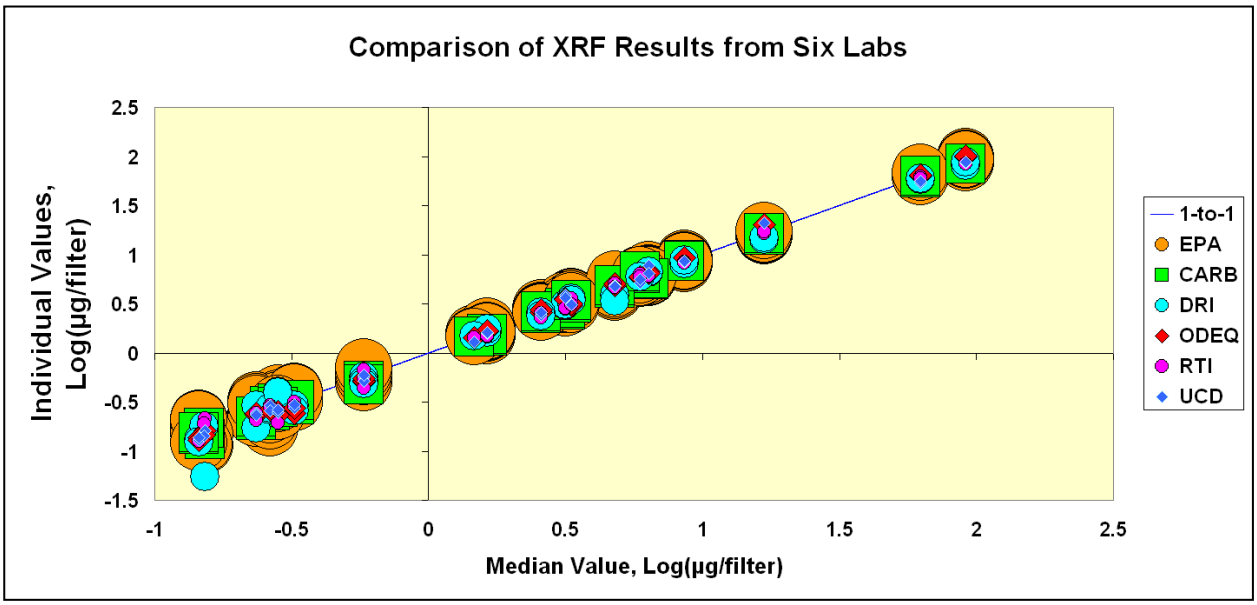
Table 8 Elements Reported by Lab

Element	Z	CARB	DRI	ODEQ	RTI	UCD	EPA
K	19	X	X	X	X	X	X
Ca	20	X	X	X	X	X	X
Sc	21		X	X	X		X
Ti	22	X	X	X	X	X	X
V	23	X	X	X	X	X	X
Cr	24	X	X	X	X	X	X
Mn	25	X	X	X	X	X	X
Fe	26	X	X	X	X	X	X
Co	27	X	X	X	X		X
Ni	28	X	X	X	X	X	X
Cu	29	X	X	X	X	X	X
Zn	30	X	X	X	X	X	X
Ga	31		X	X	X		X
As	33	X	X	X	X	X	X
Se	34	X	X	X	X	X	X
Br	35	X	X	X	X	X	X
Rb	37	X	X	X	X	X	X
Sr	38	X	X	X	X	X	X
Y	39	X	X	X	X		X
Zr	40		X	X	X	X	X
Nb	41		X	X	X		X
Mo	42	X	X	X	X		X
Ag	47		X	X	X		X
Cd	48		X	X	X		X
In	49		X	X	X		X
Sn	50	X	X	X	X		X
Sb	51	X	X	X	X		X
Cs	55		X	X	X		X
Ba	56	X	X	X	X		X
La	57		X	X	X		X
Ce	58		X	X	X		X
Sm	62		X	X	X		X
Eu	63		X	X	X		X
Tb	65		X	X	X		X
Hf	72		X	X	X		
Ta	73		X	X	X		X
W	74		X	X	X		X
Ir	77		X	X	X		
Au	79		X	X	X		X
Hg	80	X	X	X	X		X
Pb	82	X	X	X	X	X	X

The large number of results makes it difficult to present an element by element comparison of all results. For this study, all of the results greater than three sigma as determined by all labs have been compared to the median values by constructing a scatter plot shown in Figure 32. Figure 32 does not include the samples created by Alion. A log-log plot was constructed with the median values forming a straight line of

unity slope. The corresponding results from all of the labs were superimposed on the median line. Most of the results were very near the median indicating good agreement among the participating labs. Even though Figure 32 gives a quick visual impression of many results that cover a wide range of concentrations, this scatter plot does not identify the element plotted or the sample.

Figure 32



The more significant XRF results from two sampling events are presented again as stacked-bar graphs in Figure 33 and Figure 34. Each bar segment represents an individual value reported by one of the labs. Every other segment of each bar in the graph represents a value determined by the EPA lab.

Figure 33

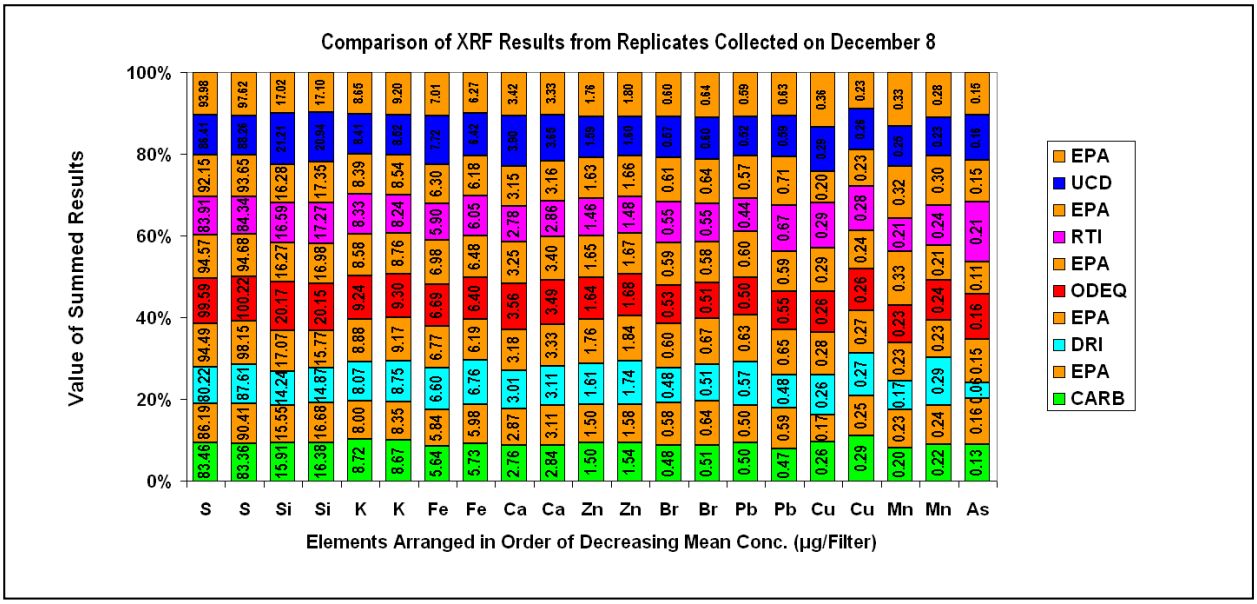
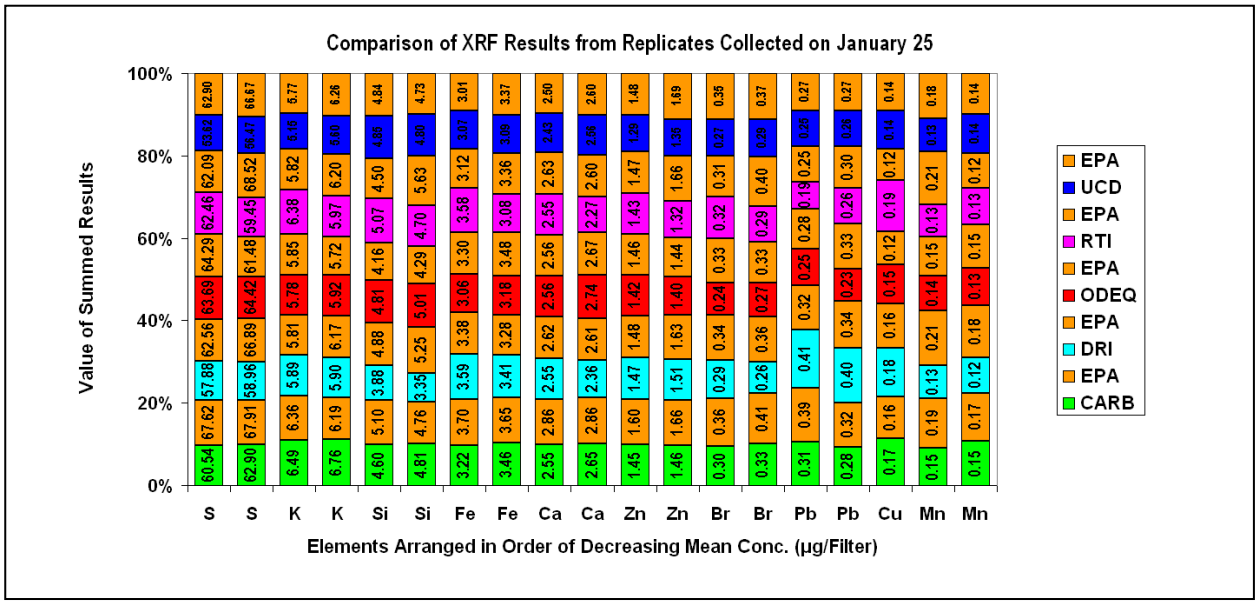


Figure 34



By presenting the results in this manner, it is possible to show the test lab result immediately below the EPA result with both labs having analyzed the same filter. 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 labs identified in the legend. Each bar segment is color coded to identify the lab and labeled to show the reported concentration value.

The normalized stacked-bar graphs presented in Figures 33 and 34 show at a glance the level of agreement among the different labs for several elements. Reasonably good agreement is seen for the elements with concentrations greater than three times the uncertainty of the measurement. Each bar in the graph would have equal segments if all of the results were in perfect agreement. Again, the only results shown in the graphs are those that are significantly above the reported uncertainty.

In addition to filter samples created at NAREL, a replicate set of Teflon® filter samples were also created by Alion for this study. These filters were spiked by Alion in March of 2007. Each filter was loaded with equal deposits of eight elements. The EPA lab analyzed all filters in October of 2007 before they were distributed to the other participating labs. Each lab received two of the replicate filters to analyze. Figure 35 presents a view of each lab's results compared to EPA's results. For example, the first two bars represent CARB's results for Cr for two replicate samples. The next two bars are EPA's results for the same two samples. The poor precision seen for mercury in figure 35 is most likely due to the seven month time delay between spiking the filters and the first EPA analysis.

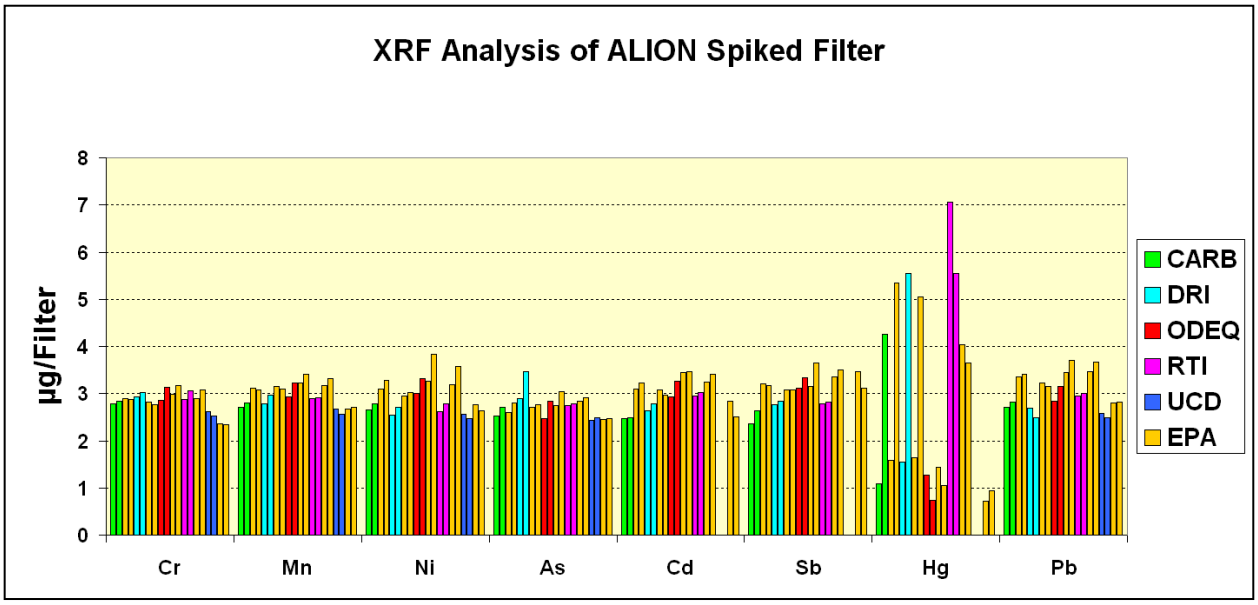


Figure 35

Each of the previous figures presented for XRF show an overall comparison of results of multiple analytes analyzed by all labs. The next figures, Figures 36 – 46, present another view of the individual elements that have a significant concentration as shown in figures 33 and 34. The following graphs present a comparison of element concentration with the measurement uncertainty reported by each lab. The error bars represent ±3-sigma uncertainty which was used to select those results presented previously in Figures 33 and 34. Each alternate orange bar in the graphs is the EPA result for the same sample shown in the preceding bar.

Figure 36

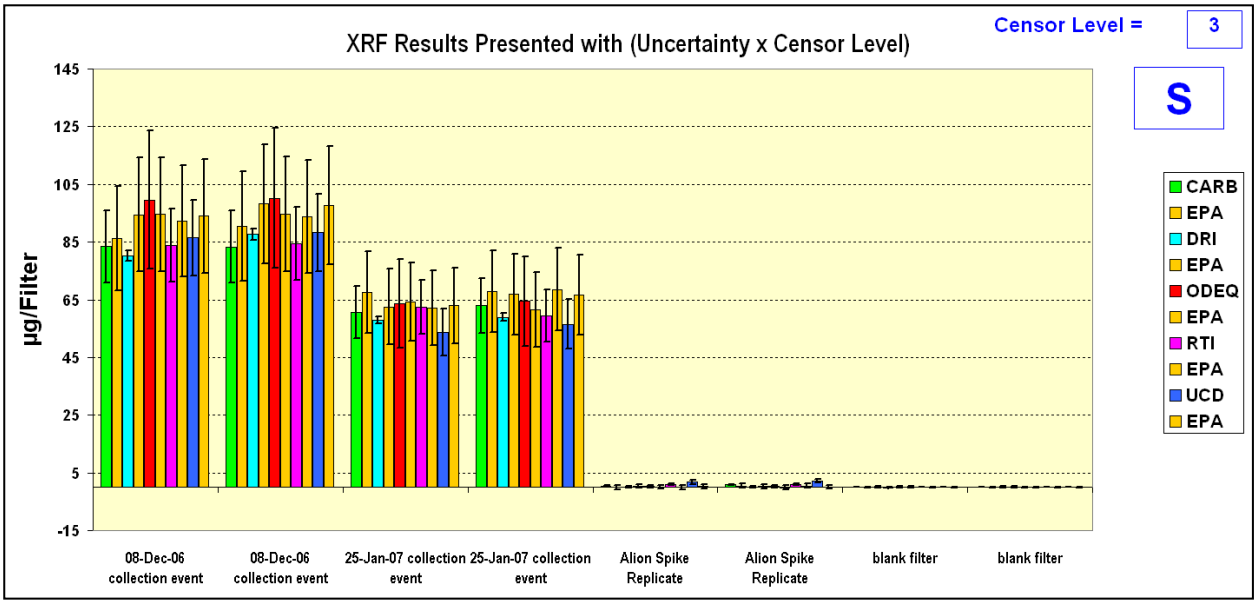


Figure 37

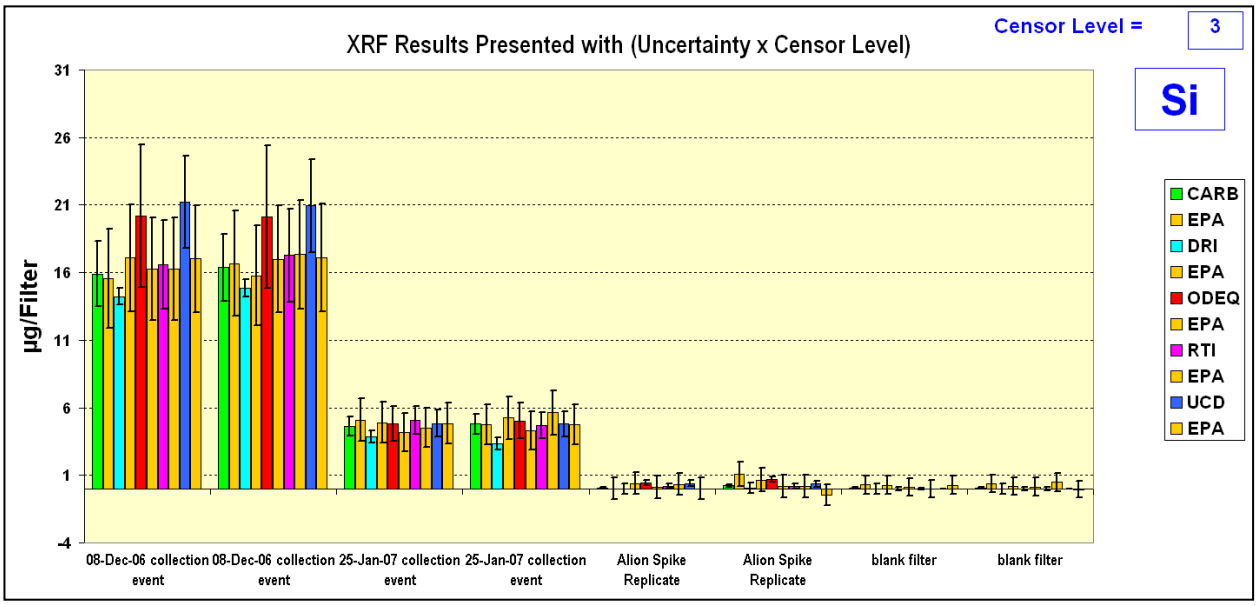


Figure 38

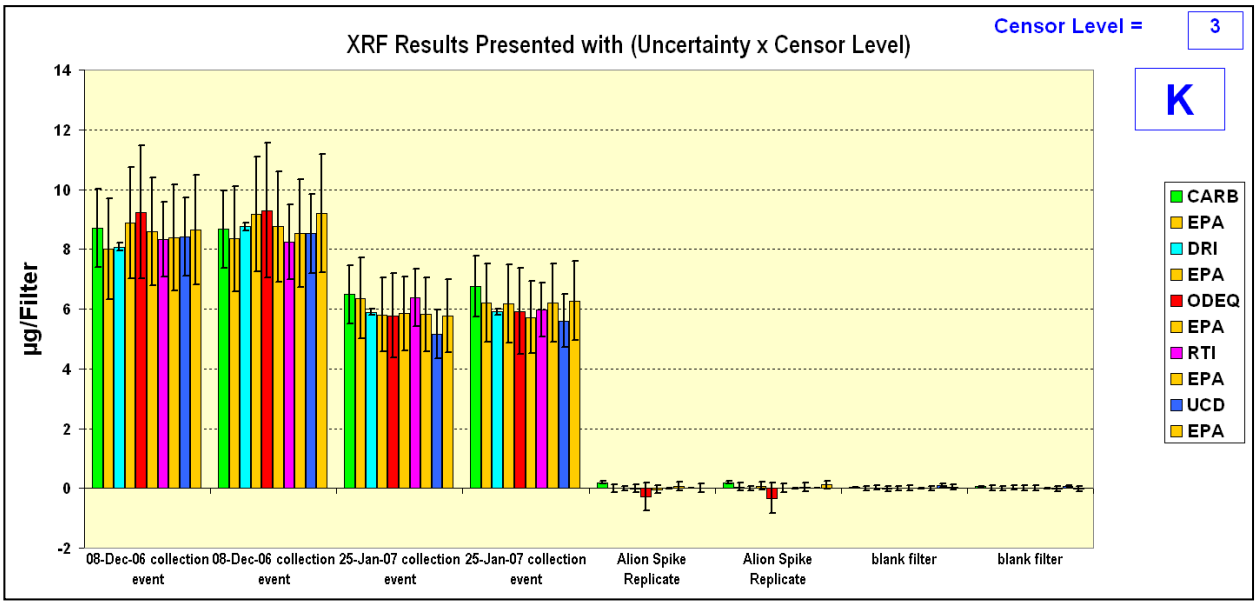


Figure 39

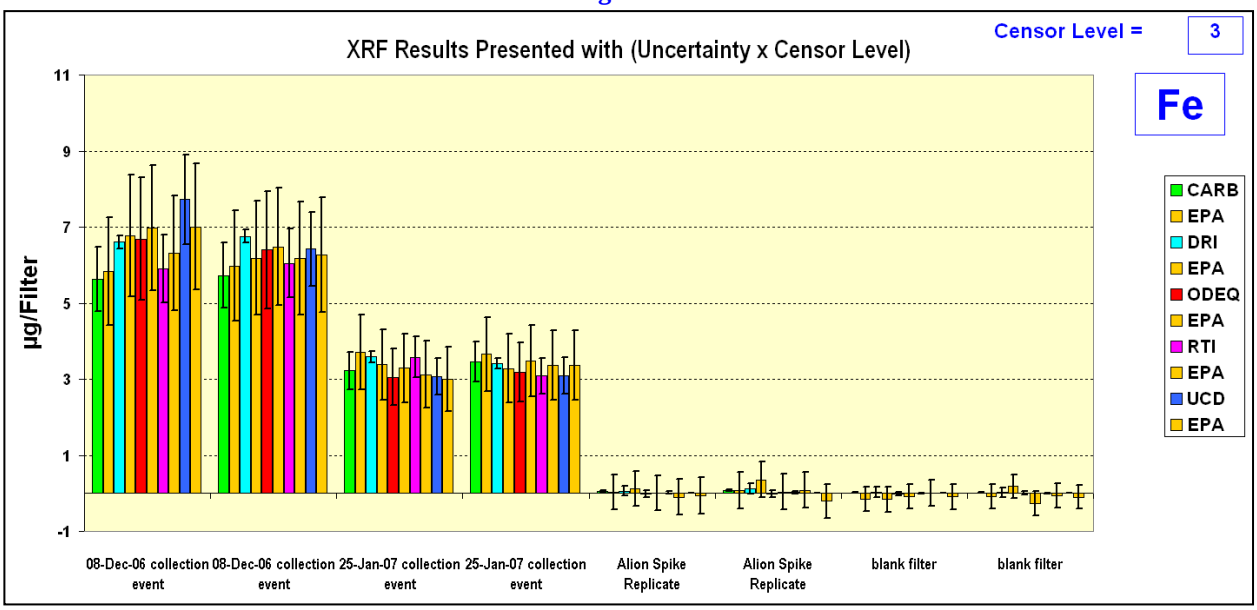


Figure 40

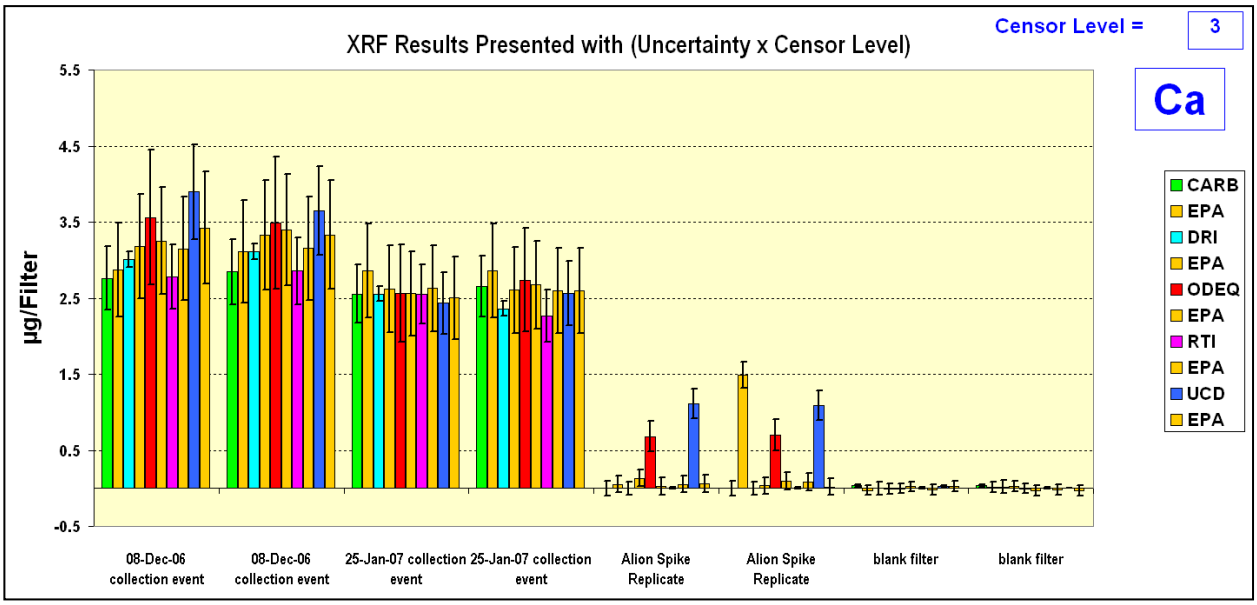


Figure 41

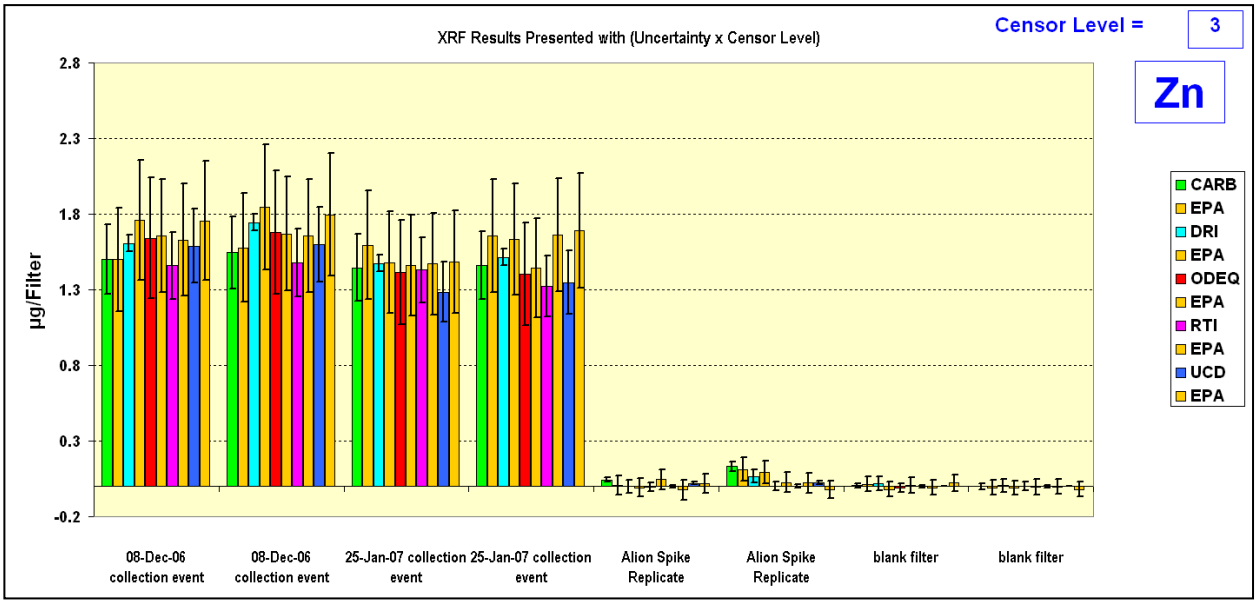


Figure 42

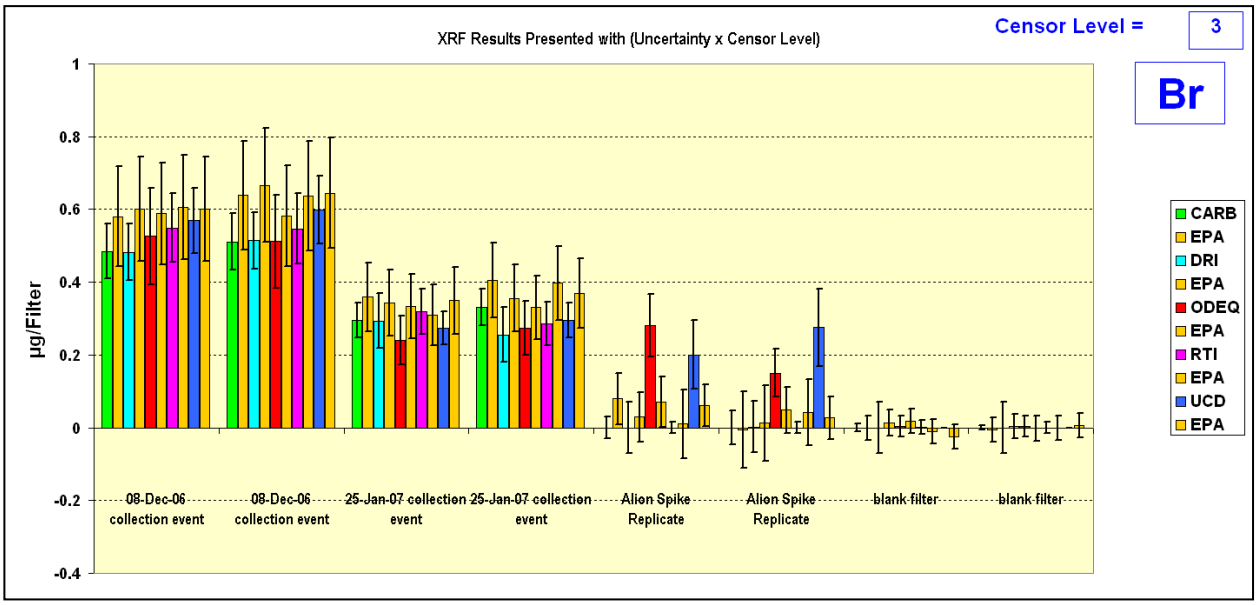


Figure 43

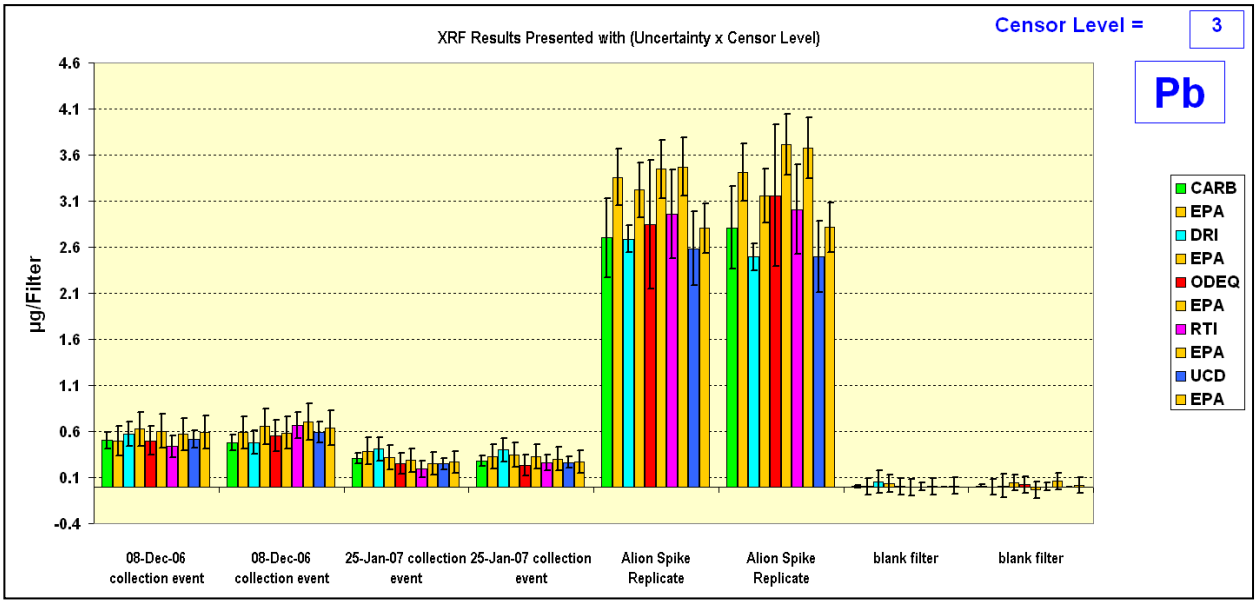


Figure 44

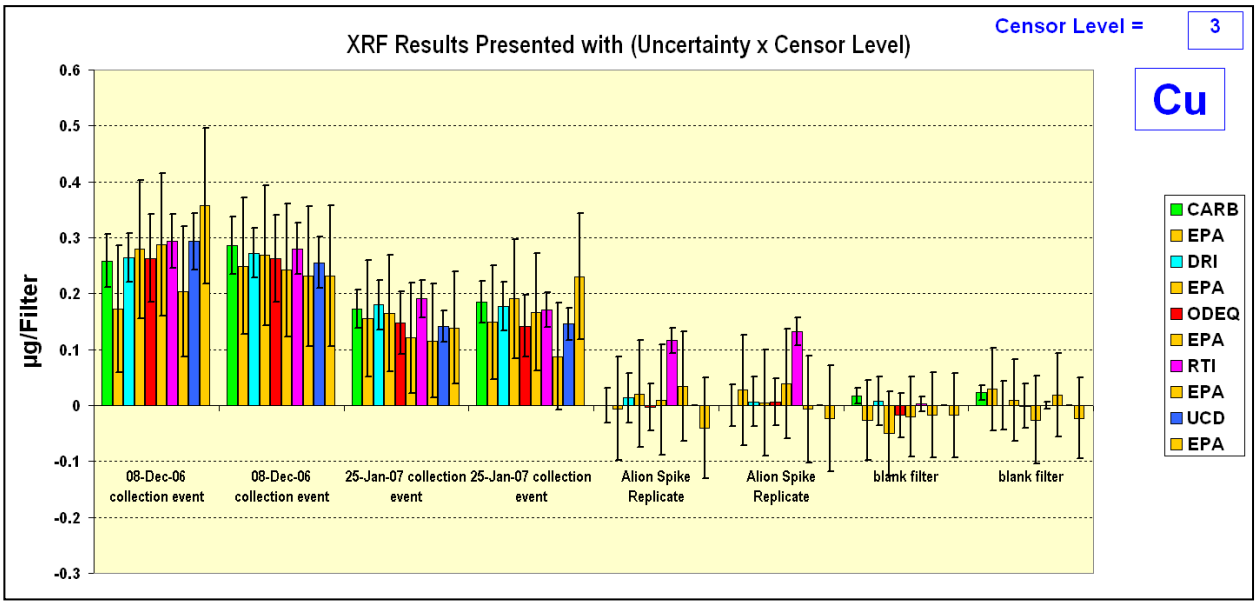


Figure 45

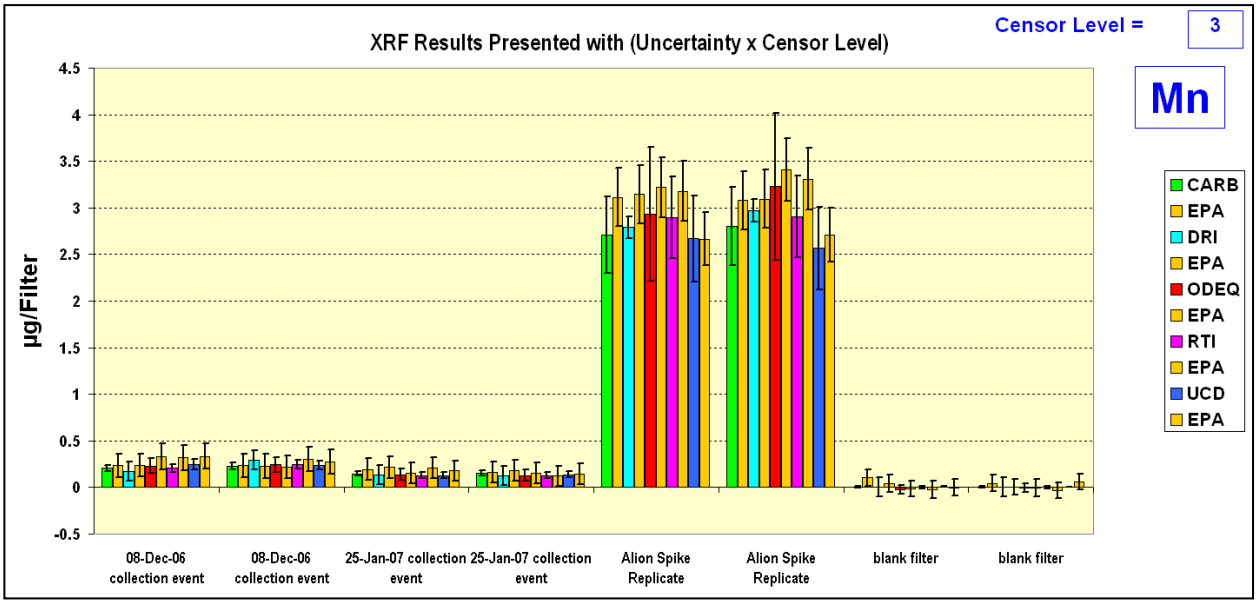
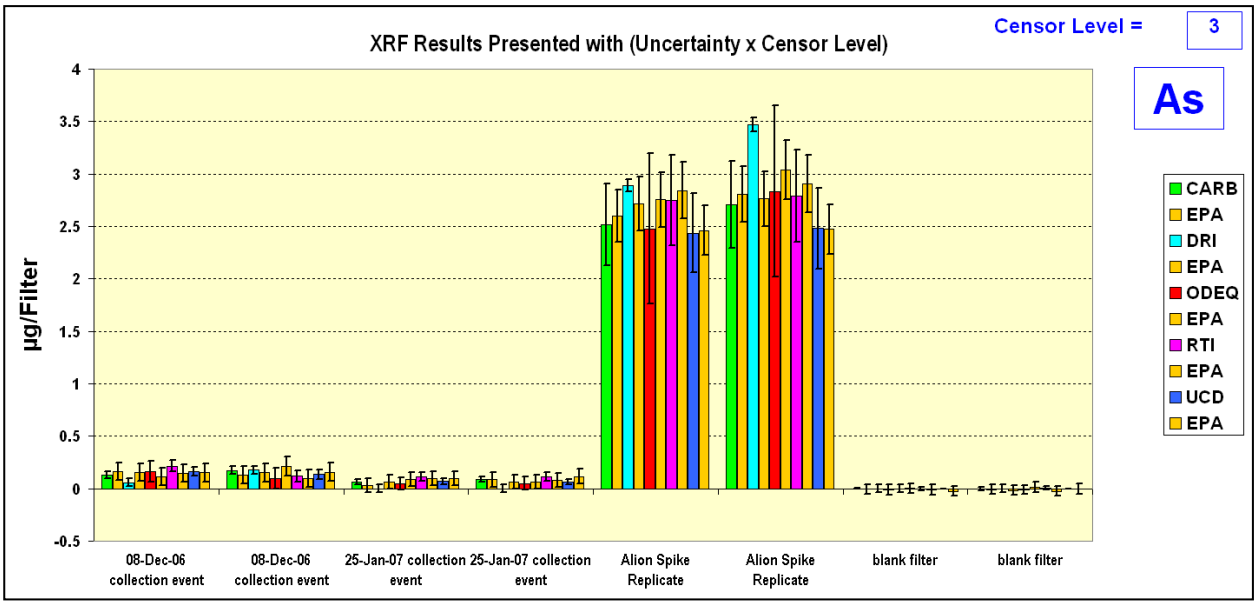


Figure 46



Figures 36 – 46 show the between lab agreement in element concentration as well as the comparability of the estimated uncertainty of each measurement. The figures illustrate surprisingly good between lab agreement for the reported uncertainties considering that each lab uses a different XRF system and a custom method to estimate the uncertainty. In the majority of the above figures, the uncertainties reported by DRI are the smallest and those reported by ODEQ are the largest. DRI calculates the XRF measurement uncertainty of each element by adding the standard deviation of lab blank measurements to the absolute sample concentration multiplied by the relative standard deviation of multiple measurements of the low standard. ODEQ calculates uncertainties based on count statistics, estimated modeling uncertainty, sampling error and calibration uncertainty and uncertainty due to particle size attenuation.

