TECHNICAL MEMORANDUM

TO: Dennis Crumpler / OAQPS
FROM: Eric Boswell / NAREL
COPY: Dr. Jason Low / AQMD
AUTHOR: Jewell Smiley / NAREL
DATE: April 2, 2010
SUBJECT: AQMD Laboratory Audit

Introduction

On October 20-21, 2009, a Technical Systems Audit (TSA) was conducted at the South Coast Air Quality Management District (AQMD) Laboratory, located in Diamond Bar, CA. This TSA was performed as part of the quality assurance oversight provided by the U.S. Environmental Protection Agency (EPA) for the $PM_{2.5}$ Chemical Speciation Network (CSN) of air monitoring stations. Most of the speciation samples that are collected from the CSN sites within the greater Los Angeles area are analyzed at the AQMD laboratory.

The audit was performed by three physical scientists from EPA: Steve Taylor and Jewell Smiley from the National Air and Radiation Environmental Laboratory (NAREL) located in Montgomery, AL, with Dennis Crumpler from the Office of Air Quality Planning and Standards (OAQPS) located in Research Triangle Park, NC. This TSA was a routine inspection of specific laboratory operations and was the first on-site CSN audit performed by EPA at AQMD.

Summary of Audit Proceedings

Several days of planning and communication were necessary before the auditors actually traveled to AQMD. Normally it would be sufficient preparation for the auditors to study the laboratory Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan before traveling. However, these documents were in various stages of revision at AQMD, and the new documents would not be complete before the audit. To address this problem, the auditors prepared a list of more than three hundred questions regarding the laboratory operations, and this questionnaire was submitted to AQMD on September 29. Response to the advanced questions was used to create an agenda for the on-site visit. The advanced questions along with the responses from AQMD are included as Appendix A to this report.

The audit team arrived at AQMD early in the morning on October 20, and they were greeted by Dr. Jason Low and Dr. Raul Dominguez. Jason is the Quality Assurance Manager, and Raul is a Senior Air Quality Chemist also responsible for laboratory QA. After passing through security, the audit team was escorted to a conference room which was already occupied by several of the laboratory staff awaiting the audit briefing.

After introductions, the audit team gave a brief overview of the audit process. The agenda called for inspection of the following areas of the laboratory, and interviews were conducted with those analysts that actually perform the work.

- ✓ Sample Prep/Sample Receiving – Ms. Malou Cartwright
- ✓ Organic Carbon/Elemental Carbon (OC/EC) Analysis – Ms. Cynthia Fisette
- ✓ Anions Analysis by Ion Chromatography (IC) – Mr. Roger Bond
- ✓ Cations Analysis by IC – Ms. Judy Hwa
- ✓ Elements by X-ray Fluorescence (XRF) Analysis – Ms. Laura Julius
- ✓ Gravimetric Mass Analysis – Ms. Monna Trinh
- ✓ Data Management – Mr. Stephen Dutz

Several experimental activities were on the agenda which were discussed with AQMD staff during the briefing. Blind samples had been prepared at NAREL for each analytical area and brought to the audit so that analysts could be observed performing the analysis and results could be compared to expected values immediately. The details of these experiments will be described later within the appropriate section of this report. AQMD was one of several laboratories to participate in the annual inter-laboratory study which was sponsored by NAREL in 2009 [reference 1], and results from that study were discussed with AQMD staff during the audit.

At least one of the following AQMD managers and senior staff were present with the auditors for the entire audit and were able to participate in the interviews with technical staff.

- ✓ Mr. Rudy Eden – Senior Manager, Laboratory Services
- ✓ Mr. Solomon Teffera – Aerosol Analysis Supervisor
- ✓ Dr. Jason Low – Quality Assurance Manager
- ✓ Dr. Raul Dominguez – Senior Air Quality Chemist

Sample Prep/Sample Receiving

At the time of this audit, AQMD was providing all of the field and laboratory support for eight Met One SASS units located at seven different monitoring sites within the district. The auditors were surprised to learn that each SASS unit was supplied with nine filters for the 24-hour sampling event (see figure 1). Usually only three filters are used for CSN sampling.

Figure 1. Filter Assembly for AQMD SASS Network Measurements

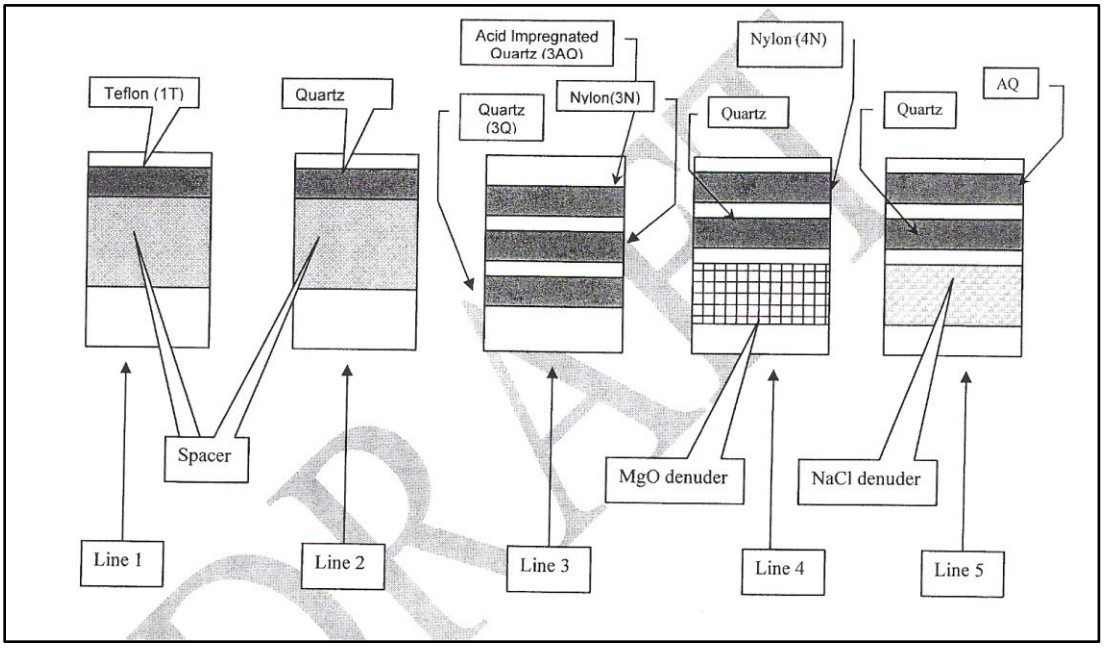
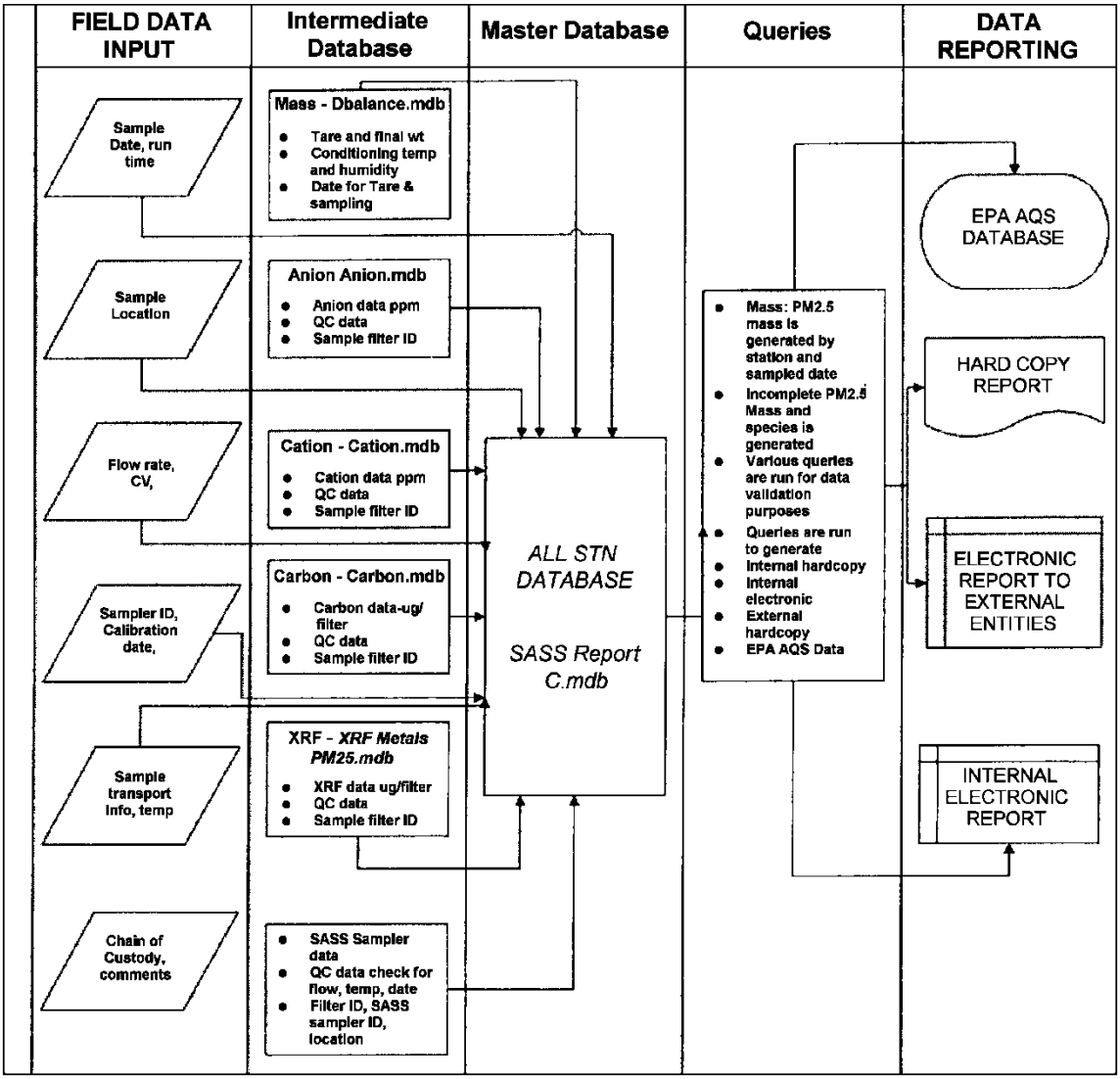


Figure 1 was taken from the Quality Assurance Project Plan (QAPP) which was still in draft status during the audit. At the AQMD laboratory ions are determined not only from Nylon® membrane filters but also from quartz fiber filters. All of the filters recovered from channels 3, 4, and 5 are available for extraction and analysis using ion chromatography. After seeing figure 1, the auditors had to admit their lack of experience for analyzing ions from a quartz filter.

Ms. Malou Cartwright was available to explain how fresh filters are prepared for transport to the field sites and how exposed filters are recovered. AQMD personnel are responsible for obtaining new filters, performing the filter acceptance testing, assembling fresh filters into the appropriate SASS canisters, and transporting the canisters to the field sites. Field activities were not discussed since the audit schedule did not include field operations. Malou explained that after each sampling event, the field service operator transports the canisters back to the laboratory after which a technician will disassemble the canisters to recover the exposed filters.