Table 9a is a summary of results for several elements grouped by sample type. Each statistical value in the table was derived from the results of two replicates analyzed at the lab identified in each column.

Table 9a. Summary of XRF Results for Twenty-one Elements (µg/filter)

	CARB Results	EPA Results	DRI Results	EPA Results	ODEQ Results	EPA Results	RTI Results	EPA Results	UCD Results	EPA Results
Dec 8 Replicates										
Mean	5.899	6.169	6.083	6.660	6.844	6.585	5.979	6.470	6.281	6.654
Max	83.461	90.409	87.613	98.150	100.218	94.682	84.343	93.655	88.258	97.617
Min	0.000	-0.092	0.000	-0.136	-1.081	-0.057	0.000	-0.239	0.000	-0.174
Std. Dev.	17.961	18.982	17.999	20.681	21.588	20.320	18.128	19.964	18.979	20.585
Count	42	42	42	42	42	42	42	42	42	42
Jan25 Replicates										
Mean	3.992	4.424	3.848	4.162	3.946	4.043	3.911	4.201	3.532	4.212
Max	62.898	67.913	58.958	66.894	64.415	64.290	62.455	68.519	56.469	66.669
Min	0.000	-0.028	0.000	-0.019	-0.807	-0.163	0.000	-0.137	0.000	-0.142
Std. Dev.	13.187	14.451	12.453	13.823	13.712	13.418	13.028	13.956	11.771	13.824
Count	42	42	42	42	42	42	42	42	42	42
Alion Replicates										
Mean	0.737	0.882	0.722	0.870	0.812	0.869	0.759	0.822	0.873	0.718
Max	2.831	3.410	3.469	3.221	3.313	3.829	3.069	3.676	2.669	2.813
Min	-0.113	-0.092	0.000	-0.051	-0.333	-0.347	0.000	-0.100	0.000	-0.442
Std. Dev.	1.150	1.283	1.216	1.236	1.258	1.403	1.213	1.363	1.086	1.137
Count	42	42	42	42	42	42	42	42	42	42
Blank Filters										
Mean	0.010	0.058	0.006	0.101	-0.001	0.043	0.001	0.040	0.021	0.038
Max	0.054	1.058	0.052	1.739	0.090	0.808	0.011	1.152	0.284	0.667
Min	-0.045	-0.147	0.000	-0.161	-0.058	-0.275	0.000	-0.065	0.000	-0.104
Std. Dev.	0.018	0.200	0.011	0.350	0.021	0.176	0.003	0.196	0.053	0.143
Count	42	42	42	42	42	42	42	42	42	42

Table 9b. Summary of XRF Uncertainties for Twenty-one Elements (µg/filter)

	CARB Uncert.	EPA Uncert.	DRI Uncert.	EPA Uncert.	ODEQ Uncert.	EPA Uncert.	RTI Uncert.	EPA Uncert.	UCD Uncert.	EPA Uncert.
Dec 8 Replicates										
Mean	0.300	0.507	0.067	0.544	0.619	0.536	0.330	0.529	0.324	0.545
Max	4.174	6.307	0.608	6.845	8.055	6.604	4.224	6.532	4.452	6.808
Min	0.003	0.014	0.001	0.014	0.011	0.014	0.004	0.014	0.000	0.015
Std. Dev.	0.897	1.323	0.126	1.440	1.726	1.415	0.914	1.391	0.960	1.433
Count	42	42	42	42	42	42	42	42	42	42
Jan 25 Replicates										
Mean	0.204	0.384	0.056	0.368	0.364	0.359	0.217	0.370	0.195	0.368
Max	3.146	4.742	0.437	4.671	5.182	4.490	3.129	4.784	2.861	4.655
Min	0.002	0.013	0.001	0.013	0.010	0.013	0.004	0.013	0.000	0.012
Std. Dev.	0.658	1.011	0.093	0.966	1.095	0.939	0.650	0.976	0.596	0.968
Count	42	42	42	42	42	42	42	42	42	42
Alion Replicates										
Mean	0.047	0.120	0.039	0.117	0.099	0.120	0.050	0.119	0.064	0.114
Max	0.149	0.770	0.132	0.744	0.271	0.776	0.163	0.735	0.272	0.754
Min	0.003	0.012	0.001	0.012	0.010	0.013	0.003	0.012	0.000	0.012
Std. Dev.	0.054	0.161	0.035	0.158	0.095	0.162	0.059	0.157	0.076	0.158
Count	42	42	42	42	42	42	42	42	42	42
Blank Filters										
Mean	0.008	0.072	0.037	0.074	0.026	0.074	0.011	0.073	0.007	0.072
Max	0.036	0.567	0.131	0.613	0.073	0.603	0.057	0.584	0.118	0.577
Min	0.002	0.010	0.001	0.011	0.009	0.011	0.002	0.011	0.000	0.010
Std. Dev.	0.008	0.123	0.035	0.129	0.019	0.126	0.013	0.125	0.020	0.123
Count	42	42	42	42	42	42	42	42	42	42

Table 9b is a summary of the reported uncertainties grouped by sample type. Both tables are structured to offer the same information matrix so that each statistical value in Table 9a can be identified with the corresponding uncertainty value in Table 9b. For example, the mean of forty-two results reported by CARB for the December 8 replicates was 5.899 µg/filter, and the mean uncertainty for the same set of results was 0.300 µg/filter. Since only two labs reported the full set of forty-eight elements, the statistical parameters were based upon the largest subset of twenty-one elements that were reported by all of the labs. The statistical values in Tables 9a and 9b were based upon results and uncertainties reported for the following elements: Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, As, Se, Br, Rb, Sr, and Pb.

Some of the results in Table 9a are negative values. It is not unusual for a lab to report a small negative concentration when the element is either absent from the sample or present at a level near the detection limit since statistically, negative and positive values are equally probable outcomes of the fitting algorithms. One can argue that reporting a zero concentration for a negative value is a form of censorship. On the other hand, one should question a zero uncertainty. A request was made for all participating labs to report a one-sigma uncertainty, but several labs reported more than one expression of uncertainty. For example, the UCD lab reported a Method Detection Limit (MDL) along with the one-sigma uncertainty. Table 9b shows us that the smallest single uncertainty was reported from the UCD lab. It appears that zero uncertainty was reported for some of their results. It is important to understand, however, that in every

case a reasonable MDL was also reported with each sample result, and zero uncertainty was reported only when the element was not detected in the sample.

All of the XRF results are presented at the end of this report in Table 13 and Table 14. Examples of XRF spectra were not produced for this report; however, spectra for samples very similar to this year's PE samples may be viewed in NAREL's 2006 inter-lab PE study report (see reference 26).

Conclusions

This study was designed to evaluate the analytical performance of several $PM_{2.5}$ speciation labs. The approach was similar to the studies conducted in 2006 and 2005 (see reference 26 and 27). Each lab analyzed an almost identical set of blind PE samples, and the results reported from all of the labs have been compared. The scope of the study included four analytical techniques, and multiple methods were reported for the IC, TOA carbon, and XRF. At least one EPA lab was able to report results for most of the methods used during this study.

Five labs analyzed a set of PE samples for gravimetric mass, and all results were within the 3-sigma advisory limits established by NAREL. All of the results reported from the participating labs showed good agreement with the gravimetric results reported from NAREL.

Five different labs reported IC results from at least one set of PE samples, and three different methods were tested. Both Nylon® and Teflon® filters were analyzed for selected ions during this study. It is interesting to note that the analytical results from this study have confirmed a sampling bias that is well documented in the scientific literature. Nylon® filters capture nitrate from the ambient air better than Teflon® filters. Good performance was observed from all of the participating labs, and no significant problems were observed in the IC results from this study.

Four labs analyzed sets of quartz PE filters. Each set was a nearly identical set of six filters composed of replicates from two sampling events and blank filters. Most of the labs analyzed each filter multiple times in order to report results using more that one TOA method. The results from this study are useful to evaluate performance at several different levels. The replicate filter sets allow precision to be evaluated among different labs while duplicates within each set allow precision to be evaluated within individual labs. Results for the STN and IMPROVE_A methods were reported, and results were reported from three different models of instrumentation. Precision was good for the TC, and this was true when results were compared among labs, among methods, and among instruments. Carbon fractions are affected by the choice of method. Within each method, STN or IMPROVE_A, results from this study show relatively good precision for the major carbon fractions, OC and EC, regardless of which instrument performed the analysis. Precision between instrument types, Sunset Labs or DRI Model 2001, was better for both instruments when performing the IMPROVE_A method. The smaller carbon fractions, such as OC1, EC1, and PyrolC, are referred to as subfractions in this report. In past PE studies, precision between the subfractions has not been as good as the precision between the major fractions. This study showed unusually good subfraction precision when using the IMPROVE_A method. This may be due to factors such as oven temperature calibration procedures now in place at most of the labs, better prevention of extraneous oxygen, and improved flow control. Improved precision of the carbon fractions may also be attributed to the variable time duration at each temperature set point specified by the IMPROVE_A protocol opposed to the fixed durations specified by the STN method. Variable time durations allow peaks to evolve completely which should result in better precision. Additional variability of subfractions may result if peaks are not allowed sufficient time to completely evolve in the limited time permitted by the STN method.

Six XRF labs participated in this study. By design, the results reported from five labs were compared to the results from a single lab, EPA's NERL. All of the filters used in this study were first analyzed at NERL. By having a single lab analyze all of the samples, a new level of confidence can be achieved in the

quality of hidden replicates distributed to all of the labs. None of the labs used the same instrument to report XRF results. The most similar instrumentation is at the CARB and RTI labs. RTI and CARB both use Quantex instruments. Even though their instruments were supplied by the same vendor, different hardware configurations were used for this study. The most unusual instrumentation is used at the UCD Crocker Nuclear Lab. Two separate instruments built by the Davis lab are routinely used for the XRF analysis of 25 mm Teflon® filters used to collect samples in the IMPROVE air monitoring network. In order to participate in this study in which 47 mm filters were analyzed, modifications to the normal instrument conditions were made along with a re-calibration based on the larger and thicker 47 mm Teflon®. Considering the differences in hardware and software used during this study, remarkably good agreement was observed in the results from different labs for those elements reported at higher abundance in the samples.

References

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Table 10. Gravimetric Mass PE Results

Sample ID	Sample Description	Tare Mass		Final Mass		Captured $PM_{2.5}$		Inter-Lab Difference* of Captured $PM_{2.5}$ (mg)	Name of the Test Lab
		Test Lab (mg)	NAREL (mg)	Test Lab (mg)	NAREL (mg)	Test Lab (mg)	NAREL (mg)		
T07-12164	48-hr collection event	140.385	140.385	140.472	140.477	0.087	0.092	0.005	CARB
T07-12165	48-hr collection event	141.956	141.953	142.054	142.058	0.098	0.105	0.007	CARB
T07-12166	20-hr collection event	141.136	141.135	141.168	141.169	0.032	0.034	0.002	CARB
T07-12167	20-hr collection event	141.763	141.763	141.799	141.801	0.036	0.038	0.002	CARB
T07-12168	24-hr collection event	140.301	140.299	140.366	140.368	0.065	0.069	0.004	CARB
T07-12169	24-hr collection event	140.892	140.893	140.960	140.964	0.068	0.071	0.003	CARB
T07-12170	36-hr collection event	142.662	142.663	142.779	142.783	0.117	0.120	0.003	CARB
T07-12171	filter blank	141.272	141.272	141.272	141.271	0.000	-0.001	-0.001	CARB
T07-12172	filter blank	139.850	139.851	139.850	139.850	0.000	-0.001	-0.001	CARB
T07-12173	filter blank	141.841	141.841	141.840	141.840	-0.001	-0.001	0.000	CARB
MW07-12214	metallic transfer weight	190.523	190.521	190.522	190.521	-0.001	0.000	0.001	CARB
MW07-12215	metallic transfer weight	94.834	94.834	94.833	94.834	-0.001	0.000	0.001	CARB
T07-12174	48-hr collection event	140.267	140.252	140.351	140.340	0.084	0.088	0.004	DRI
T07-12175	48-hr collection event	137.593	137.577	137.671	137.664	0.078	0.087	0.009	DRI
T07-12176	20-hr collection event	138.768	138.753	138.798	138.791	0.030	0.038	0.008	DRI
T07-12177	20-hr collection event	143.146	143.129	143.176	143.168	0.030	0.039	0.009	DRI
T07-12178	24-hr collection event	146.356	146.338	146.418	146.411	0.062	0.073	0.011	DRI
T07-12179	24-hr collection event	147.817	147.799	147.881	147.871	0.064	0.072	0.008	DRI
T07-12180	36-hr collection event	146.895	146.877	147.009	147.002	0.114	0.125	0.011	DRI
T07-12181	filter blank	146.234	146.218	146.229	146.217	-0.005	-0.001	0.004	DRI
T07-12182	filter blank	146.265	146.247	146.262	146.249	-0.003	0.002	0.005	DRI
T07-12183	filter blank	143.959	143.939	143.953	143.941	-0.006	0.002	0.008	DRI
MW07-12216	metallic transfer weight	181.327	181.335	181.327	181.335	0.000	0.000	0.000	DRI

Table 10. Gravimetric Mass PE Results

Sample ID	Sample Description	Tare Mass		Final Mass		Captured $PM_{2.5}$		Inter-Lab Difference* of Captured $PM_{2.5}$ (mg)	Name of the Test Lab
		Test Lab (mg)	NAREL (mg)	Test Lab (mg)	NAREL (mg)	Test Lab (mg)	NAREL (mg)		
MW07-12217	metallic transfer weight	88.202	88.207	88.201	88.207	-0.001	0.000	0.001	DRI
T07-12184	48-hr collection event	147.193	147.197	147.282	147.290	0.089	0.093	0.004	ODEQ
T07-12185	48-hr collection event	145.605	145.610	145.694	145.701	0.089	0.091	0.002	ODEQ
T07-12186	20-hr collection event	143.888	143.894	143.923	143.928	0.035	0.034	-0.001	ODEQ
T07-12187	20-hr collection event	147.434	147.440	147.470	147.476	0.036	0.036	0.000	ODEQ
T07-12188	24-hr collection event	145.345	145.351	145.412	145.420	0.067	0.069	0.002	ODEQ
T07-12189	24-hr collection event	145.078	145.082	145.148	145.154	0.070	0.072	0.002	ODEQ
T07-12190	36-hr collection event	144.204	144.210	144.327	144.336	0.123	0.126	0.003	ODEQ
T07-12191	filter blank	145.190	145.194	145.191	145.196	0.001	0.002	0.001	ODEQ
T07-12192	filter blank	144.868	144.876	144.872	144.876	0.004	0.000	-0.004	ODEQ
T07-12193	filter blank	146.136	146.141	146.138	146.143	0.002	0.002	0.000	ODEQ
MW07-12218	metallic transfer weight	192.420	192.421	192.419	192.422	-0.001	0.001	0.002	ODEQ
MW07-12219	metallic transfer weight	97.545	97.547	97.544	97.547	-0.001	0.000	0.001	ODEQ
T07-12194	48-hr collection event	146.532	146.537	146.613	146.623	0.081	0.086	0.005	RTI
T07-12195	48-hr collection event	146.360	146.365	146.442	146.451	0.082	0.086	0.004	RTI
T07-12196	20-hr collection event	145.195	145.199	145.233	145.236	0.038	0.037	-0.001	RTI
T07-12197	20-hr collection event	147.131	147.135	147.168	147.168	0.037	0.033	-0.004	RTI
T07-12198	24-hr collection event	145.871	145.876	145.942	145.946	0.071	0.070	-0.001	RTI
T07-12199	24-hr collection event	148.808	148.812	148.877	148.881	0.069	0.069	0.000	RTI
T07-12200	36-hr collection event	144.019	144.023	144.139	144.145	0.120	0.122	0.002	RTI
T07-12201	filter blank	145.602	145.608	145.607	145.607	0.005	-0.001	-0.006	RTI
T07-12202	filter blank	144.777	144.781	144.780	144.781	0.003	0.000	-0.003	RTI
T07-12203	filter blank	144.003	144.006	144.006	144.004	0.003	-0.002	-0.005	RTI

Table 10. Gravimetric Mass PE Results

Sample ID	Sample Description	Tare Mass		Final Mass		Captured $PM_{2.5}$		Inter-Lab Difference* of Captured $PM_{2.5}$ (mg)	Name of the Test Lab
		Test Lab (mg)	NAREL (mg)	Test Lab (mg)	NAREL (mg)	Test Lab (mg)	NAREL (mg)		
MW07-12220	metallic transfer weight	191.060	191.061	191.060	191.061	0.000	0.000	0.000	RTI
MW07-12221	metallic transfer weight	96.352	96.353	96.352	96.353	0.000	0.000	0.000	RTI
T07-12204	48-hr collection event	44.829	44.834	44.911	44.927	0.082	0.093	0.011	UCD
T07-12211	48-hr collection event	43.797	43.801	43.877	43.890	0.080	0.089	0.009	UCD
T07-12206	20-hr collection event	45.033	45.035	45.063	45.073	0.030	0.038	0.008	UCD
T07-12207	20-hr collection event	41.995	41.998	42.025	42.035	0.030	0.037	0.007	UCD
T07-12208	24-hr collection event	42.224	42.227	42.285	42.296	0.061	0.069	0.008	UCD
T07-12209	24-hr collection event	49.543	49.548	49.606	49.616	0.063	0.068	0.005	UCD
T07-12210	36-hr collection event	46.552	46.556	46.661	46.675	0.109	0.119	0.010	UCD
T07-12205	filter blank	41.769	41.772	41.770	41.776	0.001	0.004	0.003	UCD
T07-12212	filter blank	40.672	40.674	40.671	40.677	-0.001	0.003	0.004	UCD
T07-12213	filter blank	45.079	45.084	45.078	45.085	-0.001	0.001	0.002	UCD
MW07-12222	metallic transfer weight	41.818	41.818	41.819	41.819	0.001	0.001	0.000	UCD
MW07-12223	metallic transfer weight	38.535	38.534	38.535	38.535	0.000	0.001	0.001	UCD

**** Negative values indicate a smaller capture determined by NAREL.***

Table 11. Ion Chromatography PE Results

Sample ID	Filter Medium	Sample Description	Lab	Method	Concentration (µg/filter)						
					Chloride	Nitrate	Nitrite	Sulfate	Ammonium	Potassium	Sodium
N07-12006	nylon	152-hr Event 02/08/07	CARB	STN	-----	151.687	-----	173.811	90.954	2.648	3.267
N07-12007	nylon	152-hr Event 02/08/07	CARB	STN	-----	142.686	-----	171.618	89.235	2.763	2.826
N07-12008	nylon	152-hr Event 02/08/07	DRI	STN	-----	142.803	-----	175.393	108.327	2.140	2.387
N07-12009	nylon	152-hr Event 02/08/07	DRI	STN	-----	146.181	-----	180.368	111.457	2.095	2.306
N07-12010	nylon	152-hr Event 02/08/07	ODEQ	STN	-----	137	-----	181	70.2	4.02	9.99
N07-12011	nylon	152-hr Event 02/08/07	ODEQ	STN	-----	138	-----	170	66.7	4.7	<3.6
N07-12012	nylon	152-hr Event 02/08/07	RTI	STN	-----	142.716	-----	176.319	97.102	3.047	2.800
N07-12013	nylon	152-hr Event 02/08/07	RTI	STN	-----	150.869	-----	183.240	101.229	2.989	2.839
N07-12015	nylon	152-hr Event 02/08/07	NAREL	STN	7.438	139.114	1.726	169.787	80.923	4.069	2.852
N07-12016	nylon	152-hr Event 02/08/07	NAREL	STN	8.253	142.294	2.023	173.945	81.771	4.731	2.946
N06-11930	nylon	189-hr Event 11/14/06	CARB	STN	-----	141.517	-----	265.423	112.656	3.564	2.022
N06-11931	nylon	189-hr Event 11/14/06	CARB	STN	-----	125.463	-----	262.831	110.421	3.443	1.836
N06-11932	nylon	189-hr Event 11/14/06	DRI	STN	-----	124.972	-----	268.047	127.883	3.028	1.294
N06-11933	nylon	189-hr Event 11/14/06	DRI	STN	-----	126.468	-----	274.178	130.785	2.845	1.330
N06-11934	nylon	189-hr Event 11/14/06	ODEQ	STN	-----	118	-----	261	83.3	4.62	<3.6
N06-11935	nylon	189-hr Event 11/14/06	ODEQ	STN	-----	128	-----	255	82.9	4.54	<3.6
N06-11936	nylon	189-hr Event 11/14/06	RTI	STN	-----	125.356	-----	269.642	122.574	3.611	1.891
N06-11937	nylon	189-hr Event 11/14/06	RTI	STN	-----	137.876	-----	276.569	126.572	3.635	1.815
N06-11938	nylon	189-hr Event 11/14/06	NAREL	STN	6.725	131.397	2.131	258.135	105.673	5.195	1.886
N06-11939	nylon	189-hr Event 11/14/06	NAREL	STN	6.475	130.685	2.150	261.693	104.930	5.125	1.816
N07-12224	nylon	filter blank	CARB	STN	-----	<0.5	-----	<1.75	<0.5	<1.25	<0.75
N07-12225	nylon	filter blank	CARB	STN	-----	<0.5	-----	<1.75	<0.5	<1.25	<0.75
N07-12226	nylon	filter blank	DRI	STN	-----	0.000	-----	0.738	0.000	0.415	0.000
N07-12227	nylon	filter blank	DRI	STN	-----	0.837	-----	0.000	0.000	0.000	0.000
N07-12228	nylon	filter blank	ODEQ	STN	-----	<1.4	-----	<1.4	<0.72	<1.1	<3.6
N07-12229	nylon	filter blank	ODEQ	STN	-----	<1.4	-----	<1.4	<0.72	<1.1	<3.6
N07-12230	nylon	filter blank	RTI	STN	-----	0.511	-----	0.000	0.000	0.000	0.000
N07-12231	nylon	filter blank	RTI	STN	-----	0.516	-----	0.000	0.000	0.000	0.000

Table 11. Ion Chromatography PE Results

Sample ID	Filter Medium	Sample Description	Lab	Method	Concentration (µg/filter)						
					Chloride	Nitrate	Nitrite	Sulfate	Ammonium	Potassium	Sodium
N07-12232	nylon	filter blank	NAREL	STN	<0.2	0.853	1.405	<0.2	<0.2	<0.2	0.296
N07-12233	nylon	filter blank	NAREL	STN	<0.2	1.030	2.147	<0.2	<0.2	<0.2	0.211
N07-12018	nylon	152-hr Event 02/16/07	RTI	IMPROVE	10.947	107.120	0.933	131.534	65.037	-----	-----
N07-12019	nylon	152-hr Event 02/16/07	RTI	IMPROVE	11.120	106.687	0.987	133.744	64.612	-----	-----
N07-12020	nylon	152-hr Event 02/16/07	NAREL	IMPROVE	10.022	104.226	1.291	127.872	55.203	-----	-----
N07-12021	nylon	152-hr Event 02/16/07	NAREL	IMPROVE	9.202	107.552	0.768	127.209	57.395	-----	-----
N06-11958	nylon	194-hr Event 11/28/06	RTI	IMPROVE	14.235	100.266	1.291	142.404	68.774	-----	-----
N06-11959	nylon	194-hr Event 11/28/06	RTI	IMPROVE	12.155	98.116	1.561	142.199	67.492	-----	-----
N06-11960	nylon	194-hr Event 11/28/06	NAREL	IMPROVE	11.218	96.731	1.716	128.863	55.070	-----	-----
N06-11961	nylon	194-hr Event 11/28/06	NAREL	IMPROVE	11.156	98.228	1.500	135.759	57.392	-----	-----
N07-12234	nylon	filter blank	RTI	IMPROVE	0.089	0.539	1.002	0.000	0.000	-----	-----
N07-12235	nylon	filter blank	RTI	IMPROVE	0.088	0.577	0.843	0.000	0.000	-----	-----
N07-12236	nylon	filter blank	NAREL	IMPROVE	<0.2	<0.2	0.657	0.744	<0.2	-----	-----
N07-12237	nylon	filter blank	NAREL	IMPROVE	<0.2	<0.2	0.678	0.762	<0.2	-----	-----
T07-12022	teflon	152-hr Event 02/16/07	DRI	STN	-----	10.520	-----	118.115	43.266	2.781	5.072
T07-12023	teflon	152-hr Event 02/16/07	DRI	STN	-----	10.725	-----	117.688	42.890	2.938	5.620
T07-12024	teflon	152-hr Event 02/16/07	NAREL	STN	0.850	8.673	0.550	112.724	36.805	3.721	6.195
T07-12025	teflon	152-hr Event 02/16/07	NAREL	STN	0.920	9.581	0.756	113.163	37.666	3.758	5.304
T06-11963	teflon	194-hr Event 11/28/06	DRI	STN	-----	27.704	-----	122.013	45.562	3.889	8.338
T06-11964	teflon	194-hr Event 11/28/06	DRI	STN	-----	32.370	-----	121.538	45.015	3.726	8.389
T06-11965	teflon	194-hr Event 11/28/06	NAREL	STN	1.154	30.785	0.951	116.525	40.797	6.078	8.585
T06-11966	teflon	194-hr Event 11/28/06	NAREL	STN	1.010	31.341	0.692	119.260	41.468	6.364	8.925
T07-12238	teflon	filter blank	DRI	STN	-----	0.686	-----	0.000	0.000	0.000	0.271
T07-12239	teflon	filter blank	DRI	STN	-----	0.000	-----	0.000	0.000	0.446	0.126
T07-12240	teflon	filter blank	NAREL	STN	0.620	0.836	0.411	<0.2	<0.2	<0.2	0.932
T07-12241	teflon	filter blank	NAREL	STN	0.591	0.780	0.546	0.644	<0.2	<0.2	0.601

Table 12. TOA Carbon PE Results

Sample ID	Sample Description	Lab	Instrument (see text)*	Method	Concentration (µg/cm^2)							
					EC	OC	TC	OC1	OC2	OC3	OC4	PyrolC
Q06-11921	200-hr Event 10/06/06	DRI	9	STN	1.2 ± 0.2	17.5 ± 0.5	18.8 ± 0.4	4.3 ± 0.5	2.8 ± 0.2	1.8 ± 0.2	5.0 ± 1.6	3.7 ± 0.7
Q06-11921	200-hr Event 10/06/06	DRI	12	STN	1.4 ± 0.2	16.8 ± 0.5	18.2 ± 0.4	4.9 ± 0.5	2.3 ± 0.2	1.6 ± 0.2	3.3 ± 1.1	4.7 ± 0.8
Q06-11922	200-hr Event 10/06/06	DRI	11	STN	1.5 ± 0.2	17.1 ± 0.5	18.6 ± 0.4	4.6 ± 0.5	2.3 ± 0.2	1.9 ± 0.2	4.3 ± 1.4	3.9 ± 0.7
Q06-11922	200-hr Event 10/06/06	DRI	12	STN	1.1 ± 0.2	17.5 ± 0.5	18.6 ± 0.4	5.0 ± 0.6	2.3 ± 0.2	1.8 ± 0.2	3.7 ± 1.2	4.6 ± 0.8
Q06-11925	200-hr Event 10/06/06	NAREL	#1	STN	1.9 ± 0.3	18.1 ± 1.1	20.0 ± 1.3	5.49	1.71	1.34	1.61	7.92
Q06-11926	200-hr Event 10/06/06	NAREL	#1	STN	1.9 ± 0.3	19.0 ± 1.1	20.9 ± 1.3	5.7	1.88	1.29	1.65	8.47
Q06-11923	200-hr Event 10/06/06	RTI	R	STN	1.7 ± 0.4	17.7 ± 1.2	19.4 ± 1.4	4.5 ± 0.5	2.9 ± 0.4	2.4 ± 0.6	5.4 ± 1.0	2.5 ± 3.8
11923dup	200-hr Event 10/06/06	RTI	R	STN	1.8 ± 0.4	19.0 ± 1.2	20.8 ± 1.5	5.0 ± 0.5	3.1 ± 0.5	2.4 ± 0.6	5.3 ± 1.0	3.1 ± 4.7
Q06-11923	200-hr Event 10/06/06	RTI	T	STN	2.0 ± 0.4	20.7 ± 1.3	22.8 ± 1.6	4.3 ± 0.5	3.0 ± 0.5	3.5 ± 0.6	6.9 ± 1.1	3.0 ± 4.4
Q06-11924	200-hr Event 10/06/06	RTI	R	STN	1.9 ± 0.4	17.9 ± 1.2	19.8 ± 1.4	4.7 ± 0.5	2.9 ± 0.4	2.3 ± 0.6	4.9 ± 0.9	3.2 ± 4.7
Q06-11924	200-hr Event 10/06/06	RTI	T	STN	2.4 ± 0.4	20.2 ± 1.3	22.6 ± 1.6	4.3 ± 0.5	2.9 ± 0.4	3.3 ± 0.6	6.3 ± 1.1	3.4 ± 5.0
Q07-12030	214-hr Event 2/26/07	DRI	11	STN	2.6 ± 0.3	47.5 ± 1.1	50.1 ± 0.7	13.4 ± 1.5	8.0 ± 0.7	4.0 ± 0.4	8.1 ± 2.6	13.9 ± 2.5
Q07-12030	214-hr Event 2/26/07	DRI	9	STN	2.6 ± 0.3	47.0 ± 1.1	49.5 ± 0.7	11.8 ± 1.3	8.8 ± 0.8	3.7 ± 0.4	10.3 ± 3.3	12.2 ± 2.2
Q07-12031	214-hr Event 2/26/07	DRI	9	STN	2.3 ± 0.3	47.5 ± 1.1	49.8 ± 0.7	11.8 ± 1.3	8.9 ± 0.8	3.8 ± 0.4	10.7 ± 3.4	12.2 ± 2.2
Q07-12031	214-hr Event 2/26/07	DRI	12	STN	2.6 ± 0.3	46.7 ± 1.1	49.3 ± 0.7	12.9 ± 1.4	8.2 ± 0.7	3.5 ± 0.3	6.6 ± 2.1	15.1 ± 2.8
Q07-12034	214-hr Event 2/26/07	NAREL	#1	STN	3.9 ± 0.4	50.6 ± 2.7	54.5 ± 3.0	13.8	7.64	5.2	3.11	20.84
Q07-12035	214-hr Event 2/26/07	NAREL	#1	STN	4.2 ± 0.4	51.4 ± 2.8	55.5 ± 3.1	14.28	7.27	5.27	3.21	21.35
Q07-12032	214-hr Event 2/26/07	RTI	R	STN	4.4 ± 0.5	50.5 ± 2.8	54.9 ± 3.2	11.4 ± 0.9	10.5 ± 0.8	6.9 ± 0.8	11.8 ± 1.6	10.0 ± 14.3
Q07-12032	214-hr Event 2/26/07	RTI	T	STN	5.3 ± 0.6	51.4 ± 2.9	56.6 ± 3.3	9.5 ± 0.8	8.2 ± 0.7	9.6 ± 0.9	16.2 ± 2.1	7.8 ± 11.2
Q07-12033	214-hr Event 2/26/07	RTI	R	STN	4.0 ± 0.5	50.3 ± 2.8	54.4 ± 3.2	11.2 ± 0.9	10.5 ± 0.8	7.1 ± 0.8	11.8 ± 1.6	9.7 ± 13.9
12033dup	214-hr Event 2/26/07	RTI	R	STN	4.1 ± 0.5	49.5 ± 2.8	53.7 ± 3.1	11.2 ± 0.9	10.2 ± 0.8	6.8 ± 0.8	11.4 ± 1.6	10.0 ± 14.3
Q07-12033	214-hr Event 2/26/07	RTI	T	STN	5.1 ± 0.6	51.7 ± 2.9	56.8 ± 3.3	9.4 ± 0.8	7.8 ± 0.7	9.4 ± 0.9	15.2 ± 2.0	9.9 ± 14.1
Q07-12244	filter blank	DRI	12	STN	0.0 ± 0.1	0.1 ± 0.3	0.1 ± 0.3	0.1 ± 0.1	0.0 ± 0.1	0.0 ± 0.2	0.0 ± 0.1	0.0 ± 0.1
Q07-12244	filter blank	DRI	9	STN	0.0 ± 0.1	0.1 ± 0.3	0.1 ± 0.3	0.1 ± 0.0	0.0 ± 0.1	0.0 ± 0.2	0.0 ± 0.1	0.0 ± 0.1
Q07-12245	filter blank	DRI	9	STN	0.0 ± 0.1	0.1 ± 0.3	0.1 ± 0.3	0.1 ± 0.0	0.0 ± 0.1	0.0 ± 0.2	0.0 ± 0.1	0.0 ± 0.1
Q07-12245	filter blank	DRI	12	STN	0.0 ± 0.1	0.5 ± 0.5	0.5 ± 0.5	0.1 ± 0.1	0.3 ± 0.3	0.1 ± 0.2	0.0 ± 0.1	0.0 ± 0.1
Q07-12248	filter blank	NAREL	#1	STN	0.0 ± 0.2	0.2 ± 0.2	0.2 ± 0.3	0.05	0.06	0.03	0.04	0.03
Q07-12249	filter blank	NAREL	#1	STN	0.0 ± 0.2	0.2 ± 0.2	0.2 ± 0.3	0.06	0.03	0.02	0.01	0.05