Critical bookkeeping is required to insure sample integrity and keep track of data as it is generated. Figure 2 is a data flow chart that was taken from the QAPP.

Figure 2. Data Flow Chart for $PM_{2.5}$ Speciation Program at AQMD



AQMD maintains a supply of unexposed filters that are ready for sampling. A request was made to remove a few filters from this supply. Two filters of each medium (Teflon®, Nylon®, and quartz) were randomly selected and carried to NAREL for analysis. Results from the analyses performed at NAREL are shown in table 1.

Table 1. Results from Clean Filters Removed from the Canister Assembly Area.

Filter ID	Filter Description	Parameter	Instrument	Concentration (µg/filter)
N09-13180	Nylon® filter	Chloride	IC	not detected
		Nitrate	IC	0.72 ± 1
		Sulfate	IC	not detected
		Sodium	IC	0.01 ± 0.5
		Ammonium	IC	-0.10 ± 1
		Potassium	IC	not detected
N09-13181	Nylon® filter	Chloride	IC	not detected
		Nitrate	IC	0.56 ± 1
		Sulfate	IC	not detected
		Sodium	IC	not detected
		Ammonium	IC	-0.09 ± 1
		Potassium	IC	-0.004 ± 0.5
Q09-13178	Quartz filter	Chloride	IC	not detected
		Nitrate	IC	0.51 ± 1
		Sulfate	IC	not detected
		Sodium	IC	0.05 ± 0.5
		Ammonium	IC	0.12 ± 1
		Potassium	IC	0.13 ± 0.5
Q09-13179	Quartz filter	Chloride	IC	0.36 ± 0.5
		Nitrate	IC	0.48 ± 1
		Sulfate	IC	0.27 ± 1
		Sodium	IC	0.27 ± 0.5
		Ammonium	IC	0.07 ± 1
		Potassium	IC	0.30 ± 0.5
Q09-13176	Quartz filter	OC	OC/EC Analyzer	7.4 ± 2.7
		EC	OC/EC Analyzer	1.5 ± 2.4
Q09-13177	Quartz filter	OC	OC/EC Analyzer	4.7 ± 2.6
		EC	OC/EC Analyzer	0.0 ± 2.4
T09-13182	Teflon® filter (serial number T9504239)	$PM_{2.5}$ Mass	Balance	-3 ± 5*
T09-13183	Teflon® filter (serial number T9504238)	$PM_{2.5}$ Mass	Balance	1 ± 5*
Pre-mass determined at AQMD and Post-Mass determined at NAREL				

No significant contamination was observed on the filters listed in table 1 except for Organic Carbon (OC). Both filters that were analyzed for carbon (Q09-13176 and Q09-13177) showed OC above the analytical uncertainty. This outcome was not surprising since AQMD has decided

not to thermally clean the quartz filters before sampling. Also in table 1, please note that the $PM_{2.5}$ mass concentration was determined by subtracting the tare mass determined by AQMD from the final mass determined several days later at NAREL.

There is a potential to contaminate filters due to sample handling in the laboratory and in the field. Field blanks are used to evaluate contamination, and they are run at a frequency of at least quarterly. The field blanks are treated like other samples except that they are mounted on the sampler for only a few minutes. The audit team made a request to examine current field blank results, and those results are summarized in table 2.

Table 2. Summary of Field Blank Results from 2008

Statistics	All Concentrations (µg/filter)											
	Grav. Mass	Carbon		Anions from Nylon® filters			Anions & Cations from quartz filters					
		OC	EC	Cl	NO_3	SO_4	Cl	NO_3	SO_4	Na	NH_4	K
Average	15	15	1	1.05	1.85	0.29	0.95	3.00	0.34	1.01	0.32	0.10
Median	15	12	0	0.96	2.32	0.00	0.95	2.50	0.20	0.96	0.00	0.00
Std Dev	7	12	4	0.52	1.38	0.61	0.43	2.52	0.59	0.50	0.67	0.33
Minimum	-1	6	0	0.11	0.00	-0.21	0.00	0.00	-0.39	0.00	0.00	0.00
Maximum	29	62	17	1.97	4.04	2.16	2.04	8.70	2.54	2.13	2.40	1.47
Count	23	23	23	19	19	19	21	21	21	22	22	22
	Elements by X-Ray Fluorescence							Cations from acidified quartz filters				
	Mg	S	Ti	Mn	Fe	Ni	Cu	Na			NH_4	K
Average	1.70	0.20	0.21	0.14	0.70	0.04	0.25	not reported			2.62	0.00
Median	2.16	0.00	0.16	0.00	0.71	0.00	0.24	not reported			2.55	0.00
Std Dev	1.90	0.40	0.25	0.23	0.33	0.06	0.19	not reported			1.88	0.03
Minimum	0.00	0.00	0.00	0.00	0.08	0.00	0.00	not reported			0.00	0.00
Maximum	6.19	1.15	1.01	0.55	1.27	0.16	0.71	not reported			6.84	0.20
Count	19	19	19	19	19	19	19	not reported			42	42

Organic Carbon/Elemental Carbon Analysis

Ms. Cynthia Fisette was the analyst responsible for the determination of carbon residues present on quartz filters. Cynthia had three carbon analyzers at her workstation, and all three units were DRI model 2001 instruments. All three instruments were set up to run the IMPROVE thermal profile. At the time of this audit, organic carbon (OC) and elemental carbon (EC) were the only carbon fractions reported.

During the briefing at the beginning of the audit, Cynthia had been given two blind samples with a request to analyze them at her earliest convenience. The samples had been prepared at NAREL and brought to the audit. One sample was prepared from a thermally cleaned quartz fiber filter from which several circular 0.5 cm^2 subsamples were removed using a punch tool and placed into a labeled Petri-dish with a tight fitting lid. A second sample was prepared exactly like the first except that each subsample was spiked with 20 µg (40 µg/cm^2) of carbon from a sucrose solution that was allowed to air dry in a separate labeled Petri-dish. Except for the labels, the two samples were visibly indistinguishable.

Cynthia had just finished her analysis of the demonstration samples when the auditors arrived at her workstation. The auditors were able to review the raw data produced by her analysis and discuss her results which are presented in table 3 along with spike levels and results from independent analyses performed at NAREL.

Table 3. Demonstration of Carbon Analysis

Sample ID	Sample Description	Carbon Fraction	Spike Level (µgC/cm^2)	AQMD Result (µgC/cm^2)	NAREL Pre-Audit Result (µgC/cm^2)	NAREL Post-Audit Result (µgC/cm^2)
Q09-13172	Blank Quartz	OC	0.00	0.38	0.00 ± 0.20	0.28 ± 0.21
		EC	0.00	0.00	0.00 ± 0.20	0.01 ± 0.20
Q09-13173	Spiked Quartz	OC	40.0	38.8	40.2 ± 2.2	41.5 ± 2.3
		EC	0.00	2.8	0.00 ± 0.20	0.03 ± 0.20

Notice that table 3 includes NAREL results which were determined before the audit and also after the audit. The small increase in OC may have been due to accidental contamination which is commonly associated with filter transport and handling. Table 3 shows good agreement between labs except for the EC results from the spiked quartz (sample Q09-13173). Sample Q09-13173 was spiked with sucrose which does not contain EC. Sucrose was selected for the spike material because it chars readily during the analysis, like many ambient air samples, and it offers a good challenge for how well the analysis can distinguish the OC and EC originally present in the sample.

Travel blanks were brought to the audit and were not opened before they were carried back to NAREL for analysis. Experience has shown that travel blanks can be very useful for those audits that include demonstration blanks. The results from two quartz travel blanks are shown in table 4.

Table 4. Trip Blanks and Calibration Standard Analyzed at NAREL

Sample ID	Sample Description	Carbon Fraction	Spike Level (µgC/cm^2)	NAREL Post-Audit Result (µgC/cm^2)
Q09-13176	Quartz Travel Blank #1	OC	0.00	-0.10 ± 0.20
		EC	0.00	0.00 ± 0.20
Q09-13177	Quartz Travel Blank #2	OC	0.00	-0.02 ± 0.20
		EC	0.00	0.00 ± 0.20
SS09-13174	KHP solution provided by AQMD	OC	18.2	18.3 ± 1.1
		EC	0.00	-0.01 ± 0.20

Table 4 also contains results from a potassium hydrogen phthalate (KHP) solution. Cynthia was asked to give the auditors some of her calibration solution so that it could be analyzed at NAREL. According to NAREL's analysis, the KHP solution was very accurate.

Carbon results from a recent inter-laboratory comparison study (reference 1) were discussed with Cynthia during her interview.

Analysis of Anions by Ion Chromatography (IC)

Mr. Roger Bond was the analyst responsible for the analysis of anions extracted from filter residues. His workstation was equipped with a Dionex IC instrument running Chromeleon software. Anion results were calculated using external standards, and six levels of analyte were routinely analyzed to establish the instrument response curve. Independent calibration checks were analyzed at the beginning of the analytical sequence and again after every tenth sample during the sequence. At the instrument it was noticed that duplicate injections were performed for every sample. This practice is remarkable since the auditors had not observed this high frequency of duplicate injections at other labs. A large 1-mL loop was used for injections.

Roger was given the opportunity to demonstrate his ability to analyze an unknown solution during the audit. The auditors had brought a calibration standard with them for Roger to analyze. He was advised to dilute it by a factor of ten before his analysis, and he should use his own pipets, containers, and the local reagent water to perform the dilution. He was given the unknown solution (sample SS09-13168) during the initial briefing so there was plenty of time to perform his analysis. Surprisingly there was a problem with Roger's first attempt to analyze the unknown. Luckily there was enough time and a sufficient volume of the unknown for Roger to reanalyze the sample. His final results were excellent, and they are presented in table 5.

Table 5. Demonstration of Anion Analysis

Sample_ID	Sample Description	Parameter	Expected Value (ppm)	AQMD Result (ppm)
SS09-13168	Anion solution provided by NAREL	Fluoride	1.00	not reported
		Chloride	1.00	1.08
		Nitrite	1.00	not reported
		Nitrate	2.00	1.93
		Sulfate	2.00	1.99

Roger was asked to give the auditors some of his calibration solution so that it could be analyzed at NAREL. According to NAREL's analysis shown in table 6, the anion solution provided by Roger was very accurate.

Table 6. AQMD Calibration Standard Analyzed at NAREL

Sample_ID	Sample Description	Parameter	Expected Value (ppm)	NAREL Result (ppm)
SS09-13170	Anion solution provided by AQMD	Chloride	0.20	0.20
		Nitrate	1.00	1.04
		Sulfate	1.00	1.04

Anion results from a recent inter-laboratory comparison study (reference 1) were discussed with Roger during his interview.

Analysis of Cations by Ion Chromatography (IC)

Ms. Judy Hwa was the analyst responsible for the analysis of cations. Her workstation was equipped with a Metrohm IC instrument running IC Net 2.3 software. Cation results were calculated using external standards, and at least four levels of analyte were routinely analyzed to establish the instrument response curve. Six-level curves were used for calculations during the audit. Independent calibration checks were analyzed at the beginning of the analytical sequence and again after every tenth sample during the sequence. Samples were injected using a 40-µL loop. Again it was noticed that duplicate injections were performed for every sample, and this practice was commendable. The auditors were not familiar with Metrohm instruments, and they were pleasantly amazed to see Judy's linear response curve for ammonium. Her six-level curve for ammonium was extremely linear over the calibration range from 0.1 to 4 ppm.