Table 12. TOA Carbon PE Results

Sample ID	Sample Description	Lab	Instrument (see text)*	Method	Concentration (µg/cm^2)							
					EC	OC	TC	OC1	OC2	OC3	OC4	PyrolC
Q07-12246	filter blank	RTI	R	STN	0.0 ± 0.3	0.2 ± 0.3	0.2 ± 0.5	0.0 ± 0.3	0.1 ± 0.3	0.0 ± 0.5	0.0 ± 0.5	0.0 ± 0.3
Q07-12246	filter blank	RTI	T	STN	0.0 ± 0.3	0.2 ± 0.3	0.2 ± 0.5	0.1 ± 0.3	0.1 ± 0.3	0.0 ± 0.5	0.0 ± 0.5	0.0 ± 0.3
12246dup	filter blank	STN	T	STN	0.0 ± 0.3	0.6 ± 0.3	0.6 ± 0.5	0.1 ± 0.3	0.3 ± 0.3	0.1 ± 0.5	0.1 ± 0.5	0.0 ± 0.3
Q07-12247	filter blank	RTI	R	STN	0.0 ± 0.3	0.2 ± 0.3	0.2 ± 0.5	0.1 ± 0.3	0.1 ± 0.3	0.0 ± 0.5	0.0 ± 0.5	0.0 ± 0.3
Q07-12247	filter blank	RTI	T	STN	0.0 ± 0.3	0.2 ± 0.3	0.2 ± 0.5	0.1 ± 0.3	0.1 ± 0.3	0.0 ± 0.5	0.0 ± 0.5	0.0 ± 0.3
Q06-11919	200-hr Event 10/06/06	CARB	#1	IMPROVE_A	5.64	14.17	19.81	0.20	3.83	4.66	2.72	2.76
Q06-11920	200-hr Event 10/06/06	CARB	#1	IMPROVE_A	6.12	14.70	20.82	0.20	4.23	4.81	2.52	2.94
Q06-11921	200-hr Event 10/06/06	DRI	7	IMPROVE_A	5.7 ± 0.3	12.5 ± 0.5	18.2 ± 0.7	0.6 ± 0.2	3.3 ± 0.5	3.7 ± 0.5	2.1 ± 0.4	2.9 ± 0.3
Q06-11921	200-hr Event 10/06/06	DRI	12	IMPROVE_A	5.4 ± 0.3	12.6 ± 0.5	18.0 ± 0.7	0.6 ± 0.2	4.0 ± 0.6	3.3 ± 0.4	1.6 ± 0.3	3.1 ± 0.3
Q06-11922	200-hr Event 10/06/06	DRI	7	IMPROVE_A	5.8 ± 0.3	12.6 ± 0.5	18.4 ± 0.7	0.3 ± 0.1	3.6 ± 0.5	4.0 ± 0.5	2.1 ± 0.4	2.5 ± 0.2
Q06-11922	200-hr Event 10/06/06	DRI	11	IMPROVE_A	5.3 ± 0.3	11.8 ± 0.4	17.1 ± 0.7	0.8 ± 0.3	3.1 ± 0.5	3.3 ± 0.4	1.8 ± 0.3	2.7 ± 0.2
Q06-11925	200-hr Event 10/06/06	NAREL	#2	IMPROVE_A	5.6 ± 0.5	13.6 ± 0.9	19.1 ± 1.3	1.35	4.44	2.59	1.43	3.75
Q06-11926	200-hr Event 10/06/06	NAREL	#2	IMPROVE_A	5.8 ± 0.5	14.0 ± 0.9	19.8 ± 1.3	1.47	4.62	2.69	1.48	3.72
Q06-11923	200-hr Event 10/06/06	RTI	#1	IMPROVE_A	6.4 ± 1.5	13.9 ± 1.5	20.4 ± 1.9	0.4 ± 0.3	4.9 ± 0.9	3.2 ± 0.8	1.8 ± 0.8	3.6 ± 3.7
11923dup	200-hr Event 10/06/06	RTI	#1	IMPROVE_A	6.2 ± 1.4	15.1 ± 1.6	21.3 ± 2.0	0.0 ± 0.2	5.8 ± 1.1	3.7 ± 0.9	2.3 ± 1.0	3.3 ± 3.4
Q06-11923	200-hr Event 10/06/06	RTI	F	IMPROVE_A	5.7 ± 1.4	13.5 ± 1.5	19.3 ± 1.9	0.4 ± 0.3	4.1 ± 0.8	3.3 ± 0.8	1.9 ± 0.9	3.8 ± 3.9
Q06-11924	200-hr Event 10/06/06	RTI	#1	IMPROVE_A	6.4 ± 1.5	14.0 ± 1.5	20.4 ± 1.9	0.2 ± 0.2	5.2 ± 1.0	3.6 ± 0.8	2.3 ± 1.0	2.8 ± 2.9
11924dup	200-hr Event 10/06/06	RTI	#1	IMPROVE_A	6.8 ± 1.5	15.3 ± 1.6	22.1 ± 2.0	0.3 ± 0.3	5.9 ± 1.1	3.7 ± 0.9	2.3 ± 1.0	3.2 ± 3.3
Q06-11924	200-hr Event 10/06/06	RTI	F	IMPROVE_A	6.1 ± 1.4	14.0 ± 1.5	20.1 ± 1.9	0.5 ± 0.3	4.4 ± 0.9	3.3 ± 0.8	1.9 ± 0.9	3.9 ± 4.0
Q07-12028	214-hr Event 2/26/07	CARB	#1	IMPROVE_A	10.85	42.13	52.98	0.8	11.430	15.080	6.590	8.230
Q07-12029	214-hr Event 2/26/07	CARB	#1	IMPROVE_A	11.44	44.45	55.89	0.85	11.900	16.280	6.590	8.830
Q07-12030	214-hr Event 2/26/07	DRI	11	IMPROVE_A	10.9 ± 0.6	38.1 ± 1.2	49.1 ± 1.7	4.7 ± 1.9	7.9 ± 1.2	11.4 ± 1.3	5.9 ± 1.1	8.2 ± 0.7
Q07-12030	214-hr Event 2/26/07	DRI	9	IMPROVE_A	10.9 ± 0.6	37.8 ± 1.2	48.8 ± 1.7	3.8 ± 1.5	7.5 ± 1.1	12.6 ± 1.5	6.7 ± 1.3	7.2 ± 0.6
Q07-12031	214-hr Event 2/26/07	DRI	7	IMPROVE_A	12.4 ± 0.7	39.8 ± 1.2	52.3 ± 1.8	2.7 ± 1.1	9.5 ± 1.4	13.5 ± 1.6	7.1 ± 1.3	6.9 ± 0.6
Q07-12031	214-hr Event 2/26/07	DRI	11	IMPROVE_A	11.5 ± 0.6	38.4 ± 1.2	49.9 ± 1.7	4.6 ± 1.8	7.8 ± 1.2	12.7 ± 1.5	5.8 ± 1.1	7.5 ± 0.7
Q07-12034	214-hr Event 2/26/07	NAREL	#2	IMPROVE_A	13.0 ± 0.8	41.6 ± 2.3	54.6 ± 3.0	5.48	11.59	10.50	3.39	10.66
Q07-12035	214-hr Event 2/26/07	NAREL	#2	IMPROVE_A	12.8 ± 0.8	40.6 ± 2.2	53.4 ± 3.0	5.21	11.16	10.41	4.41	9.42
Q07-12032	214-hr Event 2/26/07	RTI	#1	IMPROVE_A	13.1 ± 2.5	47.0 ± 3.2	60.1 ± 3.9	1.0 ± 0.4	16.1 ± 2.6	11.8 ± 2.1	6.7 ± 2.5	11.4 ± 11.5

Table 12. TOA Carbon PE Results

Sample ID	Sample Description	Lab	Instrument (see text)*	Method	Concentration (µg/cm^2)							
					EC	OC	TC	OC1	OC2	OC3	OC4	PyrolC
Q07-12032	214-hr Event 2/26/07	RTI	F	IMPROVE_A	13.3 ± 2.5	44.8 ± 3.0	58.0 ± 3.8	3.0 ± 0.8	11.9 ± 2.0	11.3 ± 2.0	3.9 ± 1.6	14.6 ± 14.7
Q07-12033	214-hr Event 2/26/07	RTI	#1	IMPROVE_A	12.9 ± 2.4	46.2 ± 3.1	59.0 ± 3.9	1.4 ± 0.5	15.3 ± 2.5	11.5 ± 2.0	5.2 ± 2.0	12.9 ± 13.0
12033dup	214-hr Event 2/26/07	RTI	#1	IMPROVE_A	12.5 ± 2.4	46.8 ± 3.1	59.4 ± 3.9	0.9 ± 0.4	15.8 ± 2.6	12.0 ± 2.1	6.4 ± 2.5	11.8 ± 11.9
Q07-12033	214-hr Event 2/26/07	RTI	F	IMPROVE_A	12.4 ± 2.4	41.9 ± 2.9	54.3 ± 3.6	2.6 ± 0.7	11.1 ± 1.9	10.5 ± 1.9	5.7 ± 2.2	12.0 ± 12.1
Q07-12242	filter blank	CARB	#1	IMPROVE_A	<LOD	<LOD	<LOD	0	0.100	0.280	0.000	0.000
Q07-12243	filter blank	CARB	#1	IMPROVE_A	<LOD	<LOD	<LOD	0	0.110	0.190	0.000	0.000
Q07-12244	filter blank	DRI	9	IMPROVE_A	0.0 ± 0.1	0.1 ± 0.3	0.1 ± 0.3	0.0 ± 0.0	0.0 ± 0.1	0.1 ± 0.2	0.0 ± 0.1	0.0 ± 0.1
Q07-12244	filter blank	DRI	7	IMPROVE_A	0.0 ± 0.1	0.4 ± 0.4	0.4 ± 0.4	0.0 ± 0.0	0.1 ± 0.1	0.3 ± 0.3	0.0 ± 0.1	0.0 ± 0.1
Q07-12245	filter blank	DRI	12	IMPROVE_A	0.0 ± 0.1	0.1 ± 0.3	0.1 ± 0.3	0.0 ± 0.0	0.0 ± 0.1	0.1 ± 0.2	0.0 ± 0.1	0.0 ± 0.1
Q07-12245	filter blank	DRI	11	IMPROVE_A	0.0 ± 0.1	0.1 ± 0.3	0.1 ± 0.3	0.0 ± 0.0	0.0 ± 0.1	0.1 ± 0.2	0.0 ± 0.1	0.0 ± 0.1
Q07-12248	filter blank	NAREL	#2	IMPROVE_A	0.0 ± 0.2	0.0 ± 0.2	0.0 ± 0.3	0.00	0.01	0.03	0.00	0.00
Q07-12249	filter blank	NAREL	#2	IMPROVE_A	0.0 ± 0.2	0.0 ± 0.2	0.0 ± 0.3	0.00	0.00	0.01	0.00	0.00
Q07-12246	filter blank	RTI	#1	IMPROVE_A	0.0 ± 0.5	0.3 ± 0.8	0.3 ± 0.9	0.0 ± 0.2	0.2 ± 0.2	0.1 ± 0.3	0.0 ± 0.2	0.0 ± 0.1
Q07-12246	filter blank	RTI	F	IMPROVE_A	0.0 ± 0.5	0.5 ± 0.8	0.5 ± 0.9	0.1 ± 0.2	0.0 ± 0.2	0.2 ± 0.3	0.0 ± 0.2	0.1 ± 0.2
Q07-12247	filter blank	RTI	#1	IMPROVE_A	0.0 ± 0.5	0.2 ± 0.8	0.2 ± 0.9	0.0 ± 0.2	0.2 ± 0.2	0.1 ± 0.3	0.0 ± 0.2	0.0 ± 0.1
12247dup	filter blank	RTI	#1	IMPROVE_A	0.0 ± 0.5	0.3 ± 0.8	0.3 ± 0.9	0.0 ± 0.2	0.1 ± 0.2	0.1 ± 0.3	0.0 ± 0.2	0.0 ± 0.1
Q07-12247	filter blank	RTI	F	IMPROVE_A	0.0 ± 0.5	0.7 ± 0.8	0.7 ± 0.9	0.2 ± 0.2	0.1 ± 0.2	0.1 ± 0.3	0.0 ± 0.2	0.2 ± 0.3

**** Instruments identified as DRI #7, #9, #11, #12, CARB #1, and RTI #1 are DRI/Model 2001 instruments capable of the TOR and the TOT analysis. RTI instruments identified as R, T, and NAREL #1 are early model Sunset instruments set up for the TOT analysis. The instruments identified as RTI F and NAREL #2 are newer Sunset Dual Mode instruments capable of the TOR and the TOT analysis.***

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Na	11	231-hr event	T06-11968	CARB	-----	-----	-----
Mg	12	231-hr event	T06-11968	CARB	-----	-----	-----
Al	13	231-hr event	T06-11968	CARB	2.538 ± 0.148	3.302 ± 1.012	-----
Si	14	231-hr event	T06-11968	CARB	15.906 ± 0.798	15.551 ± 1.216	16.834
P	15	231-hr event	T06-11968	CARB	0.000 ± 0.028	0.279 ± 0.283	-----
S	16	231-hr event	T06-11968	CARB	83.461 ± 4.174	86.187 ± 6.013	91.280
Cl	17	231-hr event	T06-11968	CARB	0.966 ± 0.051	0.960 ± 0.127	-----
K	19	231-hr event	T06-11968	CARB	8.718 ± 0.436	7.997 ± 0.562	8.617
Ca	20	231-hr event	T06-11968	CARB	2.763 ± 0.139	2.873 ± 0.207	3.166
Sc	21	231-hr event	T06-11968	CARB	-----	-0.038 ± 0.040	-----
Ti	22	231-hr event	T06-11968	CARB	0.197 ± 0.015	0.195 ± 0.056	-----
V	23	231-hr event	T06-11968	CARB	0.050 ± 0.008	0.074 ± 0.033	-----
Cr	24	231-hr event	T06-11968	CARB	0.055 ± 0.006	0.050 ± 0.016	-----
Mn	25	231-hr event	T06-11968	CARB	0.205 ± 0.011	0.234 ± 0.042	0.235
Fe	26	231-hr event	T06-11968	CARB	5.638 ± 0.283	5.841 ± 0.471	6.351
Co	27	231-hr event	T06-11968	CARB	0.000 ± 0.024	-0.038 ± 0.086	-----
Ni	28	231-hr event	T06-11968	CARB	0.029 ± 0.003	-0.092 ± 0.073	-----
Cu	29	231-hr event	T06-11968	CARB	0.259 ± 0.016	0.173 ± 0.038	0.264
Zn	30	231-hr event	T06-11968	CARB	1.503 ± 0.077	1.500 ± 0.114	1.635
Ga	31	231-hr event	T06-11968	CARB	-----	-0.023 ± 0.017	-----
As	33	231-hr event	T06-11968	CARB	0.131 ± 0.011	0.164 ± 0.028	0.152
Se	34	231-hr event	T06-11968	CARB	0.101 ± 0.007	0.098 ± 0.016	-----
Br	35	231-hr event	T06-11968	CARB	0.485 ± 0.025	0.580 ± 0.046	0.581
Rb	37	231-hr event	T06-11968	CARB	0.020 ± 0.005	0.022 ± 0.014	-----
Sr	38	231-hr event	T06-11968	CARB	0.037 ± 0.005	0.037 ± 0.015	-----
Y	39	231-hr event	T06-11968	CARB	0.000 ± 0.009	0.051 ± 0.056	-----
Zr	40	231-hr event	T06-11968	CARB	-----	-0.004 ± 0.046	-----
Nb	41	231-hr event	T06-11968	CARB	-----	-0.025 ± 0.052	-----
Mo	42	231-hr event	T06-11968	CARB	0.000 ± 0.023	0.051 ± 0.053	-----
Ag	47	231-hr event	T06-11968	CARB	-----	0.134 ± 0.050	-----
Cd	48	231-hr event	T06-11968	CARB	-----	0.116 ± 0.056	-----
In	49	231-hr event	T06-11968	CARB	-----	0.111 ± 0.063	-----
Sn	50	231-hr event	T06-11968	CARB	0.241 ± 0.045	0.260 ± 0.075	-----
Sb	51	231-hr event	T06-11968	CARB	0.200 ± 0.061	0.281 ± 0.081	-----
Cs	55	231-hr event	T06-11968	CARB	-----	0.149 ± 0.062	-----
Ba	56	231-hr event	T06-11968	CARB	0.330 ± 0.032	0.367 ± 0.104	-----
La	57	231-hr event	T06-11968	CARB	-----	-0.043 ± 0.054	-----
Ce	58	231-hr event	T06-11968	CARB	-----	0.011 ± 0.084	-----
Sm	62	231-hr event	T06-11968	CARB	-----	0.042 ± 0.049	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Eu	63	231-hr event	T06-11968	CARB	-----	0.269 ± 0.383	-----
Tb	65	231-hr event	T06-11968	CARB	-----	0.222 ± 0.321	-----
Hf	72	231-hr event	T06-11968	CARB	-----	-----	-----
Ta	73	231-hr event	T06-11968	CARB	-----	0.084 ± 0.072	-----
W	74	231-hr event	T06-11968	CARB	-----	-0.072 ± 0.068	-----
Ir	77	231-hr event	T06-11968	CARB	-----	-----	-----
Au	79	231-hr event	T06-11968	CARB	-----	0.000 ± 0.034	-----
Hg	80	231-hr event	T06-11968	CARB	0.031 ± 0.008	-0.036 ± 0.028	-----
Pb	82	231-hr event	T06-11968	CARB	0.503 ± 0.029	0.498 ± 0.054	0.579
Na	11	231-hr event	T06-11969	CARB	-----	-----	-----
Mg	12	231-hr event	T06-11969	CARB	-----	-----	-----
Al	13	231-hr event	T06-11969	CARB	2.546 ± 0.150	2.820 ± 1.004	-----
Si	14	231-hr event	T06-11969	CARB	16.378 ± 0.822	16.683 ± 1.295	16.834
P	15	231-hr event	T06-11969	CARB	0.000 ± 0.027	0.688 ± 0.294	-----
S	16	231-hr event	T06-11969	CARB	83.360 ± 4.169	90.409 ± 6.307	91.280
Cl	17	231-hr event	T06-11969	CARB	0.979 ± 0.052	0.670 ± 0.117	-----
K	19	231-hr event	T06-11969	CARB	8.668 ± 0.434	8.354 ± 0.587	8.617
Ca	20	231-hr event	T06-11969	CARB	2.844 ± 0.142	3.112 ± 0.224	3.166
Sc	21	231-hr event	T06-11969	CARB	-----	-0.048 ± 0.042	-----
Ti	22	231-hr event	T06-11969	CARB	0.223 ± 0.016	0.185 ± 0.057	-----
V	23	231-hr event	T06-11969	CARB	0.040 ± 0.008	0.054 ± 0.033	-----
Cr	24	231-hr event	T06-11969	CARB	0.038 ± 0.005	0.043 ± 0.016	-----
Mn	25	231-hr event	T06-11969	CARB	0.225 ± 0.012	0.236 ± 0.042	0.235
Fe	26	231-hr event	T06-11969	CARB	5.727 ± 0.287	5.980 ± 0.482	6.351
Co	27	231-hr event	T06-11969	CARB	0.000 ± 0.024	-0.042 ± 0.088	-----
Ni	28	231-hr event	T06-11969	CARB	0.026 ± 0.003	-0.007 ± 0.074	-----
Cu	29	231-hr event	T06-11969	CARB	0.286 ± 0.017	0.249 ± 0.041	0.264
Zn	30	231-hr event	T06-11969	CARB	1.545 ± 0.079	1.577 ± 0.119	1.635
Ga	31	231-hr event	T06-11969	CARB	-----	0.002 ± 0.017	-----
As	33	231-hr event	T06-11969	CARB	0.172 ± 0.012	0.131 ± 0.027	0.152
Se	34	231-hr event	T06-11969	CARB	0.101 ± 0.007	0.103 ± 0.017	-----
Br	35	231-hr event	T06-11969	CARB	0.511 ± 0.026	0.638 ± 0.050	0.581
Rb	37	231-hr event	T06-11969	CARB	0.035 ± 0.005	0.034 ± 0.014	-----
Sr	38	231-hr event	T06-11969	CARB	0.034 ± 0.005	0.039 ± 0.015	-----
Y	39	231-hr event	T06-11969	CARB	0.000 ± 0.009	0.053 ± 0.057	-----
Zr	40	231-hr event	T06-11969	CARB	-----	-0.030 ± 0.048	-----
Nb	41	231-hr event	T06-11969	CARB	-----	0.025 ± 0.054	-----
Mo	42	231-hr event	T06-11969	CARB	0.000 ± 0.023	0.106 ± 0.056	-----
Ag	47	231-hr event	T06-11969	CARB	-----	0.064 ± 0.049	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Cd	48	231-hr event	T06-11969	CARB	-----	0.030 ± 0.054	-----
In	49	231-hr event	T06-11969	CARB	-----	0.077 ± 0.062	-----
Sn	50	231-hr event	T06-11969	CARB	0.116 ± 0.045	0.170 ± 0.074	-----
Sb	51	231-hr event	T06-11969	CARB	0.218 ± 0.062	0.236 ± 0.081	-----
Cs	55	231-hr event	T06-11969	CARB	-----	0.034 ± 0.062	-----
Ba	56	231-hr event	T06-11969	CARB	0.360 ± 0.034	0.370 ± 0.107	-----
La	57	231-hr event	T06-11969	CARB	-----	-0.072 ± 0.055	-----
Ce	58	231-hr event	T06-11969	CARB	-----	-0.055 ± 0.086	-----
Sm	62	231-hr event	T06-11969	CARB	-----	-0.079 ± 0.049	-----
Eu	63	231-hr event	T06-11969	CARB	-----	0.331 ± 0.386	-----
Tb	65	231-hr event	T06-11969	CARB	-----	-0.003 ± 0.329	-----
Hf	72	231-hr event	T06-11969	CARB	-----	-----	-----
Ta	73	231-hr event	T06-11969	CARB	-----	-0.022 ± 0.071	-----
W	74	231-hr event	T06-11969	CARB	-----	0.101 ± 0.068	-----
Ir	77	231-hr event	T06-11969	CARB	-----	-----	-----
Au	79	231-hr event	T06-11969	CARB	-----	-0.053 ± 0.034	-----
Hg	80	231-hr event	T06-11969	CARB	0.000 ± 0.012	-0.008 ± 0.030	-----
Pb	82	231-hr event	T06-11969	CARB	0.473 ± 0.028	0.587 ± 0.059	0.579
Na	11	231-hr event	T06-11970	DRI	6.014 ± 1.498	-----	-----
Mg	12	231-hr event	T06-11970	DRI	0.890 ± 0.719	-----	-----
Al	13	231-hr event	T06-11970	DRI	3.022 ± 0.133	4.078 ± 1.050	-----
Si	14	231-hr event	T06-11970	DRI	14.239 ± 0.208	17.074 ± 1.324	16.834
P	15	231-hr event	T06-11970	DRI	3.239 ± 0.051	0.429 ± 0.294	-----
S	16	231-hr event	T06-11970	DRI	80.216 ± 0.563	94.486 ± 6.590	91.280
Cl	17	231-hr event	T06-11970	DRI	0.555 ± 0.027	1.055 ± 0.132	-----
K	19	231-hr event	T06-11970	DRI	8.075 ± 0.041	8.878 ± 0.623	8.617
Ca	20	231-hr event	T06-11970	DRI	3.008 ± 0.034	3.177 ± 0.228	3.166
Sc	21	231-hr event	T06-11970	DRI	0.000 ± 0.094	-0.013 ± 0.042	-----
Ti	22	231-hr event	T06-11970	DRI	0.228 ± 0.018	0.263 ± 0.060	-----
V	23	231-hr event	T06-11970	DRI	0.025 ± 0.001	0.061 ± 0.032	-----
Cr	24	231-hr event	T06-11970	DRI	0.046 ± 0.016	0.048 ± 0.016	-----
Mn	25	231-hr event	T06-11970	DRI	0.173 ± 0.034	0.234 ± 0.041	0.235
Fe	26	231-hr event	T06-11970	DRI	6.603 ± 0.054	6.772 ± 0.533	6.351
Co	27	231-hr event	T06-11970	DRI	0.000 ± 0.001	0.135 ± 0.090	-----
Ni	28	231-hr event	T06-11970	DRI	0.019 ± 0.008	-0.136 ± 0.074	-----
Cu	29	231-hr event	T06-11970	DRI	0.264 ± 0.015	0.280 ± 0.041	0.264
Zn	30	231-hr event	T06-11970	DRI	1.606 ± 0.018	1.758 ± 0.132	1.635
Ga	31	231-hr event	T06-11970	DRI	0.000 ± 0.051	0.030 ± 0.018	-----
As	33	231-hr event	T06-11970	DRI	0.055 ± 0.012	0.154 ± 0.028	0.152