Judy was also given the opportunity to demonstrate her ability to analyze an unknown solution during the audit. She was given the unknown solution (sample SS09-13169) during the initial briefing, and she was also advised to dilute it by a factor of ten before her analysis using her own pipets, containers, and the local reagent water to perform the dilution. Except for calcium, her results were excellent, and they are presented in table 7. It is important to say that AQMD does not report calcium for the any of its programs.

Table 7. Demonstration of Cation Analysis

Sample_ID	Sample Description	Parameter	Expected Value (ppm)	AQMD Result (ppm)
SS09-13169	Cation solution provided by NAREL	Lithium	0.25	not reported
		Sodium	1.00	1.02
		Ammonium	1.00	2.03
		Potassium	1.00	1.01
		Magnesium	1.00	1.07
		Calcium	5.00	5.83

Judy provided the auditors with some of her calibration solution so that it could be analyzed at NAREL. The results from NAREL's analysis are shown in table 8.

Table 8. AQMD Calibration Standard Analyzed at NAREL

Sample_ID	Sample Description	Parameter	Expected Value (ppm)	NAREL Result (ppm)
SS09-13171	Cation solution provided by AQMD	Sodium	2.00	2.02
		Ammonium	2.00	2.06
		Potassium	2.00	2.03
		Magnesium	2.00	2.03
		Calcium	2.00	1.91

Cation results from a recent inter-laboratory comparison study (reference 1) were discussed with Judy during her interview.

Gravimetric Mass Analysis

AQMD has a spacious weighing chamber which was set up for determining the filter-based gravimetric mass of particulate matter (PM) captured from ambient air. Ms. Monna Trinh was the laboratory technician on duty when the audit team entered the weighing chamber. She was weighing a set of filters and metallic weights that were brought to the audit from NAREL's weighing chamber. Monna was using one of the two Sartorius MC5 microbalances to perform the weighing. Polonium-210 strips were used to remove electrical static from the filters before they were weighed. The results from her weighing session are presented in table 9 along with measurements that were performed at NAREL.

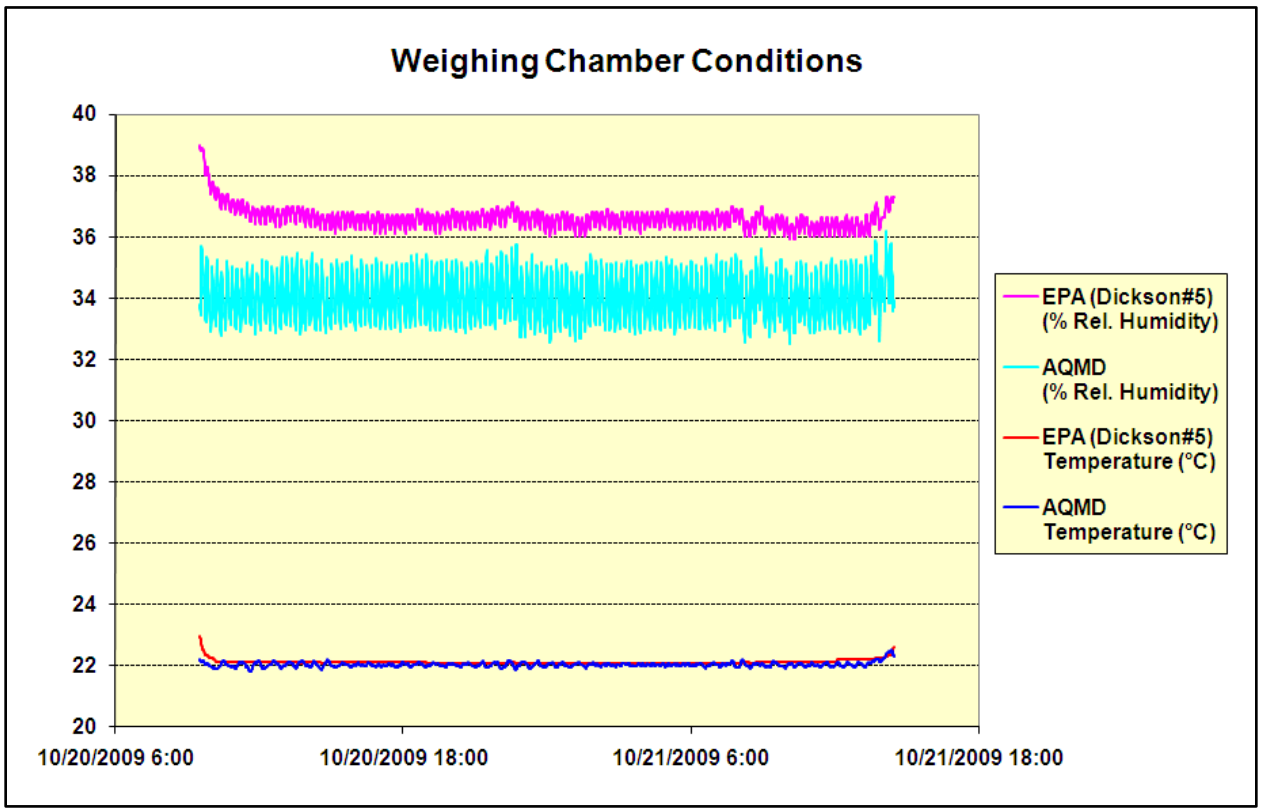
Table 9. Demonstration of Gravimetric Mass Analysis

Sample ID	Sample Description	EPA Pre-Audit Mass (mg)	AQMD Mass (mg)	EPA Post-Audit Mass (mg)
MW09-13162	Metallic weight provided by EPA	180.868	180.867	180.868
MW09-13163	Metallic weight provided by EPA	91.558	91.559	91.558
T09-13164	Teflon® filter provided by EPA	147.212	147.211	147.212
T09-13165	Teflon® filter provided by EPA	146.431	146.420	146.420
T09-13166	Teflon® filter (serial # T9504256) taken from AQMD weighing chamber	-----	148.249	148.243
T09-13167	Teflon® filter (serial # T9504399) taken from AQMD weighing chamber	-----	149.742	149.741

Monna's demonstration was very successful. However, one of the EPA measurements was suspicious. EPA's pre-audit measurement of filter sample T09-13165 was eleven micrograms higher than the post-audit value. These results were checked, and neither value was affected by a transcription error. It is likely that some very small contaminant was present on the filter when it was first weighed at NAREL, but not present on the filter for subsequent measurements. Other explanations are also possible.

For compliance monitoring, the weighing lab should have rigorous control of dust, temperature, and humidity to support filter equilibration and reliable weighing. EPA Quality Assurance Guidance Document 2.12 (reference 2) specifies the chamber temperature to be maintained at 20-23 °C, for 24 hours prior to weighing, and the average relative humidity (RH) should be maintained at 30-40% over the same time period. Accurate control of the climate inside the weighing room is important because the balance calibration is very sensitive to temperature, and the equilibrated mass of an exposed Teflon® filter is sensitive to humidity. Dickson data loggers were brought to the audit and placed inside the weighing chamber for the duration of the audit. The Dickson loggers were placed near the AQMD sensors that measure temperature and humidity. Figure 3 is a visual comparison of the data collected by the collocated devices. Figure 3 shows good steady control of the chamber temperature and humidity even when seven people were inside the chamber during Monna's interview.

Figure 3. Temperature and Humidity Measurements



The measurement differences are within acceptable limits based on the accuracy for each device. The uncertainty expected from the Dickson measurements was ± 2 % for RH and ± 0.5 °C for temperature. It is worth stating that the Dickson measurements are traceable to the National Institute of Standards and Technology (NIST) on an annual basis.

Gravimetric mass results from a recent inter-laboratory comparison study (reference 1) were discussed with Monna during her interview.

X-Ray Fluorescence (XRF) Analysis

Teflon® filters returned from the field sites are first analyzed for the gravimetric mass of PM captured by the filter. After the gravimetric analysis is complete, the filter is then submitted for XRF analysis to determine the elements present in the captured PM. Ms. Laura Julius was the analyst responsible for the XRF analysis. Her workstation was equipped with a PANalytical Epsilon 5 instrument running version 2.0C software.

A single Teflon® filter was brought to the audit and submitted to Laura during the initial audit briefing. She was told to analyze the filter as a demonstration of her analytical skills, but she was not given the history of the filter. In fact the filter had been analyzed previously at AQMD and also at the Research Triangle Institute (RTI). RTI had served as a reference lab for a recent inter-laboratory comparison study (reference 1) with six XRF labs participating.

Results from Laura's demonstration are presented in figure 4 along with results from the previous analysis at AQMD. The results for several elements are presented as a normalized

stack bar graph. Only those elements with results significantly above the method detection limit (MDL) are shown in the graph.