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Se	34	231-hr event	T06-11970	DRI	0.037 ± 0.034	0.107 ± 0.017	-----
Br	35	231-hr event	T06-11970	DRI	0.483 ± 0.026	0.601 ± 0.048	0.581
Rb	37	231-hr event	T06-11970	DRI	0.035 ± 0.018	0.023 ± 0.014	-----
Sr	38	231-hr event	T06-11970	DRI	0.114 ± 0.032	0.037 ± 0.015	-----
Y	39	231-hr event	T06-11970	DRI	0.017 ± 0.024	-0.002 ± 0.055	-----
Zr	40	231-hr event	T06-11970	DRI	0.000 ± 0.055	0.033 ± 0.048	0.011
Nb	41	231-hr event	T06-11970	DRI	0.018 ± 0.043	-0.069 ± 0.052	-----
Mo	42	231-hr event	T06-11970	DRI	0.017 ± 0.038	0.007 ± 0.053	-----
Ag	47	231-hr event	T06-11970	DRI	0.000 ± 0.068	0.004 ± 0.046	-----
Cd	48	231-hr event	T06-11970	DRI	0.001 ± 0.084	-0.057 ± 0.051	-----
In	49	231-hr event	T06-11970	DRI	0.000 ± 0.050	0.090 ± 0.062	-----
Sn	50	231-hr event	T06-11970	DRI	0.055 ± 0.063	0.284 ± 0.076	-----
Sb	51	231-hr event	T06-11970	DRI	0.202 ± 0.119	0.373 ± 0.085	-----
Cs	55	231-hr event	T06-11970	DRI	0.000 ± 0.019	-0.014 ± 0.061	-----
Ba	56	231-hr event	T06-11970	DRI	0.000 ± 0.010	0.416 ± 0.107	-----
La	57	231-hr event	T06-11970	DRI	0.000 ± 0.015	-0.009 ± 0.053	-----
Ce	58	231-hr event	T06-11970	DRI	0.000 ± 0.020	-0.013 ± 0.085	-----
Sm	62	231-hr event	T06-11970	DRI	0.000 ± 0.028	0.052 ± 0.048	-----
Eu	63	231-hr event	T06-11970	DRI	0.042 ± 0.105	0.100 ± 0.379	-----
Tb	65	231-hr event	T06-11970	DRI	0.024 ± 0.035	-0.285 ± 0.335	-----
Hf	72	231-hr event	T06-11970	DRI	0.000 ± 0.229	-----	-----
Ta	73	231-hr event	T06-11970	DRI	0.000 ± 0.192	-0.100 ± 0.071	-----
W	74	231-hr event	T06-11970	DRI	0.000 ± 0.275	-0.015 ± 0.068	-----
Ir	77	231-hr event	T06-11970	DRI	0.000 ± 0.060	-----	-----
Au	79	231-hr event	T06-11970	DRI	0.000 ± 0.127	0.023 ± 0.033	-----
Hg	80	231-hr event	T06-11970	DRI	0.000 ± 0.038	0.044 ± 0.030	-----
Pb	82	231-hr event	T06-11970	DRI	0.573 ± 0.043	0.625 ± 0.061	0.579
Na	11	231-hr event	T06-11971	DRI	6.666 ± 1.513	-----	-----
Mg	12	231-hr event	T06-11971	DRI	0.153 ± 0.713	-----	-----
Al	13	231-hr event	T06-11971	DRI	3.397 ± 0.134	0.971 ± 0.986	-----
Si	14	231-hr event	T06-11971	DRI	14.873 ± 0.212	15.775 ± 1.237	16.834
P	15	231-hr event	T06-11971	DRI	3.666 ± 0.053	0.690 ± 0.305	-----
S	16	231-hr event	T06-11971	DRI	87.613 ± 0.608	98.150 ± 6.845	91.280
Cl	17	231-hr event	T06-11971	DRI	0.636 ± 0.027	1.105 ± 0.136	-----
K	19	231-hr event	T06-11971	DRI	8.754 ± 0.043	9.170 ± 0.644	8.617
Ca	20	231-hr event	T06-11971	DRI	3.108 ± 0.034	3.330 ± 0.239	3.166
Sc	21	231-hr event	T06-11971	DRI	0.027 ± 0.094	0.010 ± 0.043	-----
Ti	22	231-hr event	T06-11971	DRI	0.296 ± 0.018	0.235 ± 0.060	-----
V	23	231-hr event	T06-11971	DRI	0.051 ± 0.001	0.038 ± 0.033	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Cr	24	231-hr event	T06-11971	DRI	0.024 ± 0.016	0.028 ± 0.016	-----
Mn	25	231-hr event	T06-11971	DRI	0.294 ± 0.034	0.227 ± 0.043	0.235
Fe	26	231-hr event	T06-11971	DRI	6.755 ± 0.055	6.188 ± 0.497	6.351
Co	27	231-hr event	T06-11971	DRI	0.000 ± 0.001	-0.029 ± 0.090	-----
Ni	28	231-hr event	T06-11971	DRI	0.031 ± 0.008	0.003 ± 0.077	-----
Cu	29	231-hr event	T06-11971	DRI	0.272 ± 0.015	0.268 ± 0.042	0.264
Zn	30	231-hr event	T06-11971	DRI	1.744 ± 0.018	1.844 ± 0.138	1.635
Ga	31	231-hr event	T06-11971	DRI	0.000 ± 0.051	0.010 ± 0.018	-----
As	33	231-hr event	T06-11971	DRI	0.179 ± 0.012	0.152 ± 0.029	0.152
Se	34	231-hr event	T06-11971	DRI	0.073 ± 0.034	0.143 ± 0.019	-----
Br	35	231-hr event	T06-11971	DRI	0.514 ± 0.026	0.666 ± 0.052	0.581
Rb	37	231-hr event	T06-11971	DRI	0.000 ± 0.018	0.032 ± 0.014	-----
Sr	38	231-hr event	T06-11971	DRI	0.120 ± 0.032	0.053 ± 0.016	-----
Y	39	231-hr event	T06-11971	DRI	0.020 ± 0.024	0.103 ± 0.061	-----
Zr	40	231-hr event	T06-11971	DRI	0.089 ± 0.057	0.014 ± 0.050	0.011
Nb	41	231-hr event	T06-11971	DRI	0.000 ± 0.043	-0.112 ± 0.053	-----
Mo	42	231-hr event	T06-11971	DRI	0.009 ± 0.038	0.003 ± 0.054	-----
Ag	47	231-hr event	T06-11971	DRI	0.033 ± 0.068	0.055 ± 0.050	-----
Cd	48	231-hr event	T06-11971	DRI	0.146 ± 0.084	-0.026 ± 0.054	-----
In	49	231-hr event	T06-11971	DRI	0.000 ± 0.050	0.034 ± 0.063	-----
Sn	50	231-hr event	T06-11971	DRI	0.000 ± 0.063	0.252 ± 0.077	-----
Sb	51	231-hr event	T06-11971	DRI	0.172 ± 0.119	0.342 ± 0.087	-----
Cs	55	231-hr event	T06-11971	DRI	0.000 ± 0.019	0.091 ± 0.064	-----
Ba	56	231-hr event	T06-11971	DRI	0.000 ± 0.009	0.371 ± 0.108	-----
La	57	231-hr event	T06-11971	DRI	0.000 ± 0.015	0.014 ± 0.056	-----
Ce	58	231-hr event	T06-11971	DRI	0.017 ± 0.020	0.043 ± 0.087	-----
Sm	62	231-hr event	T06-11971	DRI	0.000 ± 0.028	0.019 ± 0.050	-----
Eu	63	231-hr event	T06-11971	DRI	0.000 ± 0.104	0.864 ± 0.404	-----
Tb	65	231-hr event	T06-11971	DRI	0.000 ± 0.036	0.493 ± 0.338	-----
Hf	72	231-hr event	T06-11971	DRI	0.068 ± 0.229	-----	-----
Ta	73	231-hr event	T06-11971	DRI	0.000 ± 0.191	0.086 ± 0.074	-----
W	74	231-hr event	T06-11971	DRI	0.000 ± 0.275	0.141 ± 0.072	-----
Ir	77	231-hr event	T06-11971	DRI	0.000 ± 0.060	-----	-----
Au	79	231-hr event	T06-11971	DRI	0.000 ± 0.127	-0.042 ± 0.035	-----
Hg	80	231-hr event	T06-11971	DRI	0.000 ± 0.038	-0.019 ± 0.030	-----
Pb	82	231-hr event	T06-11971	DRI	0.481 ± 0.043	0.653 ± 0.064	0.579
Na	11	231-hr event	T06-11972	ODEQ	-----	-----	-----
Mg	12	231-hr event	T06-11972	ODEQ	-----	-----	-----
Al	13	231-hr event	T06-11972	ODEQ	2.003 ± 0.197	3.290 ± 1.020	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Si	14	231-hr event	T06-11972	ODEQ	20.170 ± 1.761	16.271 ± 1.268	16.834
P	15	231-hr event	T06-11972	ODEQ	-0.642 ± 0.248	0.532 ± 0.296	-----
S	16	231-hr event	T06-11972	ODEQ	99.587 ± 8.004	94.569 ± 6.596	91.280
Cl	17	231-hr event	T06-11972	ODEQ	-1.081 ± 0.727	0.853 ± 0.124	-----
K	19	231-hr event	T06-11972	ODEQ	9.243 ± 0.746	8.582 ± 0.603	8.617
Ca	20	231-hr event	T06-11972	ODEQ	3.560 ± 0.295	3.251 ± 0.233	3.166
Sc	21	231-hr event	T06-11972	ODEQ	-0.098 ± 0.046	-0.070 ± 0.043	-----
Ti	22	231-hr event	T06-11972	ODEQ	0.371 ± 0.067	0.238 ± 0.059	-----
V	23	231-hr event	T06-11972	ODEQ	0.044 ± 0.024	0.047 ± 0.033	-----
Cr	24	231-hr event	T06-11972	ODEQ	0.131 ± 0.016	0.054 ± 0.017	-----
Mn	25	231-hr event	T06-11972	ODEQ	0.231 ± 0.026	0.330 ± 0.046	0.235
Fe	26	231-hr event	T06-11972	ODEQ	6.687 ± 0.537	6.985 ± 0.550	6.351
Co	27	231-hr event	T06-11972	ODEQ	-0.024 ± 0.034	0.136 ± 0.091	-----
Ni	28	231-hr event	T06-11972	ODEQ	0.044 ± 0.014	-0.010 ± 0.075	-----
Cu	29	231-hr event	T06-11972	ODEQ	0.263 ± 0.026	0.288 ± 0.043	0.264
Zn	30	231-hr event	T06-11972	ODEQ	1.640 ± 0.133	1.655 ± 0.125	1.635
Ga	31	231-hr event	T06-11972	ODEQ	-0.007 ± 0.059	0.024 ± 0.018	-----
As	33	231-hr event	T06-11972	ODEQ	0.161 ± 0.033	0.114 ± 0.027	0.152
Se	34	231-hr event	T06-11972	ODEQ	0.091 ± 0.014	0.128 ± 0.018	-----
Br	35	231-hr event	T06-11972	ODEQ	0.526 ± 0.044	0.588 ± 0.047	0.581
Rb	37	231-hr event	T06-11972	ODEQ	-0.002 ± 0.012	0.049 ± 0.015	-----
Sr	38	231-hr event	T06-11972	ODEQ	-0.002 ± 0.011	0.032 ± 0.015	-----
Y	39	231-hr event	T06-11972	ODEQ	0.001 ± 0.013	-0.040 ± 0.053	-----
Zr	40	231-hr event	T06-11972	ODEQ	0.034 ± 0.015	0.008 ± 0.049	0.011
Nb	41	231-hr event	T06-11972	ODEQ	-0.003 ± 0.018	0.018 ± 0.055	-----
Mo	42	231-hr event	T06-11972	ODEQ	0.003 ± 0.021	0.064 ± 0.055	-----
Ag	47	231-hr event	T06-11972	ODEQ	0.036 ± 0.049	0.040 ± 0.049	-----
Cd	48	231-hr event	T06-11972	ODEQ	0.042 ± 0.045	-0.058 ± 0.054	-----
In	49	231-hr event	T06-11972	ODEQ	0.020 ± 0.046	0.001 ± 0.062	-----
Sn	50	231-hr event	T06-11972	ODEQ	0.153 ± 0.059	0.306 ± 0.078	-----
Sb	51	231-hr event	T06-11972	ODEQ	0.046 ± 0.068	0.141 ± 0.081	-----
Cs	55	231-hr event	T06-11972	ODEQ	0.002 ± 0.116	-0.028 ± 0.062	-----
Ba	56	231-hr event	T06-11972	ODEQ	0.032 ± 0.236	0.270 ± 0.105	-----
La	57	231-hr event	T06-11972	ODEQ	0.306 ± 0.192	0.016 ± 0.057	-----
Ce	58	231-hr event	T06-11972	ODEQ	-0.095 ± 0.235	0.018 ± 0.086	-----
Sm	62	231-hr event	T06-11972	ODEQ	-0.566 ± 0.880	0.011 ± 0.050	-----
Eu	63	231-hr event	T06-11972	ODEQ	1.782 ± 1.922	-0.393 ± 0.397	-----
Tb	65	231-hr event	T06-11972	ODEQ	-3.019 ± 3.047	-0.330 ± 0.340	-----
Hf	72	231-hr event	T06-11972	ODEQ	-0.054 ± 0.175	-----	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Ta	73	231-hr event	T06-11972	ODEQ	-0.020 ± 0.200	-0.054 ± 0.074	-----
W	74	231-hr event	T06-11972	ODEQ	0.024 ± 0.070	0.000 ± 0.068	-----
Ir	77	231-hr event	T06-11972	ODEQ	-0.002 ± 0.041	-----	-----
Au	79	231-hr event	T06-11972	ODEQ	0.012 ± 0.036	-0.030 ± 0.034	-----
Hg	80	231-hr event	T06-11972	ODEQ	0.007 ± 0.028	0.039 ± 0.031	-----
Pb	82	231-hr event	T06-11972	ODEQ	0.501 ± 0.053	0.603 ± 0.060	0.579
Na	11	231-hr event	T06-11973	ODEQ	-----	-----	-----
Mg	12	231-hr event	T06-11973	ODEQ	-----	-----	-----
Al	13	231-hr event	T06-11973	ODEQ	2.157 ± 0.210	2.327 ± 0.978	-----
Si	14	231-hr event	T06-11973	ODEQ	20.149 ± 1.759	16.984 ± 1.317	16.834
P	15	231-hr event	T06-11973	ODEQ	-0.613 ± 0.249	0.777 ± 0.299	-----
S	16	231-hr event	T06-11973	ODEQ	100.218 ± 8.055	94.682 ± 6.604	91.280
Cl	17	231-hr event	T06-11973	ODEQ	-0.950 ± 0.731	0.850 ± 0.122	-----
K	19	231-hr event	T06-11973	ODEQ	9.302 ± 0.751	8.759 ± 0.615	8.617
Ca	20	231-hr event	T06-11973	ODEQ	3.491 ± 0.290	3.401 ± 0.243	3.166
Sc	21	231-hr event	T06-11973	ODEQ	-0.103 ± 0.047	0.060 ± 0.044	-----
Ti	22	231-hr event	T06-11973	ODEQ	0.189 ± 0.062	0.250 ± 0.059	-----
V	23	231-hr event	T06-11973	ODEQ	0.017 ± 0.024	0.011 ± 0.032	-----
Cr	24	231-hr event	T06-11973	ODEQ	0.025 ± 0.011	0.022 ± 0.016	-----
Mn	25	231-hr event	T06-11973	ODEQ	0.243 ± 0.026	0.215 ± 0.041	0.235
Fe	26	231-hr event	T06-11973	ODEQ	6.399 ± 0.514	6.480 ± 0.514	6.351
Co	27	231-hr event	T06-11973	ODEQ	0.018 ± 0.032	-0.031 ± 0.088	-----
Ni	28	231-hr event	T06-11973	ODEQ	0.041 ± 0.013	-0.057 ± 0.075	-----
Cu	29	231-hr event	T06-11973	ODEQ	0.262 ± 0.026	0.242 ± 0.040	0.264
Zn	30	231-hr event	T06-11973	ODEQ	1.679 ± 0.136	1.669 ± 0.126	1.635
Ga	31	231-hr event	T06-11973	ODEQ	-0.021 ± 0.059	-0.001 ± 0.017	-----
As	33	231-hr event	T06-11973	ODEQ	0.097 ± 0.033	0.210 ± 0.030	0.152
Se	34	231-hr event	T06-11973	ODEQ	0.092 ± 0.014	0.097 ± 0.016	-----
Br	35	231-hr event	T06-11973	ODEQ	0.512 ± 0.043	0.581 ± 0.046	0.581
Rb	37	231-hr event	T06-11973	ODEQ	0.010 ± 0.012	0.029 ± 0.014	-----
Sr	38	231-hr event	T06-11973	ODEQ	0.030 ± 0.011	0.018 ± 0.014	-----
Y	39	231-hr event	T06-11973	ODEQ	-0.009 ± 0.012	-0.063 ± 0.051	-----
Zr	40	231-hr event	T06-11973	ODEQ	0.045 ± 0.014	0.019 ± 0.048	0.011
Nb	41	231-hr event	T06-11973	ODEQ	-0.003 ± 0.017	-0.058 ± 0.051	-----
Mo	42	231-hr event	T06-11973	ODEQ	0.006 ± 0.019	0.033 ± 0.053	-----
Ag	47	231-hr event	T06-11973	ODEQ	0.004 ± 0.049	0.041 ± 0.046	-----
Cd	48	231-hr event	T06-11973	ODEQ	0.032 ± 0.044	-0.075 ± 0.051	-----
In	49	231-hr event	T06-11973	ODEQ	-0.002 ± 0.045	0.100 ± 0.062	-----
Sn	50	231-hr event	T06-11973	ODEQ	0.215 ± 0.059	0.125 ± 0.071	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Sb	51	231-hr event	T06-11973	ODEQ	0.023 ± 0.067	0.338 ± 0.083	-----
Cs	55	231-hr event	T06-11973	ODEQ	0.029 ± 0.112	0.073 ± 0.062	-----
Ba	56	231-hr event	T06-11973	ODEQ	0.367 ± 0.235	0.271 ± 0.104	-----
La	57	231-hr event	T06-11973	ODEQ	0.308 ± 0.187	-0.016 ± 0.055	-----
Ce	58	231-hr event	T06-11973	ODEQ	-0.063 ± 0.228	0.043 ± 0.084	-----
Sm	62	231-hr event	T06-11973	ODEQ	-0.245 ± 0.856	-0.043 ± 0.049	-----
Eu	63	231-hr event	T06-11973	ODEQ	0.403 ± 1.867	0.490 ± 0.382	-----
Tb	65	231-hr event	T06-11973	ODEQ	3.532 ± 2.993	0.333 ± 0.333	-----
Hf	72	231-hr event	T06-11973	ODEQ	-0.084 ± 0.175	-----	-----
Ta	73	231-hr event	T06-11973	ODEQ	-0.066 ± 0.200	-0.096 ± 0.071	-----
W	74	231-hr event	T06-11973	ODEQ	-0.008 ± 0.069	0.032 ± 0.068	-----
Ir	77	231-hr event	T06-11973	ODEQ	-0.032 ± 0.040	-----	-----
Au	79	231-hr event	T06-11973	ODEQ	-0.011 ± 0.036	-0.025 ± 0.033	-----
Hg	80	231-hr event	T06-11973	ODEQ	-0.018 ± 0.027	0.034 ± 0.030	-----
Pb	82	231-hr event	T06-11973	ODEQ	0.554 ± 0.056	0.585 ± 0.059	0.579
Na	11	231-hr event	T06-11974	RTI	3.379 ± 0.365	-----	-----
Mg	12	231-hr event	T06-11974	RTI	0.707 ± 0.093	-----	-----
Al	13	231-hr event	T06-11974	RTI	2.791 ± 0.285	2.856 ± 1.018	-----
Si	14	231-hr event	T06-11974	RTI	16.588 ± 1.103	16.276 ± 1.268	16.834
P	15	231-hr event	T06-11974	RTI	0.000 ± 0.111	0.653 ± 0.295	-----
S	16	231-hr event	T06-11974	RTI	83.914 ± 4.203	92.151 ± 6.428	91.280
Cl	17	231-hr event	T06-11974	RTI	0.983 ± 0.058	0.774 ± 0.120	-----
K	19	231-hr event	T06-11974	RTI	8.334 ± 0.418	8.391 ± 0.590	8.617
Ca	20	231-hr event	T06-11974	RTI	2.782 ± 0.142	3.148 ± 0.226	3.166
Sc	21	231-hr event	T06-11974	RTI	0.000 ± 0.024	0.036 ± 0.042	-----
Ti	22	231-hr event	T06-11974	RTI	0.171 ± 0.023	0.148 ± 0.058	-----
V	23	231-hr event	T06-11974	RTI	0.229 ± 0.017	0.092 ± 0.033	-----
Cr	24	231-hr event	T06-11974	RTI	0.000 ± 0.010	0.040 ± 0.016	-----
Mn	25	231-hr event	T06-11974	RTI	0.206 ± 0.014	0.316 ± 0.044	0.235
Fe	26	231-hr event	T06-11974	RTI	5.900 ± 0.296	6.304 ± 0.503	6.351
Co	27	231-hr event	T06-11974	RTI	0.000 ± 0.009	-0.023 ± 0.089	-----
Ni	28	231-hr event	T06-11974	RTI	0.020 ± 0.004	0.009 ± 0.074	-----
Cu	29	231-hr event	T06-11974	RTI	0.293 ± 0.016	0.204 ± 0.039	0.264
Zn	30	231-hr event	T06-11974	RTI	1.459 ± 0.074	1.630 ± 0.123	1.635
Ga	31	231-hr event	T06-11974	RTI	0.000 ± 0.008	-0.021 ± 0.017	-----
As	33	231-hr event	T06-11974	RTI	0.215 ± 0.018	0.149 ± 0.028	0.152
Se	34	231-hr event	T06-11974	RTI	0.106 ± 0.011	0.110 ± 0.017	-----
Br	35	231-hr event	T06-11974	RTI	0.549 ± 0.032	0.605 ± 0.048	0.581
Rb	37	231-hr event	T06-11974	RTI	0.022 ± 0.010	0.027 ± 0.014	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Sr	38	231-hr event	T06-11974	RTI	0.003 ± 0.008	0.042 ± 0.015	-----
Y	39	231-hr event	T06-11974	RTI	0.000 ± 0.007	0.001 ± 0.054	-----
Zr	40	231-hr event	T06-11974	RTI	0.027 ± 0.016	-0.042 ± 0.046	0.011
Nb	41	231-hr event	T06-11974	RTI	0.000 ± 0.012	-0.042 ± 0.051	-----
Mo	42	231-hr event	T06-11974	RTI	0.000 ± 0.015	0.084 ± 0.055	-----
Ag	47	231-hr event	T06-11974	RTI	0.000 ± 0.043	0.126 ± 0.050	-----
Cd	48	231-hr event	T06-11974	RTI	0.000 ± 0.046	0.109 ± 0.056	-----
In	49	231-hr event	T06-11974	RTI	0.000 ± 0.068	0.091 ± 0.062	-----
Sn	50	231-hr event	T06-11974	RTI	0.057 ± 0.124	0.223 ± 0.075	-----
Sb	51	231-hr event	T06-11974	RTI	0.170 ± 0.158	0.223 ± 0.081	-----
Cs	55	231-hr event	T06-11974	RTI	0.000 ± 0.067	0.028 ± 0.062	-----
Ba	56	231-hr event	T06-11974	RTI	0.000 ± 0.027	0.528 ± 0.111	-----
La	57	231-hr event	T06-11974	RTI	0.000 ± 0.037	-0.028 ± 0.054	-----
Ce	58	231-hr event	T06-11974	RTI	0.000 ± 0.019	-0.230 ± 0.087	-----
Sm	62	231-hr event	T06-11974	RTI	0.000 ± 0.018	-0.073 ± 0.048	-----
Eu	63	231-hr event	T06-11974	RTI	0.000 ± 0.027	-0.385 ± 0.387	-----
Tb	65	231-hr event	T06-11974	RTI	0.003 ± 0.067	0.194 ± 0.332	-----
Hf	72	231-hr event	T06-11974	RTI	0.000 ± 0.017	-----	-----
Ta	73	231-hr event	T06-11974	RTI	0.000 ± 0.051	0.042 ± 0.072	-----
W	74	231-hr event	T06-11974	RTI	0.000 ± 0.031	0.010 ± 0.067	-----
Ir	77	231-hr event	T06-11974	RTI	0.000 ± 0.024	-----	-----
Au	79	231-hr event	T06-11974	RTI	0.060 ± 0.027	-0.008 ± 0.034	-----
Hg	80	231-hr event	T06-11974	RTI	0.167 ± 0.043	0.019 ± 0.030	-----
Pb	82	231-hr event	T06-11974	RTI	0.436 ± 0.039	0.569 ± 0.058	0.579
Na	11	231-hr event	T06-11975	RTI	3.921 ± 0.400	-----	-----
Mg	12	231-hr event	T06-11975	RTI	0.862 ± 0.097	-----	-----
Al	13	231-hr event	T06-11975	RTI	2.441 ± 0.270	3.444 ± 1.027	-----
Si	14	231-hr event	T06-11975	RTI	17.266 ± 1.147	17.351 ± 1.342	16.834
P	15	231-hr event	T06-11975	RTI	0.023 ± 0.113	0.357 ± 0.291	-----
S	16	231-hr event	T06-11975	RTI	84.343 ± 4.224	93.655 ± 6.532	91.280
Cl	17	231-hr event	T06-11975	RTI	1.023 ± 0.061	0.868 ± 0.122	-----
K	19	231-hr event	T06-11975	RTI	8.241 ± 0.414	8.541 ± 0.600	8.617
Ca	20	231-hr event	T06-11975	RTI	2.856 ± 0.145	3.155 ± 0.227	3.166
Sc	21	231-hr event	T06-11975	RTI	0.000 ± 0.024	-0.052 ± 0.042	-----
Ti	22	231-hr event	T06-11975	RTI	0.155 ± 0.023	0.053 ± 0.055	-----
V	23	231-hr event	T06-11975	RTI	0.246 ± 0.017	0.035 ± 0.032	-----
Cr	24	231-hr event	T06-11975	RTI	0.000 ± 0.010	0.040 ± 0.016	-----
Mn	25	231-hr event	T06-11975	RTI	0.244 ± 0.016	0.302 ± 0.044	0.235
Fe	26	231-hr event	T06-11975	RTI	6.049 ± 0.304	6.178 ± 0.495	6.351

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Co	27	231-hr event	T06-11975	RTI	0.000 ± 0.010	-0.021 ± 0.086	-----
Ni	28	231-hr event	T06-11975	RTI	0.020 ± 0.004	-0.239 ± 0.079	-----
Cu	29	231-hr event	T06-11975	RTI	0.280 ± 0.015	0.231 ± 0.042	0.264
Zn	30	231-hr event	T06-11975	RTI	1.479 ± 0.075	1.655 ± 0.125	1.635
Ga	31	231-hr event	T06-11975	RTI	0.000 ± 0.008	0.020 ± 0.018	-----
As	33	231-hr event	T06-11975	RTI	0.118 ± 0.018	0.095 ± 0.027	0.152
Se	34	231-hr event	T06-11975	RTI	0.068 ± 0.010	0.114 ± 0.017	-----
Br	35	231-hr event	T06-11975	RTI	0.547 ± 0.032	0.637 ± 0.050	0.581
Rb	37	231-hr event	T06-11975	RTI	0.014 ± 0.010	0.052 ± 0.014	-----
Sr	38	231-hr event	T06-11975	RTI	0.035 ± 0.008	0.014 ± 0.014	-----
Y	39	231-hr event	T06-11975	RTI	0.000 ± 0.007	0.039 ± 0.055	-----
Zr	40	231-hr event	T06-11975	RTI	0.000 ± 0.012	0.084 ± 0.050	0.011
Nb	41	231-hr event	T06-11975	RTI	0.015 ± 0.017	-0.040 ± 0.052	-----
Mo	42	231-hr event	T06-11975	RTI	0.000 ± 0.015	0.004 ± 0.053	-----
Ag	47	231-hr event	T06-11975	RTI	0.000 ± 0.043	-0.016 ± 0.045	-----
Cd	48	231-hr event	T06-11975	RTI	0.000 ± 0.046	0.021 ± 0.053	-----
In	49	231-hr event	T06-11975	RTI	0.000 ± 0.068	0.055 ± 0.060	-----
Sn	50	231-hr event	T06-11975	RTI	0.079 ± 0.124	0.256 ± 0.074	-----
Sb	51	231-hr event	T06-11975	RTI	0.000 ± 0.112	0.237 ± 0.081	-----
Cs	55	231-hr event	T06-11975	RTI	0.000 ± 0.067	0.115 ± 0.062	-----
Ba	56	231-hr event	T06-11975	RTI	0.176 ± 0.044	0.715 ± 0.115	-----
La	57	231-hr event	T06-11975	RTI	0.114 ± 0.044	-0.042 ± 0.055	-----
Ce	58	231-hr event	T06-11975	RTI	0.104 ± 0.032	-0.237 ± 0.086	-----
Sm	62	231-hr event	T06-11975	RTI	0.000 ± 0.018	0.017 ± 0.049	-----
Eu	63	231-hr event	T06-11975	RTI	0.000 ± 0.027	-0.438 ± 0.378	-----
Tb	65	231-hr event	T06-11975	RTI	0.002 ± 0.068	0.597 ± 0.331	-----
Hf	72	231-hr event	T06-11975	RTI	0.000 ± 0.017	-----	-----
Ta	73	231-hr event	T06-11975	RTI	0.000 ± 0.042	0.041 ± 0.071	-----
W	74	231-hr event	T06-11975	RTI	0.000 ± 0.031	-0.077 ± 0.071	-----
Ir	77	231-hr event	T06-11975	RTI	0.000 ± 0.024	-----	-----
Au	79	231-hr event	T06-11975	RTI	0.000 ± 0.019	0.011 ± 0.034	-----
Hg	80	231-hr event	T06-11975	RTI	0.160 ± 0.041	0.040 ± 0.030	-----
Pb	82	231-hr event	T06-11975	RTI	0.669 ± 0.047	0.707 ± 0.066	0.579
Na	11	231-hr event	T06-11976	UCD	0.000 ± 0.000	-----	-----
Mg	12	231-hr event	T06-11976	UCD	0.000 ± 0.000	-----	-----
Al	13	231-hr event	T06-11976	UCD	0.000 ± 0.000	2.010 ± 0.997	-----
Si	14	231-hr event	T06-11976	UCD	21.210 ± 1.144	17.018 ± 1.321	16.834
P	15	231-hr event	T06-11976	UCD	0.000 ± 0.000	0.673 ± 0.300	-----
S	16	231-hr event	T06-11976	UCD	86.414 ± 4.359	93.978 ± 6.555	91.280

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Cl	17	231-hr event	T06-11976	UCD	0.000 ± 0.000	1.095 ± 0.134	-----
K	19	231-hr event	T06-11976	UCD	8.412 ± 0.435	8.652 ± 0.608	8.617
Ca	20	231-hr event	T06-11976	UCD	3.897 ± 0.207	3.422 ± 0.245	3.166
Sc	21	231-hr event	T06-11976	UCD	-----	0.054 ± 0.044	-----
Ti	22	231-hr event	T06-11976	UCD	0.283 ± 0.019	0.186 ± 0.057	-----
V	23	231-hr event	T06-11976	UCD	0.066 ± 0.010	0.057 ± 0.033	-----
Cr	24	231-hr event	T06-11976	UCD	0.409 ± 0.025	0.081 ± 0.018	-----
Mn	25	231-hr event	T06-11976	UCD	0.245 ± 0.018	0.333 ± 0.046	0.235
Fe	26	231-hr event	T06-11976	UCD	7.724 ± 0.391	7.011 ± 0.554	6.351
Co	27	231-hr event	T06-11976	UCD	-----	-0.043 ± 0.092	-----
Ni	28	231-hr event	T06-11976	UCD	0.109 ± 0.008	0.105 ± 0.082	-----
Cu	29	231-hr event	T06-11976	UCD	0.293 ± 0.017	0.357 ± 0.046	0.264
Zn	30	231-hr event	T06-11976	UCD	1.588 ± 0.081	1.757 ± 0.132	1.635
Ga	31	231-hr event	T06-11976	UCD	-----	0.021 ± 0.018	-----
As	33	231-hr event	T06-11976	UCD	0.161 ± 0.014	0.151 ± 0.028	0.152
Se	34	231-hr event	T06-11976	UCD	0.110 ± 0.007	0.133 ± 0.018	-----
Br	35	231-hr event	T06-11976	UCD	0.569 ± 0.030	0.601 ± 0.048	0.581
Rb	37	231-hr event	T06-11976	UCD	0.035 ± 0.009	0.067 ± 0.015	-----
Sr	38	231-hr event	T06-11976	UCD	0.012 ± 0.005	0.018 ± 0.015	-----
Y	39	231-hr event	T06-11976	UCD	-----	-0.113 ± 0.052	-----
Zr	40	231-hr event	T06-11976	UCD	0.000 ± 0.000	-0.007 ± 0.048	0.011
Nb	41	231-hr event	T06-11976	UCD	-----	0.041 ± 0.056	-----
Mo	42	231-hr event	T06-11976	UCD	-----	0.012 ± 0.054	-----
Ag	47	231-hr event	T06-11976	UCD	-----	-0.003 ± 0.048	-----
Cd	48	231-hr event	T06-11976	UCD	-----	0.063 ± 0.056	-----
In	49	231-hr event	T06-11976	UCD	-----	0.023 ± 0.062	-----
Sn	50	231-hr event	T06-11976	UCD	-----	0.154 ± 0.074	-----
Sb	51	231-hr event	T06-11976	UCD	-----	0.265 ± 0.083	-----
Cs	55	231-hr event	T06-11976	UCD	-----	0.111 ± 0.063	-----
Ba	56	231-hr event	T06-11976	UCD	-----	0.454 ± 0.109	-----
La	57	231-hr event	T06-11976	UCD	-----	-0.013 ± 0.056	-----
Ce	58	231-hr event	T06-11976	UCD	-----	-0.033 ± 0.086	-----
Sm	62	231-hr event	T06-11976	UCD	-----	-0.061 ± 0.049	-----
Eu	63	231-hr event	T06-11976	UCD	-----	-0.264 ± 0.392	-----
Tb	65	231-hr event	T06-11976	UCD	-----	0.590 ± 0.349	-----
Hf	72	231-hr event	T06-11976	UCD	-----	-----	-----
Ta	73	231-hr event	T06-11976	UCD	-----	-0.067 ± 0.071	-----
W	74	231-hr event	T06-11976	UCD	-----	0.099 ± 0.074	-----
Ir	77	231-hr event	T06-11976	UCD	-----	-----	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Au	79	231-hr event	T06-11976	UCD	-----	-0.045 ± 0.035	-----
Hg	80	231-hr event	T06-11976	UCD	-----	0.016 ± 0.031	-----
Pb	82	231-hr event	T06-11976	UCD	0.515 ± 0.033	0.588 ± 0.060	0.579
Na	11	231-hr event	T06-11977	UCD	0.000 ± 0.000	-----	-----
Mg	12	231-hr event	T06-11977	UCD	0.000 ± 0.000	-----	-----
Al	13	231-hr event	T06-11977	UCD	0.000 ± 0.000	2.037 ± 1.017	-----
Si	14	231-hr event	T06-11977	UCD	20.940 ± 1.140	17.102 ± 1.329	16.834
P	15	231-hr event	T06-11977	UCD	0.000 ± 0.000	0.487 ± 0.301	-----
S	16	231-hr event	T06-11977	UCD	88.258 ± 4.452	97.617 ± 6.808	91.280
Cl	17	231-hr event	T06-11977	UCD	0.000 ± 0.000	1.125 ± 0.136	-----
K	19	231-hr event	T06-11977	UCD	8.522 ± 0.441	9.196 ± 0.656	8.617
Ca	20	231-hr event	T06-11977	UCD	3.648 ± 0.195	3.334 ± 0.239	3.166
Sc	21	231-hr event	T06-11977	UCD	-----	0.006 ± 0.044	-----
Ti	22	231-hr event	T06-11977	UCD	0.310 ± 0.024	0.163 ± 0.058	-----
V	23	231-hr event	T06-11977	UCD	0.050 ± 0.009	0.080 ± 0.033	-----
Cr	24	231-hr event	T06-11977	UCD	0.027 ± 0.005	0.050 ± 0.017	-----
Mn	25	231-hr event	T06-11977	UCD	0.234 ± 0.015	0.275 ± 0.044	0.235
Fe	26	231-hr event	T06-11977	UCD	6.421 ± 0.326	6.268 ± 0.504	6.351
Co	27	231-hr event	T06-11977	UCD	-----	0.040 ± 0.090	-----
Ni	28	231-hr event	T06-11977	UCD	0.020 ± 0.004	-0.174 ± 0.081	-----
Cu	29	231-hr event	T06-11977	UCD	0.255 ± 0.015	0.231 ± 0.042	0.264
Zn	30	231-hr event	T06-11977	UCD	1.600 ± 0.082	1.796 ± 0.135	1.635
Ga	31	231-hr event	T06-11977	UCD	-----	-0.024 ± 0.018	-----
As	33	231-hr event	T06-11977	UCD	0.135 ± 0.015	0.155 ± 0.029	0.152
Se	34	231-hr event	T06-11977	UCD	0.105 ± 0.007	0.097 ± 0.017	-----
Br	35	231-hr event	T06-11977	UCD	0.599 ± 0.031	0.645 ± 0.051	0.581
Rb	37	231-hr event	T06-11977	UCD	0.029 ± 0.009	0.046 ± 0.015	-----
Sr	38	231-hr event	T06-11977	UCD	0.017 ± 0.006	0.020 ± 0.015	-----
Y	39	231-hr event	T06-11977	UCD	-----	-0.066 ± 0.054	-----
Zr	40	231-hr event	T06-11977	UCD	0.000 ± 0.000	0.042 ± 0.049	0.011
Nb	41	231-hr event	T06-11977	UCD	-----	0.010 ± 0.053	-----
Mo	42	231-hr event	T06-11977	UCD	-----	-0.055 ± 0.052	-----
Ag	47	231-hr event	T06-11977	UCD	-----	0.148 ± 0.052	-----
Cd	48	231-hr event	T06-11977	UCD	-----	0.073 ± 0.056	-----
In	49	231-hr event	T06-11977	UCD	-----	0.207 ± 0.067	-----
Sn	50	231-hr event	T06-11977	UCD	-----	0.260 ± 0.079	-----
Sb	51	231-hr event	T06-11977	UCD	-----	0.324 ± 0.085	-----
Cs	55	231-hr event	T06-11977	UCD	-----	0.080 ± 0.063	-----
Ba	56	231-hr event	T06-11977	UCD	-----	0.474 ± 0.110	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
La	57	231-hr event	T06-11977	UCD	-----	-0.008 ± 0.056	-----
Ce	58	231-hr event	T06-11977	UCD	-----	-0.126 ± 0.086	-----
Sm	62	231-hr event	T06-11977	UCD	-----	0.047 ± 0.051	-----
Eu	63	231-hr event	T06-11977	UCD	-----	0.038 ± 0.394	-----
Tb	65	231-hr event	T06-11977	UCD	-----	0.076 ± 0.337	-----
Hf	72	231-hr event	T06-11977	UCD	-----	-----	-----
Ta	73	231-hr event	T06-11977	UCD	-----	0.034 ± 0.072	-----
W	74	231-hr event	T06-11977	UCD	-----	0.067 ± 0.074	-----
Ir	77	231-hr event	T06-11977	UCD	-----	-----	-----
Au	79	231-hr event	T06-11977	UCD	-----	-0.062 ± 0.035	-----
Hg	80	231-hr event	T06-11977	UCD	-----	0.034 ± 0.030	-----
Pb	82	231-hr event	T06-11977	UCD	0.591 ± 0.037	0.635 ± 0.062	0.579
Na	11	232-hr event	T07-11985	CARB	-----	-----	-----
Mg	12	232-hr event	T07-11985	CARB	-----	-----	-----
Al	13	232-hr event	T07-11985	CARB	1.443 ± 0.097	3.200 ± 0.986	-----
Si	14	232-hr event	T07-11985	CARB	4.597 ± 0.234	5.102 ± 0.522	4.804
P	15	232-hr event	T07-11985	CARB	0.000 ± 0.026	0.518 ± 0.263	-----
S	16	232-hr event	T07-11985	CARB	60.537 ± 3.027	67.619 ± 4.721	62.731
Cl	17	232-hr event	T07-11985	CARB	0.554 ± 0.032	0.742 ± 0.114	-----
K	19	232-hr event	T07-11985	CARB	6.490 ± 0.325	6.363 ± 0.449	5.909
Ca	20	232-hr event	T07-11985	CARB	2.553 ± 0.128	2.864 ± 0.206	2.580
Sc	21	232-hr event	T07-11985	CARB	-----	-0.014 ± 0.040	-----
Ti	22	232-hr event	T07-11985	CARB	0.144 ± 0.012	0.126 ± 0.054	-----
V	23	232-hr event	T07-11985	CARB	0.023 ± 0.007	0.057 ± 0.031	-----
Cr	24	232-hr event	T07-11985	CARB	0.019 ± 0.003	0.036 ± 0.015	-----
Mn	25	232-hr event	T07-11985	CARB	0.148 ± 0.008	0.191 ± 0.039	0.145
Fe	26	232-hr event	T07-11985	CARB	3.222 ± 0.162	3.702 ± 0.328	3.325
Co	27	232-hr event	T07-11985	CARB	0.000 ± 0.020	-0.055 ± 0.077	-----
Ni	28	232-hr event	T07-11985	CARB	0.020 ± 0.002	-0.008 ± 0.071	-----
Cu	29	232-hr event	T07-11985	CARB	0.173 ± 0.011	0.155 ± 0.035	0.160
Zn	30	232-hr event	T07-11985	CARB	1.446 ± 0.075	1.596 ± 0.120	1.466
Ga	31	232-hr event	T07-11985	CARB	-----	0.015 ± 0.016	-----
As	33	232-hr event	T07-11985	CARB	0.061 ± 0.008	0.029 ± 0.023	0.068
Se	34	232-hr event	T07-11985	CARB	0.057 ± 0.005	0.062 ± 0.015	-----
Br	35	232-hr event	T07-11985	CARB	0.296 ± 0.016	0.359 ± 0.031	0.325
Rb	37	232-hr event	T07-11985	CARB	0.026 ± 0.003	0.045 ± 0.014	-----
Sr	38	232-hr event	T07-11985	CARB	0.034 ± 0.005	0.026 ± 0.015	-----
Y	39	232-hr event	T07-11985	CARB	0.000 ± 0.009	-0.001 ± 0.054	-----
Zr	40	232-hr event	T07-11985	CARB	-----	0.021 ± 0.048	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Nb	41	232-hr event	T07-11985	CARB	-----	-0.085 ± 0.051	-----
Mo	42	232-hr event	T07-11985	CARB	0.000 ± 0.023	-0.008 ± 0.052	-----
Ag	47	232-hr event	T07-11985	CARB	-----	-0.005 ± 0.046	-----
Cd	48	232-hr event	T07-11985	CARB	-----	0.126 ± 0.056	-----
In	49	232-hr event	T07-11985	CARB	-----	0.107 ± 0.062	-----
Sn	50	232-hr event	T07-11985	CARB	0.000 ± 0.059	0.255 ± 0.075	-----
Sb	51	232-hr event	T07-11985	CARB	0.165 ± 0.061	0.273 ± 0.081	-----
Cs	55	232-hr event	T07-11985	CARB	-----	0.071 ± 0.058	-----
Ba	56	232-hr event	T07-11985	CARB	0.287 ± 0.028	0.373 ± 0.103	-----
La	57	232-hr event	T07-11985	CARB	-----	0.083 ± 0.054	-----
Ce	58	232-hr event	T07-11985	CARB	-----	-0.140 ± 0.080	-----
Sm	62	232-hr event	T07-11985	CARB	-----	0.005 ± 0.047	-----
Eu	63	232-hr event	T07-11985	CARB	-----	-0.202 ± 0.358	-----
Tb	65	232-hr event	T07-11985	CARB	-----	0.124 ± 0.285	-----
Hf	72	232-hr event	T07-11985	CARB	-----	-----	-----
Ta	73	232-hr event	T07-11985	CARB	-----	-0.100 ± 0.066	-----
W	74	232-hr event	T07-11985	CARB	-----	0.109 ± 0.066	-----
Ir	77	232-hr event	T07-11985	CARB	-----	-----	-----
Au	79	232-hr event	T07-11985	CARB	-----	-0.015 ± 0.034	-----
Hg	80	232-hr event	T07-11985	CARB	0.007 ± 0.008	-0.017 ± 0.030	-----
Pb	82	232-hr event	T07-11985	CARB	0.305 ± 0.019	0.387 ± 0.048	0.282
Na	11	232-hr event	T07-11986	CARB	-----	-----	-----
Mg	12	232-hr event	T07-11986	CARB	-----	-----	-----
Al	13	232-hr event	T07-11986	CARB	1.509 ± 0.099	3.281 ± 0.967	-----
Si	14	232-hr event	T07-11986	CARB	4.806 ± 0.244	4.762 ± 0.500	4.804
P	15	232-hr event	T07-11986	CARB	0.000 ± 0.027	0.363 ± 0.259	-----
S	16	232-hr event	T07-11986	CARB	62.898 ± 3.146	67.913 ± 4.742	62.731
Cl	17	232-hr event	T07-11986	CARB	0.602 ± 0.033	0.584 ± 0.108	-----
K	19	232-hr event	T07-11986	CARB	6.761 ± 0.339	6.191 ± 0.437	5.909
Ca	20	232-hr event	T07-11986	CARB	2.651 ± 0.133	2.856 ± 0.206	2.580
Sc	21	232-hr event	T07-11986	CARB	-----	-0.015 ± 0.041	-----
Ti	22	232-hr event	T07-11986	CARB	0.157 ± 0.012	0.107 ± 0.052	-----
V	23	232-hr event	T07-11986	CARB	0.020 ± 0.007	0.050 ± 0.031	-----
Cr	24	232-hr event	T07-11986	CARB	0.029 ± 0.005	0.010 ± 0.015	-----
Mn	25	232-hr event	T07-11986	CARB	0.154 ± 0.009	0.167 ± 0.037	0.145
Fe	26	232-hr event	T07-11986	CARB	3.456 ± 0.173	3.652 ± 0.323	3.325
Co	27	232-hr event	T07-11986	CARB	0.000 ± 0.020	0.099 ± 0.078	-----
Ni	28	232-hr event	T07-11986	CARB	0.029 ± 0.002	-0.028 ± 0.070	-----
Cu	29	232-hr event	T07-11986	CARB	0.185 ± 0.012	0.148 ± 0.034	0.160

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Zn	30	232-hr event	T07-11986	CARB	1.461 ± 0.075	1.658 ± 0.125	1.466
Ga	31	232-hr event	T07-11986	CARB	-----	0.012 ± 0.017	-----
As	33	232-hr event	T07-11986	CARB	0.087 ± 0.008	0.084 ± 0.023	0.068
Se	34	232-hr event	T07-11986	CARB	0.062 ± 0.005	0.069 ± 0.015	-----
Br	35	232-hr event	T07-11986	CARB	0.331 ± 0.017	0.406 ± 0.034	0.325
Rb	37	232-hr event	T07-11986	CARB	0.009 ± 0.003	0.037 ± 0.013	-----
Sr	38	232-hr event	T07-11986	CARB	0.031 ± 0.005	0.020 ± 0.015	-----
Y	39	232-hr event	T07-11986	CARB	0.000 ± 0.009	-0.021 ± 0.054	-----
Zr	40	232-hr event	T07-11986	CARB	-----	-0.054 ± 0.046	-----
Nb	41	232-hr event	T07-11986	CARB	-----	-0.090 ± 0.050	-----
Mo	42	232-hr event	T07-11986	CARB	0.000 ± 0.023	0.097 ± 0.055	-----
Ag	47	232-hr event	T07-11986	CARB	-----	-0.040 ± 0.045	-----
Cd	48	232-hr event	T07-11986	CARB	-----	0.024 ± 0.053	-----
In	49	232-hr event	T07-11986	CARB	-----	-0.023 ± 0.059	-----
Sn	50	232-hr event	T07-11986	CARB	0.081 ± 0.043	0.190 ± 0.072	-----
Sb	51	232-hr event	T07-11986	CARB	0.353 ± 0.060	0.194 ± 0.080	-----
Cs	55	232-hr event	T07-11986	CARB	-----	-0.045 ± 0.058	-----
Ba	56	232-hr event	T07-11986	CARB	0.292 ± 0.028	0.322 ± 0.100	-----
La	57	232-hr event	T07-11986	CARB	-----	0.094 ± 0.053	-----
Ce	58	232-hr event	T07-11986	CARB	-----	-0.024 ± 0.079	-----
Sm	62	232-hr event	T07-11986	CARB	-----	0.074 ± 0.047	-----
Eu	63	232-hr event	T07-11986	CARB	-----	-0.272 ± 0.352	-----
Tb	65	232-hr event	T07-11986	CARB	-----	-0.171 ± 0.281	-----
Hf	72	232-hr event	T07-11986	CARB	-----	-----	-----
Ta	73	232-hr event	T07-11986	CARB	-----	0.085 ± 0.067	-----
W	74	232-hr event	T07-11986	CARB	-----	-0.043 ± 0.065	-----
Ir	77	232-hr event	T07-11986	CARB	-----	-----	-----
Au	79	232-hr event	T07-11986	CARB	-----	-0.006 ± 0.033	-----
Hg	80	232-hr event	T07-11986	CARB	0.000 ± 0.012	-0.041 ± 0.028	-----
Pb	82	232-hr event	T07-11986	CARB	0.279 ± 0.018	0.324 ± 0.045	0.282
Na	11	232-hr event	T07-11987	DRI	6.395 ± 1.507	-----	-----
Mg	12	232-hr event	T07-11987	DRI	0.660 ± 0.716	-----	-----
Al	13	232-hr event	T07-11987	DRI	1.539 ± 0.125	2.159 ± 0.919	-----
Si	14	232-hr event	T07-11987	DRI	3.878 ± 0.150	4.882 ± 0.504	4.804
P	15	232-hr event	T07-11987	DRI	2.345 ± 0.047	0.639 ± 0.259	-----
S	16	232-hr event	T07-11987	DRI	57.881 ± 0.431	62.565 ± 4.370	62.731
Cl	17	232-hr event	T07-11987	DRI	0.166 ± 0.026	0.531 ± 0.105	-----
K	19	232-hr event	T07-11987	DRI	5.893 ± 0.036	5.805 ± 0.410	5.909
Ca	20	232-hr event	T07-11987	DRI	2.555 ± 0.033	2.620 ± 0.189	2.580

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Sc	21	232-hr event	T07-11987	DRI	0.020 ± 0.094	-0.059 ± 0.039	-----
Ti	22	232-hr event	T07-11987	DRI	0.164 ± 0.018	0.152 ± 0.053	-----
V	23	232-hr event	T07-11987	DRI	0.050 ± 0.001	0.014 ± 0.030	-----
Cr	24	232-hr event	T07-11987	DRI	0.016 ± 0.016	0.007 ± 0.015	-----
Mn	25	232-hr event	T07-11987	DRI	0.131 ± 0.034	0.214 ± 0.038	0.145
Fe	26	232-hr event	T07-11987	DRI	3.585 ± 0.049	3.379 ± 0.307	3.325
Co	27	232-hr event	T07-11987	DRI	0.000 ± 0.001	-0.082 ± 0.075	-----
Ni	28	232-hr event	T07-11987	DRI	0.014 ± 0.008	-0.013 ± 0.068	-----
Cu	29	232-hr event	T07-11987	DRI	0.180 ± 0.015	0.164 ± 0.035	0.160
Zn	30	232-hr event	T07-11987	DRI	1.475 ± 0.018	1.479 ± 0.112	1.466
Ga	31	232-hr event	T07-11987	DRI	0.000 ± 0.051	0.013 ± 0.016	-----
As	33	232-hr event	T07-11987	DRI	0.000 ± 0.012	0.067 ± 0.022	0.068
Se	34	232-hr event	T07-11987	DRI	0.077 ± 0.034	0.060 ± 0.014	-----
Br	35	232-hr event	T07-11987	DRI	0.294 ± 0.025	0.343 ± 0.030	0.325
Rb	37	232-hr event	T07-11987	DRI	0.000 ± 0.018	0.029 ± 0.013	-----
Sr	38	232-hr event	T07-11987	DRI	0.069 ± 0.032	0.049 ± 0.015	-----
Y	39	232-hr event	T07-11987	DRI	0.015 ± 0.024	0.030 ± 0.055	-----
Zr	40	232-hr event	T07-11987	DRI	0.016 ± 0.055	0.015 ± 0.047	0.007
Nb	41	232-hr event	T07-11987	DRI	0.000 ± 0.043	-0.169 ± 0.049	-----
Mo	42	232-hr event	T07-11987	DRI	0.000 ± 0.038	0.060 ± 0.054	-----
Ag	47	232-hr event	T07-11987	DRI	0.000 ± 0.068	-0.054 ± 0.045	-----
Cd	48	232-hr event	T07-11987	DRI	0.010 ± 0.084	-0.046 ± 0.051	-----
In	49	232-hr event	T07-11987	DRI	0.005 ± 0.050	0.032 ± 0.061	-----
Sn	50	232-hr event	T07-11987	DRI	0.041 ± 0.063	0.100 ± 0.070	-----
Sb	51	232-hr event	T07-11987	DRI	0.104 ± 0.119	0.199 ± 0.079	-----
Cs	55	232-hr event	T07-11987	DRI	0.000 ± 0.019	0.016 ± 0.058	-----
Ba	56	232-hr event	T07-11987	DRI	0.000 ± 0.009	0.201 ± 0.097	-----
La	57	232-hr event	T07-11987	DRI	0.000 ± 0.015	0.003 ± 0.053	-----
Ce	58	232-hr event	T07-11987	DRI	0.000 ± 0.020	-0.054 ± 0.078	-----
Sm	62	232-hr event	T07-11987	DRI	0.020 ± 0.028	0.012 ± 0.047	-----
Eu	63	232-hr event	T07-11987	DRI	0.002 ± 0.105	-0.464 ± 0.351	-----
Tb	65	232-hr event	T07-11987	DRI	0.000 ± 0.035	0.157 ± 0.279	-----
Hf	72	232-hr event	T07-11987	DRI	0.000 ± 0.229	-----	-----
Ta	73	232-hr event	T07-11987	DRI	0.000 ± 0.190	-0.037 ± 0.065	-----
W	74	232-hr event	T07-11987	DRI	0.000 ± 0.273	0.080 ± 0.064	-----
Ir	77	232-hr event	T07-11987	DRI	0.000 ± 0.060	-----	-----
Au	79	232-hr event	T07-11987	DRI	0.000 ± 0.127	0.023 ± 0.033	-----
Hg	80	232-hr event	T07-11987	DRI	0.041 ± 0.038	0.024 ± 0.029	-----
Pb	82	232-hr event	T07-11987	DRI	0.407 ± 0.043	0.318 ± 0.043	0.282

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Na	11	232-hr event	T07-11988	DRI	2.076 ± 1.417	-----	-----
Mg	12	232-hr event	T07-11988	DRI	0.488 ± 0.715	-----	-----
Al	13	232-hr event	T07-11988	DRI	1.481 ± 0.124	1.372 ± 0.913	-----
Si	14	232-hr event	T07-11988	DRI	3.350 ± 0.147	5.255 ± 0.527	4.804
P	15	232-hr event	T07-11988	DRI	2.505 ± 0.047	0.173 ± 0.253	-----
S	16	232-hr event	T07-11988	DRI	58.958 ± 0.437	66.894 ± 4.671	62.731
Cl	17	232-hr event	T07-11988	DRI	0.233 ± 0.026	0.569 ± 0.107	-----
K	19	232-hr event	T07-11988	DRI	5.902 ± 0.036	6.165 ± 0.435	5.909
Ca	20	232-hr event	T07-11988	DRI	2.363 ± 0.033	2.607 ± 0.188	2.580
Sc	21	232-hr event	T07-11988	DRI	0.024 ± 0.094	0.004 ± 0.038	-----
Ti	22	232-hr event	T07-11988	DRI	0.103 ± 0.018	0.055 ± 0.052	-----
V	23	232-hr event	T07-11988	DRI	0.010 ± 0.001	0.026 ± 0.031	-----
Cr	24	232-hr event	T07-11988	DRI	0.026 ± 0.016	0.011 ± 0.015	-----
Mn	25	232-hr event	T07-11988	DRI	0.124 ± 0.034	0.182 ± 0.037	0.145
Fe	26	232-hr event	T07-11988	DRI	3.414 ± 0.049	3.283 ± 0.300	3.325
Co	27	232-hr event	T07-11988	DRI	0.000 ± 0.001	0.103 ± 0.077	-----
Ni	28	232-hr event	T07-11988	DRI	0.027 ± 0.008	-0.019 ± 0.068	-----
Cu	29	232-hr event	T07-11988	DRI	0.177 ± 0.015	0.191 ± 0.035	0.160
Zn	30	232-hr event	T07-11988	DRI	1.514 ± 0.018	1.635 ± 0.123	1.466
Ga	31	232-hr event	T07-11988	DRI	0.015 ± 0.051	0.014 ± 0.016	-----
As	33	232-hr event	T07-11988	DRI	0.000 ± 0.012	0.064 ± 0.022	0.068
Se	34	232-hr event	T07-11988	DRI	0.024 ± 0.034	0.106 ± 0.016	-----
Br	35	232-hr event	T07-11988	DRI	0.255 ± 0.025	0.356 ± 0.031	0.325
Rb	37	232-hr event	T07-11988	DRI	0.000 ± 0.018	0.046 ± 0.013	-----
Sr	38	232-hr event	T07-11988	DRI	0.053 ± 0.032	0.043 ± 0.015	-----
Y	39	232-hr event	T07-11988	DRI	0.007 ± 0.024	-0.008 ± 0.052	-----
Zr	40	232-hr event	T07-11988	DRI	0.003 ± 0.055	0.069 ± 0.048	0.007
Nb	41	232-hr event	T07-11988	DRI	0.023 ± 0.043	0.060 ± 0.053	-----
Mo	42	232-hr event	T07-11988	DRI	0.021 ± 0.038	-0.021 ± 0.050	-----
Ag	47	232-hr event	T07-11988	DRI	0.000 ± 0.068	-0.014 ± 0.045	-----
Cd	48	232-hr event	T07-11988	DRI	0.058 ± 0.084	0.027 ± 0.053	-----
In	49	232-hr event	T07-11988	DRI	0.000 ± 0.050	0.015 ± 0.060	-----
Sn	50	232-hr event	T07-11988	DRI	0.000 ± 0.063	0.115 ± 0.070	-----
Sb	51	232-hr event	T07-11988	DRI	0.122 ± 0.119	0.215 ± 0.078	-----
Cs	55	232-hr event	T07-11988	DRI	0.000 ± 0.019	0.122 ± 0.059	-----
Ba	56	232-hr event	T07-11988	DRI	0.000 ± 0.010	0.315 ± 0.100	-----
La	57	232-hr event	T07-11988	DRI	0.000 ± 0.015	0.083 ± 0.054	-----
Ce	58	232-hr event	T07-11988	DRI	0.000 ± 0.020	-0.062 ± 0.080	-----
Sm	62	232-hr event	T07-11988	DRI	0.027 ± 0.028	-0.017 ± 0.046	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Eu	63	232-hr event	T07-11988	DRI	0.000 ± 0.104	-0.353 ± 0.347	-----
Tb	65	232-hr event	T07-11988	DRI	0.000 ± 0.036	-0.244 ± 0.279	-----
Hf	72	232-hr event	T07-11988	DRI	0.000 ± 0.229	-----	-----
Ta	73	232-hr event	T07-11988	DRI	0.000 ± 0.191	0.062 ± 0.066	-----
W	74	232-hr event	T07-11988	DRI	0.000 ± 0.275	0.104 ± 0.064	-----
Ir	77	232-hr event	T07-11988	DRI	0.000 ± 0.060	-----	-----
Au	79	232-hr event	T07-11988	DRI	0.000 ± 0.127	0.021 ± 0.032	-----
Hg	80	232-hr event	T07-11988	DRI	0.000 ± 0.038	0.004 ± 0.029	-----
Pb	82	232-hr event	T07-11988	DRI	0.399 ± 0.042	0.342 ± 0.045	0.282
Na	11	232-hr event	T07-11989	ODEQ	-----	-----	-----
Mg	12	232-hr event	T07-11989	ODEQ	-----	-----	-----
Al	13	232-hr event	T07-11989	ODEQ	0.887 ± 0.104	1.884 ± 0.914	-----
Si	14	232-hr event	T07-11989	ODEQ	4.814 ± 0.423	4.159 ± 0.466	4.804
P	15	232-hr event	T07-11989	ODEQ	-0.394 ± 0.162	0.432 ± 0.258	-----
S	16	232-hr event	T07-11989	ODEQ	63.687 ± 5.124	64.290 ± 4.490	62.731
Cl	17	232-hr event	T07-11989	ODEQ	-0.784 ± 0.468	0.535 ± 0.104	-----
K	19	232-hr event	T07-11989	ODEQ	5.776 ± 0.468	5.848 ± 0.413	5.909
Ca	20	232-hr event	T07-11989	ODEQ	2.558 ± 0.213	2.560 ± 0.185	2.580
Sc	21	232-hr event	T07-11989	ODEQ	-0.049 ± 0.037	0.004 ± 0.039	-----
Ti	22	232-hr event	T07-11989	ODEQ	0.168 ± 0.057	0.046 ± 0.050	-----
V	23	232-hr event	T07-11989	ODEQ	0.020 ± 0.022	0.059 ± 0.030	-----
Cr	24	232-hr event	T07-11989	ODEQ	0.015 ± 0.011	0.019 ± 0.015	-----
Mn	25	232-hr event	T07-11989	ODEQ	0.138 ± 0.020	0.151 ± 0.037	0.145
Fe	26	232-hr event	T07-11989	ODEQ	3.057 ± 0.247	3.295 ± 0.301	3.325
Co	27	232-hr event	T07-11989	ODEQ	-0.020 ± 0.019	0.075 ± 0.074	-----
Ni	28	232-hr event	T07-11989	ODEQ	0.005 ± 0.012	-0.163 ± 0.067	-----
Cu	29	232-hr event	T07-11989	ODEQ	0.147 ± 0.019	0.121 ± 0.033	0.160
Zn	30	232-hr event	T07-11989	ODEQ	1.415 ± 0.115	1.462 ± 0.111	1.466
Ga	31	232-hr event	T07-11989	ODEQ	-0.004 ± 0.059	0.009 ± 0.016	-----
As	33	232-hr event	T07-11989	ODEQ	0.049 ± 0.020	0.087 ± 0.023	0.068
Se	34	232-hr event	T07-11989	ODEQ	0.040 ± 0.012	0.076 ± 0.014	-----
Br	35	232-hr event	T07-11989	ODEQ	0.240 ± 0.022	0.334 ± 0.029	0.325
Rb	37	232-hr event	T07-11989	ODEQ	0.015 ± 0.010	0.037 ± 0.013	-----
Sr	38	232-hr event	T07-11989	ODEQ	0.020 ± 0.011	0.070 ± 0.016	-----
Y	39	232-hr event	T07-11989	ODEQ	0.007 ± 0.012	-0.022 ± 0.053	-----
Zr	40	232-hr event	T07-11989	ODEQ	0.020 ± 0.013	0.027 ± 0.049	0.007
Nb	41	232-hr event	T07-11989	ODEQ	0.001 ± 0.016	-0.024 ± 0.051	-----
Mo	42	232-hr event	T07-11989	ODEQ	0.009 ± 0.019	0.073 ± 0.052	-----
Ag	47	232-hr event	T07-11989	ODEQ	0.070 ± 0.048	0.016 ± 0.046	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Cd	48	232-hr event	T07-11989	ODEQ	0.094 ± 0.044	0.067 ± 0.053	-----
In	49	232-hr event	T07-11989	ODEQ	0.047 ± 0.045	0.041 ± 0.059	-----
Sn	50	232-hr event	T07-11989	ODEQ	0.021 ± 0.055	0.120 ± 0.070	-----
Sb	51	232-hr event	T07-11989	ODEQ	0.056 ± 0.066	0.210 ± 0.078	-----
Cs	55	232-hr event	T07-11989	ODEQ	0.037 ± 0.109	0.015 ± 0.057	-----
Ba	56	232-hr event	T07-11989	ODEQ	0.076 ± 0.231	0.318 ± 0.099	-----
La	57	232-hr event	T07-11989	ODEQ	0.196 ± 0.180	0.011 ± 0.052	-----
Ce	58	232-hr event	T07-11989	ODEQ	0.178 ± 0.223	-0.117 ± 0.079	-----
Sm	62	232-hr event	T07-11989	ODEQ	-0.865 ± 0.843	0.081 ± 0.048	-----
Eu	63	232-hr event	T07-11989	ODEQ	0.242 ± 1.838	0.119 ± 0.348	-----
Tb	65	232-hr event	T07-11989	ODEQ	-0.082 ± 2.920	-0.202 ± 0.276	-----
Hf	72	232-hr event	T07-11989	ODEQ	-0.077 ± 0.174	-----	-----
Ta	73	232-hr event	T07-11989	ODEQ	0.013 ± 0.199	0.053 ± 0.063	-----
W	74	232-hr event	T07-11989	ODEQ	-0.038 ± 0.064	-0.113 ± 0.063	-----
Ir	77	232-hr event	T07-11989	ODEQ	-0.026 ± 0.039	-----	-----
Au	79	232-hr event	T07-11989	ODEQ	-0.023 ± 0.034	0.067 ± 0.033	-----
Hg	80	232-hr event	T07-11989	ODEQ	0.002 ± 0.027	0.043 ± 0.029	-----
Pb	82	232-hr event	T07-11989	ODEQ	0.255 ± 0.038	0.285 ± 0.042	0.282
Na	11	232-hr event	T07-11990	ODEQ	-----	-----	-----
Mg	12	232-hr event	T07-11990	ODEQ	-----	-----	-----
Al	13	232-hr event	T07-11990	ODEQ	0.902 ± 0.105	2.441 ± 0.945	-----
Si	14	232-hr event	T07-11990	ODEQ	5.015 ± 0.441	4.287 ± 0.471	4.804
P	15	232-hr event	T07-11990	ODEQ	-0.413 ± 0.164	0.828 ± 0.262	-----
S	16	232-hr event	T07-11990	ODEQ	64.415 ± 5.182	61.478 ± 4.294	62.731
Cl	17	232-hr event	T07-11990	ODEQ	-0.807 ± 0.474	0.662 ± 0.110	-----
K	19	232-hr event	T07-11990	ODEQ	5.916 ± 0.480	5.721 ± 0.404	5.909
Ca	20	232-hr event	T07-11990	ODEQ	2.738 ± 0.227	2.673 ± 0.193	2.580
Sc	21	232-hr event	T07-11990	ODEQ	-0.030 ± 0.038	-0.036 ± 0.039	-----
Ti	22	232-hr event	T07-11990	ODEQ	0.253 ± 0.059	0.039 ± 0.050	-----
V	23	232-hr event	T07-11990	ODEQ	0.038 ± 0.023	0.006 ± 0.030	-----
Cr	24	232-hr event	T07-11990	ODEQ	0.032 ± 0.011	0.016 ± 0.015	-----
Mn	25	232-hr event	T07-11990	ODEQ	0.129 ± 0.020	0.152 ± 0.037	0.145
Fe	26	232-hr event	T07-11990	ODEQ	3.182 ± 0.257	3.481 ± 0.313	3.325
Co	27	232-hr event	T07-11990	ODEQ	-0.011 ± 0.019	0.066 ± 0.078	-----
Ni	28	232-hr event	T07-11990	ODEQ	0.013 ± 0.013	-0.056 ± 0.069	-----
Cu	29	232-hr event	T07-11990	ODEQ	0.142 ± 0.018	0.166 ± 0.035	0.160
Zn	30	232-hr event	T07-11990	ODEQ	1.403 ± 0.114	1.443 ± 0.110	1.466
Ga	31	232-hr event	T07-11990	ODEQ	-0.009 ± 0.059	0.009 ± 0.016	-----
As	33	232-hr event	T07-11990	ODEQ	0.050 ± 0.020	0.065 ± 0.022	0.068