Figure 4. Demonstration of XRF Analysis

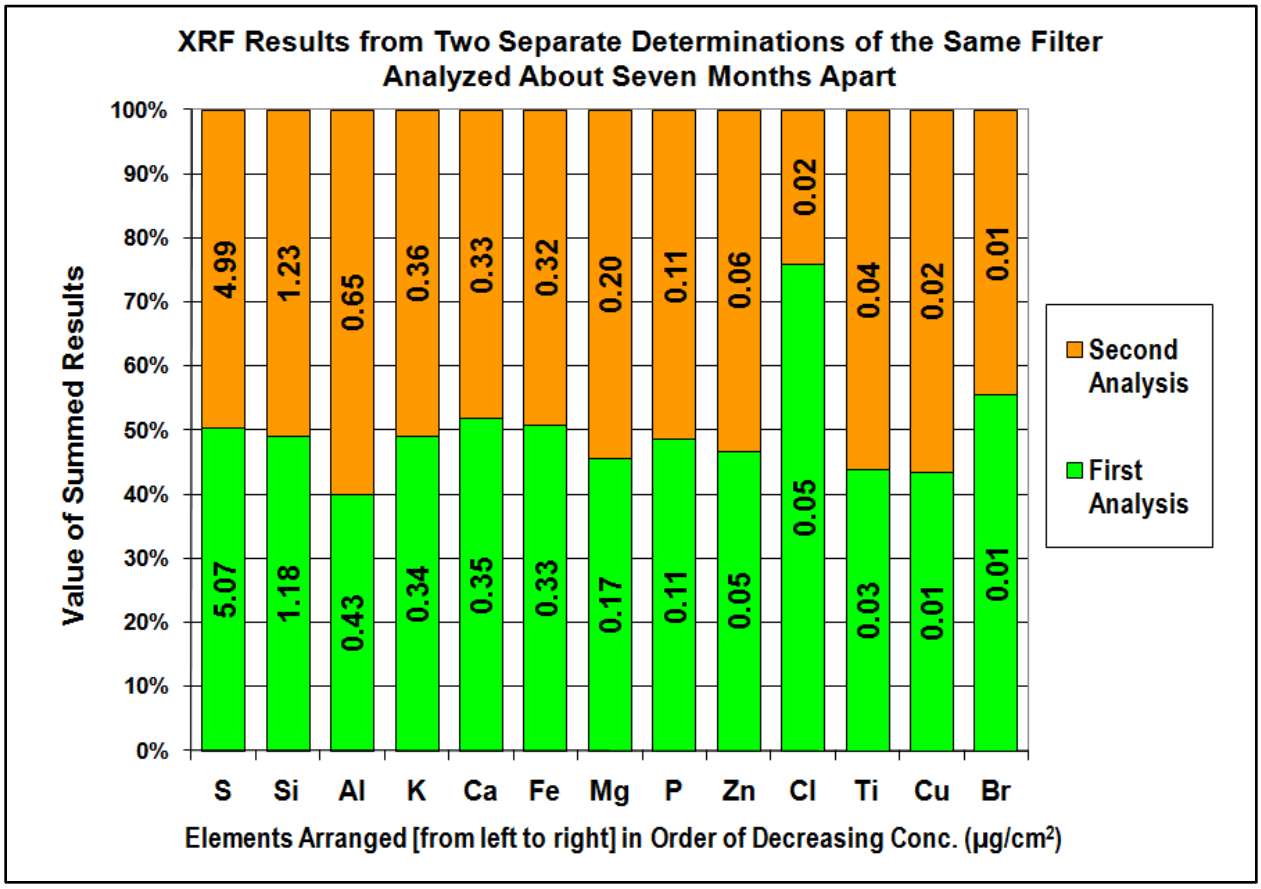


Figure 4 shows at a glance that the analysis performed on the day of the audit compares very well with the previous analysis for most elements. According to figure 4, chlorine showed the worst precision (greatest percent difference) for the two determinations. Table 10 is a more comprehensive list of results that includes all of the elements reported. The data in table 10 also includes the MDL or the stated uncertainty if they were reported.

Table 10. XRF Results from Demonstration Filter

Z	Element	First Analysis (µg/cm^2)			Second Analysis (µg/cm^2)		
		Sample Conc.	MDL	Uncertainty	Sample Conc.	MDL	Uncertainty
12	Mg	0.170	0.168	-----	0.203	-----	0.138
13	Al	0.434	0.120	-----	0.652	-----	0.221
14	Si	1.182	0.160	-----	1.227	-----	0.288
15	P	0.108	0.159	-----	0.114	-----	0.029
16	S	5.073	0.025	-----	4.987	-----	0.943
17	Cl	0.054	0.017	-----	0.017	-----	0.012
19	K	0.344	0.006	-----	0.358	-----	0.076

Z	Element	First Analysis (µg/cm^2)			Second Analysis (µg/cm^2)		
		Sample Conc.	MDL	Uncertainty	Sample Conc.	MDL	Uncertainty
20	Ca	0.354	0.007	-----	0.329	-----	0.067
21	Sc	ND	0.006	-----	0.198	-----	0.043
22	Ti	0.031	0.006	-----	0.039	-----	0.015
23	V	0.002	0.007	-----	ND	0.009	-----
24	Cr	ND	0.006	-----	ND	0.006	-----
25	Mn	ND	0.007	-----	ND	0.008	-----
26	Fe	0.329	0.004	-----	0.319	-----	0.065
27	Co	ND	0.002	-----	ND	0.005	-----
28	Ni	ND	0.001	-----	ND	0.005	-----
29	Cu	0.012	0.002	-----	0.015	-----	0.007
30	Zn	0.049	0.002	-----	0.056	-----	0.014
31	Ga	ND	0.009	-----	ND	0.014	-----
32	Ge	ND	0.016	-----	ND	-----	0.015
33	As	0.001	0.013	-----	ND	0.007	-----
34	Se	ND	0.012	-----	ND	0.014	-----
35	Br	0.013	0.003	-----	0.010	-----	0.007
37	Rb	ND	0.007	-----	ND	0.008	-----
38	Sr	ND	0.002	-----	ND	0.008	-----
39	Y	ND	0.007	-----	ND	0.007	-----
41	Nb	ND	0.002	-----	ND	0.012	-----
42	Mo	ND	0.011	-----	-----	-----	-----
46	Pd	ND	0.002	-----	ND	0.017	-----
47	Ag	ND	0.019	-----	ND	0.019	-----
48	Cd	ND	0.018	-----	ND	0.019	-----
49	In	ND	0.021	-----	-----	-----	-----
50	Sn	ND	0.003	-----	ND	0.026	-----
51	Sb	ND	0.001	-----	0.040	0.024	-----
55	Cs	ND	0.053	-----	ND	0.055	-----
56	Ba	ND	0.007	-----	ND	0.066	-----
57	La	ND	0.029	-----	ND	0.070	-----
78	Pt	ND	0.022	-----	ND	0.021	-----
79	Au	ND	0.013	-----	ND	0.032	-----
81	Tl	ND	0.016	-----	ND	0.016	-----
82	Pb	ND	0.001	-----	0.026	-----	0.010
83	Bi	ND	0.018	-----	ND	0.017	-----
92	U	ND	0.066	-----	ND	0.020	-----
ND = Not Detected							

XRF results from the recent inter-laboratory comparison study (reference 1) were discussed with Laura during her interview.

Conclusions

This TSA has produced the following findings, recommendations, and comments.

1. Many of the QA documents were not available for this audit. The revisions need to be completed for the Quality Assurance Project Plan and several analytical SOPs. The revised documents need to include current procedures, equipment, objectives, policy, personnel, and other information that documents the actual work performed.

2. Two concerns were noted for the thermal-optical carbon analysis. False-positive EC was observed during the audit and also during the recent inter-laboratory study. False-positive EC is not usually a problem for the carbon analysis since it is relatively easy to prevent EC contamination of the filter samples.

   It was also noted that the instruments were running the older IMPROVE temperature protocol even though other labs have adopted the newer IMPROVE_A protocol. Switching temperature protocols should not affect the two major carbon fractions (OC and EC) that have been reported in the past, but will affect the sub-fractions such as OC1 and EC1, if they are reported in the future.

3. AQMD has a unique method for determining ions by IC. According to figure 1 and the draft QAPP, the IC results are derived from analysis of the filters recovered from channel 3. Most CSN sampling is performed by placing a single Nylon® filter downstream of a magnesium oxide denuder. Considering the many differences in sampling configuration, it is unclear how comparable the ion results would be.

4. Table 10 shows that only MDLs were released for the first XRF analysis reported on March 13, 2009. Uncertainties were reported for the second analysis performed during the audit, but only for those elements that were detected in the sample. All XRF labs are encouraged to develop a method for estimating and reporting a standard (one-sigma) uncertainty for every element including those that are below detection in the sample. There are many sources of random error to consider such as the Poisson count statistics for the sample spectra and the background spectra. There is uncertainty of the sample volume, the filter deposit area, and the calibration standards. Unfortunately EPA is not able to suggest a single method that works well for all XRF labs.

The audit team appreciates the professionalism they observed as well as the warm hospitality they experienced during this audit.

References

1. EPA/NAREL. September 9, 2009. Technical Memorandum: Experimental Inter-comparison of Speciation Laboratories. U.S. Environmental Protection Agency. [currently available on the web] http://www.epa.gov/ttn/amtic/files/ambient/pm25/spec/MultilabSpeciationPT2008_09Sep09.pdf

2. EPA. November 1998. *Quality Assurance Guidance Document for Monitoring $PM_{2.5}$ in Ambient Air Using Designated Reference Method or Class I Equivalent Methods*, Human Exposure and Atmospheric Science Division, National Exposure Research Laboratory, US Environmental Protection Agency, Research Triangle Park, North Carolina. [currently available on the web] http://www.epa.gov/ttnamti1/files/ambient/pm25/qa/m212covd.pdf

Appendix A

Advance Questions and Responses for the
Technical Systems Audit at South Coast Air Quality Management District (AQMD)
Scheduled for October 20-21, 2009

AQMD responses were submitted to NAREL on October 15, 2009.

Item	Category	Question	Response
1	General	Can we get a list of the staff at AQMD that perform work for the PM2.5 Speciation program?	Yes, see "Personnel" Sheet in this File
2	General	What are the routine analytical measurements currently performed at AQMD for the Speciation program? Gravimetric mass, XRF, IC, OC/EC?	Gravimetric mass, XRF, IC, OC/EC
3	General	What is the volume of analytical work performed for the PM2.5 Speciation Program?	6 Monitors: 1/6 day; for 2009 an additional 2 with 1/3day
4	General	Will the laboratory staff be available for interviewing during the TSA?	Yes
5	General	Will the labs be operational and analyzing samples during the audit?	Yes
6	General	Will there be opportunity to take experimental measurements during the audit? For example, the audit team may bring one or two single blind samples from NAREL to the audit so that the test sample can be analyzed in the presence of an auditor.	Yes
7	General	Will the audit team be allowed to select and remove a few filters from the archive for the purpose of performing an independent analysis?	Yes
8	General	How much time will we need during the audit to discuss recent PT results?	1 Hour
9	General	How much time will we need during the audit to discuss participation in the next inter-laboratory study?	0.5 Hour
10	Facility	Is the facility generally well maintained, clean, and in	Yes

Item	Category	Question	Response
		order?	
11	Facility	Is access to the facility limited and controlled?	Yes
12	Facility	Is the restricted entry policy enforced? (e.g. are doors left unlocked or propped open?)	Yes, card key entry
13	Facility	Is the visitor sign-in/sign-out log used consistently and correctly?	Yes
14	Facility	Are samples maintained in a secure area at all times after being delivered to the facility?	Yes, front lobby check-in; visitor badges; employee escort
15	Facility	Is there a client confidentiality policy in place? Is it followed?	Yes
16	Facility	Are laboratory accommodations (i.e., bench space, fume hoods, ventilation, dust abatement, etc.) appropriate for the performance of the test procedures?	Yes
17	Documentation	Who is authorized to halt program activities due to inadequate quality?	DEO STA has authority that may be delegated to the AM, QA or Lab Manager.
18	Documentation	Does the program maintain written descriptions of the program organization and personnel responsibilities?	The QMP provides the global documentation with the QAPP having program specific documentation.
19	Documentation	Does the program maintain current summaries of the training and qualifications of program personnel?	Yes, centralized records exist, standard training form
20	Documentation	How are records of critical consumables (such as filter lot numbers) maintained?	Computer files/spreadsheets
21	Documentation	Has each filter been assigned a unique alphanumeric identification?	Yes
22	Documentation	Are reports available from previous audits (internal or external)?	Yes
23	Documentation	Are reports available for recent preventive or corrective actions?	Yes
24	Documentation	Are there periodic summary reports of quality measurements and if so, what information does the report contain?	Annual QA Summary Report; Training, Audit, Certification, Corrective action, etc.