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Se	34	232-hr event	T07-11990	ODEQ	0.043 ± 0.012	0.070 ± 0.014	-----
Br	35	232-hr event	T07-11990	ODEQ	0.274 ± 0.025	0.330 ± 0.029	0.325
Rb	37	232-hr event	T07-11990	ODEQ	0.012 ± 0.011	0.038 ± 0.013	-----
Sr	38	232-hr event	T07-11990	ODEQ	0.022 ± 0.011	0.063 ± 0.016	-----
Y	39	232-hr event	T07-11990	ODEQ	0.005 ± 0.012	0.004 ± 0.056	-----
Zr	40	232-hr event	T07-11990	ODEQ	0.004 ± 0.014	-0.036 ± 0.046	0.007
Nb	41	232-hr event	T07-11990	ODEQ	-0.020 ± 0.017	-0.069 ± 0.052	-----
Mo	42	232-hr event	T07-11990	ODEQ	-0.004 ± 0.019	0.007 ± 0.052	-----
Ag	47	232-hr event	T07-11990	ODEQ	0.002 ± 0.048	0.027 ± 0.047	-----
Cd	48	232-hr event	T07-11990	ODEQ	0.041 ± 0.044	0.050 ± 0.053	-----
In	49	232-hr event	T07-11990	ODEQ	0.007 ± 0.045	0.043 ± 0.061	-----
Sn	50	232-hr event	T07-11990	ODEQ	0.043 ± 0.056	0.068 ± 0.069	-----
Sb	51	232-hr event	T07-11990	ODEQ	0.132 ± 0.067	0.220 ± 0.079	-----
Cs	55	232-hr event	T07-11990	ODEQ	0.134 ± 0.112	-0.055 ± 0.058	-----
Ba	56	232-hr event	T07-11990	ODEQ	-0.061 ± 0.231	0.343 ± 0.099	-----
La	57	232-hr event	T07-11990	ODEQ	0.122 ± 0.182	0.047 ± 0.052	-----
Ce	58	232-hr event	T07-11990	ODEQ	-0.017 ± 0.226	-0.106 ± 0.079	-----
Sm	62	232-hr event	T07-11990	ODEQ	-0.334 ± 0.853	0.030 ± 0.047	-----
Eu	63	232-hr event	T07-11990	ODEQ	-0.342 ± 1.858	-0.095 ± 0.351	-----
Tb	65	232-hr event	T07-11990	ODEQ	-0.702 ± 2.959	-0.148 ± 0.282	-----
Hf	72	232-hr event	T07-11990	ODEQ	0.041 ± 0.174	-----	-----
Ta	73	232-hr event	T07-11990	ODEQ	-0.069 ± 0.199	-0.040 ± 0.065	-----
W	74	232-hr event	T07-11990	ODEQ	-0.074 ± 0.065	0.048 ± 0.064	-----
Ir	77	232-hr event	T07-11990	ODEQ	0.009 ± 0.039	-----	-----
Au	79	232-hr event	T07-11990	ODEQ	-0.044 ± 0.034	0.051 ± 0.033	-----
Hg	80	232-hr event	T07-11990	ODEQ	-0.003 ± 0.027	-0.007 ± 0.028	-----
Pb	82	232-hr event	T07-11990	ODEQ	0.234 ± 0.037	0.330 ± 0.044	0.282
Na	11	232-hr event	T07-11991	RTI	2.644 ± 0.305	-----	-----
Mg	12	232-hr event	T07-11991	RTI	0.112 ± 0.070	-----	-----
Al	13	232-hr event	T07-11991	RTI	1.661 ± 0.222	2.154 ± 0.931	-----
Si	14	232-hr event	T07-11991	RTI	5.074 ± 0.353	4.496 ± 0.483	4.804
P	15	232-hr event	T07-11991	RTI	0.000 ± 0.098	0.257 ± 0.252	-----
S	16	232-hr event	T07-11991	RTI	62.455 ± 3.129	62.089 ± 4.336	62.731
Cl	17	232-hr event	T07-11991	RTI	0.295 ± 0.032	0.440 ± 0.102	-----
K	19	232-hr event	T07-11991	RTI	6.378 ± 0.320	5.817 ± 0.411	5.909
Ca	20	232-hr event	T07-11991	RTI	2.553 ± 0.130	2.626 ± 0.190	2.580
Sc	21	232-hr event	T07-11991	RTI	0.000 ± 0.024	-0.012 ± 0.039	-----
Ti	22	232-hr event	T07-11991	RTI	0.111 ± 0.019	0.104 ± 0.053	-----
V	23	232-hr event	T07-11991	RTI	0.205 ± 0.015	0.022 ± 0.030	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Cr	24	232-hr event	T07-11991	RTI	0.000 ± 0.008	0.041 ± 0.015	-----
Mn	25	232-hr event	T07-11991	RTI	0.127 ± 0.011	0.209 ± 0.038	0.145
Fe	26	232-hr event	T07-11991	RTI	3.582 ± 0.181	3.118 ± 0.293	3.325
Co	27	232-hr event	T07-11991	RTI	0.000 ± 0.007	-0.014 ± 0.077	-----
Ni	28	232-hr event	T07-11991	RTI	0.009 ± 0.004	-0.067 ± 0.069	-----
Cu	29	232-hr event	T07-11991	RTI	0.191 ± 0.011	0.115 ± 0.034	0.160
Zn	30	232-hr event	T07-11991	RTI	1.430 ± 0.072	1.470 ± 0.112	1.466
Ga	31	232-hr event	T07-11991	RTI	0.000 ± 0.008	-0.013 ± 0.016	-----
As	33	232-hr event	T07-11991	RTI	0.114 ± 0.014	0.098 ± 0.023	0.068
Se	34	232-hr event	T07-11991	RTI	0.046 ± 0.009	0.070 ± 0.015	-----
Br	35	232-hr event	T07-11991	RTI	0.319 ± 0.021	0.310 ± 0.028	0.325
Rb	37	232-hr event	T07-11991	RTI	0.017 ± 0.008	0.035 ± 0.013	-----
Sr	38	232-hr event	T07-11991	RTI	0.000 ± 0.006	-0.011 ± 0.014	-----
Y	39	232-hr event	T07-11991	RTI	0.000 ± 0.006	-0.065 ± 0.052	-----
Zr	40	232-hr event	T07-11991	RTI	0.003 ± 0.016	-0.042 ± 0.045	0.007
Nb	41	232-hr event	T07-11991	RTI	0.000 ± 0.011	-0.077 ± 0.050	-----
Mo	42	232-hr event	T07-11991	RTI	0.000 ± 0.015	0.081 ± 0.054	-----
Ag	47	232-hr event	T07-11991	RTI	0.010 ± 0.050	0.047 ± 0.048	-----
Cd	48	232-hr event	T07-11991	RTI	0.000 ± 0.046	0.009 ± 0.053	-----
In	49	232-hr event	T07-11991	RTI	0.000 ± 0.068	-0.064 ± 0.059	-----
Sn	50	232-hr event	T07-11991	RTI	0.000 ± 0.085	-0.046 ± 0.068	-----
Sb	51	232-hr event	T07-11991	RTI	0.520 ± 0.138	0.297 ± 0.081	-----
Cs	55	232-hr event	T07-11991	RTI	0.000 ± 0.065	-0.057 ± 0.057	-----
Ba	56	232-hr event	T07-11991	RTI	0.000 ± 0.027	0.381 ± 0.102	-----
La	57	232-hr event	T07-11991	RTI	0.000 ± 0.042	0.070 ± 0.053	-----
Ce	58	232-hr event	T07-11991	RTI	0.000 ± 0.027	-0.076 ± 0.079	-----
Sm	62	232-hr event	T07-11991	RTI	0.000 ± 0.018	0.058 ± 0.047	-----
Eu	63	232-hr event	T07-11991	RTI	0.000 ± 0.025	-0.095 ± 0.352	-----
Tb	65	232-hr event	T07-11991	RTI	0.000 ± 0.048	0.048 ± 0.281	-----
Hf	72	232-hr event	T07-11991	RTI	0.000 ± 0.016	-----	-----
Ta	73	232-hr event	T07-11991	RTI	0.000 ± 0.042	0.019 ± 0.066	-----
W	74	232-hr event	T07-11991	RTI	0.000 ± 0.031	-0.038 ± 0.064	-----
Ir	77	232-hr event	T07-11991	RTI	0.000 ± 0.024	-----	-----
Au	79	232-hr event	T07-11991	RTI	0.000 ± 0.019	-0.011 ± 0.032	-----
Hg	80	232-hr event	T07-11991	RTI	0.000 ± 0.029	0.026 ± 0.028	-----
Pb	82	232-hr event	T07-11991	RTI	0.193 ± 0.030	0.252 ± 0.041	0.282
Na	11	232-hr event	T07-11992	RTI	2.192 ± 0.280	-----	-----
Mg	12	232-hr event	T07-11992	RTI	0.073 ± 0.069	-----	-----
Al	13	232-hr event	T07-11992	RTI	1.300 ± 0.201	2.574 ± 0.937	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Si	14	232-hr event	T07-11992	RTI	4.695 ± 0.329	5.634 ± 0.549	4.804
P	15	232-hr event	T07-11992	RTI	0.000 ± 0.096	0.547 ± 0.262	-----
S	16	232-hr event	T07-11992	RTI	59.449 ± 2.979	68.519 ± 4.784	62.731
Cl	17	232-hr event	T07-11992	RTI	0.133 ± 0.029	0.524 ± 0.104	-----
K	19	232-hr event	T07-11992	RTI	5.973 ± 0.300	6.203 ± 0.438	5.909
Ca	20	232-hr event	T07-11992	RTI	2.266 ± 0.116	2.597 ± 0.188	2.580
Sc	21	232-hr event	T07-11992	RTI	0.000 ± 0.023	-0.013 ± 0.039	-----
Ti	22	232-hr event	T07-11992	RTI	0.104 ± 0.019	0.153 ± 0.052	-----
V	23	232-hr event	T07-11992	RTI	0.175 ± 0.014	-0.003 ± 0.030	-----
Cr	24	232-hr event	T07-11992	RTI	0.000 ± 0.008	0.017 ± 0.015	-----
Mn	25	232-hr event	T07-11992	RTI	0.127 ± 0.010	0.121 ± 0.035	0.145
Fe	26	232-hr event	T07-11992	RTI	3.083 ± 0.155	3.355 ± 0.305	3.325
Co	27	232-hr event	T07-11992	RTI	0.000 ± 0.007	-0.024 ± 0.075	-----
Ni	28	232-hr event	T07-11992	RTI	0.013 ± 0.004	-0.137 ± 0.068	-----
Cu	29	232-hr event	T07-11992	RTI	0.171 ± 0.010	0.088 ± 0.032	0.160
Zn	30	232-hr event	T07-11992	RTI	1.323 ± 0.067	1.662 ± 0.125	1.466
Ga	31	232-hr event	T07-11992	RTI	0.000 ± 0.008	0.001 ± 0.017	-----
As	33	232-hr event	T07-11992	RTI	0.114 ± 0.014	0.082 ± 0.023	0.068
Se	34	232-hr event	T07-11992	RTI	0.014 ± 0.008	0.071 ± 0.014	-----
Br	35	232-hr event	T07-11992	RTI	0.286 ± 0.020	0.397 ± 0.034	0.325
Rb	37	232-hr event	T07-11992	RTI	0.028 ± 0.008	0.037 ± 0.013	-----
Sr	38	232-hr event	T07-11992	RTI	0.012 ± 0.008	0.035 ± 0.014	-----
Y	39	232-hr event	T07-11992	RTI	0.000 ± 0.007	0.087 ± 0.055	-----
Zr	40	232-hr event	T07-11992	RTI	0.000 ± 0.011	0.043 ± 0.048	0.007
Nb	41	232-hr event	T07-11992	RTI	0.000 ± 0.011	0.026 ± 0.052	-----
Mo	42	232-hr event	T07-11992	RTI	0.000 ± 0.014	0.084 ± 0.054	-----
Ag	47	232-hr event	T07-11992	RTI	0.000 ± 0.043	0.045 ± 0.047	-----
Cd	48	232-hr event	T07-11992	RTI	0.000 ± 0.046	0.034 ± 0.052	-----
In	49	232-hr event	T07-11992	RTI	0.000 ± 0.068	0.069 ± 0.060	-----
Sn	50	232-hr event	T07-11992	RTI	0.000 ± 0.085	0.125 ± 0.069	-----
Sb	51	232-hr event	T07-11992	RTI	0.000 ± 0.112	0.074 ± 0.075	-----
Cs	55	232-hr event	T07-11992	RTI	0.000 ± 0.064	0.111 ± 0.059	-----
Ba	56	232-hr event	T07-11992	RTI	0.000 ± 0.027	0.266 ± 0.098	-----
La	57	232-hr event	T07-11992	RTI	0.000 ± 0.037	0.003 ± 0.052	-----
Ce	58	232-hr event	T07-11992	RTI	0.000 ± 0.019	0.069 ± 0.078	-----
Sm	62	232-hr event	T07-11992	RTI	0.000 ± 0.018	0.011 ± 0.046	-----
Eu	63	232-hr event	T07-11992	RTI	0.000 ± 0.025	0.517 ± 0.347	-----
Tb	65	232-hr event	T07-11992	RTI	0.008 ± 0.049	0.147 ± 0.277	-----
Hf	72	232-hr event	T07-11992	RTI	0.000 ± 0.016	-----	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Ta	73	232-hr event	T07-11992	RTI	0.000 ± 0.042	0.063 ± 0.066	-----
W	74	232-hr event	T07-11992	RTI	0.042 ± 0.037	-0.078 ± 0.063	-----
Ir	77	232-hr event	T07-11992	RTI	0.000 ± 0.024	-----	-----
Au	79	232-hr event	T07-11992	RTI	0.000 ± 0.019	0.018 ± 0.032	-----
Hg	80	232-hr event	T07-11992	RTI	0.092 ± 0.039	0.015 ± 0.028	-----
Pb	82	232-hr event	T07-11992	RTI	0.259 ± 0.029	0.303 ± 0.042	0.282
Na	11	232-hr event	T07-11993	UCD	0.000 ± 0.000	-----	-----
Mg	12	232-hr event	T07-11993	UCD	0.000 ± 0.000	-----	-----
Al	13	232-hr event	T07-11993	UCD	0.641 ± 0.219	2.519 ± 0.935	-----
Si	14	232-hr event	T07-11993	UCD	4.846 ± 0.328	4.839 ± 0.500	4.804
P	15	232-hr event	T07-11993	UCD	0.000 ± 0.000	0.552 ± 0.257	-----
S	16	232-hr event	T07-11993	UCD	53.619 ± 2.718	62.902 ± 4.393	62.731
Cl	17	232-hr event	T07-11993	UCD	0.000 ± 0.000	0.620 ± 0.106	-----
K	19	232-hr event	T07-11993	UCD	5.146 ± 0.270	5.773 ± 0.408	5.909
Ca	20	232-hr event	T07-11993	UCD	2.433 ± 0.134	2.501 ± 0.181	2.580
Sc	21	232-hr event	T07-11993	UCD	-----	-0.009 ± 0.038	-----
Ti	22	232-hr event	T07-11993	UCD	0.153 ± 0.011	0.004 ± 0.051	-----
V	23	232-hr event	T07-11993	UCD	0.056 ± 0.012	0.054 ± 0.030	-----
Cr	24	232-hr event	T07-11993	UCD	0.008 ± 0.003	0.048 ± 0.015	-----
Mn	25	232-hr event	T07-11993	UCD	0.128 ± 0.010	0.178 ± 0.037	0.145
Fe	26	232-hr event	T07-11993	UCD	3.071 ± 0.158	3.008 ± 0.282	3.325
Co	27	232-hr event	T07-11993	UCD	-----	-0.079 ± 0.074	-----
Ni	28	232-hr event	T07-11993	UCD	0.000 ± 0.000	-0.142 ± 0.067	-----
Cu	29	232-hr event	T07-11993	UCD	0.142 ± 0.009	0.139 ± 0.033	0.160
Zn	30	232-hr event	T07-11993	UCD	1.285 ± 0.066	1.484 ± 0.112	1.466
Ga	31	232-hr event	T07-11993	UCD	-----	0.014 ± 0.016	-----
As	33	232-hr event	T07-11993	UCD	0.069 ± 0.010	0.095 ± 0.022	0.068
Se	34	232-hr event	T07-11993	UCD	0.052 ± 0.004	0.078 ± 0.015	-----
Br	35	232-hr event	T07-11993	UCD	0.275 ± 0.015	0.349 ± 0.030	0.325
Rb	37	232-hr event	T07-11993	UCD	0.031 ± 0.007	-0.001 ± 0.012	-----
Sr	38	232-hr event	T07-11993	UCD	0.028 ± 0.006	-0.001 ± 0.014	-----
Y	39	232-hr event	T07-11993	UCD	-----	-0.093 ± 0.048	-----
Zr	40	232-hr event	T07-11993	UCD	0.000 ± 0.000	0.010 ± 0.047	0.007
Nb	41	232-hr event	T07-11993	UCD	-----	-0.063 ± 0.050	-----
Mo	42	232-hr event	T07-11993	UCD	-----	-0.074 ± 0.050	-----
Ag	47	232-hr event	T07-11993	UCD	-----	0.034 ± 0.046	-----
Cd	48	232-hr event	T07-11993	UCD	-----	0.113 ± 0.055	-----
In	49	232-hr event	T07-11993	UCD	-----	-0.030 ± 0.059	-----
Sn	50	232-hr event	T07-11993	UCD	-----	0.186 ± 0.071	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Sb	51	232-hr event	T07-11993	UCD	-----	0.058 ± 0.075	-----
Cs	55	232-hr event	T07-11993	UCD	-----	0.121 ± 0.058	-----
Ba	56	232-hr event	T07-11993	UCD	-----	0.457 ± 0.103	-----
La	57	232-hr event	T07-11993	UCD	-----	0.035 ± 0.053	-----
Ce	58	232-hr event	T07-11993	UCD	-----	-0.173 ± 0.080	-----
Sm	62	232-hr event	T07-11993	UCD	-----	0.021 ± 0.046	-----
Eu	63	232-hr event	T07-11993	UCD	-----	-0.004 ± 0.342	-----
Tb	65	232-hr event	T07-11993	UCD	-----	0.191 ± 0.268	-----
Hf	72	232-hr event	T07-11993	UCD	-----	-----	-----
Ta	73	232-hr event	T07-11993	UCD	-----	-0.020 ± 0.063	-----
W	74	232-hr event	T07-11993	UCD	-----	-0.056 ± 0.062	-----
Ir	77	232-hr event	T07-11993	UCD	-----	-----	-----
Au	79	232-hr event	T07-11993	UCD	-----	0.010 ± 0.032	-----
Hg	80	232-hr event	T07-11993	UCD	-----	0.012 ± 0.028	-----
Pb	82	232-hr event	T07-11993	UCD	0.248 ± 0.020	0.266 ± 0.041	0.282
Na	11	232-hr event	T07-11994	UCD	3.112 ± 1.059	-----	-----
Mg	12	232-hr event	T07-11994	UCD	0.000 ± 0.000	-----	-----
Al	13	232-hr event	T07-11994	UCD	1.022 ± 0.241	3.658 ± 0.969	-----
Si	14	232-hr event	T07-11994	UCD	4.802 ± 0.313	4.732 ± 0.496	4.804
P	15	232-hr event	T07-11994	UCD	0.000 ± 0.000	0.802 ± 0.266	-----
S	16	232-hr event	T07-11994	UCD	56.469 ± 2.861	66.669 ± 4.655	62.731
Cl	17	232-hr event	T07-11994	UCD	0.000 ± 0.000	0.411 ± 0.100	-----
K	19	232-hr event	T07-11994	UCD	5.603 ± 0.294	6.264 ± 0.442	5.909
Ca	20	232-hr event	T07-11994	UCD	2.563 ± 0.140	2.599 ± 0.188	2.580
Sc	21	232-hr event	T07-11994	UCD	-----	-0.031 ± 0.039	-----
Ti	22	232-hr event	T07-11994	UCD	0.158 ± 0.013	0.110 ± 0.051	-----
V	23	232-hr event	T07-11994	UCD	0.048 ± 0.011	0.060 ± 0.030	-----
Cr	24	232-hr event	T07-11994	UCD	0.011 ± 0.003	0.034 ± 0.015	-----
Mn	25	232-hr event	T07-11994	UCD	0.138 ± 0.010	0.142 ± 0.036	0.145
Fe	26	232-hr event	T07-11994	UCD	3.085 ± 0.159	3.368 ± 0.306	3.325
Co	27	232-hr event	T07-11994	UCD	-----	0.070 ± 0.076	-----
Ni	28	232-hr event	T07-11994	UCD	0.014 ± 0.003	-0.056 ± 0.069	-----
Cu	29	232-hr event	T07-11994	UCD	0.146 ± 0.010	0.230 ± 0.038	0.160
Zn	30	232-hr event	T07-11994	UCD	1.348 ± 0.069	1.690 ± 0.127	1.466
Ga	31	232-hr event	T07-11994	UCD	-----	0.038 ± 0.017	-----
As	33	232-hr event	T07-11994	UCD	0.063 ± 0.009	0.117 ± 0.023	0.068
Se	34	232-hr event	T07-11994	UCD	0.049 ± 0.004	0.067 ± 0.014	-----
Br	35	232-hr event	T07-11994	UCD	0.295 ± 0.016	0.370 ± 0.032	0.325
Rb	37	232-hr event	T07-11994	UCD	0.026 ± 0.007	0.025 ± 0.013	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Sr	38	232-hr event	T07-11994	UCD	0.018 ± 0.005	0.060 ± 0.015	-----
Y	39	232-hr event	T07-11994	UCD	-----	-0.022 ± 0.051	-----
Zr	40	232-hr event	T07-11994	UCD	0.034 ± 0.010	-0.031 ± 0.047	0.007
Nb	41	232-hr event	T07-11994	UCD	-----	0.034 ± 0.053	-----
Mo	42	232-hr event	T07-11994	UCD	-----	0.092 ± 0.055	-----
Ag	47	232-hr event	T07-11994	UCD	-----	0.043 ± 0.046	-----
Cd	48	232-hr event	T07-11994	UCD	-----	0.005 ± 0.052	-----
In	49	232-hr event	T07-11994	UCD	-----	0.092 ± 0.061	-----
Sn	50	232-hr event	T07-11994	UCD	-----	-0.010 ± 0.067	-----
Sb	51	232-hr event	T07-11994	UCD	-----	0.318 ± 0.081	-----
Cs	55	232-hr event	T07-11994	UCD	-----	0.109 ± 0.058	-----
Ba	56	232-hr event	T07-11994	UCD	-----	0.288 ± 0.098	-----
La	57	232-hr event	T07-11994	UCD	-----	-0.056 ± 0.050	-----
Ce	58	232-hr event	T07-11994	UCD	-----	-0.074 ± 0.078	-----
Sm	62	232-hr event	T07-11994	UCD	-----	-0.013 ± 0.046	-----
Eu	63	232-hr event	T07-11994	UCD	-----	0.367 ± 0.351	-----
Tb	65	232-hr event	T07-11994	UCD	-----	-0.130 ± 0.276	-----
Hf	72	232-hr event	T07-11994	UCD	-----	-----	-----
Ta	73	232-hr event	T07-11994	UCD	-----	-0.086 ± 0.067	-----
W	74	232-hr event	T07-11994	UCD	-----	-0.023 ± 0.064	-----
Ir	77	232-hr event	T07-11994	UCD	-----	-----	-----
Au	79	232-hr event	T07-11994	UCD	-----	-0.039 ± 0.032	-----
Hg	80	232-hr event	T07-11994	UCD	-----	0.035 ± 0.029	-----
Pb	82	232-hr event	T07-11994	UCD	0.264 ± 0.020	0.271 ± 0.041	0.282
Na	11	filter blank	T07-12116	CARB	-----	-----	-----
Mg	12	filter blank	T07-12116	CARB	-----	-----	-----
Al	13	filter blank	T07-12116	CARB	-0.045 ± 0.036	0.475 ± 0.562	-----
Si	14	filter blank	T07-12116	CARB	0.042 ± 0.017	0.279 ± 0.218	-----
P	15	filter blank	T07-12116	CARB	0.000 ± 0.014	0.375 ± 0.144	-----
S	16	filter blank	T07-12116	CARB	0.000 ± 0.017	-0.053 ± 0.074	-----
Cl	17	filter blank	T07-12116	CARB	0.026 ± 0.006	-0.039 ± 0.067	-----
K	19	filter blank	T07-12116	CARB	0.034 ± 0.006	-0.004 ± 0.027	-----
Ca	20	filter blank	T07-12116	CARB	0.032 ± 0.007	-0.028 ± 0.022	-----
Sc	21	filter blank	T07-12116	CARB	-----	0.046 ± 0.025	-----
Ti	22	filter blank	T07-12116	CARB	0.005 ± 0.006	-0.097 ± 0.037	-----
V	23	filter blank	T07-12116	CARB	0.000 ± 0.012	0.024 ± 0.026	-----
Cr	24	filter blank	T07-12116	CARB	0.000 ± 0.009	-0.024 ± 0.012	-----
Mn	25	filter blank	T07-12116	CARB	0.003 ± 0.002	0.103 ± 0.030	-----
Fe	26	filter blank	T07-12116	CARB	0.016 ± 0.002	-0.147 ± 0.107	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Co	27	filter blank	T07-12116	CARB	0.003 ± 0.002	-0.004 ± 0.053	-----
Ni	28	filter blank	T07-12116	CARB	0.000 ± 0.010	0.051 ± 0.054	-----
Cu	29	filter blank	T07-12116	CARB	0.017 ± 0.005	-0.027 ± 0.024	-----
Zn	30	filter blank	T07-12116	CARB	0.006 ± 0.005	0.014 ± 0.016	-----
Ga	31	filter blank	T07-12116	CARB	-----	0.043 ± 0.015	-----
As	33	filter blank	T07-12116	CARB	0.001 ± 0.002	-0.005 ± 0.016	-----
Se	34	filter blank	T07-12116	CARB	0.000 ± 0.002	-0.004 ± 0.011	-----
Br	35	filter blank	T07-12116	CARB	0.000 ± 0.003	-0.002 ± 0.011	-----
Rb	37	filter blank	T07-12116	CARB	0.000 ± 0.003	-0.011 ± 0.011	-----
Sr	38	filter blank	T07-12116	CARB	0.006 ± 0.003	-0.020 ± 0.013	-----
Y	39	filter blank	T07-12116	CARB	0.006 ± 0.005	-0.089 ± 0.047	-----
Zr	40	filter blank	T07-12116	CARB	-----	0.062 ± 0.046	-----
Nb	41	filter blank	T07-12116	CARB	-----	0.042 ± 0.052	-----
Mo	42	filter blank	T07-12116	CARB	0.000 ± 0.020	-0.049 ± 0.048	-----
Ag	47	filter blank	T07-12116	CARB	-----	-0.023 ± 0.043	-----
Cd	48	filter blank	T07-12116	CARB	-----	-0.079 ± 0.048	-----
In	49	filter blank	T07-12116	CARB	-----	0.030 ± 0.057	-----
Sn	50	filter blank	T07-12116	CARB	0.062 ± 0.040	-0.029 ± 0.056	-----
Sb	51	filter blank	T07-12116	CARB	0.000 ± 0.071	0.050 ± 0.061	-----
Cs	55	filter blank	T07-12116	CARB	-----	0.001 ± 0.044	-----
Ba	56	filter blank	T07-12116	CARB	0.075 ± 0.014	0.219 ± 0.077	-----
La	57	filter blank	T07-12116	CARB	-----	-0.029 ± 0.041	-----
Ce	58	filter blank	T07-12116	CARB	-----	-0.119 ± 0.063	-----
Sm	62	filter blank	T07-12116	CARB	-----	0.035 ± 0.040	-----
Eu	63	filter blank	T07-12116	CARB	-----	-0.551 ± 0.273	-----
Tb	65	filter blank	T07-12116	CARB	-----	0.041 ± 0.167	-----
Hf	72	filter blank	T07-12116	CARB	-----	-----	-----
Ta	73	filter blank	T07-12116	CARB	-----	-0.011 ± 0.051	-----
W	74	filter blank	T07-12116	CARB	-----	0.105 ± 0.051	-----
Ir	77	filter blank	T07-12116	CARB	-----	-----	-----
Au	79	filter blank	T07-12116	CARB	-----	-0.032 ± 0.029	-----
Hg	80	filter blank	T07-12116	CARB	0.008 ± 0.007	-0.012 ± 0.026	-----
Pb	82	filter blank	T07-12116	CARB	0.003 ± 0.005	0.001 ± 0.029	-----
Na	11	filter blank	T07-12117	CARB	-----	-----	-----
Mg	12	filter blank	T07-12117	CARB	-----	-----	-----
Al	13	filter blank	T07-12117	CARB	0.029 ± 0.036	1.058 ± 0.567	-----
Si	14	filter blank	T07-12117	CARB	0.053 ± 0.018	0.359 ± 0.215	-----
P	15	filter blank	T07-12117	CARB	0.000 ± 0.015	0.161 ± 0.139	-----
S	16	filter blank	T07-12117	CARB	0.000 ± 0.017	-0.019 ± 0.074	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Cl	17	filter blank	T07-12117	CARB	0.027 ± 0.007	-0.009 ± 0.068	-----
K	19	filter blank	T07-12117	CARB	0.054 ± 0.007	0.015 ± 0.027	-----
Ca	20	filter blank	T07-12117	CARB	0.032 ± 0.007	0.016 ± 0.022	-----
Sc	21	filter blank	T07-12117	CARB	-----	0.039 ± 0.025	-----
Ti	22	filter blank	T07-12117	CARB	0.007 ± 0.006	-0.026 ± 0.040	-----
V	23	filter blank	T07-12117	CARB	0.000 ± 0.012	-0.025 ± 0.026	-----
Cr	24	filter blank	T07-12117	CARB	0.018 ± 0.003	0.017 ± 0.013	-----
Mn	25	filter blank	T07-12117	CARB	0.003 ± 0.002	0.046 ± 0.030	-----
Fe	26	filter blank	T07-12117	CARB	0.017 ± 0.002	-0.081 ± 0.106	-----
Co	27	filter blank	T07-12117	CARB	0.000 ± 0.002	0.009 ± 0.054	-----
Ni	28	filter blank	T07-12117	CARB	0.002 ± 0.002	0.072 ± 0.053	-----
Cu	29	filter blank	T07-12117	CARB	0.023 ± 0.005	0.029 ± 0.025	-----
Zn	30	filter blank	T07-12117	CARB	0.000 ± 0.007	-0.008 ± 0.016	-----
Ga	31	filter blank	T07-12117	CARB	-----	0.028 ± 0.014	-----
As	33	filter blank	T07-12117	CARB	0.000 ± 0.006	-0.009 ± 0.015	-----
Se	34	filter blank	T07-12117	CARB	0.000 ± 0.006	-0.013 ± 0.010	-----
Br	35	filter blank	T07-12117	CARB	0.000 ± 0.002	-0.005 ± 0.011	-----
Rb	37	filter blank	T07-12117	CARB	0.000 ± 0.005	-0.005 ± 0.011	-----
Sr	38	filter blank	T07-12117	CARB	0.000 ± 0.008	0.009 ± 0.013	-----
Y	39	filter blank	T07-12117	CARB	0.010 ± 0.005	0.008 ± 0.051	-----
Zr	40	filter blank	T07-12117	CARB	-----	-0.084 ± 0.041	-----
Nb	41	filter blank	T07-12117	CARB	-----	-0.047 ± 0.048	-----
Mo	42	filter blank	T07-12117	CARB	0.000 ± 0.021	0.032 ± 0.050	-----
Ag	47	filter blank	T07-12117	CARB	-----	-0.035 ± 0.042	-----
Cd	48	filter blank	T07-12117	CARB	-----	0.048 ± 0.050	-----
In	49	filter blank	T07-12117	CARB	-----	0.139 ± 0.059	-----
Sn	50	filter blank	T07-12117	CARB	0.149 ± 0.041	-0.002 ± 0.056	-----
Sb	51	filter blank	T07-12117	CARB	0.037 ± 0.055	0.090 ± 0.061	-----
Cs	55	filter blank	T07-12117	CARB	-----	0.119 ± 0.048	-----
Ba	56	filter blank	T07-12117	CARB	0.088 ± 0.015	0.102 ± 0.079	-----
La	57	filter blank	T07-12117	CARB	-----	-0.053 ± 0.044	-----
Ce	58	filter blank	T07-12117	CARB	-----	0.029 ± 0.065	-----
Sm	62	filter blank	T07-12117	CARB	-----	0.029 ± 0.040	-----
Eu	63	filter blank	T07-12117	CARB	-----	0.047 ± 0.276	-----
Tb	65	filter blank	T07-12117	CARB	-----	-0.155 ± 0.168	-----
Hf	72	filter blank	T07-12117	CARB	-----	-----	-----
Ta	73	filter blank	T07-12117	CARB	-----	-0.092 ± 0.052	-----
W	74	filter blank	T07-12117	CARB	-----	0.063 ± 0.051	-----
Ir	77	filter blank	T07-12117	CARB	-----	-----	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Au	79	filter blank	T07-12117	CARB	-----	-0.055 ± 0.028	-----
Hg	80	filter blank	T07-12117	CARB	0.010 ± 0.007	0.022 ± 0.026	-----
Pb	82	filter blank	T07-12117	CARB	0.008 ± 0.005	-0.007 ± 0.029	-----
Na	11	filter blank	T07-12118	DRI	0.110 ± 1.377	-----	-----
Mg	12	filter blank	T07-12118	DRI	0.000 ± 0.710	-----	-----
Al	13	filter blank	T07-12118	DRI	0.000 ± 0.118	1.440 ± 0.613	-----
Si	14	filter blank	T07-12118	DRI	0.000 ± 0.131	0.258 ± 0.226	-----
P	15	filter blank	T07-12118	DRI	0.000 ± 0.038	0.115 ± 0.144	-----
S	16	filter blank	T07-12118	DRI	0.000 ± 0.104	-0.130 ± 0.076	-----
Cl	17	filter blank	T07-12118	DRI	0.035 ± 0.026	-0.093 ± 0.069	-----
K	19	filter blank	T07-12118	DRI	0.009 ± 0.024	-0.018 ± 0.028	-----
Ca	20	filter blank	T07-12118	DRI	0.000 ± 0.028	-0.005 ± 0.023	-----
Sc	21	filter blank	T07-12118	DRI	0.015 ± 0.094	0.060 ± 0.026	-----
Ti	22	filter blank	T07-12118	DRI	0.007 ± 0.018	-0.074 ± 0.040	-----
V	23	filter blank	T07-12118	DRI	0.000 ± 0.001	0.017 ± 0.026	-----
Cr	24	filter blank	T07-12118	DRI	0.012 ± 0.016	0.015 ± 0.013	-----
Mn	25	filter blank	T07-12118	DRI	0.000 ± 0.034	0.041 ± 0.030	-----
Fe	26	filter blank	T07-12118	DRI	0.026 ± 0.043	-0.161 ± 0.110	-----
Co	27	filter blank	T07-12118	DRI	0.000 ± 0.001	-0.021 ± 0.055	-----
Ni	28	filter blank	T07-12118	DRI	0.007 ± 0.008	0.009 ± 0.056	-----
Cu	29	filter blank	T07-12118	DRI	0.008 ± 0.015	-0.050 ± 0.025	-----
Zn	30	filter blank	T07-12118	DRI	0.019 ± 0.015	-0.020 ± 0.017	-----
Ga	31	filter blank	T07-12118	DRI	0.000 ± 0.051	-0.006 ± 0.015	-----
As	33	filter blank	T07-12118	DRI	0.000 ± 0.012	-0.009 ± 0.016	-----
Se	34	filter blank	T07-12118	DRI	0.000 ± 0.034	0.012 ± 0.012	-----
Br	35	filter blank	T07-12118	DRI	0.000 ± 0.024	0.013 ± 0.012	-----
Rb	37	filter blank	T07-12118	DRI	0.000 ± 0.018	0.027 ± 0.012	-----
Sr	38	filter blank	T07-12118	DRI	0.000 ± 0.032	0.011 ± 0.014	-----
Y	39	filter blank	T07-12118	DRI	0.000 ± 0.024	0.097 ± 0.055	-----
Zr	40	filter blank	T07-12118	DRI	0.000 ± 0.055	-0.074 ± 0.043	-----
Nb	41	filter blank	T07-12118	DRI	0.000 ± 0.043	-0.070 ± 0.049	-----
Mo	42	filter blank	T07-12118	DRI	0.019 ± 0.038	0.067 ± 0.052	-----
Ag	47	filter blank	T07-12118	DRI	0.050 ± 0.068	0.059 ± 0.046	-----
Cd	48	filter blank	T07-12118	DRI	0.072 ± 0.084	0.047 ± 0.052	-----
In	49	filter blank	T07-12118	DRI	0.020 ± 0.050	0.131 ± 0.060	-----
Sn	50	filter blank	T07-12118	DRI	0.000 ± 0.063	-0.047 ± 0.057	-----
Sb	51	filter blank	T07-12118	DRI	0.000 ± 0.119	0.062 ± 0.063	-----
Cs	55	filter blank	T07-12118	DRI	0.001 ± 0.019	0.078 ± 0.046	-----
Ba	56	filter blank	T07-12118	DRI	0.000 ± 0.009	0.225 ± 0.081	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
La	57	filter blank	T07-12118	DRI	0.000 ± 0.015	-0.031 ± 0.044	-----
Ce	58	filter blank	T07-12118	DRI	0.000 ± 0.020	-0.122 ± 0.065	-----
Sm	62	filter blank	T07-12118	DRI	0.024 ± 0.028	-0.013 ± 0.040	-----
Eu	63	filter blank	T07-12118	DRI	0.000 ± 0.104	0.109 ± 0.283	-----
Tb	65	filter blank	T07-12118	DRI	0.000 ± 0.036	0.157 ± 0.175	-----
Hf	72	filter blank	T07-12118	DRI	0.052 ± 0.229	-----	-----
Ta	73	filter blank	T07-12118	DRI	0.000 ± 0.192	0.046 ± 0.056	-----
W	74	filter blank	T07-12118	DRI	0.063 ± 0.275	0.015 ± 0.053	-----
Ir	77	filter blank	T07-12118	DRI	0.000 ± 0.060	-----	-----
Au	79	filter blank	T07-12118	DRI	0.000 ± 0.127	-0.034 ± 0.029	-----
Hg	80	filter blank	T07-12118	DRI	0.000 ± 0.038	-0.046 ± 0.026	-----
Pb	82	filter blank	T07-12118	DRI	0.052 ± 0.042	0.034 ± 0.031	-----
Na	11	filter blank	T07-12119	DRI	0.000 ± 1.366	-----	-----
Mg	12	filter blank	T07-12119	DRI	0.000 ± 0.709	-----	-----
Al	13	filter blank	T07-12119	DRI	0.010 ± 0.118	1.739 ± 0.577	-----
Si	14	filter blank	T07-12119	DRI	0.000 ± 0.130	0.179 ± 0.208	-----
P	15	filter blank	T07-12119	DRI	0.000 ± 0.037	0.342 ± 0.140	-----
S	16	filter blank	T07-12119	DRI	0.000 ± 0.104	0.115 ± 0.074	-----
Cl	17	filter blank	T07-12119	DRI	0.002 ± 0.026	0.153 ± 0.068	-----
K	19	filter blank	T07-12119	DRI	0.000 ± 0.024	0.015 ± 0.027	-----
Ca	20	filter blank	T07-12119	DRI	0.018 ± 0.028	0.023 ± 0.022	-----
Sc	21	filter blank	T07-12119	DRI	0.000 ± 0.094	0.013 ± 0.024	-----
Ti	22	filter blank	T07-12119	DRI	0.001 ± 0.018	0.026 ± 0.038	-----
V	23	filter blank	T07-12119	DRI	0.000 ± 0.001	-0.022 ± 0.025	-----
Cr	24	filter blank	T07-12119	DRI	0.003 ± 0.016	-0.003 ± 0.012	-----
Mn	25	filter blank	T07-12119	DRI	0.000 ± 0.034	0.005 ± 0.028	-----
Fe	26	filter blank	T07-12119	DRI	0.023 ± 0.043	0.182 ± 0.103	-----
Co	27	filter blank	T07-12119	DRI	0.000 ± 0.001	0.063 ± 0.052	-----
Ni	28	filter blank	T07-12119	DRI	0.000 ± 0.008	-0.012 ± 0.052	-----
Cu	29	filter blank	T07-12119	DRI	0.000 ± 0.015	0.009 ± 0.024	-----
Zn	30	filter blank	T07-12119	DRI	0.006 ± 0.015	-0.011 ± 0.015	-----
Ga	31	filter blank	T07-12119	DRI	0.021 ± 0.051	0.011 ± 0.014	-----
As	33	filter blank	T07-12119	DRI	0.000 ± 0.012	-0.016 ± 0.015	-----
Se	34	filter blank	T07-12119	DRI	0.009 ± 0.034	0.019 ± 0.011	-----
Br	35	filter blank	T07-12119	DRI	0.000 ± 0.024	0.003 ± 0.011	-----
Rb	37	filter blank	T07-12119	DRI	0.000 ± 0.018	0.032 ± 0.011	-----
Sr	38	filter blank	T07-12119	DRI	0.000 ± 0.032	0.012 ± 0.013	-----
Y	39	filter blank	T07-12119	DRI	0.000 ± 0.024	-0.021 ± 0.048	-----
Zr	40	filter blank	T07-12119	DRI	0.000 ± 0.055	0.108 ± 0.047	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Nb	41	filter blank	T07-12119	DRI	0.011 ± 0.043	0.031 ± 0.050	-----
Mo	42	filter blank	T07-12119	DRI	0.000 ± 0.038	0.009 ± 0.049	-----
Ag	47	filter blank	T07-12119	DRI	0.000 ± 0.068	0.014 ± 0.042	-----
Cd	48	filter blank	T07-12119	DRI	0.141 ± 0.084	0.053 ± 0.049	-----
In	49	filter blank	T07-12119	DRI	0.000 ± 0.051	-0.041 ± 0.053	-----
Sn	50	filter blank	T07-12119	DRI	0.052 ± 0.063	0.023 ± 0.055	-----
Sb	51	filter blank	T07-12119	DRI	0.068 ± 0.119	0.145 ± 0.062	-----
Cs	55	filter blank	T07-12119	DRI	0.003 ± 0.019	0.085 ± 0.045	-----
Ba	56	filter blank	T07-12119	DRI	0.000 ± 0.009	0.084 ± 0.076	-----
La	57	filter blank	T07-12119	DRI	0.000 ± 0.015	-0.052 ± 0.041	-----
Ce	58	filter blank	T07-12119	DRI	0.000 ± 0.020	0.039 ± 0.061	-----
Sm	62	filter blank	T07-12119	DRI	0.019 ± 0.028	0.032 ± 0.038	-----
Eu	63	filter blank	T07-12119	DRI	0.000 ± 0.104	-0.241 ± 0.263	-----
Tb	65	filter blank	T07-12119	DRI	0.000 ± 0.035	-0.220 ± 0.160	-----
Hf	72	filter blank	T07-12119	DRI	0.055 ± 0.229	-----	-----
Ta	73	filter blank	T07-12119	DRI	0.000 ± 0.191	0.056 ± 0.052	-----
W	74	filter blank	T07-12119	DRI	0.000 ± 0.275	0.028 ± 0.049	-----
Ir	77	filter blank	T07-12119	DRI	0.000 ± 0.060	-----	-----
Au	79	filter blank	T07-12119	DRI	0.011 ± 0.128	-0.027 ± 0.027	-----
Hg	80	filter blank	T07-12119	DRI	0.000 ± 0.038	0.019 ± 0.024	-----
Pb	82	filter blank	T07-12119	DRI	0.009 ± 0.042	0.042 ± 0.028	-----
Na	11	filter blank	T07-12120	ODEQ	-----	-----	-----
Mg	12	filter blank	T07-12120	ODEQ	-----	-----	-----
Al	13	filter blank	T07-12120	ODEQ	-0.008 ± 0.056	0.630 ± 0.564	-----
Si	14	filter blank	T07-12120	ODEQ	-0.014 ± 0.039	0.097 ± 0.212	-----
P	15	filter blank	T07-12120	ODEQ	-0.004 ± 0.042	0.350 ± 0.141	-----
S	16	filter blank	T07-12120	ODEQ	0.031 ± 0.072	0.092 ± 0.076	-----
Cl	17	filter blank	T07-12120	ODEQ	-0.058 ± 0.053	0.040 ± 0.068	-----
K	19	filter blank	T07-12120	ODEQ	-0.005 ± 0.028	0.003 ± 0.027	-----
Ca	20	filter blank	T07-12120	ODEQ	-0.005 ± 0.022	0.021 ± 0.022	-----
Sc	21	filter blank	T07-12120	ODEQ	0.001 ± 0.024	-0.002 ± 0.025	-----
Ti	22	filter blank	T07-12120	ODEQ	0.002 ± 0.052	-0.001 ± 0.040	-----
V	23	filter blank	T07-12120	ODEQ	-0.006 ± 0.021	-0.026 ± 0.025	-----
Cr	24	filter blank	T07-12120	ODEQ	-0.005 ± 0.010	-0.012 ± 0.013	-----
Mn	25	filter blank	T07-12120	ODEQ	-0.024 ± 0.015	-0.016 ± 0.029	-----
Fe	26	filter blank	T07-12120	ODEQ	-0.007 ± 0.015	-0.088 ± 0.109	-----
Co	27	filter blank	T07-12120	ODEQ	-0.008 ± 0.011	0.005 ± 0.055	-----
Ni	28	filter blank	T07-12120	ODEQ	-0.004 ± 0.012	-0.043 ± 0.054	-----
Cu	29	filter blank	T07-12120	ODEQ	-0.017 ± 0.013	-0.020 ± 0.024	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Zn	30	filter blank	T07-12120	ODEQ	-0.011 ± 0.009	0.006 ± 0.017	-----
Ga	31	filter blank	T07-12120	ODEQ	0.005 ± 0.059	0.003 ± 0.014	-----
As	33	filter blank	T07-12120	ODEQ	0.001 ± 0.013	0.002 ± 0.015	-----
Se	34	filter blank	T07-12120	ODEQ	0.002 ± 0.011	0.008 ± 0.011	-----
Br	35	filter blank	T07-12120	ODEQ	0.005 ± 0.009	0.018 ± 0.011	-----
Rb	37	filter blank	T07-12120	ODEQ	0.001 ± 0.009	-0.002 ± 0.011	-----
Sr	38	filter blank	T07-12120	ODEQ	-0.006 ± 0.010	-0.017 ± 0.013	-----
Y	39	filter blank	T07-12120	ODEQ	-0.006 ± 0.011	0.012 ± 0.052	-----
Zr	40	filter blank	T07-12120	ODEQ	-0.008 ± 0.012	0.092 ± 0.050	-----
Nb	41	filter blank	T07-12120	ODEQ	0.004 ± 0.015	-0.125 ± 0.047	-----
Mo	42	filter blank	T07-12120	ODEQ	0.000 ± 0.018	-0.043 ± 0.049	-----
Ag	47	filter blank	T07-12120	ODEQ	0.009 ± 0.047	-0.024 ± 0.043	-----
Cd	48	filter blank	T07-12120	ODEQ	0.010 ± 0.043	-0.001 ± 0.049	-----
In	49	filter blank	T07-12120	ODEQ	0.047 ± 0.044	0.015 ± 0.056	-----
Sn	50	filter blank	T07-12120	ODEQ	0.022 ± 0.054	0.022 ± 0.057	-----
Sb	51	filter blank	T07-12120	ODEQ	-0.025 ± 0.064	0.012 ± 0.061	-----
Cs	55	filter blank	T07-12120	ODEQ	-0.025 ± 0.105	0.021 ± 0.045	-----
Ba	56	filter blank	T07-12120	ODEQ	-0.092 ± 0.227	0.120 ± 0.080	-----
La	57	filter blank	T07-12120	ODEQ	0.036 ± 0.173	-0.012 ± 0.043	-----
Ce	58	filter blank	T07-12120	ODEQ	-0.044 ± 0.213	-0.005 ± 0.064	-----
Sm	62	filter blank	T07-12120	ODEQ	-0.280 ± 0.817	0.029 ± 0.040	-----
Eu	63	filter blank	T07-12120	ODEQ	-0.778 ± 1.797	0.340 ± 0.276	-----
Tb	65	filter blank	T07-12120	ODEQ	-1.750 ± 2.867	0.189 ± 0.172	-----
Hf	72	filter blank	T07-12120	ODEQ	-0.020 ± 0.173	-----	-----
Ta	73	filter blank	T07-12120	ODEQ	0.016 ± 0.198	0.062 ± 0.053	-----
W	74	filter blank	T07-12120	ODEQ	-0.017 ± 0.049	-0.034 ± 0.052	-----
Ir	77	filter blank	T07-12120	ODEQ	0.014 ± 0.038	-----	-----
Au	79	filter blank	T07-12120	ODEQ	0.000 ± 0.029	0.010 ± 0.029	-----
Hg	80	filter blank	T07-12120	ODEQ	-0.004 ± 0.026	-0.013 ± 0.024	-----
Pb	82	filter blank	T07-12120	ODEQ	0.005 ± 0.030	-0.008 ± 0.029	-----
Na	11	filter blank	T07-12121	ODEQ	-----	-----	-----
Mg	12	filter blank	T07-12121	ODEQ	-----	-----	-----
Al	13	filter blank	T07-12121	ODEQ	0.090 ± 0.057	0.808 ± 0.603	-----
Si	14	filter blank	T07-12121	ODEQ	-0.002 ± 0.039	0.134 ± 0.224	-----
P	15	filter blank	T07-12121	ODEQ	0.001 ± 0.042	0.201 ± 0.147	-----
S	16	filter blank	T07-12121	ODEQ	-0.035 ± 0.073	-0.020 ± 0.078	-----
Cl	17	filter blank	T07-12121	ODEQ	-0.022 ± 0.054	0.088 ± 0.072	-----
K	19	filter blank	T07-12121	ODEQ	0.007 ± 0.029	0.002 ± 0.028	-----
Ca	20	filter blank	T07-12121	ODEQ	-0.004 ± 0.022	-0.033 ± 0.023	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Sc	21	filter blank	T07-12121	ODEQ	-0.015 ± 0.023	0.046 ± 0.026	-----
Ti	22	filter blank	T07-12121	ODEQ	0.029 ± 0.054	0.034 ± 0.041	-----
V	23	filter blank	T07-12121	ODEQ	0.007 ± 0.022	-0.049 ± 0.026	-----
Cr	24	filter blank	T07-12121	ODEQ	0.013 ± 0.011	-0.001 ± 0.013	-----
Mn	25	filter blank	T07-12121	ODEQ	-0.008 ± 0.015	-0.003 ± 0.031	-----
Fe	26	filter blank	T07-12121	ODEQ	-0.005 ± 0.015	-0.275 ± 0.107	-----
Co	27	filter blank	T07-12121	ODEQ	-0.001 ± 0.011	-0.054 ± 0.056	-----
Ni	28	filter blank	T07-12121	ODEQ	0.004 ± 0.012	-0.025 ± 0.056	-----
Cu	29	filter blank	T07-12121	ODEQ	-0.001 ± 0.013	-0.026 ± 0.026	-----
Zn	30	filter blank	T07-12121	ODEQ	0.003 ± 0.009	-0.004 ± 0.018	-----
Ga	31	filter blank	T07-12121	ODEQ	-0.002 ± 0.058	0.020 ± 0.015	-----
As	33	filter blank	T07-12121	ODEQ	-0.009 ± 0.014	0.016 ± 0.016	-----
Se	34	filter blank	T07-12121	ODEQ	0.001 ± 0.011	0.021 ± 0.011	-----
Br	35	filter blank	T07-12121	ODEQ	0.003 ± 0.010	-0.002 ± 0.012	-----
Rb	37	filter blank	T07-12121	ODEQ	0.006 ± 0.009	-0.022 ± 0.011	-----
Sr	38	filter blank	T07-12121	ODEQ	0.004 ± 0.011	-0.029 ± 0.014	-----
Y	39	filter blank	T07-12121	ODEQ	0.004 ± 0.012	0.084 ± 0.055	-----
Zr	40	filter blank	T07-12121	ODEQ	0.012 ± 0.013	0.064 ± 0.048	-----
Nb	41	filter blank	T07-12121	ODEQ	0.001 ± 0.016	-0.027 ± 0.051	-----
Mo	42	filter blank	T07-12121	ODEQ	0.012 ± 0.019	-0.059 ± 0.050	-----
Ag	47	filter blank	T07-12121	ODEQ	-0.028 ± 0.048	-0.011 ± 0.045	-----
Cd	48	filter blank	T07-12121	ODEQ	-0.021 ± 0.043	0.095 ± 0.054	-----
In	49	filter blank	T07-12121	ODEQ	-0.013 ± 0.045	-0.102 ± 0.057	-----
Sn	50	filter blank	T07-12121	ODEQ	-0.048 ± 0.055	-0.034 ± 0.058	-----
Sb	51	filter blank	T07-12121	ODEQ	-0.003 ± 0.065	0.073 ± 0.064	-----
Cs	55	filter blank	T07-12121	ODEQ	-0.030 ± 0.108	0.046 ± 0.046	-----
Ba	56	filter blank	T07-12121	ODEQ	0.049 ± 0.230	-0.056 ± 0.080	-----
La	57	filter blank	T07-12121	ODEQ	0.006 ± 0.179	-0.028 ± 0.044	-----
Ce	58	filter blank	T07-12121	ODEQ	0.161 ± 0.221	0.096 ± 0.066	-----
Sm	62	filter blank	T07-12121	ODEQ	0.548 ± 0.841	-0.035 ± 0.040	-----
Eu	63	filter blank	T07-12121	ODEQ	0.656 ± 1.836	0.367 ± 0.288	-----
Tb	65	filter blank	T07-12121	ODEQ	3.446 ± 2.942	0.164 ± 0.174	-----
Hf	72	filter blank	T07-12121	ODEQ	0.032 ± 0.174	-----	-----
Ta	73	filter blank	T07-12121	ODEQ	-0.047 ± 0.198	0.018 ± 0.056	-----
W	74	filter blank	T07-12121	ODEQ	0.099 ± 0.051	0.041 ± 0.053	-----
Ir	77	filter blank	T07-12121	ODEQ	0.014 ± 0.038	-----	-----
Au	79	filter blank	T07-12121	ODEQ	0.061 ± 0.030	-0.002 ± 0.031	-----
Hg	80	filter blank	T07-12121	ODEQ	0.045 ± 0.027	-0.028 ± 0.026	-----
Pb	82	filter blank	T07-12121	ODEQ	0.020 ± 0.030	-0.035 ± 0.030	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Na	11	filter blank	T07-12122	RTI	0.000 ± 0.033	-----	-----
Mg	12	filter blank	T07-12122	RTI	0.000 ± 0.011	-----	-----
Al	13	filter blank	T07-12122	RTI	0.000 ± 0.057	0.005 ± 0.573	-----
Si	14	filter blank	T07-12122	RTI	0.000 ± 0.027	-0.023 ± 0.219	-----
P	15	filter blank	T07-12122	RTI	0.000 ± 0.023	0.211 ± 0.143	-----
S	16	filter blank	T07-12122	RTI	0.000 ± 0.014	-0.028 ± 0.076	-----
Cl	17	filter blank	T07-12122	RTI	0.000 ± 0.010	0.022 ± 0.071	-----
K	19	filter blank	T07-12122	RTI	0.000 ± 0.005	-0.004 ± 0.028	-----
Ca	20	filter blank	T07-12122	RTI	0.000 ± 0.004	-0.017 ± 0.023	-----
Sc	21	filter blank	T07-12122	RTI	0.000 ± 0.004	0.001 ± 0.026	-----
Ti	22	filter blank	T07-12122	RTI	0.000 ± 0.011	0.011 ± 0.042	-----
V	23	filter blank	T07-12122	RTI	0.010 ± 0.010	-0.024 ± 0.026	-----
Cr	24	filter blank	T07-12122	RTI	0.000 ± 0.006	-0.018 ± 0.013	-----
Mn	25	filter blank	T07-12122	RTI	0.000 ± 0.005	-0.023 ± 0.030	-----
Fe	26	filter blank	T07-12122	RTI	0.000 ± 0.004	0.005 ± 0.114	-----
Co	27	filter blank	T07-12122	RTI	0.003 ± 0.004	0.105 ± 0.056	-----
Ni	28	filter blank	T07-12122	RTI	0.000 ± 0.003	-0.065 ± 0.056	-----
Cu	29	filter blank	T07-12122	RTI	0.003 ± 0.004	-0.017 ± 0.025	-----
Zn	30	filter blank	T07-12122	RTI	0.000 ± 0.003	-0.009 ± 0.017	-----
Ga	31	filter blank	T07-12122	RTI	0.000 ± 0.008	-0.014 ± 0.014	-----
As	33	filter blank	T07-12122	RTI	0.000 ± 0.006	-0.010 ± 0.016	-----
Se	34	filter blank	T07-12122	RTI	0.000 ± 0.006	-0.014 ± 0.011	-----
Br	35	filter blank	T07-12122	RTI	0.001 ± 0.007	-0.011 ± 0.011	-----
Rb	37	filter blank	T07-12122	RTI	0.000 ± 0.004	0.011 ± 0.012	-----
Sr	38	filter blank	T07-12122	RTI	0.000 ± 0.004	0.009 ± 0.014	-----
Y	39	filter blank	T07-12122	RTI	0.000 ± 0.004	0.027 ± 0.054	-----
Zr	40	filter blank	T07-12122	RTI	0.000 ± 0.005	-0.003 ± 0.045	-----
Nb	41	filter blank	T07-12122	RTI	0.000 ± 0.004	0.000 ± 0.052	-----
Mo	42	filter blank	T07-12122	RTI	0.000 ± 0.003	-0.040 ± 0.049	-----
Ag	47	filter blank	T07-12122	RTI	0.000 ± 0.043	-0.061 ± 0.043	-----
Cd	48	filter blank	T07-12122	RTI	0.000 ± 0.046	0.046 ± 0.051	-----
In	49	filter blank	T07-12122	RTI	0.000 ± 0.049	-0.002 ± 0.057	-----
Sn	50	filter blank	T07-12122	RTI	0.000 ± 0.062	-0.091 ± 0.057	-----
Sb	51	filter blank	T07-12122	RTI	0.000 ± 0.067	0.042 ± 0.063	-----
Cs	55	filter blank	T07-12122	RTI	0.000 ± 0.009	-0.024 ± 0.047	-----
Ba	56	filter blank	T07-12122	RTI	0.000 ± 0.027	0.190 ± 0.084	-----
La	57	filter blank	T07-12122	RTI	0.000 ± 0.022	-0.124 ± 0.041	-----
Ce	58	filter blank	T07-12122	RTI	0.000 ± 0.019	-0.055 ± 0.067	-----
Sm	62	filter blank	T07-12122	RTI	0.007 ± 0.016	-0.015 ± 0.041	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Eu	63	filter blank	T07-12122	RTI	0.006 ± 0.016	0.387 ± 0.288	-----
Tb	65	filter blank	T07-12122	RTI	0.000 ± 0.009	-0.259 ± 0.175	-----
Hf	72	filter blank	T07-12122	RTI	0.000 ± 0.007	-----	-----
Ta	73	filter blank	T07-12122	RTI	0.015 ± 0.036	0.018 ± 0.054	-----
W	74	filter blank	T07-12122	RTI	0.000 ± 0.023	-0.025 ± 0.052	-----
Ir	77	filter blank	T07-12122	RTI	0.000 ± 0.024	-----	-----
Au	79	filter blank	T07-12122	RTI	0.011 ± 0.017	0.017 ± 0.030	-----
Hg	80	filter blank	T07-12122	RTI	0.000 ± 0.029	-0.007 ± 0.025	-----
Pb	82	filter blank	T07-12122	RTI	0.000 ± 0.015	0.001 ± 0.030	-----
Na	11	filter blank	T07-12123	RTI	0.000 ± 0.033	-----	-----
Mg	12	filter blank	T07-12123	RTI	0.000 ± 0.011	-----	-----
Al	13	filter blank	T07-12123	RTI	0.000 ± 0.057	1.152 ± 0.584	-----
Si	14	filter blank	T07-12123	RTI	0.009 ± 0.041	0.489 ± 0.221	-----
P	15	filter blank	T07-12123	RTI	0.000 ± 0.023	0.032 ± 0.139	-----
S	16	filter blank	T07-12123	RTI	0.000 ± 0.014	-0.039 ± 0.075	-----
Cl	17	filter blank	T07-12123	RTI	0.000 ± 0.010	-0.034 ± 0.068	-----
K	19	filter blank	T07-12123	RTI	0.000 ± 0.005	-0.016 ± 0.027	-----
Ca	20	filter blank	T07-12123	RTI	0.000 ± 0.004	-0.018 ± 0.022	-----
Sc	21	filter blank	T07-12123	RTI	0.000 ± 0.004	0.058 ± 0.026	-----
Ti	22	filter blank	T07-12123	RTI	0.000 ± 0.011	-0.014 ± 0.039	-----
V	23	filter blank	T07-12123	RTI	0.000 ± 0.008	0.018 ± 0.025	-----
Cr	24	filter blank	T07-12123	RTI	0.009 ± 0.007	0.012 ± 0.013	-----
Mn	25	filter blank	T07-12123	RTI	0.000 ± 0.005	-0.031 ± 0.029	-----
Fe	26	filter blank	T07-12123	RTI	0.001 ± 0.005	-0.062 ± 0.107	-----
Co	27	filter blank	T07-12123	RTI	0.000 ± 0.003	-0.052 ± 0.054	-----
Ni	28	filter blank	T07-12123	RTI	0.000 ± 0.003	0.063 ± 0.054	-----
Cu	29	filter blank	T07-12123	RTI	0.000 ± 0.002	0.019 ± 0.025	-----
Zn	30	filter blank	T07-12123	RTI	0.000 ± 0.003	-0.003 ± 0.017	-----
Ga	31	filter blank	T07-12123	RTI	0.000 ± 0.008	0.040 ± 0.015	-----
As	33	filter blank	T07-12123	RTI	0.005 ± 0.006	-0.025 ± 0.016	-----
Se	34	filter blank	T07-12123	RTI	0.000 ± 0.006	0.023 ± 0.011	-----
Br	35	filter blank	T07-12123	RTI	0.000 ± 0.005	-0.001 ± 0.011	-----
Rb	37	filter blank	T07-12123	RTI	0.011 ± 0.006	0.015 ± 0.011	-----
Sr	38	filter blank	T07-12123	RTI	0.010 ± 0.006	0.011 ± 0.013	-----
Y	39	filter blank	T07-12123	RTI	0.000 ± 0.004	0.026 ± 0.051	-----
Zr	40	filter blank	T07-12123	RTI	0.003 ± 0.012	-0.029 ± 0.043	-----
Nb	41	filter blank	T07-12123	RTI	0.000 ± 0.004	0.025 ± 0.050	-----
Mo	42	filter blank	T07-12123	RTI	0.000 ± 0.003	0.071 ± 0.050	-----
Ag	47	filter blank	T07-12123	RTI	0.000 ± 0.043	0.009 ± 0.043	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Cd	48	filter blank	T07-12123	RTI	0.000 ± 0.046	0.038 ± 0.050	-----
In	49	filter blank	T07-12123	RTI	0.000 ± 0.049	-0.032 ± 0.056	-----
Sn	50	filter blank	T07-12123	RTI	0.000 ± 0.062	-0.037 ± 0.055	-----
Sb	51	filter blank	T07-12123	RTI	0.000 ± 0.067	0.078 ± 0.062	-----
Cs	55	filter blank	T07-12123	RTI	0.000 ± 0.009	-0.034 ± 0.043	-----
Ba	56	filter blank	T07-12123	RTI	0.000 ± 0.027	0.029 ± 0.078	-----
La	57	filter blank	T07-12123	RTI	0.000 ± 0.022	-0.003 ± 0.042	-----
Ce	58	filter blank	T07-12123	RTI	0.000 ± 0.019	-0.058 ± 0.062	-----
Sm	62	filter blank	T07-12123	RTI	0.000 ± 0.013	0.067 ± 0.040	-----
Eu	63	filter blank	T07-12123	RTI	0.000 ± 0.013	0.268 ± 0.272	-----
Tb	65	filter blank	T07-12123	RTI	0.000 ± 0.009	0.265 ± 0.171	-----
Hf	72	filter blank	T07-12123	RTI	0.000 ± 0.007	-----	-----
Ta	73	filter blank	T07-12123	RTI	0.000 ± 0.031	-0.029 ± 0.052	-----
W	74	filter blank	T07-12123	RTI	0.000 ± 0.023	0.065 ± 0.051	-----
Ir	77	filter blank	T07-12123	RTI	0.014 ± 0.025	-----	-----
Au	79	filter blank	T07-12123	RTI	0.000 ± 0.014	0.036 ± 0.028	-----
Hg	80	filter blank	T07-12123	RTI	0.002 ± 0.034	0.016 ± 0.025	-----
Pb	82	filter blank	T07-12123	RTI	0.000 ± 0.015	0.061 ± 0.030	-----
Na	11	filter blank	T07-12124	UCD	0.000 ± 0.000	-----	-----
Mg	12	filter blank	T07-12124	UCD	1.127 ± 0.360	-----	-----
Al	13	filter blank	T07-12124	UCD	0.000 ± 0.000	0.485 ± 0.577	-----
Si	14	filter blank	T07-12124	UCD	0.000 ± 0.000	0.275 ± 0.218	-----
P	15	filter blank	T07-12124	UCD	0.128 ± 0.041	0.067 ± 0.141	-----
S	16	filter blank	T07-12124	UCD	0.000 ± 0.000	-0.072 ± 0.075	-----
Cl	17	filter blank	T07-12124	UCD	0.109 ± 0.033	0.109 ± 0.071	-----
K	19	filter blank	T07-12124	UCD	0.096 ± 0.017	0.031 ± 0.028	-----
Ca	20	filter blank	T07-12124	UCD	0.021 ± 0.006	0.023 ± 0.022	-----
Sc	21	filter blank	T07-12124	UCD	-----	-0.006 ± 0.025	-----
Ti	22	filter blank	T07-12124	UCD	0.019 ± 0.004	-0.034 ± 0.039	-----
V	23	filter blank	T07-12124	UCD	0.000 ± 0.000	0.012 ± 0.027	-----
Cr	24	filter blank	T07-12124	UCD	0.005 ± 0.002	0.004 ± 0.013	-----
Mn	25	filter blank	T07-12124	UCD	0.005 ± 0.002	-0.002 ± 0.029	-----
Fe	26	filter blank	T07-12124	UCD	0.006 ± 0.002	-0.094 ± 0.109	-----
Co	27	filter blank	T07-12124	UCD	-----	0.045 ± 0.054	-----
Ni	28	filter blank	T07-12124	UCD	0.000 ± 0.000	-0.024 ± 0.056	-----
Cu	29	filter blank	T07-12124	UCD	0.000 ± 0.000	-0.018 ± 0.025	-----
Zn	30	filter blank	T07-12124	UCD	0.000 ± 0.000	0.023 ± 0.018	-----
Ga	31	filter blank	T07-12124	UCD	-----	0.022 ± 0.015	-----
As	33	filter blank	T07-12124	UCD	0.000 ± 0.000	-0.026 ± 0.016	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Se	34	filter blank	T07-12124	UCD	0.004 ± 0.001	-0.018 ± 0.010	-----
Br	35	filter blank	T07-12124	UCD	0.000 ± 0.000	-0.025 ± 0.011	-----
Rb	37	filter blank	T07-12124	UCD	0.000 ± 0.000	0.001 ± 0.011	-----
Sr	38	filter blank	T07-12124	UCD	0.000 ± 0.000	-0.002 ± 0.013	-----
Y	39	filter blank	T07-12124	UCD	-----	-0.030 ± 0.050	-----
Zr	40	filter blank	T07-12124	UCD	0.000 ± 0.000	0.035 ± 0.046	-----
Nb	41	filter blank	T07-12124	UCD	-----	0.020 ± 0.051	-----
Mo	42	filter blank	T07-12124	UCD	-----	-0.052 ± 0.050	-----
Ag	47	filter blank	T07-12124	UCD	-----	-0.021 ± 0.043	-----
Cd	48	filter blank	T07-12124	UCD	-----	0.039 ± 0.051	-----
In	49	filter blank	T07-12124	UCD	-----	-0.090 ± 0.056	-----
Sn	50	filter blank	T07-12124	UCD	-----	-0.060 ± 0.057	-----
Sb	51	filter blank	T07-12124	UCD	-----	0.120 ± 0.065	-----
Cs	55	filter blank	T07-12124	UCD	-----	0.011 ± 0.046	-----
Ba	56	filter blank	T07-12124	UCD	-----	0.063 ± 0.078	-----
La	57	filter blank	T07-12124	UCD	-----	-0.014 ± 0.044	-----
Ce	58	filter blank	T07-12124	UCD	-----	-0.007 ± 0.065	-----
Sm	62	filter blank	T07-12124	UCD	-----	0.058 ± 0.041	-----
Eu	63	filter blank	T07-12124	UCD	-----	0.117 ± 0.280	-----
Tb	65	filter blank	T07-12124	UCD	-----	0.059 ± 0.169	-----
Hf	72	filter blank	T07-12124	UCD	-----	-----	-----
Ta	73	filter blank	T07-12124	UCD	-----	0.022 ± 0.055	-----
W	74	filter blank	T07-12124	UCD	-----	-0.046 ± 0.051	-----
Ir	77	filter blank	T07-12124	UCD	-----	-----	-----
Au	79	filter blank	T07-12124	UCD	-----	0.007 ± 0.029	-----
Hg	80	filter blank	T07-12124	UCD	-----	0.032 ± 0.026	-----
Pb	82	filter blank	T07-12124	UCD	0.000 ± 0.000	0.006 ± 0.030	-----
Na	11	filter blank	T07-12125	UCD	0.000 ± 0.000	-----	-----
Mg	12	filter blank	T07-12125	UCD	0.000 ± 0.000	-----	-----
Al	13	filter blank	T07-12125	UCD	0.284 ± 0.118	0.667 ± 0.559	-----
Si	14	filter blank	T07-12125	UCD	0.000 ± 0.000	-0.066 ± 0.206	-----
P	15	filter blank	T07-12125	UCD	0.000 ± 0.000	0.289 ± 0.139	-----
S	16	filter blank	T07-12125	UCD	0.000 ± 0.000	-0.022 ± 0.074	-----
Cl	17	filter blank	T07-12125	UCD	0.109 ± 0.029	0.079 ± 0.068	-----
K	19	filter blank	T07-12125	UCD	0.053 ± 0.018	-0.016 ± 0.027	-----
Ca	20	filter blank	T07-12125	UCD	0.000 ± 0.000	-0.031 ± 0.022	-----
Sc	21	filter blank	T07-12125	UCD	-----	-0.003 ± 0.026	-----
Ti	22	filter blank	T07-12125	UCD	0.012 ± 0.003	0.012 ± 0.040	-----
V	23	filter blank	T07-12125	UCD	0.000 ± 0.000	0.009 ± 0.026	-----

Table 13. XRF PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Cr	24	filter blank	T07-12125	UCD	0.000 ± 0.000	-0.007 ± 0.012	-----
Mn	25	filter blank	T07-12125	UCD	0.000 ± 0.000	0.060 ± 0.029	-----
Fe	26	filter blank	T07-12125	UCD	0.008 ± 0.002	-0.104 ± 0.104	-----
Co	27	filter blank	T07-12125	UCD	-----	-0.040 ± 0.053	-----
Ni	28	filter blank	T07-12125	UCD	0.000 ± 0.000	-0.005 ± 0.052	-----
Cu	29	filter blank	T07-12125	UCD	0.000 ± 0.000	-0.023 ± 0.024	-----
Zn	30	filter blank	T07-12125	UCD	0.000 ± 0.000	-0.019 ± 0.016	-----
Ga	31	filter blank	T07-12125	UCD	-----	0.020 ± 0.014	-----
As	33	filter blank	T07-12125	UCD	0.000 ± 0.000	-0.003 ± 0.015	-----
Se	34	filter blank	T07-12125	UCD	0.000 ± 0.000	0.006 ± 0.010	-----
Br	35	filter blank	T07-12125	UCD	0.000 ± 0.000	0.007 ± 0.011	-----
Rb	37	filter blank	T07-12125	UCD	0.010 ± 0.005	0.011 ± 0.011	-----
Sr	38	filter blank	T07-12125	UCD	0.000 ± 0.000	0.018 ± 0.013	-----
Y	39	filter blank	T07-12125	UCD	-----	0.006 ± 0.051	-----
Zr	40	filter blank	T07-12125	UCD	0.000 ± 0.000	0.053 ± 0.048	-----
Nb	41	filter blank	T07-12125	UCD	-----	-0.052 ± 0.049	-----
Mo	42	filter blank	T07-12125	UCD	-----	0.034 ± 0.051	-----
Ag	47	filter blank	T07-12125	UCD	-----	0.053 ± 0.045	-----
Cd	48	filter blank	T07-12125	UCD	-----	0.099 ± 0.051	-----
In	49	filter blank	T07-12125	UCD	-----	-0.023 ± 0.056	-----
Sn	50	filter blank	T07-12125	UCD	-----	0.130 ± 0.058	-----
Sb	51	filter blank	T07-12125	UCD	-----	0.120 ± 0.063	-----
Cs	55	filter blank	T07-12125	UCD	-----	0.042 ± 0.047	-----
Ba	56	filter blank	T07-12125	UCD	-----	0.019 ± 0.078	-----
La	57	filter blank	T07-12125	UCD	-----	0.016 ± 0.045	-----
Ce	58	filter blank	T07-12125	UCD	-----	-0.012 ± 0.063	-----
Sm	62	filter blank	T07-12125	UCD	-----	0.007 ± 0.039	-----
Eu	63	filter blank	T07-12125	UCD	-----	-0.224 ± 0.267	-----
Tb	65	filter blank	T07-12125	UCD	-----	0.039 ± 0.165	-----
Hf	72	filter blank	T07-12125	UCD	-----	-----	-----
Ta	73	filter blank	T07-12125	UCD	-----	0.005 ± 0.053	-----
W	74	filter blank	T07-12125	UCD	-----	0.006 ± 0.051	-----
Ir	77	filter blank	T07-12125	UCD	-----	-----	-----
Au	79	filter blank	T07-12125	UCD	-----	0.020 ± 0.029	-----
Hg	80	filter blank	T07-12125	UCD	-----	0.003 ± 0.025	-----
Pb	82	filter blank	T07-12125	UCD	0.000 ± 0.000	0.013 ± 0.029	-----

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

Table 14. XRF Spiked Filter PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Na	11	Alion Filter	T07-12099	CARB	-----	-----	-----
Mg	12	Alion Filter	T07-12099	CARB	-----	-----	-----
Al	13	Alion Filter	T07-12099	CARB	-0.113 ± 0.045	0.841 ± 0.731	-----
Si	14	Alion Filter	T07-12099	CARB	0.064 ± 0.021	0.013 ± 0.266	0.202
P	15	Alion Filter	T07-12099	CARB	0.000 ± 0.017	0.279 ± 0.176	-----
S	16	Alion Filter	T07-12099	CARB	0.461 ± 0.029	-0.039 ± 0.229	0.285
Cl	17	Alion Filter	T07-12099	CARB	0.953 ± 0.050	0.533 ± 0.089	-----
K	19	Alion Filter	T07-12099	CARB	0.185 ± 0.014	-0.002 ± 0.045	0.000
Ca	20	Alion Filter	T07-12099	CARB	0.000 ± 0.032	0.051 ± 0.036	0.053
Sc	21	Alion Filter	T07-12099	CARB	-----	0.002 ± 0.037	-----
Ti	22	Alion Filter	T07-12099	CARB	0.021 ± 0.008	-0.078 ± 0.047	-----
V	23	Alion Filter	T07-12099	CARB	0.000 ± 0.014	0.012 ± 0.031	-----
Cr	24	Alion Filter	T07-12099	CARB	2.783 ± 0.140	2.889 ± 0.091	-----
Mn	25	Alion Filter	T07-12099	CARB	2.711 ± 0.137	3.114 ± 0.104	2.953
Fe	26	Alion Filter	T07-12099	CARB	0.049 ± 0.006	0.036 ± 0.152	0.029
Co	27	Alion Filter	T07-12099	CARB	0.012 ± 0.002	0.049 ± 0.066	-----
Ni	28	Alion Filter	T07-12099	CARB	2.651 ± 0.133	3.091 ± 0.123	-----
Cu	29	Alion Filter	T07-12099	CARB	0.000 ± 0.010	-0.006 ± 0.031	0.005
Zn	30	Alion Filter	T07-12099	CARB	0.044 ± 0.006	0.007 ± 0.021	0.020
Ga	31	Alion Filter	T07-12099	CARB	-----	-0.019 ± 0.020	-----
As	33	Alion Filter	T07-12099	CARB	2.517 ± 0.129	2.597 ± 0.083	2.752
Se	34	Alion Filter	T07-12099	CARB	0.000 ± 0.008	0.007 ± 0.013	-----
Br	35	Alion Filter	T07-12099	CARB	0.000 ± 0.010	0.079 ± 0.024	0.028
Rb	37	Alion Filter	T07-12099	CARB	0.005 ± 0.003	-0.014 ± 0.012	-----
Sr	38	Alion Filter	T07-12099	CARB	0.012 ± 0.005	0.004 ± 0.015	-----
Y	39	Alion Filter	T07-12099	CARB	0.005 ± 0.006	-0.052 ± 0.053	-----
Zr	40	Alion Filter	T07-12099	CARB	-----	0.012 ± 0.048	-----
Nb	41	Alion Filter	T07-12099	CARB	-----	-0.027 ± 0.053	-----
Mo	42	Alion Filter	T07-12099	CARB	0.000 ± 0.023	-0.083 ± 0.050	-----
Ag	47	Alion Filter	T07-12099	CARB	-----	0.072 ± 0.048	-----
Cd	48	Alion Filter	T07-12099	CARB	2.463 ± 0.130	3.096 ± 0.125	-----
In	49	Alion Filter	T07-12099	CARB	-----	-0.001 ± 0.059	-----
Sn	50	Alion Filter	T07-12099	CARB	0.000 ± 0.059	-0.097 ± 0.064	-----
Sb	51	Alion Filter	T07-12099	CARB	2.361 ± 0.140	3.215 ± 0.127	-----
Cs	55	Alion Filter	T07-12099	CARB	-----	0.113 ± 0.060	-----
Ba	56	Alion Filter	T07-12099	CARB	0.035 ± 0.020	0.201 ± 0.092	-----
La	57	Alion Filter	T07-12099	CARB	-----	0.018 ± 0.056	-----
Ce	58	Alion Filter	T07-12099	CARB	-----	-0.103 ± 0.078	-----
Sm	62	Alion Filter	T07-12099	CARB	-----	0.053 ± 0.052	-----

Table 14. XRF Spiked Filter PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Eu	63	Alion Filter	T07-12099	CARB	-----	-0.214 ± 0.489	-----
Tb	65	Alion Filter	T07-12099	CARB	-----	-0.193 ± 0.204	-----
Hf	72	Alion Filter	T07-12099	CARB	-----	-----	-----
Ta	73	Alion Filter	T07-12099	CARB	-----	0.011 ± 0.072	-----
W	74	Alion Filter	T07-12099	CARB	-----	-0.040 ± 0.079	-----
Ir	77	Alion Filter	T07-12099	CARB	-----	-----	-----
Au	79	Alion Filter	T07-12099	CARB	-----	0.026 ± 0.041	-----
Hg	80	Alion Filter	T07-12099	CARB	1.090 ± 0.058	1.593 ± 0.069	-----
Pb	82	Alion Filter	T07-12099	CARB	2.702 ± 0.144	3.356 ± 0.102	2.984
Na	11	Alion Filter	T07-12100	CARB	-----	-----	-----
Mg	12	Alion Filter	T07-12100	CARB	-----	-----	-----
Al	13	Alion Filter	T07-12100	CARB	-0.113 ± 0.046	1.337 ± 0.770	-----
Si	14	Alion Filter	T07-12100	CARB	0.227 ± 0.026	1.065 ± 0.298	0.202
P	15	Alion Filter	T07-12100	CARB	0.000 ± 0.019	0.264 ± 0.192	-----
S	16	Alion Filter	T07-12100	CARB	0.914 ± 0.052	0.463 ± 0.266	0.285
Cl	17	Alion Filter	T07-12100	CARB	0.515 ± 0.028	0.052 ± 0.085	-----
K	19	Alion Filter	T07-12100	CARB	0.189 ± 0.014	0.049 ± 0.047	0.000
Ca	20	Alion Filter	T07-12100	CARB	0.000 ± 0.033	1.486 ± 0.058	0.053
Sc	21	Alion Filter	T07-12100	CARB	-----	0.036 ± 0.043	-----
Ti	22	Alion Filter	T07-12100	CARB	0.000 ± 0.016	-0.092 ± 0.047	-----
V	23	Alion Filter	T07-12100	CARB	0.000 ± 0.014	-0.068 ± 0.032	-----
Cr	24	Alion Filter	T07-12100	CARB	2.831 ± 0.142	2.868 ± 0.091	-----
Mn	25	Alion Filter	T07-12100	CARB	2.802 ± 0.141	3.080 ± 0.104	2.953
Fe	26	Alion Filter	T07-12100	CARB	0.082 ± 0.007	0.069 ± 0.160	0.029
Co	27	Alion Filter	T07-12100	CARB	0.010 ± 0.002	0.030 ± 0.070	-----
Ni	28	Alion Filter	T07-12100	CARB	2.788 ± 0.140	3.285 ± 0.131	-----
Cu	29	Alion Filter	T07-12100	CARB	0.000 ± 0.012	0.027 ± 0.033	0.005
Zn	30	Alion Filter	T07-12100	CARB	0.132 ± 0.010	0.112 ± 0.026	0.020
Ga	31	Alion Filter	T07-12100	CARB	-----	0.028 ± 0.021	-----
As	33	Alion Filter	T07-12100	CARB	2.707 ± 0.138	2.806 ± 0.089	2.752
Se	34	Alion Filter	T07-12100	CARB	0.000 ± 0.008	0.020 ± 0.014	-----
Br	35	Alion Filter	T07-12100	CARB	0.000 ± 0.016	-0.005 ± 0.035	0.028
Rb	37	Alion Filter	T07-12100	CARB	0.005 ± 0.003	0.002 ± 0.013	-----
Sr	38	Alion Filter	T07-12100	CARB	0.012 ± 0.005	0.025 ± 0.016	-----
Y	39	Alion Filter	T07-12100	CARB	0.000 ± 0.010	-0.098 ± 0.055	-----
Zr	40	Alion Filter	T07-12100	CARB	-----	-0.046 ± 0.049	-----
Nb	41	Alion Filter	T07-12100	CARB	-----	-0.001 ± 0.053	-----
Mo	42	Alion Filter	T07-12100	CARB	0.000 ± 0.023	-0.017 ± 0.052	-----
Ag	47	Alion Filter	T07-12100	CARB	-----	0.132 ± 0.051	-----

Table 14. XRF Spiked Filter PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Cd	48	Alion Filter	T07-12100	CARB	2.497 ± 0.132	3.225 ± 0.130	-----
In	49	Alion Filter	T07-12100	CARB	-----	-0.023 ± 0.060	-----
Sn	50	Alion Filter	T07-12100	CARB	0.000 ± 0.059	0.014 ± 0.067	-----
Sb	51	Alion Filter	T07-12100	CARB	2.636 ± 0.153	3.172 ± 0.131	-----
Cs	55	Alion Filter	T07-12100	CARB	-----	0.004 ± 0.063	-----
Ba	56	Alion Filter	T07-12100	CARB	0.027 ± 0.020	0.220 ± 0.093	-----
La	57	Alion Filter	T07-12100	CARB	-----	-0.008 ± 0.057	-----
Ce	58	Alion Filter	T07-12100	CARB	-----	0.017 ± 0.080	-----
Sm	62	Alion Filter	T07-12100	CARB	-----	-0.106 ± 0.052	-----
Eu	63	Alion Filter	T07-12100	CARB	-----	0.697 ± 0.508	-----
Tb	65	Alion Filter	T07-12100	CARB	-----	0.060 ± 0.217	-----
Hf	72	Alion Filter	T07-12100	CARB	-----	-----	-----
Ta	73	Alion Filter	T07-12100	CARB	-----	-0.050 ± 0.076	-----
W	74	Alion Filter	T07-12100	CARB	-----	0.018 ± 0.088	-----
Ir	77	Alion Filter	T07-12100	CARB	-----	-----	-----
Au	79	Alion Filter	T07-12100	CARB	-----	0.024 ± 0.046	-----
Hg	80	Alion Filter	T07-12100	CARB	4.260 ± 0.216	5.339 ± 0.152	-----
Pb	82	Alion Filter	T07-12100	CARB	2.811 ± 0.149	3.410 ± 0.104	2.984
Na	11	Alion Filter	T07-12101	DRI	1.745 ± 1.410	-----	-----
Mg	12	Alion Filter	T07-12101	DRI	0.803 ± 0.719	-----	-----
Al	13	Alion Filter	T07-12101	DRI	0.175 ± 0.119	0.862 ± 0.725	-----
Si	14	Alion Filter	T07-12101	DRI	0.000 ± 0.130	0.392 ± 0.270	0.202
P	15	Alion Filter	T07-12101	DRI	0.000 ± 0.037	0.200 ± 0.176	-----
S	16	Alion Filter	T07-12101	DRI	0.000 ± 0.104	0.397 ± 0.232	0.285
Cl	17	Alion Filter	T07-12101	DRI	0.622 ± 0.027	0.878 ± 0.092	-----
K	19	Alion Filter	T07-12101	DRI	0.000 ± 0.026	-0.013 ± 0.045	0.000
Ca	20	Alion Filter	T07-12101	DRI	0.000 ± 0.029	0.132 ± 0.037	0.053
Sc	21	Alion Filter	T07-12101	DRI	0.059 ± 0.094	0.017 ± 0.037	-----
Ti	22	Alion Filter	T07-12101	DRI	0.000 ± 0.018	0.044 ± 0.047	-----
V	23	Alion Filter	T07-12101	DRI	0.019 ± 0.001	-0.051 ± 0.031	-----
Cr	24	Alion Filter	T07-12101	DRI	2.922 ± 0.020	2.815 ± 0.089	-----
Mn	25	Alion Filter	T07-12101	DRI	2.789 ± 0.040	3.144 ± 0.105	2.953
Fe	26	Alion Filter	T07-12101	DRI	0.061 ± 0.043	0.127 ± 0.151	0.029
Co	27	Alion Filter	T07-12101	DRI	0.000 ± 0.001	0.029 ± 0.065	-----
Ni	28	Alion Filter	T07-12101	DRI	2.535 ± 0.012	2.946 ± 0.121	-----
Cu	29	Alion Filter	T07-12101	DRI	0.014 ± 0.015	0.021 ± 0.032	0.005
Zn	30	Alion Filter	T07-12101	DRI	0.000 ± 0.015	-0.008 ± 0.021	0.020
Ga	31	Alion Filter	T07-12101	DRI	0.000 ± 0.051	0.013 ± 0.020	-----
As	33	Alion Filter	T07-12101	DRI	2.889 ± 0.020	2.718 ± 0.085	2.752

Table 14. XRF Spiked Filter PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Se	34	Alion Filter	T07-12101	DRI	0.011 ± 0.034	0.007 ± 0.013	-----
Br	35	Alion Filter	T07-12101	DRI	0.000 ± 0.024	0.029 ± 0.023	0.028
Rb	37	Alion Filter	T07-12101	DRI	0.000 ± 0.018	-0.003 ± 0.012	-----
Sr	38	Alion Filter	T07-12101	DRI	0.066 ± 0.032	0.001 ± 0.015	-----
Y	39	Alion Filter	T07-12101	DRI	0.000 ± 0.024	-0.084 ± 0.051	-----
Zr	40	Alion Filter	T07-12101	DRI	0.095 ± 0.057	0.022 ± 0.048	0.008
Nb	41	Alion Filter	T07-12101	DRI	0.000 ± 0.043	0.099 ± 0.055	-----
Mo	42	Alion Filter	T07-12101	DRI	0.000 ± 0.038	0.046 ± 0.053	-----
Ag	47	Alion Filter	T07-12101	DRI	0.000 ± 0.068	0.053 ± 0.047	-----
Cd	48	Alion Filter	T07-12101	DRI	2.635 ± 0.093	3.079 ± 0.126	-----
In	49	Alion Filter	T07-12101	DRI	0.000 ± 0.050	0.016 ± 0.059	-----
Sn	50	Alion Filter	T07-12101	DRI	0.000 ± 0.063	-0.030 ± 0.064	-----
Sb	51	Alion Filter	T07-12101	DRI	2.766 ± 0.124	3.072 ± 0.125	-----
Cs	55	Alion Filter	T07-12101	DRI	0.000 ± 0.019	-0.020 ± 0.059	-----
Ba	56	Alion Filter	T07-12101	DRI	0.000 ± 0.009	-0.025 ± 0.090	-----
La	57	Alion Filter	T07-12101	DRI	0.000 ± 0.015	0.002 ± 0.055	-----
Ce	58	Alion Filter	T07-12101	DRI	0.000 ± 0.020	0.039 ± 0.076	-----
Sm	62	Alion Filter	T07-12101	DRI	0.027 ± 0.028	-0.056 ± 0.051	-----
Eu	63	Alion Filter	T07-12101	DRI	0.000 ± 0.104	-0.528 ± 0.492	-----
Tb	65	Alion Filter	T07-12101	DRI	0.000 ± 0.035	0.000 ± 0.199	-----
Hf	72	Alion Filter	T07-12101	DRI	0.000 ± 0.229	-----	-----
Ta	73	Alion Filter	T07-12101	DRI	0.000 ± 0.192	0.101 ± 0.074	-----
W	74	Alion Filter	T07-12101	DRI	0.000 ± 0.275	-0.054 ± 0.080	-----
Ir	77	Alion Filter	T07-12101	DRI	0.000 ± 0.060	-----	-----
Au	79	Alion Filter	T07-12101	DRI	0.016 ± 0.128	0.052 ± 0.041	-----
Hg	80	Alion Filter	T07-12101	DRI	1.554 ± 0.044	1.632 ± 0.069	-----
Pb	82	Alion Filter	T07-12101	DRI	2.688 ± 0.050	3.221 ± 0.099	2.984
Na	11	Alion Filter	T07-12102	DRI	1.066 ± 1.397	-----	-----
Mg	12	Alion Filter	T07-12102	DRI	1.080 ± 0.720	-----	-----
Al	13	Alion Filter	T07-12102	DRI	0.042 ± 0.118	1.850 ± 0.744	-----
Si	14	Alion Filter	T07-12102	DRI	0.060 ± 0.132	0.660 ± 0.282	0.202
P	15	Alion Filter	T07-12102	DRI	0.034 ± 0.038	0.428 ± 0.186	-----
S	16	Alion Filter	T07-12102	DRI	0.000 ± 0.104	0.292 ± 0.264	0.285
Cl	17	Alion Filter	T07-12102	DRI	0.464 ± 0.027	0.046 ± 0.084	-----
K	19	Alion Filter	T07-12102	DRI	0.000 ± 0.026	0.079 ± 0.045	0.000
Ca	20	Alion Filter	T07-12102	DRI	0.000 ± 0.029	0.033 ± 0.037	0.053
Sc	21	Alion Filter	T07-12102	DRI	0.067 ± 0.095	0.043 ± 0.039	-----
Ti	22	Alion Filter	T07-12102	DRI	0.007 ± 0.018	0.040 ± 0.047	-----
V	23	Alion Filter	T07-12102	DRI	0.000 ± 0.001	-0.043 ± 0.032	-----