Item	Category	Question	Response
25	Documentation	How are QA documents controlled at AQMD?	QA Branch maintains files. Hard in notebooks and electronic on a network drive
26	Documentation	How often are QA documents reviewed for accuracy?	At least annually; QA annual report.
27	Documentation	Are obsolete documents such as the old version of an SOP retained?	Yes, electronically in an archive directory
28	Documentation	How long are technical records maintained before they are disposed?	See document retention policy table
29	Documentation	How are electronic records backed-up to prevent loss?	Electronic records are periodically stored of a network drive before final results are reported to AQS. The network drive is backed up nightly.
30	Documentation	Do the records for each analytical test contain sufficient information to enable the test to be repeated under conditions as close as possible to the original?	Yes
31	Documentation	Are the records sufficiently complete to identify the personnel responsible for sampling, receiving, testing, calibration, and checking of results?	Yes
32	Documentation	How are corrections/amendments made to hand-written records?	Strike through, initial and date
33	Documentation	How are corrections/amendments made to electronic records?	
34	Documentation	How are instrument maintenance records maintained?	Instrument maintanance and repair are recorded in instrument log books.
35	Documentation	For automated data collection systems, have all personnel involved in the design or operation of the system had adequate education, training, and experience to enable them to perform the assigned system functions?	LIMS question/ RFQ should be available
36	Documentation	How is this education, training, and experience documented?	Training Forms
37	Documentation	Is there a written description of the computer system(s)	Yes, RFQ or Requisition, IM/Purchasing

Item	Category	Question	Response
		hardware?	
38	Documentation	Has all computer equipment been installed in accordance with manufacturer's recommendation? If not, why? If so, how is this documented?	Yes
39	Documentation	Is there a user's manual for each software program in use? If the program was written in-house, the minimum documentation should include a user guide and the source code.	Yes for commercial software; other programs usage in SOPs
40	Documentation	Is there an approval process for testing and validating either purchased or in-house analytical software before it is used to generate data?	Yes
41	Documentation	Are there adequate acceptance procedures for software changes?	Yes for Commercial software, custom software varies on procedures due to unique situations, but checking is performed at the QC level
42	Documentation	Is there a problem-reporting or corrective action process in place to ensure that problems with the system that can affect data quality are documented when they occur, are subject to corrective action, and that the action is documented?	Yes
43	Documentation	Has a security risk assessment been made, points of vulnerability of the system determined, and all necessary security measures to resolve the vulnerabilities been implemented?	Yes, IM Division responsibility
44	Documentation	Is physical access to records stored magnetically or in hard copy format controlled appropriately?	Yes
45	Documentation	Are there procedures in place to ensure that only personnel with documented authorization can access automated data collection systems?	Yes
46	Documentation	Are there procedures in place for protecting the system from introduction of external programs/software, e.g., to prevent introduction of viruses, worms, etc?	Yes

Item	Category	Question	Response
47	Documentation	Is it required that audit trails be produced showing all data entered, changed, or deleted? If so, are these reports reviewed thoroughly by appropriate personnel?	Yes
48	Documentation	Is there manual rechecking of data entered against source documents at any point? How is this accomplished and documented?	Yes - Paperwork is initialed by checker.
49	Documentation	Are there procedures that ensure that the data collection system is secured so that the data integrity can be protected against unintentional error or intentional fraud?	Yes
50	Documentation	Is there an SOP or policy to establish procedures for entry of data and proper identification of the individual entering the data?	No
51	Documentation	Is there sufficient verification of manually or electronically input data? How is this done and documented?	Yes, first level review process
52	Documentation	Is there adequate storage capability of the automated data collection systems or of the facility itself to provide for retention of raw data, including archives of computer-resident data?	Yes, IM Division responsibility
53	Documentation	Are there policies governing conditions of raw data storage and retention times?	Retention Policy
54	Documentation	Does each instrument have a bound logbook? If not, how is instrument usage, calibration, and maintenance documented?	Yes
55	Documentation	Are entries into the logbook initialed and dated?	Yes
56	Documentation	Are corrections to data and logbook entries made correctly, one line through the data and initialed and dated? (e.g. no whiteout or masking of original entry)	Yes
57	Doc. Control	Is there a document control program in place? Is it fully and correctly implemented?	SOP for SOP implements document control; new documentation as it becomes approved via

Item	Category	Question	Response
			the QA Branch will have document control enforced
58	Doc. Control	Are all QMPs, QAPPs, SOPs, and other technical documents in the document control system?	New documentation falls into the documentation control system as it becomes updated; since all documentation is being updated, it is anticipated that it will all be in the document control system soon
59	Doc. Control	Have all documents related to the Quality Assurance Program been reviewed, approved, and signed by the QA manager?	Document updating occuring and as documents become updated, review approval and signature will be included by the QA Manager.
60	Doc. Control	How is the actual production of documents handled to ensure that unauthorized copies are not made and distributed?	QA Branch Policy specifies version control procedures/ Tracked in Inventory System
61	Doc. Control	Does each copy of a controlled document at AQMD have an appropriate document control number?	New documentation falls into the documentation control system as it becomes updated; since all documentation is being updated, it is anticipated that it will all be in the document control system soon
62	Doc. Control	Does the Document Control Record contain complete written records of all documents in the document control system?	New documentation falls into the documentation control system as it becomes updated; since all documentation is being updated, it is anticipated that it will all be in the document control system soon
63	Doc. Control	Does the Document Control Record contain a revision history for controlled documents?	Yes. New system has a section entitled "revision history" and "changes since last revision" (See SOP for SOPs)
64	Doc. Control	Are there pen-and-ink revisions on copies of controlled documents that have not been approved by the responsible official(s)?	No
65	Doc. Control	If pen-and-ink changes have been approved, has the same change been made to every copy of the document	Not Applicable

Item	Category	Question	Response
		in distribution?	
66	Doc. Control	How are outdated controlled documents collected for disposal?	Hard copies removed from binders and instrument location by Prin. Chemist - verified by QA Sr, Chemist; electronic copies moved to a limited access archive by QA Branch.
67	Doc. Control	Is the disposal process and history of a controlled document well documented?	Insufficient history
68	QAPP	Is there an approved quality assurance project plan (QAPP) for the overall program and has it been reviewed by all appropriate personnel?	Under development
69	QAPP	Is a copy of the approved QAPP available for review by the laboratory analysts? If not, briefly describe how and where QA requirements and procedures are documented and are made available to them.	EPA and RTI QAPP used as guideline - AQMD specific QAPP is under development; The draft QAPP lists the QA requirements and procedures and will be made available to all staff
70	QAPP	Is the design and implementation of the program described accurately in the QAPP?	EPA and RTI QAPP used as guideline - AQMD specific QAPP is under development; The draft QAPP is designed to reflect current program accurately
71	QAPP	Are there deviations from the QAPP?	EPA and RTI QAPP used as guideline - AQMD QAPP is under development; The draft QAPP is designed to reflect current program accurately
72	QAPP	How are any deviations from the QAPP noted?	To be determined
73	QAPP	Is the anticipated use of the data known and documented in the QAPP?	This is already in QAPP draft
74	QAPP	What are the critical measurements in the program as defined in the QAPP?	This is already in QAPP draft
75	QAPP	For each critical measurement, does the QAPP specify the frequency of calibration, the acceptance criteria for	This is already in QAPP draft and/or SOPs

Item	Category	Question	Response
		the calibration, and the process for calibration, data reduction, and review?	
76	QAPP	Does the QAPP list measurement quality objectives (MQOs) for each critical measurement clearly and explicitly?	This is already in QAPP draft
77	QAPP	Are the MQOs based either on documented performance criteria or on actual QC data compiled for the measured parameter?	MQO based upon documented performance criteria for EPA program; IF QC data is appropriate for measured parameter, a technical report will be produced along with consensus from U.S. EPA before implementation
78	QAPP	Are there established procedures for corrective or response actions when MQOs are not met? If yes, briefly describe them.	The AQMD has a CAR process in place. Specific actions will be in the various SOPs
79	QAPP	Have any such corrective actions been taken during the program?	Yes
80	QAPP	Has the performance of each of the critical measurements been assessed and documented during the program?	Yes
81	QAPP	To what extent is AQMD responsible for performing annual calibrations, adjustments, and major repair of the field samplers?	The Support group within the Atmospheric Measurements Branch is responsible for all these functions
82	Qual. Mgt.	Is there a Quality Management Plan (QMP) in place?	Yes
83	Qual. Mgt.	Is the QMP current?	Yes
84	Qual. Mgt.	Is the QMP available to all staff?	Yes
85	Qual. Mgt.	Are there regular staff meetings to discuss quality issues and problems?	Yes
86	Qual. Mgt.	Has training on the elements of a quality assurance plan been done? Is it documented?	Training has been completed on the roles of QA Branch and Corrective action system to both laboratory and field staff in individual groups; when website is complete, a division-wide training will be implemented

Item	Category	Question	Response
87	Qual. Mgt.	Are administrative policies complete, clear, and well-documented?	Yes
88	Qual. Mgt.	Does the QA manager have direct access to the highest level of management at which decisions are made on lab policy and resources?	Yes
89	Qual. Mgt.	How does AQMD deal with complaints from the client regarding work performance?	Corrective action process
90	Qual. Mgt.	Are written job descriptions available for each member of the staff?	Yes
91	Qual. Mgt.	How are new staff members trained?	Apprenticeship to experienced staff; SOPs, instrument manuals, manufacturer presentations
92	Qual. Mgt.	How is it documented that each staff member meets the minimum qualifications for his or her job description?	Hiring process requires submission of documentation before candidate for a position can be considered. A QAP and final hiring interview are then performd to assess a candidate more fully.
93	Qual. Mgt.	Are resumes available for each staff member?	No, HR application process does not include resumes
94	Qual. Mgt.	Is a formal training program for facility staff in place? Is it fully implemented? Is it followed?	Yes
95	Qual. Mgt.	Is there an SOP for training and certification of staff? Is it implemented? Is it followed?	Not developed as each training session is different and usually requires a different type of training; Training memo was released with instructions on how to use the training forms
96	Qual. Mgt.	Is there an adequate initial training program for new employees which covers health and safety, quality assurance policies and procedures, AQMD policies, and analytical or other job-related responsibilities?	Once QA documentation is complete, QA training has been performed with existing staff; Laboratory safety training is done for new employees; An initiation training of new employees for all topics will be implemented annually

Item	Category	Question	Response
97	Qual. Mgt.	How is training for a new job responsibility done? Is there a process of training, testing, and validation for a new job responsibility?	Apprenticeship to experienced staff; SOPs, instrument manuals, manufacturer presentations
98	Qual. Mgt.	Are analysts and other staff adequately trained to use appropriate software and computer systems?	Staff are sent to AQS training and are sent to inhouse software training run by IM
99	Qual. Mgt.	Are training records for all staff complete, up-to-date, and easily accessible?	Yes
100	SOPs	Are Standard Operating Procedures in place for all analytical methods, general procedures and policies, and other processes which have an impact on data quality?	Yes, but are being updated
101	SOPs	Are the SOPs complete, up-to-date, and followed?	Not currently, but all SOPs are in the process of revision to reflect current practice
102	SOPs	Do the SOPs address selection and control of calibration standards?	Yes
103	SOPs	Do the SOPs address calibrations and their frequency?	Yes
104	SOPs	Do the SOPs include QC acceptance limits and associated corrective actions when such limits are surpassed?	Yes
105	SOPs	Do the SOPs include preventive and remedial maintenance?	Yes
106	SOPs	Do the SOPs explain how to record and validate data?	Yes
107	SOPs	How are data quality assessments made for precision and accuracy?	Data is reviewed before submission, instrument qualifications are performed periodically and the AQMD participates in audits and intercomparison studies.
108	SOPs	How are measurement uncertainties calculated?	Typically by 3*standard deviation in a standard approaching the MDL
109	SOPs	Are SOPs controlled documents?	QA Branch retains originals of documents both in hard copy and electronically; will be electronically available through centralized web interface controlled by QA Branch

Item	Category	Question	Response
110	SOPs	Are SOPs implemented and followed?	SOP revision underway will ensure documents are relevant to current practices and procedures.
111	SOPs	Are SOPs accessible to the persons who need to use them, and available at all appropriate work sites?	Available for all instruments subject to this TSA.
112	SOPs	Is there evidence of unauthorized changes to SOPs?	None
113	SOPs	Are there deviations from an SOP which have not been documented or approved?	None
114	SOPs	Are SOPs current and updated to requirements and procedures?	SOP revision underway will ensure documents are relevant to current practices and procedures.
115	SOPs	Has training been conducted for each SOP now in place?	Staff training is an on-going process.
116	SOPs	Have all SOPs been reviewed during the past year? Is this documented?	Yes
117	SOPs	Are SOPs in place covering system security, training, hardware and software changes, data changes, procedures for manual operations during system downtime, disaster recovery, backup and restore procedures, and general system safety?	These topics are subject of new SOPs or are addressed in IM SOPs/policies
118	SOPs	Is there an SOP for software development, maintenance, and changes?	These topics are subject of new SOPs or are part of IM SOPs/policies
119	QC	How are new filter lots tested before they are used to collect routine field samples?	Filters are examined for visual defects over a bright light table
120	QC	How are filter lots tracked and documented?	Usable filters are placed in a container labeled with the type of filter, inspection date, inspector's initials and "LI" to indicate that they have passed lightinspection.
121	QC	When a new individual filter is inspected for use, what are the acceptance criteria for using it?	See SOPs SOP0087, SOP0096 and SOP0097
122	QC	Have maximum holding times been established for the critical steps of the overall sample analysis?	Yes

Item	Category	Question	Response
123	QC	Is there a mechanism for input into data quality issues from staff at all levels?	Yes - The AQMD has procedures for corrective action and staff level quality assurance alerts.
124	QC	Are QC samples analyzed at the prescribed or client-requested rate?	Yes
125	QC	Do all QC data meet the specified QC acceptance criteria? If not, was investigation made and corrective action taken? How is this documented?	Yes. Recorded in log book and maintenance sheets
126	QC	Are out-of-control events properly documented, tracked, and followed up?	Yes
127	QC	Have records been identified as quality control records? Have retention times been established?	A document retention policy is in place. Except carbon analyzer, control charts are in place and qualification studies are performed at least annually.
128	QC	Are quality control records stored in such a manner to protect against damage, deterioration, and loss?	Hard copies and electronic documents are used.
129	QC	Are all QC data reviewed by the QA Officer?	Yes
130	QC	Are Corrective Action Reports used correctly? Who initiates the CARs? How are they tracked?	Yes - Corrective action reports are issued from the QA Branch as QA issues are identified from , inspection internal audits or external TSAs.
131	QC	If a QC analysis fails, is the entire batch re-analyzed?	Depends on when the QC failure occurs. Post batch - yes. Pre-batch corrective action is performed before samples are analyzed.
132	QC	Does the QA officer review all client data packages?	QA Manager Reviews data submitted to AQS, end user would vary
133	QC	How is this review documented?	QA Manager approves data submitted to AQS. Failures result in CAR documenting failures.
134	QC	What steps are taken to ensure that all materials, reagents, standards, chemicals, etc, meet requirements for high quality and reliability?	Materials, reagents, standards, chemicals, etc, are purchased from established suppliers and must meet ACS or better standards for purity.

Item	Category	Question	Response
135	Safety	Is there a formal health and safety program in place at AQMD?	AQMD has a Risk Manager for the agency and the lab has a Safety Officer. Safety committee will meet periodically to discuss safety issues
136	Safety	Who is authorized to halt program activities due to health or safety issues?	The AQMD Risk Manager, Lab Manager or their designee can halt activity
137	Safety	Is there special safety equipment required to ensure the health and safety of personnel?	Fire extinguishers, eye washes, safety showers, smoke alarms, hood alarms, first aid kits, evacuation plan
138	Safety	Are personnel outfitted with any required safety equipment?	Lab coats and gloves as needed
139	Safety	Are personnel adequately trained regarding appropriate safety procedures?	Formal training is needed and is planned for use of safety equipment. New employees are given orientation which includes where safety equipment are located and evacuation procedures.
140	Safety	Is there a Hazard Communication Worker Right-to-Know Program implemented?	Yes
141	Safety	Are Material Safety Data Sheets available and easily accessible for all chemicals kept on-site?	Yes
142	Safety	What kind of safety training is done, on what schedule, and how is it documented?	New employees are given orientation which includes where safety equipment are located and evacuation procedures. New employees sign a document attesting to orientation completion . This is filed in Human Resources.
143	Safety	Is a chemical hygiene plan available and implemented?	The Chemical Hygiene Plan was revised in 2009
144	Safety	Are fire extinguishers and other safety equipment appropriate, in place, and clearly marked?	Yes
145	Safety	Are gas cylinders anchored and secure?	Yes
146	Safety	Is fume hood monitoring performed and documented?	Yes
147	Safety	Are personal safety items such as lab coats, safety	Yes

Item	Category	Question	Response
		glasses, and safety shields in place?	
148	Safety	Is there evidence of smoking, eating, or drinking in laboratory areas?	No
149	Safety	Is safety equipment checked at recommended or required frequency?	Yes
150	PEs / Audits	Are Performance Testing samples from an external source prepared and analyzed on a regular basis?	Yes
151	PEs / Audits	Does the QA staff provide single blind and/or double blind samples for analysis on a regular basis? If so, for what tests?	Filter blind samples have been ordered
152	PEs / Audits	Is the analytical performance on PT samples consistently acceptable?	Not enough PT samples performed for PM2.5 speciation program to assess consistency yet; Corrective action is implemented when PT samples results do not fall within specified criteria
153	PEs / Audits	Do analysts and supervisors receive feedback on PT results, nonconformances, and corrective actions?	Yes
154	PEs / Audits	Are corrective actions taken on failed parameters for PT samples?	Yes
155	PEs / Audits	Are corrective actions documented and filed to be easily accessible for review?	Yes
156	PEs / Audits	Are PT results monitored and trends noted?	Yes
157	PEs / Audits	Are PT results and the results of corrective actions reported to management?	Yes
158	PEs / Audits	Is a complete systems audit performed by the QA staff at some established minimum frequency?	Yes
159	PEs / Audits	Are routine internal inspections conducted monthly by the QA staff?	Yes - In the lab, the Senior AQ Chemist reviews notebooks and available QA data weekly.
160	PEs / Audits	Have external audits been conducted of the AQMD facility in the past for those operations currently	2009 was the first year the AQMD participated in a speciation study

Item	Category	Question	Response
		performed for the PM2.5 Speciation program? Give details.	
161	PEs / Audits	Are corrective actions to audit findings completed in a timely manner?	Yes, corrective action deadlines are tracked, and modified pending priorities or extra difficulty in resolving finding
162	PEs / Audits	For any audit, are audit findings distributed to AQMD staff?	Yes
163	PEs / Audits	Are corrective actions to audit findings complete, well documented, and accessible for review?	Yes - CARs contain information satisfying this requirement
164	PEs / Audits	Are records of all audits, findings, responses, and corrective actions easily accessible for review during this TSA?	Yes
165	Sample Rec.	What action will be taken if a comment on the field log sheet states that the grass around the shelter was mowed during a collection event?	Recorded on Chain of Custody Sheet
166	Sample Rec.	Which staff members are authorized to amend the primary records received from the field operator? How are amendments documented?	Senior AQIS, Spreadsheet Documentation
167	Sample Rec.	How long are records from the field site operator retained?	Keep for one year
168	Grav.mass	How are filters conditioned before gravimetric mass measurements are taken?	Filters are conditioned in a humidity and temperature controlled room
169	Grav.mass	Are the temperature and relative humidity (RH) inside the conditioning environment recorded on a continuous basis during filter conditioning?	Yes
170	Grav.mass	Describe the temperature and RH measurement devices and data recording system, including the sampling frequency.	QA SENSOR TYPE: Omega Digital RH and thermistor/thermometer sensor - Continous
171	Grav.mass	Is the calibration of the temperature and RH devices verified on a regular basis?	ARB performs an annual audit; Device certified annually

Item	Category	Question	Response
172	Grav.mass	Do laboratory records indicate that the filter conditioning environment provides a mean temperature (over 24 hours) between 20 and 23 degrees C, and temperature stability (measured as one standard deviation) less than 2 degrees C?	Yes
173	Grav.mass	Do laboratory records indicate that the filter conditioning environment provides control of the RH such that the mean RH (over 24 hours) is between 30 and 40 percent and the RH stability (measured as one standard deviation) is less than 5 percent?	Yes
174	Grav.mass	Do laboratory records indicate that the mean RH during postsampling conditioning is within 5 percent the RH value during presampling conditioning?	Yes
175	Grav.mass	Does the laboratory analyst check the temperature and RH data from the preceding 24 hours before starting a weighing session?	Yes
176	Grav.mass	Describe any air filtration system.	Yes
177	Grav.mass	Is a sticky floor-mat located at the entrance to the conditioning environment?	Yes
178	Grav.mass	Is the conditioning environment clean?	Yes
179	Grav.mass	What is the manufacturer and model of each microbalance used to weigh sample filters?	Mettler AE200 (#4999), Sartorius MC5 A, Sartorius MC5 B
180	Grav.mass	Has the microbalance been modified in any way since it was received from the manufacturer? If so, what was the modification?	None
181	Grav.mass	Does the microbalance have a specified readability and resolution of at least 1 microgram?	Yes
182	Grav.mass	Does the microbalance have adequate weight capacity and weighing pan surface area to accommodate sample filters?	Yes
183	Grav.mass	Does the weighing laboratory have a service agreement	Yes

Item	Category	Question	Response
		for periodic microbalance calibration and servicing?	
184	Grav.mass	Is the microbalance recalibrated externally and serviced at least yearly?	Yes
185	Grav.mass	Is the microbalance recalibrated externally using the laboratory's standards or provided by the service technician?	Watson Brothers provides annual balance calibration
186	Grav.mass	After the recalibration, are the weights of the laboratory's standards within the specified tolerance of their certified values?	Yes
187	Grav.mass	Is the microbalance located in an area that is free from vibration, contamination, drafts, and temperature gradients?	Yes
188	Grav.mass	Is the microbalance mounted on a sturdy base?	Yes
189	Grav.mass	Is the microbalance located in the filter conditioning environment?	Yes
190	Grav.mass	Are ANSI/ASTM Class 1 mass reference standards used as working standards for the microbalance quality control checks?	Yes
191	Grav.mass	Does the range of the mass reference standards bracket the mass of PM2.5 filters?	Yes
192	Grav.mass	Are the mass reference standards recertified on a regular basis (e.g. yearly)?	Yes
193	Grav.mass	Is the recertification traceable to NIST via a State weights and measures laboratory or a NVLAP-accredited laboratory?	Yes
194	Grav.mass	Does the weighing laboratory have laboratory primary standards as well as working standards?	Yes
195	Grav.mass	Are the working standards' masses verified against the laboratory primary standards every 3 to 6 months?	Yes
196	Grav.mass	Are the working standard verification data recorded in a notebook or data base?	Yes