Table 14. XRF Spiked Filter PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Cr	24	Alion Filter	T07-12102	DRI	3.027 ± 0.020	2.769 ± 0.088	-----
Mn	25	Alion Filter	T07-12102	DRI	2.973 ± 0.041	3.092 ± 0.104	2.953
Fe	26	Alion Filter	T07-12102	DRI	0.120 ± 0.043	0.360 ± 0.155	0.029
Co	27	Alion Filter	T07-12102	DRI	0.000 ± 0.001	0.120 ± 0.067	-----
Ni	28	Alion Filter	T07-12102	DRI	2.702 ± 0.012	3.028 ± 0.125	-----
Cu	29	Alion Filter	T07-12102	DRI	0.007 ± 0.015	0.005 ± 0.032	0.005
Zn	30	Alion Filter	T07-12102	DRI	0.067 ± 0.015	0.093 ± 0.025	0.020
Ga	31	Alion Filter	T07-12102	DRI	0.000 ± 0.051	0.013 ± 0.021	-----
As	33	Alion Filter	T07-12102	DRI	3.469 ± 0.021	2.762 ± 0.087	2.752
Se	34	Alion Filter	T07-12102	DRI	0.000 ± 0.034	0.007 ± 0.013	-----
Br	35	Alion Filter	T07-12102	DRI	0.002 ± 0.024	0.012 ± 0.034	0.028
Rb	37	Alion Filter	T07-12102	DRI	0.000 ± 0.018	-0.008 ± 0.013	-----
Sr	38	Alion Filter	T07-12102	DRI	0.067 ± 0.032	0.014 ± 0.015	-----
Y	39	Alion Filter	T07-12102	DRI	0.005 ± 0.024	-0.041 ± 0.058	-----
Zr	40	Alion Filter	T07-12102	DRI	0.000 ± 0.055	0.055 ± 0.050	0.008
Nb	41	Alion Filter	T07-12102	DRI	0.000 ± 0.043	-0.082 ± 0.050	-----
Mo	42	Alion Filter	T07-12102	DRI	0.000 ± 0.038	0.085 ± 0.055	-----
Ag	47	Alion Filter	T07-12102	DRI	0.064 ± 0.068	0.038 ± 0.047	-----
Cd	48	Alion Filter	T07-12102	DRI	2.782 ± 0.093	2.976 ± 0.125	-----
In	49	Alion Filter	T07-12102	DRI	0.000 ± 0.050	-0.019 ± 0.060	-----
Sn	50	Alion Filter	T07-12102	DRI	0.000 ± 0.063	-0.012 ± 0.065	-----
Sb	51	Alion Filter	T07-12102	DRI	2.832 ± 0.124	3.083 ± 0.124	-----
Cs	55	Alion Filter	T07-12102	DRI	0.000 ± 0.019	0.004 ± 0.059	-----
Ba	56	Alion Filter	T07-12102	DRI	0.002 ± 0.009	-0.009 ± 0.091	-----
La	57	Alion Filter	T07-12102	DRI	0.000 ± 0.015	-0.031 ± 0.054	-----
Ce	58	Alion Filter	T07-12102	DRI	0.000 ± 0.020	0.128 ± 0.079	-----
Sm	62	Alion Filter	T07-12102	DRI	0.020 ± 0.028	0.039 ± 0.053	-----
Eu	63	Alion Filter	T07-12102	DRI	0.000 ± 0.104	-0.231 ± 0.500	-----
Tb	65	Alion Filter	T07-12102	DRI	0.000 ± 0.035	-0.429 ± 0.208	-----
Hf	72	Alion Filter	T07-12102	DRI	0.000 ± 0.228	-----	-----
Ta	73	Alion Filter	T07-12102	DRI	0.049 ± 0.192	0.063 ± 0.074	-----
W	74	Alion Filter	T07-12102	DRI	0.000 ± 0.275	-0.047 ± 0.084	-----
Ir	77	Alion Filter	T07-12102	DRI	0.000 ± 0.060	-----	-----
Au	79	Alion Filter	T07-12102	DRI	0.000 ± 0.128	0.019 ± 0.045	-----
Hg	80	Alion Filter	T07-12102	DRI	5.552 ± 0.062	5.053 ± 0.146	-----
Pb	82	Alion Filter	T07-12102	DRI	2.492 ± 0.049	3.155 ± 0.098	2.984
Na	11	Alion Filter	T07-12103	ODEQ	-----	-----	-----
Mg	12	Alion Filter	T07-12103	ODEQ	-----	-----	-----
Al	13	Alion Filter	T07-12103	ODEQ	0.051 ± 0.058	-0.347 ± 0.737	-----

Table 14. XRF Spiked Filter PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Si	14	Alion Filter	T07-12103	ODEQ	0.438 ± 0.056	0.091 ± 0.279	0.202
P	15	Alion Filter	T07-12103	ODEQ	-0.016 ± 0.043	0.057 ± 0.179	-----
S	16	Alion Filter	T07-12103	ODEQ	0.278 ± 0.146	0.042 ± 0.236	0.285
Cl	17	Alion Filter	T07-12103	ODEQ	0.933 ± 0.108	1.138 ± 0.100	-----
K	19	Alion Filter	T07-12103	ODEQ	-0.277 ± 0.154	-0.041 ± 0.046	0.000
Ca	20	Alion Filter	T07-12103	ODEQ	0.683 ± 0.065	0.028 ± 0.037	0.053
Sc	21	Alion Filter	T07-12103	ODEQ	-0.225 ± 0.038	-0.069 ± 0.038	-----
Ti	22	Alion Filter	T07-12103	ODEQ	0.035 ± 0.057	-0.045 ± 0.049	-----
V	23	Alion Filter	T07-12103	ODEQ	0.007 ± 0.023	-0.003 ± 0.032	-----
Cr	24	Alion Filter	T07-12103	ODEQ	2.864 ± 0.231	2.990 ± 0.095	-----
Mn	25	Alion Filter	T07-12103	ODEQ	2.933 ± 0.239	3.218 ± 0.108	2.953
Fe	26	Alion Filter	T07-12103	ODEQ	-0.016 ± 0.028	0.003 ± 0.154	0.029
Co	27	Alion Filter	T07-12103	ODEQ	-0.008 ± 0.011	0.034 ± 0.067	-----
Ni	28	Alion Filter	T07-12103	ODEQ	2.996 ± 0.242	3.265 ± 0.129	-----
Cu	29	Alion Filter	T07-12103	ODEQ	-0.003 ± 0.014	0.010 ± 0.033	0.005
Zn	30	Alion Filter	T07-12103	ODEQ	-0.004 ± 0.010	0.045 ± 0.022	0.020
Ga	31	Alion Filter	T07-12103	ODEQ	-0.009 ± 0.059	0.011 ± 0.021	-----
As	33	Alion Filter	T07-12103	ODEQ	2.477 ± 0.239	2.755 ± 0.087	2.752
Se	34	Alion Filter	T07-12103	ODEQ	-0.005 ± 0.011	-0.013 ± 0.013	-----
Br	35	Alion Filter	T07-12103	ODEQ	0.281 ± 0.029	0.071 ± 0.023	0.028
Rb	37	Alion Filter	T07-12103	ODEQ	-0.062 ± 0.012	0.015 ± 0.013	-----
Sr	38	Alion Filter	T07-12103	ODEQ	-0.006 ± 0.011	0.005 ± 0.015	-----
Y	39	Alion Filter	T07-12103	ODEQ	-0.025 ± 0.015	-0.083 ± 0.054	-----
Zr	40	Alion Filter	T07-12103	ODEQ	-0.004 ± 0.014	-0.014 ± 0.047	0.008
Nb	41	Alion Filter	T07-12103	ODEQ	-0.028 ± 0.017	-0.064 ± 0.052	-----
Mo	42	Alion Filter	T07-12103	ODEQ	-0.012 ± 0.020	0.050 ± 0.054	-----
Ag	47	Alion Filter	T07-12103	ODEQ	0.007 ± 0.049	0.049 ± 0.049	-----
Cd	48	Alion Filter	T07-12103	ODEQ	2.934 ± 0.241	3.448 ± 0.136	-----
In	49	Alion Filter	T07-12103	ODEQ	0.009 ± 0.046	0.015 ± 0.062	-----
Sn	50	Alion Filter	T07-12103	ODEQ	0.064 ± 0.057	-0.016 ± 0.067	-----
Sb	51	Alion Filter	T07-12103	ODEQ	3.112 ± 0.265	3.150 ± 0.128	-----
Cs	55	Alion Filter	T07-12103	ODEQ	-0.028 ± 0.114	-0.070 ± 0.062	-----
Ba	56	Alion Filter	T07-12103	ODEQ	-0.046 ± 0.234	0.118 ± 0.096	-----
La	57	Alion Filter	T07-12103	ODEQ	-0.092 ± 0.187	0.019 ± 0.057	-----
Ce	58	Alion Filter	T07-12103	ODEQ	0.031 ± 0.231	-0.077 ± 0.081	-----
Sm	62	Alion Filter	T07-12103	ODEQ	-0.644 ± 0.867	-0.052 ± 0.054	-----
Eu	63	Alion Filter	T07-12103	ODEQ	-0.546 ± 1.889	0.081 ± 0.505	-----
Tb	65	Alion Filter	T07-12103	ODEQ	0.757 ± 3.003	-0.079 ± 0.206	-----
Hf	72	Alion Filter	T07-12103	ODEQ	-0.027 ± 0.175	-----	-----

Table 14. XRF Spiked Filter PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Ta	73	Alion Filter	T07-12103	ODEQ	-0.042 ± 0.201	0.013 ± 0.075	-----
W	74	Alion Filter	T07-12103	ODEQ	0.021 ± 0.052	0.062 ± 0.080	-----
Ir	77	Alion Filter	T07-12103	ODEQ	0.010 ± 0.047	-----	-----
Au	79	Alion Filter	T07-12103	ODEQ	-0.008 ± 0.031	-0.043 ± 0.040	-----
Hg	80	Alion Filter	T07-12103	ODEQ	1.279 ± 0.108	1.432 ± 0.067	-----
Pb	82	Alion Filter	T07-12103	ODEQ	2.844 ± 0.232	3.446 ± 0.104	2.984
Na	11	Alion Filter	T07-12104	ODEQ	-----	-----	-----
Mg	12	Alion Filter	T07-12104	ODEQ	-----	-----	-----
Al	13	Alion Filter	T07-12104	ODEQ	-0.025 ± 0.058	1.208 ± 0.776	-----
Si	14	Alion Filter	T07-12104	ODEQ	0.699 ± 0.074	0.198 ± 0.279	0.202
P	15	Alion Filter	T07-12104	ODEQ	-0.018 ± 0.043	0.384 ± 0.185	-----
S	16	Alion Filter	T07-12104	ODEQ	0.258 ± 0.157	-0.085 ± 0.233	0.285
Cl	17	Alion Filter	T07-12104	ODEQ	0.592 ± 0.089	0.733 ± 0.094	-----
K	19	Alion Filter	T07-12104	ODEQ	-0.333 ± 0.171	0.000 ± 0.048	0.000
Ca	20	Alion Filter	T07-12104	ODEQ	0.701 ± 0.067	0.094 ± 0.039	0.053
Sc	21	Alion Filter	T07-12104	ODEQ	-0.177 ± 0.038	-0.035 ± 0.039	-----
Ti	22	Alion Filter	T07-12104	ODEQ	0.038 ± 0.058	-0.101 ± 0.049	-----
V	23	Alion Filter	T07-12104	ODEQ	-0.006 ± 0.023	0.044 ± 0.033	-----
Cr	24	Alion Filter	T07-12104	ODEQ	3.132 ± 0.252	3.172 ± 0.100	-----
Mn	25	Alion Filter	T07-12104	ODEQ	3.229 ± 0.263	3.405 ± 0.112	2.953
Fe	26	Alion Filter	T07-12104	ODEQ	-0.016 ± 0.030	0.038 ± 0.157	0.029
Co	27	Alion Filter	T07-12104	ODEQ	-0.002 ± 0.012	-0.115 ± 0.068	-----
Ni	28	Alion Filter	T07-12104	ODEQ	3.313 ± 0.267	3.829 ± 0.139	-----
Cu	29	Alion Filter	T07-12104	ODEQ	0.006 ± 0.014	0.039 ± 0.033	0.005
Zn	30	Alion Filter	T07-12104	ODEQ	0.000 ± 0.010	0.027 ± 0.022	0.020
Ga	31	Alion Filter	T07-12104	ODEQ	0.011 ± 0.060	0.037 ± 0.022	-----
As	33	Alion Filter	T07-12104	ODEQ	2.835 ± 0.271	3.040 ± 0.093	2.752
Se	34	Alion Filter	T07-12104	ODEQ	-0.015 ± 0.012	-0.025 ± 0.013	-----
Br	35	Alion Filter	T07-12104	ODEQ	0.150 ± 0.022	0.048 ± 0.021	0.028
Rb	37	Alion Filter	T07-12104	ODEQ	-0.034 ± 0.011	-0.003 ± 0.013	-----
Sr	38	Alion Filter	T07-12104	ODEQ	-0.012 ± 0.011	0.011 ± 0.015	-----
Y	39	Alion Filter	T07-12104	ODEQ	-0.030 ± 0.015	-0.039 ± 0.056	-----
Zr	40	Alion Filter	T07-12104	ODEQ	-0.003 ± 0.014	0.032 ± 0.050	0.008
Nb	41	Alion Filter	T07-12104	ODEQ	0.011 ± 0.018	-0.002 ± 0.054	-----
Mo	42	Alion Filter	T07-12104	ODEQ	-0.002 ± 0.020	0.040 ± 0.054	-----
Ag	47	Alion Filter	T07-12104	ODEQ	-0.020 ± 0.050	0.092 ± 0.050	-----
Cd	48	Alion Filter	T07-12104	ODEQ	3.258 ± 0.266	3.466 ± 0.137	-----
In	49	Alion Filter	T07-12104	ODEQ	-0.016 ± 0.046	0.124 ± 0.065	-----
Sn	50	Alion Filter	T07-12104	ODEQ	-0.010 ± 0.057	-0.132 ± 0.067	-----

Table 14. XRF Spiked Filter PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Sb	51	Alion Filter	T07-12104	ODEQ	3.334 ± 0.283	3.652 ± 0.138	-----
Cs	55	Alion Filter	T07-12104	ODEQ	0.035 ± 0.115	0.024 ± 0.062	-----
Ba	56	Alion Filter	T07-12104	ODEQ	-0.062 ± 0.235	0.203 ± 0.097	-----
La	57	Alion Filter	T07-12104	ODEQ	-0.143 ± 0.189	0.054 ± 0.058	-----
Ce	58	Alion Filter	T07-12104	ODEQ	-0.028 ± 0.234	-0.172 ± 0.082	-----
Sm	62	Alion Filter	T07-12104	ODEQ	-0.009 ± 0.872	0.071 ± 0.055	-----
Eu	63	Alion Filter	T07-12104	ODEQ	0.430 ± 1.899	0.341 ± 0.513	-----
Tb	65	Alion Filter	T07-12104	ODEQ	-1.474 ± 3.033	0.063 ± 0.209	-----
Hf	72	Alion Filter	T07-12104	ODEQ	0.030 ± 0.175	-----	-----
Ta	73	Alion Filter	T07-12104	ODEQ	-0.082 ± 0.202	-0.030 ± 0.077	-----
W	74	Alion Filter	T07-12104	ODEQ	0.069 ± 0.052	-0.037 ± 0.082	-----
Ir	77	Alion Filter	T07-12104	ODEQ	0.030 ± 0.049	-----	-----
Au	79	Alion Filter	T07-12104	ODEQ	0.042 ± 0.031	0.031 ± 0.041	-----
Hg	80	Alion Filter	T07-12104	ODEQ	0.735 ± 0.067	1.046 ± 0.058	-----
Pb	82	Alion Filter	T07-12104	ODEQ	3.159 ± 0.257	3.713 ± 0.110	2.984
Na	11	Alion Filter	T07-12105	RTI	1.266 ± 0.162	-----	-----
Mg	12	Alion Filter	T07-12105	RTI	1.396 ± 0.106	-----	-----
Al	13	Alion Filter	T07-12105	RTI	0.000 ± 0.057	0.115 ± 0.719	-----
Si	14	Alion Filter	T07-12105	RTI	0.207 ± 0.060	0.338 ± 0.275	0.202
P	15	Alion Filter	T07-12105	RTI	0.000 ± 0.023	0.139 ± 0.181	-----
S	16	Alion Filter	T07-12105	RTI	1.040 ± 0.074	-0.021 ± 0.255	0.285
Cl	17	Alion Filter	T07-12105	RTI	0.180 ± 0.029	0.186 ± 0.084	-----
K	19	Alion Filter	T07-12105	RTI	0.000 ± 0.005	0.066 ± 0.046	0.000
Ca	20	Alion Filter	T07-12105	RTI	0.000 ± 0.004	0.054 ± 0.037	0.053
Sc	21	Alion Filter	T07-12105	RTI	0.000 ± 0.004	0.055 ± 0.038	-----
Ti	22	Alion Filter	T07-12105	RTI	0.000 ± 0.011	0.001 ± 0.047	-----
V	23	Alion Filter	T07-12105	RTI	0.000 ± 0.008	-0.036 ± 0.031	-----
Cr	24	Alion Filter	T07-12105	RTI	2.875 ± 0.146	2.891 ± 0.092	-----
Mn	25	Alion Filter	T07-12105	RTI	2.894 ± 0.147	3.177 ± 0.107	2.953
Fe	26	Alion Filter	T07-12105	RTI	0.015 ± 0.010	-0.100 ± 0.153	0.029
Co	27	Alion Filter	T07-12105	RTI	0.000 ± 0.003	0.081 ± 0.066	-----
Ni	28	Alion Filter	T07-12105	RTI	2.622 ± 0.132	3.180 ± 0.127	-----
Cu	29	Alion Filter	T07-12105	RTI	0.116 ± 0.007	0.034 ± 0.033	0.005
Zn	30	Alion Filter	T07-12105	RTI	0.000 ± 0.003	-0.024 ± 0.022	0.020
Ga	31	Alion Filter	T07-12105	RTI	0.025 ± 0.014	0.023 ± 0.020	-----
As	33	Alion Filter	T07-12105	RTI	2.748 ± 0.144	2.841 ± 0.089	2.752
Se	34	Alion Filter	T07-12105	RTI	0.000 ± 0.006	-0.002 ± 0.013	-----
Br	35	Alion Filter	T07-12105	RTI	0.000 ± 0.005	0.010 ± 0.032	0.028
Rb	37	Alion Filter	T07-12105	RTI	0.000 ± 0.004	-0.001 ± 0.013	-----

Table 14. XRF Spiked Filter PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Sr	38	Alion Filter	T07-12105	RTI	0.000 ± 0.004	0.010 ± 0.015	-----
Y	39	Alion Filter	T07-12105	RTI	0.000 ± 0.004	0.011 ± 0.056	-----
Zr	40	Alion Filter	T07-12105	RTI	0.003 ± 0.015	0.035 ± 0.049	0.008
Nb	41	Alion Filter	T07-12105	RTI	0.000 ± 0.004	-0.024 ± 0.051	-----
Mo	42	Alion Filter	T07-12105	RTI	0.000 ± 0.003	0.026 ± 0.053	-----
Ag	47	Alion Filter	T07-12105	RTI	0.000 ± 0.043	0.011 ± 0.046	-----
Cd	48	Alion Filter	T07-12105	RTI	2.941 ± 0.182	3.240 ± 0.131	-----
In	49	Alion Filter	T07-12105	RTI	0.000 ± 0.049	0.002 ± 0.059	-----
Sn	50	Alion Filter	T07-12105	RTI	0.000 ± 0.062	-0.078 ± 0.064	-----
Sb	51	Alion Filter	T07-12105	RTI	2.780 ± 0.237	3.346 ± 0.130	-----
Cs	55	Alion Filter	T07-12105	RTI	0.000 ± 0.009	0.079 ± 0.061	-----
Ba	56	Alion Filter	T07-12105	RTI	0.000 ± 0.027	0.042 ± 0.091	-----
La	57	Alion Filter	T07-12105	RTI	0.000 ± 0.022	-0.039 ± 0.055	-----
Ce	58	Alion Filter	T07-12105	RTI	0.000 ± 0.019	0.063 ± 0.077	-----
Sm	62	Alion Filter	T07-12105	RTI	0.321 ± 0.041	-0.012 ± 0.052	-----
Eu	63	Alion Filter	T07-12105	RTI	0.347 ± 0.085	0.552 ± 0.499	-----
Tb	65	Alion Filter	T07-12105	RTI	0.000 ± 0.009	-0.022 ± 0.201	-----
Hf	72	Alion Filter	T07-12105	RTI	0.003 ± 0.019	-----	-----
Ta	73	Alion Filter	T07-12105	RTI	0.000 ± 0.031	-0.110 ± 0.073	-----
W	74	Alion Filter	T07-12105	RTI	0.015 ± 0.045	0.020 ± 0.083	-----
Ir	77	Alion Filter	T07-12105	RTI	0.000 ± 0.024	-----	-----
Au	79	Alion Filter	T07-12105	RTI	0.000 ± 0.014	0.024 ± 0.043	-----
Hg	80	Alion Filter	T07-12105	RTI	7.051 ± 0.378	4.037 ± 0.123	-----
Pb	82	Alion Filter	T07-12105	RTI	2.958 ± 0.160	3.469 ± 0.106	2.984
Na	11	Alion Filter	T07-12106	RTI	0.655 ± 0.135	-----	-----
Mg	12	Alion Filter	T07-12106	RTI	1.102 ± 0.090	-----	-----
Al	13	Alion Filter	T07-12106	RTI	0.000 ± 0.057	0.451 ± 0.735	-----
Si	14	Alion Filter	T07-12106	RTI	0.177 ± 0.059	0.176 ± 0.274	0.202
P	15	Alion Filter	T07-12106	RTI	0.000 ± 0.023	0.093 ± 0.180	-----
S	16	Alion Filter	T07-12106	RTI	0.963 ± 0.070	0.430 ± 0.250	0.285
Cl	17	Alion Filter	T07-12106	RTI	0.374 ± 0.034	0.270 ± 0.085	-----
K	19	Alion Filter	T07-12106	RTI	0.000 ± 0.005	0.034 ± 0.046	0.000
Ca	20	Alion Filter	T07-12106	RTI	0.000 ± 0.004	0.083 ± 0.037	0.053
Sc	21	Alion Filter	T07-12106	RTI	0.000 ± 0.004	0.040 ± 0.039	-----
Ti	22	Alion Filter	T07-12106	RTI	0.000 ± 0.011	-0.070 ± 0.046	-----
V	23	Alion Filter	T07-12106	RTI	0.000 ± 0.008	0.026 ± 0.032	-----
Cr	24	Alion Filter	T07-12106	RTI	3.069 ± 0.156	3.077 ± 0.097	-----
Mn	25	Alion Filter	T07-12106	RTI	2.905 ± 0.148	3.309 ± 0.109	2.953
Fe	26	Alion Filter	T07-12106	RTI	0.022 ± 0.010	0.083 ± 0.158	0.029

Table 14. XRF Spiked Filter PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Co	27	Alion Filter	T07-12106	RTI	0.000 ± 0.003	-0.017 ± 0.068	-----
Ni	28	Alion Filter	T07-12106	RTI	2.788 ± 0.140	3.571 ± 0.135	-----
Cu	29	Alion Filter	T07-12106	RTI	0.132 ± 0.008	-0.007 ± 0.032	0.005
Zn	30	Alion Filter	T07-12106	RTI	0.000 ± 0.004	0.022 ± 0.022	0.020
Ga	31	Alion Filter	T07-12106	RTI	0.000 ± 0.008	0.021 ± 0.021	-----
As	33	Alion Filter	T07-12106	RTI	2.788 ± 0.146	2.907 ± 0.091	2.752
Se	34	Alion Filter	T07-12106	RTI	0.000 ± 0.006	-0.003 ± 0.013	-----
Br	35	Alion Filter	T07-12106	RTI	0.000 ± 0.005	0.042 ± 0.030	0.028
Rb	37	Alion Filter	T07-12106	RTI	0.006 ± 0.007	0.001 ± 0.012	-----
Sr	38	Alion Filter	T07-12106	RTI	0.008 ± 0.009	0.006 ± 0.015	-----
Y	39	Alion Filter	T07-12106	RTI	0.000 ± 0.004	-0.007 ± 0.057	-----
Zr	40	Alion Filter	T07-12106	RTI	0.000 ± 0.005	-0.082 ± 0.045	0.008
Nb	41	Alion Filter	T07-12106	RTI	0.000 ± 0.004	-0.128 ± 0.049	-----
Mo	42	Alion Filter	T07-12106	RTI	0.000 ± 0.003	0.039 ± 0.052	-----
Ag	47	Alion Filter	T07-12106	RTI	0.000 ± 0.043	0.058 ± 0.047	-----
Cd	48	Alion Filter	T07-12106	RTI	3.028 ± 0.189	3.414 ± 0.136	-----
In	49	Alion Filter	T07-12106	RTI	0.000 ± 0.049	-0.043 ± 0.057	-----
Sn	50	Alion Filter	T07-12106	RTI	0.000 ± 0.062	-0.067 ± 0.064	-----
Sb	51	Alion Filter	T07-12106	RTI	2.814 ± 0.238	3.511 ± 0.133	-----
Cs	55	Alion Filter	T07-12106	RTI	0.000 ± 0.009	-0.004 ± 0.061	-----
Ba	56	Alion Filter	T07-12106	RTI	0.000 ± 0.027	0.074 ± 0.091	-----
La	57	Alion Filter	T07-12106	RTI	0.000 ± 0.022	0.029 ± 0.056	-----
Ce	58	Alion Filter	T07-12106	RTI	0.000 ± 0.019	-0.057 ± 0.078	-----
Sm	62	Alion Filter	T07-12106	RTI	0.345 ± 0.041	0.015 ± 0.053	-----
Eu	63	Alion Filter	T07-12106	RTI	0.559 ± 0.089	0.075 ± 0.510	-----
Tb	65	Alion Filter	T07-12106	RTI	0.000 ± 0.009	0.062 ± 0.211	-----
Hf	72	Alion Filter	T07-12106	RTI	0.072 ± 0.020	-----	-----
Ta	73	Alion Filter	T07-12106	RTI	0.000 ± 0.031	-0.046 ± 0.076	-----
W	74	Alion Filter	T07-12106	RTI	0.000 ± 0.023	-0.092 ± 0.083	-----
Ir	77	Alion Filter	T07-12106	RTI	0.000 ± 0.024	-----	-----
Au	79	Alion Filter	T07-12106	RTI	0.000 ± 0.014	0.038 ± 0.043	-----
Hg	80	Alion Filter	T07-12106	RTI	5.548 ± 0.304	3.650 ± 0.115	-----
Pb	82	Alion Filter	T07-12106	RTI	3.009 ± 0.163	3.676 ± 0.109	2.984
Na	11	Alion Filter	T07-12107	UCD	0.000 ± 0.000	-----	-----
Mg	12	Alion Filter	T07-12107	UCD	0.000 ± 0.000	-----	-----
Al	13	Alion Filter	T07-12107	UCD	0.000 ± 0.000	0.754 ± 0.754	-----
Si	14	Alion Filter	T07-12107	UCD	0.405 ± 0.084	0.019 ± 0.275	0.202
P	15	Alion Filter	T07-12107	UCD	0.000 ± 0.000	0.185 ± 0.180	-----
S	16	Alion Filter	T07-12107	UCD	1.864 ± 0.250	0.241 ± 0.226	0.285

Table 14. XRF Spiked Filter PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Cl	17	Alion Filter	T07-12107	UCD	1.630 ± 0.128	2.150 ± 0.114	-----
K	19	Alion Filter	T07-12107	UCD	0.000 ± 0.000	0.005 ± 0.044	0.000
Ca	20	Alion Filter	T07-12107	UCD	1.109 ± 0.065	0.057 ± 0.037	0.053
Sc	21	Alion Filter	T07-12107	UCD	-----	0.098 ± 0.039	-----
Ti	22	Alion Filter	T07-12107	UCD	0.018 ± 0.004	0.053 ± 0.047	-----
V	23	Alion Filter	T07-12107	UCD	0.000 ± 0.000	0.018 ± 0.032	-----
Cr	24	Alion Filter	T07-12107	UCD	2.619 ± 0.135	2.362 ± 0.077	-----
Mn	25	Alion Filter	T07-12107	UCD	2.669 ± 0.154	2.666 ± 0.096	2.953
Fe	26	Alion Filter	T07-12107	UCD	0.000 ± 0.000	-0.063 ± 0.158	0.029
Co	27	Alion Filter	T07-12107	UCD	-----	0.078 ± 0.068	-----
Ni	28	Alion Filter	T07-12107	UCD	2.570 ± 0.131	2.764 ± 0.118	-----
Cu	29	Alion Filter	T07-12107	UCD	0.000 ± 0.000	-0.040 ± 0.030	0.005
Zn	30	Alion Filter	T07-12107	UCD	0.020 ± 0.003	0.020 ± 0.021	0.020
Ga	31	Alion Filter	T07-12107	UCD	-----	0.043 ± 0.020	-----
As	33	Alion Filter	T07-12107	UCD	2.438 ± 0.125	2.460 ± 0.079	2.752
Se	34	Alion Filter	T07-12107	UCD	0.000 ± 0.000	-0.002 ± 0.013	-----
Br	35	Alion Filter	T07-12107	UCD	0.200 ± 0.032	0.060 ± 0.019	0.028
Rb	37	Alion Filter	T07-12107	UCD	0.000 ± 0.000	0.003 ± 0.012	-----
Sr	38	Alion Filter	T07-12107	UCD	0.000 ± 0.000	0.032 ± 0.015	-----
Y	39	Alion Filter	T07-12107	UCD	-----	-0.033 ± 0.056	-----
Zr	40	Alion Filter	T07-12107	UCD	0.014 ± 0.006	0.056 ± 0.050	0.008
Nb	41	Alion Filter	T07-12107	UCD	-----	-0.096 ± 0.052	-----
Mo	42	Alion Filter	T07-12107	UCD	-----	-0.025 ± 0.052	-----
Ag	47	Alion Filter	T07-12107	UCD	-----	0.070 ± 0.049	-----
Cd	48	Alion Filter	T07-12107	UCD	-----	2.834 ± 0.122	-----
In	49	Alion Filter	T07-12107	UCD	-----	0.091 ± 0.063	-----
Sn	50	Alion Filter	T07-12107	UCD	-----	-0.099 ± 0.065	-----
Sb	51	Alion Filter	T07-12107	UCD	-----	3.457 ± 0.134	-----
Cs	55	Alion Filter	T07-12107	UCD	-----	0.107 ± 0.061	-----
Ba	56	Alion Filter	T07-12107	UCD	-----	-0.139 ± 0.091	-----
La	57	Alion Filter	T07-12107	UCD	-----	-0.021 ± 0.057	-----
Ce	58	Alion Filter	T07-12107	UCD	-----	0.133 ± 0.078	-----
Sm	62	Alion Filter	T07-12107	UCD	-----	0.015 ± 0.052	-----
Eu	63	Alion Filter	T07-12107	UCD	-----	0.717 ± 0.486	-----
Tb	65	Alion Filter	T07-12107	UCD	-----	-0.036 ± 0.213	-----
Hf	72	Alion Filter	T07-12107	UCD	-----	-----	-----
Ta	73	Alion Filter	T07-12107	UCD	-----	-0.098 ± 0.071	-----
W	74	Alion Filter	T07-12107	UCD	-----	0.022 ± 0.078	-----
Ir	77	Alion Filter	T07-12107	UCD	-----	-----	-----

Table 14. XRF Spiked Filter PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
Au	79	Alion Filter	T07-12107	UCD	-----	-0.011 ± 0.039	-----
Hg	80	Alion Filter	T07-12107	UCD	-----	0.715 ± 0.050	-----
Pb	82	Alion Filter	T07-12107	UCD	2.586 ± 0.133	2.806 ± 0.090	2.984
Na	11	Alion Filter	T07-12108	UCD	0.000 ± 0.000	-----	-----
Mg	12	Alion Filter	T07-12108	UCD	0.000 ± 0.000	-----	-----
Al	13	Alion Filter	T07-12108	UCD	0.807 ± 0.272	-0.202 ± 0.720	-----
Si	14	Alion Filter	T07-12108	UCD	0.343 ± 0.073	-0.442 ± 0.261	0.202
P	15	Alion Filter	T07-12108	UCD	0.231 ± 0.057	0.202 ± 0.178	-----
S	16	Alion Filter	T07-12108	UCD	2.278 ± 0.208	0.075 ± 0.224	0.285
Cl	17	Alion Filter	T07-12108	UCD	0.962 ± 0.080	0.980 ± 0.094	-----
K	19	Alion Filter	T07-12108	UCD	0.000 ± 0.000	0.114 ± 0.044	0.000
Ca	20	Alion Filter	T07-12108	UCD	1.086 ± 0.064	0.017 ± 0.037	0.053
Sc	21	Alion Filter	T07-12108	UCD	-----	-0.012 ± 0.038	-----
Ti	22	Alion Filter	T07-12108	UCD	0.000 ± 0.000	0.042 ± 0.047	-----
V	23	Alion Filter	T07-12108	UCD	0.000 ± 0.000	0.033 ± 0.032	-----
Cr	24	Alion Filter	T07-12108	UCD	2.528 ± 0.130	2.348 ± 0.076	-----
Mn	25	Alion Filter	T07-12108	UCD	2.568 ± 0.148	2.709 ± 0.096	2.953
Fe	26	Alion Filter	T07-12108	UCD	0.000 ± 0.000	-0.207 ± 0.148	0.029
Co	27	Alion Filter	T07-12108	UCD	-----	-0.068 ± 0.066	-----
Ni	28	Alion Filter	T07-12108	UCD	2.461 ± 0.126	2.633 ± 0.115	-----
Cu	29	Alion Filter	T07-12108	UCD	0.000 ± 0.000	-0.024 ± 0.032	0.005
Zn	30	Alion Filter	T07-12108	UCD	0.024 ± 0.003	-0.022 ± 0.020	0.020
Ga	31	Alion Filter	T07-12108	UCD	-----	0.025 ± 0.020	-----
As	33	Alion Filter	T07-12108	UCD	2.479 ± 0.127	2.472 ± 0.079	2.752
Se	34	Alion Filter	T07-12108	UCD	0.000 ± 0.000	-0.001 ± 0.012	-----
Br	35	Alion Filter	T07-12108	UCD	0.275 ± 0.035	0.027 ± 0.019	0.028
Rb	37	Alion Filter	T07-12108	UCD	0.000 ± 0.000	0.028 ± 0.013	-----
Sr	38	Alion Filter	T07-12108	UCD	0.000 ± 0.000	0.000 ± 0.015	-----
Y	39	Alion Filter	T07-12108	UCD	-----	0.068 ± 0.059	-----
Zr	40	Alion Filter	T07-12108	UCD	0.000 ± 0.000	0.073 ± 0.050	0.008
Nb	41	Alion Filter	T07-12108	UCD	-----	-0.043 ± 0.052	-----
Mo	42	Alion Filter	T07-12108	UCD	-----	-0.009 ± 0.052	-----
Ag	47	Alion Filter	T07-12108	UCD	-----	0.046 ± 0.048	-----
Cd	48	Alion Filter	T07-12108	UCD	-----	2.507 ± 0.114	-----
In	49	Alion Filter	T07-12108	UCD	-----	0.027 ± 0.061	-----
Sn	50	Alion Filter	T07-12108	UCD	-----	-0.015 ± 0.065	-----
Sb	51	Alion Filter	T07-12108	UCD	-----	3.113 ± 0.126	-----
Cs	55	Alion Filter	T07-12108	UCD	-----	-0.023 ± 0.061	-----
Ba	56	Alion Filter	T07-12108	UCD	-----	-0.016 ± 0.092	-----

Table 14. XRF Spiked Filter PE Results

Element	Z	Sample Description	Sample ID	Test Lab	Test Lab Result (µg/filter)	NERL Result (µg/filter)	Median* (µg/filter)
La	57	Alion Filter	T07-12108	UCD	-----	-0.031 ± 0.055	-----
Ce	58	Alion Filter	T07-12108	UCD	-----	0.027 ± 0.078	-----
Sm	62	Alion Filter	T07-12108	UCD	-----	0.033 ± 0.052	-----
Eu	63	Alion Filter	T07-12108	UCD	-----	-0.044 ± 0.478	-----
Tb	65	Alion Filter	T07-12108	UCD	-----	0.311 ± 0.206	-----
Hf	72	Alion Filter	T07-12108	UCD	-----	-----	-----
Ta	73	Alion Filter	T07-12108	UCD	-----	-0.021 ± 0.073	-----
W	74	Alion Filter	T07-12108	UCD	-----	-0.071 ± 0.076	-----
Ir	77	Alion Filter	T07-12108	UCD	-----	-----	-----
Au	79	Alion Filter	T07-12108	UCD	-----	-0.005 ± 0.039	-----
Hg	80	Alion Filter	T07-12108	UCD	-----	0.935 ± 0.053	-----
Pb	82	Alion Filter	T07-12108	UCD	2.498 ± 0.129	2.813 ± 0.091	2.984

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