Item	Category	Question	Response
197	Grav.mass	Do the verification records indicate that the mass of the working standard is stable?	Yes
198	Grav.mass	Are the mass reference standards handled using clean, smooth, nonmetallic forceps?	Yes
199	Grav.mass	Are the mass reference standard forceps different from the filter-handling forceps?	Yes
200	Grav.mass	Is the filter handling and weighing area clean?	Yes
201	Grav.mass	Is the filter handling and weighing area cleaned before each weighing session?	Yes
202	Grav.mass	Does the laboratory analyst wear clean laboratory clothing and antistatic, powder-free gloves to reduce contamination?	Yes
203	Grav.mass	Are the filters handled by their support rings using clean, smooth, nonserrated forceps?	Yes
204	Grav.mass	Briefly describe the procedure that is followed to prepare unexposed filters for shipment into the field after their presampling weighing.	See draft QAPP or SOP0087
205	Grav.mass	Is the temperature of the exposed filters recorded upon their receipt from the field?	Yes
206	Grav.mass	Briefly describe the procedure that is followed after an exposed filter is received from the field, including the filter storage temperature.	See SOP0104
207	Grav.mass	How does the laboratory track its filter inventory?	See SOP0104
208	Grav.mass	How and where is a filter lot stored when it is first received by the weighing laboratory?	See SOP0104
209	Grav.mass	Are filters kept in their original, sealed containers until they are inspected?	Yes
210	Grav.mass	Are all filters visually inspected for defects immediately before both presampling and postsampling conditioning?	Yes
211	Grav.mass	Are the results of the inspection recorded?	
212	Grav.mass	What happens when a defective filter is discovered	See SOPs SOP0087, SOP0096 and SOP0097

Item	Category	Question	Response
		during presampling inspection?	
213	Grav.mass	What happens when a defective filter is discovered during postsampling inspection?	Document it on the custody sheet.
214	Grav.mass	How are filters stored during conditioning?	In open petri dishes placed on cabinet shelf.
215	Grav.mass	Are filters stored in Petri dishes or other suitable containers during conditioning?	Yes
216	Grav.mass	Are filters conditioned for at least 24 hours?	Yes
217	Grav.mass	What is the filter conditioning period and how was it determined?	See above. EPA PM2.5 filters conditioning guidance criteria
218	Grav.mass	Are filters conditioned at the same conditions (RH within +/- 5 percent) before presampling and before postsampling weighings?	Yes - Filters are stored pre and post sampling in a temperature and humidity controled room.
219	Grav.mass	Are records of filter conditioning kept?	Yes - see logbooks
220	Grav.mass	Do any such records show that filter conditioning procedures are being followed?	Yes - see logbooks
221	Grav.mass	Are lot blanks in each filter lot weighed to determine the filter weight stability?	Yes - see logbooks
222	Grav.mass	How many lot blanks in each lot are weighed?	Yes - see logbooks
223	Grav.mass	Do the data from the filter weight stability experiments support the filter conditioning period being used in the laboratory?	Yes - see logbooks
224	Grav.mass	Are laboratory blanks weighed routinely during weighing sessions? If so, what warning/control limits are applied?	Yes - see logbooks
225	Grav.mass	How many laboratory blanks are weighed during weighing sessions?	At least one blank daily
226	Grav.mass	Do laboratory blank weighings indicate that the conditioning environment is contaminated (i.e., weight change exceeds 15 micrograms)?	No contamination potential should be Noted
227	Grav.mass	Are field blanks weighed routinely along with PM2.5 filters during presampling and postsampling weighing	Yes - see logbooks

Item	Category	Question	Response
		sessions? If so, what warning/control limits are applied?	
228	Grav.mass	How frequently do laboratory records indicate that field blanks are collected and weighed?	Daily
229	Grav.mass	Do field blank weighings indicate that contamination exists in the field (i.e., weight change exceeds 30 micrograms)?	No contamination potential should be Noted
230	Grav.mass	What action is taken if laboratory or field blank acceptance criteria are exceeded?	A single failure results in an investigation; multiple failures result in a CAR
231	Grav.mass	Are the microbalance and other electronic equipment properly grounded?	Yes
232	Grav.mass	Are nonconductive surfaces of the microbalance coated with an antistatic solution, if necessary?	No
233	Grav.mass	Is the weighing chamber cleaned with a fine, antistatic brush, if necessary?	Yes
234	Grav.mass	Are polonium antistatic units used to remove static from filters?	Yes
235	Grav.mass	Are the polonium antistatic units replaced every six months?	Yes
236	Grav.mass	Are any other electrostatic charge neutralization techniques (e.g., antistatic floor mats and antistatic shipping bags) being used?	No
237	Grav.mass	Are presampling and postsampling weighing of filters done on the same microbalance?	Yes
238	Grav.mass	Are filters weighed immediately following conditioning without intermediate or transient exposure to other conditions or environments?	Yes
239	Grav.mass	Are two working standards weighed at the beginning and end of each weighing session?	Yes
240	Grav.mass	Is at least one working standard reweighed after approximately every tenth filter?	Yes

Item	Category	Question	Response
241	Grav.mass	Do verified and measured values of the working standard agree to within 3 micrograms? What action is taken if this acceptance criterion is exceeded?	Yes - weights may be reweighed, balance checked with the primary standard, or recalibrated by external contractor
242	Grav.mass	Is at least one routine filter reweighed at the end of the weighing session?	Yes
243	Grav.mass	Do original and replicate measurements of routine filters agree to within 15 micrograms? What action is taken if this acceptance criterion is exceeded?	Yes - reweighing may be performed, an investigation is done, standards are weighed, etc.
244	Grav.mass	If exposed filters are stored at ambient temperature from retrieval to conditioning, is the postsampling weighing completed within 10 days after the end of the sample period?	Yes
245	Grav.mass	If exposed filters are stored at 4 degrees C or less from retrieval to conditioning, is the postsampling weighing completed within 30 days after the end of the sample period?	Yes
246	Grav.mass	Are routine filter loadings corrected by weight gains in laboratory or field blanks?	No if filter differences are within the uncertainty
247	Grav.mass	Briefly describe how the QC data from gravimetric mass measurements are recorded and evaluated.	Staff verify that data satisfy QC requirements - review by ARB audit and QA staff examination occur. Data is recorded in a log book.
248	Grav.mass	Do the laboratory records show that the QC checks are being performed at the required frequency and in the required manner?	Yes
249	Grav.mass	Does the laboratory analyst maintain control charts for QC data or otherwise monitor long-term trends in these data?	Yes
250	Grav.mass	Does a qualified person, such as the QA manager or the program manager, review and certify laboratory records (e.g., routine filter weighings, QC data, and data	Yes

Item	Category	Question	Response
		completeness) on a routine basis?	
251	Grav.mass	Is an internal accuracy assessment of each microbalance conducted on an annual basis?	Yes
252	Grav.mass	Do the measured and certified weights of the assessment standard agree to within 20 micrograms? What action is taken if this acceptance criterion is exceeded?	Yes - the weights may be recertified by Watson Brothers
253	Grav.mass	Describe the procedures that are used to store or archive filters after their postsampling weighings.	See SOP104
254	Grav.mass	How long are these filters stored?	Two years
255	Grav.mass	What are the storage conditions?	Filters are stored in a temperature and humidity controled room.
256	Grav.mass	What records are kept about these filters?	Log book contains: filter identifier, weights (pre and post), QC information and unusual conditions
257	Grav.mass	Describe the laboratory record keeping system.	Logbooks and electronic records – LIMS going on-line soon
258	Grav.mass	Are standard paper or electronic forms used to record filter weighing data, conditioning environment data, and quality control data?	Yes
259	Grav.mass	Are these laboratory records kept up to date and properly filled in?	Yes
260	Grav.mass	Are the laboratory records dated?	Yes
261	Grav.mass	Is the laboratory analyst who recorded the data identified?	Yes
262	Grav.mass	Are paper records written in permanent ink?	Yes
263	Grav.mass	Describe how outgoing and incoming filters are tracked in the laboratory records.	Filter records are maintained in a logbook
264	Grav.mass	Is there a formal maintenance logbook or file for the microbalance? Are the entries current?	Yes
265	Grav.mass	How are filter holder cassettes currently recycled?	Yes

Item	Category	Question	Response
266	Grav.mass	You are the technician scheduled to remove a filter from the cassette, and you discover that a filter is missing. What action do you take?	Track down the filter ID that was placed in that casette. Contact the field operator. Inform the chemist in charge.
267	Grav.mass	You are the technician weighing a filter already loaded with PM2.5, and you accidentally drop the filter onto the floor before the mass measurement is taken. What action do you take?	Inform the chemist in charge. Either flag or invalidate the data point.
268	Grav.mass	You are the technician weighing filters, and you notice that the balance fails to return to zero between samples such that the empty weighing pan displays a negative mass value of -0.007 mg. What action do you take?	Recalibrate the balance as per the SOP. If it still does not read 0.000mg, contact the chemist in charge.
269	Grav.mass	What method is used at AQMD to estimate the uncertainty of measurement for gravimetric mass?	Guidelines for determining uncertainty for all measurements has been documented, present in SOP
270	Reporting	Exactly what data are reported to AQS?	Gravimetric mass, XRF, IC, and OC/EC data including QC
271	Reporting	What are the elements of data validation performed at AQMD before the analytical results are reported to AQS?	First - line staff review and examine data. Second Principal Chemist reviwes dta and the QA Manager performs a final review before certifying data
272	Reporting	Do the current data flags sufficiently communicate critical information to the data users?	AQMD uses data flags as available in AQS, but flags sometimes do not fit conditions 273 Reporting
273	Reporting	If a flow rate problem is discovered during the annual field audit, what action is taken to inform the data users?	Corrective action process used to investigate issue; if confirmed flow problem, then reported on AQS data summary flag sheet for data submitters to flag data to last known good calibration/ flow check date
274	Reporting	How is completeness calculated?	Number scheduled samples divided by number of reportable results
275	Reporting	What are the most common reasons for declaring a	Most Frequent: Field Issues (e.g. Insufficient

Item	Category	Question	Response
		sample invalid? What is the most unusual reason?	air volume, operator error, etc.) Least Frequent: Natural Events
276	XRF	How many XRF instruments are used to analyze PM2.5 filters? If more than one instrument is used, what studies are available that compare results between instruments?	One XRF is designated for PM2.5. It's equiped w/ a Sc/W dual anode x-ray tube.
277	XRF	What is the manufacturer and model of each XRF instrument used to analyze filters from the PM2.5 Speciation Program?	PANalytical Epsilon 5 EDXRF equiped w/ SC/W x-ray tube.
278	XRF	How many spectra are normally required to complete the XRF analysis and what are the instrumnet conditions for each spectrum?	Ten spectra are used to complete Analysis
279	XRF	Are samples analyzed under vacuum, helium purge, or some other atmosphere?	Under vacuum (PM2.5)
280	XRF	How is the XRF energy calibration performed for the multi-channel analyzer, and how often is it repeated?	Detector calibration performed once per week (168 hrs)
281	XRF	What minimum detector resolution is required before acceptable qualitative analysis can be achieved?	165 eV (manufacture specification)
282	XRF	How many standards are used to develop the calibration curves for quantitative analysis? Are some elements determined by interpolation?	One standard is used per element (47 calibration stds used) No interpolation.
283	XRF	How closely does the matrix and presentation geometry match for XRF samples and standards?	Micromatter Co. thin film standards
284	XRF	Are any of the standards multi-element? If so, how were they prepared?	No. Purchased from Micromatter Co.
285	XRF	How are background corrections performed, and what is the history of blank filters that are used for spectral corrections?	Background corrections performed by software. Calculates the scattered background & subtracts it from the sample
286	XRF	Are attenuation corrections made for the lighter elements? If so, how were the correction factors determined?	No corrections are made other than the software corrections; compton matrix correction models and deconvolution.

Item	Category	Question	Response
287	XRF	What are the components of uncertainty for XRF results?	Detection limit, Std Dev of deposit area of filter sample, air volume (std dev of flow variation), & calibration std uncertainity
288	XRF	How is the XRF uncertainty calculated?	Sum of Squares of the ratio of uncertainty components (See SOP)
289	XRF	Briefly, how is the arsenic (As) result calculated if lead (Pb) is also present in the sample?	Software uses line overlap correction and deconvolution to mathematically determine individual peaks from each element
290	XRF	What is the maximum acceptable dead time? What action is taken when this level of dead time is exceeded?	50% PM2.5 filters rarely exceed 10 % deadtime due to the low mass density.
291	XRF	What effort has been made to evaluate the homogeneity of the filter deposit?	The sample holder cups spins continous throughout the analysis at a specified speed to compensate for any homogeneity.
292	XRF	What value is used for the deposit area of a filter sample, and how was it determined?	12 cm2 is the value for the deposit area of sample; 15 deposited filters were manually measured and the average was taken.
293	XRF	Are negative concentrations reported?	No, negative concenrations are replaced w/ MDL values
294	XRF	Are the raw data files stored as ASCII text?	Yes
295	XRF	Is there a visual or audible warning device to indicate that the x-ray tube is energized?	Visual; yellow button stay lit on control panel and yellow light on top of instrument are lit while x-ray tubeis on. It can also be checked in the PANalytical software under the view-maintenance window.
296	XRF	What method is used at AQMD to estimate the uncertainty of XRF results?	Sum of Squares of the ratio of uncertainty components (See SOP)
297	IC	What analytes are reported from the IC analysis? Are some of the ions determined using another analytical technique?	Anions: Cl, NO3, and SO4. Cations: Na, NH4, and K
298	IC	What is the manufacturer and model of each IC used to analyze filter sample extracts from the PM2.5 Speciation	Anions: Dionex -120 Cations: Metrohm System with IC Net 2.3

Item	Category	Question	Response
		Program?	Software
299	IC	How often is the instrument calibrated?	Anions: At the beginning of EVERY run. Cations: at the beginning of every run
300	IC	How often is the instrument calibration checked and how?	Anions: After the 10th run a check std is run. Cations: Each run with NIST tracable control
301	IC	How many levels of analyte are used for calibration to check linearity?	Anions: 6 Cations: at least four levels
302	IC	Do any of the analytes have a nonlinear calibration curve?	Anions: EPA method 300 for Anions uses a quadratic curve. Cations: no
303	IC	Is the instrument operated with an isocratic profile for the mobile phase?	Anions: yes Cations: yes
304	IC	How are the calibration standards themselves checked for accuracy?	Anions: An independent standard is run several times during the run. Cations: they are checked with control standard
305	IC	What is the concentration of the lowest calibration standard, and what is the injection volume?	Anions: 0.05ppm for Cl. 1ml sample loop is used. Cations: 0.2ppm, it was injected through 40 ul sample loop
306	IC	Are laboratory blanks analyzed on a regular basis? If so, how are those data used?	Anions: Every extraction a lab blank is generated and analyzed. If results are high it is reported to the supervisor for corrective action. Cations: yes. It is subtracted from the field samples
307	IC	Are analytical results corrected for contamination observed in laboratory or field blanks?	Anions: No contamination observed so far Cations: no
308	IC	How is sensitivity of the IC method evaluated?	Anions: We run the low standard 10 times, spaced between 10 D.I. water runs. Cations: LOD is calculated when changing column or semiannually. Lowest standard is

Item	Category	Question	Response
			run in replicate to determine 3SD
309	IC	How is precision and accuracy of the IC method evaluated?	Anions: By analysis of an independent standard. Cations: duplicate samples are run for each field samples and RPD is calculated. RPA (Relative Percent Accuracy) is also calculated for control sample).
310	IC	If multiple instruments are used, has the precision been evaluated between instruments?	Only one instrument each are used for both Anions and Cations
311	IC	Has chemical interference been observed in chromatograms?	Anions: Only acid contamination has been observed which abrogates the results which are then re-run. Cations: Very rarely
312	IC	What specific filter media are used to collect PM2.5 for subsequent IC analysis?	Anions: Teflon filters, Quartz, Nylon and acidified Quartz 47mm filters Cations: Quartz and Nylon
313	IC	Is the filter split into subsamples before it is extracted? If so, has there been any effort to evaluate the crossover and accuracy of the subsampling technique?	Anions: N / A Cations: No
314	IC	What solvent is used to extract the filter for IC analysis?	Anions: Nanopure D.I. water Cations: DI water
315	IC	What is the effective total extract volume (mL/filter)?	Anions: with the exception of the anion and cation spikes the extraction volume is 30mls. Cations: 30 ml
316	IC	Is the filter extraction assisted by application of an external source of energy such as sonication or shaking? If so, for what period of time?	Anions: Samples are sonicated for 60 minutes, then put on the orbital shaker 60 minutes and then centrifuged for 30 minutes. Cations: the extracts are sonicated for 30 min
317	IC	How long are extracts retained in archive before they are disposed, and what are the archive conditions?	Anions: Three months in a refrigerator @ 45 degrees Farenheight and then a minimum of 9 months in a store room at approx. 70 degrees

Item	Category	Question	Response
			farenheight. Cations: the extracts are kept in referidgerator before analysis and moved to storage for at least one year before disposed
318	IC	Are the raw data files stored as ASCII text?	Anions: No, an excel file. Cations: No, they are stored as MS Excel files.
319	IC	You are the instrument technician looking at a chromatogram, and you notice a sulfate peak that is larger than your highest calibration standard. What action do you take?	Anions: Check the duplicate and rerun if necessary then if dictated dilute and re-run sample. Cations: make a dilution and run it again
320	IC	You are the extraction technician and you accidentally drop an exposed filter on the floor before it is extracted. What action do you take?	Anions: Mark the sample as invalid record in logbook and notify supervisor. Cations: Invalidate sample
321	IC	What method is used at AQMD to estimate the uncertainty of IC results?	Anions: Identify uncertainity components, quantify and convert to standard uncertainity and use the Root of Sum of Squares equatin to calculate expanded uncertaintiy. Cations: Uncertainty components are identified, volume dilution, standard concentration purity, instrument drift; all converted to standard uncertainty and the Root of the Sum of the Squares formula used to calculate the expanded uncertainty
322	OC/EC	What carbon fractions are reported from the OC/EC analysis?	Only bulk OC and EC are reported presently (Until January, 2010
323	OC/EC	What is the manufacturer and model of each OC/EC instrument used for the PM2.5 Speciation Program?	DRI/Model 2001
324	OC/EC	How often is the instrument calibrated, and what carbon sources are used for calibration?	Every 6 months, KHP
325	OC/EC	How often is the instrument calibration checked and what source of carbon is used for the calibration check?	Daily check is with a gas standard

Item	Category	Question	Response
326	OC/EC	How many levels of analyte are used for calibration to check linearity?	Three levels with three injections at each level.
327	OC/EC	Is the calibration curve forced through zero?	No
328	OC/EC	How are the calibration standards themselves checked for accuracy?	Calibration Curve is checked against NIST certified standards
329	OC/EC	Is the instrument ever programmed to inject the internal standard more than once so that its response can be evaluated at more than one place in the thermogram?	During the calibration run three injections are made, one in the OC, on in EC, and the normal calibration injection.
330	OC/EC	What is the mass of carbon present in the lowest calibration standard?	9 ug fo KHP; 27 ug for Methane & CO2
331	OC/EC	Are laboratory blanks analyzed on a regular basis? If so, how are those data used?	Daily and/or with each batch - data is used to assess whether there is contamination
332	OC/EC	Are analytical results corrected for contamination observed in laboratory or field blanks?	No
333	OC/EC	How is sensitivity of the OC/EC method evaluated?	Replicate runs of lowest standard and calculation of 3*SD
334	OC/EC	How is precision and accuracy of the OC/EC method evaluated?	Through routine check standard Injections
335	OC/EC	If multiple instruments are used, has the precision been evaluated between instruments?	Yes, all instruments use the same check standard
336	OC/EC	What specific filter media are used to collect PM2.5 for subsequent OC/EC analysis?	Quartz filters
337	OC/EC	Since a punch device is used to divide the filter into subsamples, has there been any effort to evaluate crossover from the punch device?	Punches are cleaned between punches and blank filters are reviewed for carbon content
338	OC/EC	How was the area of the punch device determined?	By the manufacturer
339	OC/EC	What filter deposit area is used to calculate micrograms of carbon per filter (µgC/filter)?	0.497 cm2
340	OC/EC	What grade of helium is used to feed the instrument, and is the helium supply subjected to further inline purification?	UHP helium

Item	Category	Question	Response
341	OC/EC	What kind of tubing is used for the helium line, and is there an inline oxygen indicator near the instrument?	Copper tubing, oxygen trap and indicator is on order
342	OC/EC	How long are filter remnants retained in archive before they are disposed, and what are the archive conditions?	Two years
343	OC/EC	Are the raw data files stored as ASCII text?	Yes
344	OC/EC	You are the instrument technician, and you notice that the internal standard peak area has been gradually decreasing over the past few sample runs such that it is down to half its normal size for the last sample. What action do you take?	Instrument flows are checked, system is checked for leaks. If peak remains low the supervising chemist is informed.
345	OC/EC	What method is used at AQMD to estimate the uncertainty of OC/EC results?	Uncertainity components are identified, such as filter deposit variability, detection limit, instrument repeatability. These are converted to standard uncertainity and the Root of the Sum of the Squares formula used to calculate the expanded uncertainity
346	Field	Does AQMD staff have any responsibility to perform field audits? If so, briefly what items/activities are checked?	Being conducted/ flows/ cleanliness/ log books
347	Field	What speciation samplers are used at the supported field monitoring sites?	Met one SASS/ URG
348	Field	What are the most common mistakes made by the field operators?	Communication/ shipments of samples back and forth/ Shipping Logistics
349	Field	How important is it to know the local time at every field site?	90% of programs use standard time; PAMS uses local time
350	Field	What additional training, if any, do the field operators need?	Cyclone cleaning/ Occasional Refresher training